

# Package ‘consensusOV’

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**Type** Package

**Title** Gene expression-based subtype classification for high-grade serous ovarian cancer

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**Description** This package implements four major subtype classifiers for high-grade serous (HGS) ovarian cancer as described by Helland et al. (PLoS One, 2011), Bentink et al. (PLoS One, 2012), Verhaak et al. (J Clin Invest, 2013), and Konecny et al. (J Natl Cancer Inst, 2014). In addition, the package implements a consensus classifier, which consolidates and improves on the robustness of the proposed subtype classifiers, thereby providing reliable stratification of patients with HGS ovarian tumors of clearly defined subtype.

**License** Artistic-2.0

**Depends** R (>= 3.6)

**Imports** Biobase, GSVA (>= 1.50.0), gdata, genefu, limma, matrixStats, randomForest, stats, utils, methods, BiocParallel

**URL** <http://www.pmgenomics.ca/bhklab/software/consensusOV>

**Suggests** BiocStyle, ggplot2, knitr, rmarkdown, magick

**VignetteBuilder** knitr

**Encoding** UTF-8

**RoxygenNote** 7.3.1

**LazyData** true

**biocViews** Classification, Clustering, DifferentialExpression, GeneExpression, Microarray, Transcriptomics

**BugReports** <https://github.com/bhklab/consensusOV/issues>

**git\_url** <https://git.bioconductor.org/packages/consensusOV>

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dataset.merging	<i>Merging all individual esets and merging them into a big eset</i>
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## Description

Merging all individual esets and merging them into a big eset

## Usage

```
dataset.merging(  
  esets,  
  method = c("union", "intersect"),  
  standardization = c("quantile", "robust.scaling", "scaling", "none"),  
  nthread = 1  
)
```

**Arguments**

esets	The list containing all GSE file that need to be merged.
method	either "unique" or "intersect" is use to for selecting geneid
standardization	choose between "quantile", "robust.scaling", "scaling" or "none"
nthread	number of threads (1 by default)

**Value**

The merging eset

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get.bentink.subtypes *Get ovarian cancer subtypes as defined by Bentink et al., 2012*

---

**Description**

Get ovarian cancer subtypes as defined by Bentink et al., 2012

**Usage**

```
get.bentink.subtypes(expression.matrix, entrez.ids)
```

**Arguments**

expression.matrix	A matrix of gene expression values with rows as genes, columns as samples.
entrez.ids	A vector of Entrez Gene IDs, corresponding to the rows of expression.matrix

**Value**

A list with first value Bentink.subtypes containing a factor of subtype names; and second value angio containing the ouput of genefu::ovcAngiogenic

**References**

Bentink et al. *Angiogenic mRNA and microRNA gene expression signature predicts a novel subtype of serous ovarian cancer*. PloS one (2012).

**Examples**

```
library(Biobase)
library(genefu)
data(GSE14764.eset)
expression.matrix <- exprs(GSE14764.eset)
entrez.ids <- as.character(fData(GSE14764.eset)$EntrezGene.ID)
get.bentink.subtypes(expression.matrix, entrez.ids)
```

---

```
get.consensus.subtypes
```

*Get consensusOV ovarian cancer subtypes*

---

## Description

Get consensusOV ovarian cancer subtypes

## Usage

```
get.consensus.subtypes(  
  expression.matrix,  
  entrez.ids,  
  concordant.tumors.only = TRUE,  
  remove.using.cutoff = FALSE,  
  percentage.dataset.removed = 0.75,  
  .training.dataset = consensus.training.dataset.full,  
  .dataset.names.to.keep = names(esets.rescaled.classified.filteredgenes)  
)  
  
margin(rf.probs)
```

## Arguments

`expression.matrix`  
A matrix of gene expression values with rows as genes, columns as samples.

`entrez.ids`  
A vector of Entrez Gene IDs, corresponding to the rows of `expression.matrix`

`concordant.tumors.only`  
Logical. Should the classifier trained only on tumors that are concordantly classified by Helland, Konecny, and Verhaak? Defaults to TRUE.

