

# Package ‘DIAAlignR’

May 13, 2024

**Type** Package

**Title** Dynamic Programming Based Alignment of MS2 Chromatograms

**Version** 2.12.0

## Description

To obtain unbiased proteome coverage from a biological sample, mass-spectrometer is operated in Data Independent Acquisition (DIA) mode. Alignment of these DIA runs establishes consistency and less missing values in complete data-matrix. This package implements dynamic programming with affine gap penalty based approach for pair-wise alignment of analytes. A hybrid approach of global alignment (through MS2 features) and local alignment (with MS2 chromatograms) is implemented in this tool.

**License** GPL-3

**Encoding** UTF-8

**LazyData** false

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**Depends** methods, stats, R (>= 4.0)

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---

|                |                                      |
|----------------|--------------------------------------|
| addFlankToLeft | <i>Add signal to the left of XIC</i> |
|----------------|--------------------------------------|

---

## Description

This function copies flanking chromatogram from XIC and paste it to the left of newXIC.

## Usage

```
addFlankToLeft(flankSeq, XIC, newXIC)
```

## Arguments

|          |  |
|----------|--|
| flankSeq | (logical) must be TRUE at the front of the vector.             |
| XIC      | (data-frame) first column is time, second column is intensity. |
| newXIC   | (data-frame) first column is time, second column is intensity. |

## Value

(dataframe) has two columns:

|           |           |
|-----------|-----------|
| time      | (numeric) |
| intensity | (numeric) |

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**See Also**

[childXIC](#), [addFlankToRight](#)

**Examples**

```
time <- seq(from = 3003.4, to = 3048, by = 3.4)
y <- c(0.2050595, 0.8850070, 2.2068768, 3.7212677, 5.1652605, 5.8288915, 5.5446804,
      4.5671360, 3.3213154, 1.9485889, 0.9520709, 0.3294218, 0.2009581, 0.1420923)
chrom <- data.frame(time, y)
chrom2 <- data.frame(time = c(3013.4, 3016, 3020), intensity = c(1.2, 3.4, 5.6))
flankSeq <- as.logical(c(1,1,0,0,0,0,0,0,0,0,0,0,1,1))
## Not run:
addFlankToLeft(flankSeq, chrom, chrom2)

## End(Not run)
```

---

|                 |                                       |
|-----------------|---------------------------------------|
| addFlankToRight | <i>Add signal to the right of XIC</i> |
|-----------------|---------------------------------------|

---

**Description**

This function copies flanking chromatogram from XIC and paste it to the right of newXIC.

**Usage**

```
addFlankToRight(flankSeq, XIC, newXIC)
```

**Arguments**

|          |  |
|----------|--|
| flankSeq | (logical) must be TRUE at the tail of the vector.              |
| XIC      | (data-frame) first column is time, second column is intensity. |
| newXIC   | (data-frame) first column is time, second column is intensity. |

**Value**

(dataframe) has two columns:

|           |           |
|-----------|-----------|
| time      | (numeric) |
| intensity | (numeric) |

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**See Also**

[childXIC](#), [addFlankToLeft](#)

**Examples**

```
time <- seq(from = 3003.4, to = 3048, by = 3.4)
y <- c(0.2050595, 0.8850070, 2.2068768, 3.7212677, 5.1652605, 5.8288915, 5.5446804,
      4.5671360, 3.3213154, 1.9485889, 0.9520709, 0.3294218, 0.2009581, 0.1420923)
chrom <- data.frame(time, y)
chrom2 <- data.frame(time = c(3013.4, 3016, 3020), intensity = c(1.2, 3.4, 5.6))
flankSeq <- as.logical(c(1,1,0,0,0,0,0,0,0,0,0,0,1,1))
## Not run:
addFlankToRight(flankSeq, chrom, chrom2)

## End(Not run)
```

---

addXIC

*Add XIC to pyopenms experiment*

---

**Description**

A chromatogram and its respective native ID (transition ID) is added to MSEExperiment object.

**Usage**

```
addXIC(ropenms, experiment, xic, nativeId)
```

**Arguments**

|            |  |
|------------|--|
| ropenms    | (pyopenms module) get this python module through <code>get_ropenms()</code> .        |
| experiment | (python object) an <code>MSEExperiment()</code> created using <code>ropenms</code> . |
| xic        | (data-frame) must have two numeric columns.  |
| nativeId   | (integer) transition ID of the xic.  |

**Value**

(None)

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**Examples**

```
## Not run:
ropenms <- get_ropenms(condaEnv = "envName", useConda=TRUE)
exprimnt <- ropenms$MSExperiment()
data(XIC_QFNNTDIVLLEDFQK_3_DIAalignR)
xic <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120808_Strep10%PlasmaBio1Rep11_R03_SW_filt"]][["4618"]][[1]]
addXIC(ropenms, expriment, xic, 34L)
chroms <- expriment$getChromatograms()
reticulate::py_to_r(chroms[[0]]$getNativeID())
reticulate::py_to_r(chroms[[0]]$get_peaks())

## End(Not run)
```

---

AffineAlignObj-class    *An S4 object for class AffineAlignObj*

---

**Description**

s is a point-wise similarity matrix between signalA and signalB. Intermediate matrices M,A,B are calculated from s for affine-alignment. Each cell of the Traceback matrix has coordinate of its parent cell. path matrix is a binary matrix with ones indicating path of maximum cumulative score. GapOpen and GapExten are gap-opening and gap-extension penalties used by affine alignment algorithm. indexA\_aligned and indexB\_aligned are aligned indices of signalA and SignalB. The cumulative alignment score is in score vector.

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**See Also**

[doAffineAlignmentCpp](#)



---

AffineAlignObjLight-class

*An S4 object for class AffineAlignObjLight It only contains aligned indices.*

---

### Description

indexA\_aligned and indexB\_aligned are aligned indices of signalA and SignalB. The cumulative alignment score is in score vector.

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### See Also

[doAffineAlignmentCpp](#)

---

AffineAlignObjMedium-class

*An S4 object for class AffineAlignObjMedium. It only contains similarity matrix and aligned indices.*

---

### Description

s is a point-wise similarity matrix between signalA and signalB. path matrix is a binary matrix with ones indicating path of maximum cumulative score. GapOpen and GapExten are gap-opening and gap-extension penalties used by affine alignment algorithm. indexA\_aligned and indexB\_aligned are aligned indices of signalA and SignalB. The cumulative alignment score is in score vector.

### Author(s)

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### See Also

[doAffineAlignmentCpp](#)

---

alignChromatogramsCpp *Aligns MS2 extracted-ion chromatograms(XICs) pair.*

---

### Description

Aligns MS2 extracted-ion chromatograms(XICs) pair.

### Usage

```
alignChromatogramsCpp(  
  l1,  
  l2,  
  alignType,  
  tA,  
  tB,  
  normalization,  
  simType,  
  B1p = 0,  
  B2p = 0,  
  noBeef = 0L,  
  goFactor = 0.125,  
  geFactor = 40,  
  cosAngleThresh = 0.3,  
  OverlapAlignment = TRUE,  
  dotProdThresh = 0.96,  
  gapQuantile = 0.5,  
  kerLen = 9L,  
  hardConstrain = FALSE,  
  samples4gradient = 100,  
  objType = "heavy"  
)
```

### Arguments

|               |  |
|---------------|--|
| l1            | (list) A list of numeric vectors. l1 and l2 should have same length.                       |
| l2            | (list) A list of numeric vectors. l1 and l2 should have same length.                       |
| alignType     | (char) A character string. Available alignment methods are "global", "local" and "hybrid". |
| tA            | (numeric) A numeric vector. This vector has equally spaced timepoints of XIC A.            |
| tB            | (numeric) A numeric vector. This vector has equally spaced timepoints of XIC B.            |
| normalization | (char) A character string. Normalization must be selected from (L2, mean or none).         |

|                  |  |
|------------------|--|
| simType          | (char) A character string. Similarity type must be selected from (dotProductMasked, dotProduct, cosineAngle, cosine2Angle, euclideanDist, covariance, correlation, crossCorrelation).<br>Mask = $s > \text{quantile}(s, \text{dotProdThresh})$<br>AllowDotProd = $[\text{Mask} \times \text{cosine2Angle} + (1 - \text{Mask})] > \text{cosAngleThresh}$<br>$s_{\text{new}} = s \times \text{AllowDotProd}$ |
| B1p              | (numeric) Timepoint mapped by global fit for tA[1].  |
| B2p              | (numeric) Timepoint mapped by global fit for tA[length(tA)].   |
| noBeef           | (integer) It defines the distance from the global fit, upto which no penalization is performed.<br>The window length = $2 * \text{noBeef}$ .   |
| goFactor         | (numeric) Penalty for introducing first gap in alignment. This value is multiplied by base gap-penalty.  |
| geFactor         | (numeric) Penalty for introducing subsequent gaps in alignment. This value is multiplied by base gap-penalty.  |
| cosAngleThresh   | (numeric) In simType = dotProductMasked mode, angular similarity should be higher than cosAngleThresh otherwise similarity is forced to zero.  |
| OverlapAlignment | (logical) An input for alignment with free end-gaps. False: Global alignment, True: overlap alignment.   |
| dotProdThresh    | (numeric) In simType = dotProductMasked mode, values in similarity matrix higher than dotProdThresh quantile are checked for angular similarity.   |
| gapQuantile      | (numeric) Must be between 0 and 1. This is used to calculate base gap-penalty from similarity distribution.  |
| kerLen           | (integer) In simType = crossCorrelation, length of the kernel used to sum similarity score. Must be an odd number.   |
| hardConstrain    | (logical) if false; indices farther from noBeef distance are filled with distance from linear fit line.  |
| samples4gradient | (numeric) This parameter modulates penalization of masked indices.   |
| objType          | (char) A character string. Must be either light, medium or heavy.  |

**Value**

affineAlignObj (S4class) A S4class object from C++ AffineAlignObj struct.

**Author(s)**

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**Examples**

```
data(XIC_QFNNTDIVLLEDFQK_3_DIAalignR, package="DIAalignR")
XICs <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR
data(oswFiles_DIAalignR, package="DIAalignR")
```

```

oswFiles <- oswFiles_DIAAlignR
XICs.ref <- XICs[["hroest_K120809_Strep0%PlasmaBiolRepl2_R04_SW_filt"]][["4618"]]
XICs.exp <- XICs[["hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt"]][["4618"]]
tVec.ref <- XICs.ref[[1]][["time"]] # Extracting time component
tVec.exp <- XICs.exp[[1]][["time"]] # Extracting time component
B1p <- 4964.752
B2p <- 5565.462
noBeef <- 77.82315/3.414
l1 <- lapply(XICs.ref, `[`, 2)
l2 <- lapply(XICs.exp, `[`, 2)
AlignObj <- alignChromatogramsCpp(l1, l2, alignType = "hybrid", tA = tVec.ref, tB = tVec.exp,
  normalization = "mean", simType = "dotProductMasked", B1p = B1p, B2p = B2p, noBeef = noBeef,
  goFactor = 0.125, geFactor = 40, cosAngleThresh = 0.3, OverlapAlignment = TRUE,
  dotProdThresh = 0.96, gapQuantile = 0.5, hardConstrain = FALSE, samples4gradient = 100,
  objType = "light")

```

---

alignedXIC

*Create an aligned chromatogram*


---

### Description

Modifies chromatogram to have the same length as indices. Imputes missing values with appropriate method. Time and intensity for the flanking missing indices are set as NA.

### Usage

```

alignedXIC(
  XIC,
  indices,
  method = "spline",
  polyOrd = 4,
  kernellLen = 9,
  splineMethod = "fmm"
)

```

### Arguments

|              |  |
|--------------|--|
| XIC          | (data-frame) first column is time, second column is intensity. |
| indices      | (integer) vector of monotonically increasing integers.         |
| method       | (string) must be either "spline", "sgolay" or "linear".        |
| polyOrd      | (integer) must be less than kernellLen.                        |
| kernellLen   | (integer) must be an odd integer.                              |
| splineMethod | (string) must be either "fmm" or "natural".                    |

**Value**

(dataframe) has two columns:

|           |           |
|-----------|-----------|
| time      | (numeric) |
| intensity | (numeric) |

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**See Also**

[childXIC](#), [imputeChromatogram](#)

**Examples**

```
data(XIC_QFNNTDIVLLEDFQK_3_DIAAlignR, package="DIAAlignR")
data(alignObj_DIAAlignR, package="DIAAlignR")
XICs.ref <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[["hroest_K120809_Strep0%PlasmaBiolRepl2_R04_SW_filt"]][["4618"]]
alignedIndices <- cbind(alignObj_DIAAlignR@indexA_aligned, alignObj_DIAAlignR@indexB_aligned)
colnames(alignedIndices) <- c("indexAligned.ref", "indexAligned.exp")
alignedIndices[, 1:2][alignedIndices[, 1:2] == 0] <- NA_integer_
## Not run:
plot(alignedXIC(XICs.ref[[1]]), alignedIndices[, "indexAligned.ref"], type = "l")

## End(Not run)
```

---

|                |                                 |
|----------------|---------------------------------|
| alignmentStats | <i>Prints alignment summary</i> |
|----------------|---------------------------------|

---

**Description**

Prints alignment summary

**Usage**

```
alignmentStats(finalTbl, params)
```

**Arguments**

finalTbl (dataframe) an output of [writeTables](#) function.

params (list) must have following elements: alignedFDR2 and unalignedFDR.

**Value**

Invisible NULL

**Author(s)**

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**See Also**

[paramsDIAAlignR](#), [writeTables](#)

---

AlignObj-class      *An S4 object for class AlignObj*

---

**Description**

s is a point-wise similarity matrix between signalA and signalB. Intermediate matrices M is calculated from s for alignment. Each cell of the Traceback matrix has coordinate of its parent cell. path matrix is a binary matrix with ones indicating path of maximum cumulative score. GapOpen and GapExten are gap-opening and gap-extension penalties used by alignment algorithm. They must be the same. indexA\_aligned and indexB\_aligned are aligned indices of signalA and SignalB. The cumulative alignment score is in score vector.

**Author(s)**

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License: (c) Author (2019) + GPL-3 Date: 2019-12-14

**See Also**

[doAlignmentCpp](#)

---

alignObj\_DIAAlignR      *Alignment object of a peptide.*

---

**Description**

Aligned XICs of peptide (ID = 4618) 14299\_QFNNTDIVLLEDFQK/3 across two SWATH runs:

run1 : hroest\_K120809\_Strep0%PlasmaBiolRepl2\_R04\_SW\_filt.chrom.mzML

run2 : hroest\_K120809\_Strep10%PlasmaBiolRepl2\_R04\_SW\_filt.chrom.mzML

**Usage**

alignObj\_DIAAlignR

**Format**

A S4 object of 16 slots:

**s** similarity score matrix.

**M** Match or Mismatch matrix, residues of A and B are aligned without a gap.  $M(i,j)$  = Best score upto (i,j) given  $A_i$  is aligned to  $B_j$ .

**A** Insert in sequence A, residue in A is aligned to gap in B.  $A(i,j)$  is the best score given that  $A_i$  is aligned to a gap in B.

**B** Insert in sequence B, residue in B is aligned to gap in A.  $B(i,j)$  is the best score given that  $B_j$  is aligned to a gap in A.

**Traceback** Traceback matrices store source matrix name and direction as matrices are filled with dynamic programming.

**path** Path matrix would represent alignment path through similarity matrix as binary-hot encoding.

**signalA\_len** Number of data-points in signal A.

**signalB\_len** Number of data-points in signal B.

**GapOpen** Penalty for Gap opening. For n consecutive gaps:  $\text{Penalty} = \text{GapOpen} + (n-1)*\text{GapExten}$ .

**GapExten** Penalty for Gap extension. For n consecutive gaps:  $\text{Penalty} = \text{GapOpen} + (n-1)*\text{GapExten}$ .

**FreeEndGaps** True for Overlap alignment.

**indexA\_aligned** Aligned signalA indices after affine alignment.

**indexB\_aligned** Aligned signalB indices after affine alignment.

**score** Cumulative score along the aligned path.

**simScore\_forw** Not needed, will be removed.

**nGaps** Total number of gaps in the alignment path.

**Source**

C++ code is explained at [DIAAlign namespace](#). File test\_GenerateData.R has [source code](#) to generate the example data.

---

alignTargetedRuns

*Outputs intensities for each analyte from aligned Targeted-MS runs*

---

**Description**

This function expects osw and xics directories at dataPath. It first reads osw files and fetches chromatogram indices for each analyte. It then align XICs of its reference XICs. Best peak, which has lowest m-score, about the aligned retention time is picked for quantification.

**Usage**

```
alignTargetedRuns(
  dataPath,
  outFile = "DIAAlignR",
  params = paramsDIAAlignR(),
  oswMerged = TRUE,
  scoreFile = NULL,
  runs = NULL,
  peps = NULL,
  refRun = NULL,
  applyFun = lapply,
  saveAlignedPeaks = FALSE
)
```

**Arguments**

|                  |   |
|------------------|---|
| dataPath         | (string) path to xics and osw directory.  |
| outFile          | (string) name of the output file.   |
| params           | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function.    |
| oswMerged        | (logical) TRUE if merged file from pyprophet is used.   |
| scoreFile        | (string) path to the peptide score file, needed when oswMerged is FALSE.                          |
| runs             | (string) names of xics file without extension.  |
| peps             | (integer) ids of peptides to be aligned. If NULL, align all peptides.                             |
| refRun           | (string) reference for alignment. If no run is provided, m-score is used to select reference run. |
| applyFun         | (function) value must be either lapply or BiocParallel::bplapply.                                 |
| saveAlignedPeaks | (logical) Save a mapping table to track aligned feature ids against reference feature id          |

**Value**

An output table with following columns: precursor, run, intensity, RT, leftWidth, rightWidth, peak\_group\_rank, m\_score, alignment\_rank, peptide\_id, sequence, charge, group\_label.

**Author(s)**

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License: (c) Author (2019) + GPL-3 Date: 2019-12-14

**References**

Gupta S, Ahadi S, Zhou W, Röst H. "DIAAlignR Provides Precise Retention Time Alignment Across Distant Runs in DIA and Targeted Proteomics." *Mol Cell Proteomics*. 2019 Apr;18(4):806-817. doi: <https://doi.org/10.1074/mcp.TIR118.001132> Epub 2019 Jan 31.



**See Also**

[getRunNames](#), [getFeatures](#), [setAlignmentRank](#), [getMultipeptide](#)

**Examples**

```
params <- paramsDIAAlignR()
params[["context"]] <- "experiment-wide"
dataPath <- system.file("extdata", package = "DIAAlignR")
BiocParallel::register(BiocParallel::MulticoreParam(workers = 4, progressBar = TRUE))
alignTargetedRuns(dataPath, outFile = "testDIAAlignR", params = params, applyFun = BiocParallel::bplapply)
```

---

|               |                                    |
|---------------|------------------------------------|
| alignToMaster | <i>Align descendants to master</i> |
|---------------|------------------------------------|

---

**Description**

During traverse-down, parent runs are aligned to the master/child run. This function performs the alignment by already saved aligned parent-child time vectors. For the aligned peaks, alignment\_rank is set to 1 in multipeptide environment.

**Usage**

```
alignToMaster(
  ref,
  exp,
  alignedVecs,
  refRun,
  adaptiveRT,
  multipeptide,
  prec2chromIndex,
  mzPtrs,
  fileInfo,
  precursors,
  params,
  applyFun = lapply
)
```

**Arguments**

|             |  |
|-------------|--|
| ref         | (string) name of the descendant run. Must be in the rownames of fileInfo.  |
| exp         | (string) name of one of the parent run. Must be in the rownames of fileInfo.   |
| alignedVecs | (list of dataframes) Each dataframe contains aligned parents time-vectors and resulting child/master time vector for a precursor. This is the second element of <a href="#">getChildXICs</a> output. |
| refRun      | (integer) must be of the same length as of precursors. 1: reference is runA, 2: reference is runB.   |

|                 |   |
|-----------------|---|
| multipeptide    | (environment) contains multiple data-frames that are collection of features associated with analytes. This is an output of <a href="#">getMultipeptide</a> .              |
| prec2chromIndex | (list) a list of dataframes having following columns:<br>transition_group_id: it is PRECURSOR.ID from osw file.<br>chromatogramIndex: index of chromatogram in mzML file. |
| mzPntrs         | (list) a list of mzRpwiz.   |
| fileInfo        | (data-frame) output of <a href="#">getRunNames</a> .  |
| precursors      | (data-frame) atleast two columns transition_group_id and transition_ids are required.   |
| params          | (list) parameters are entered as list. Output of the <a href="#">paramsDIAalignR</a> function.  |
| applyFun        | (function) value must be either lapply or BiocParallel::bplapply.   |

### Details

refRun is flipped if eXp is runB instead of runA.

### Value

(None)

### Author(s)

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ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-07-19

### See Also

[traverseUp](#), [traverseDown](#), [setAlignmentRank](#)

### Examples

```
dataPath <- system.file("extdata", package = "DIAalignR")
params <- paramsDIAalignR()
fileInfo <- DIAalignR::getRunNames(dataPath = dataPath)
mzPntrs <- list2env(getMZMLpointers(fileInfo))
features <- list2env(getFeatures(fileInfo, maxFdrQuery = 0.05, runType = "DIA-Proteomics"))
precursors <- getPrecursors(fileInfo, oswMerged = TRUE, runType = params[["runType"]],
  context = "experiment-wide", maxPeptideFdr = params[["maxPeptideFdr"]])
precursors <- dplyr::arrange(precursors, .data$peptide_id, .data$transition_group_id)
peptideIDs <- unique(precursors$peptide_id)
peptideScores <- getPepptideScores(fileInfo, peptideIDs, oswMerged = TRUE, params[["runType"]], params[["context"]])
peptideScores <- lapply(peptideIDs, function(pep) dplyr::filter(peptideScores, .data$peptide_id == pep))
names(peptideScores) <- as.character(peptideIDs)
prec2chromIndex <- list2env(getChromatogramIndices(fileInfo, precursors, mzPntrs))
multipeptide <- getMultipeptide(precursors, features)
prec2chromIndex <- list2env(getChromatogramIndices(fileInfo, precursors, mzPntrs))
```

```

adaptiveRTs <- new.env()
refRuns <- new.env()
tree <- ape::reorder.phylo(ape::read.tree(text = "(run1:7,run2:2)master1;"), "postorder")
## Not run:
ropenms <- get_ropenms(condaEnv = "envName", useConda=TRUE)
multipeptide <- traverseUp(tree, dataPath, fileInfo, features, mzPntrs, prec2chromIndex, precursors, params,
  adaptiveRTs, refRuns, multipeptide, peptideScores, ropenms)
multipeptide <- getMultipeptide(precursors, features)
alignedVecs <- readRDS(file = file.path(dataPath, "master1_av.rds"))
adaptiveRT <- (adaptiveRTs[["run1_run2"]] + adaptiveRTs[["run2_run1"]])/2
multipeptide[["14383"]]$alignment_rank[multipeptide[["14383"]]$run == "master1"] <- 1L
multipeptide <- alignToMaster(ref = "master1", exp = "run1", alignedVecs, refRuns[["master1"]][,1], adaptiveRT,
  multipeptide, prec2chromIndex, mzPntrs, fileInfo, precursors, params)
# Cleanup
for(run in names(mzPntrs)) DBI::dbDisconnect(mzPntrs[[run]])
file.remove(file.path(dataPath, "master1_av.rds"))
file.remove(file.path(dataPath, "xics", "master1.chrom.sqMass"))

## End(Not run)

```

---

alignToRef

*Aligns an analyte from an experiment to the reference run*


---

## Description

df contains unaligned features for an analyte across multiple runs. This function aligns eXp run to ref run and updates corresponding features.

## Usage

```

alignToRef(
  exp,
  ref,
  refIdx,
  fileInfo,
  XICs,
  XICs.ref,
  params,
  df,
  globalFits,
  RSE,
  feature_alignment_map = NULL
)

```

## Arguments

exp (string) name of the run to be aligned to reference run. Must be in the rownames of fileInfo.

|                           |   |
|---------------------------|---|
| ref                       | (string) name of the reference run. Must be in the rownames of fileInfo.  |
| refIdx                    | (integer) index of the reference feature in df.   |
| fileInfo                  | (data-frame) output of <a href="#">getRunNames</a> .  |
| XICs                      | (list of dataframes) fragment-ion chromatograms of the analytes for all runs.   |
| XICs.ref                  | (list of dataframes) fragment-ion chromatograms of the analyte_chr from the reference run.  |
| params                    | (list) parameters are entered as list. Output of the <a href="#">paramsDIALignR</a> function.   |
| df                        | (dataframe) a collection of features related to the peptide   |
| globalFits                | (list) each element is either of class lm or loess. This is an output of <a href="#">getGlobalFits</a> .  |
| RSE                       | (list) Each element represents Residual Standard Error of corresponding fit in globalFits.  |
| feature_alignment_mapping | (data.table) contains experiment feature ids mapped to corresponding reference feature id per analyte. This is an output of <a href="#">getRefExpFeatureMap</a> . |

**Value**

invisible NULL

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-07-26

**See Also**

[alignTargetedRuns](#), [perBatch](#), [setAlignmentRank](#), [getMultipeptide](#), [getRefExpFeatureMap](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIALignR")
```

---

alignToRefMST

*Aligns an analyte for an edge of MST*


---

**Description**

df contains unaligned features for an analyte across multiple runs. This function aligns eXp run to ref run and updates corresponding features.

**Usage**

```
alignToRefMST(iNet, net, fileInfo, XICs, params, analytes, df, globalFits, RSE)
```

**Arguments**

|            |  |
|------------|--|
| iNet       | (integer) the index of edge to be aligned in the net.  |
| net        | (matrix) each row represents an edge of MST.   |
| fileInfo   | (data-frame) output of <a href="#">getRunNames</a> .   |
| XICs       | (list of dataframes) fragment-ion chromatograms of the analytes for all runs.                            |
| params     | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function.           |
| analytes   | (string) precursor IDs of the requested peptide.   |
| df         | (dataframe) a collection of features related to analytes.  |
| globalFits | (list) each element is either of class lm or loess. This is an output of <a href="#">getGlobalFits</a> . |
| RSE        | (list) Each element represents Residual Standard Error of corresponding fit in globalFits.               |

**Value**

invisible NULL

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2021) + GPL-3 Date: 2021-05-15

**See Also**

[mstAlignRuns](#), [MSTperBatch](#), [setAlignmentRank](#), [getMultipeptide](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
```

---

alignToRoot4                      *Step 4 for progressive alignment*

---

**Description**

This is needed when leaves of the tree are directly aligned to the root

**Usage**

```
alignToRoot4(
  dataPath,
  params,
  outFile = "DIAAlignR",
  oswMerged = TRUE,
  applyFun = lapply
)
```

**Arguments**

|           |  |
|-----------|--|
| dataPath  | (string) path to xics and osw directory.   |
| params    | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function. |
| outFile   | (string) name of the output file.  |
| oswMerged | (logical) TRUE if merged file from pyprophet is used.  |
| applyFun  | (function) value must be either lapply or BiocParallel::bplapply.                              |

**Author(s)**

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License: (c) Author (2021) + GPL-3 Date: 2021-09-25

**See Also**

[progAlignRuns](#)

---

analytesFromFeatures *Outputs analytes below FDR*

---

**Description**

Provides all found analytes or only common analytes that have m-score less than analyteFDR.

**Usage**

```
analytesFromFeatures(features, analyteFDR = 1, commonAnalytes = TRUE)
```

**Arguments**

|                |   |
|----------------|---|
| features       | (list of data-frames) contains features and their properties identified in each run.      |
| analyteFDR     | (numeric) only analytes that have m-score less than this, will be included in the output. |
| commonAnalytes | (logical) TRUE: intersect across all runs, FALSE: union across all runs.                  |

**Value**

a vector of integer.

