



Tutorial 1.4: Explore results in a heatmap

Explore the heatmap with the enrichment analysis results by sorting, filtering, hiding and moving rows and columns

File Edit Data Help

New

Open

Save

Save As ...

Close

Import

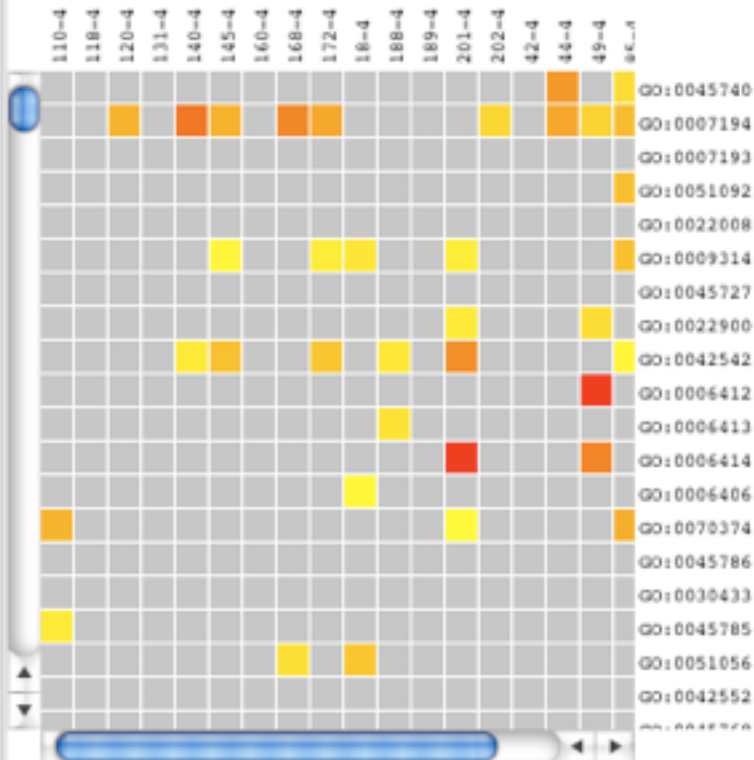
Export

Exit

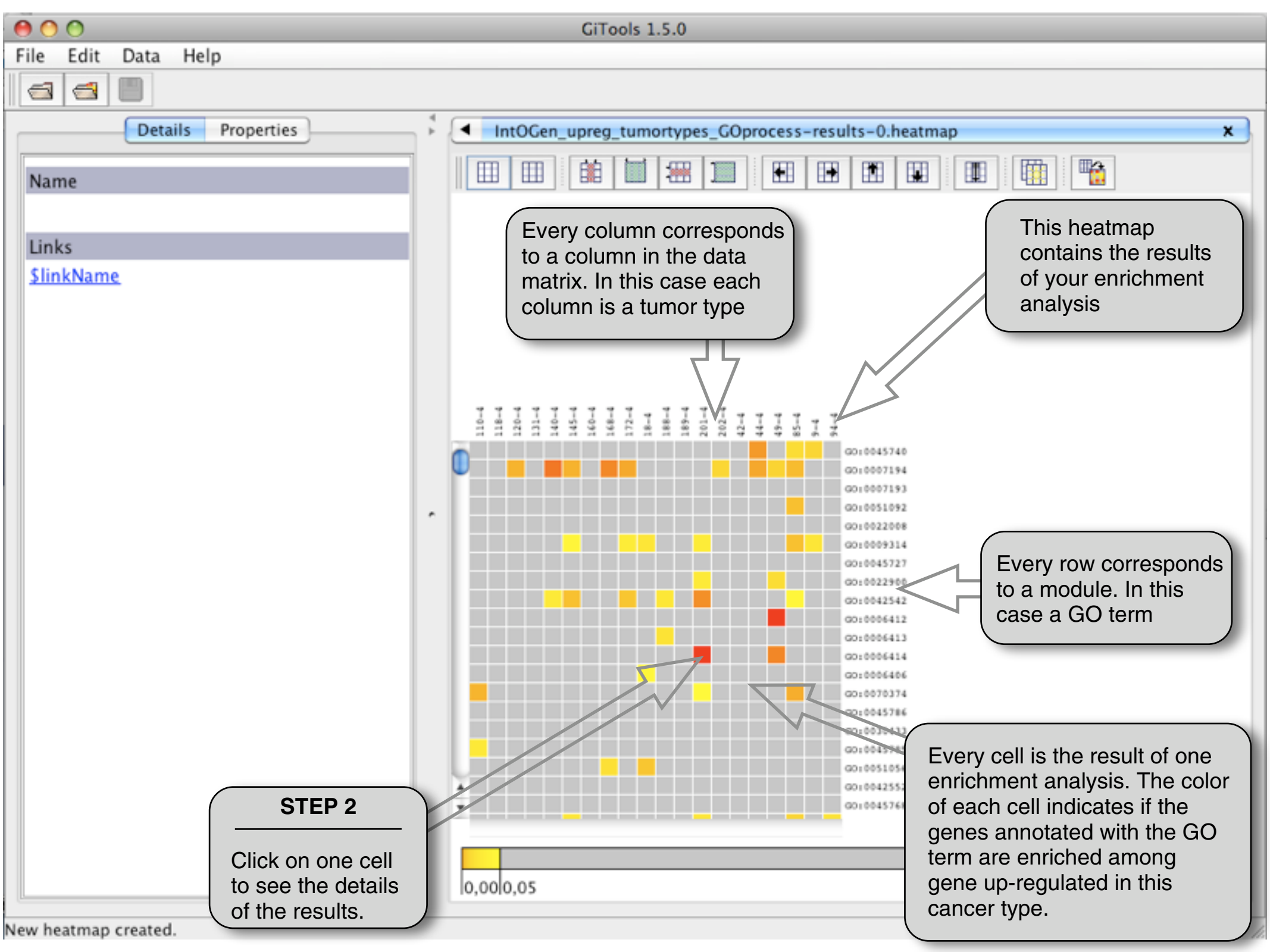
Enrichment analysis ...

Heatmap ...

IntOGen_upreg_tumortypes_GOprocess-results-0.heatmap

**STEP 1**

If it is not already open, open an existing Enrichment analysis and open the Results matrix





Details Properties

Condition

201-4

Module

GO:0006414

N 103

Observed 27

Population

Probability 0.104

Exp-Mean 10.7

Exp-StDev 3.09

P-Values

Left 1.00

Right 4.53e-06

Two-Tail 1.00

Correction

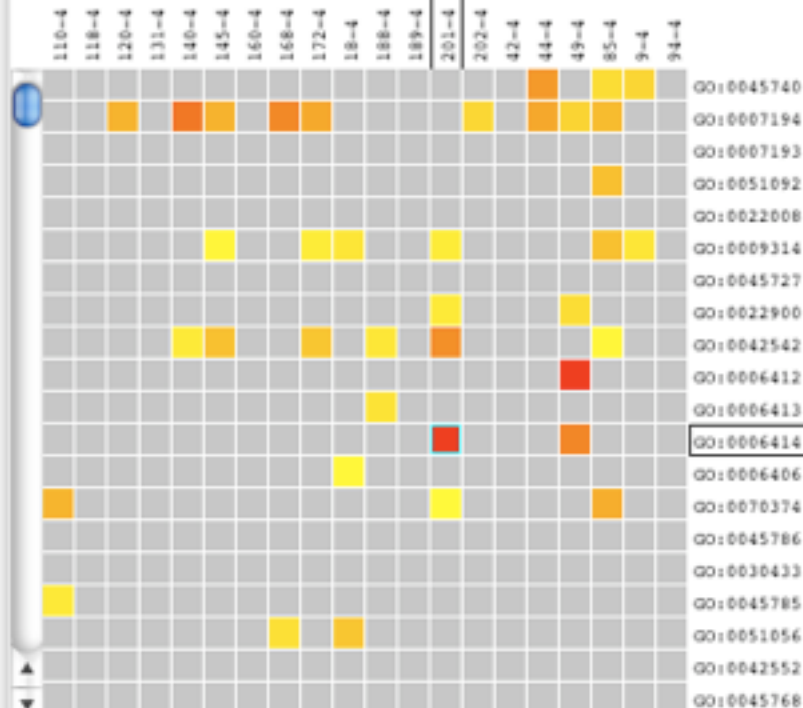
Left 1.00

Right 0.000157

Two-Tail 1.00

This panel shows
Details of the results
for the selected cell.

