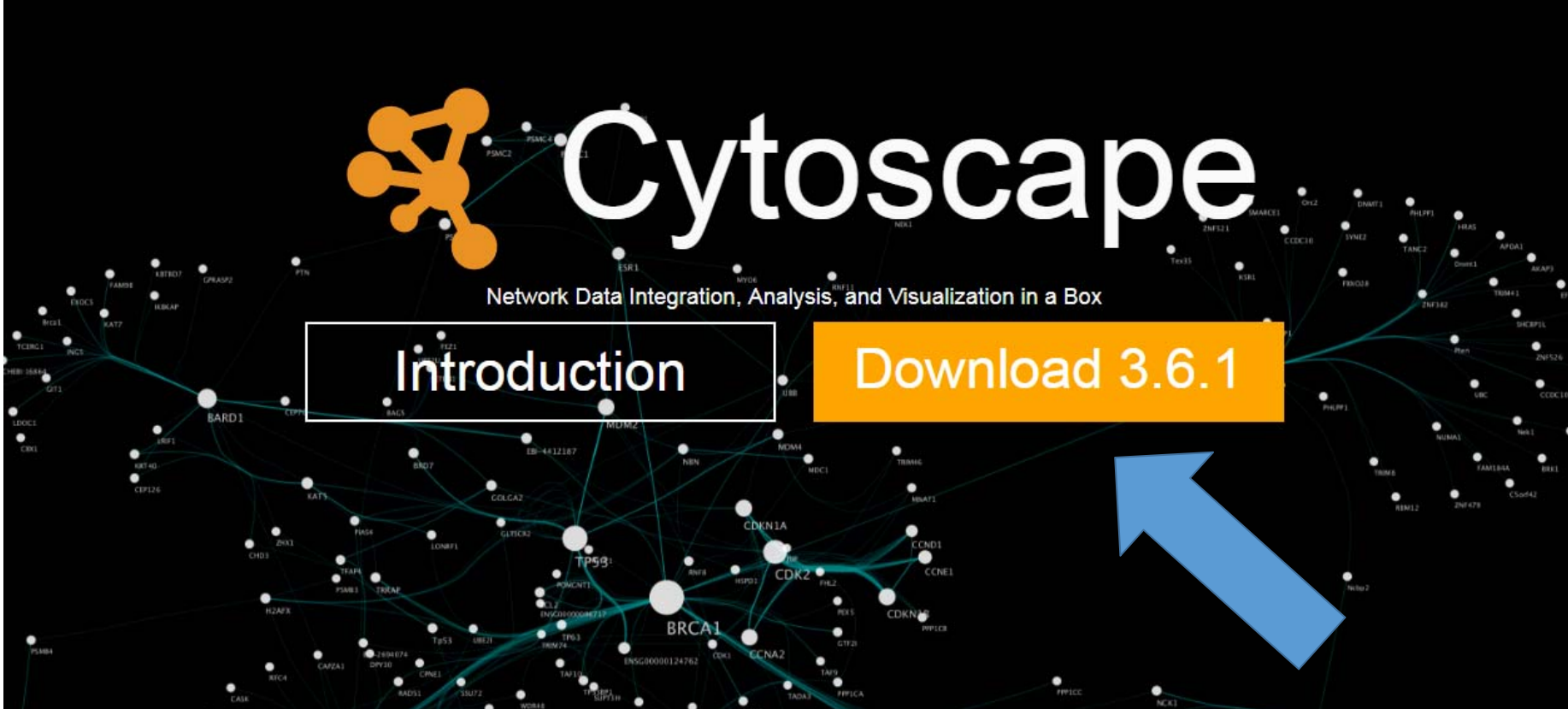


# 1. www.cytoscape.org



The image features the Cytoscape logo, which consists of four orange spheres connected by lines, positioned to the left of the word "Cytoscape" in a large, white, sans-serif font. Below the logo and text, the tagline "Network Data Integration, Analysis, and Visualization in a Box" is centered. The background is a complex network graph with numerous nodes and edges, rendered in shades of green and blue. Two prominent white boxes with black borders are overlaid on the network: one on the left containing the word "Introduction" and one on the right containing the text "Download 3.6.1". A large blue arrow points from the bottom right towards the "Download 3.6.1" box.