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-04-14

**See Also**[getFeatures](#)**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath = dataPath)
features <- getFeatures(fileInfo, maxFdrQuery = 1.00, runType = "DIA_Proteomics")
## Not run:
commonAnalytes <- analytesFromFeatures(features, analyteFDR = 0.01, commonAnalytes = TRUE)

## End(Not run)
```

---

**approxFill***Fill missing values using linear interpolation*

---

**Description**

Fill missing values using linear interpolation

**Usage**

```
approxFill(chrom)
```

**Arguments**

chrom (data-frames) first column is time, second column is intensity.

**Value**

(dataframe) has two columns:

|           |           |
|-----------|-----------|
| time      | (numeric) |
| intensity | (numeric) |

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-05-21

**See Also**

[na.approx](#), [approx](#)

**Examples**

```

time <- seq(from = 3003.4, to = 3048, by = 3.4)
y <- c(0.2050595, 0.8850070, 2.2068768, 3.7212677, 5.1652605, 5.8288915, 5.5446804,
      4.5671360, 3.3213154, 1.9485889, 0.9520709, 0.3294218, 0.2009581, 0.1420923)
chrom <- data.frame(time, y)
chrom$y[c(1,8, 14)] <- NA
## Not run:
approxFill(chrom)

## End(Not run)

```

---

|                |   |
|----------------|---|
| areaIntegrator | <i>Calculates area between signal-boundaries.</i> |
|----------------|---|

---

**Description**

This function sums all the intensities between left-index and right-index.

**Usage**

```

areaIntegrator(
  l1,
  l2,
  left,
  right,
  integrationType,
  baselineType,
  fitEMG,
  baseSubtraction,
  kernelLen = 0L,
  polyOrd = 3L
)

```

**Arguments**

|                 |  |
|-----------------|--|
| l1              | (list) A list of time vectors.   |
| l2              | (list) A list of intensity vectors.  |
| left            | (numeric) left boundary of the peak.   |
| right           | (numeric) right boundary of the peak.  |
| integrationType | (string) method to compute the area of a peak contained in XICs. Must be from "intensity_sum", "trapezoid", "simpson".                                 |
| baselineType    | (string) method to estimate the background of a peak contained in XICs. Must be from "base_to_base", "vertical_division_min", "vertical_division_max". |
| fitEMG          | (logical) enable/disable exponentially modified gaussian peak model fitting.   |



baseSubtraction (logical) TRUE: remove background from peak signal using estimated noise levels.

kernellLen (integer) length of filter. Must be an odd number.

polyOrd (integer) TRUE: remove background from peak signal using estimated noise levels.

**Value**

area (numeric).

**Author(s)**

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**Examples**

```
data("XIC_QFNNTDIVLLEDFQK_3_DIAAlignR", package = "DIAAlignR")
XICs <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[["hroest_K120809_Strep0%PlasmaBioRep12_R04_SW_filt"]][["4618"]]
l1 <- lapply(XICs, `[[`, 1) # time
l2 <- lapply(XICs, `[[`, 2) # intensity
areaIntegrator(l1, l2, left = 5203.7, right = 5268.5, "intensity_sum", "base_to_base", FALSE, TRUE)
# 66.10481 69.39996 46.53095 16.34266 13.13564 13.42331
areaIntegrator(l1, l2, left = 5203.7, right = 5268.5, kernellLen = 9L, "intensity_sum", "base_to_base", FALSE, TRUE)
# 65.01449 71.74432 52.73518 23.84420 17.61869 16.48190
```

---

as.list, AffineAlignObj-method

*Converts instances of class AffineAlignObj into list*

---

**Description**

Converts instances of class AffineAlignObj into list

**Usage**

```
## S4 method for signature 'AffineAlignObj'
as.list(x)
```

**Arguments**

x An object of class AffineAlignObj.

**Value**

list

**Author(s)**

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License: (c) Author (2019) + GPL-3 Date: 2020-03-31

---

as.list,AffineAlignObjLight-method

*Converts instances of class AffineAlignObjLight into list*

---

**Description**

Converts instances of class AffineAlignObjLight into list

**Usage**

```
## S4 method for signature 'AffineAlignObjLight'  
as.list(x)
```

**Arguments**

x                    An object of class AffineAlignObjLight

**Value**

list

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2020-03-31

---

as.list,AffineAlignObjMedium-method

*Converts instances of class AffineAlignObjMedium into list*

---

**Description**

Converts instances of class AffineAlignObjMedium into list

**Usage**

```
## S4 method for signature 'AffineAlignObjMedium'  
as.list(x)
```

**Arguments**

x                    An object of class AffineAlignObjMedium

**Value**

list

**Author(s)**

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License: (c) Author (2019) + GPL-3 Date: 2020-03-31

---

*as.list, AlignObj-method*

*Converts instances of class AlignObj into list*

---

**Description**

Converts instances of class AlignObj into list

**Usage**

```
## S4 method for signature 'AlignObj'  
as.list(x)
```

**Arguments**

x                    An object of class AlignObj

**Value**

list

**Author(s)**

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License: (c) Author (2019) + GPL-3 Date: 2020-03-31

---

`blobXICs`*Format XICs to blob*

---

**Description**

Format XICs to blob

**Usage**

```
blobXICs(XICs, nativeIds, lossy = TRUE)
```

**Arguments**

|                       |   |
|-----------------------|---|
| <code>XICs</code>     | (list) a list of data-frames. Each data frame has elution time and intensity of fragment-ion XIC. |
| <code>lossy</code>    | (logical) if TRUE, time and intensity are lossy-compressed.                                       |
| <code>nativeId</code> | (integer) transition ID of the xic.   |

**Details**

DATA\_TYPE is one of 0 = mz, 1 = intensity, 2 = rt

COMPRESSION is one of 0 = no, 1 = zlib, 2 = np-linear, 3 = np-slof, 4 = np-pic, 5 = np-linear + zlib, 6 = np-slof + zlib, 7 = np-pic + zlib

**Value**

(data.frame)

**Author(s)**

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License: (c) Author (2021) + GPL-3 Date: 2021-01-16

**Examples**

```
data(XIC_QFNNTDIVLLEDFQK_3_DIAalignR)
XICs <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120808_Strep10%PlasmaBiolRep11_R03_SW_filt"]][["4618"]]
nativeIds <- 27706:27711
## Not run:
blobXICs(XICs, nativeIds)

## End(Not run)
```

---

calculateIntensity      *Calculates area of a peak in XIC group*

---

### Description

Retention time from reference run is mapped to experiment run using AlignObj.

### Usage

```
calculateIntensity(XICs, left, right, params)
```

### Arguments

|        |  |
|--------|--|
| XICs   | (list) list of extracted ion chromatograms of a precursor.                                     |
| left   | (numeric) left boundary of the peak.   |
| right  | (numeric) right boundary of the peak.  |
| params | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function. |

### Value

area (numeric)

### Author(s)

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ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-04-13

### See Also

[areaIntegrator](#), [setAlignmentRank](#)

### Examples

```
data(XIC_QFNNTDIVLLEDFQK_3_DIAAlignR, package="DIAAlignR")
XICs <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[["hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt"]][["4618"]]
## Not run:
calculateIntensity(XICs, 5220, 5261, integrationType = "intensity_sum",
  baselineType = "base_to_base", fitEMG = FALSE)

## End(Not run)
```

---

|              |                                   |
|--------------|-----------------------------------|
| checkOverlap | <i>Overlap of two time ranges</i> |
|--------------|-----------------------------------|

---

**Description**

Overlap of two time ranges

**Usage**

```
checkOverlap(x, y)
```

**Arguments**

x                    (numeric) must have only two values and  $x[2] > x[1]$ .  
y                    (numeric) must have only two values and  $y[2] > y[1]$ .

**Value**

(logical) TRUE: both time ranges overlap. FALSE: both time ranges do not overlap.

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-07-17

**See Also**

getChildFeature

**Examples**

```
## Not run:  
checkOverlap(c(9.1, 13.1), c(2.1, 3.1))  
checkOverlap(c(1.1, 3.1), c(3.2, 7.1))  
  
## End(Not run)
```

---

|             |  |
|-------------|--|
| checkParams | <i>Checks all the alignment parameters</i> |
|-------------|--|

---

**Description**

Parameters are defined in the [paramsDIAAlignR](#) function. If parameters are found incongruous, the program will terminate.

**Usage**

```
checkParams(params)
```

**Arguments**

params (list) parameters are entered as list. Output of the [paramsDIAAlignR](#) function.

**Value**

Invisible NULL

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-07-01

**See Also**

[paramsDIAAlignR](#)

**Examples**

```
params <- paramsDIAAlignR()
## Not run:
checkParams(params)

## End(Not run)
```

---

 childXIC

*Get a child chromatogram from parents*


---

### Description

Internal gaps in reference chromatogram and corresponding indices in experiment chromatogram are discarded while merging both chromatogram to obtain a child chromatogram.

### Usage

```
childXIC(
  XIC.ref,
  XIC.exp,
  alignedIndices,
  method = "spline",
  polyOrd = 4,
  kernelLen = 9,
  splineMethod = "fmm",
  wRef = 0.5,
  mergeStrategy = "avg",
  keepFlanks = TRUE
)
```

### Arguments

|                |   |
|----------------|---|
| XIC.ref        | (data-frame) extracted ion chromatogram from reference run. Must not contain missing values.  |
| XIC.exp        | (data-frame) extracted ion chromatogram from experiment run. Must not contain missing values. |
| alignedIndices | (data-frame) must have two columns "indexAligned.ref" and "indexAligned.exp".                 |
| method         | (string) must be either "spline", "sgolay" or "linear".                                       |
| polyOrd        | (integer) must be less than kernelLen.  |
| kernelLen      | (integer) must be an odd integer.   |
| splineMethod   | (string) must be either "fmm" or "natural".   |
| wRef           | (numeric) Weight of the reference XIC. Must be between 0 and 1.                               |
| mergeStrategy  | (string) must be either ref, avg, refStart or refEnd.   |
| keepFlanks     | (logical) TRUE: Flanking chromatogram is not removed.   |

### Value

(list) the first element is chromatogram. The second element is aligned parent time-vectors.



**time-merging**

There are three strategies for calculating time to keep sampling rate equal to parents:

- Use reference time.
- Average time (Non-gap region will have parent's sampling rate).
- Start/end with the average then fixed sampling rate.

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-05-23

**See Also**

[mergeXIC](#), [alignedXIC](#), [childXICs](#)

**Examples**

```
data(XIC_QFNNTDIVLLEDFQK_3_DIAalignR, package="DIAalignR")
data(alignObj_DIAalignR, package="DIAalignR")
XICs.ref <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120809_Strep0%PlasmaBiolRepl2_R04_SW_filt"]][["4618"]]
XICs.eXp <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt"]][["4618"]]
alignedIndices <- cbind(alignObj_DIAalignR@indexA_aligned, alignObj_DIAalignR@indexB_aligned)
colnames(alignedIndices) <- c("indexAligned.ref", "indexAligned.eXp")
alignedIndices[, 1:2][alignedIndices[, 1:2] == 0] <- NA_integer_
## Not run:
plot(childXIC(XICs.ref[[1]], XICs.eXp[[1]], alignedIndices)[[1]], type = 'l')

## End(Not run)
```

---

childXICs

*Get child chromatograms from parents*

---

**Description**

Get child chromatograms from parents

**Usage**

```
childXICs(
  XICs.ref,
  XICs.eXp,
  alignedIndices,
  method = "spline",
  polyOrd = 4,
  kernelLen = 9,
  splineMethod = "fmm",
```

```
wRef = 0.5,
mergeStrategy = "avg",
keepFlanks = TRUE
)
```

### Arguments

XICs.ref (list of data-frames) extracted ion chromatograms from reference run.

XICs.eXp (list of data-frames) extracted ion chromatograms from experiment run.

alignedIndices (data-frame) must have two columns "indexAligned.ref" and "indexAligned.eXp".

method (string) must be either "spline", "sgolay" or "linear".

polyOrd (integer) must be less than kernelLen.

kernelLen (integer) must be an odd integer.

splineMethod (string) must be either "fmm" or "natural".

wRef (numeric) Weight of the reference XIC. Must be between 0 and 1.

mergeStrategy (string) must be either ref, avg, refStart or refEnd.

keepFlanks (logical) TRUE: Flanking chromatogram is not removed.

### Value

(list) the first element is a list of chromatograms. The second element is aligned parent time-vectors.

### Author(s)

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 ORCID: 0000-0003-3500-8152  
 License: (c) Author (2020) + GPL-3 Date: 2020-05-23

### See Also

[childXIC](#), [mergeXIC](#)

### Examples

```
data(XIC_QFNNTDIVLLEDFQK_3_DIAalignR, package="DIAalignR")
data(alignObj_DIAalignR, package="DIAalignR")
XICs.ref <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt"]][["4618"]]
XICs.eXp <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120809_Strep10%PlasmaBiolRep12_R04_SW_filt"]][["4618"]]
alignedIndices <- cbind(alignObj_DIAalignR@indexA_aligned, alignObj_DIAalignR@indexB_aligned)
colnames(alignedIndices) <- c("indexAligned.ref", "indexAligned.eXp")
alignedIndices[, 1:2][alignedIndices[, 1:2] == 0] <- NA_integer_
newXICs <- childXICs(XICs.ref, XICs.eXp, alignedIndices)[[1]]
plotXICgroup(XICs.ref)
plotXICgroup(newXICs)
```

---

 chromatogramIdAsInteger

*Coerce chromatogram ids as integer*


---

**Description**

chromatogramHeader has 10 columns. The two important columns are: "chromatogramId" which has fragment-ion ID that matches with transition ID in osw file. "chromatogramIndex" that lists indices of chromatograms in mzML file.

**Usage**

```
chromatogramIdAsInteger(chromatogramHeader)
```

**Arguments**

```
chromatogramHeader
      (dataframe)
```

**Value**

Invisible NULL

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

---

 constrainSimCpp

*Constrain similarity matrix with a mask*


---

**Description**

Constrain similarity matrix with a mask

**Usage**

```
constrainSimCpp(sim, MASK, samples4gradient = 100)
```

**Arguments**

```
sim          (matrix) A numeric matrix. Input similarity matrix.
MASK        (matrix) A numeric matrix. Masked indices have non-zero values.
samples4gradient
            (numeric) This parameter modulates penalization of masked indices.
```

**Value**

s\_new (matrix) A constrained similarity matrix.

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca> ORCID: 0000-0003-3500-8152 License: (c) Author (2019) + MIT Date: 2019-03-08

**Examples**

```
sim <- matrix(c(-2, 10, -2, -2, -2, -2, 10, -2, 10, -2, -2, -2, -2, -2, 10, 10, -2, -2, -2),
  4, 5, byrow = FALSE)
MASK <- matrix(c(0.000, 0.000, 0.707, 1.414, 0.000, 0.000, 0.000, 0.707, 0.707, 0.000,
  0.000, 0.000, 1.414, 0.707, 0, 0, 2.121, 1.414, 0, 0), 4, 5, byrow = FALSE)
constrainSimCpp(sim, MASK, 10)
matrix(c(-2, 10, -3.414, -4.828, -2, -2, 10, -3.414, 8.586, -2, -2, -2, -4.828,
  -3.414, -2, 10, 5.758, -4.828, -2, -2), 4, 5, byrow = FALSE)
```

---

createMZML

*Create an mzML file*

---

**Description**

Writes an mzML file having chromatograms and their native IDs.

**Usage**

```
createMZML(ropenms, filename, XICs, transitionIDs)
```

**Arguments**

|               |  |
|---------------|--|
| ropenms       | (pyopenms module) get this python module through get_ropenms().                      |
| filename      | (string) name of the mzML file to be written. Extension should be .chrom.mzML.       |
| XICs          | (list of list of data-frames) list of extracted ion chromatograms of all precursors. |
| transitionIDs | (list of integer) length must be the same as of XICs.                                |

**Value**

(None)

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>  
ORCID: 0000-0003-3500-8152  
License: (c) Author (2020) + GPL-3 Date: 2020-06-06

**See Also**

[get\\_ropenms](#), [addXIC](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
filename <- paste0(dataPath, "/xics/hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt.chrom.mzML")
data(XIC_QFNNTDIVLLEDFQK_3_DIAAlignR)
XICs <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[["hroest_K120808_Strep10%PlasmaBiolRepl1_R03_SW_filt"]]
nativeIds <- list(27706:27711)
## Not run:
ropenms <- get_ropenms(condaEnv = "envName")
createMZML(ropenms, "testfile.chrom.mzML", XICs, nativeIds)
mzR::chromatogramHeader(mzR::openMSfile("testfile.chrom.mzML", backend = "pwiz"))
file.remove("testfile.chrom.mzML")

## End(Not run)
```

---

|              |                              |
|--------------|------------------------------|
| createSqMass | <i>Create an sqMass file</i> |
|--------------|------------------------------|

---

**Description**

Writes a sqMass file having chromatograms and their native IDs.

**Usage**

```
createSqMass(filename, XICs, transitionIDs, lossy)
```

**Arguments**

|               |  |
|---------------|--|
| filename      | (string) name of the mzML file to be written. Extension should be .chrom.sqMass.     |
| XICs          | (list of list of data-frames) list of extracted ion chromatograms of all precursors. |
| transitionIDs | (list of integer) length must be the same as of XICs.                                |
| lossy         | (logical) if TRUE, time and intensity are lossy-compressed.                          |

**Details**

- compression is one of 0 = no, 1 = zlib, 2 = np-linear, 3 = np-slof, 4 = np-pic, 5 = np-linear + zlib, 6 = np-slof + zlib, 7 = np-pic + zlib
- data\_type is one of 0 = mz, 1 = int, 2 = rt
- data contains the raw (blob) data for a single data array

**Value**

(None)

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2021) + GPL-3 Date: 2021-01-16

**See Also**

[createMZML](#), [blobXICs](#)

**Examples**

```
data(XIC_QFNNTDIVLLEDFQK_3_DIAAlignR)
XICs <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[["hroest_K120808_Strep10%PlasmaBiolRepl1_R03_SW_filt"]]
XICs <- list(XICs[[1]], XICs[[1]])
nativeIds <- list(27706:27711, 1:6)
sqName <- "testfile.chrom.sqMass"
## Not run:
createSqMass(sqName, XICs, nativeIds, TRUE)
con <- DBI::dbConnect(RSQLite::SQLite(), dbname = sqName)
XIC_group <- extractXIC_group2(con, 0:5)
DBI::dbDisconnect(con)
file.remove(sqName)

## End(Not run)
```

---

DIAAlignR

*DIAAlignR*

---

**Description**

This package implements dynamic programming with affine gap penalty to find a highest-scoring scoring path. A hybrid approach of global alignment through MS2 features and local alignment with MS2 chromatograms is implemented in this tool.

**Author(s)**

Shubham Gupta, Hannes Rost

---

|               |  |
|---------------|--|
| dialignrLoess | <i>Modified loess for condition handling</i> |
|---------------|--|

---

**Description**

Modified loess for condition handling

**Usage**

```
dialignrLoess(RUNS_RT, spanvalue)
```

**Arguments**

RUNS\_RT (data-frame) must have three columns: transition\_group\_id, RT.eXp, and RT.ref.  
spanvalue (numeric) spanvalue for LOESS fit. For targeted proteomics 0.1 could be used.

**Value**

An object of class "loess" or "lm".

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-07-11

**See Also**

[getLinearfit](#), [getLOESSfit](#)

**Examples**

```
df <- data.frame("transition_group_id" = 1:10, "RT.eXp" = 2:11, "RT.ref" = 10:19)
## Not run:
dialignrLoess(df, 0.1)
dialignrLoess(df[1:4,], 0.1)

## End(Not run)
```

---

doAffineAlignmentCpp *Perform affine global and overlap alignment on a similarity matrix*

---

### Description

Perform affine global and overlap alignment on a similarity matrix

### Usage

```
doAffineAlignmentCpp(sim, go, ge, OverlapAlignment)
```

### Arguments

|                  |  |
|------------------|--|
| sim              | (NumericMatrix) A numeric matrix with similarity values of two sequences or signals.                   |
| go               | (numeric) Penalty for introducing first gap in alignment.  |
| ge               | (numeric) Penalty for introducing subsequent gaps in alignment.  |
| OverlapAlignment | (logical) An input for alignment with free end-gaps. False: Global alignment, True: overlap alignment. |

### Value

affineAlignObj (S4class) An object from C++ class of AffineAlignObj.

### Author(s)

Shubham Gupta, <shubh.gupta@mail.utoronto.ca> ORCID: 0000-0003-3500-8152 License: (c) Author (2019) + MIT Date: 2019-03-08

### Examples

```
# Get sequence similarity of two DNA strings
Match=10; MisMatch=-2
seq1 = "GCAT"; seq2 = "CAGTG"
s <- getSeqSimMatCpp(seq1, seq2, Match, MisMatch)
objAffine_Global <- doAffineAlignmentCpp(s, 22, 7, FALSE)
slot(objAffine_Global, "score") # -2 -4 -6 4 -18
objAffine_Olap <- doAffineAlignmentCpp(s, 22, 7, TRUE)
slot(objAffine_Olap, "score") # 0 10 20 18 18 18

Match=10; MisMatch=-2
seq1 = "CAT"; seq2 = "CAGTG"
s <- getSeqSimMatCpp(seq1, seq2, Match, MisMatch)
objAffine_Global <- doAffineAlignmentCpp(s, 22, 7, FALSE)
slot(objAffine_Global, "score") # 10 20 -2 -9 -11
objAffine_Olap <- doAffineAlignmentCpp(s, 22, 7, TRUE)
slot(objAffine_Olap, "score") # 10 20 18 18 18
```



```

Match=10; MisMatch=-2
seq1 = "CA"; seq2 = "AG"
s <- getSeqSimMatCpp(seq1, seq2, Match, MisMatch)
objAffine_Global <- doAffineAlignmentCpp(s, 22, 7, FALSE)
slot(objAffine_Global, "simScore_forw") # -4

```

---

|                |   |
|----------------|---|
| doAlignmentCpp | <i>Perform non-affine global and overlap alignment on a similarity matrix</i> |
|----------------|---|

---

## Description

Perform non-affine global and overlap alignment on a similarity matrix

## Usage

```
doAlignmentCpp(sim, gap, OverlapAlignment)
```

## Arguments

|                  |  |
|------------------|--|
| sim              | (NumericMatrix) A numeric matrix with similarity values of two sequences or signals.                   |
| gap              | (double) Penalty for introducing gaps in alignment.  |
| OverlapAlignment | (logical) An input for alignment with free end-gaps. False: Global alignment, True: overlap alignment. |

## Value

AlignObj (S4class) An object from C++ class of AlignObj.

## Author(s)

Shubham Gupta, <shubh.gupta@mail.utoronto.ca> ORCID: 0000-0003-3500-8152 License: (c) Author (2019) + MIT Date: 2019-03-08

## Examples

```

# Get sequence similarity of two DNA strings
Match=10; MisMatch=-2
seq1 = "GCAT"; seq2 = "CAGTG"
s <- getSeqSimMatCpp(seq1, seq2, Match, MisMatch)
obj_Global <- doAlignmentCpp(s, 22, FALSE)
slot(obj_Global, "score") # -2 -4 -6 4 -18
obj_Olap <- doAlignmentCpp(s, 22, TRUE)
slot(obj_Olap, "score") # 0 10 20 18 18 18

Match=1; MisMatch=-1

```

```
seq1 = "TTTC"; seq2 = "TGC"
s <- getSeqSimMatCpp(seq1, seq2, Match, MisMatch)
obj_Global <- doAlignmentCpp(s, 2, FALSE)
slot(obj_Global, "optionalPaths")
matrix(data = c(1,1,1,1,1,1,1,1,1,2,1,2,1,3,3,1,1,3,6,3), nrow = 5, ncol =4, byrow = TRUE)
slot(obj_Global, "M_forw")
matrix(data = c(0,-2,-4,-6,-2,-7,-22,-45,-4,-20,-72,-184,-6,-41,-178,-547,-8,-72,-366,-1274),
  nrow = 5, ncol =4, byrow = TRUE)
```

---

|                  |                                     |
|------------------|-------------------------------------|
| extractXIC_group | <i>Extract XICs of chromIndices</i> |
|------------------|-------------------------------------|

---

### Description

Extracts XICs using mz object. Each chromatogram represents a transition of precursor.

### Usage

```
extractXIC_group(mz, chromIndices)
```

### Arguments

mz (mzRpwiz object)  
 chromIndices (vector of Integers) Indices of chromatograms to be extracted.

### Value

A list of data-frames. Each data frame has elution time and intensity of fragment-ion XIC.

### Author(s)

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>  
 ORCID: 0000-0003-3500-8152  
 License: (c) Author (2019) + GPL-3 Date: 2019-12-13

### Examples

```
dataPath <- system.file("extdata", package = "DIAAlignR")
mzmlName<-paste0(dataPath,"/xics/hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt.chrom.mzML")
mz <- mzR::openMSfile(mzmlName, backend = "pwiz")
chromIndices <- c(37L, 38L, 39L, 40L, 41L, 42L)
## Not run:
XIC_group <- extractXIC_group(mz, chromIndices)

## End(Not run)
```

---

|                   |                                     |
|-------------------|-------------------------------------|
| extractXIC_group2 | <i>Extract XICs of chromIndices</i> |
|-------------------|-------------------------------------|

---

**Description**

DATA\_TYPE is one of 0 = mz, 1 = intensity, 2 = rt Extracts XICs using connection to sqMass file  
Each chromatogram represents a transition of precursor.

**Usage**

```
extractXIC_group2(con, chromIndices)
```

**Arguments**

chromIndices (vector of Integers) Indices of chromatograms to be extracted.  
mz (SQLiteConnection object)

**Value**

A list of data-frames. Each data frame has elution time and intensity of fragment-ion XIC.

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-12-25

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
sqName <- paste0(dataPath, "/xics/hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt.chrom.sqMass")
chromIndices <- c(36L, 37L, 38L, 39L, 40L, 41L)
## Not run:
con <- DBI::dbConnect(RSQLite::SQLite(), dbname = sqName)
XIC_group <- extractXIC_group2(con, chromIndices)
DBI::dbDisconnect(con)

## End(Not run)
```

---

|                   |                                   |
|-------------------|-----------------------------------|
| fetchAnalytesInfo | <i>Fetch features of analytes</i> |
|-------------------|-----------------------------------|

---

### Description

Get a data-frame of analytes' transition\_group\_ids, their OpenSwath features, chromatogram indices and associated FDR-scores.

### Usage

```
fetchAnalytesInfo(
  oswName,
  maxFdrQuery,
  oswMerged,
  analytes,
  filename,
  runType = "DIA_Proteomics",
  analyteInGroupLabel = FALSE
)
```

### Arguments

|                     |  |
|---------------------|--|
| oswName             | (char) path to the osw file.   |
| maxFdrQuery         | (numeric) A numeric value between 0 and 1. It is used to filter features from osw file which have SCORE_MS2.QVALUE less than itself.                                     |
| oswMerged           | (logical) TRUE for experiment-wide FDR and FALSE for run-specific FDR by pyprophet.  |
| analytes            | (vector of strings) transition_group_ids for which features are to be extracted. analyteInGroupLabel must be set according the pattern used here.                        |
| filename            | (data-frame) Should be from the RUN.FILENAME column from osw files.  |
| runType             | (char) This must be one of the strings "DIA_Proteomics", "DIA_Metabolomics".   |
| analyteInGroupLabel | (logical) TRUE for getting analytes as PRECURSOR.GROUP_LABEL from osw file. FALSE for fetching analytes as PEPTIDE.MODIFIED_SEQUENCE and PRECURSOR.CHARGE from osw file. |

### Value

(data-frames) Data-frame has following columns:

|                     |  |
|---------------------|--|
| transition_group_id | (string) it is either fetched from PRECURSOR.GROUP_LABEL or a combination of PEPTIDE.MODIFIED_SEQUENCE and PRECURSOR.CHARGE from osw file. |
| filename            | (string) as mentioned in RUN table of osw files.   |

|                 |   |
|-----------------|---|
| RT              | (numeric) retention time as in FEATURE.EXP_RT of osw files.   |
| delta_rt        | (numeric) as in FEATURE.DELTA_RT of osw files.  |
| assay_RT        | (numeric) library retention time as in PRECURSOR.LIBRARY_RT of osw files.   |
| Intensity       | (numeric) peak intensity as in FEATURE_MS2.AREA_INTENSITY of osw files.   |
| leftWidth       | (numeric) as in FEATURE.LEFT_WIDTH of osw files.  |
| rightWidth      | (numeric) as in FEATURE.RIGHT_WIDTH of osw files.   |
| peak_group_rank | (integer) rank of each feature associated with transition_group_id.   |
| m_score         | (numeric) q-value of each feature associated with transition_group_id.  |
| transition_id   | (integer) fragment-ion ID associated with transition_group_id. This is matched with chromatogram ID in mzML file. |

**Author(s)**

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License: (c) Author (2019) + GPL-3 Date: 2019-12-13

**See Also**

[getRunNames](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
filenames <- getRunNames(dataPath = dataPath)
oswName <- paste0(dataPath, "/osw/merged.osw")
## Not run:
analytesInfo <- fetchAnalytesInfo(oswName, maxFdrQuery = 0.05, oswMerged = TRUE,
  analytes = c("19051_KLIVTSEGC[160]FK/2"), filename = filenames$filename[2],
  runType = "DIA_Proteomics", analyteInGroupLabel = TRUE)
analytesInfo <- fetchAnalytesInfo(oswName, maxFdrQuery = 0.05, oswMerged = TRUE,
  analytes = c("IHFLSPVRPFTLTPGDEEESFIQLITPVR_3"), filename = filenames$filename[3],
  runType = "DIA_Proteomics", analyteInGroupLabel = FALSE)

## End(Not run)
```

---

fetchFeaturesFromRun *Get features from a feature file.*

---

**Description**

Get a data-frame of OpenSwath features that contains retention time, intensities, boundaries etc.

**Usage**

```

fetchFeaturesFromRun(
  filename,
  runID,
  maxFdrQuery = 1,
  maxIPFFdrQuery = 1,
  runType = "DIA_Proteomics"
)

```

**Arguments**

|                |  |
|----------------|--|
| filename       | (string) Path to the feature file.   |
| runID          | (string) id in RUN.ID column of the feature file.  |
| maxFdrQuery    | (numeric) A numeric value between 0 and 1. It is used to filter features from osw file which have SCORE_MS2.QVALUE less than itself.                   |
| maxIPFFdrQuery | (numeric) A numeric value between 0 and 1. It is used to filter features from osw file which have SCORE_IPF.QVALUE less than itself. (For PTM IPF use) |
| runType        | (char) This must be one of the strings "DIA_Proteomics", "DIA_IPF", "DIA_Metabolomics".  |

**Value**

(data-frames) Data-frame has following columns:

|                     |   |
|---------------------|---|
| transition_group_id | (integer) a unique id for each precursor.                               |
| RT                  | (numeric) retention time as in FEATURE.EXP_RT of osw files.             |
| Intensity           | (numeric) peak intensity as in FEATURE_MS2.AREA_INTENSITY of osw files. |
| leftWidth           | (numeric) as in FEATURE.LEFT_WIDTH of osw files.                        |
| rightWidth          | (numeric) as in FEATURE.RIGHT_WIDTH of osw files.                       |
| peak_group_rank     | (integer) rank of each feature associated with transition_group_id.     |
| m_score             | (numeric) q-value of each feature associated with transition_group_id.  |

**Author(s)**

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License: (c) Author (2019) + GPL-3 Date: 2019-04-04

**See Also**

[getRunNames](#), [getFeatures](#), [getFeaturesQuery](#)

## Examples

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath = dataPath)
## Not run:
featuresInfo <- fetchFeaturesFromRun(fileInfo$featureFile[1], fileInfo$spectraFileID[1],
  maxFdrQuery = 0.05)
dim(featuresInfo) # 211 8

## End(Not run)
```

---

fetchPeptidesInfo      *Get scores of all peptides*

---

## Description

Return a scores, pvalues, and qvalues for all peptides from the osw file.

## Usage

```
fetchPeptidesInfo(oswName, runType, context)
```

## Arguments

|         |  |
|---------|--|
| oswName | (char) path to the osw file.   |
| runType | (char) This must be one of the strings "DIA_Proteomics", "DIA_IPF", "DIA_Metabolomics".                    |
| context | (string) Context used in pyprophet peptide. Must be either "run-specific", "experiment-wide", or "global". |

## Value

(dataframe) with following columns:

|            |  |
|------------|--|
| peptide_id | (integer) a unique id for each precursor.            |
| run        | (character) as in SCORE_PEPTIDE.RUN_ID of osw files. |
| score      | (numeric) as in SCORE_PEPTIDE.SCORE of osw files.    |
| pvalue     | (numeric) as in SCORE_PEPTIDE.PVALUE of osw files.   |
| qvalue     | (numeric) as in SCORE_PEPTIDE.QVALUE of osw files.   |

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**See Also**

[getPeptideQuery](#), [getPeptideScores](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath = dataPath)
oswName <- fileInfo[["featureFile"]][1]
## Not run:
precursorsInfo <- fetchPeptidesInfo(fileInfo, runType = "DIA_Proteomics", context = "experiment-wide")

## End(Not run)
```

---

fetchPeptidesInfo2      *Get scores of all peptides*

---

**Description**

Return a scores, pvalues, and qvalues for all peptides from the osw file.

