

# TDARACNE

March 24, 2012

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CalcMI\_time2      *CalcMI\_time2*

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## Description

Compute the d-delayed Mutual information

## Usage

```
CalcMI_time2(l, t, delta)
```

## Arguments

l	one gene profile
t	another gene profile
delta	maximum delay

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DPI2\_TDAracne      *DPI2\_TDAracne*

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## Description

MAke the second DPI

## Usage

```
DPI2_TDAracne(MItab, tolerance)
```

## Arguments

MItab	MItab is the adjacency matrix before the second DPI
tolerance	tolerance is the DPI tolerance.

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DPI_TDAracne	<i>DPI_TDAracne</i>
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### Description

MAake the first DPI

### Usage

```
DPI_TDAracne(MItab, delta, tolerance)
```

### Arguments

MItab	MItab is the adjacency matrix before DPI
delta	delta is the maximum time delay allowed to infer connections.
tolerance	tolerance is the DPI tolerance.

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IcEfx	<i>IcEfx</i>
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### Description

Select the point of Initial change Expression of the genes

### Usage

```
IcEfx(z, likelihood, logarit)
```

### Arguments

z	z is the data matrix
likelihood	likelihood is the fold change used as threshold to state the initial change expression
logarit	if z is log put logarithm == 0;

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 MItimeIcE2

*MtimeIcE2*


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**Description**

Compute the d-delayed Mutual information all over the whole set of genes

**Usage**

```
MItimeIcE2(z, N, delta, norm, threshold, ksd, IcE)
```

**Arguments**

z	z is the data matrix
N	N is respectively the number of bins in percentile normalization or in rank normalization
delta	delta is the maximum time delay allowed to infer connections
norm	if you want column percentile normalization put norm == 1; if you want Rank normalization put norm == 2;
threshold	the Influence threshold. if you have a threshold and a SD put them here in this format: c(thresh,SD) if you don't have threshold put 0 in thresh;
ksd	ksd is the standard deviation multiplier;
IcE	the IcE value

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 MItimeThreshperm2

*MtimeThreshperm2*


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**Description**

Compute the threshold of the d-delayed Mutual information

**Usage**

```
MItimeThreshperm2(z, N, delta, norm)
```

**Arguments**

z	z is the data matrix
N	N is respectively the number of bins in percentile normalization or in rank normalization
delta	delta is the maximum time delay allowed to infer connections
norm	if you want column percentile normalization put norm == 1; if you want Rank normalization put norm == 2;

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PercentileC	<i>PercentileC</i>
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**Description**

Percentile row normalization, each column goes from 0 to 1

**Usage**

```
PercentileC(z, N)
```

**Arguments**

z	z is the data matrix
N	N is respectively the number of bins in percentile normalization or in rank normalization

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RangeRank2	<i>RangeRank2</i>
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**Description**

Column Rank discretization and normalization, each row goes from 0 to 1

**Usage**

```
RangeRank2(z, N)
```

**Arguments**

z	the data matrix
N	number of bins

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TDARACNE	<i>TDARACNE</i>
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**Description**

Main function, see P. Zoppoli, S. Morganella, M. Ceccarelli. TimeDelay-ARACNE: Reverse engineering of gene networks from time-course data by an information theoretic approach. BMC Bioinformatics 2010, 11:154.

**Usage**

```
TDARACNE(eSet, N, delta=3, likelihood=1.2, norm=2, logarithm=1, thresh=0, ksd=1, tolerance=
```

**Arguments**

eSet	eSet is the ExpressionSet object
N	N is respectively the number of bins in percentile normalization or in rank normalization
delta	delta is the maximum time delay allowed to infer connections
likelihood	likelihood is the fold change used as threshold to state the initial change expression (IcE)
norm	if you want column percentile normalization put norm == 1; if you want Rank normalization put norm == 2;
logarithm	if z is log put logarithm == 0;
thresh	the Influence threshold. if you have a threshold and a SD put them here in this format: c(thresh,SD) if you don't have threshold put 0 in thresh;
ksd	ksd is the standard deviation multiplier;
tolerance	tolerance is the DPI tolerance; 0 means no tolerance 1 means no DPI 0.15 is the default ARACNE tolerance as it is for TDARACNE
plot	plot must be TRUE to obtain automatically the graph
dot	dot must be TRUE to obtain a .dot file
name	name must be written with quotation marks(like this:'examplename') and is the name of the .dot file produced;
adj	adj must be TRUE to obtain an adjacent matrix