IntOGen_upreg_tumortypes_GOprocess-results-0.heatmap



STEP 3

Click Sort rows
button to sort the
rows according
to the values of
the selected row.

Details Properties

Condition

201-4

Module

GO:0006414

N 103

Observed 27

Population

Probability 0.104

Exp-Mean 10.7

Exp-StDev 3.09

P-Values

Left 1.00

Right 4.53e-06

Two-Tail 1.00

Correction

Left 1.00

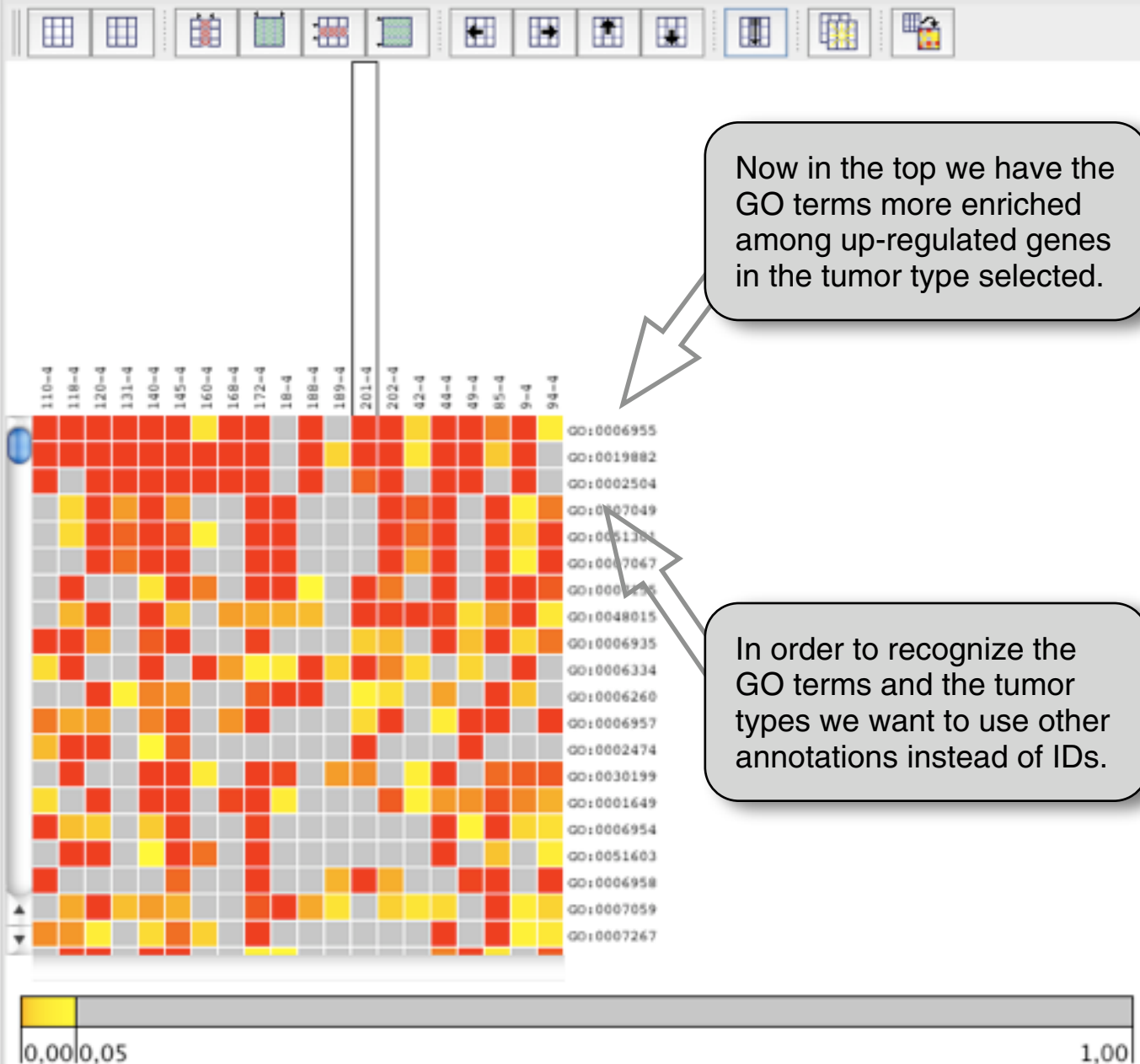
Right 0.000157

Two-Tail 1.00

STEP 4

Click Properties
tab to change
properties of the
matrix

IntOGen_upreg_tumortypes_GOprocess-results-0.heatmap



Document	Rows	Columns	Cells
----------	------	---------	-------

Width Fg Bg

Font

File GOprocessID2annotations.tsv

Open...

Clear

Filter

Pattern

 $\$ \{id\}$

000

Name	Google
------	--------

Url pattern

```
http://www.google.com/search?q=${url:
id}
```

STEP 5

Select Rows tab
to change
Properties of the
rows

STEP 6

Open the file that contains annotations for rows. GO terms in this case





Details Properties

Document Rows Columns Cells

Size, Colors and Font

Width 300 Fg Bg

Font Monospaced, 9 Select...

Annotations

File GOprocessID2annotations.tsv...

Open...

Clear

Filter

Labels

Pattern

{id}

...

Links

Name Google

Url pattern

[http://www.google.com/search?q=\\${url:id}](http://www.google.com/search?q=${url:id})

IntOGen_upreg_tumortypes_GOprocess-results-1.heatmap



Select annotation ...

ID

GO Term Name (bp)

GO Term Definition (bp)

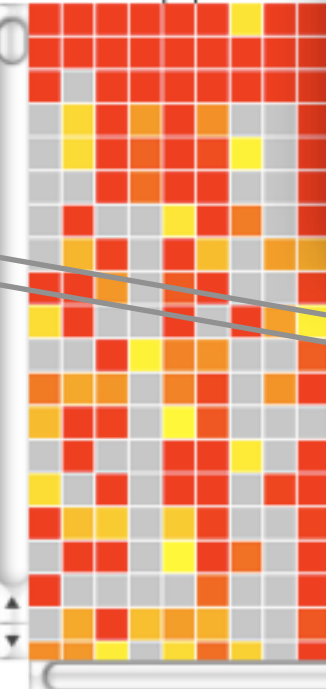
GO Term Evidence Code (bp)

OK

Cancel

STEP 7

Click on ... for
Labels and Select
GO Term Name as
the annotation to
show

110-d
118-d
120-d
131-d
140-d
145-d
160-d
168-d
172-d

0,000,05

1,00

Details Properties

Document	Rows	Columns	Cells
----------	------	---------	-------

Size, Colors and Font

Width Fg Bg

Font

Annotations

File GOprocessID2annotations.tsv.