**Usage**

```
fetchPeptidesInfo2(oswName, runType, context, runID)
```

**Arguments**

|         |  |
|---------|--|
| oswName | (char) path to the osw file.   |
| runType | (char) This must be one of the strings "DIA_Proteomics", "DIA_IPF", "DIA_Metabolomics".                    |
| context | (string) Context used in pyprophet peptide. Must be either "run-specific", "experiment-wide", or "global". |

**Value**

(dataframe) with following columns:

|            |  |
|------------|--|
| peptide_id | (integer) a unique id for each precursor.            |
| run        | (character) as in SCORE_PEPTIDE.RUN_ID of osw files. |
| score      | (numeric) as in SCORE_PEPTIDE.SCORE of osw files.    |
| pvalue     | (numeric) as in SCORE_PEPTIDE.PVALUE of osw files.   |
| qvalue     | (numeric) as in SCORE_PEPTIDE.QVALUE of osw files.   |

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**See Also**

[getPeptideQuery](#), [getPeptideScores](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath = dataPath)
oswName <- fileInfo[["featureFile"]][1]
## Not run:
precursorsInfo <- fetchPeptidesInfo(fileInfo, runType = "DIA_Proteomics", context = "experiment-wide")

## End(Not run)
```

---

fetchPrecursorsInfo    *Get precursors from a feature file*

---

**Description**

Get a data-frame of analytes' transition\_group\_id, transition\_ids, peptide\_id and amino-acid sequences.

**Usage**

```
fetchPrecursorsInfo(
  filename,
  runType = "DIA_Proteomics",
  selectIDs = NULL,
  context = "global",
  maxPeptideFdr = 0.05,
  level = "Peptide",
  useIdentifying = FALSE
)
```

**Arguments**

|                |  |
|----------------|--|
| filename       | (string) Should be from the RUN.FILENAME column from osw files.  |
| runType        | (string) This must be one of the strings "DIA_Proteomics", "DIA_IPF", "DIA_Metabolomics".  |
| selectIDs      | (integer) a vector of integers.  |
| context        | (string) Context used in pyprophet peptide. Must be either "run-specific", "experiment-wide", or "global".                               |
| maxPeptideFdr  | (numeric) A numeric value between 0 and 1. It is used to filter peptides from osw file which have SCORE_PEPTIDE.QVALUE less than itself. |
| level          | (string) Apply maxPeptideFDR on Protein as well if specified as "Protein". Default: "Peptide".   |
| useIdentifying | (logical) Set TRUE to use identifying transitions in alignment. (DEFAULT: FALSE)   |

**Value**

(data-frames) Data-frame has following columns:

|                     |  |
|---------------------|--|
| transition_group_id | (integer) a unique id for each precursor.  |
| transition_id       | (list) fragment-ion ID associated with transition_group_id. This is matched with chromatogram ID in mzML file. |
| peptide_id          | (integer) a unique id for each peptide. A peptide can have multiple precursors.                                |
| sequence            | (string) amino-acid sequence of the precursor with possible modifications.                                     |
| charge              | (integer) charge on the precursor.   |
| group_label         | (string) TODO Figure it out.   |

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License: (c) Author (2019) + GPL-3 Date: 2019-04-04

**See Also**

[getRunNames](#), [getPrecursors](#), [getPrecursorsQuery](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
filename <- paste0(dataPath, "/osw/merged.osw")
## Not run:
precursorsInfo <- fetchPrecursorsInfo(filename, runType = "DIA-Proteomics", context = "experiment-wide")
dim(precursorsInfo) # 234 6

## End(Not run)
```

---

fetchTransitionsFromRun

*Get transitions from a feature file*

---

**Description**

Get a data-frame of OpenSwath features that contains retention time, transition intensities, boundaries etc.

**Usage**

```
fetchTransitionsFromRun(  
  filename,  
  runID,  
  maxFdrQuery = 1,  
  runType = "DIA_Proteomics"  
)
```

**Arguments**

|             |  |
|-------------|--|
| filename    | (string) Path to the feature file.   |
| runID       | (string) id in RUN.ID column of the feature file.  |
| maxFdrQuery | (numeric) A numeric value between 0 and 1. It is used to filter features from osw file which have SCORE_MS2.QVALUE less than itself. |
| runType     | (char) This must be one of the strings "DIA_Proteomics", "DIA_Metabolomics".   |

**Value**

(data-frames) Data-frame has following columns:

|                     |  |
|---------------------|--|
| transition_group_id | (integer) a unique id for each precursor.  |
| RT                  | (numeric) retention time as in FEATURE.EXP_RT of osw files.                      |
| intensity           | (list) of peak intensities as in FEATURE_TRANSITION.AREA_INTENSITY of osw files. |
| leftWidth           | (numeric) as in FEATURE.LEFT_WIDTH of osw files.                                 |
| rightWidth          | (numeric) as in FEATURE.RIGHT_WIDTH of osw files.                                |
| peak_group_rank     | (integer) rank of each feature associated with transition_group_id.              |
| m_score             | (numeric) q-value of each feature associated with transition_group_id.           |

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License: (c) Author (2020) + GPL-3 Date: 2020-11-15

**See Also**

[getRunNames](#), [getTransitions](#), [getTransitionsQuery](#)

## Examples

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath = dataPath)
## Not run:
transitionsInfo <- fetchTransitionsFromRun(fileInfo$featureFile[1], fileInfo$spectraFileID[1],
  maxFdrQuery = 0.05)
dim(transitionsInfo) # 211 8

## End(Not run)
```

---

filenamesFromMZML      *Get mzML filenames from the directory.*

---

## Description

Reads all mzML names available in the directory.

## Usage

```
filenamesFromMZML(dataPath, chromFile)
```

## Arguments

dataPath            (char) Path to xics and osw directory.

## Value

A dataframe with two columns:

runName            (string) contain respective mzML names without extension.

chromatogramFile  
                  (string) Path to the chromatogram file.

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## Examples

```
dataPath <- system.file("extdata", package = "DIAAlignR")
## Not run:
filenamesFromMZML(dataPath)

## End(Not run)
```

---

|                  |   |
|------------------|---|
| filenamesFromOSW | <i>Get mzML filenames from osw RUN table.</i> |
|------------------|---|

---

**Description**

Get mzML filenames from osw RUN table.

**Usage**

```
filenamesFromOSW(dataPath, pattern)
```

**Arguments**

dataPath (char) path to xics and osw directory.  
pattern (char) must be either \*.osw or \*merged.osw .

**Value**

A dataframe with three columns:

spectraFile (string) as mentioned in RUN table of osw files.  
spectraFileID (string) ID in RUN table of osw files.  
featureFile (string) Path to the feature file.

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License: (c) Author (2019) + GPL-3 Date: 2019-12-14

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")  
## Not run:  
filenamesFromOSW(dataPath, "*.osw")  
filenamesFromOSW(dataPath, "*merged.osw")  
  
## End(Not run)
```

---

getAlignedFigs      *Plot aligned XICs group for a specific peptide.*

---

### Description

AlignObj is the output from getAlignObjs function. This function prepares ggplot objects from AlignObj.

### Usage

```
getAlignedFigs(  
  AlignObj,  
  XICs.ref,  
  XICs.exp,  
  refPeakLabel,  
  annotatePeak = FALSE  
)
```

### Arguments

|              |  |
|--------------|--|
| AlignObj     | (S4 object)  |
| XICs.ref     | (list) List of extracted ion chromatograms (dataframe) from reference run. The dataframe has two columns: first column is for time and second column indicates intensity.  |
| XICs.exp     | (list) List of extracted ion chromatograms (dataframe) from experiment run. The dataframe has two columns: first column is for time and second column indicates intensity. |
| refPeakLabel | (numeric vector) It contains peak apex, left width and right width.  |
| annotatePeak | (logical) TRUE: Peak boundaries and apex will be highlighted.  |

### Value

A plot to the current device.

### Author(s)

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License: (c) Author (2019) + GPL-3 Date: 2019-12-13

**Examples**

```

dataPath <- system.file("extdata", package = "DIAAlignR")
runs <- c("hroest_K120809_Strep0%PlasmaBiolRepl2_R04_SW_filt",
         "hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt")
AlignObjOutput <- getAlignObjs(analytes = 4618L, runs, dataPath = dataPath)
AlignObj <- AlignObjOutput[[2]][["4618"]][[1]][["AlignObj"]]
XICs.ref <- AlignObjOutput[[2]][["4618"]][[1]][["ref"]]
XICs.eXp <- AlignObjOutput[[2]][["4618"]][[1]][["eXp"]]
refPeakLabel <- AlignObjOutput[[2]][["4618"]][[1]][["peak"]]
## Not run:
getAlignedFigs(AlignObj, XICs.ref, XICs.eXp, refPeakLabel)

## End(Not run)

```

---

|                   |                             |
|-------------------|-----------------------------|
| getAlignedIndices | <i>Get aligned indices.</i> |
|-------------------|-----------------------------|

---

**Description**

This function aligns XICs of reference and experiment runs. It produces aligned indices between reference run and experiment run.

**Usage**

```

getAlignedIndices(
  XICs.ref,
  XICs.eXp,
  globalFit,
  alignType,
  adaptiveRT,
  normalization,
  simMeasure,
  goFactor,
  geFactor,
  cosAngleThresh,
  OverlapAlignment,
  dotProdThresh,
  gapQuantile,
  kerLen,
  hardConstrain,
  samples4gradient,
  objType = "light"
)

```

**Arguments**

XICs.ref      List of extracted ion chromatograms from reference run.

|                  |  |
|------------------|--|
| XICs.eXp         | List of extracted ion chromatograms from experiment run.   |
| globalFit        | Linear or loess fit object between reference and experiment run.   |
| alignType        | Available alignment methods are "global", "local" and "hybrid".  |
| adaptiveRT       | (numeric) Similarity matrix is not penalized within adaptive RT.   |
| normalization    | (character) Must be selected from "mean", "l2".  |
| simMeasure       | (string) Must be selected from dotProduct, cosineAngle, crossCorrelation, cosine2Angle, dotProductMasked, euclideanDist, covariance and correlation. |
| goFactor         | (numeric) Penalty for introducing first gap in alignment. This value is multiplied by base gap-penalty.  |
| geFactor         | (numeric) Penalty for introducing subsequent gaps in alignment. This value is multiplied by base gap-penalty.  |
| cosAngleThresh   | (numeric) In simType = dotProductMasked mode, angular similarity should be higher than cosAngleThresh otherwise similarity is forced to zero.        |
| OverlapAlignment | (logical) An input for alignment with free end-gaps. False: Global alignment, True: overlap alignment.   |
| dotProdThresh    | (numeric) In simType = dotProductMasked mode, values in similarity matrix higher than dotProdThresh quantile are checked for angular similarity.     |
| gapQuantile      | (numeric) Must be between 0 and 1. This is used to calculate base gap-penalty from similarity distribution.  |
| kerLen           | (integer) In simType = crossCorrelation, length of the kernel used to sum similarity score. Must be an odd number.                                   |
| hardConstrain    | (logical) If FALSE; indices farther from noBeef distance are filled with distance from linear fit line.  |
| samples4gradient | (numeric) This parameter modulates penalization of masked indices.   |
| objType          | (char) Must be selected from light, medium and heavy.  |

**Value**

(data-frame) Aligned indices of reference and experiment runs. Gaps are introduced as NA.

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License: (c) Author (2020) + GPL-3 Date: 2020-06-07

**See Also**

[alignChromatogramsCpp](#), [getAlignObj](#)



**Examples**

```

data(XIC_QFNNTDIVLLEDFQK_3_DIAAlignR, package="DIAAlignR")
data(oswFiles_DIAAlignR, package="DIAAlignR")
run1 <- "hroest_K120809_Strep0%PlasmaBiolRepl2_R04_SW_filt"
run2 <- "hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt"
XICs.ref <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[[run1]][["4618"]]
XICs.eXp <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[[run2]][["4618"]]
globalFit <- getGlobalAlignment(oswFiles_DIAAlignR, ref = "run1", eXp = "run2",
  fitType = "loess", maxFdrGlobal = 0.05, spanvalue = 0.1)
adaptiveRT <- 77.82315 #3.5*globalFit$
## Not run:
getAlignedIndices(XICs.ref, XICs.eXp, globalFit, alignType = "hybrid",
  adaptiveRT = adaptiveRT, normalization = "mean",
  simMeasure = "dotProductMasked", goFactor = 0.125, geFactor = 40, cosAngleThresh = 0.3,
  OverlapAlignment = TRUE, dotProdThresh = 0.96, gapQuantile = 0.5, kerLen = 9L, hardConstrain = FALSE,
  samples4gradient = 100)

## End(Not run)

```

---

|                 |                                     |
|-----------------|-------------------------------------|
| getAlignedTimes | <i>Get aligned Retention times.</i> |
|-----------------|-------------------------------------|

---

**Description**

This function aligns XICs of reference and experiment runs. It produces aligned retention times between reference run and experiment run.

**Usage**

```

getAlignedTimes(
  XICs.ref,
  XICs.eXp,
  globalFit,
  alignType,
  adaptiveRT,
  normalization,
  simMeasure,
  goFactor,
  geFactor,
  cosAngleThresh,
  OverlapAlignment,
  dotProdThresh,
  gapQuantile,
  kerLen,
  hardConstrain,
  samples4gradient,
  objType = "light"
)

```

**Arguments**

|                  |  |
|------------------|--|
| XICs.ref         | List of extracted ion chromatograms from reference run.  |
| XICs.exp         | List of extracted ion chromatograms from experiment run.   |
| globalFit        | Linear or loess fit object between reference and experiment run.   |
| alignType        | Available alignment methods are "global", "local" and "hybrid".  |
| adaptiveRT       | (numeric) Similarity matrix is not penalized within adaptive RT.   |
| normalization    | (character) Must be selected from "mean", "l2".  |
| simMeasure       | (string) Must be selected from dotProduct, cosineAngle, crossCorrelation, cosine2Angle, dotProductMasked, euclideanDist, covariance and correlation. |
| goFactor         | (numeric) Penalty for introducing first gap in alignment. This value is multiplied by base gap-penalty.  |
| geFactor         | (numeric) Penalty for introducing subsequent gaps in alignment. This value is multiplied by base gap-penalty.  |
| cosAngleThresh   | (numeric) In simType = dotProductMasked mode, angular similarity should be higher than cosAngleThresh otherwise similarity is forced to zero.        |
| OverlapAlignment | (logical) An input for alignment with free end-gaps. False: Global alignment, True: overlap alignment.   |
| dotProdThresh    | (numeric) In simType = dotProductMasked mode, values in similarity matrix higher than dotProdThresh quantile are checked for angular similarity.     |
| gapQuantile      | (numeric) Must be between 0 and 1. This is used to calculate base gap-penalty from similarity distribution.  |
| kerLen           | (integer) In simType = crossCorrelation, length of the kernel used to sum similarity score. Must be an odd number.                                   |
| hardConstrain    | (logical) If FALSE; indices farther from noBeef distance are filled with distance from linear fit line.  |
| samples4gradient | (numeric) This parameter modulates penalization of masked indices.   |
| objType          | (char) Must be selected from light, medium and heavy.  |

**Value**

(list) the first element corresponds to the aligned reference time, the second element is the aligned experiment time.

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**See Also**

[alignChromatogramsCpp](#), [getAlignObj](#)

**Examples**

```

data(XIC_QFNNTDIVLLEDFQK_3_DIAAlignR, package="DIAAlignR")
data(oswFiles_DIAAlignR, package="DIAAlignR")
run1 <- "hroest_K120809_Strep0%PlasmaBiolRepl2_R04_SW_filt"
run2 <- "hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt"
XICs.ref <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[[run1]][["4618"]]
XICs.exp <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[[run2]][["4618"]]
RUNS_RT <- getRTdf(oswFiles_DIAAlignR, ref = "run1", exp = "run2", maxFdrGlobal = 0.05)
globalFit <- loess(RT.exp ~ RT.ref, data = RUNS_RT, span = 0.1, control=loess.control(surface="direct"))
adaptiveRT <- 77.82315 #3.5*globalFit$s
getAlignedTimes(XICs.ref, XICs.exp, globalFit, alignType = "hybrid",
  adaptiveRT = adaptiveRT, normalization = "mean",
  simMeasure = "dotProductMasked", goFactor = 0.125, geFactor = 40, cosAngleThresh = 0.3,
  OverlapAlignment = TRUE, dotProdThresh = 0.96, gapQuantile = 0.5, kerLen = 9L, hardConstrain = FALSE,
  samples4gradient = 100)

```

---

|                    |   |
|--------------------|---|
| getAlignedTimesCpp | <i>Get aligned indices from MS2 extracted-ion chromatograms(XICs) pair.</i> |
|--------------------|---|

---

**Description**

Get aligned indices from MS2 extracted-ion chromatograms(XICs) pair.

**Usage**

```

getAlignedTimesCpp(
  l1,
  l2,
  kernelLen,
  polyOrd,
  alignType,
  adaptiveRT,
  normalization,
  simType,
  Bp,
  goFactor = 0.125,
  geFactor = 40,
  cosAngleThresh = 0.3,
  OverlapAlignment = TRUE,
  dotProdThresh = 0.96,
  gapQuantile = 0.5,
  kerLen = 9L,
  hardConstrain = FALSE,
  samples4gradient = 100
)

```

**Arguments**

|                  |  |
|------------------|--|
| l1               | (list) A list of numeric matrix of two columns. l1 and l2 should have same length.   |
| l2               | (list) A list of numeric matrix of two columns. l1 and l2 should have same length.   |
| kernellLen       | (integer) length of filter. Must be an odd number.   |
| polyOrd          | (integer) TRUE: remove background from peak signal using estimated noise levels.   |
| alignType        | (char) A character string. Available alignment methods are "global", "local" and "hybrid".   |
| adaptiveRT       | (numeric) Similarity matrix is not penalized within adaptive RT.   |
| normalization    | (char) A character string. Normalization must be selected from (L2, mean or none).   |
| simType          | (char) A character string. Similarity type must be selected from (dotProductMasked, dotProduct, cosineAngle, cosine2Angle, euclideanDist, covariance, correlation, crossCorrelation).<br>Mask = $s > \text{quantile}(s, \text{dotProdThresh})$<br>AllowDotProd = $[\text{Mask} \times \text{cosine2Angle} + (1 - \text{Mask})] > \text{cosAngleThresh}$<br>$s_{\text{new}} = s \times \text{AllowDotProd}$ |
| Bp               | (numeric) Timepoint mapped by global fit for tA.   |
| goFactor         | (numeric) Penalty for introducing first gap in alignment. This value is multiplied by base gap-penalty.  |
| geFactor         | (numeric) Penalty for introducing subsequent gaps in alignment. This value is multiplied by base gap-penalty.  |
| cosAngleThresh   | (numeric) In simType = dotProductMasked mode, angular similarity should be higher than cosAngleThresh otherwise similarity is forced to zero.  |
| OverlapAlignment | (logical) An input for alignment with free end-gaps. False: Global alignment, True: overlap alignment.   |
| dotProdThresh    | (numeric) In simType = dotProductMasked mode, values in similarity matrix higher than dotProdThresh quantile are checked for angular similarity.   |
| gapQuantile      | (numeric) Must be between 0 and 1. This is used to calculate base gap-penalty from similarity distribution.  |
| kerLen           | (integer) In simType = crossCorrelation, length of the kernel used to sum similarity score. Must be an odd number.   |
| hardConstrain    | (logical) if false; indices farther from noBeef distance are filled with distance from linear fit line.  |
| samples4gradient | (numeric) This parameter modulates penalization of masked indices.   |

**Value**

NumericMatrix Aligned indices of l1 and l2.

**Author(s)**

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**Examples**

```
data(XIC_QFNNTDIVLLEDFQK_3_DIAAlignR, package="DIAAlignR")
XICs <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR
XICs.ref <- lapply(XICs[["hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt"]][["4618"]], as.matrix)
XICs.exp <- lapply(XICs[["hroest_K120809_Strep10%PlasmaBiolRep12_R04_SW_filt"]][["4618"]], as.matrix)
Bp <- seq(4964.752, 5565.462, length.out = nrow(XICs.ref[[1]]))
time <- getAlignedTimesCpp(XICs.ref, XICs.exp, 11, 4, alignType = "hybrid", adaptiveRT = 77.82315,
  normalization = "mean", simType = "dotProductMasked", Bp = Bp,
  goFactor = 0.125, geFactor = 40, cosAngleThresh = 0.3, OverlapAlignment = TRUE,
  dotProdThresh = 0.96, gapQuantile = 0.5, hardConstrain = FALSE, samples4gradient = 100)
```

---

getAlignedTimesFast     *Get aligned Retention times.*

---

**Description**

This function aligns XICs of reference and experiment runs. It produces aligned retention times between reference run and experiment run.

**Usage**

```
getAlignedTimesFast(XICs.ref, XICs.exp, globalFit, adaptiveRT, params)
```

**Arguments**

|            |  |
|------------|--|
| XICs.ref   | List of extracted ion chromatograms from reference run.  |
| XICs.exp   | List of extracted ion chromatograms from experiment run.                                       |
| globalFit  | Linear or loess fit object between reference and experiment run.                               |
| adaptiveRT | (numeric) Similarity matrix is not penalized within adaptive RT.                               |
| params     | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function. |

**Value**

(matrix) the first column corresponds to the aligned reference time, the second column is the aligned experiment time.

**Author(s)**

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ORCID: 0000-0003-3500-8152  
License: (c) Author (2021) + GPL-3 Date: 2021-01-02

**See Also**

[alignChromatogramsCpp](#), [getAlignObj](#)

**Examples**

```
data(XIC_QFNNTDIVLLEDFQK_3_DIAAlignR, package="DIAAlignR")
data(oswFiles_DIAAlignR, package="DIAAlignR")
run1 <- "hroest_K120809_Strep0%PlasmaBiolRepl2_R04_SW_filt"
run2 <- "hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt"
XICs.ref <- lapply(XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[[run1]][["4618"]], as.matrix)
XICs.eXp <- lapply(XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[[run2]][["4618"]], as.matrix)
params <- paramsDIAAlignR()
params[["globalAlignment"]] <- "linear"
globalFit <- getGlobalAlignment(oswFiles_DIAAlignR, ref = "run2", eXp = "run0",
  fitType = params[["globalAlignment"]], maxFdrGlobal = 0.05, spanvalue = 0.1)
adaptiveRT <- 77.82315 #3.5*getRSE(globalFit, params[["globalAlignment"]])
globalFit <- coef(globalFit)
getAlignedTimesFast(XICs.ref, XICs.eXp, globalFit, adaptiveRT, params)
```

---

getAlignObj

*Outputs AlignObj from an alignment of two XIC-groups*

---

**Description**

Outputs AlignObj from an alignment of two XIC-groups

**Usage**

```
getAlignObj(
  XICs.ref,
  XICs.eXp,
  globalFit,
  alignType,
  adaptiveRT,
  normalization,
  simType,
  goFactor,
  geFactor,
  cosAngleThresh,
  OverlapAlignment,
  dotProdThresh,
  gapQuantile,
  kerLen,
  hardConstrain,
  samples4gradient,
  objType = "light"
)
```

**Arguments**

|                  |  |
|------------------|--|
| XICs.ref         | List of extracted ion chromatograms from reference run.  |
| XICs.exp         | List of extracted ion chromatograms from experiment run.   |
| globalFit        | Linear or loess fit object between reference and experiment run.   |
| alignType        | Available alignment methods are "global", "local" and "hybrid".  |
| adaptiveRT       | (numeric) Similarity matrix is not penalized within adaptive RT.   |
| normalization    | (character) Must be selected from "mean", "l2".  |
| simType          | (string) Must be selected from dotProduct, cosineAngle, crossCorrelation, cosine2Angle, dotProductMasked, euclideanDist, covariance and correlation. |
| goFactor         | (numeric) Penalty for introducing first gap in alignment. This value is multiplied by base gap-penalty.  |
| geFactor         | (numeric) Penalty for introducing subsequent gaps in alignment. This value is multiplied by base gap-penalty.  |
| cosAngleThresh   | (numeric) In simType = dotProductMasked mode, angular similarity should be higher than cosAngleThresh otherwise similarity is forced to zero.        |
| OverlapAlignment | (logical) An input for alignment with free end-gaps. False: Global alignment, True: overlap alignment.   |
| dotProdThresh    | (numeric) In simType = dotProductMasked mode, values in similarity matrix higher than dotProdThresh quantile are checked for angular similarity.     |
| gapQuantile      | (numeric) Must be between 0 and 1. This is used to calculate base gap-penalty from similarity distribution.  |
| kerLen           | (integer) In simType = crossCorrelation, length of the kernel used to sum similarity score. Must be an odd number.                                   |
| hardConstrain    | (logical) If FALSE; indices farther from noBeef distance are filled with distance from linear fit line.  |
| samples4gradient | (numeric) This parameter modulates penalization of masked indices.   |
| objType          | (char) Must be selected from light, medium and heavy.  |

**Value**

A S4 object. Three most-important slots are:

|                |  |
|----------------|--|
| indexA_aligned | (integer) aligned indices of reference run.  |
| indexB_aligned | (integer) aligned indices of experiment run. |
| score          | (numeric) cumulative score of alignment.     |

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

**See Also**

[alignChromatogramsCpp](#)

**Examples**

```
data(XIC_QFNNTDIVLLEDFQK_3_DIAAlignR, package="DIAAlignR")
data(oswFiles_DIAAlignR, package="DIAAlignR")
run1 <- "hroest_K120809_Strep0%PlasmaBio1Rep12_R04_SW_filt"
run2 <- "hroest_K120809_Strep10%PlasmaBio1Rep12_R04_SW_filt"
XICs.ref <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[[run1]][["4618"]]
XICs.exp <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[[run2]][["4618"]]
RUNS_RT <- getRTdf(oswFiles_DIAAlignR, ref = "run1", exp = "run2", maxFdrGlobal = 0.05)
globalFit <- loess(RT.exp ~ RT.ref, data = RUNS_RT, span = 0.1, control=loess.control(surface="direct"))
AlignObj <- getAlignObj(XICs.ref, XICs.exp, globalFit, alignType = "hybrid", adaptiveRT = 77.82315,
  normalization = "mean", simType = "dotProductMasked", goFactor = 0.125,
  geFactor = 40, cosAngleThresh = 0.3, OverlapAlignment = TRUE, dotProdThresh = 0.96,
  gapQuantile = 0.5, kerLen = 9L, hardConstrain = FALSE, samples4gradient = 100, objType = "light")
```

---

getAlignObjs

*AlignObj for analytes between a pair of runs*

---

**Description**

This function expects osw and xics directories at dataPath. It first reads osw files and fetches chromatogram indices for each requested analyte. It then align XICs of each analyte to its reference XICs. AlignObj is returned which contains aligned indices and cumulative score along the alignment path.

**Usage**

```
getAlignObjs(
  analytes,
  runs,
  dataPath = ".",
  refRun = NULL,
  oswMerged = TRUE,
  params = paramsDIAAlignR(),
  objType = "light"
)
```

**Arguments**

|          |   |
|----------|---|
| analytes | (vector of integers) transition_group_ids for which features are to be extracted.                 |
| runs     | (string) names of xics file without extension.  |
| dataPath | (string) path to xics and osw directory.  |
| refRun   | (string) reference for alignment. If no run is provided, m-score is used to select reference run. |



oswMerged (logical) TRUE if merged file from pyprophet is used.  
params (list) parameters are entered as list. Output of the [paramsDIAAlignR](#) function.  
objType (char) Must be selected from light, medium and heavy.

### Value

A list of fileInfo and AlignObjs. Each AlignObj is an S4 object. Three most-important slots are:

indexA\_aligned (integer) aligned indices of reference run.  
indexB\_aligned (integer) aligned indices of experiment run.  
score (numeric) cumulative score of alignment.

### Author(s)

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-14

### References

Gupta S, Ahadi S, Zhou W, Röst H. "DIAAlignR Provides Precise Retention Time Alignment Across Distant Runs in DIA and Targeted Proteomics." *Mol Cell Proteomics*. 2019 Apr;18(4):806-817. doi: <https://doi.org/10.1074/mcp.TIR118.001132> Epub 2019 Jan 31.

### See Also

[plotAlignedAnalytes](#), [getRunNames](#), [getFeatures](#), [getXICs4AlignObj](#), [getAlignObj](#)

### Examples

```
dataPath <- system.file("extdata", package = "DIAAlignR")
params <- paramsDIAAlignR()
params[["context"]] <- "experiment-wide"
runs <- c("hroest_K120808_Strep10%PlasmaBiolRep11_R03_SW_filt",
         "hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt",
         "hroest_K120809_Strep10%PlasmaBiolRep12_R04_SW_filt")
analytes <- c(32L, 898L, 2474L)
AlignObjOutput <- getAlignObjs(analytes, runs, dataPath = dataPath)
plotAlignedAnalytes(AlignObjOutput)
```

---

|                  |  |
|------------------|--|
| getAnalytesQuery | <i>Generate SQL query to fetch limited information from osw files.</i> |
|------------------|--|

---

**Description**

Generate SQL query to fetch limited information from osw files.

**Usage**

```
getAnalytesQuery(  
  maxFdrQuery,  
  oswMerged = TRUE,  
  filename = NULL,  
  runType = "DIA_Proteomics",  
  analyteInGroupLabel = FALSE  
)
```

**Arguments**

|                     |  |
|---------------------|--|
| maxFdrQuery         | (numeric) value between 0 and 1. It is used to filter features from osw file which have SCORE_MS2.QVALUE less than itself. |
| oswMerged           | (logical) TRUE for experiment-wide FDR and FALSE for run-specific FDR by pyprophet.  |
| filename            | (string) as mentioned in RUN table of osw files..  |
| runType             | (char) This must be one of the strings "DIA_Proteomics", "DIA_Metabolomics".   |
| analyteInGroupLabel | (logical) TRUE for getting analytes as PRECURSOR.GROUP_LABEL from osw file.  |

**Value**

SQL query to be searched.

**Author(s)**

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License: (c) Author (2019) + GPL-3 Date: 2019-12-14

**See Also**

[getOswAnalytes](#)

---

getBaseGapPenaltyCpp *Calculates gap penalty for dynamic programming based alignment.*

---

### Description

This function outputs base gap-penalty depending on SimType used. In case of getting base gap-penalty from similarity matrix distribution, gapQuantile will be used to pick the value.

### Usage

```
getBaseGapPenaltyCpp(sim, SimType, gapQuantile = 0.5)
```

### Arguments

|             |   |
|-------------|---|
| sim         | (matrix) A numeric matrix. Input similarity matrix.   |
| SimType     | (char) A character string. Similarity type must be selected from (dotProductMasked, dotProduct, cosineAngle, cosine2Angle, euclideanDist, covariance, correlation, crossCorrelation). |
| gapQuantile | (numeric) Must be between 0 and 1.  |

### Value

baseGapPenalty (numeric).

### Author(s)

Shubham Gupta, <shubh.gupta@mail.utoronto.ca> ORCID: 0000-0003-3500-8152 License: (c) Author (2019) + MIT Date: 2019-03-08

### Examples

```
sim <- matrix(c(-12, 1.0, 12, -2.3, -2, -2, 1.07, -2, 1.80, 2, 22, 42, -2, -1.5, -2, 10), 4, 4,
  byrow = FALSE)
getBaseGapPenaltyCpp(sim, "dotProductMasked", 0.5) # -0.25
```

---

getChildFeature *Transform features to child time-domain*

---

### Description

This function transforms the peaks' times to child run's time-domain. The feature intensity is calculated with appropriate method stated in params. Internal missing values are not allowed in timeParent.