**Cytoscape**  
Network Data Integration, Analysis, and Visualization in a Box

**Introduction**

**Download 3.6.1**

# Download Cytoscape 3.6.1

 for Windows (64 bit)

Java 8 will be automatically installed if not already present

Java 9 is not yet supported

Problems? [Read this page first](#)

Window 32bit  
MAC OS

[Release Notes](#)

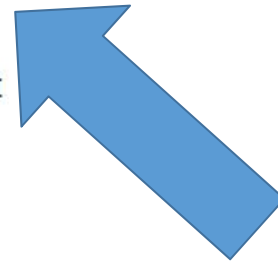
[Other Platforms](#)

[Old Versions](#)

[Donate](#)



This is a tax deductible donation to a 501(c)(3) nonprofit organization,  
The Cytoscape Consortium, Tax ID: 20-4909879.





# Download 3.6.1

## Platform Specific Installers

Java 8 is required and is automatically installed for Windows and Mac OS



Mac OS X

Windows 64bit

Linux

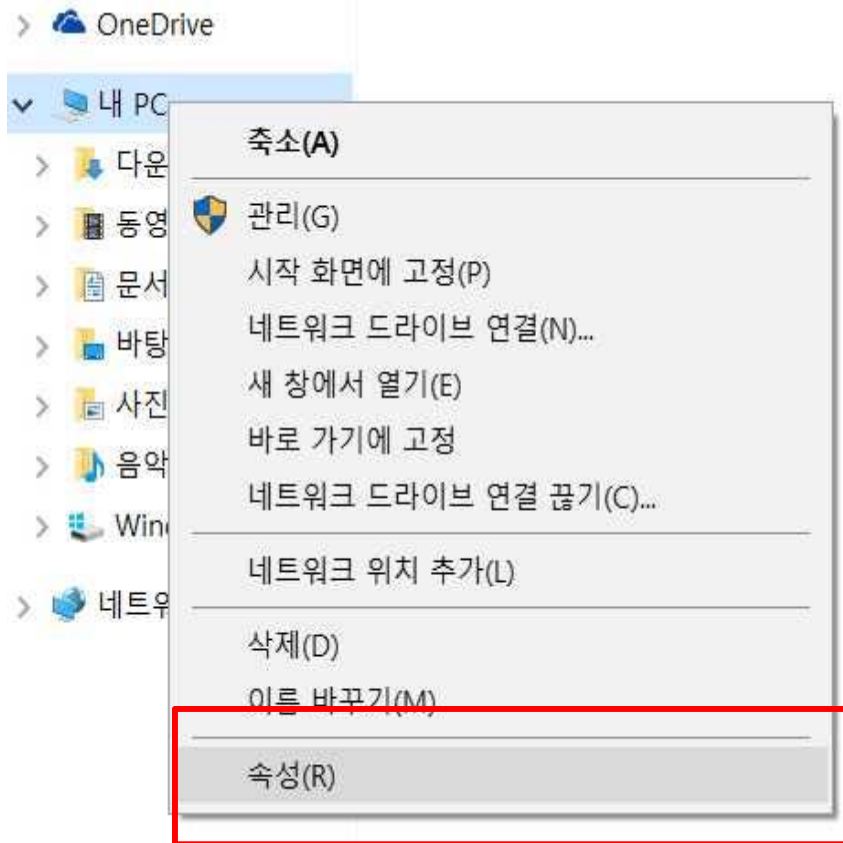


Windows 32bit

This is the **last version** of Cytoscape for Windows 32bit. Please consider upgrading your system to a 64 bit processor and using a 64 bit Java VM so you can take advantage of substantial improvements in Cytoscape speed and memory usage that enable faster processing and larger networks.

## Archive Distributions

# How to check your computer's OS version. (windows case)



## 컴퓨터에 대한 기본 정보 보기

### Windows 버전

Windows 10 Home

© 2016 Microsoft Corporation. All rights reserved.