Open...

Clear

Filter

Labels

Pattern

`#{GO Term Name (bp)}`

Links

Name	Google
------	--------

Url pattern

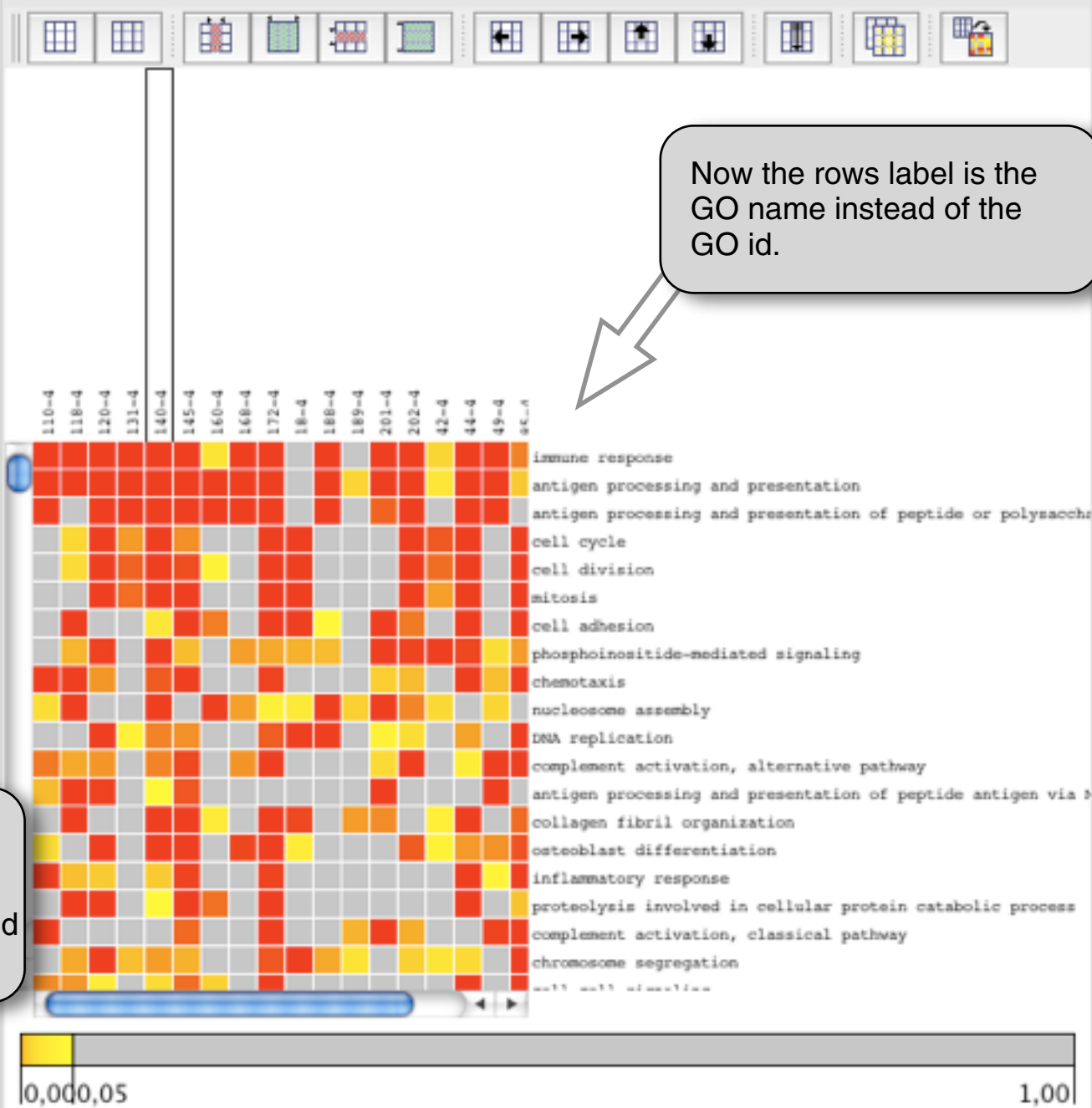
<http://www.google.com/sd>

STEP 8

Delete `{id}` to not show the GO id and hit enter.

Now the rows label is the GO name instead of the GO id.

IntOGen_upreg_tumortypes_GOprocess-results-1.heatmap



File Edit Data Help



Details Properties

STEP 9

Click Columns
tab to change
properties of the
columns

STEP 10

Open the file that
contains annotations
for columns. tumor
types in this case

Document Rows Columns Cells

Size, Colors and Font

Height 200 Fg Bg

Font Monospaced, 9 Select...

Annotations

File tumortypes.column.annotations.tsv

Open...

Clear

Filter

Labels

Pattern

{id}

...

Links

Name Google

Url pattern

http://www.google.com/search?q=\${url:1}

g_tumortypes_GOprocess-results-1.heatmap

Select annotation ...