**Examples**

```
## take paper data
library(TDARACNE)
data(dataIRMAon)
data(threshIRMAon)
## main function; in output gives to you and adj matrix and a .dot file
# eSet is the ExpressionSet object
# N is respectively the number of bins in percentile normalization or in rank normalization
# delta is the maximum time delay allowed to infer connections
# likelihood is the fold change used as threshold to state the initial change expression (IcE)
# if you want column percentile normalization put norm == 1;
# if you want Rank normalization put norm == 2;
# if z is log put logarithm == 0;
# if you don't have threshold put 0 in thresh;
# ksd is the standard deviation multiplier;
# tolerance is the DPI tolerance;
# plot must be TRUE to obtain automatically the graph
# dot must be TRUE to obtain a .dot file
# name must be written with quotation marks(like this:'examplename') and is the name of the .dot file produced;
# adj must be TRUE to obtain an adjacent matrix

TDARACNE(dataIRMAon, 11, "netIRMAon", delta=3, likelihood=1.2, norm=2, logarithm=1, thresh=threshIRMAon, ksd=1, tolerance=0.15, plot=TRUE, dot=TRUE, name="netIRMAon.dot", adj=TRUE)
```

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```
TDARACNEdataPublished
      TDARACNEdataPublished
```

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### Description

main function with reference paper data. This reproduce the paper results. Simply run the function with no arguments to obtain the paper results.

### Usage

```
TDARACNEdataPublished()
```

### Examples

```
## take the paper data
library(TDARACNE)
data(dataYeast)
data(dataSOSmean)
data(dataIRMAon)
data(threshIRMAon)
data(threshSOSmean)
data(threshYeast)
## paper results
      TDARACNEdataPublished()
## see in your working directory for .dot files
```

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```
ToTheGraph_timeShiftmax2
      ToTheGraph_timeShiftmax2
```

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### Description

make a .dot file of the adj

### Usage

```
ToTheGraph_timeShiftmax2(network, name)
```

### Arguments

network	the adj matrix
name	name for the .dot file

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bootstrap	<i>bootstrap</i>
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**Description**

make a block bootstrap. See the reference paper

**Usage**

```
bootstrap(TS)
```

**Arguments**

TS                      TS is the time series that have to be bootstrapped

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dataIRMAoff	<i>dataIRMAoff</i>
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**Description**