**Usage**

```
getChildFeature(XICs, alignedVec, df.ref, df.eXp, i.ref, i.eXp, params)
```

**Arguments**

|            |   |
|------------|---|
| XICs       | (list of data-frames) extracted ion chromatograms from the child run.   |
| alignedVec | (data-frame) aligned parent time-vectors. Must have five columns  |
| df.ref     | (data-frame) contains reference-run features to be transformed. It has a format of <a href="#">getFeatures</a> output.  |
| df.eXp     | (data-frame) contains experiment-run features to be transformed. It has a format of <a href="#">getFeatures</a> output. |
| params     | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function.                          |

**Value**

(data-frame) this has a format of [getFeatures](#) output.

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-07-17

**See Also**

[trfrParentFeature](#), [getNodeRun](#)

**Examples**

```
data(masterXICs_DIAAlignR, package="DIAAlignR")
newXICs <- masterXICs_DIAAlignR
params <- paramsDIAAlignR()
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- DIAAlignR::getRunNames(dataPath = dataPath)
features <- getFeatures(fileInfo, maxFdrQuery = 1.00, runType = "DIA_Proteomics")
df.ref <- features$run1[features$run1$transition_group_id == 4618L, ]
df.eXp <- features$run2[features$run2$transition_group_id == 4618L, ]
## Not run:
getChildFeature(newXICs[[1]], newXICs[[2]], df.ref, df.eXp, params)

## End(Not run)
```

---

`getChildXICpp`*Get child chromatogram from two parent chromatogram*

---

**Description**

Get child chromatogram from two parent chromatogram

**Usage**

```
getChildXICpp(  
  l1,  
  l2,  
  kernelLen,  
  polyOrd,  
  alignType,  
  adaptiveRT,  
  normalization,  
  simType,  
  Bp,  
  goFactor = 0.125,  
  geFactor = 40,  
  cosAngleThresh = 0.3,  
  OverlapAlignment = TRUE,  
  dotProdThresh = 0.96,  
  gapQuantile = 0.5,  
  kerLen = 9L,  
  hardConstrain = FALSE,  
  samples4gradient = 100,  
  wRef = 0.5,  
  splineMethod = "natural",  
  mergeStrategy = "avg",  
  keepFlanks = TRUE  
)
```

**Arguments**

|                        |  |
|------------------------|--|
| <code>l1</code>        | (list) A list of numeric matrix of two columns. <code>l1</code> and <code>l2</code> should have same length. |
| <code>l2</code>        | (list) A list of numeric matrix of two columns. <code>l1</code> and <code>l2</code> should have same length. |
| <code>kernelLen</code> | (integer) length of filter. Must be an odd number.   |
| <code>polyOrd</code>   | (integer) TRUE: remove background from peak signal using estimated noise levels.                             |
| <code>alignType</code> | (char) A character string. Available alignment methods are "global", "local" and "hybrid".                   |

|                  |  |
|------------------|--|
| adaptiveRT       | (numeric) Similarity matrix is not penalized within adaptive RT.   |
| normalization    | (char) A character string. Normalization must be selected from (L2, mean or none).   |
| simType          | (char) A character string. Similarity type must be selected from (dotProductMasked, dotProduct, cosineAngle, cosine2Angle, euclideanDist, covariance, correlation, crossCorrelation).<br>Mask = $s > \text{quantile}(s, \text{dotProdThresh})$<br>AllowDotProd = $[\text{Mask} \times \text{cosine2Angle} + (1 - \text{Mask})] > \text{cosAngleThresh}$<br>$s_{\text{new}} = s \times \text{AllowDotProd}$ |
| Bp               | (numeric) Timepoint mapped by global fit for tA.   |
| goFactor         | (numeric) Penalty for introducing first gap in alignment. This value is multiplied by base gap-penalty.  |
| geFactor         | (numeric) Penalty for introducing subsequent gaps in alignment. This value is multiplied by base gap-penalty.  |
| cosAngleThresh   | (numeric) In simType = dotProductMasked mode, angular similarity should be higher than cosAngleThresh otherwise similarity is forced to zero.  |
| OverlapAlignment | (logical) An input for alignment with free end-gaps. False: Global alignment, True: overlap alignment.   |
| dotProdThresh    | (numeric) In simType = dotProductMasked mode, values in similarity matrix higher than dotProdThresh quantile are checked for angular similarity.   |
| gapQuantile      | (numeric) Must be between 0 and 1. This is used to calculate base gap-penalty from similarity distribution.  |
| kerLen           | (integer) In simType = crossCorrelation, length of the kernel used to sum similarity score. Must be an odd number.   |
| hardConstrain    | (logical) if false; indices farther from noBeef distance are filled with distance from linear fit line.  |
| samples4gradient | (numeric) This parameter modulates penalization of masked indices.   |
| wRef             | (numeric) Weight of the reference XIC. Must be between 0 and 1.  |
| splineMethod     | (string) must be either "fmm" or "natural".  |
| mergeStrategy    | (string) must be either ref, avg, refStart or refEnd.  |
| keepFlanks       | (logical) TRUE: Flanking chromatogram is not removed.  |

**Value**

(List) of chromatograms and their aligned time vectors.

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca> ORCID: 0000-0003-3500-8152 License: (c) Author (2021) + MIT Date: 2021-01-08

**Examples**

```

data(XIC_QFNNTDIVLLEDFQK_3_DIAAlignR, package="DIAAlignR")
XICs <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR
XICs.ref <- lapply(XICs[["hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt"]][["4618"]], as.matrix)
XICs.eXp <- lapply(XICs[["hroest_K120809_Strep10%PlasmaBiolRep12_R04_SW_filt"]][["4618"]], as.matrix)
Bp <- seq(4964.752, 5565.462, length.out = nrow(XICs.ref[[1]]))
chrom <- getChildXICpp(XICs.ref, XICs.eXp, 11L, 4L, alignType = "hybrid", adaptiveRT = 77.82315,
  normalization = "mean", simType = "dotProductMasked", Bp = Bp,
  goFactor = 0.125, geFactor = 40, cosAngleThresh = 0.3, OverlapAlignment = TRUE,
  dotProdThresh = 0.96, gapQuantile = 0.5, hardConstrain = FALSE, samples4gradient = 100,
  wRef = 0.5, keepFlanks= TRUE)

```

---

getChildXICs

*Develop child XICs for precursors*


---

**Description**

This function performs the chromatogram alignment of all precursors across runA and runB. Aligned chromatograms are merged into a child chromatogram. Aligned time vector and resulting child time vector for each precursor is also returned.

**Usage**

```

getChildXICs(
  runA,
  runB,
  fileInfo,
  features,
  mzPntrs,
  precursors,
  prec2chromIndex,
  refRun,
  peptideScores,
  params,
  applyFun = lapply
)

```

**Arguments**

|          |  |
|----------|--|
| runA     | (string) name of a run to be merged with runB. Must be in the rownames of fileInfo.  |
| runB     | (string) name of a run to be merged with runA. Must be in the rownames of fileInfo.  |
| fileInfo | (data-frame) output of <a href="#">getRunNames</a> .                                 |
| features | (list of data-frames) contains features and their properties identified in each run. |
| mzPntrs  | (list) a list of mzRpwis.  |

|                 |   |
|-----------------|---|
| precursors      | (data-frame) atleast two columns transition_group_id and transition_ids are required.   |
| prec2chromIndex | (list) a list of dataframes having following columns:<br>transition_group_id: it is PRECURSOR.ID from osw file.<br>chromatogramIndex: index of chromatogram in mzML file. |
| refRun          | (integer) must be of the same length as of precursors. 1: reference is runA, 2: reference is runB.  |
| peptideScores   | (list of data-frames) each dataframe has scores of a peptide across all runs.   |
| params          | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function.  |
| applyFun        | (function) value must be either lapply or BiocParallel::bplapply.   |

### Value

(list) has three elements. The first element has child XICs for all the precursors. The second element has corresponding aligned time vectors. Third element contains Residual Standard Errors (RSE) of global fits amongst runA and runB.

### Author(s)

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ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-06-06

### See Also

[childXICs](#), [getNodeRun](#)

### Examples

```
dataPath <- system.file("extdata", package = "DIAAlignR")
params <- paramsDIAAlignR()
fileInfo <- DIAAlignR::getRunNames(dataPath = dataPath)
mzPntrs <- getMZMLpointers(fileInfo)
features <- getFeatures(fileInfo, maxFdrQuery = 1.00, runType = "DIA_Proteomics")
precursors <- getPrecursors(fileInfo, oswMerged = TRUE, runType = "DIA_Proteomics",
  context = "experiment-wide", maxPeptideFdr = 0.05)
precursors <- dplyr::arrange(precursors, .data$peptide_id, .data$transition_group_id)
peptideIDs <- unique(precursors$peptide_id)
peptideScores <- getPeptideScores(fileInfo, peptideIDs, oswMerged = TRUE, params[["runType"]], params[["context"])
peptideScores <- lapply(peptideIDs, function(pep) dplyr::filter(peptideScores, .data$peptide_id == pep))
names(peptideScores) <- as.character(peptideIDs)
prec2chromIndex <- getChromatogramIndices(fileInfo, precursors, mzPntrs)
var2 <- as.character(sapply(peptideIDs, function(p) precursors$transition_group_id[which(precursors$peptide_id ==
  refRun <- data.frame(rep(1L, length(peptideIDs)), var2)
mergedXICs <- getChildXICs(runA = "run1", runB = "run2", fileInfo, features, mzPntrs,
  precursors, prec2chromIndex, refRun, peptideScores, params)
for(con in mzPntrs) DBI::dbDisconnect(con)
```



---

`getChromatogramIndices`*Get chromatogram indices of precursors.*

---

**Description**

This function reads the header of chromatogram files. It then fetches chromatogram indices by matching `transition_id(osw)` with `chromatogramID(xics)`.

**Usage**

```
getChromatogramIndices(fileInfo, precursors, mzPntrs, applyFun = lapply)
```

**Arguments**

|                         |   |
|-------------------------|---|
| <code>fileInfo</code>   | (data-frame) Output of <code>getRunNames</code> function.   |
| <code>precursors</code> | (data-frame) Atleast two columns <code>transition_group_id</code> and <code>transition_ids</code> are required. |
| <code>mzPntrs</code>    | A list of <code>mzRpwiz</code> .  |
| <code>applyFun</code>   | (function) value must be either <code>lapply</code> or <code>BiocParallel::bplapply</code> .                    |

**Value**

(list) A list of dataframes having following columns:

|                                  |  |
|----------------------------------|--|
| <code>transition_group_id</code> | (string) it is <code>PRECURSOR.ID</code> from <code>osw</code> file. |
| <code>chromatogramIndex</code>   | (integer) index of chromatogram in <code>mzML</code> file.           |

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-04-07

**See Also**

[chromatogramIdAsInteger](#), [mapPrecursorToChromIndices](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath = dataPath)
precursors <- getPrecursors(fileInfo, oswMerged = TRUE, context = "experiment-wide")
mzPntrs <- getMZMLpointers(fileInfo)
prec2chromIndex <- getChromatogramIndices(fileInfo, precursors, mzPntrs)
for(mz in mzPntrs) DBI::dbDisconnect(mz)
```

---

getChromSimMatCpp      *Calculates similarity matrix of two fragment-ion chromatogram groups or extracted-ion chromatograms(XICs)*

---

### Description

Calculates similarity matrix of two fragment-ion chromatogram groups or extracted-ion chromatograms(XICs)

### Usage

```
getChromSimMatCpp(
    l1,
    l2,
    normalization,
    simType,
    cosAngleThresh = 0.3,
    dotProdThresh = 0.96,
    kerLen = 9L
)
```

### Arguments

|                |  |
|----------------|--|
| l1             | (list) A list of vectors. Length should be same as of l2.  |
| l2             | (list) A list of vectors. Length should be same as of l1.  |
| normalization  | (char) A character string. Normalization must be selected from (L2, mean or none).   |
| simType        | (char) A character string. Similarity type must be selected from (dotProductMasked, dotProduct, cosineAngle, cosine2Angle, euclideanDist, covariance, correlation, crossCorrelation).<br>Mask = s > quantile(s, dotProdThresh)<br>AllowDotProd= [Mask × cosine2Angle + (1 - Mask)] > cosAngleThresh<br>s_new= s × AllowDotProd |
| cosAngleThresh | (numeric) In simType = dotProductMasked mode, angular similarity should be higher than cosAngleThresh otherwise similarity is forced to zero.  |
| dotProdThresh  | (numeric) In simType = dotProductMasked mode, values in similarity matrix higher than dotProdThresh quantile are checked for angular similarity.   |
| kerLen         | (integer) In simType = crossCorrelation, length of the kernel used to sum similarity score. Must be an odd number.   |

### Value

s (matrix) Numeric similarity matrix. Rows and columns expresses seq1 and seq2, respectively.

### Author(s)

Shubham Gupta, <shubh.gupta@mail.utoronto.ca> ORCID: 0000-0003-3500-8152 License: (c) Author (2019) + MIT Date: 2019-03-05

**Examples**

```

# Get similarity matrix of dummy chromatograms
r1 <- list(c(1.0,3.0,2.0,4.0), c(0.0,0.0,0.0,1.0), c(4.0,4.0,4.0,5.0))
r2 <- list(c(1.4,2.0,1.5,4.0), c(0.0,0.5,0.0,0.0), c(2.0,3.0,4.0,0.9))
round(getChromSimMatCpp(r1, r2, "L2", "dotProductMasked"), 3)
matrix(c(0.125, 0.162, 0.144, 0.208, 0.186, 0.240,
0.213, 0.313, 0.233, 0.273, 0.253, 0.346, 0.101, 0.208, 0.154, 0.273), 4, 4, byrow = FALSE)

round(getChromSimMatCpp(r1, r2, "L2", "dotProduct"), 3)
matrix(c(0.125, 0.162, 0.144, 0.208, 0.186,0.240, 0.213, 0.313, 0.233,
0.273, 0.253, 0.346, 0.101, 0.208, 0.154, 0.273), 4, 4, byrow = FALSE)

round(getChromSimMatCpp(r1, r2, "L2", "cosineAngle"), 3)
matrix(c(0.934, 0.999, 0.989, 0.986, 0.933, 0.989,
0.983, 0.996, 0.994, 0.960, 0.995, 0.939, 0.450,
0.761, 0.633, 0.772), 4, 4, byrow = FALSE)

round(getChromSimMatCpp(r1, r2, "L2", "cosine2Angle"), 3)
matrix(c(0.744, 0.998, 0.957, 0.944, 0.740, 0.956, 0.932,
0.985, 0.974, 0.842, 0.978, 0.764, -0.596, 0.158,
-0.200, 0.190), 4, 4, byrow = FALSE)

round(getChromSimMatCpp(r1, r2, "mean", "euclideanDist"), 3)
matrix(c(0.608, 0.614, 0.680, 0.434, 0.530, 0.742,
0.659, 0.641, 0.520, 0.541, 0.563, 0.511, 0.298,
0.375, 0.334, 0.355), 4, 4, byrow = FALSE)

round(getChromSimMatCpp(r1, r2, "L2", "covariance"), 3)
matrix(c(0.025, 0.028, 0.027, 0.028, 0.032, 0.034,
0.033, 0.034, 0.055, 0.051, 0.053, 0.051,
-0.004, 0.028, 0.012, 0.028), 4, 4, byrow = FALSE)

round(getChromSimMatCpp(r1, r2, "L2", "correlation"), 3)
matrix(c(0.874, 0.999, 0.974, 0.999, 0.923, 0.986, 0.993,
0.986, 0.991, 0.911, 0.990, 0.911, -0.065, 0.477,
0.214, 0.477), 4, 4, byrow = FALSE)

```

getFeatures

*Get features from all feature files***Description**

Get a list of data-frame of OpenSwath features that contains retention time, intensities, boundaries etc.

**Usage**

```

getFeatures(
  fileInfo,

```

```

maxFdrQuery = 0.05,
maxIPFFdrQuery = 0.05,
runType = "DIA_Proteomics",
applyFun = lapply
)

```

### Arguments

**fileInfo** (data-frame) output of [getRunNames](#) function.

**maxFdrQuery** (numeric) a numeric value between 0 and 1. It is used to filter features from osw file which have SCORE\_MS2.QVALUE less than itself.

**maxIPFFdrQuery** (numeric) A numeric value between 0 and 1. It is used to filter features from osw file which have SCORE\_IPF.QVALUE less than itself. (For PTM IPF use)

**runType** (char) This must be one of the strings "DIA\_Proteomics", "DIA\_IPF", "DIA\_Metabolomics".

**applyFun** (function) value must be either lapply or BiocParallel::bplapply.

### Value

(list of dataframes) each dataframe has following columns:

**transition\_group\_id** (integer) a unique id for each precursor.

**RT** (numeric) retention time as in FEATURE.EXP\_RT of osw files.

**Intensity** (numeric) peak intensity as in FEATURE\_MS2.AREA\_INTENSITY of osw files.

**leftWidth** (numeric) as in FEATURE.LEFT\_WIDTH of osw files.

**rightWidth** (numeric) as in FEATURE.RIGHT\_WIDTH of osw files.

**peak\_group\_rank** (integer) rank of each feature associated with transition\_group\_id.

**m\_score** (numeric) q-value of each feature associated with transition\_group\_id. (If using 'DIA\_IPF' runType, this will represent IPF's QVALUE)

**ms2\_m\_score** (numeric) MS2 q-value of each feature associated with transition\_group\_id. (Will only be present if using 'DIA\_IPF' runType)

### Author(s)

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ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-04-06

### See Also

[getRunNames](#), [fetchPrecursorsInfo](#)

## Examples

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath = dataPath)
features <- getFeatures(fileInfo, maxFdrQuery = 1.00, runType = "DIA_Proteomics")
dim(features[[2]]) # 938 8
```

---

getFeaturesQuery      *Get features from a SQLite file*

---

## Description

Query is generated to identify features below a FDR cut-off from a run.

## Usage

```
getFeaturesQuery(runType = "DIA_Proteomics")
```

## Arguments

runType            (char) This must be one of the strings "DIA\_Proteomics", "DIA\_IPF", "DIA\_Metabolomics".

## Value

SQL query to be searched.

## Author(s)

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ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2020-04-07

## See Also

[fetchFeaturesFromRun](#)

---

getGlobalAlignMaskCpp *Outputs a mask for constraining similarity matrix*

---

### Description

This function takes in timeVectors from both runs, global-fit mapped values of end-points of first time vector and sample-length of window of no constraining. Outside of window, all elements of matrix are either equally weighted or weighted proportional to distance from window-boundry.

### Usage

```
getGlobalAlignMaskCpp(tA, tB, tBp, noBeef = 50L, hardConstrain = FALSE)
```

### Arguments

|               |  |
|---------------|--|
| tA            | (numeric) This vector has equally spaced timepoints of XIC A.  |
| tB            | (numeric) This vector has equally spaced timepoints of XIC B.  |
| tBp           | (numeric) mapping of tA to run B using some global fit.  |
| noBeef        | (integer) It defines the distance from the global fit, upto which no penalization is performed.<br>The window length = 2*noBeef. |
| hardConstrain | (logical) if false; indices farther from noBeef distance are filled with distance from linear fit line.                          |

### Value

mask (matrix) A numeric matrix.

### Author(s)

Shubham Gupta, <shubh.gupta@mail.utoronto.ca> ORCID: 0000-0003-3500-8152 License: (c) Author (2019) + MIT Date: 2019-03-08

### Examples

```
tA <- c(1707.6, 1711, 1714.5, 1717.9, 1721.3, 1724.7, 1728.1, 1731.5, 1734.9, 1738.4)
tB <- c(1765.7, 1769.1, 1772.5, 1775.9, 1779.3, 1782.7, 1786.2, 1789.6, 1793, 1796.4)
tBp <- c(1786.9, 1790.35, 1793.9, 1797.36, 1800.81, 1804.26, 1807.71, 1811.17, 1814.62, 1818.17)
noBeef <- 1
mask <- getGlobalAlignMaskCpp(tA, tB, tBp, noBeef, FALSE)
round(mask, 3)
matrix(c( 5.215,4.218,4.221,2.225,1.228,0,0,0,0.788, 1.785,
6.226,5.230,4.233,3.236,2.239,1.243,0,0,0, 0.774), nrow = 2, ncol = 10, byrow = FALSE)
#image(mask) # A is on x-axis, B is on y-axis
```

---

getGlobalAlignment      *Calculates global alignment between RT of two runs*

---

### Description

This function selects features from oswFiles which has m-score < maxFdrLoess. It fits linear/loess regression on these feature. Retention-time mapping is established from reference to experiment run.

### Usage

```
getGlobalAlignment(  
  oswFiles,  
  ref,  
  exp,  
  fitType = "linear",  
  maxFdrGlobal = 0.01,  
  spanvalue = 0.1  
)
```

### Arguments

|              |  |
|--------------|--|
| oswFiles     | (list of data-frames) it is output from getFeatures function.  |
| ref          | (string) Must be a combination of "run" and an iteger e.g. "run2".   |
| exp          | (string) Must be a combination of "run" and an iteger e.g. "run2".   |
| fitType      | (string) Must be from "loess" or "linear".   |
| maxFdrGlobal | (numeric) A numeric value between 0 and 1. Features should have m-score lower than this value for participation in global fit. |
| spanvalue    | (numeric) Spanvalue for LOESS fit. For targeted proteomics 0.1 could be used.  |

### Value

An object of class "loess".

### Author(s)

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ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-14

### See Also

[getFeatures](#)

**Examples**

```
data(oswFiles_DIAAlignR, package="DIAAlignR")
fit <- getGlobalAlignment(oswFiles = oswFiles_DIAAlignR, ref = "run1", exp = "run2",
  fitType = "linear", maxFdrGlobal = 0.05, spanvalue = 0.1)
```

---

|               |   |
|---------------|---|
| getGlobalFits | <i>Calculates all global alignment needed in refRun</i> |
|---------------|---|

---

**Description**

Calculates all global alignment needed in refRun

**Usage**

```
getGlobalFits(
  refRun,
  features,
  fileInfo,
  globalAlignment,
  globalAlignmentFdr,
  globalAlignmentSpan,
  applyFun = lapply
)
```

**Arguments**

|                     |  |
|---------------------|--|
| refRun              | (data-frame) Output of getRefRun function. Must have two columns : transition_group_id and run.                                |
| features            | (list of data-frames) it is output from getFeatures function.  |
| fileInfo            | (data-frame) Output of getRunNames function.   |
| globalAlignment     | (string) Must be from "loess" or "linear".   |
| globalAlignmentFdr  | (numeric) A numeric value between 0 and 1. Features should have m-score lower than this value for participation in global fit. |
| globalAlignmentSpan | (numeric) Spanvalue for LOESS fit. For targeted proteomics 0.1 could be used.  |

**Value**

(list) Each element is either of class lm or loess.

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-04-19



**See Also**

[getRefRun](#), [getFeatures](#), [getGlobalAlignment](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath, oswMerged = TRUE)
features <- getFeatures(fileInfo, maxFdrQuery = 0.05)
precursors <- getPrecursors(fileInfo, TRUE, "DIA_Proteomics", "experiment-wide", 0.01)
precursors <- dplyr::arrange(precursors, .data$peptide_id, .data$transition_group_id)
peptideIDs <- unique(precursors$peptide_id)
peptideScores <- getPeptideScores(fileInfo, peptideIDs, TRUE, "DIA_Proteomics", "experiment-wide")
peptideScores <- lapply(peptideIDs, function(pep) dplyr::filter(peptideScores, .data$peptide_id == pep))
names(peptideScores) <- as.character(peptideIDs)
## Not run:
refRun <- getRefRun(peptideScores)
fits <- getGlobalFits(refRun, features, fileInfo, "linear", 0.05, 0.1)

## End(Not run)
```

---

getLinearfit

*Calculates linear fit between RT of two runs*

---

**Description**

This function uses output of getRTdf that selects features from oswFiles which has m-score < maxFdrLoess. It fits Linear model on these feature. Loess mapping is established from reference to experiment run.

**Usage**

```
getLinearfit(RUNS_RT)
```

**Arguments**

RUNS\_RT (data-frame) must have three columns: transition\_group\_id, RT.eXp, and RT.ref.

**Value**

An object of class "lm".

**Author(s)**

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License: (c) Author (2019) + GPL-3 Date: 2019-12-14

**See Also**

[getLOESSfit](#), [getFeatures](#), [getRTdf](#)

**Examples**

```
data(oswFiles_DIAAlignR, package="DIAAlignR")
## Not run:
RUNS_RT <- getRTdf(oswFiles = oswFiles_DIAAlignR, ref = "run1", eXp = "run2", maxFdrGlobal = 0.05)
lm.fit <- getLinearfit(RUNS_RT)

## End(Not run)
```

---

getLOESSfit

*Calculates LOESS fit between RT of two runs*

---

**Description**

This function uses output of `getRTdf` that selects features from `oswFiles` which has `m-score < maxFdrLoess`. It fits LOESS on these feature. Loess mapping is established from reference to experiment run.

**Usage**

```
getLOESSfit(RUNS_RT, spanvalue = 0.1)
```

**Arguments**

`RUNS_RT` (data-frame) must have three columns: `transition_group_id`, `RT.eXp`, and `RT.ref`.  
`spanvalue` (numeric) Spanvalue for LOESS fit. For targeted proteomics 0.1 could be used.

**Value**

An object of class "loess".

**Author(s)**

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License: (c) Author (2019) + GPL-3 Date: 2019-12-14

**See Also**

[getLinearfit](#), [getFeatures](#), [getRTdf](#)

**Examples**

```

data(oswFiles_DIAAlignR, package="DIAAlignR")
## Not run:
RUNS_RT <- getRTdf(oswFiles = oswFiles_DIAAlignR, ref = "run1", eXp = "run2", maxFdrGlobal = 0.05)
Loess.fit <- getLOESSfit(RUNS_RT, spanvalue = 0.1)

## End(Not run)

```

---

getMappedRT

*Get mapping of reference RT on experiment run.*


---

**Description**

This function aligns XICs of reference and experiment runs. Using alignment, it maps retention time from reference run on experiment run.

**Usage**

```

getMappedRT(
  refRT,
  XICs.ref,
  XICs.eXp,
  globalFit,
  alignType,
  adaptiveRT,
  normalization,
  simMeasure,
  goFactor,
  geFactor,
  cosAngleThresh,
  OverlapAlignment,
  dotProdThresh,
  gapQuantile,
  kerLen,
  hardConstrain,
  samples4gradient,
  objType = "light"
)

```

**Arguments**

|           |  |
|-----------|--|
| refRT     | Peak's retention-time in reference run.                          |
| XICs.ref  | List of extracted ion chromatograms from reference run.          |
| XICs.eXp  | List of extracted ion chromatograms from experiment run.         |
| globalFit | Linear or loess fit object between reference and experiment run. |
| alignType | Available alignment methods are "global", "local" and "hybrid".  |

|                  |  |
|------------------|--|
| adaptiveRT       | (numeric) Similarity matrix is not penalized within adaptive RT.   |
| normalization    | (character) Must be selected from "mean", "l2".  |
| simMeasure       | (string) Must be selected from dotProduct, cosineAngle, crossCorrelation, cosine2Angle, dotProductMasked, euclideanDist, covariance and correlation. |
| goFactor         | (numeric) Penalty for introducing first gap in alignment. This value is multiplied by base gap-penalty.  |
| geFactor         | (numeric) Penalty for introducing subsequent gaps in alignment. This value is multiplied by base gap-penalty.  |
| cosAngleThresh   | (numeric) In simType = dotProductMasked mode, angular similarity should be higher than cosAngleThresh otherwise similarity is forced to zero.        |
| OverlapAlignment | (logical) An input for alignment with free end-gaps. False: Global alignment, True: overlap alignment.   |
| dotProdThresh    | (numeric) In simType = dotProductMasked mode, values in similarity matrix higher than dotProdThresh quantile are checked for angular similarity.     |
| gapQuantile      | (numeric) Must be between 0 and 1. This is used to calculate base gap-penalty from similarity distribution.  |
| kerLen           | (integer) In simType = crossCorrelation, length of the kernel used to sum similarity score. Must be an odd number.                                   |
| hardConstrain    | (logical) If FALSE; indices farther from noBeef distance are filled with distance from linear fit line.  |
| samples4gradient | (numeric) This parameter modulates penalization of masked indices.   |
| objType          | (char) Must be selected from light, medium and heavy.  |

**Value**

(numeric)

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

**See Also**[alignChromatogramsCpp](#)**Examples**

```

data(XIC_QFNNTDIVLLEDFQK_3_DIAalignR, package="DIAalignR")
data(oswFiles_DIAalignR, package="DIAalignR")
run1 <- "hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt"
run2 <- "hroest_K120809_Strep10%PlasmaBiolRep12_R04_SW_filt"
XICs.ref <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[[run1]][["4618"]]

```

```
XICs.eXp <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[[run2]][["4618"]]
RUNS_RT <- getRTdf(oswFiles_DIAAlignR, ref = "run1", eXp = "run2", maxFdrGlobal = 0.05)
globalFit <- loess(RT.eXp ~ RT.ref, data = RUNS_RT, span = 0.1, control=loess.control(surface="direct"))
adaptiveRT <- 77.82315 #3.5*globalFit$s
## Not run:
getMappedRT(refRT = 5238.35, XICs.ref, XICs.eXp, globalFit, alignType = "hybrid",
  adaptiveRT = adaptiveRT, normalization = "mean",
  simMeasure = "dotProductMasked", goFactor = 0.125, geFactor = 40, cosAngleThresh = 0.3,
  OverlapAlignment = TRUE, dotProdThresh = 0.96, gapQuantile = 0.5, kerLen = 9L, hardConstrain = FALSE,
  samples4gradient = 100)

## End(Not run)
```

---

getMST

*Create a MST from distance matrix*

---

## Description

Builds a minimum spanning tree from the distance.

## Usage

```
getMST(distMat)
```

## Arguments

distMat (dist) a pairwise distance matrix.

## Value

(matrix) array of tree-edges.

## Author(s)

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ORCID: 0000-0003-3500-8152

License: (c) Author (2021) + GPL-3 Date: 2021-05-14

## See Also

[mst](#), [traverseMST](#)

**Examples**

```

m <- matrix(c(0,13,21,22, 13,0,12,13, 21,12,0,13, 22,13,13,0), byrow = TRUE,
            ncol = 4, dimnames = list(c("run1", "run2", "run3", "run4"),
                                     c("run1", "run2", "run3", "run4")))
distMat <- as.dist(m, diag = FALSE, upper = FALSE)
## Not run:
x <- as.data.frame(getMST(distMat))
weights <- reshape2::melt(as.matrix(distMat))
weights$Var <- paste(weights$Var1, weights$Var2, sep = "_")
x$weight <- weights[match(paste(x[,1], x[,2], sep = "_"), weights$Var), "value"]
g1 <- igraph::graph_from_data_frame(x, directed = FALSE)
plot(g1, edge.label = igraph::E(g1)$weight)

## End(Not run)

```

---

getMultipeptide

*Get multipeptides*


---

**Description**

Each element of the multipeptide is a collection of features associated with a peptide.

**Usage**

```

getMultipeptide(
  precursors,
  features,
  runType = "DIA_Proteomics",
  applyFun = lapply,
  masters = NULL
)

```

**Arguments**

|            |   |
|------------|---|
| precursors | (data-frames) Contains precursors and associated transition IDs.                        |
| features   | (list of data-frames) Contains features and their properties identified in each run.    |
| runType    | (char) This must be one of the strings "DIA_Proteomics", "DIA_IPF", "DIA_Metabolomics". |
| applyFun   | (function) value must be either lapply or BiocParallel::bplapply.                       |
| masters    | (characters) names of extra runs.   |

**Value**

(list) of dataframes having following columns:

|                     |   |
|---------------------|---|
| transition_group_id | (integer) a unique id for each precursor. |
| run                 | (string) run identifier.                  |

|                 |   |
|-----------------|---|
| RT              | (numeric) retention time as in FEATURE.EXP_RT of osw files.             |
| Intensity       | (numeric) peak intensity as in FEATURE_MS2.AREA_INTENSITY of osw files. |
| leftWidth       | (numeric) as in FEATURE.LEFT_WIDTH of osw files.                        |
| rightWidth      | (numeric) as in FEATURE.RIGHT_WIDTH of osw files.                       |
| peak_group_rank | (integer) rank of each feature associated with transition_group_id.     |
| m_score         | (numeric) q-value of each feature associated with transition_group_id.  |
| alignment_rank  | (integer) rank of each feature post-alignment.                          |

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-04-08

**See Also**

[getPrecursors](#), [getFeatures](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath, oswMerged = TRUE)
precursors <- getPrecursors(fileInfo, oswMerged = TRUE, context = "experiment-wide")
features <- getFeatures(fileInfo, maxFdrQuery = 0.05)
multipeptide <- getMultipeptide(precursors, features)
multipeptide[["9861"]]
```

---

getMZMLpointers      *Get pointers to each mzML file.*

---

**Description**

Returns instantiated mzRpviz object associated to mzML file.