ID

topography

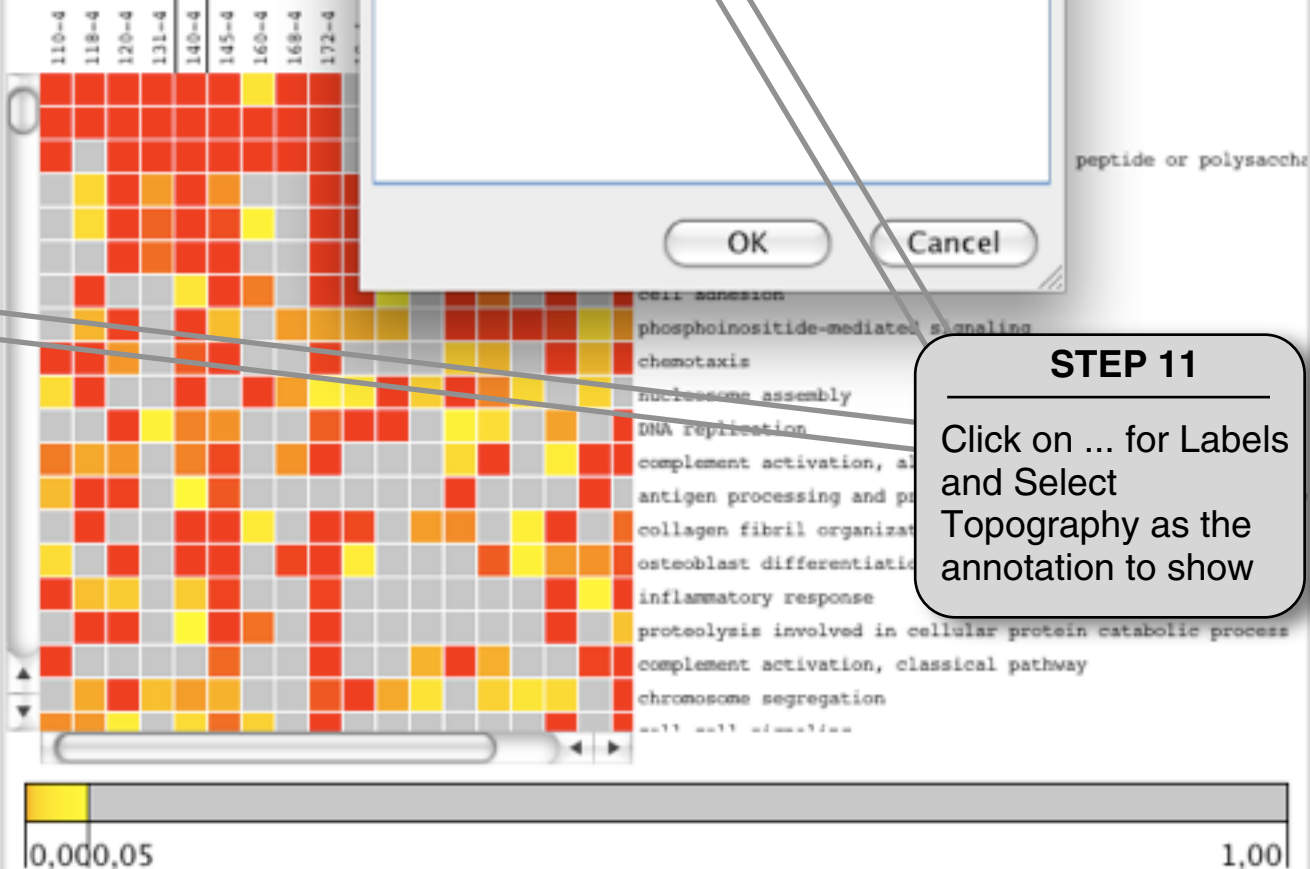
morphology

OK

Cancel

STEP 11

Click on ... for Labels
and Select
Topography as the
annotation to show





Details

Properties

Document

Rows

Columns

Cells

Size, Colors and Font

Height200

Fg

Bg

FontMonospaced, 9

Select...

Annotations

Filetumortypes.column.annotations.tsv

Open...

Clear

Filter

Labels

Pattern

Links

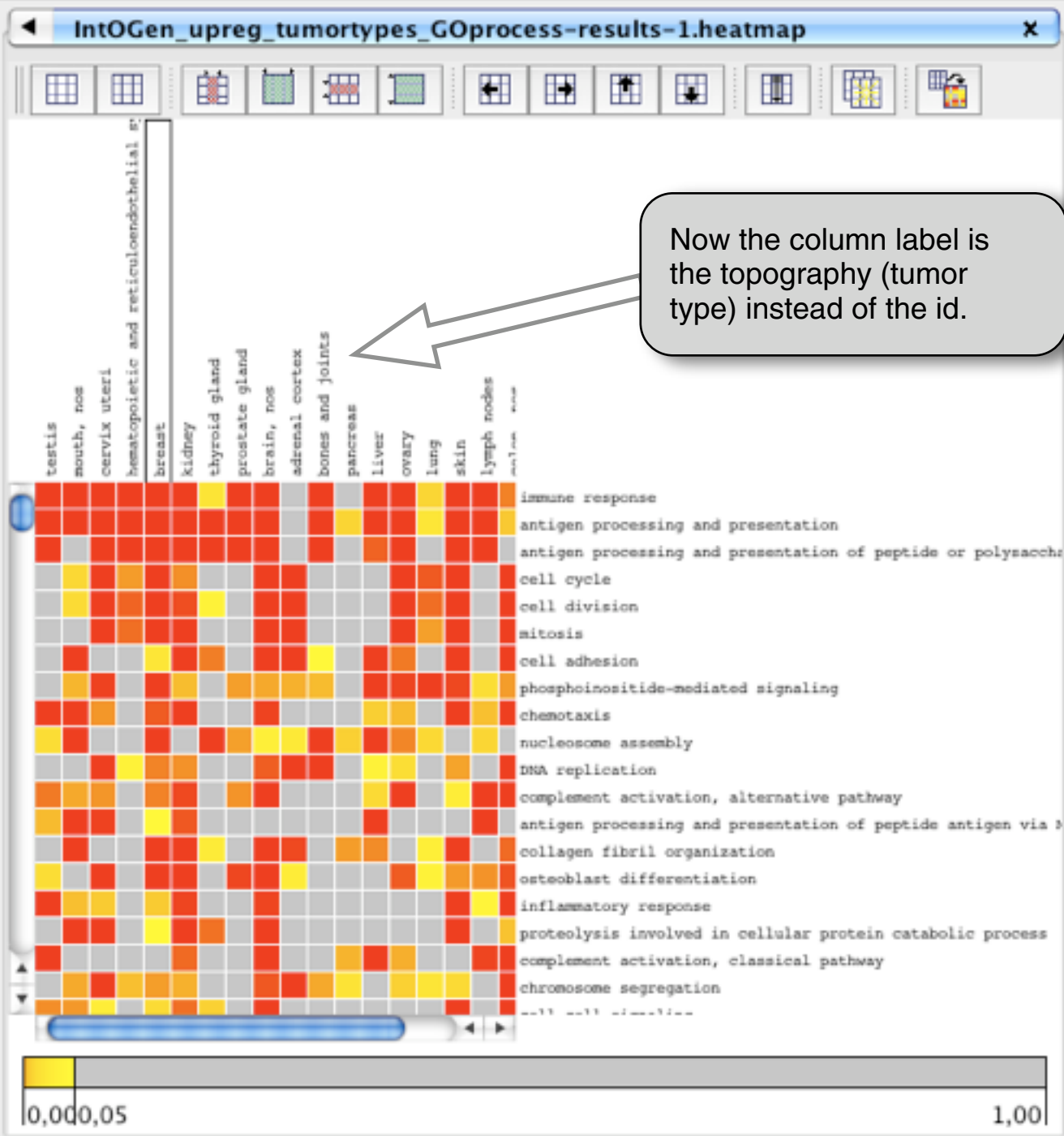
NameGoogle

Url pattern

http://www.google.c

d}

STEP 12
Delete \${id} to not show the id and hit enter.



Now the column label is the topography (tumor type) instead of the id.



Details

Properties

Document

Rows

Columns

Cells

Size, Colors and Font

Height 200 Fg Bg

Font Monospaced, 9 Select...