data used to infer the IRMAoff network

**Usage**

```
data(dataIRMAoff)
```

**Format**

The format is: Formal class 'ExpressionSet' [package "Biobase"] with 7 slots ..@ assayData :<environment: 0x115feb540> ..@ phenoData :Formal class 'AnnotatedDataFrame' [package "Biobase"] with 4 slots .. ..@ varMetadata :'data.frame': 0 obs. of 1 variable: .. .. ..\$ labelDescription: chr(0) .. .. ..@ data :'data.frame': 21 obs. of 0 variables .. .. ..@ dimLabels : chr [1:2] "sampleNames" "sampleColumns" .. .. ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. .. ..@ .Data:List of 1 .. .. .. ..\$ : int [1:3] 1 1 0 ..@ featureData :Formal class 'AnnotatedDataFrame' [package "Biobase"] with 4 slots .. .. ..@ varMetadata :'data.frame': 0 obs. of 1 variable: .. .. ..\$ labelDescription: chr(0) .. .. ..@ data :'data.frame': 5 obs. of 0 variables .. .. ..@ dimLabels : chr [1:2] "featureNames" "featureColumns" .. .. ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. .. ..@ .Data:List of 1 .. .. .. ..\$ : int [1:3] 1 1 0 ..@ experimentData :Formal class 'MIAME' [package "Biobase"] with 13 slots .. .. ..@ name : chr "" .. .. ..@ lab : chr "" .. .. ..@ contact : chr "" .. .. ..@ title : chr "" .. .. ..@ abstract : chr "" .. .. ..@ url : chr "" .. .. ..@ pubMedIds : chr "" .. .. ..@ samples : list() .. .. ..@ hybridizations : list() .. .. ..@ normControls : list() .. .. ..@ preprocessing : list() .. .. ..@ other : list() .. .. ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. .. ..@ .Data:List of 1 .. .. .. ..\$ : int [1:3] 1 0 0 ..@ annotation : chr(0) ..@ protocolData :Formal class 'AnnotatedDataFrame' [package "Biobase"] with 4 slots .. .. ..@ varMetadata :'data.frame': 0 obs. of 1 variable: .. .. ..\$ labelDescription: chr(0) .. .. ..@ data :'data.frame': 21 obs. of 0 variables .. .. ..@ dimLabels : chr [1:2] "sampleNames" "sampleColumns" .. .. ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. .. ..@ .Data:List of 1 .. .. .. ..\$ : int [1:3] 1 1 0 ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. .. ..@ .Data:List of 4 .. .. .. ..\$ : int [1:3] 2 11 0 .. .. .. ..\$ : int [1:3] 2 8 0 .. .. .. ..\$ : int [1:3] 1 3 0 .. .. .. ..\$ : int [1:3] 1 0 0

**Details**

gene on the rows and time points on the columns

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dataIRMAon

*dataIRMAon*

---

**Description**

data used to infer the IRMA network

**Usage**

```
data(dataIRMAon)
```

**Format**

The format is: Formal class 'ExpressionSet' [package "Biobase"] with 7 slots ..@ assayData :<environment: 0x1159767c8> ..@ phenoData :Formal class 'AnnotatedDataFrame' [package "Biobase"] with 4 slots .. ..@ varMetadata :'data.frame': 0 obs. of 1 variable: .. .. ..\$ labelDescription: chr(0) .. .. ..@ data :'data.frame': 16 obs. of 0 variables .. .. ..@ dimLabels : chr [1:2] "sampleNames" "sampleColumns" .. .. ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. .. ..@ .Data:List of 1 .. .. .. ..\$ : int [1:3] 1 1 0 ..@ featureData :Formal class 'AnnotatedDataFrame' [package "Biobase"] with 4 slots .. .. ..@ varMetadata :'data.frame': 0 obs. of 1 variable: .. .. ..\$ labelDescription: chr(0) .. .. ..@ data :'data.frame': 5 obs. of 0 variables .. .. ..@ dimLabels : chr [1:2] "featureNames" "featureColumns" .. .. ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. .. ..@ .Data:List of 1 .. .. .. ..\$ : int [1:3] 1 1 0 ..@ experimentData :Formal class 'MIAME' [package "Biobase"] with 13 slots .. .. ..@ name : chr "" .. .. ..@ lab : chr "" .. .. ..@ contact : chr "" .. .. ..@ title : chr "" .. .. ..@ abstract : chr "" .. .. ..@ url : chr "" .. .. ..@ pubMedIds : chr "" .. .. ..@ samples : list() .. .. ..@ hybridizations : list() .. .. ..@ normControls : list() .. .. ..@ preprocessing : list() .. .. ..@ other : list() .. .. ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. .. ..@ .Data:List of 1 .. .. .. ..\$ : int [1:3] 1 0 0 ..@ annotation : chr(0) ..@ protocolData :Formal class 'AnnotatedDataFrame' [package "Biobase"] with 4 slots .. .. ..@ varMetadata :'data.frame': 0 obs. of 1 variable: .. .. ..\$ labelDescription: chr(0) .. .. ..@ data :'data.frame': 16 obs. of 0 variables .. .. ..@ dimLabels : chr [1:2] "sampleNames" "sampleColumns" .. .. ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. .. ..@ .Data:List of 1 .. .. .. ..\$ : int [1:3] 1 1 0 ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. .. ..@ .Data:List of 4 .. .. .. ..\$ : int [1:3] 2 11 0 .. .. .. ..\$ : int [1:3] 2 8 0 .. .. .. ..\$ : int [1:3] 1 3 0 .. .. ..\$ : int [1:3] 1 0 0