### 시스템

프로세서: Intel(R) Pentium(R) CPU N3540 @ 2.16GHz 2.16 GHz

설치된 메모리(RAM): 4.00GB(3.88GB 사용 가능)

시스템 종류: 64비트 운영 체제, x64 기반 프로세서

펜 및 터치: 이 디스플레이에 사용할 수 있는 펜 또는 터치식 입력이 없습니다.

### 컴퓨터 이름, 도메인 및 작업 그룹 설정

컴퓨터 이름: 200laptop

전체 컴퓨터 이름: 200laptop

컴퓨터 설명:

작업 그룹: WORKGROUP

### Windows 정품 인증

Windows 정품 인증을 받았습니다. [Microsoft 소프트웨어 사용 조건 읽기](#)

제품 ID: 00326-10000-00000-AA758

# Download java from

<http://java.sun.com/javase/downloads/index.jsp>

## Java SE Downloads



Java Platform (JDK) 8



JDK 8 & NetBeans 8.0

Java Platform, Standard Edition	
<b>Java SE 8</b> This new major release contains several new features and enhancements that increase the performance of existing applications, make it easier to develop applications for modern platforms, and increase maintainability of code. <a href="#">Learn more</a> ▶	
<ul style="list-style-type: none"><li>Installation Instructions</li><li>Release Notes</li><li>Oracle License</li><li>Java SE Products</li><li>Third Party Licenses</li><li>Certified System Configurations</li><li>Readme Files<ul style="list-style-type: none"><li>JDK ReadMe</li><li>JRE ReadMe</li></ul></li></ul>	<b>JDK 8</b> <a href="#">DOWNLOAD</a> ↓
	<b>Server JRE 8</b> <a href="#">DOWNLOAD</a> ↓
	<b>JRE 8</b> <a href="#">DOWNLOAD</a> ↓

Download JRE by clicking red arrow



# Download Java 8 that suits your OS.

## Java SE Runtime Environment 8 Downloads

Do you want to run Java™ programs, or do you want to develop Java programs? If you want to run Java programs, but not develop them, download the Java Runtime Environment, or JRE™.

If you want to develop applications for Java, download the Java Development Kit, or JDK™. The JDK includes the JRE, so you do not have to download both separately.

JRE 8u161 Checksum  
JRE 8u162 Checksum

### Java SE Runtime Environment 8u161

You must accept the [Oracle Binary Code License Agreement for Java SE](#) to download this software.