Annotations

File tumortypes.column.annotations.tsv

Open... Clear Filter

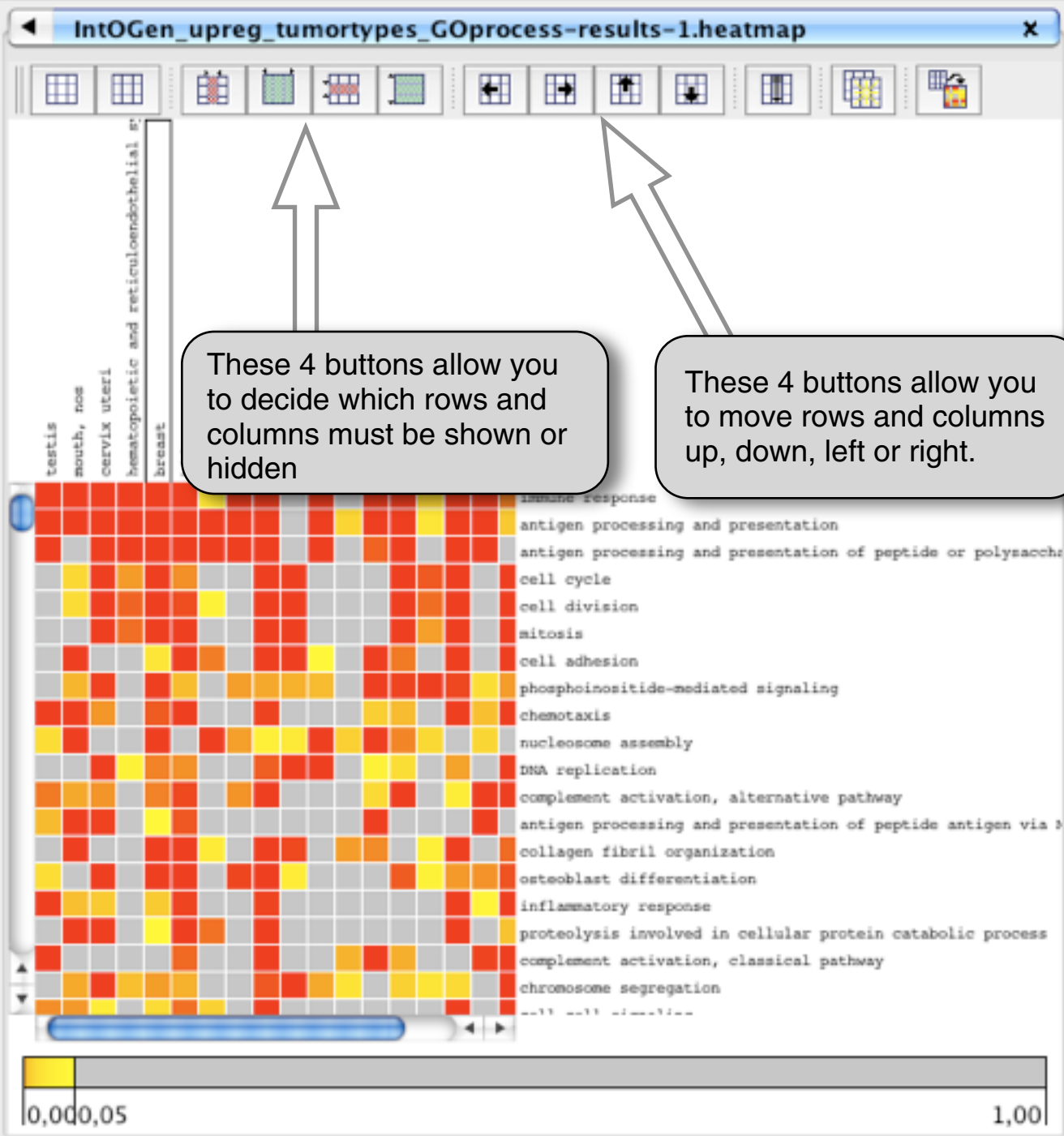
Labels

Pattern \${topography} ...

Links

Name Google

Url pattern http://www.google.com/search?q=\${url:id}



These 4 buttons allow you to decide which rows and columns must be shown or hidden

These 4 buttons allow you to move rows and columns up, down, left or right.

- Filter
 - Filter by label...
 - Filter by values...
- Sort
- Move
- Visibility
- MTC

Documents Columns Cells

Size, Colors and Font

Height 200 Fg Bg

Font Monospaced, 9 Select...

Annotations

File tumortypes.column.annotations.tsv

Open...

Clear

Filter

Labels

Pattern

\${topography}

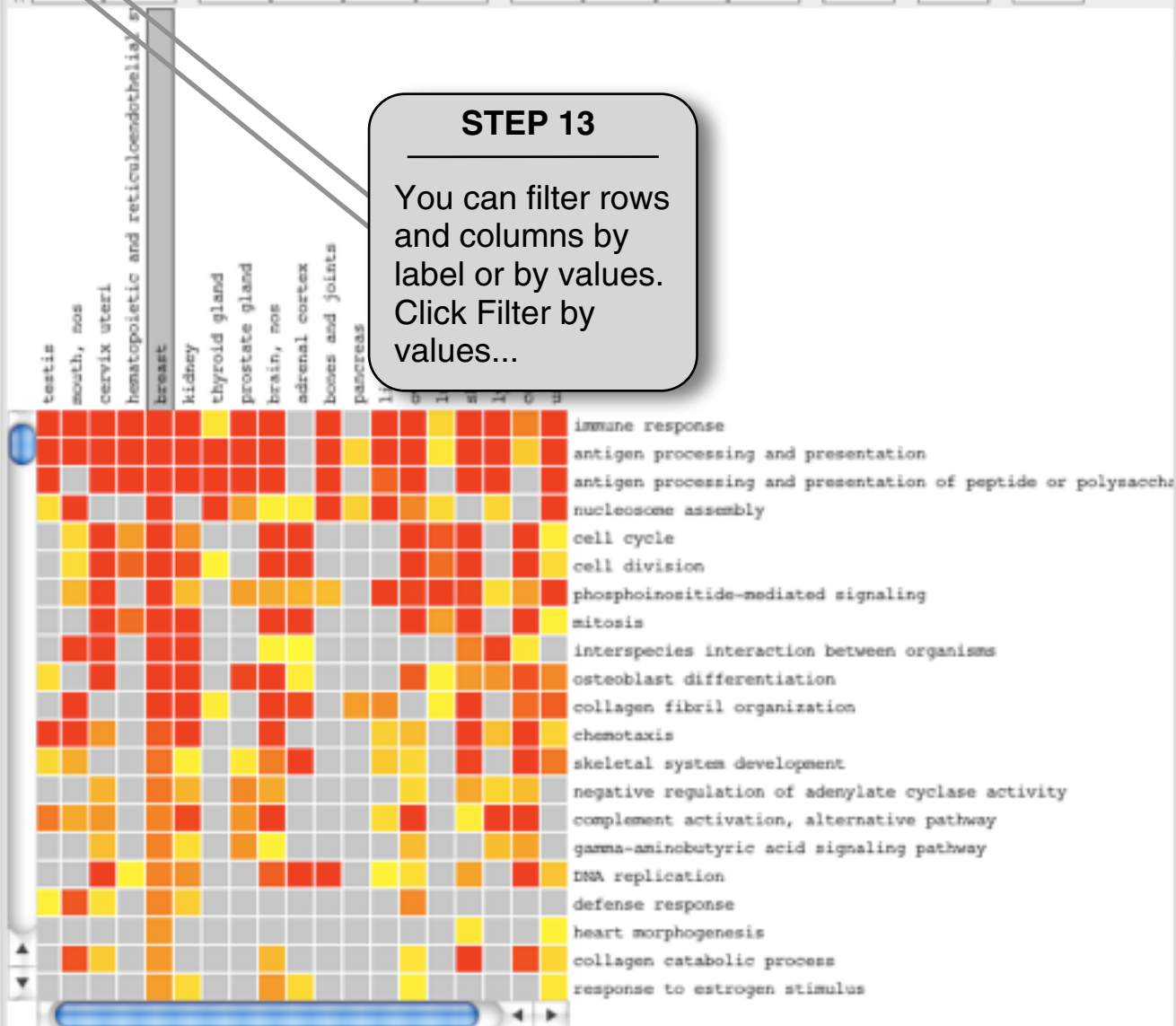
Links

Name Google

Url pattern

http://www.google.com/search?q=\${url:1}

IntOGen_upreg_tumortypes_GOprocess-results-1.heatmap



STEP 13

You can filter rows and columns by label or by values. Click Filter by values...

Details Properties

Document Rows Columns Cells

Size, Colors and Font

Height Fg  Bg Font

Annotations

File

Labels

Pattern

...

Links

Name

Url pattern

Filter criteria

Attribute	Condition	Value
Observed events	>	10.0
Corrected right P-Value	<	0.01

- ☐ All criteria should match
- ☐ All elements should match
- ☐ Invert criteria when filtering

Apply to:

- ☒ rows
- ☐ columns
- ☐ rows and columns

STEP 14

Add criteria you
want to filter rows
or columns
according to them



- Filter
 - Filter by label...
 - Filter by values...
- Sort
- Move
- Visibility
- MTC

Documents Columns Cells

Size, Colors and Font

Height 200 Fg Bg

Font Monospaced, 9 Select...