**Usage**

```
getMZMLpointers(fileInfo)
```

**Arguments**

fileInfo      (data-frame) Output of DIAAlignR::getRunNames function

**Value**

(A list of mzRpviz)

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath = dataPath)
mzPntrs <- getMZMLpointers(fileInfo)
```

---

getNativeIDs

*Fetch NativeIDs*

---

**Description**

Get transition(native) IDs for the peptides.

**Usage**

```
getNativeIDs(oswIn, peps, params = paramsDIAAlignR(), oswMerged = TRUE)
```

**Arguments**

|           |  |
|-----------|--|
| oswIn     | (string) path to the osw feature file.   |
| peps      | (integer) ids of peptides to be aligned. If NULL, align all peptides.                          |
| params    | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function. |
| oswMerged | (logical) TRUE if merged file from pyprophet is used.  |

**Value**

(integer) a vector of transition IDs.

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2022) + GPL-3 Date: 2022-04-19

**See Also**

[reduceXICs](#)



**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
oswIn <- file.path(dataPath, "osw", "merged.osw")
peps <- c(3L, 11L) # No transitions for 3L.
params <- paramsDIAAlignR()
params[["context"]] <- "experiment-wide"
getNodeIDs(oswIn, peps, params) # 106468 106469 106470 106471 106472 106473
```

---

`getNodeIDs`*Get node IDs from tree*

---

**Description**

Get node IDs from tree

**Usage**

```
getNodeIDs(tree)
```

**Arguments**

`tree` (phylo) a phylogenetic tree.

**Value**

(integer) a vector with names being node IDs.

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-05-31

**See Also**

[getTree](#)

**Examples**

```
m <- matrix(c(0,1,2,3, 1,0,1.5,1.5, 2,1.5,0,1, 3,1.5,1,0), byrow = TRUE,
            ncol = 4, dimnames = list(c("run1", "run2", "run3", "run4"),
                                     c("run1", "run2", "run3", "run4")))

distMat <- as.dist(m)
## Not run:
tree <- getTree(distMat)
getNodeIDs(tree)

## End(Not run)
```

---

|            |  |
|------------|--|
| getNodeRun | <i>Create a child run from two parent runs</i> |
|------------|--|

---

### Description

Get merged features and merged chromatograms from parent runs. Chromatograms are written on the disk at dataPath/xics. For each precursor aligned parent time-vectors and corresponding child time-vector are also calculated and written as \*\_av.rda at dataPath.

### Usage

```
getNodeRun(
  runA,
  runB,
  mergeName,
  dataPath,
  fileInfo,
  features,
  mzPtrs,
  prec2chromIndex,
  precursors,
  params,
  adaptiveRTs,
  refRuns,
  multipeptide,
  peptideScores,
  ropenms,
  applyFun = lapply
)
```

### Arguments

|                 |   |
|-----------------|---|
| runA            | (string) name of a run to be merged with runB. Must be in the rownames of fileInfo.   |
| runB            | (string) name of a run to be merged with runA. Must be in the rownames of fileInfo.   |
| mergeName       | (string) name of the node that is generated with merging of runA and runB.  |
| dataPath        | (string) path to xics and osw directory.  |
| fileInfo        | (data-frame) output of <a href="#">getRunNames</a> .  |
| features        | (list of data-frames) contains features and their properties identified in each run.  |
| mzPtrs          | (list) a list of mzRpwiz.   |
| prec2chromIndex | (list) a list of dataframes having following columns:<br>transition_group_id: it is PRECURSOR.ID from osw file.<br>chromatogramIndex: index of chromatogram in mzML file. |

|               |  |
|---------------|--|
| precursors    | (data-frame) atleast two columns transition_group_id and transition_ids are required.  |
| params        | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function.   |
| adaptiveRTs   | (environment) an empty environment used to store data for downstream analysis.   |
| refRuns       | (environment) an empty environment used to store data for downstream analysis.   |
| multipeptide  | (environment) contains multiple data-frames that are collection of features associated with analytes. This is an output of <a href="#">getMultipeptide</a> . |
| peptideScores | (list of data-frames) each dataframe has scores of a peptide across all runs.  |
| ropenms       | (pyopenms module) get this python module through <a href="#">get_ropenms</a> . Required only for chrom.mzML files.   |
| applyFun      | (function) value must be either lapply or BiocParallel::bplapply.  |

**Value**

(None)

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License: (c) Author (2020) + GPL-3 Date: 2020-06-06

**See Also**[childXICs](#), [getChildXICs](#), [traverseUp](#)**Examples**

```

library(data.table)
dataPath <- system.file("extdata", package = "DIAAlignR")
params <- paramsDIAAlignR()
fileInfo <- getRunNames(dataPath = dataPath)
mzPtrs <- list2env(getMZMLpointers(fileInfo))
precursors <- getPrecursors(fileInfo, oswMerged = TRUE, runType = params[["runType"]],
  context = "experiment-wide", maxPeptideFdr = params[["maxPeptideFdr"]])
peptideIDs <- unique(precursors$peptide_id)
peptideScores <- getPeptideScores(fileInfo, peptideIDs, oswMerged = TRUE, params[["runType"]], params[["context"])
masters <- paste("master", 1:(nrow(fileInfo)-1), sep = "")
peptideScores <- lapply(peptideIDs, function(pep) {x <- peptideScores[.(pep)][,-c(1L)]
  x <- rbindlist(list(x, data.table("run" = masters, "score" = NA_real_, "pvalue" = NA_real_,
    "qvalue" = NA_real_)), use.names=TRUE)
  setkeyv(x, "run"); x})
names(peptideScores) <- as.character(peptideIDs)
features <- getFeatures(fileInfo, maxFdrQuery = 1.00, runType = "DIA-Proteomics")
## Not run:
masterFeatures <- dummyFeatures(precursors, nrow(fileInfo)-1, 1L)
features <- do.call(c, list(features, masterFeatures))
multipeptide <- getMultipeptide(precursors, features, numMerge = 0L, startIdx = 1L)

```

```

prec2chromIndex <- getChromatogramIndices(fileInfo, precursors, mzPntrs)
masterChromIndex <- dummyChromIndex(precursors, nrow(fileInfo)-1, 1L)
prec2chromIndex <- do.call(c, list(prec2chromIndex, masterChromIndex))
mergeName <- "master1"
adaptiveRTs <- new.env()
refRuns <- new.env()
getNodeRun(runA = "run2", runB = "run0", mergeName = mergeName, dataPath = ".", fileInfo, features,
  mzPntrs, prec2chromIndex, precursors, params, adaptiveRTs, refRuns, multipeptide, peptideScores, ropenms = NULL)
file.remove(file.path(".", "xics", paste0(mergeName, ".chrom.sqMass")))
file.remove(list.files(".", pattern = "*_av.rds", full.names = TRUE))

## End(Not run)
for(run in names(mzPntrs)) DBI::dbDisconnect(mzPntrs[[run]])

```

---

getOswAnalytes

*Fetch analytes from OSW file*


---

## Description

Get a data-frame of analytes, their chromatogram indices and associated FDR-scores.

## Usage

```

getOswAnalytes(
  fileInfo,
  oswMerged = TRUE,
  analyteInGroupLabel = FALSE,
  maxFdrQuery = 0.05,
  runType = "DIA_Proteomics"
)

```

## Arguments

|                     |   |
|---------------------|---|
| oswMerged           | (logical) TRUE for experiment-wide FDR and FALSE for run-specific FDR by pyprophet.   |
| analyteInGroupLabel | (logical) TRUE for getting analytes as PRECURSOR.GROUP_LABEL from osw file. FALSE for fetching analytes as PEPTIDE.MODIFIED_SEQUENCE and PRECURSOR.CHARGE from osw file.                    |
| maxFdrQuery         | (numeric) A numeric value between 0 and 1. It is used to filter features from osw file which have SCORE_MS2.QVALUE less than itself.  |
| runType             | (char) This must be one of the strings "DIA_Proteomics", "DIA_Metabolomics".  |
| dataPath            | (char) path to xics and osw directory.  |
| filenames           | (data-frame) column "filename" contains RUN table from osw files. column "runs" contain respective mzML names without extension. To get filenames use <a href="#">getRunNames</a> function. |

**Value**

(A list of data-frames) Each data-frame has following columns:

|                     |  |
|---------------------|--|
| transition_group_id | (string) it is either fetched from PRECURSOR.GROUP_LABEL or a combination of PEPTIDE.MODIFIED_SEQUENCE and PRECURSOR.CHARGE from osw file. |
| filename            | (string) as mentioned in RUN table of osw files.   |
| peak_group_rank     | (integer) rank of each feature associated with transition_group_id.  |
| m_score             | (numeric) q-value of each feature associated with transition_group_id.   |
| transition_id       | (integer) fragment-ion ID associated with transition_group_id. This is matched with chromatogram ID in mzML file.                          |

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**See Also**

[getRunNames](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
filenames <- getRunNames(dataPath = dataPath)
## Not run:
oswFiles <- getOswAnalytes(dataPath = dataPath, filenames = filenames,
  analyteInGroupLabel = TRUE)
oswFiles[["run0"]][1,]
oswFiles <- getOswAnalytes(dataPath = dataPath, filenames = filenames,
  analyteInGroupLabel = FALSE)
oswFiles[["run0"]][1,]

## End(Not run)
```

---

getOswFiles

*Get list of peptides and their chromatogram indices.*

---

**Description**

This function reads all osw and xics files in the directories at dataPath. It selects analytes which has associated features with m-score < maxFdrQuery. For these analytes it fetches chromatogram indices by matching transition\_id(osw) with chromatogramID(xics).

**Usage**

```

getOswFiles(
  fileInfo,
  mzPntrs,
  maxFdrQuery = 0.05,
  analyteFDR = 0.01,
  oswMerged = TRUE,
  analytes = NULL,
  runType = "DIA_Proteomics",
  analyteInGroupLabel = FALSE
)

```

**Arguments**

|                     |   |
|---------------------|---|
| mzPntrs             | A list of mzRpwiz. FALSE for fetching analytes as PEPTIDE.MODIFIED_SEQUENCE and PRECURSOR.CHARGE from osw file.   |
| maxFdrQuery         | (numeric) A numeric value between 0 and 1. It is used to filter features from osw file which have SCORE_MS2.QVALUE less than itself.  |
| analyteFDR          | (numeric) Not used.   |
| oswMerged           | (logical) TRUE for experiment-wide FDR and FALSE for run-specific FDR by pyprophet.   |
| analytes            | (string) analyte is as PRECURSOR.GROUP_LABEL or as PEPTIDE.MODIFIED_SEQUENCE and PRECURSOR.CHARGE from osw file.  |
| runType             | (char) This must be one of the strings "DIA_Proteomics", "DIA_Metabolomics".  |
| analyteInGroupLabel | (logical) TRUE for getting analytes as PRECURSOR.GROUP_LABEL from osw file.   |
| dataPath            | (char) path to xics and osw directory.  |
| filenames           | (data-frame) column "filename" contains RUN table from osw files. column "runs" contain respective mzML names without extension. To get filenames use DIALignR::getRunNames function. |

**Value**

(data-frames) Data-frame has following columns:

|                     |  |
|---------------------|--|
| transition_group_id | (string) it is either fetched from PRECURSOR.GROUP_LABEL or a combination of PEPTIDE.MODIFIED_SEQUENCE and PRECURSOR.CHARGE from osw file. |
| RT                  | (numeric) retention time as in FEATURE.EXP_RT of osw files.  |
| delta_rt            | (numeric) as in FEATURE.DELTA_RT of osw files.   |
| assay_RT            | (numeric) library retention time as in PRECURSOR.LIBRARY_RT of osw files.  |
| Intensity           | (numeric) peak intensity as in FEATURE_MS2.AREA_INTENSITY of osw files.  |

leftWidth (numeric) as in FEATURE.LEFT\_WIDTH of osw files.  
 rightWidth (numeric) as in FEATURE.RIGHT\_WIDTH of osw files.  
 peak\_group\_rank (integer) rank of each feature associated with transition\_group\_id.  
 m\_score (numeric) q-value of each feature associated with transition\_group\_id.  
 chromatogramIndex (integer) Index of chromatogram in mzML file.  
 transition\_ids (integer) fragment-ion ID associated with transition\_group\_id. This is matched with chromatogram ID in mzML file.

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**See Also**

[getRunNames](#)

**Examples**

```

dataPath <- system.file("extdata", package = "DIAAlignR")
filenames <- getRunNames(dataPath = dataPath)
## Not run:
mzPntrs <- getMZMLpointers(filenames)
oswFiles <- getOswFiles(filenames, mzPntrs, analyteInGroupLabel = TRUE)
rm(mzPntrs)

## End(Not run)

```

---

|                 |                           |
|-----------------|---------------------------|
| getPeptideQuery | <i>Get peptide scores</i> |
|-----------------|---------------------------|

---

**Description**

For each peptide, its score, pvalue and qvalues are fetched across all runs.

**Usage**

```
getPeptideQuery(runType = "DIA_Proteomics")
```

**Arguments**

runType (char) This must be one of the strings "DIA\_proteomics", "DIA\_IPF", "DIA\_Metabolomics".

**Value**

SQL query to be searched.

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-07-01

**See Also**

[getPeptideScores](#)

---

getPeptideQuery2

*Get peptide scores*

---

**Description**

For each peptide, its score, pvalue and qvalues are fetched across all runs.

**Usage**

```
getPeptideQuery2(runType = "DIA_Proteomics")
```

**Arguments**

runType (char) This must be one of the strings "DIA\_proteomics", "DIA\_IPF", "DIA\_Metabolomics".

**Value**

SQL query to be searched.

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-11-18

**See Also**

[getPeptideScores](#)



---

getPeptideScores      *Get scores of peptide*

---

### Description

Get a list of dataframes that contains peptide scores, pvalues, and qvalues across all runs.

### Usage

```
getPeptideScores(  
  fileInfo,  
  peptides,  
  oswMerged = TRUE,  
  runType = "DIA_Proteomics",  
  context = "global"  
)
```

### Arguments

|           |  |
|-----------|--|
| fileInfo  | (data-frame) Output of <a href="#">getRunNames</a> function.   |
| peptides  | (integer) Ids of peptides for which scores are required.   |
| oswMerged | (logical) TRUE for experiment-wide FDR and FALSE for run-specific FDR by pyprophet.                        |
| runType   | (char) This must be one of the strings "DIA_Proteomics", "DIA_IPF", "DIA_Metabolomics".                    |
| context   | (string) Context used in pyprophet peptide. Must be either "run-specific", "experiment-wide", or "global". |

### Value

(list of dataframes) dataframe has following columns:

|            |  |
|------------|--|
| peptide_id | (integer) a unique id for each precursor.            |
| run        | (character) as in SCORE_PEPTIDE.RUN_ID of osw files. |
| score      | (numeric) as in SCORE_PEPTIDE.SCORE of osw files.    |
| pvalue     | (numeric) as in SCORE_PEPTIDE.PVALUE of osw files.   |
| qvalue     | (numeric) as in SCORE_PEPTIDE.QVALUE of osw files.   |

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License: (c) Author (2020) + GPL-3 Date: 2020-07-01

### See Also

[getRunNames](#), [fetchPeptidesInfo](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath = dataPath)
precursorsInfo <- getPrecursors(fileInfo, oswMerged = TRUE, runType = "DIA_Proteomics",
context = "experiment-wide", maxPeptideFdr = 0.05)
peptidesInfo <- getPeptideScores(fileInfo, unique(precursorsInfo$peptide_id))
dim(peptidesInfo) # 684 5
```

---

getPrecursorByID      *Find precursors given their IDs*

---

**Description**

Get a data-frame of analytes' transition\_group\_id, transition\_ids, peptide\_id and amino-acid sequences.

**Usage**

```
getPrecursorByID(
  analytes,
  fileInfo,
  oswMerged = TRUE,
  runType = "DIA_Proteomics"
)
```

**Arguments**

|           |   |
|-----------|---|
| analytes  | (integer) a vector of integers.   |
| fileInfo  | (data-frame) Output of <code>getRunNames</code> function.                               |
| oswMerged | (logical) TRUE for experiment-wide FDR and FALSE for run-specific FDR by pyprophet.     |
| runType   | (char) This must be one of the strings "DIA_Proteomics", "DIA_IPF", "DIA_Metabolomics". |

**Value**

(data-frames) A data-frame having following columns:

|                     |  |
|---------------------|--|
| transition_group_id | (integer) a unique id for each precursor.  |
| transition_id       | (list) fragment-ion ID associated with transition_group_id. This is matched with chromatogram ID in mzML file. |
| peptide_id          | (integer) a unique id for each peptide. A peptide can have multiple precursors.                                |
| sequence            | (string) amino-acid sequence of the precursor with possible modifications.                                     |
| charge              | (integer) charge on the precursor.   |
| group_label         | (string) TODO Figure it out.   |

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License: (c) Author (2020) + GPL-3 Date: 2019-04-06

**See Also**

[getRunNames](#), [fetchPrecursorsInfo](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath = dataPath, oswMerged = TRUE)
precursors <- getPrecursorByID(c(32L, 2474L), fileInfo, oswMerged = TRUE)
```

---

getPrecursorIndices    *Get MSI chromatogram indices of precursors.*

---

**Description**

This function reads the header of chromatogram files. It then fetches chromatogram indices by matching transition\_group\_id(osw) with chromatogramID(xics).

**Usage**

```
getPrecursorIndices(
  fileInfo,
  precursors,
  mzPntrs,
  ions = ".*",
  applyFun = lapply
)
```

**Arguments**

|            |   |
|------------|---|
| fileInfo   | (data-frame) Output of getRunNames function.  |
| precursors | (data-frame) Atleast two columns transition_group_id and transition_ids are required. |
| mzPntrs    | A list of mzRpwiz.  |
| ions       | (character) Strings to specify ions. eg. i0, i1.                                      |
| applyFun   | (function) value must be either lapply or BiocParallel::bplapply.                     |

**Value**

(list) A list of dataframes having following columns:

transition\_group\_id

(string) it is PRECURSOR.ID from osw file.

chromatogramIndex

(integer) index of MS1 chromatogram in mzML file.

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License: (c) Author (2022) + GPL-3 Date: 2022-01-15

**See Also**

[chromatogramIdAsInteger](#), [mapPrecursorToChromIndices](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath = dataPath)
precursors <- getPrecursors(fileInfo, oswMerged = TRUE, context = "experiment-wide")
mzPntrs <- getMZMLpointers(fileInfo)
prec2chromIndex <- getPrecursorIndices(fileInfo, precursors, mzPntrs)
for(mz in mzPntrs) DBI::dbDisconnect(mz)
```

---

getPrecursors

*Get precursors from all feature files*

---

**Description**

Get a data-frame of analytes' transition\_group\_id, transition\_ids, peptide\_id and amino-acid sequences.

**Usage**

```
getPrecursors(
  fileInfo,
  oswMerged = TRUE,
  runType = "DIA_Proteomics",
  context = "global",
  maxPeptideFdr = 0.05,
  level = "Peptide",
  useIdentifying = FALSE
)
```

**Arguments**

|                |  |
|----------------|--|
| fileInfo       | (data-frame) Output of <a href="#">getRunNames</a> function.   |
| oswMerged      | (logical) TRUE for experiment-wide FDR and FALSE for run-specific FDR by pyprophet.  |
| runType        | (char) This must be one of the strings "DIA_Proteomics", "DIA_IPF", "DIA_Metabolomics".  |
| context        | (string) Context used in pyprophet peptide. Must be either "run-specific", "experiment-wide", or "global".                               |
| maxPeptideFdr  | (numeric) A numeric value between 0 and 1. It is used to filter peptides from osw file which have SCORE_PEPTIDE.QVALUE less than itself. |
| level          | (string) Apply maxPeptideFDR on Protein as well if specified as "Protein". Default: "Peptide".   |
| useIdentifying | (logical) Set TRUE to use identifying transitions in alignment. (DEFAULT: FALSE)   |

**Value**

(data-frames) A data-frame having following columns:

|                     |  |
|---------------------|--|
| transition_group_id | (integer) a unique id for each precursor.  |
| peptide_id          | (integer) a unique id for each peptide. A peptide can have multiple precursors.                                |
| sequence            | (string) amino-acid sequence of the precursor with possible modifications.                                     |
| charge              | (integer) charge on the precursor.   |
| group_label         | (string) TODO Figure it out.   |
| transition_ids      | (list) fragment-ion ID associated with transition_group_id. This is matched with chromatogram ID in mzML file. |

**Author(s)**

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License: (c) Author (2019) + GPL-3 Date: 2019-04-06

**See Also**

[getRunNames](#), [fetchPrecursorsInfo](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath = dataPath)
precursorsInfo <- getPrecursors(fileInfo, oswMerged = TRUE, runType = "DIA_Proteomics",
context = "experiment-wide", maxPeptideFdr = 0.05)
dim(precursorsInfo) # 234 6
```

---

getPrecursorsQuery     *Get precursor Info*

---

### Description

For each precursor in the table respective transition ids are fetched. Order of transition is kept same as the order of their intensities in [getTransitionsQuery](#).

### Usage

```
getPrecursorsQuery(runType = "DIA-Proteomics", level = "Peptide")
```

### Arguments

runType            (string) This must be one of the strings "DIA-Proteomics", "DIA-IPF", "DIA-Metabolomics".  
level              (string) Apply maxPeptideFDR on Protein as well if specified as "Protein". Default: "Peptide".

### Value

SQL query to be searched.

### Author(s)

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License: (c) Author (2019) + GPL-3 Date: 2020-04-04

### See Also

[fetchPrecursorsInfo](#)

---

getPrecursorsQueryID     *Get precursor Info*

---

### Description

For each precursor in the table respective transition ids are fetched. Order of transition is kept same as the order of their intensities in [getTransitionsQuery](#).

### Usage

```
getPrecursorsQueryID(analytes, runType = "DIA-Proteomics")
```

**Arguments**

- analytes (integer) A vector of integer that is searched in PRECURSOR.ID.
- runType (char) This must be one of the strings "DIA\_Proteomics", "DIA\_IPF", "DIA\_Metabolomics".

**Value**

SQL query to be searched.

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-04-04

**See Also**

[fetchPrecursorsInfo](#)

---

*getPrecursorSubset*      *Prints messages if a certain number of analytes are aligned*

---

**Description**

Prints messages if a certain number of analytes are aligned

**Usage**

```
getPrecursorSubset(precursors, params)
```

**Value**

Invisible NULL

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-11-19

---

|          |  |
|----------|--|
| getQuery | <i>Generate SQL query to fetch information from osw files.</i> |
|----------|--|

---

**Description**

Generate SQL query to fetch information from osw files.

**Usage**

```
getQuery(
  maxFdrQuery,
  oswMerged = TRUE,
  analytes = NULL,
  filename = NULL,
  runType = "DIA_Proteomics",
  analyteInGroupLabel = FALSE,
  identifying = FALSE
)
```

**Arguments**

|                     |   |
|---------------------|---|
| maxFdrQuery         | (numeric) value between 0 and 1. It is used to filter features from osw file which have SCORE_MS2.QVALUE less than itself.                        |
| oswMerged           | (logical) TRUE for experiment-wide FDR and FALSE for run-specific FDR by pyprophet.   |
| analytes            | (vector of strings) transition_group_ids for which features are to be extracted. analyteInGroupLabel must be set according the pattern used here. |
| filename            | (string) as mentioned in RUN table of osw files.  |
| runType             | (char) This must be one of the strings "DIA_Proteomics", "DIA_Metabolomics".  |
| analyteInGroupLabel | (logical) TRUE for getting analytes as PRECURSOR.GROUP_LABEL from osw file.   |
| identifying         | (logical) TRUE for the extraction of identifying transtions. (Default: FALSE)   |

**Value**

SQL query to be searched.

**Author(s)**

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License: (c) Author (2019) + GPL-3 Date: 2019-12-14



---

getRefExpFeatureMap     *Alignment Feature Mapping Table*

---

### Description

Construct an alignment feature mapping table for star align method, to map aligned features in experiment runs to the reference run

### Usage

```
getRefExpFeatureMap(precursors, features, applyFun = lapply)
```

### Arguments

precursors     (data-frames) Contains precursors and associated transition IDs.  
features        (list of data-frames) Contains features and their properties identified in each run.  
applyFun        (function) value must be either lapply or BiocParallel::bplapply.

### Value

(list) of dataframes per precursor peptide id having following columns:

reference\_feature\_id  
                      (integer) id of reference feature.  
experiment\_feature\_id  
                      (integer) id of experiment feature aligned to reference feature.

### Author(s)

Justin Sing, <justinc.sing@mail.utoronto.ca>  
ORCID: 0000-0003-0386-0092  
License: (c) Author (2020) + GPL-3 Date: 2022-11-07

### See Also

[getPrecursors](#), [getFeatures](#)

### Examples

```
dataPath <- system.file("extdata", package = "DIAAlignR")  
fileInfo <- getRunNames(dataPath, oswMerged = TRUE)  
precursors <- getPrecursors(fileInfo, oswMerged = TRUE, context = "experiment-wide")  
features <- getFeatures(fileInfo, maxFdrQuery = 0.05)  
multiFeatureAlignmentMap <- getRefExpFeatureMap(precursors, features)  
multiFeatureAlignmentMap[["9861"]]
```

---

`getRefRun`*Fetch the reference run for each peptide*

---

**Description**

Provides the reference run based on lowest p-value.

**Usage**

```
getRefRun(peptideScores, applyFun = lapply)
```

**Arguments**

`peptideScores` (list of data-frames) each dataframe has scores of a peptide across all runs.  
`applyFun` (function) value must be either `lapply` or `BiocParallel::bplapply`.

**Value**

(dataframe) has two columns:

`peptide_id` (integer) a unique id for each peptide.  
`run` (string) run identifier.

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-04-08

**See Also**

[getPeptideScores](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath = dataPath)
precursorsInfo <- getPrecursors(fileInfo, oswMerged = TRUE, runType = "DIA_Proteomics",
                               context = "experiment-wide", maxPeptideFdr = 0.05)
peptideIDs <- unique(precursorsInfo$peptide_id)
peptidesInfo <- getPeptideScores(fileInfo, peptideIDs)
peptidesInfo <- lapply(peptideIDs, function(pep) peptidesInfo [.(pep),])
names(peptidesInfo) <- as.character(peptideIDs)
getRefRun(peptidesInfo)
```

---

|        |  |
|--------|--|
| getRSE | <i>Calculates Residual Standard Error of the fit</i> |
|--------|--|

---

**Description**

Calculates Residual Standard Error of the fit

**Usage**

```
getRSE(fit, globalAlignment)
```

**Arguments**

fit (lm or loess) Linear or loess fit object between reference and experiment run.

**Value**

(numeric)

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-04-08

**See Also**

[getLOESSfit](#), [getLinearfit](#), [getGlobalAlignment](#)

**Examples**

```
data(oswFiles_DIAAlignR, package="DIAAlignR")
## Not run:
Loess.fit <- getGlobalAlignment(oswFiles = oswFiles_DIAAlignR, ref = "run1", exp = "run2",
maxFdrGlobal = 0.05, spanvalue = 0.1, fit = "loess")
getRSE(Loess.fit, "loess")

## End(Not run)
```

---

`getRTdf`*Calculates global alignment between RT of two runs*

---

**Description**

This function selects features from `oswFiles` which has `m-score < maxFdrLoess`. It fits linear/loess regression on these feature. Retention-time mapping is established from reference to experiment run.

**Usage**

```
getRTdf(features, ref, exp, maxFdrGlobal)
```

**Arguments**

|                           |  |
|---------------------------|--|
| <code>features</code>     | (list of data-frames) it is output from <code>getFeatures</code> function.   |
| <code>ref</code>          | (string) Must be a combination of "run" and an iteger e.g. "run2".   |
| <code>exp</code>          | (string) Must be a combination of "run" and an iteger e.g. "run2".   |
| <code>maxFdrGlobal</code> | (numeric) A numeric value between 0 and 1. Features should have m-score lower than this value for participation in global fit. |

**Value**

A data-frame

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2021) + GPL-3 Date: 2019-03-01

**See Also**

[getGlobalAlignment](#)

**Examples**

```
data(oswFiles_DIAAlignR, package="DIAAlignR")
df <- getRTdf(features = oswFiles_DIAAlignR, ref = "run1", exp = "run2", maxFdrGlobal = 0.05)
```

---

|             |                              |
|-------------|------------------------------|
| getRunNames | <i>Get names of all runs</i> |
|-------------|------------------------------|

---

### Description

Fetches all osw files, then, keeps only those runs which has corresponding mzML files. mzML file names must match with RUN.FILENAME columns of osw files.