Accept License Agreement  Decline License Agreement

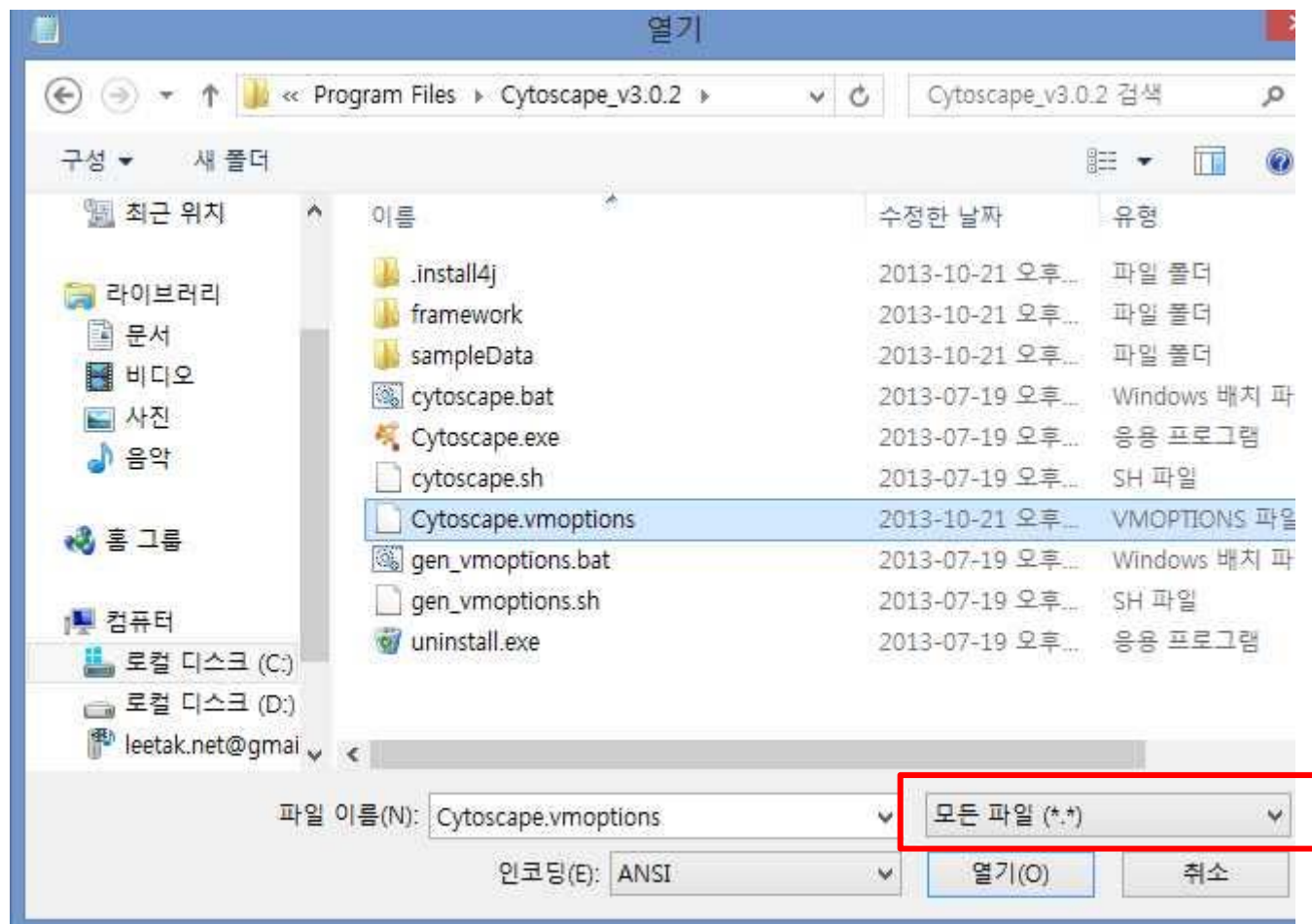
Product / File Description	File Size	Download
Linux x86	63.4 MB	<a href="#">jre-8u161-linux-i586.rpm</a>
Linux x86	79.29 MB	<a href="#">jre-8u161-linux-i586.tar.gz</a>
Linux x64	60.4 MB	<a href="#">jre-8u161-linux-x64.rpm</a>
Linux x64	76.35 MB	<a href="#">jre-8u161-linux-x64.tar.gz</a>
macOS	74.17 MB	<a href="#">jre-8u161-macosx-x64.dmg</a>
macOS	65.86 MB	<a href="#">jre-8u161-macosx-x64.tar.gz</a>
Solaris SPARC 64-bit	52.24 MB	<a href="#">jre-8u161-solaris-sparcv9.tar.gz</a>
Solaris x64	50 MB	<a href="#">jre-8u161-solaris-x64.tar.gz</a>
Windows x86 Online	1.78 MB	<a href="#">jre-8u161-windows-i586-iftw.exe</a>
Windows x86 Offline	61.35 MB	<a href="#">jre-8u161-windows-i586.exe</a>
Windows x86	64.56 MB	<a href="#">jre-8u161-windows-i586.tar.gz</a>
Windows x64 Offline	68.02 MB	<a href="#">jre-8u161-windows-x64.exe</a>
Windows x64	68.58 MB	<a href="#">jre-8u161-windows-x64.tar.gz</a>

Install Java and Cytoscape by default setting.