Annotations

File tumortypes.column.annotations.tsv

Open...

Clear

Filter

Labels

Pattern

\${topography}

...

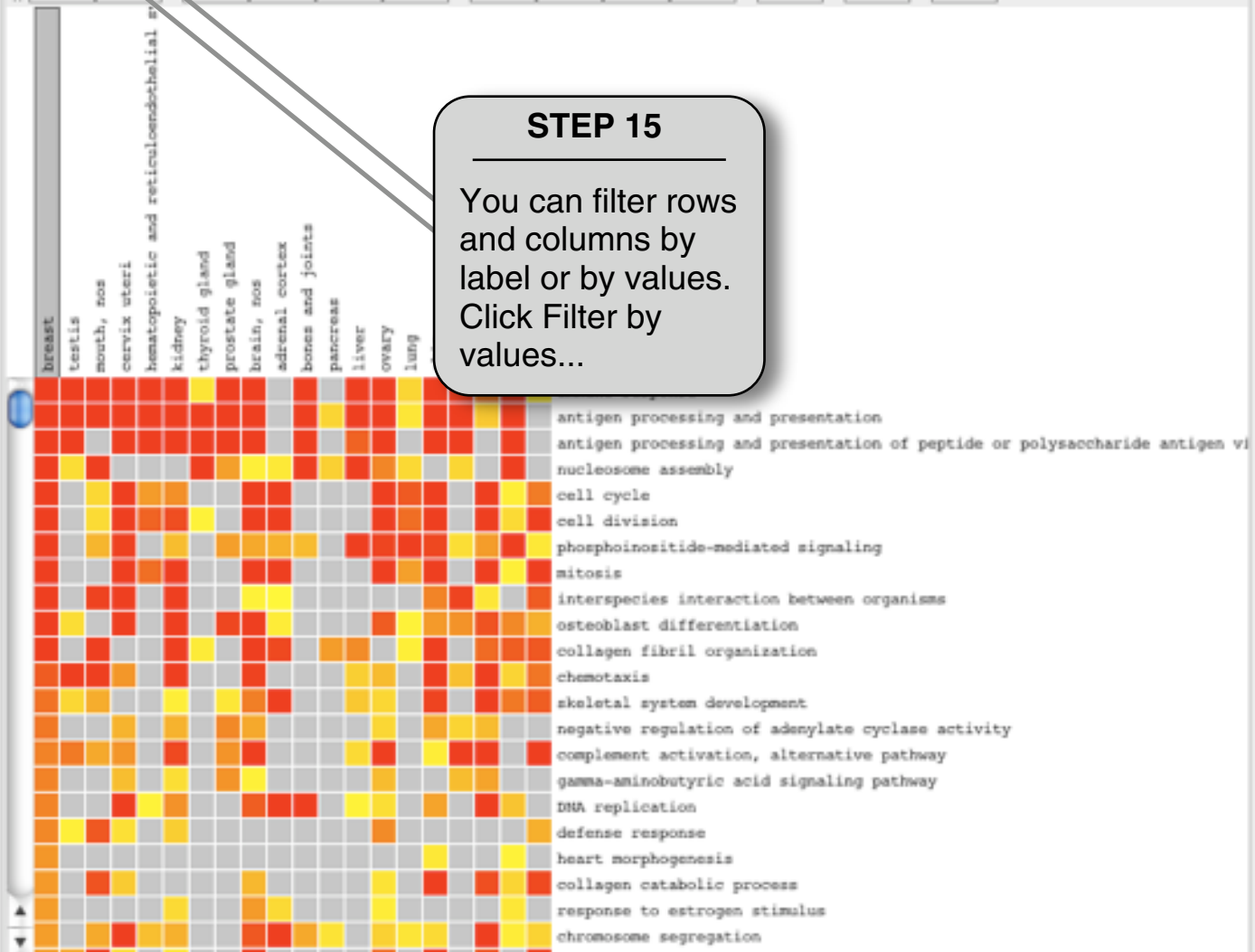
Links

Name Google

Url pattern

http://www.google.com/search?q=\${url:1}

intOGen_upreg_tumortypes_GOprocess-results-0.heatmap



STEP 15

You can filter rows and columns by label or by values. Click Filter by values...



Details Properties

Document Rows Columns Cells

Size, Colors and Font

Height 200 Fg Bg

Font Monospaced, 9 Select...

Annotations

File tumortypes.column.annotations.tsv

Open...

Clear

Filter

Labels

Pattern

\${topography}



Links

Name Google

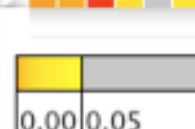
Url pattern

http://www.google.com/search?q=\${url:id}

IntOGen_u



breast
testis
mouth, nos
cervix uteri
hematopoietic and reticuloendothelial s
kidney



Filter labels...

Write one label pattern per line:

immune response
cell cycle
cell division
DNA replication
glycolysis
cell adhesion
anti-apoptosis
cell-cell signaling

Load...

Save...

☐ Use regular expressions

☐ Use original ids only (without annotation substitut

Apply to:

☒ rows

☐ columns

☐ rows and columns

OK

Cancel

STEP 16

Type in or Load a file with the label for the rows that you want to keep and click OK



Details Properties

Document Rows Columns Cells

Size, Colors and Font

Height 200 Fg Bg

Font Monospaced, 9 Select...

Annotations

File tumortypes.column.annotations.tsv

Open...

Clear

Filter

Labels

Pattern

{topography}

...

Links

Name Google

Url pattern

http://www.google.com/search?q=\${url:1}

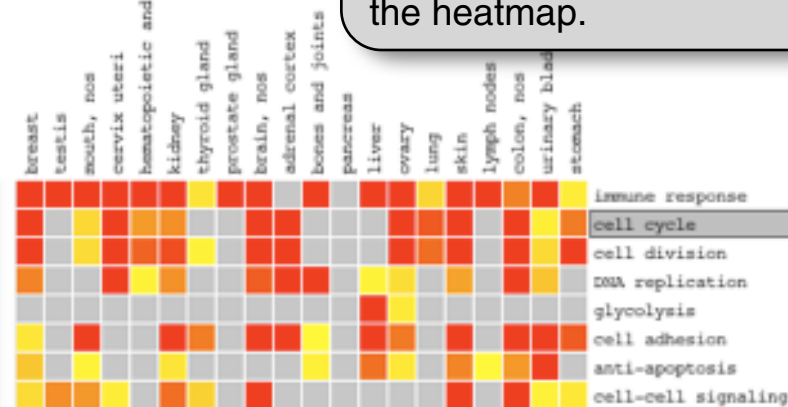
IntOGen_upreg_tumortypes_GOprocess-results-0.heatmap



Now the heatmap shows only the modules selected. With this button you could show again all rows in the heatmap.