### Usage

```
getRunNames(dataPath, oswMerged = TRUE, params = paramsDIAAlignR())
```

### Arguments

|           |  |
|-----------|--|
| dataPath  | (char) Path to xics and osw directory.   |
| oswMerged | (logical) TRUE for experiment-wide FDR and FALSE for run-specific FDR by pyprophet.            |
| params    | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function. |

### Value

(dataframe) it has five columns:

|                  |   |
|------------------|---|
| spectraFile      | (string) as mentioned in RUN table of osw files.          |
| runName          | (string) contain respective mzML names without extension. |
| spectraFileID    | (string) ID in RUN table of osw files.                    |
| featureFile      | (string) Path to the feature file.                        |
| chromatogramFile | (string) Path to the chromatogram file.                   |

### Author(s)

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-14

### Examples

```
dataPath <- system.file("extdata", package = "DIAAlignR")
getRunNames(dataPath = dataPath, oswMerged = TRUE)
```

---

|                 |   |
|-----------------|---|
| getSeqSimMatCpp | <i>Calculates similarity matrix for two sequences</i> |
|-----------------|---|

---

**Description**

Calculates similarity matrix for two sequences

**Usage**

```
getSeqSimMatCpp(seq1, seq2, match, misMatch)
```

**Arguments**

|          |  |
|----------|--|
| seq1     | (char) A single string.                |
| seq2     | (char) A single string.                |
| match    | (double) Score for character match.    |
| misMatch | (double) score for character mismatch. |

**Value**

s (matrix) Numeric similarity matrix. Rows and columns expresses seq1 and seq2, respectively.

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca> ORCID: 0000-0003-3500-8152 License: (c) Author (2019) + MIT Date: 2019-03-05

**Examples**

```
# Get sequence similarity of two DNA strings
Match=10; MisMatch=-2
seq1 = "GCAT"; seq2 = "CAGTG"
getSeqSimMatCpp(seq1, seq2, Match, MisMatch)
matrix(c(-2, 10, -2, -2, -2, -2, 10, -2, 10, -2, -2, -2, -2, -2, 10, 10, -2, -2, -2),
  4, 5, byrow = FALSE)
```

---

|                |   |
|----------------|---|
| getTransitions | <i>Get transitions from all feature files</i> |
|----------------|---|

---

**Description**

Get a list of data-frame of OpenSwath features that contains retention time, intensities, boundaries etc.

**Usage**

```
getTransitions(  
  fileInfo,  
  maxFdrQuery = 0.05,  
  runType = "DIA_Proteomics",  
  applyFun = lapply  
)
```

**Arguments**

|             |  |
|-------------|--|
| fileInfo    | (data-frame) output of <a href="#">getRunNames</a> function.   |
| maxFdrQuery | (numeric) a numeric value between 0 and 1. It is used to filter features from osw file which have SCORE_MS2.QVALUE less than itself. |
| runType     | (char) this must be one of the strings "DIA_Proteomics", "DIA_Metabolomics".   |
| applyFun    | (function) value must be either lapply or BiocParallel::bplapply.  |

**Value**

(list of dataframes) each dataframe has following columns:

|                     |  |
|---------------------|--|
| transition_group_id | (integer) a unique id for each precursor.  |
| RT                  | (numeric) retention time as in FEATURE.EXP_RT of osw files.                      |
| intensity           | (list) of peak intensities as in FEATURE_TRANSITION.AREA_INTENSITY of osw files. |
| leftWidth           | (numeric) as in FEATURE.LEFT_WIDTH of osw files.                                 |
| rightWidth          | (numeric) as in FEATURE.RIGHT_WIDTH of osw files.                                |
| peak_group_rank     | (integer) rank of each feature associated with transition_group_id.              |
| m_score             | (numeric) q-value of each feature associated with transition_group_id.           |

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-11-15

**See Also**

[getRunNames](#), [fetchTransitionsFromRun](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
fileInfo <- getRunNames(dataPath = dataPath)
transitions <- getTransitions(fileInfo, maxFdrQuery = 1.00, runType = "DIA_Proteomics")
dim(transitions[[2]]) # 938 8
```

---

getTransitionsQuery    *Get transitions from a SQLite file*

---

**Description**

Query is generated to identify features and their transitions below a FDR cut-off from a run. Order of transition intensity is kept same as the order of their Ids in [getPrecursorsQuery](#).

**Usage**

```
getTransitionsQuery(runType = "DIA_Proteomics")
```

**Arguments**

runType            (char) This must be one of the strings "DIA\_proteomics", "DIA\_IPF", "DIA\_Metabolomics".

**Value**

SQL query to be searched.

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-11-15

**See Also**

[fetchTransitionsFromRun](#), [getPrecursorsQueryID](#), [getPrecursorsQuery](#)



---

`getTree`*Create a phylogenetic tree*

---

**Description**

Builds a phylogenetic tree from the distance matrix using UPGMA algorithm.

**Usage**

```
getTree(distMat, method = "average", prefix = "master")
```

**Arguments**

`distMat` (dist) a pairwise distance matrix.

**Value**

(phylo) a tree.

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-05-31

**See Also**

[upgma](#), [getNodeIDs](#)

**Examples**

```
m <- matrix(c(0,1,2,3, 1,0,1.5,1.5, 2,1.5,0,1, 3,1.5,1,0), byrow = TRUE,
            ncol = 4, dimnames = list(c("run1", "run2", "run3", "run4"),
                                     c("run1", "run2", "run3", "run4")))
distMat <- as.dist(m, diag = FALSE, upper = FALSE)
## Not run:
tree <- getTree(distMat)

## End(Not run)
tree <- ape::read.tree(text = "(run1:9,(run2:7,run0:2)master2:5)master1;")
plot(tree, type = "phylogram", show.node.label = TRUE)
ape::axisPhylo(1)
plot(tree, type = "unrooted", show.node.label = TRUE)
ape::edgelabels(tree$edge.length)
tree <- ape::nj(distMat) # Neighbor-Joining tree
plot(tree, type = "unrooted", show.node.label = TRUE)
ape::edgelabels(tree$edge.length)
```

---

getXICs                      *Get XICs of all analytes*

---

### Description

For all the analytes requested in runs, it first creates oswFiles, then, fetches chromatogram indices from oswFiles and extract chromatograms from mzML files.

### Usage

```
getXICs(  
  analytes,  
  runs,  
  dataPath = ".",  
  maxFdrQuery = 1,  
  runType = "DIA_Proteomics",  
  oswMerged = TRUE,  
  params = paramsDIAAlignR()  
)
```

### Arguments

|             |  |
|-------------|--|
| analytes    | (integer) a vector of precursor IDs.   |
| runs        | (vector of string) names of mzML files without extension.  |
| dataPath    | (string) Path to xics and osw directory.   |
| maxFdrQuery | (numeric) A numeric value between 0 and 1. It is used to filter features from osw file which have SCORE_MS2.QVALUE less than itself. |
| runType     | (char) This must be one of the strings "DIA_Proteomics", "DIA_Metabolomics".   |
| oswMerged   | (logical) TRUE for experiment-wide FDR and FALSE for run-specific FDR by pyprophet.  |
| params      | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function.                                       |

### Value

A list of list. Each list contains XIC-group for that run. XIC-group is a list of dataframe that has elution time and intensity of fragment-ion XIC.

### Author(s)

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

### See Also

[getXICs4AlignObj](#), [getRunNames](#), [analytesFromFeatures](#)

### Examples

```
dataPath <- system.file("extdata", package = "DIAAlignR")
runs <- c("hroest_K120808_Strep10%PlasmaBiolRepl1_R03_SW_filt",
         "hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt")
analytes <- c(32L, 898L, 2474L)
XICs <- getXICs(analytes, runs = runs, dataPath = dataPath)
```

---

getXICs4AlignObj      *Extract XICs of analytes*

---

### Description

For all the analytes requested, it fetches chromatogram indices from prec2chromIndex and extracts chromatograms using mzPntrs.

### Usage

```
getXICs4AlignObj(mzPntrs, fileInfo, runs, prec2chromIndex, analytes)
```

### Arguments

|                 |  |
|-----------------|--|
| mzPntrs         | a list of mzRpwiz.   |
| fileInfo        | (data-frame) output of getRunNames().  |
| runs            | (vector of string) names of mzML files without extension.  |
| prec2chromIndex | (list of data-frames) output of getChromatogramIndices(). Each dataframe has two columns: transition_group_id and chromatogramIndex. |
| analytes        | (integer) a vector of precursor IDs.   |

### Value

A list of list of data-frames. Each data frame has elution time and intensity of fragment-ion XIC.

### Author(s)

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

### See Also

[getChromatogramIndices](#), [getRunNames](#)

**Examples**

```

dataPath <- system.file("extdata", package = "DIAAlignR")
runs <- c("hroest_K120809_Strep0%PlasmaBiolRepl2_R04_SW_filt",
         "hroest_K120808_Strep10%PlasmaBiolRepl1_R03_SW_filt")
analytes <- c(32L, 898L, 2474L)
params <- paramsDIAAlignR()
params[["chromFile"]] <- "mzML"
fileInfo <- getRunNames(dataPath = dataPath)
fileInfo <- updateFileInfo(fileInfo, runs)
precursors <- getPrecursorByID(analytes, fileInfo)
mzPntrs <- getMZMLpointers(fileInfo)
prec2chromIndex <- getChromatogramIndices(fileInfo, precursors, mzPntrs)
XICs <- getXICs4AlignObj(mzPntrs, fileInfo, runs, prec2chromIndex, analytes)
rm(mzPntrs)

```

---

get\_ropenms

*Get ropenms handle*


---

**Description**

Python path can also be set using `Sys.setenv(RETICULATE_PYTHON = pythonPath)`. Also, remove `.Rhistory` file to avoid conflict with previously used python version.

**Usage**

```
get_ropenms(pythonPath = NULL, condaEnv = NULL, useConda = TRUE)
```

**Arguments**

`pythonPath` (string) path of the python program that has pyopenms module.

`condaEnv` (string) name of the conda environment that has pyopenms module.

`useConda` (logical) TRUE: Use conda environment. FALSE: Use python through python-Path.

**Value**

(pyopenms module)

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-06-06

**Examples**

```
## Not run:
  ropenms <- get_ropenms(condaEnv = "envName", useConda=TRUE)

## End(Not run)
```

---

imputeChromatogram      *Fill missing intensities in a chromatogram*

---

**Description**

Fill missing intensities in a chromatogram

**Usage**

```
imputeChromatogram(
  chromatogram,
  method = "spline",
  polyOrd = 4,
  kernellLen = 9,
  splineMethod = "fmm"
)
```

**Arguments**

chromatogram      (data-frames) first column is time, second column is intensity.  
method            (string) must be either "spline", "sgolay" or "linear".  
polyOrd           (integer) must be less than kernellLen.  
kernellLen        (integer) must be an odd integer.  
splineMethod      (string) must be either "fmm" or "natural".

**Value**

(dataframe) has two columns:

time              (numeric)  
intensity         (numeric)

**Author(s)**

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ORCID: 0000-0003-3500-8152  
License: (c) Author (2020) + GPL-3 Date: 2020-05-21

**See Also**

[na.approx](#), [na.spline](#)

**Examples**

```
time <- seq(from = 3003.4, to = 3048, by = 3.4)
y <- c(0.2050595, 0.8850070, 2.2068768, 3.7212677, 5.1652605, 5.8288915, 5.5446804,
      4.5671360, 3.3213154, 1.9485889, 0.9520709, 0.3294218, 0.2009581, 0.1420923)
chrom <- data.frame(time, y)
chrom$y[c(1,8, 14)] <- NA
imputeChromatogram(chrom, "sgolay")
imputeChromatogram(chrom, "spline")
imputeChromatogram(chrom, "linear")
```

---

ipfReassignFDR

*Re-Assign FDR Aligned Peaks*


---

**Description**

This method will re-assign peaks with either the MS2 FDR if there was not enough confidence (identifying transitions) in the IPF FDR, or it will assign the user defined alignedFDR2. This assumes the reference run has a really good peak that meets the IPF FDR threshold.

**Usage**

```
ipfReassignFDR(dt, refRuns, fileInfo, params)
```

**Arguments**

|          |  |
|----------|--|
| dt       | (data.table) Aligned results tables from writeTables                       |
| refRuns  | (dataframe) A peptide reference run table from getRefRun                   |
| fileInfo | (dataframe) A table with run filename information from getRunNames         |
| params   | (list) A list of parameters used by DIALignR generated from paramsDIALignR |

**Value**

(data.table) Aligned results table with reassigned m-scores

**Author(s)**

Justin Sing, <justinc.sing@mail.utoronto.ca>

ORCID: 0000-0003-0386-0092

License: (c) Author (2020) + GPL-3 Date: 2020-07-17

**See Also**

[writeTables](#), [getRefRun](#), [getRunNames](#), [paramsDIALignR](#)

**Examples**

```
## Not run:  
finalTbl <- ipfReassignFDR(finalTbl, refRuns, fileInfo, params)  
  
## End(Not run)
```

---

|              |   |
|--------------|---|
| mapIdxToTime | <i>Establishes mapping from index to time</i> |
|--------------|---|

---

**Description**

Takes a time vector and index vector of same length. This function create a new time vector given indices specified in idx.

**Usage**

```
mapIdxToTime(timeVec, idx)
```

**Arguments**

|         |                   |
|---------|-------------------|
| timeVec | A numeric vector  |
| idx     | An integer vector |

**Value**

A mutated time vector

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

**Examples**

```
timeVec <- c(1.3,5.6,7.8)  
idx <- c(NA, NA, 1L, 2L, NA, NA, 3L, NA)  
mapIdxToTime(timeVec, idx) # c(NA, NA, 1.3, 5.6, 6.333, 7.067, 7.8, NA)
```

---

mappedRTfromAlignObj *Map reference run time on the experiment run.*

---

## Description

Retention time from reference run is mapped to experiment run using AlignObj.

## Usage

```
mappedRTfromAlignObj(refRT, tVec.ref, tVec.exp, AlignObj)
```

## Arguments

|          |  |
|----------|--|
| refRT    | (numeric) retention time in reference run.                               |
| tVec.ref | (numeric) time vector of reference run.                                  |
| tVec.exp | (numeric) time vector of experiment run.                                 |
| AlignObj | (S4 object) must have indexA_aligned, indexB_aligned and score as slots. |

## Value

(numeric)

## Author(s)

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

## Examples

```
data(XIC_QFNNTDIVLLEDFQK_3_DIAalignR, package="DIAalignR")
tVec.ref <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120809_Strep0%PlasmaBio1Rep12_R04_SW_filt"]][["4618"]][[1]]
tVec.exp <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120809_Strep10%PlasmaBio1Rep12_R04_SW_filt"]][["4618"]][[1]]
## Not run:
AlignObj <- testAlignObj()
mappedRTfromAlignObj(refRT= 5238.35, tVec.ref, tVec.exp, AlignObj)

## End(Not run)
```



---

`mapPrecursorToChromIndices`*Merge precursor and transitions mapping with chromatogram header*

---

**Description**

Merges dataframes on `transition_ids(OSW) = chromatogramId(mzML)`.

**Usage**

```
mapPrecursorToChromIndices(prec2transition, chromHead)
```

**Arguments**

`prec2transition`

(dataframe) This has two columns: `transition_group_id` and `transition_ids` with integer values.

`chromHead`

(dataframe) This has two columns: `chromatogramId` and `chromatogramIndex` with integer values.

**Value**

(dataframe) having following columns:

`transition_group_id`

(string) it is either fetched from `PRECURSOR.GROUP_LABEL` or a combination of `PEPTIDE.MODIFIED_SEQUENCE` and `PRECURSOR.CHARGE` from `osw` file.

`chromatogramIndex`

(integer) Index of chromatogram in `mzML` file.

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2020-04-07

**See Also**

[getChromatogramIndices](#)

---

```
masterXICs_DIAalignR    Master fragment-ion chromatograms from two parents
```

---

### Description

Created merged XICs of peptide (ID = 4618) 14299\_QFNNTDIVLLEDFQK/3 from two SWATH runs:

run1 : hroest\_K120809\_Strep0%PlasmaBiolRepl2\_R04\_SW\_filt.chrom.mzML

run2 : hroest\_K120809\_Strep10%PlasmaBiolRepl2\_R04\_SW\_filt.chrom.mzML

### Usage

```
masterXICs_DIAalignR
```

### Format

The format is similar to the output of childXICs. A list of two elements: First element contains six fragmentation chromatograms. The second element has aligned parent time-vectors and corresponding child time-vector. It has five columns:

**indexAligned.ref** (integer) aligned indices of reference run.

**indexAligned.eXp** (integer) aligned indices of experiment run.

**tAligned.ref** (numeric) aligned time-vector of reference run.

**tAligned.eXp** (numeric) aligned time-vector of experiment run.

**alignedChildTime** (numeric) aligned time-vector of master run.

### Source

File test\_GenerateData.R has [source code](#) to generate the example data.

---

```
mergeOswAnalytes_ChromHeader
    Merge dataframes from OSW and mzML files
```

---

### Description

Merges dataframes on `transition_id(OSW) = chromatogramId(mzML)`.

### Usage

```
mergeOswAnalytes_ChromHeader(
  oswAnalytes,
  chromHead,
  analyteFDR = 1,
  runType = "DIA_Proteomics"
)
```

**Arguments**

|             |   |
|-------------|---|
| oswAnalytes | (dataframe) This is an output of getOswFiles.   |
| chromHead   | (dataframe) This has two columns: chromatogramId and chromatogramIndex with integer values. |
| analyteFDR  | (numeric) Not used.   |
| runType     | (char) This must be one of the strings "DIA_Proteomics", "DIA_Metabolomics".                |

**Value**

Invisible NULL

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License: (c) Author (2019) + GPL-3 Date: 2019-12-13

**See Also**

[getOswFiles](#)

---

|          |                                |
|----------|--------------------------------|
| mergeXIC | <i>Merge two XICs into one</i> |
|----------|--------------------------------|

---

**Description**

Both extracted-ion chromatograms must have same number of rows. Missing values are not allowed. Intensities are weighted-averaged.

**Usage**

```
mergeXIC(XIC.ref, XIC.exp, wRef, mergeStrategy)
```

**Arguments**

|               |   |
|---------------|---|
| XIC.ref       | (data-frame) extracted ion chromatogram from reference run. Must not contain missing values.  |
| XIC.exp       | (data-frame) extracted ion chromatogram from experiment run. Must not contain missing values. |
| wRef          | (numeric) Weight of the reference XIC. Must be between 0 and 1.                               |
| mergeStrategy | (string) must be either ref, avg, refStart or refEnd.   |

**Value**

(dataframe) has two columns:

|           |           |
|-----------|-----------|
| time      | (numeric) |
| intensity | (numeric) |

**time-merging**

There are three strategies for calculating time to keep sampling rate equal to parents:

- Use reference time.
- Average time (Non-gap region will have parent's sampling rate).
- Start/end with the average then fixed sampling rate.

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**See Also**

[childXIC](#), [alignedXIC](#)

**Examples**

```
data(XIC_QFNNTDIVLLEDFQK_3_DIAalignR, package="DIAalignR")
XICs.ref <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt"]][["4618"]]
XICs.exp <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120809_Strep10%PlasmaBiolRep12_R04_SW_filt"]][["14299_QFNNTDIVLLEDFQK_3_DIAalignR"]]
## Not run:
plot(mergeXIC(XICs.ref[[1]], XICs.exp[[1]], wRef = 0.5, mergeStrategy = "ref"), type = "l")

## End(Not run)
```

---

mstAlignRuns

*Peptide quantification through MST alignment*

---

**Description**

This function expects osw and xics directories at dataPath. It first reads osw files and fetches chromatogram indices for each analyte. To perform alignment, first a guide-tree is built using [mst](#) which can also be provided with mstNet parameter. As we traverse from the start node to the other nodes, runs are aligned pairwise.

**Usage**

```
mstAlignRuns(  
  dataPath,  
  outFile = "DIAAlignR",  
  params = paramsDIAAlignR(),  
  oswMerged = TRUE,  
  scoreFile = NULL,  
  runs = NULL,  
  peps = NULL,  
  mstNet = NULL,  
  applyFun = lapply  
)
```

**Arguments**

|           |  |
|-----------|--|
| dataPath  | (string) path to xics and osw directory.   |
| outFile   | (string) name of the output file.  |
| params    | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function. |
| oswMerged | (logical) TRUE if merged file from pyprophet is used.  |
| scoreFile | (string) path to the peptide score file, needed when oswMerged is FALSE.                       |
| runs      | (string) names of xics file without extension.   |
| peps      | (integer) ids of peptides to be aligned. If NULL, align all peptides.                          |
| mstNet    | (matrix) array of tree-edges. Look up <a href="#">getMST</a> .                                 |
| applyFun  | (function) value must be either lapply or BiocParallel::bplapply.                              |

**Value**

(None)

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License: (c) Author (2021) + GPL-3 Date: 2021-05-15

**See Also**

[alignTargetedRuns](#), [progAlignRuns](#), [getMST](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")  
params <- paramsDIAAlignR()  
params[["context"]] <- "experiment-wide"  
mstAlignRuns(dataPath, params = params, outFile = "DIAAlignR")  
## Not run:
```

```

y <- strsplit("run0 run1\nrun2 run2", split = '\n')[[1]]
y <- cbind(A = strsplit(y[1], " ")[[1]], B = strsplit(y[2], " ")[[1]])
plot(igraph::graph_from_edgelist(y, directed = FALSE))

## End(Not run)

```

---

MSTperBatch

*Aligns an analyte for a batch of peptides*


---

### Description

For the *i*th analyte in the batch, this function traverse the MST from start node and align runs pairwise. In the process it updates multipeptide with aligned features.

### Usage

```

MSTperBatch(
  iBatch,
  nets,
  peptides,
  multipeptide,
  refRuns,
  precursors,
  prec2chromIndex,
  fileInfo,
  mzPtrs,
  params,
  globalFits,
  RSE,
  applyFun = lapply
)

```

### Arguments

|                 |   |
|-----------------|---|
| nets            | (list) set of trees ordered for traversal obtained from <a href="#">traverseMST</a> .   |
| peptides        | (integer) vector of peptide IDs.  |
| multipeptide    | (list) contains multiple data-frames that are collection of features associated with analytes. This is an output of <a href="#">getMultipeptide</a> .                     |
| refRuns         | (data-frame) output of <a href="#">getRefRun</a> . Must have two columns : transition_group_id and run.   |
| precursors      | (data-frame) atleast two columns transition_group_id and transition_ids are required.   |
| prec2chromIndex | (list) a list of dataframes having following columns:<br>transition_group_id: it is PRECURSOR.ID from osw file.<br>chromatogramIndex: index of chromatogram in mzML file. |

|            |  |
|------------|--|
| fileInfo   | (data-frame) output of <a href="#">getRunNames</a> .   |
| mzPntrs    | (list) a list of mzRpwis.  |
| params     | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function.           |
| globalFits | (list) each element is either of class lm or loess. This is an output of <a href="#">getGlobalFits</a> . |
| RSE        | (list) Each element represents Residual Standard Error of corresponding fit in globalFits.               |

**Value**

invisible NULL

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2021) + GPL-3 Date: 2021-05-15

**See Also**

[mstAlignRuns](#), [alignToRefMST](#), [getAlignedTimesFast](#), [getMultipeptide](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
```

---

mstScript1

*Extract features and generate minimum spanning tree.*

---

**Description**

Extract features and generate minimum spanning tree.

**Usage**

```
mstScript1(  
  dataPath,  
  outFile = "DIAAlignR",  
  params = paramsDIAAlignR(),  
  oswMerged = TRUE,  
  runs = NULL,  
  mstNet = NULL,  
  applyFun = lapply  
)
```

**Arguments**

|           |  |
|-----------|--|
| dataPath  | (string) path to xics and osw directory.   |
| outFile   | (string) name of the output file.  |
| params    | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function. |
| oswMerged | (logical) TRUE if merged file from pyprophet is used.  |
| runs      | (string) names of xics file without extension.   |
| mstNet    | (string) minimum spanning tree in string format. See example of <a href="#">mstScript2</a> .   |
| applyFun  | (function) value must be either lapply or BiocParallel::bplapply.                              |

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License: (c) Author (2022) + GPL-3 Date: 2022-04-19

**See Also**

[mstAlignRuns](#), [mstScript2](#)

**Examples**

```
params <- paramsDIAAlignR()
params[["context"]] <- "experiment-wide"
dataPath <- system.file("extdata", package = "DIAAlignR")
BiocParallel::register(BiocParallel::MulticoreParam(workers = 4, progressbar = TRUE))
mstScript1(dataPath, outFile = "testDIAAlignR", params = params, applyFun = BiocParallel::bplapply)
file.remove(file.path(dataPath, "testDIAAlignR_mst1.RData"))
```

---

mstScript2

*Performs alignment using mstScript1 output*

---

**Description**

Performs alignment using mstScript1 output

**Usage**

```
mstScript2(
  dataPath,
  outFile = "DIAAlignR",
  params = paramsDIAAlignR(),
  oswMerged = TRUE,
  scoreFile = NULL,
  peps = NULL,
  mstNet = NULL,
  applyFun = lapply
)
```



### Arguments

|           |  |
|-----------|--|
| dataPath  | (string) path to xics and osw directory.   |
| outFile   | (string) name of the output file.  |
| params    | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function. |
| oswMerged | (logical) TRUE if merged file from pyprophet is used.  |
| scoreFile | (string) path to the peptide score file, needed when oswMerged is FALSE.                       |
| peps      | (integer) ids of peptides to be aligned. If NULL, align all peptides.                          |
| mstNet    | (string) minimum spanning tree in string format. See example of <a href="#">mstScript2</a> .   |
| applyFun  | (function) value must be either lapply or BiocParallel::bplapply.                              |

### Author(s)

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 License: (c) Author (2022) + GPL-3 Date: 2022-04-19

### See Also

[mstAlignRuns](#), [mstScript1](#)

### Examples

```
params <- paramsDIAAlignR()
params[["context"]] <- "experiment-wide"
dataPath <- system.file("extdata", package = "DIAAlignR")
BiocParallel::register(BiocParallel::MulticoreParam(workers = 4, progressBar = TRUE))
mstScript1(dataPath, outFile = "testDIAAlignR", params = params, applyFun = BiocParallel::bplapply)
mstNet <- "run0 run0\nrun1 run2"
mstScript2(dataPath, outFile = "testDIAAlignR", params = params, mstNet = mstNet, applyFun = lapply)
file.remove(file.path(dataPath, "testDIAAlignR_mst1.RData"))
file.remove("testDIAAlignR.tsv")
```

---

multipeptide\_DIAAlignR *Analytes information from multipeptide.*

---

### Description

analytes info from three SWATH runs:

```
run0 : hroest_K120808_Strep10%PlasmaBiolRepl1_R03_SW_filt.chrom.mzML
run1 : hroest_K120809_Strep0%PlasmaBiolRepl2_R04_SW_filt.chrom.mzML
run2 : hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt.chrom.mzML
```

### Usage

```
multipeptide_DIAAlignR
```

**Format**

A list of 199 elements where each element represents a precursor and consists of a dataframe:

**transition\_group\_id** ID of each precursor. Same as the name of the list

**RT** Retention time, in sec

**intensity** Intensity of associated feature

**leftWidth** Left width of the peak, in sec

**rightWidth** Right width of the peak, in sec

**peak\_group\_rank** Ranking of associated feature

**m\_score** qvalue of associated feature

**run** Name of the run, feature is from

**alignment\_rank** Rank of the feature after alignment

**Source**

Raw files are downloaded from [Peptide Atlas](#). File test\_GenerateData.R has [source code](#) to generate the example data.

---

 nrDesc

*Number of descendants*


---

**Description**

Get the number of descendants for each node in the tree.

**Usage**

```
nrDesc(tree)
```

**Arguments**

tree (phylo) a phylogenetic tree.

**Value**

(numeric)

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

**See Also**

[Ntip](#), [getNodeIDs](#)

## Examples

```
m <- matrix(c(0,1,2,3, 1,0,1.5,1.5, 2,1.5,0,1, 3,1.5,1,0), byrow = TRUE,
            ncol = 4, dimnames = list(c("run1", "run2", "run3", "run4"),
                                     c("run1", "run2", "run3", "run4")))
distMat <- as.dist(m, diag = FALSE, upper = FALSE)
## Not run:
tree <- getTree(distMat)
getNodeIDs(tree)
nrDesc(tree)

## End(Not run)
```

---

oswFiles\_DIAalignR

*Analytes information from osw files*

---

## Description

analytes info from three SWATH runs:

```
run0 : hroest_K120808_Strep10%PlasmaBiolRepl1_R03_SW_filt.chrom.mzML
run1 : hroest_K120809_Strep0%PlasmaBiolRepl2_R04_SW_filt.chrom.mzML
run2 : hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt.chrom.mzML
```

## Usage

```
oswFiles_DIAalignR
```

## Format

A list of three elements where each element consists of a dataframe:

**transition\_group\_id** ID of each peptide  
**RT** Retention time, in sec  
**intensity** Intensity of associated feature  
**leftWidth** Left width of the peak, in sec  
**rightWidth** Right width of the peak, in sec  
**peak\_group\_rank** Ranking of associated feature  
**m\_score** qvalue of associated feature

## Source

Raw files are downloaded from [Peptide Atlas](#). File test\_GenerateData.R has [source code](#) to generate the example data.

---

|                 |   |
|-----------------|---|
| otherChildXICpp | <i>Get child chromatogram for other precursors using main precursor alignment</i> |
|-----------------|---|

---

**Description**

Get child chromatogram for other precursors using main precursor alignment

**Usage**

```
otherChildXICpp(
  l1,
  l2,
  kernelLen,
  polyOrd,
  mat,
  childTime,
  wRef = 0.5,
  splineMethod = "natural"
)
```

**Arguments**

|              |  |
|--------------|--|
| l1           | (list) A list of numeric matrix of two columns. l1 and l2 should have same length. |
| l2           | (list) A list of numeric matrix of two columns. l1 and l2 should have same length. |
| kernelLen    | (integer) length of filter. Must be an odd number.                                 |
| polyOrd      | (integer) TRUE: remove background from peak signal using estimated noise levels.   |
| mat          | (matrix) aligned time and child time from the main precursor.                      |
| childTime    | (numeric) iime vector from the child chromatogram.                                 |
| wRef         | (numeric) Weight of the reference XIC. Must be between 0 and 1.                    |
| splineMethod | (string) must be either "fmm" or "natural".  |

**Value**

(List) of chromatograms.

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## Examples