`remove.using.cutoff`  
Specify whether to classify NA for samples that do not meet a margin cutoff

`percentage.dataset.removed`  
If `remove.using.cutoff` is TRUE, then classify this percentage of samples to NA based on margin values

`.training.dataset`  
ExpressionSet containing the training data. Defaults to the pooled dataset across selected MetaGxOvarian datasets.

`.dataset.names.to.keep`  
Names of MetaGxOvarian datasets to use for training

`rf.probs`  
random forest probabilities for each subtype as returned by [get.consensus.subtypes](#)

**Value**

get.consensus.subtypes returns a list with first value consensusOV.subtypes containing a factor of subtype labels; and second value rf.probs containing a matrix of subtype probabilities.

margin returns a numeric vector containing the classification margin scores, i.e. the difference between the top two subtype scores for each tumor.

**Examples**

```
library(Biobase)
data(GSE14764.eset)
expression.matrix <- exprs(GSE14764.eset)
entrez.ids <- as.character(fData(GSE14764.eset)$EntrezGene.ID)
sts <- get.consensus.subtypes(expression.matrix, entrez.ids)
margins <- margin(sts$rf.probs)
```

---

get.hao.subtypes	<i>Get ovarian cancer subtypes as defined by Hao et al., 2017</i>
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---

**Description**

Get ovarian cancer subtypes as defined by Hao et al., 2017

**Usage**

```
get.hao.subtypes(expression.matrix, entrez.ids)
```

**Arguments**

expression.matrix  
A matrix of gene expression values with genes as rows, samples as columns.

entrez.ids  
A vector of Entrez Gene IDs, corresponding to the rows of expression.matrix.

**Details**

Hao et al., 2017 derived a gene signature to predict the tissue of origin of ovarian tumors as either fallopian tube (FT) or ovarian surface epithelium (OSE).

The authors found that expression patterns of tissue-specific genes, prognostic genes, and molecular markers support a dualistic tissue origin of ovarian cancer, from either FT or OSE.

The subtype classifier considers 112 signature genes including 37 genes upregulated in FT and 75 genes upregulated in OSE. A score is computed that is designed to range from 0 to 1 for FT tumors, while OSE tumors have a score ranging from -1 to 0.

**Value**

A list with first value tissue containing a factor of subtype names (tissue of origin); and second value score containing the tissue-of-origin score.

**Author(s)**

Ludwig Geistlinger

**References**

Hao et al. (2017) Integrated analysis reveals tubal- and ovarian-originated serous ovarian cancer and predicts differential therapeutic responses. *Clinical Cancer Research*, 23:7400-11.

**Examples**

```
library(Biobase)
data(GSE14764.eset)
expression.matrix <- exprs(GSE14764.eset)
entrez.ids <- as.character(fData(GSE14764.eset)$EntrezGene.ID)
get.hao.subtypes(expression.matrix, entrez.ids)
```

---

get.helland.subtypes *Get ovarian cancer subtypes as defined by Helland et al., 2011*

---

**Description**

Get ovarian cancer subtypes as defined by Helland et al., 2011

**Usage**

```
get.helland.subtypes(expression.matrix, entrez.ids)
```

**Arguments**

expression.matrix      A matrix of gene expression values with rows as genes, columns as samples.  
entrez.ids              A vector of Entrez Gene IDs, corresponding to the rows of expression.matrix

**Value**

A list with first value Helland.subtypes containing a factor of subtype names; and second value subtype.scores containing a matrix of subtype scores

**References**

Helland et al. *Deregulation of MYCN, LIN28B and LET7 in a molecular subtype of aggressive high-grade serous ovarian cancers*. *PloS one* (2011).