**Details**

gene on the rows and time points on the columns





**Format**

The format is: Formal class 'ExpressionSet' [package "Biobase"] with 7 slots ..@ assayData :<environment: 0x100e32508> ..@ phenoData :Formal class 'AnnotatedDataFrame' [package "Biobase"] with 4 slots .. ..@ varMetadata :'data.frame': 0 obs. of 1 variable: .. .. .\$ labelDescription: chr(0) .. ..@ data :'data.frame': 16 obs. of 0 variables .. ..@ dimLabels : chr [1:2] "sampleNames" "sampleColumns" .. ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. ..@ .Data:List of 1 .. .. . .\$ : int [1:3] 1 1 0 ..@ featureData :Formal class 'AnnotatedDataFrame' [package "Biobase"] with 4 slots .. ..@ varMetadata :'data.frame': 0 obs. of 1 variable: .. .. . .\$ labelDescription: chr(0) .. ..@ data :'data.frame': 11 obs. of 0 variables .. ..@ dimLabels : chr [1:2] "featureNames" "featureColumns" .. ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. ..@ .Data:List of 1 .. .. . .\$ : int [1:3] 1 1 0 ..@ experimentData :Formal class 'MIAME' [package "Biobase"] with 13 slots .. ..@ name : chr "" .. ..@ lab : chr "" .. ..@ contact : chr "" .. ..@ title : chr "" .. ..@ abstract : chr "" .. ..@ url : chr "" .. ..@ pubMedIds : chr "" .. ..@ samples : list() .. ..@ hybridizations : list() .. ..@ normControls : list() .. ..@ preprocessing : list() .. ..@ other : list() .. ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. ..@ .Data:List of 1 .. .. . .\$ : int [1:3] 1 0 0 ..@ annotation : chr(0) ..@ protocolData :Formal class 'AnnotatedDataFrame' [package "Biobase"] with 4 slots .. ..@ varMetadata :'data.frame': 0 obs. of 1 variable: .. .. . .\$ labelDescription: chr(0) .. ..@ data :'data.frame': 16 obs. of 0 variables .. ..@ dimLabels : chr [1:2] "sampleNames" "sampleColumns" .. ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. ..@ .Data:List of 1 .. .. . .\$ : int [1:3] 1 1 0 ..@ \_\_classVersion\_\_:Formal class 'Versions' [package "Biobase"] with 1 slots .. ..@ .Data:List of 4 .. .. . .\$ : int [1:3] 2 11 0 .. .. . .\$ : int [1:3] 2 8 0 .. .. . .\$ : int [1:3] 1 3 0 .. .. . .\$ : int [1:3] 1 0 0

**Details**

gene on the rows and time points on the columns

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plotRgraphviz

*plotRgraphviz*

---

**Description**

use Rgraphviz to plot the adj; bonus help function

**Usage**

```
plotRgraphviz(Influence)
```

**Arguments**

Influence      the adj matrix

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saveTime	<i>saveTime</i>
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**Description**

make some useful check on the data

**Usage**

```
saveTime(newz, delta)
```

**Arguments**

newz	newz is the data matrix
delta	delta is the maximum time delay allowed to infer connections

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threshIRMAon	<i>threshIRMAon</i>
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**Description**

IRMAon thresh

**Usage**

```
data(threshIRMAon)
```

**Format**

The format is: num [1:2] 0.593 0.309

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threshSOSmean	<i>threshSOSmean</i>
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---

**Description**

SOS thresh

**Usage**

```
data(threshSOSmean)
```

**Format**

The format is: num [1:2] 0.428 0.311

---

threshYeast	<i>threshYeast</i>
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---

**Description**

Yeast threshold

**Usage**

```
data(threshYeast)
```

**Format**

The format is: num [1:2] 0.216 0.156

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