```
data(XIC_QFNNTDIVLLEDFQK_3_DIAalignR, package="DIAalignR")
XICs <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR
XICs.ref <- lapply(XICs[["hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt"]][["4618"]], as.matrix)
XICs.eXp <- lapply(XICs[["hroest_K120809_Strep10%PlasmaBiolRep12_R04_SW_filt"]][["4618"]], as.matrix)
Bp <- seq(4964.752, 5565.462, length.out = nrow(XICs.ref[[1]]))
chrom <- getChildXICpp(XICs.ref, XICs.eXp, 11L, 4L, alignType = "hybrid", adaptiveRT = 77.82315,
  normalization = "mean", simType = "dotProductMasked", Bp = Bp,
  goFactor = 0.125, geFactor = 40, cosAngleThresh = 0.3, OverlapAlignment = TRUE,
  dotProdThresh = 0.96, gapQuantile = 0.5, hardConstrain = FALSE, samples4gradient = 100,
  wRef = 0.5, keepFlanks = TRUE)
chrom2 <- otherChildXICpp(XICs.ref, XICs.eXp, 11L, 4L, chrom[[2]], chrom[[1]][[1]][,1],
  0.5, "natural")
```

---

paramsDIAalignR

*Parameters for the alignment functions*

---

## Description

Retention alignment requires OpenSWATH/pyProphet extracted features and chromatograms. This function provides a suite of parameters used for selecting features and manipulating chromatograms. Chromatogram alignment can be performed via reference based or progressively via rooted or unrooted tree. This function provides sensible parameters for these tasks.

## Usage

```
paramsDIAalignR()
```

## Value

A list of parameters:

|                |  |
|----------------|--|
| runType        | (string) must be one of the strings "DIA_Proteomics", "DIA_IPF", "DIA_Metabolomics".   |
| chromFile      | (string) must either be "mzML" or "sqMass".  |
| maxFdrQuery    | (numeric) a numeric value between 0 and 1. It is used to filter peptides from osw file which have SCORE_MS2.QVALUE less than itself.                   |
| maxIPFFdrQuery | (numeric) A numeric value between 0 and 1. It is used to filter features from osw file which have SCORE_IPF.QVALUE less than itself. (For PTM IPF use) |
| maxPeptideFdr  | (numeric) a numeric value between 0 and 1. It is used to filter peptides from osw file which have SCORE_PEPTIDE.QVALUE less than itself.               |
| analyteFDR     | (numeric) the upper limit of feature FDR to be it considered for building tree.  |
| treeDist       | (string) the method used to build distance matrix. Must be either "rsquared", "count" or "RSE".  |
| treeAgg        | (string) the method used for agglomeration while performing hierarchical clustering. Must be either "single", "average" or "complete".                 |

|                     |  |
|---------------------|--|
| alignToRoot         | (logical) if TRUE, align leaves to the root in hierarchical clustering, else use already save aligned vectors.   |
| prefix              | (string) name to be used to define merged runs.  |
| context             | (string) used in pyprophet peptide. Must be either "run-specific", "experiment-wide", or "global".   |
| unalignedFDR        | (numeric) must be between 0 and maxFdrQuery. Features below unalignedFDR are considered for quantification even without the RT alignment.  |
| alignedFDR1         | (numeric) must be between unalignedFDR and alignedFDR2. Features below alignedFDR1 and aligned to the reference are considered for quantification.   |
| alignedFDR2         | (numeric) must be between alignedFDR1 and maxFdrQuery. Features below alignedFDR2 and within certain distance from the aligned time are considered for quantification after the alignment. |
| criterion           | (integer) strategy to select peak if found overlapping peaks. 1:intensity, 2: RT overlap, 3: mscore, 4: edge distance  |
| level               | (string) apply maxPeptideFDR on Protein as well if specified as "Protein". Default: "Peptide".   |
| integrationType     | (string) method to compute the area of a peak contained in XICs. Must be from "intensity_sum", "trapezoid", "simpson".   |
| baseSubtraction     | logical TRUE: remove background from peak signal using estimated noise levels.   |
| baselineType        | (string) method to estimate the background of a peak contained in XICs. Must be from "none", "base_to_base", "vertical_division_min", "vertical_division_max".                             |
| fitEMG              | (logical) enable/disable exponentially modified gaussian peak model fitting.   |
| recalIntensity      | (logical) recalculate intensity for all analytes.  |
| fillMissing         | (logical) calculate intensity for analytes for which features are not found.   |
| XICfilter           | (string) must be either sgolay, boxcar, gaussian, loess or none.   |
| polyOrd             | (integer) order of the polynomial to be fit in the kernel.   |
| kernellLen          | (integer) number of data-points to consider in the kernel.   |
| globalAlignment     | (string) must be either "loess" or "linear".   |
| globalAlignmentFdr  | (numeric) a numeric value between 0 and 1. Features should have m-score lower than this value for participation in LOESS fit.  |
| globalAlignmentSpan | (numeric) spanvalue for LOESS fit. For targeted proteomics 0.1 could be used.  |
| RSEdistFactor       | (numeric) defines how much distance in the unit of rse remains a noBeef zone.  |
| normalization       | (string) must be selected from "mean", "l2".   |
| simMeasure          | (string) must be selected from dotProduct, cosineAngle, crossCorrelation, cosine2Angle, dotProductMasked, euclideanDist, covariance and correlation.                                       |
| alignType           | (numeric) available alignment methods are "global", "local" and "hybrid".  |

|                  |  |
|------------------|--|
| goFactor         | (numeric) penalty for introducing first gap in alignment. This value is multiplied by base gap-penalty. Should be between 10-1000.               |
| geFactor         | (numeric) penalty for introducing subsequent gaps in alignment. This value is multiplied by base gap-penalty.                                    |
| cosAngleThresh   | (numeric) in simType = dotProductMasked mode, angular similarity should be higher than cosAngleThresh otherwise similarity is forced to zero.    |
| OverlapAlignment | (logical) an input for alignment with free end-gaps. False: Global alignment, True: overlap alignment.   |
| dotProdThresh    | (numeric) in simType = dotProductMasked mode, values in similarity matrix higher than dotProdThresh quantile are checked for angular similarity. |
| gapQuantile      | (numeric) must be between 0 and 1. This is used to calculate base gap-penalty from similarity distribution.                                      |
| kerLen           | (integer) In simType = crossCorrelation, length of the kernel used to sum similarity score. Must be an odd number.                               |
| hardConstrain    | (logical) if FALSE; indices farther from noBeef distance are filled with distance from linear fit line.  |
| samples4gradient | (numeric) modulates penalization of masked indices.  |
| fillMethod       | (string) must be either "spline", "sgolay" or "linear".  |
| splineMethod     | (string) must be either "fmm" or "natural".  |
| mergeTime        | (string) must be either "ref", "avg", "refStart" or "refEnd".  |
| keepFlanks       | (logical) TRUE: Flanking chromatogram is not removed.  |
| fraction         | (integer) indicates which fraction to align.   |
| fractionNum      | (integer) Number of fractions to divide the alignment.   |
| lossy            | (logical) if TRUE, time and intensity are lossy-compressed in generated sqMass file.   |
| useIdentifying   | (logical) Set TRUE to use identifying transitions in alignment. (DEFAULT: FALSE)   |

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**See Also**

[checkParams](#), [alignTargetedRuns](#)

**Examples**

```
params <- paramsDIAalignR()
```

---

|          |                                      |
|----------|--------------------------------------|
| perBatch | <i>Aligns an analyte across runs</i> |
|----------|--------------------------------------|

---

### Description

For the *i*th analyte in multipeptide, this function aligns all runs to the reference run. The result is a dataframe that contains aligned features corresponding to the analyte across all runs.

### Usage

```
perBatch(
  iBatch,
  peptides,
  multipeptide,
  refRuns,
  precursors,
  prec2chromIndex,
  fileInfo,
  mzPtrs,
  params,
  globalFits,
  RSE,
  applyFun = lapply,
  multiFeatureAlignmentMap = NULL
)
```

### Arguments

|                 |   |
|-----------------|---|
| peptides        | (integer) vector of peptide IDs.  |
| multipeptide    | (list) contains multiple data-frames that are collection of features associated with analytes. This is an output of <a href="#">getMultiPeptide</a> .                     |
| refRuns         | (data-frame) output of <a href="#">getRefRun</a> . Must have two columns: transition_group_id and run.  |
| precursors      | (data-frame) atleast two columns transition_group_id and transition_ids are required.   |
| prec2chromIndex | (list) a list of dataframes having following columns:<br>transition_group_id: it is PRECURSOR.ID from osw file.<br>chromatogramIndex: index of chromatogram in mzML file. |
| fileInfo        | (data-frame) output of <a href="#">getRunNames</a> .  |
| mzPtrs          | (list) a list of mzRpwis.   |
| params          | (list) parameters are entered as list. Output of the <a href="#">paramsDIALignR</a> function.   |
| globalFits      | (list) each element is either of class lm or loess. This is an output of <a href="#">getGlobalFits</a> .  |
| RSE             | (list) Each element represents Residual Standard Error of corresponding fit in globalFits.  |



multiFeatureAlignmentMap  
 (list) contains multiple data-frames that are collection of experiment feature ids mapped to corresponding reference feature id per analyte. This is an output of [getRefExpFeatureMap](#).

rownum  
 (integer) represents the index of the multipeptide to be aligned.

**Value**

invisible NULL

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-07-26

**See Also**

[alignTargetedRuns](#), [alignToRef](#), [getAlignedTimesFast](#), [getMultipeptide](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
```

---

pickNearestFeature      *Pick feature closest to reference peak*

---

**Description**

It picks a feature that is within adaptiveRT window across eXpRT and has lowest m-score. Feature's m-score also has to be smaller than featureFDR.

**Usage**

```
pickNearestFeature(eXpRT, analyte, oswFiles, runname, adaptiveRT, featureFDR)
```

**Arguments**

eXpRT                    (numeric) retention time in experiment run.

analyte                    (integer) vector of precursor IDs.

oswFiles                    (list of data-frames) it is output from getFeatures function.

runname                    (string) must be a combination of "run" and an iteger e.g. "run2".

adaptiveRT                    (numeric) half-width of retention time window. Feature, if found, is picked from within this window.

featureFDR                    (numeric) upper m-score cut-off for a feature to be picked.

**Value**

(list) Following elements are present in the list:

|                 |   |
|-----------------|---|
| leftWidth       | (numeric) as in FEATURE.LEFT_WIDTH of osw files.                        |
| rightWidth      | (numeric) as in FEATURE.RIGHT_WIDTH of osw files.                       |
| RT              | (numeric) retention time as in FEATURE.EXP_RT of osw files.             |
| Intensity       | (numeric) peak intensity as in FEATURE_MS2.AREA_INTENSITY of osw files. |
| peak_group_rank | (integer) rank of each feature associated with transition_group_id.     |
| m_score         | (numeric) q-value of each feature associated with transition_group_id.  |

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

**See Also**

[getFeatures](#)

**Examples**

```
data(oswFiles_DIAAlignR, package="DIAAlignR")
## Not run:
pickNearestFeature(expRT = 5237.8, analyte = 4618L, oswFiles = oswFiles_DIAAlignR,
  runname = "run2", adaptiveRT = 77.82315, featureFDR = 0.05)

## End(Not run)
```

---

plotAlignedAnalytes *Plot aligned XICs group for a specific peptide. AlignObjOutput is the output from getAlignObjs function.*

---

**Description**

Plot aligned XICs group for a specific peptide. AlignObjOutput is the output from getAlignObjs function.

**Usage**

```
plotAlignedAnalytes(
  AlignObjOutput,
  plotType = "All",
  outFile = "AlignedAnalytes.pdf",
  annotatePeak = FALSE,
  saveFigs = FALSE
)
```

**Arguments**

AlignObjOutput (list) list contains fileInfo, AlignObj, raw XICs for reference and experiment, and reference-peak label.

plotType (string) must be one of the strings "All", "onlyUnaligned" and "onlyAligned".

outFile (string) name of the output pdf file.

annotatePeak (logical) TRUE: Peak boundaries and apex will be highlighted.

saveFigs (logical) TRUE: Figures will be saved in AlignedAnalytes.pdf.

**Value**

A plot to the current device.

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
runs <- c("hroest_K120809_Strep0%PlasmaBiolRepl2_R04_SW_filt",
         "hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt")
AlignObjOutput <- getAlignObjs(analytes = 4618L, runs, dataPath = dataPath)
plotAlignedAnalytes(AlignObjOutput)
```

---

plotAlignmentPath      *Visualize alignment path through similarity matrix*

---

**Description**

Plot aligned path through the similarity matrix. Reference run has indices on X-axis, eXp run has them on Y-axis. In getAlignObjs function, objType must be set to medium.

**Usage**

```
plotAlignmentPath(AlignObjOutput)
```

**Arguments**

AlignObjOutput (list) The list contains AlignObj, raw XICs for reference and experiment, and reference-peak label.

**Value**

A plot to the current device.

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

**Examples**

```
library(lattice)
dataPath <- system.file("extdata", package = "DIAAlignR")
runs <- c("hroest_K120809_Strep0%PlasmaBiolRepl2_R04_SW_filt",
         "hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt")
AlignObjOutput <- getAlignObjs(analytes = 4618L, runs, dataPath = dataPath, objType = "medium")
plotAlignmentPath(AlignObjOutput)
```

---

plotAnalyteXICs

*Plot extracted-ion chromatogram.*

---

**Description**

Plot extracted-ion chromatogram.

**Usage**

```
plotAnalyteXICs(
  analyte,
  run,
  dataPath = ".",
  maxFdrQuery = 1,
  XICfilter = "sgolay",
  polyOrd = 4,
  kernelLen = 9,
  runType = "DIA_Proteomics",
  oswMerged = TRUE,
  peakAnnot = NULL,
  Title = NULL
)
```

**Arguments**

|             |  |
|-------------|--|
| analyte     | (integer) an analyte is a PRECURSOR.ID from the osw file.  |
| run         | (string) Name of a xics file without extension.  |
| dataPath    | (string) path to xics and osw directory.   |
| maxFdrQuery | (numeric) A numeric value between 0 and 1. It is used to filter features from osw file which have SCORE_MS2.QVALUE less than itself. |
| XICfilter   | (string) must be either sgolay, boxcar, gaussian, loess or none.   |
| polyOrd     | (integer) order of the polynomial to be fit in the kernel.   |
| kernelLen   | (integer) number of data-points to consider in the kernel.   |
| runType     | (char) This must be one of the strings "DIA_Proteomics", "DIA_Metabolomics".   |
| oswMerged   | (logical) TRUE for experiment-wide FDR and FALSE for run-specific FDR by pyprophet.  |
| peakAnnot   | (numeric) Peak-apex time.  |
| Title       | (logical) TRUE: name of the list will be displayed as title.   |

**Value**

A plot to the current device.

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

**See Also**

[plotXICgroup](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
run <- "hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt"
plotAnalyteXICs(analyte = 2474L, run, dataPath = dataPath, oswMerged = TRUE, XICfilter = "none")
plotAnalyteXICs(analyte = 2474L, run, dataPath = dataPath, oswMerged = TRUE, XICfilter = "sgolay")
```

plotSingleAlignedChrom

*Plot an aligned XIC-group.*

---

### Description

Plot an aligned XIC-group.

### Usage

```
plotSingleAlignedChrom(XIC_group, idx, peakAnnot = NULL)
```

### Arguments

|           |   |
|-----------|---|
| XIC_group | (list) It is a list of dataframe which has two columns. First column is for time and second column indicates intensity. |
| idx       | (integer) Indices of aligned chromatograms.   |
| peakAnnot | (numeric) Peak-apex time.   |

### Details

x-axis cannot have the same time-values, therefore, x-axis is indexed.

### Value

A plot to the current device.

### Author(s)

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

---

plotXICgroup

*Plot Extracted-ion chromatogram group.*

---

### Description

Plot Extracted-ion chromatogram group.

### Usage

```
plotXICgroup(XIC_group, peakAnnot = NULL, Title = NULL)
```

**Arguments**

|           |   |
|-----------|---|
| XIC_group | (list) It is a list of dataframe which has two columns. First column is for time and second column indicates intensity. |
| peakAnnot | (numeric) Peak-apex time.   |
| Title     | (logical) TRUE: name of the list will be displayed as title.  |

**Value**

A plot to the current device.

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

**See Also**

[plotAnalyteXICs](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
runs <- c("hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt",
         "hroest_K120809_Strep10%PlasmaBiolRep12_R04_SW_filt")
XICs <- getXICs(analytes = 4618L, runs = runs, dataPath = dataPath, oswMerged = TRUE)
plotXICgroup(XICs[["hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt"]][["4618"]])
XICs <- smoothXICs(XICs[["hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt"]][["4618"]],
                  type = "sgolay", kernelLen = 13, polyOrd = 4)
plotXICgroup(XICs, Title = "Precursor 4618 \n
run hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt")
```

---

populateReferenceExperimentFeatureAlignmentMap

*Populate Alignment Feature Mapping Table*

---

**Description**

Populate an alignment feature mapping table for star align method, to map aligned features in experiment runs to the reference run for a given analyte. Is a data.table generated from of [getRefExpFeatureMap](#).

**Usage**

```
populateReferenceExperimentFeatureAlignmentMap(
  df,
  feature_alignment_mapping,
  tAligned,
  ref,
  exp,
  analyte_chr
)
```

**Arguments**

`df` (dataframe) a collection of features related to the peptide

`feature_alignment_mapping` (data.table) contains experiment feature ids mapped to corresponding reference feature id per analyte. This is an output of [getRefExpFeatureMap](#).

`tAligned` (list) the first element corresponds to the aligned reference time, the second element is the aligned experiment time.

`ref` (string) name of the reference run. Must be in the rownames of `fileInfo`.

`exp` (string) name of the run to be aligned to reference run. Must be in the rownames of `fileInfo`.

`analyte_chr` (string) name of highest quality precursor/transition\_group\_id

**Value**

invisible NULL

**Author(s)**

Justin Sing, <justinc.sing@mail.utoronto.ca>  
 ORCID: 0000-0003-0386-0092  
 License: (c) Author (2020) + GPL-3 Date: 2022-11-07

**See Also**

[getRefExpFeatureMap](#), [alignToRef](#)

**Examples**

```
data(multipeptide_DIAAlignR, package="DIAAlignR")
data(XIC_QFNNTDIVLLEDFQK_3_DIAAlignR, package="DIAAlignR")
params <- paramsDIAAlignR()
df <- multipeptide_DIAAlignR[["14383"]]
df$alignment_rank[2] <- 1L
XICs.ref <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[["hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt"]][["4618"]]
XICs.exp <- XIC_QFNNTDIVLLEDFQK_3_DIAAlignR[["hroest_K120809_Strep10%PlasmaBiolRep12_R04_SW_filt"]][["4618"]]
## Not run:
# Use getAlignedTimes() to get tAligned.
```



```

alignObj <- testAlignObj()
tAligned <- alignedTimes2(alignObj, XICs.ref, XICs.eXp)
setAlignmentRank(df, refIdx = 3L, eXp = "run2", tAligned, XICs.eXp, params, adaptiveRT = 38.66)
# Use getRefExpFeatureMap() to get a list of feature_alignment_mapping tables
feature_alignment_mapping <- data.table::as.data.table(structure(list(
  reference_feature_id = structure(c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0), class = "integer64"),
  experiment_feature_id = structure(c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0), class = "integer64")),
  row.names = c(NA, -15L), class = c("data.table", "data.frame"), sorted = "reference_feature_id"))
populateReferenceExperimentFeatureAlignmentMap(df, feature_alignment_mapping, tAligned, ref = "run0", eXp = "run2")

## End(Not run)

```

---

progAlignRuns

*Peptide quantification through progressive alignment*


---

## Description

This function expects osw and xics directories at dataPath. It first reads osw files and fetches chromatogram indices for each analyte. To perform alignment, first a crude guide-tree is built which can also be provided with newickTree parameter. As we traverse from the leaf-nodes to the root node, runs are aligned pairwise. The root node is named master1 that has average of all fragment ion chromatograms and identified peak-groups. These features are propagated back to leaf nodes and finally aligned features are written in the output file.

## Usage

```

progAlignRuns(
  dataPath,
  params,
  outFile = "DIAalignR",
  ropenms = NULL,
  oswMerged = TRUE,
  scoreFile = NULL,
  runs = NULL,
  peps = NULL,
  newickTree = NULL,
  applyFun = lapply
)

```

## Arguments

|           |  |
|-----------|--|
| dataPath  | (string) path to xics and osw directory.   |
| params    | (list) parameters are entered as list. Output of the <a href="#">paramsDIAalignR</a> function.                     |
| outFile   | (string) name of the output file.  |
| ropenms   | (pyopenms module) get this python module through <a href="#">get_ropenms</a> . Required only for chrom.mzML files. |
| oswMerged | (logical) TRUE if merged file from pyprophet is used.  |

scoreFile (string) path to the peptide score file, needed when oswMerged is FALSE.  
 runs (string) names of xics file without extension.  
 peps (integer) ids of peptides to be aligned. If NULL, align all peptides.  
 newickTree (string) guidance tree in newick format. Look up [getTree](#).  
 applyFun (function) value must be either lapply or BiocParallel::bplapply.

**Value**

(None)

**Author(s)**

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-07-10

**See Also**

[alignTargetedRuns](#)

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
params <- paramsDIAAlignR()
params[["context"]] <- "experiment-wide"
## Not run:
ropenms <- get_ropenms(condaEnv = "envName")
progAlignRuns(dataPath, params = params, outFile = "test3", ropenms = ropenms)
# Removing aligned vectors
file.remove(list.files(dataPath, pattern = "*_av.rds", full.names = TRUE))
# Removing temporarily created master chromatograms
file.remove(list.files(file.path(dataPath, "xics"), pattern = "^master[A-Za-z0-9]+\\.chrom\\.\\.sqMass$", full.names = TRUE))
file.remove(file.path(dataPath, "test3.temp.RData"))
file.remove(file.path(dataPath, "master.merged.osw"))

## End(Not run)
```

---

progComb3

*Step 3 for progressive alignment*

---

**Description**

Step 3 for progressive alignment

**Usage**

```
progComb3(  
  dataPath,  
  params,  
  outFile = "DIAAlignR",  
  oswMerged = TRUE,  
  applyFun = lapply  
)
```

**Arguments**

|           |  |
|-----------|--|
| dataPath  | (string) path to xics and osw directory.   |
| params    | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function. |
| outFile   | (string) name of the output file.  |
| oswMerged | (logical) TRUE if merged file from pyprophet is used.  |
| applyFun  | (function) value must be either lapply or BiocParallel::bplapply.                              |

**Author(s)**

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License: (c) Author (2021) + GPL-3 Date: 2021-03-03

**See Also**

[progAlignRuns](#)

---

progSplit2

*Step 2 for progressive alignment*

---

**Description**

Step 2 for progressive alignment

**Usage**

```
progSplit2(  
  dataPath,  
  params,  
  outFile = "DIAAlignR",  
  oswMerged = TRUE,  
  applyFun = lapply  
)
```

**Arguments**

|           |  |
|-----------|--|
| dataPath  | (string) path to xics and osw directory.   |
| params    | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function. |
| outFile   | (string) name of the output file.  |
| oswMerged | (logical) TRUE if merged file from pyprophet is used.  |
| applyFun  | (function) value must be either lapply or BiocParallel::bplapply.                              |

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2021) + GPL-3 Date: 2021-03-03

**See Also**

[progAlignRuns](#)

---

progSplit4

*Step 4 for progressive alignment*

---

**Description**

Step 4 for progressive alignment

**Usage**

```
progSplit4(  
  dataPath,  
  params,  
  outFile = "DIAAlignR",  
  oswMerged = TRUE,  
  applyFun = lapply  
)
```

**Arguments**

|           |  |
|-----------|--|
| dataPath  | (string) path to xics and osw directory.   |
| params    | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function. |
| outFile   | (string) name of the output file.  |
| oswMerged | (logical) TRUE if merged file from pyprophet is used.  |
| applyFun  | (function) value must be either lapply or BiocParallel::bplapply.                              |

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2021) + GPL-3 Date: 2021-03-03

**See Also**

[progAlignRuns](#)

---

progTree1

*Step 1 for progressive alignment*

---

**Description**

Step 1 for progressive alignment

**Usage**

```
progTree1(  
  dataPath,  
  outFile = "DIAAlignR",  
  params = paramsDIAAlignR(),  
  groups = NULL,  
  oswMerged = TRUE,  
  scoreFile = NULL,  
  peps = NULL,  
  runs = NULL,  
  newickTree = NULL,  
  applyFun = lapply  
)
```

**Arguments**

|            |  |
|------------|--|
| dataPath   | (string) path to xics and osw directory.   |
| outFile    | (string) name of the output file.  |
| params     | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function.                 |
| groups     | (data-frame) contains the run names and their categories/batch id to keep them on the same branch of the tree. |
| oswMerged  | (logical) TRUE if merged file from pyprophet is used.  |
| scoreFile  | (string) path to the peptide score file, needed when oswMerged is FALSE.                                       |
| peps       | (integer) ids of peptides to be aligned. If NULL, align all peptides.  |
| runs       | (string) names of xics file without extension.   |
| newickTree | (string) guidance tree in newick format. Look up <a href="#">getTree</a> .                                     |
| applyFun   | (function) value must be either lapply or BiocParallel::bplapply.  |

**Author(s)**

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License: (c) Author (2021) + GPL-3 Date: 2021-03-03

**See Also**

[progAlignRuns](#)

---

readMzMLHeader

*Get chromatogram header from a mzML file*

---

**Description**

Get a table of chromatogram indices and respective transition IDs.

**Usage**

```
readMzMLHeader(mzmlName)
```

**Arguments**

mzmlName (char) path to xics file.

**Value**

(A data-frame) It has 10 columns. The two important columns are:

chromatogramId (integer) Fragment-ion ID that matches with transition ID in osw file.

chromatogramIndex

(integer) Index of chromatogram in mzML file.

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2019) + GPL-3 Date: 2019-12-13

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
mzmlName <- paste0(dataPath, "/xics/hroest_K120809_Strep0%PlasmaBiolRepl2_R04_SW_filt.chrom.mzML")
## Not run:
chromHead <- readChromatogramHeader(mzmlName = mzmlName)

## End(Not run)
```

---

|                  |   |
|------------------|---|
| readSqMassHeader | <i>Get chromatogram header from a sqMass file</i> |
|------------------|---|

---

**Description**

Get a table of chromatogram indices and respective transition IDs.

**Usage**

```
readSqMassHeader(con)
```

**Arguments**

mzmlName (char) path to xics file.

**Value**

(A data-frame) It has 10 columns. The two important columns are:

chromatogramId (integer) Fragment-ion ID that matches with transition ID in osw file.

chromatogramIndex  
(integer) Index of chromatogram in mzML file.

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-12-25

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")
sqName <- paste0(dataPath, "/xics/hroest_K120809_Strep0%PlasmaBio1Rep12_R04_SW_filt.chrom.sqMass")
## Not run:
chromHead <- readChromatogramHeader(sqName)

## End(Not run)
```

---

recalculateIntensity *Calculates area of peaks in peakTable*

---

### Description

For the give peak boundary in peakTable, the function extracts raw chromatograms and recalculate intensities.

### Usage

```
recalculateIntensity(  
  peakTable,  
  dataPath = ".",  
  oswMerged = TRUE,  
  params = paramsDIAAlignR()  
)
```

### Arguments

|           |   |
|-----------|---|
| peakTable | (data-table) usually an output of alignTargetedRuns. Must have these columns: precursor, run, intensity, leftWidth, rightWidth. |
| dataPath  | (string) path to xics and osw directory.  |
| oswMerged | (logical) TRUE if merged file from pyprophet is used.   |
| params    | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function.                                  |

### Value

(data-table)

### Author(s)

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>  
ORCID: 0000-0003-3500-8152  
License: (c) Author (2020) + GPL-3 Date: 2020-05-28

### See Also

[alignTargetedRuns](#), [calculateIntensity](#)

### Examples

```
library(data.table)  
peakTable <- data.table(precursor = c(1967L, 1967L, 2474L, 2474L),  
  run = rep(c("hroest_K120808_Strep10%PlasmaBiolRep11_R03_SW_filt",  
    "hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt"), 2),  
  intensity = c(186.166, 579.832, 47.9525, 3.7413),  
  leftWidth = c(5001.76, 5025.66, 6441.51, 6516.6),
```



```
        rightWidth = c(5076.86, 5121.25, 6475.65, 6554.2))
dataPath <- system.file("extdata", package = "DIAAlignR")
params <- paramsDIAAlignR()
params$smoothPeakArea <- TRUE
recalculateIntensity(peakTable, dataPath, params = params)
peakTable <- data.table(precursor = c(1967L, 1967L, 2474L, 2474L),
  run = rep(c("hroest_K120808_Strep10%PlasmaBiolRep11_R03_SW_filt",
    "hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt"), 2),
  intensity = list(NA, NA, NA, NA),
  leftWidth = c(5001.76, 5025.66, 6441.51, 6516.6),
  rightWidth = c(5076.86, 5121.25, 6475.65, 6554.2))
params$transitionIntensity <- TRUE
recalculateIntensity(peakTable, dataPath, params = params)
```

---

reduceXICs

*Subset an XIC file*

---

## Description

Create a sqMass file that has chromatograms for given native IDs.

## Usage

```
reduceXICs(nativeIDs, xicFileIn, xicFileOut)
```

## Arguments

nativeIDs (integer) transition IDs to be kept.  
xicFileIn (character) name to the current file.  
xicFileOut (character) name of the new file.

## Value

(None)

## Author(s)

Shubham Gupta, <shubh.gupta@mail.utoronto.ca>

ORCID: 0000-0003-3500-8152

License: (c) Author (2022) + GPL-3 Date: 2022-04-19

## See Also

[createSqMass](#), [getNativeIDs](#)

## Examples

```
dataPath <- system.file("extdata", package = "DIAAlignR")
oswIn <- file.path(dataPath, "osw", "merged.osw")
params <- paramsDIAAlignR()
params[["context"]] <- "experiment-wide"
ids <- getNativeIDs(oswIn, 1338L, params)
xicFileIn <- file.path(dataPath, "xics", "hroest_K120809_Strep0%PlasmaBiolRepl2_R04_SW_filt.chrom.sqMass")
reduceXICs(ids, xicFileIn, xicFileOut = "temp.chrom.sqMass")
file.remove("temp.chrom.sqMass")
```

---

script1

*Extract features and generate pairwise alignments.*

---

## Description

Extract features and generate pairwise alignments.