**Examples**

```
library(Biobase)
data(GSE14764.eset)
expression.matrix <- exprs(GSE14764.eset)
entrez.ids <- as.character(fData(GSE14764.eset)$EntrezGene.ID)
get.helland.subtypes(expression.matrix, entrez.ids)
```

---

get.konecny.subtypes    *Get ovarian cancer subtypes as defined by Konecny et al., 2014*

---

### Description

Get ovarian cancer subtypes as defined by Konecny et al., 2014

### Usage

```
get.konecny.subtypes(expression.matrix, entrez.ids)
```

### Arguments

`expression.matrix`    A matrix of gene expression values with rows as genes, columns as samples.  
`entrez.ids`    A vector of Entrez Gene IDs, corresponding to the rows of `expression.matrix`

### Value

A list with first value `Konecny.subtypes` containing a factor of subtype names; and second value `spearman.cc.vals` containing the Spearman correlation values per subtype

### References

Konecny et al. *Prognostic and therapeutic relevance of molecular subtypes in high-grade serous ovarian cancer*. Journal of the National Cancer Institute (2014).

### Examples

```
library(Biobase)
data(GSE14764.eset)
expression.matrix <- exprs(GSE14764.eset)
entrez.ids <- as.character(fData(GSE14764.eset)$EntrezGene.ID)
get.konecny.subtypes(expression.matrix, entrez.ids)
```

---

get.subtypes    *Get ovarian cancer subtypes*

---

### Description

Get ovarian cancer subtypes

**Usage**

```
get.subtypes(
  expression.dataset,
  entrez.ids = NULL,
  method = c("consensusOV", "Helland", "Verhaak", "Konecny", "Bentink"),
  ...
)
```

**Arguments**

expression.dataset	Either a matrix of gene expression values with rows as genes, columns as samples; or a BioBase::ExpressionSet object from MetaGxOvarian. If expression.dataset is a matrix, then entrez.ids must have length equal to the number of rows of expression.dataset.
entrez.ids	A vector of Entrez Gene IDs, corresponding to the rows of expression.dataset
method	The subtyping method to use
...	Optional parameters to be passed to the low level function

**Value**

A list with first value Konecny.subtypes containing a factor of subtype names; and second value spearman.cc.vals containing the Spearman correlation values per subtype

**Examples**

```
library(Biobase)
data(GSE14764.eset)
expression.matrix <- exprs(GSE14764.eset)
entrez.ids <- as.character(fData(GSE14764.eset)$EntrezGene.ID)
get.subtypes(expression.matrix, entrez.ids, method="Konecny")
```

---

get.verhaak.subtypes *Get ovarian cancer subtypes as defined by Verhaak et al., 2013*

---

**Description**

Get ovarian cancer subtypes as defined by Verhaak et al., 2013

**Usage**

```
get.verhaak.subtypes(expression.matrix, entrez.ids)
```



**Arguments**

`expression.matrix` A matrix of gene expression values with rows as genes, columns as samples.  
`entrez.ids` A vector of Entrez Gene IDs, corresponding to the rows of `expression.matrix`

**Value**

A list with first value `Verhaak.subtypes` containing a factor of subtype names; and second value `gsva` containing the GSVAs subtype scores

**References**

Verhaak et al. *Prognostically relevant gene signatures of high-grade serous ovarian carcinoma*. The Journal of Clinical Investigation (2013)

**Examples**

```
library(Biobase)
data(GSE14764.eset)
expression.matrix <- exprs(GSE14764.eset)
entrez.ids <- as.character(fData(GSE14764.eset)$EntrezGene.ID)
get.konecny.subtypes(expression.matrix, entrez.ids)
```

---

GSE14764.eset	<i>Sample ExpressionSet from MetaGxOvarian</i>
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**Description**

A `Biobase::ExpressionSet` from package `MetaGxOvarian` for the dataset GSE14764

**Usage**

```
GSE14764.eset
```

**Format**

A `Biobase::ExpressionSet` object

**Source**

<http://biorxiv.org/content/biorxiv/early/2016/05/12/052910.full.pdf>

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