STEP 17

Click to this button to open a heatmap with the genes in the module (row) selected



0,00 0,05

1,00



Details Properties

Name

Links

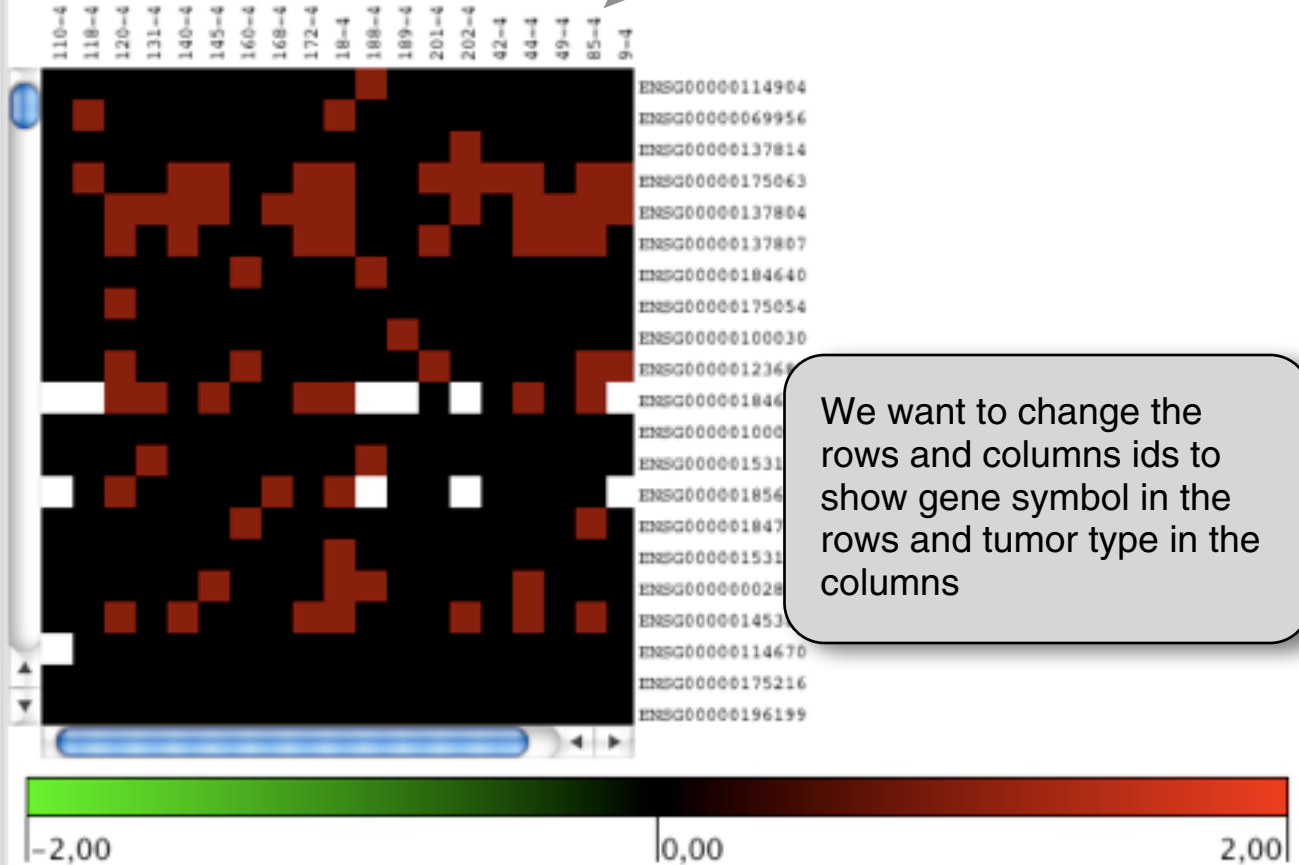
[\\$linkName](#)**STEP 18**

Click properties tab
to change
properties of the
heatmap

IntOGen_upreg_tumortypes_GOprocess-results-data-0.heatmap



A new heatmap
opens with the data
matrix for the genes
in the module that
was selected



We want to change the
rows and columns ids to
show gene symbol in the
rows and tumor type in the
columns



Details Properties

Document Rows Columns Cells

Size, Colors and Font

Width 300 Fg Bg

Font Monospaced, 9 Select...

Annotations

File .all.tumortypes.row.annotations.tsv

Open...

Clear

Filter

Labels

Pattern

...

Links

Name Google

Url pattern

<http://www.google.com/search?q=S{url:id}>**STEP 19**

Click Rows tab to change properties of the Rows

STEP 20

Open the file that contains annotations for rows

tumortypes_GOprocess-results-data-1.heatmap

Select annotation ...

ID

symbol

chromosome

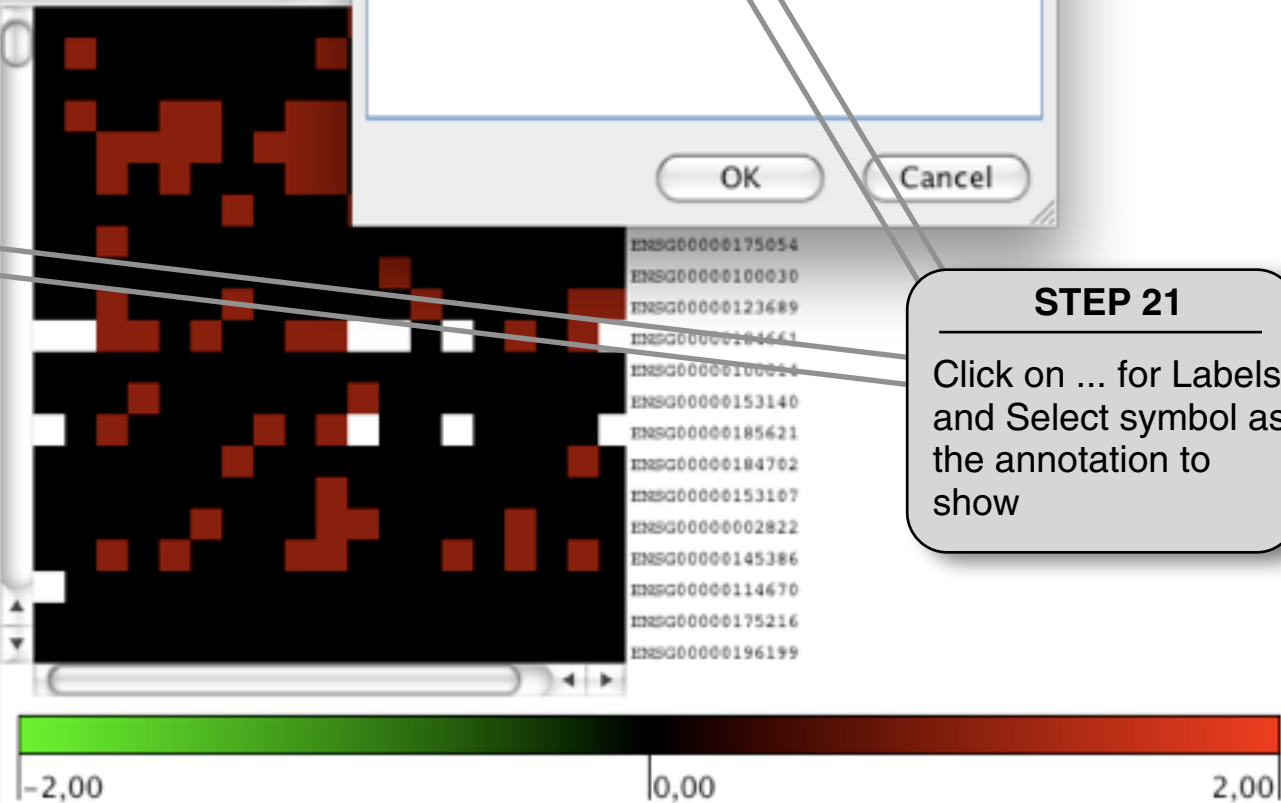
band

OK

Cancel

STEP 21

Click on ... for Labels and Select symbol as the annotation to show



Details Properties

Document Rows Columns Cells

Size, Colors and Font

Width Fg ☐ Bg ☐Font

Annotations

File

Labels

Pattern

...