## Usage

```
script1(
  dataPath,
  outFile = "DIAAlignR",
  params = paramsDIAAlignR(),
  oswMerged = TRUE,
  runs = NULL,
  applyFun = lapply
)
```

## Arguments

|           |  |
|-----------|--|
| dataPath  | (string) path to xics and osw directory.   |
| outFile   | (string) name of the output file.  |
| params    | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function. |
| oswMerged | (logical) TRUE if merged file from pyprophet is used.  |
| runs      | (string) names of xics file without extension.   |
| applyFun  | (function) value must be either lapply or BiocParallel::bplapply.                              |

## Author(s)

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License: (c) Author (2021) + GPL-3 Date: 2021-02-20

## See Also

[alignTargetedRuns](#)

## Examples

```
params <- paramsDIAAlignR()
params[["context"]] <- "experiment-wide"
dataPath <- system.file("extdata", package = "DIAAlignR")
BiocParallel::register(BiocParallel::MulticoreParam(workers = 4, progressbar = TRUE))
script1(dataPath, outFile = "testDIAAlignR", params = params, applyFun = BiocParallel::bplapply)
file.remove(file.path(dataPath, "testDIAAlignR_script1.RData"))
```

---

script2

*Performs alignment using script1 output*

---

## Description

Performs alignment using script1 output

## Usage

```
script2(
  dataPath,
  outFile = "DIAAlignR",
  params = paramsDIAAlignR(),
  oswMerged = TRUE,
  scoreFile = NULL,
  peps = NULL,
  refRun = NULL,
  applyFun = lapply
)
```

## Arguments

|           |   |
|-----------|---|
| dataPath  | (string) path to xics and osw directory.  |
| outFile   | (string) name of the output file.   |
| params    | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function.    |
| oswMerged | (logical) TRUE if merged file from pyprophet is used.   |
| scoreFile | (string) path to the peptide score file, needed when oswMerged is FALSE.                          |
| peps      | (integer) ids of peptides to be aligned. If NULL, align all peptides.                             |
| refRun    | (string) reference for alignment. If no run is provided, m-score is used to select reference run. |
| applyFun  | (function) value must be either lapply or BiocParallel::bplapply.                                 |

## Author(s)

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License: (c) Author (2021) + GPL-3 Date: 2021-02-20

**See Also**

[alignTargetedRuns](#)

**Examples**

```
params <- paramsDIAAlignR()
params[["context"]] <- "experiment-wide"
dataPath <- system.file("extdata", package = "DIAAlignR")
BiocParallel::register(BiocParallel::MulticoreParam(workers = 4, progressbar = TRUE))
script1(dataPath, outFile = "testDIAAlignR", params = params, applyFun = BiocParallel::bplapply)
script2(dataPath, outFile = "testDIAAlignR", params = params, applyFun = lapply)
file.remove(file.path(dataPath, "testDIAAlignR_script1.RData"))
```

---

|                  |  |
|------------------|--|
| setAlignmentRank | <i>Set Alignment rank to the aligned feature</i> |
|------------------|--|

---

**Description**

Picks the top feature in run by comparing m-score to unaligned FDR and aligned FDR. If no satisfactory feature is found, peak-integration is carried out by mapping left and right peak boundaries from the reference feature and integrating area under the curve.

**Usage**

```
setAlignmentRank(df, refIdx, eXp, tAligned, XICs, params, adaptiveRT)
```

**Arguments**

|            |   |
|------------|---|
| df         | (dataframe) a collection of features related to the peptide   |
| refIdx     | (integer) index of the reference feature in df.   |
| eXp        | (string) name of the run to be aligned to reference run. Must be in the rownames of fileInfo.   |
| tAligned   | (list) the first element corresponds to the aligned reference time, the second element is the aligned experiment time.                                  |
| XICs       | (list of dataframes) fragment-ion chromatograms of the analytes for all runs.   |
| params     | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function.  |
| adaptiveRT | (numeric) defines the window around the aligned retention time, within which features with m-score below aligned FDR are considered for quantification. |
| XICs.eXp   | (list) list of extracted ion chromatograms from experiment run.   |

**Value**

invisible NULL

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License: (c) Author (2020) + GPL-3 Date: 2020-04-13

**See Also**

[getMultipeptide](#), [calculateIntensity](#), [alignToRef](#)

**Examples**

```
data(multipeptide_DIAalignR, package="DIAalignR")
data(XIC_QFNNTDIVLLEDFQK_3_DIAalignR, package="DIAalignR")
params <- paramsDIAalignR()
df <- multipeptide_DIAalignR[["14383"]]
df$alignment_rank[2] <- 1L
XICs.ref <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt"]][["4618"]]
XICs.exp <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120809_Strep10%PlasmaBiolRep12_R04_SW_filt"]][["4618"]]
## Not run:
# Use getAlignedTimes() to get tAligned.
alignObj <- testAlignObj()
tAligned <- alignedTimes2(alignObj, XICs.ref, XICs.exp)
setAlignmentRank(df, refIdx = 3L, exp = "run2", tAligned, XICs.exp,
params, adaptiveRT = 38.66)

## End(Not run)
```

---

sgolayCpp

*Smooth chromatogram with savitzky-golay filter.*

---

**Description**

Smooth chromatogram with savitzky-golay filter.

**Usage**

```
sgolayCpp(chrom, kernellLen, polyOrd)
```

**Arguments**

|            |  |
|------------|--|
| chrom      | (matrix) chromatogram containing time and intensity vectors.                     |
| kernellLen | (integer) length of filter. Must be an odd number.                               |
| polyOrd    | (integer) TRUE: remove background from peak signal using estimated noise levels. |

**Value**

(matrix).

**Author(s)**

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**Examples**

```
data("XIC_QFNNTDIVLLEDFQK_3_DIAalignR", package = "DIAalignR")
XICs <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt"]][["4618"]]
xic <- sgolayCpp(as.matrix(XICs[[1]]), kernelLen = 11L, polyOrd = 4L)
```

---

sgolayFill

*Fill missing values using Savitzky–Golay*

---

**Description**

Fill missing values using Savitzky–Golay

**Usage**

```
sgolayFill(chrom, polyOrd, kernelLen)
```

**Arguments**

|           |  |
|-----------|--|
| chrom     | (data-frame) first column is time (must be equidistant), second column is intensity. |
| polyOrd   | (integer) must be less than kernelLen.   |
| kernelLen | (integer) must be an odd integer.  |

**Value**

(dataframe) has two columns:

|           |           |
|-----------|-----------|
| time      | (numeric) |
| intensity | (numeric) |

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License: (c) Author (2020) + GPL-3 Date: 2020-05-21

**See Also**

[polyfit](#), [sgolayfilt](#)

**Examples**

```

time <- seq(from = 3003.4, to = 3048, by = 3.4)
y <- c(0.2050595, 0.8850070, 2.2068768, 3.7212677, 5.1652605, 5.8288915, 5.5446804,
      4.5671360, 3.3213154, 1.9485889, 0.9520709, 0.3294218, 0.2009581, 0.1420923)
chrom <- data.frame(time, y)
chrom$y[c(1,8)] <- NA
## Not run:
sgolayFill(chrom, polyOrd = 3, kernelLen = 9)

## End(Not run)

```

---

smoothSingleXIC

*Smooth chromatogram signal*


---

**Description**

Smoothing methods are Savitzky-Golay, Boxcar, Gaussian kernel and LOESS. Savitzky-Golay smoothing is good at preserving peak-shape compared to gaussian and boxcar smoothing. However, it assumes equidistant points that fortunately is the case for DIA data. This requires a quadratic memory to store the fit and slower than other smoothing methods.

**Usage**

```

smoothSingleXIC(
  chromatogram,
  type,
  samplingTime = NULL,
  kernelLen = NULL,
  polyOrd = NULL
)

```

**Arguments**

|              |   |
|--------------|---|
| chromatogram | (dataframe) A dataframe of two columns. First column must always be monotonically increasing. |
| type         | (char) must be either sgolay, boxcar, gaussian, loess or none.                                |
| samplingTime | (numeric) Time difference between neighboring points.   |
| kernelLen    | (integer) Number of data-points to consider in the kernel.                                    |
| polyOrd      | (integer) Order of the polynomial to be fit in the kernel.                                    |

**Details**

Gaussian smoothing uses a gaussian function whose bandwidth is scaled by 0.3706505 to have quartiles at +/- 0.25\*bandwidth. The point selection cut-off is also hard at 0.3706505\*4\*bandwidth. `qnorm(0.75, sd = 0.3706505)`

The definition of C\_ksmooth can be found using `getAnywhere('C_ksmooth') stats:::C_ksmooth`

**Value**

A dataframe with two columns.

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License: (c) Author (2020) + GPL3 Date: 2020-02-21

**See Also**

<https://terpconnect.umd.edu/~toh/spectrum/Smoothing.html>, <https://rafalab.github.io/dsbook/smoothing.html>, <https://github.com/SurajGupta/r-source/blob/master/src/library/stats/src/ksmooth.c>

**Examples**

```
data("XIC_QFNNTDIVLLEDFQK_3_DIAalignR")
chrom <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120808_Strep10%PlasmaBiolRep11_R03_SW_filt"]][["4618"]][[1]]
## Not run:
newChrom <- smoothSingleXIC(chrom, type = "sgolay", samplingTime = 3.42, kernelLen = 9,
  polyOrd = 3)

## End(Not run)
```

---

smoothXICs

*Smooth chromatogram signals from a list*

---

**Description**

Smoothing methods are Savitzky-Golay, Boxcar, Gaussian kernel and LOESS. Savitzky-Golay smoothing is good at preserving peak-shape compared to gaussian and boxcar smoothing. However, it assumes equidistant points that fortunately is the case for DIA data. This requires a quadratic memory to store the fit and slower than other smoothing methods.

**Usage**

```
smoothXICs(
  XICs,
  type = "none",
  samplingTime = NULL,
  kernelLen = 9L,
  polyOrd = NULL
)
```



**Arguments**

|              |   |
|--------------|---|
| XICs         | (A list) A list of dataframe that consists of two columns. First column must be monotonically increasing.                           |
| type         | (char) must be either <code>sgolay</code> , <code>boxcar</code> , <code>gaussian</code> , <code>loess</code> or <code>none</code> . |
| samplingTime | (numeric) Time difference between neighboring points.   |
| kernellLen   | (integer) Number of data-points to consider in the kernel.  |
| polyOrd      | (integer) Order of the polynomial to be fit in the kernel.  |

**Value**

A list.

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License: (c) Author (2020) + GPL3 Date: 2020-02-21

**See Also**

<https://terpconnect.umd.edu/~toh/spectrum/Smoothing.html>, <https://rafalab.github.io/dsbook/smoothing.html>

**Examples**

```
data("XIC_QFNNTDIVLLEDFQK_3_DIAalignR")
XICs <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120808_Strep10%PlasmaBiolRepl1_R03_SW_filt"]][["4618"]]
newXICs <- smoothXICs(XICs, type = "sgolay", samplingTime = 3.42, kernellLen = 9,
  polyOrd = 3)
```

---

splineFill

*Fill missing values using spline*

---

**Description**

Fill missing values using spline

**Usage**

```
splineFill(chrom, method = "fmm")
```

**Arguments**

|        |  |
|--------|--|
| chrom  | (data-frames) first column is time, second column is intensity.        |
| method | (string) must be either <code>"fmm"</code> or <code>"natural"</code> . |

**Value**

(dataframe) has two columns:

|           |           |
|-----------|-----------|
| time      | (numeric) |
| intensity | (numeric) |

**Author(s)**

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**See Also**

[na.spline](#), [spline](#)

**Examples**

```
time <- seq(from = 3003.4, to = 3048, by = 3.4)
y <- c(0.2050595, 0.8850070, 2.2068768, 3.7212677, 5.1652605, 5.8288915, 5.5446804,
      4.5671360, 3.3213154, 1.9485889, 0.9520709, 0.3294218, 0.2009581, 0.1420923)
chrom <- data.frame(time, y)
chrom$y[c(1,8)] <- NA
## Not run:
splineFill(chrom)

## End(Not run)
```

---

splineFillCpp

*Interpolate using spline*

---

**Description**

Interpolate using spline

**Usage**

```
splineFillCpp(x, y, xout)
```

**Arguments**

|      |  |
|------|--|
| x    | (numeric) A numeric matrix with similarity values of two sequences or signals. |
| y    | (numeric) Penalty for introducing first gap in alignment.                      |
| xout | (numeric) Penalty for introducing subsequent gaps in alignment.                |

**Value**

(numeric)

**Author(s)**

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**Examples**

```
time <- seq(from = 3003.4, to = 3048, by = 3.4)
y <- c(0.2050595, 0.8850070, 2.2068768, 3.7212677, 5.1652605, 5.8288915, 5.5446804,
      4.5671360, 3.3213154, 1.9485889, 0.9520709, 0.3294218, 0.2009581, 0.1420923)
y[c(1,6)] <- NA_real_
idx <- !is.na(y)
splineFillCpp(time[idx], y[idx], time[!idx])
zoo::na.spline(zoo::zoo(y[idx], time[idx]), xout = time[!idx], method = "natural")
```

---

traverseDown

*Traverses down from the root to leaves*


---

**Description**

Features of the root node are propagated to all leaves node. Aligned features are set/added in the multipeptide environment.

**Usage**

```
traverseDown(
  tree,
  dataPath,
  fileInfo,
  multipeptide,
  prec2chromIndex,
  mzPtrs,
  precursors,
  adaptiveRTs,
  refRuns,
  params,
  applyFun = lapply
)
```

**Arguments**

|              |  |
|--------------|--|
| tree         | (phylo) a phylogenetic tree.   |
| dataPath     | (string) path to xics and osw directory.   |
| fileInfo     | (data-frame) output of <a href="#">getRunNames</a> .   |
| multipeptide | (environment) contains multiple data-frames that are collection of features associated with analytes. This is an output of <a href="#">getMultipeptide</a> . |

|                 |   |
|-----------------|---|
| prec2chromIndex | (list) a list of dataframes having following columns:<br>transition_group_id: it is PRECURSOR.ID from osw file.<br>chromatogramIndex: index of chromatogram in mzML file.                 |
| mzPntrs         | (list) a list of mzRpwis.   |
| precursors      | (data-frame) atleast two columns transition_group_id and transition_ids are required.   |
| adaptiveRTs     | (environment) For each descendant-pair, it contains the window around the aligned retention time, within which features with m-score below aligned FDR are considered for quantification. |
| refRuns         | (environment) For each descendant-pair, the reference run is indicated by 1 or 2 for all the peptides.  |
| params          | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function.  |
| applyFun        | (function) value must be either lapply or BiocParallel::bplapply.   |
| analytes        | (integer) this vector contains transition_group_id from precursors. It must be of the same length as of multipeptide.   |

**Value**

(None)

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-07-01

**See Also**[traverseUp](#), [alignToMaster](#)**Examples**

```

dataPath <- system.file("extdata", package = "DIAAlignR")
params <- paramsDIAAlignR()
fileInfo <- getRunNames(dataPath = dataPath)
mzPntrs <- list2env(getMZMLpointers(fileInfo))
features <- list2env(getFeatures(fileInfo, maxFdrQuery = params[["maxFdrQuery"]], runType = params[["runType"]]))
precursors <- getPrecursors(fileInfo, oswMerged = TRUE, runType = params[["runType"]],
  context = "experiment-wide", maxPeptideFdr = params[["maxPeptideFdr"]])
precursors <- dplyr::arrange(precursors, .data$peptide_id, .data$transition_group_id)
peptideIDs <- unique(precursors$peptide_id)
peptideScores <- getPeptideScores(fileInfo, peptideIDs, oswMerged = TRUE, params[["runType"]], params[["context"]])
peptideScores <- lapply(peptideIDs, function(pep) dplyr::filter(peptideScores, .data$peptide_id == pep))
names(peptideScores) <- as.character(peptideIDs)
prec2chromIndex <- list2env(getChromatogramIndices(fileInfo, precursors, mzPntrs))
multipeptide <- getMultipeptide(precursors, features)
adaptiveRTs <- new.env()

```

```
refRuns <- new.env()
tree <- ape::read.tree(text = "(run1:9,(run2:7,run0:2)master2:5)master1;")
tree <- ape::reorder.phylo(tree, "postorder")
## Not run:
ropenms <- get_ropenms(condaEnv = "envName", useConda=TRUE)
multipeptide <- traverseUp(tree, dataPath, fileInfo, features, mzPntrs, prec2chromIndex, precursors, params,
  adaptiveRTs, refRuns, multipeptide, peptideScores, ropenms)
multipeptide <- getMultipeptide(precursors, features)
multipeptide <- traverseDown(tree, dataPath, fileInfo, multipeptide, prec2chromIndex, mzPntrs, precursors,
  adaptiveRTs, refRuns, params)
# Cleanup
for(run in names(mzPntrs)) DBI::dbDisconnect(mzPntrs[[run]])
file.remove(list.files(dataPath, pattern = "*_av.rds", full.names = TRUE))
file.remove(list.files(file.path(dataPath, "xics"), pattern = "^master[0-9]+\\.chrom\\.sqMass$", full.names = TRUE))

## End(Not run)
```

---

traverseMST

*Reorder MST*

---

## Description

Reorder MST for traversal from a given node.

## Usage

```
traverseMST(net, ref0)
```

## Arguments

**net** (matrix) array of tree-edges.  
**ref0** (character) start node for traversal.

## Value

(matrix) array of tree-edges reordered for traversal.

## Author(s)

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License: (c) Author (2021) + GPL-3 Date: 2021-05-14

## See Also

[mstAlignRuns](#), [getMST](#)

**Examples**

```
net <- cbind("A" = c("run1","run2","run3"), "B" = c("run2","run3","run4"))
## Not run:
traverseMST(net, "run2")

## End(Not run)
```

traverseUp

*Traverses up from leaves to the root***Description**

While traversing from leaf to root node, at each node a master run is created. Merged features and merged chromatograms from parent runs are estimated. Chromatograms are written on the disk at dataPath/xics. For each precursor aligned parent time-vectors and corresponding child time-vector are also calculated and written as \*\_av.rds at dataPath.

Accessors to the new files are added to fileInfo, mzPntrs and prec2chromIndex. Features, reference used for the alignment and adaptiveRTs of global alignments are also added to corresponding environment.

**Usage**

```
traverseUp(
  tree,
  dataPath,
  fileInfo,
  features,
  mzPntrs,
  prec2chromIndex,
  precursors,
  params,
  adaptiveRTs,
  refRuns,
  multipeptide,
  peptideScores,
  ropenms,
  applyFun = lapply
)
```

**Arguments**

|          |  |
|----------|--|
| tree     | (phylo) a phylogenetic tree.   |
| dataPath | (string) path to xics and osw directory.   |
| fileInfo | (data-frame) output of <a href="#">getRunNames</a> .                                 |
| features | (list of data-frames) contains features and their properties identified in each run. |
| mzPntrs  | (list) a list of mzRpwis.  |

|                 |   |
|-----------------|---|
| prec2chromIndex | (list) a list of dataframes having following columns:<br>transition_group_id: it is PRECURSOR.ID from osw file.<br>chromatogramIndex: index of chromatogram in mzML file.                 |
| precursors      | (data-frame) atleast two columns transition_group_id and transition_ids are required.   |
| params          | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function.  |
| adaptiveRTs     | (environment) For each descendant-pair, it contains the window around the aligned retention time, within which features with m-score below aligned FDR are considered for quantification. |
| refRuns         | (environment) For each descendant-pair, the reference run is indicated by 1 or 2 for all the peptides.  |
| multipeptide    | (environment) contains multiple data-frames that are collection of features associated with analytes. This is an output of <a href="#">getMultipeptide</a> .                              |
| peptideScores   | (list of data-frames) each dataframe has scores of a peptide across all runs.   |
| ropenms         | (pyopenms module) get this python module through <a href="#">get_ropenms</a> . Required only for chrom.mzML files.  |
| applyFun        | (function) value must be either lapply or BiocParallel::bplapply.   |

**Value**

(None)

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-07-01

**See Also**[getTree](#), [getNodeRun](#)**Examples**

```

dataPath <- system.file("extdata", package = "DIAAlignR")
params <- paramsDIAAlignR()
fileInfo <- getRunNames(dataPath = dataPath)
mzPntrs <- list2env(getMZMLpointers(fileInfo))
features <- list2env(getFeatures(fileInfo, maxFdrQuery = params[["maxFdrQuery"]], runType = params[["runType"]]))
precursors <- getPrecursors(fileInfo, oswMerged = TRUE, runType = params[["runType"]],
  context = "experiment-wide", maxPeptideFdr = params[["maxPeptideFdr"]])
precursors <- dplyr::arrange(precursors, .data$peptide_id, .data$transition_group_id)
peptideIDs <- unique(precursors$peptide_id)
peptideScores <- getPeptideScores(fileInfo, peptideIDs, oswMerged = TRUE, params[["runType"]], params[["context"]])
peptideScores <- lapply(peptideIDs, function(pep) dplyr::filter(peptideScores, .data$peptide_id == pep))
names(peptideScores) <- as.character(peptideIDs)

```

```

peptideScores <- list2env(peptideScores)
multipeptide <- getMultipeptide(precursors, features)
prec2chromIndex <- list2env(getChromatogramIndices(fileInfo, precursors, mzPntrs))
adaptiveRTs <- new.env()
refRuns <- new.env()
tree <- ape::read.tree(text = "(run1:9,(run2:7,run0:2)master2:5)master1;")
tree <- ape::reorder.phylo(tree, "postorder")
## Not run:
ropenms <- get_ropenms(condaEnv = "envName", useConda=TRUE)
multipeptide <- traverseUp(tree, dataPath, fileInfo, features, mzPntrs, prec2chromIndex, precursors, params,
  adaptiveRTs, refRuns, multipeptide, peptideScores, ropenms)
for(run in names(mzPntrs)) DBI::dbDisconnect(mzPntrs[[run]])
# Cleanup
file.remove(list.files(dataPath, pattern = "*_av.rds", full.names = TRUE))
file.remove(list.files(file.path(dataPath, "xics"), pattern = "^master[0-9]+\\.chrom\\.sqMass$", full.names = TRUE))

## End(Not run)

```

---

trfrParentFeature      *Transform features to child time-domain*

---

## Description

This function transforms the peaks' times to child run's time-domain. The feature intensity is calculated with appropriate method stated in `params`. Internal missing values are not allowed in `timeParent`.

## Usage

```
trfrParentFeature(XICs, timeParent, df, i, params)
```

## Arguments

|            |  |
|------------|--|
| XICs       | (list of data-frames) extracted ion chromatograms from the child run.  |
| timeParent | (data-frame) has two columns: <code>tAligned</code> and <code>alignedChildTime</code> . <code>tAligned</code> is time vector from one of the parent run. |
| df         | (data-frame) contains features to be transformed. It has a format of <a href="#">getFeatures</a> output.   |
| params     | (list) parameters are entered as list. Output of the <a href="#">paramsDIAAlignR</a> function.   |

## Value

(data-frame) this has a format of [getFeatures](#) output.

## Author(s)

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License: (c) Author (2020) + GPL-3 Date: 2020-07-17



**See Also**[getChildFeature](#)**Examples**

```
data(masterXICs_DIAalignR, package="DIAalignR")
newXICs <- masterXICs_DIAalignR
timeParent <- newXICs[[2]][, c("tAligned.ref", "alignedChildTime")]
colnames(timeParent) <- c("tAligned", "alignedChildTime")
params <- paramsDIAalignR()
dataPath <- system.file("extdata", package = "DIAalignR")
fileInfo <- DIAalignR::getRunNames(dataPath = dataPath)
features <- getFeatures(fileInfo, maxFdrQuery = 1.00, runType = "DIA_Proteomics")
df <- features$run1[features$run1$transition_group_id == 4618L, ]
## Not run:
trfrParentFeature(newXICs[[1]], timeParent, df, params)

## End(Not run)
```

---

trimXICs

*Selects a part of chromatograms*

---

**Description**

This function trims chromatograms from the end-points.

**Usage**

```
trimXICs(XICs, len = 1)
```

**Arguments**

|      |   |
|------|---|
| XICs | (A list) A list of dataframe that consists of two columns. First column must be monotonically increasing. |
| len  | (numeric) must be between 0.1 and 1.  |

**Value**

A list.

**Author(s)**

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License: (c) Author (2020) + GPL3 Date: 2020-04-01

**Examples**

```

data("XIC_QFNNTDIVLLEDFQK_3_DIAalignR")
XICs <- XIC_QFNNTDIVLLEDFQK_3_DIAalignR[["hroest_K120808_Strep10%PlasmaBiolRepl1_R03_SW_filt"]][["4618"]]
## Not run:
newXICs <- smoothXICs(XICs, len = 0.5)

## End(Not run)

```

---

uncompressVec

*Uncompress a Blob object*


---

**Description**

compression is one of 0 = no, 1 = zlib, 2 = np-linear, 3 = np-slof, 4 = np-pic, 5 = np-linear + zlib, 6 = np-slof + zlib, 7 = np-pic + zlib

**Usage**

```
uncompressVec(x, type)
```

**Arguments**

x (Blob object)  
type (integer) must either be 5L or 6L to indicate linear and short logged float compression, respectively.

**Value**

A numeric vector. Uncompressed form of the Blob.

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-12-13

**Examples**

```

dataPath <- system.file("extdata", package = "DIAalignR")
sqName <- paste0(dataPath, "/xics/hroest_K120809_Strep10%PlasmaBiolRepl2_R04_SW_filt.chrom.sqMass")
con <- DBI::dbConnect(RSQLite::SQLite(), dbname = sqName)
df1 <- DBI::dbGetQuery(con, "SELECT CHROMATOGRAM_ID, COMPRESSION, DATA_TYPE, DATA FROM DATA WHERE CHROMATOGRAM_ID")
DBI::dbDisconnect(con)
## Not run:
time = uncompressVec(df1[["DATA"]][[1]], df1$COMPRESSION[[1]])
intensity = uncompressVec(df1[["DATA"]][[2]], df1$COMPRESSION[[2]])

## End(Not run)

```

---

|                |  |
|----------------|--|
| updateFileInfo | <i>Get intersection of runs and fileInfo</i> |
|----------------|--|

---

**Description**

Get intersection of runs and fileInfo

**Usage**

```
updateFileInfo(fileInfo, runs = NULL)
```

**Arguments**

fileInfo (data-frame) output of getRunNames function.  
runs (vector of string) names of mzML files without extension.

**Value**

(dataframe) it has five columns:

spectraFile (string) as mentioned in RUN table of osw files.  
runName (string) contain respective mzML names without extension.  
spectraFileID (string) ID in RUN table of osw files.  
featureFile (string) path to the feature file.  
chromatogramFile (string) path to the chromatogram file.

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-04-15

**Examples**

```
dataPath <- system.file("extdata", package = "DIAAlignR")  
fileInfo <- getRunNames(dataPath = dataPath, oswMerged = TRUE)  
runs <- c("hroest_K120809_Strep0%PlasmaBiolRep12_R04_SW_filt",  
         "hroest_K120808_Strep10%PlasmaBiolRep11_R03_SW_filt")  
updateFileInfo(fileInfo, runs)
```

---

`updateOnalignTargetedRuns`*Prints messages if a certain number of analytes are aligned*

---

**Description**

Prints messages if a certain number of analytes are aligned

**Usage**

```
updateOnalignTargetedRuns(i)
```

**Value**

Invisible NULL

**Author(s)**

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ORCID: 0000-0003-3500-8152

License: (c) Author (2020) + GPL-3 Date: 2020-07-26

---

`writeOutFeatureAlignmentMap`*Write out alignment map to disk*

---

**Description**

Save alignment mapping to disk, either append table to OSW file, or save TSV file(s)

**Usage**

```
writeOutFeatureAlignmentMap(multiFeatureAlignmentMap, oswMerged, fileInfo)
```

**Arguments**

`multiFeatureAlignmentMap`

(list) contains multiple data-frames that are collection of experiment feature ids mapped to corresponding reference feature id per analyte. This is an output of [getRefExpFeatureMap](#).

`oswMerged`

(logical) TRUE if merged file from pyprophet is used.

`fileInfo`

(data-frame) Output of `DIAAlignR::getRunNames` function

**Value**

Saves the alignment feature id mapping table.

The mapping table will have the following columns:

**ALIGNMENT\_GROUP\_ID:** (int) An integer number that identifies the group of experiments that are aligned per best representative precursor (peptide).

**REFERENCE:** (logical int) A logical integer, 1 indicates the feature used as the reference, 0 indicates the experiment feature being aligned to reference.

**FEATURE\_ID:** (int64) Feature id derived from OpenSwathWorkflow's peak-group picking annotation, in OSW file.

Writing to disk will be one of two possible outcomes:

1. If fileInfo contains a merged OSW, then the alignment map table will be written to the sqlite database as **ALIGNMENT\_GROUP\_FEATURE\_MAPPING**.

or

2. If fileInfo does not contain a merged OSW, then the alignment map table will be written to a TSV file.

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License: (c) Author (2020) + GPL-3 Date: 2022-11-07

**See Also**

[getRefExpFeatureMap](#), [getRunNames](#)

**Examples**

```
data(oswFiles_DIAAlignR, , package="DIAAlignR")
## Not run:
writeOutFeatureAlignmentMap(multiFeatureAlignmentMap, oswMerged, fileInfo)

## End(Not run)
```

---

writeTables

*Writes the output table post-alignment*

---

**Description**

Selects all features from multipeptide with alignment rank = 1, and write them onto the disk.

**Usage**

```
writeTables(fileInfo, multipeptide, precursors)
```

**Arguments**

|              |   |
|--------------|---|
| fileInfo     | (data-frame) Output of getRunNames function.  |
| multipeptide | (list of data-frames) Each element of the list is collection of features associated with a precursor. |
| precursors   | (data-frame) for each transition_group_id, contains peptide sequence and charge.                      |
| filename     | (string) Name of the output file.   |

**Value**

An output table with following columns: precursor, run, intensity, RT, leftWidth, rightWidth, peak\_group\_rank, m\_score, alignment\_rank, peptide\_id, sequence, charge, group\_label.

**Author(s)**

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License: (c) Author (2020) + GPL-3 Date: 2020-04-14

**See Also**

[getRunNames](#), [getMultipeptide](#), [getPrecursors](#)

**Examples**

```
data(oswFiles_DIAalignR, package="DIAalignR")
## Not run:
writeTables(fileInfo, multipeptide, precursors)

## End(Not run)
```

---

XIC\_QFNNTDIVLLEDFQK\_3\_DIAalignR

*Extracted-ion chromatograms (XICs) of a peptide*

---

**Description**

XICs of peptide QFNNTDIVLLEDFQK/3 (precursor ID: 4618) from three SWATH runs:

run0 : hroest\_K120808\_Strep10%PlasmaBiolRepl1\_R03\_SW\_filt.chrom.mzML

run1 : hroest\_K120809\_Strep0%PlasmaBiolRepl2\_R04\_SW\_filt.chrom.mzML

run2 : hroest\_K120809\_Strep10%PlasmaBiolRepl2\_R04\_SW\_filt.chrom.mzML

**Usage**

```
XIC_QFNNTDIVLLEDFQK_3_DIAalignR
```

**Format**

A list of three elements where each element consists of a list of six data frames. Each data frame has two columns:

**time** Retention time of ananlyte in the run, in sec

**intensity** Intensity of signal for the transition

**Source**

Raw files are downloaded from [Peptide Atlas](#). File test\_GenerateData.R has [source code](#) to generate the example data.

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