자바 충돌 문제 해결

메모장을 “관리자 권한”으로 실행

파일 → 열기 → cytoscape 파일 → Cytoscape\_vmoptions 파일을 열기



모든 파일 선택

자바 충돌 문제 해결

메모장을 “관리자 권한”으로 실행

파일 → 열기 → cytoscape 파일 → Cytoscape\_vmoptions 파일을 열기

-Xmx1250m 을 -Xmx512m으로 수정하여 저장



LAB 6 :

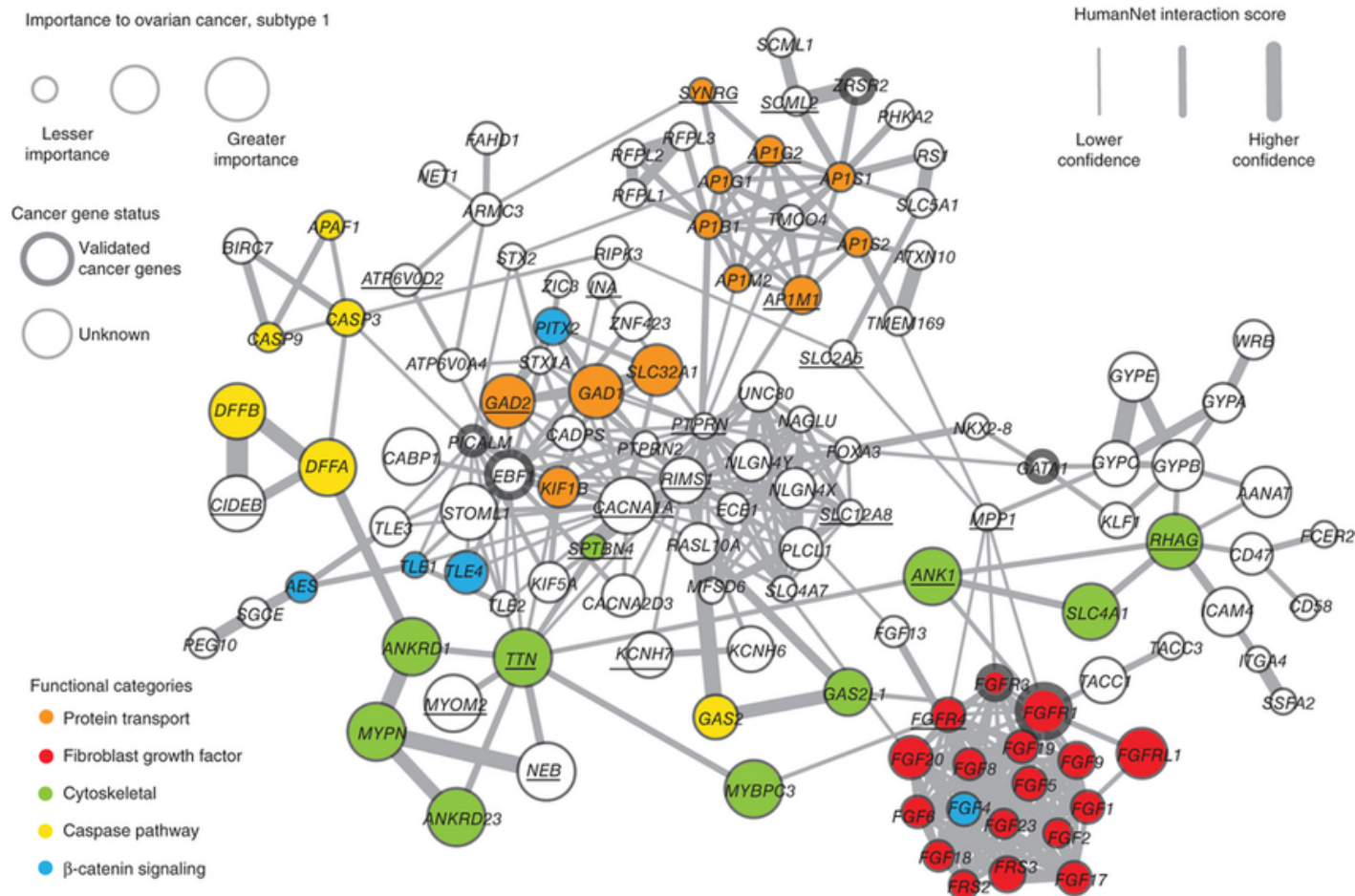
# Visualization and analysis of functional gene networks using Cytoscape