Links

Name

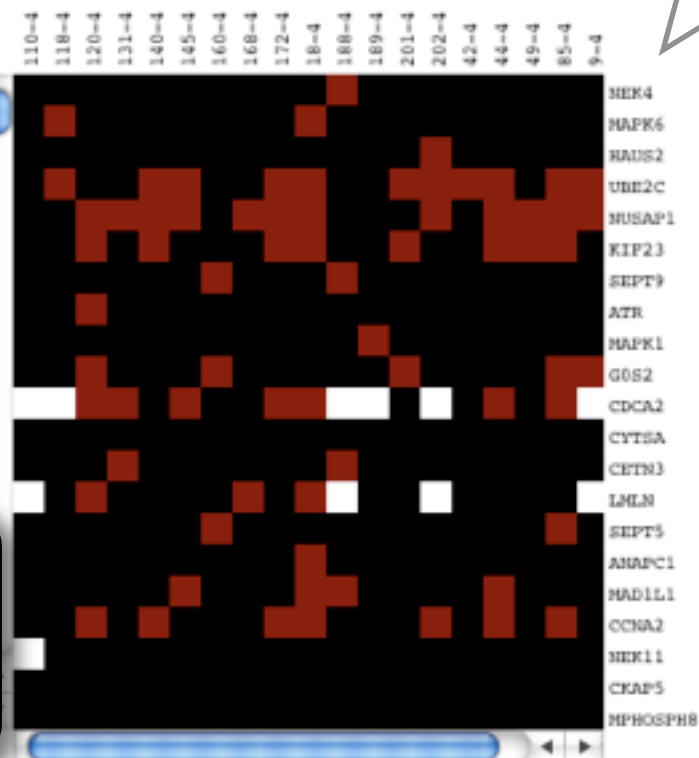
Url pattern

STEP 22Delete `${id}` to not show the GO id and click enter.

IntOGen_upreg_tumortypes_GOprocess-results-data-1.heatmap



Now the rows label is gene symbol instead of ensembl id



-2,00

0,00

2,00

Details Properties

Document Rows Columns Cells

Size, Colors and Font

Height 200

Fg

Bg

Font Monospaced, 9

Select...

Annotations

File tumortypes.column.annotations.tsv

Open...

Clear

Filter

Labels

Pattern

`${topography}`

...

Links

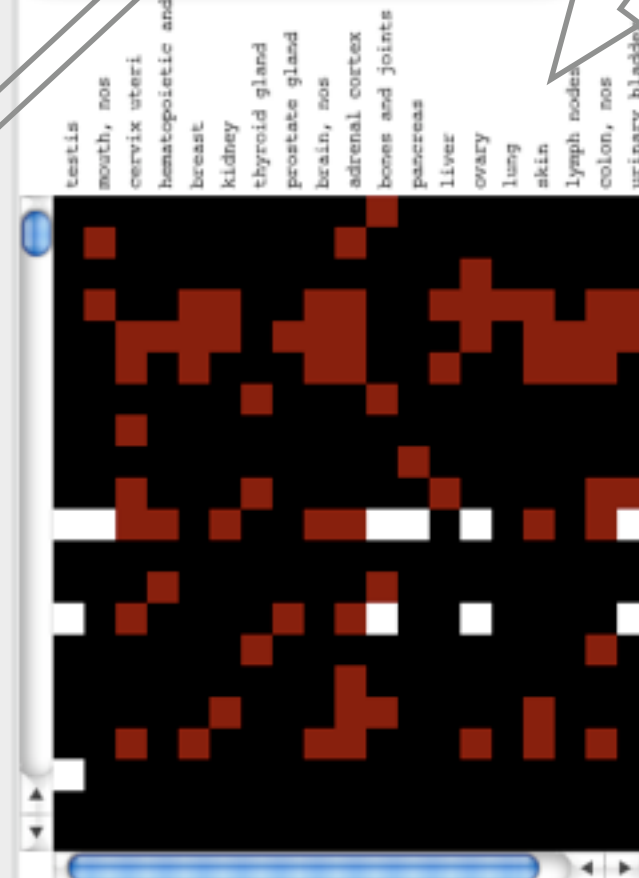
Name Google

Url pattern

`http://www.google.com/search?q=${url:1d}`**STEP 23**

Click on Columns Tab. Open the file that contains annotations for columns, select Topography as annotation to show and click enter.

Now the column label is tumor type (topography)



The color scale shown at this moment goes from -2 to 2. Since the values in the data matrix are p-values (from 0 to 1), the scale we have right now is not adequate and we want to change it.

-2,00

0,00

2,00



Details Properties

Document Rows Columns **Cells**

Size and Grid

Width 14 Height 14

☐ Show rows grid

Color ☐ Size 1

☐ Show columns grid

Color ☐ Size 1

Scale

P-Value scale

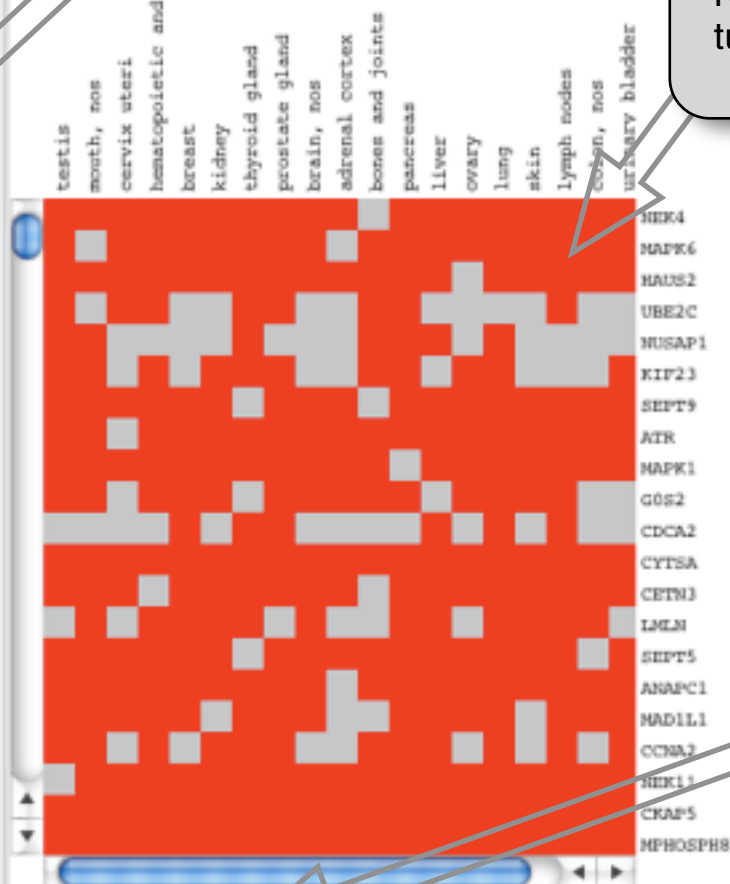
Value Value ☐ Filter sig. by

Value ☐ Sig. level 0.05


STEP 24

Click on Cells Tab. Change the scale to P-Value scale

Now the column label is tumor type (topography)



The P-value scale in Gitools by default depicts non-significant cells in grey (sig. level 0.05) and significant cells in a scale from yellow to red, red being the most significant values (closer to 0).





THANKS FOR USING GITTOOLS

<http://www.gittools.org>