# 1. Network : HumanNet v.1

a probabilistic functional gene network of 18,714 validated encoding genes of *Homo sapiens*. (Insuk *et al*, 2011)

We used subset of the network: 'breast cancer related genes'

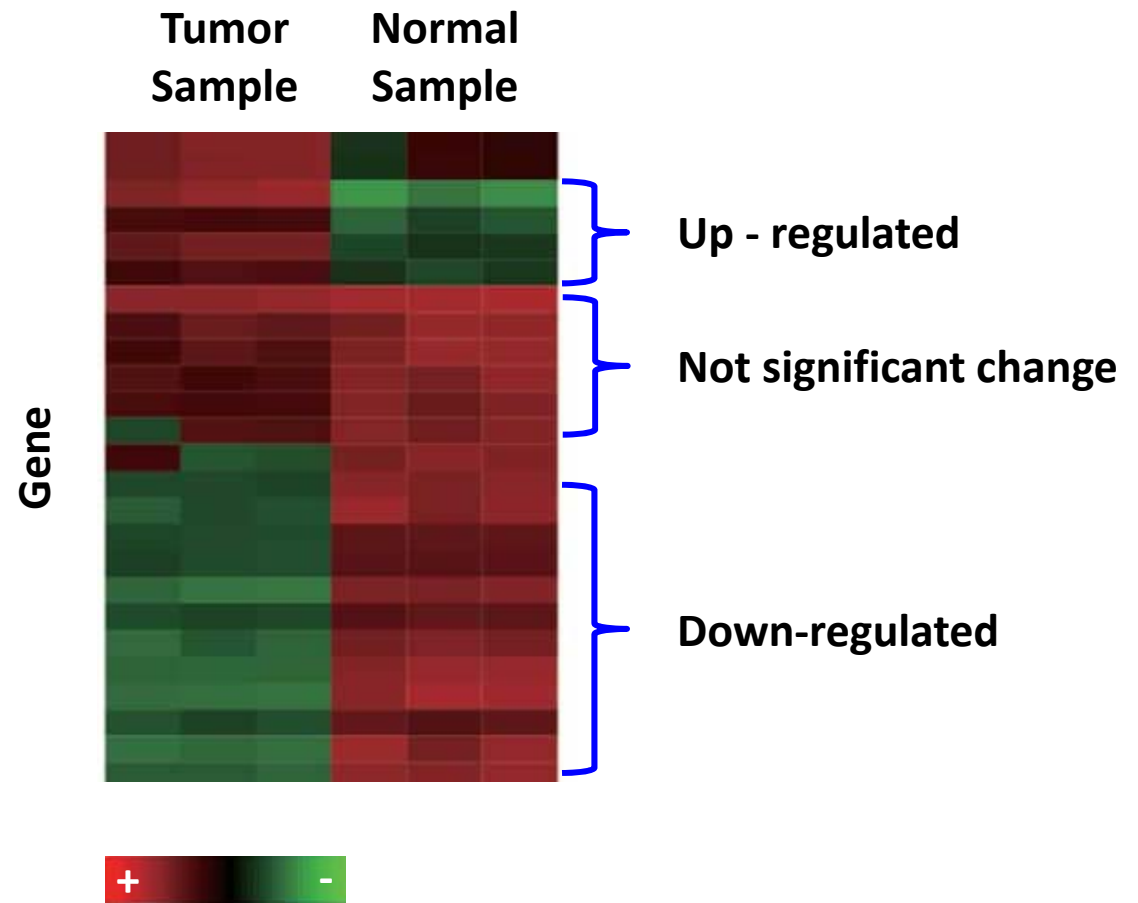


## 2. Expression data: RNA-seq data

Samples are from 3 Breast cancer patients and 3 normal .

Breast cancer patients have specific type of cancer : **Triple Negative Breast Cancer**

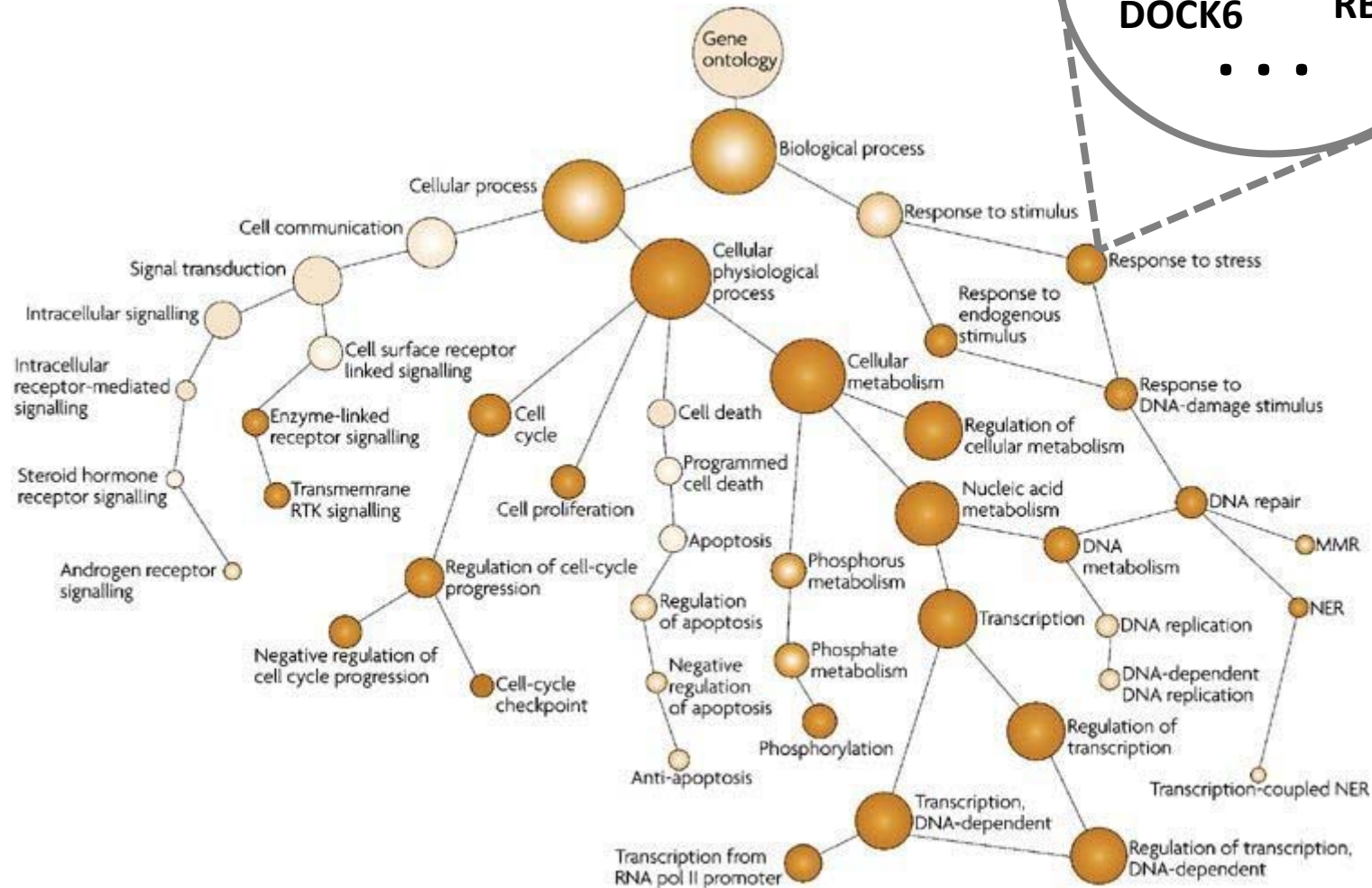
Data downloaded from : Gene Expression Omnibus (GEO) → A whole collection of various expression data

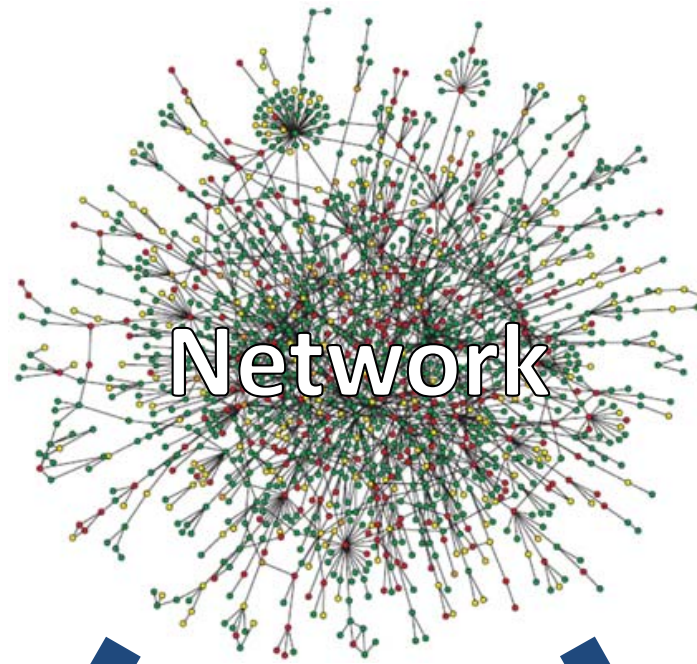


### 3. Gene Ontology : Gene-Function annotation data

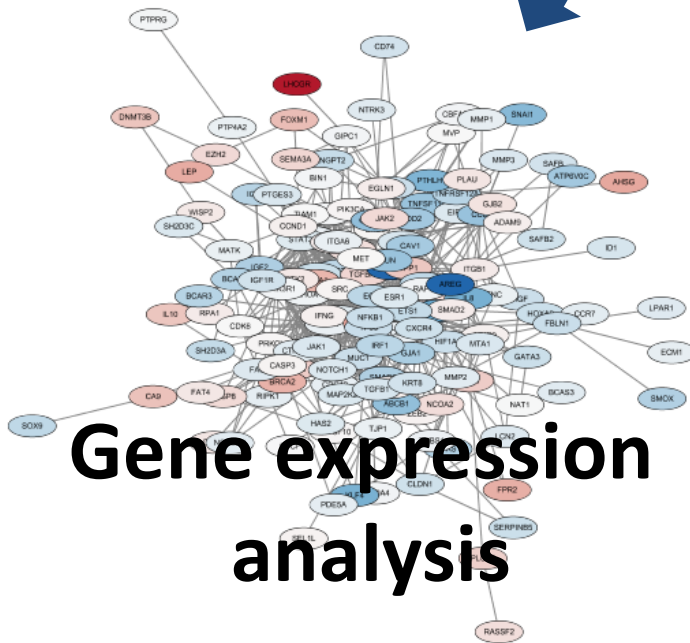
Described in 3 domains

- Molecular Function
- Cellular Component
- **Biological Process**

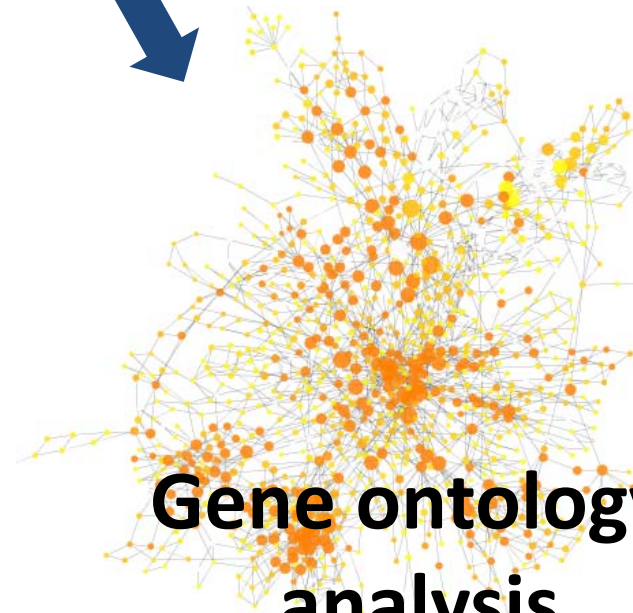




**Network**

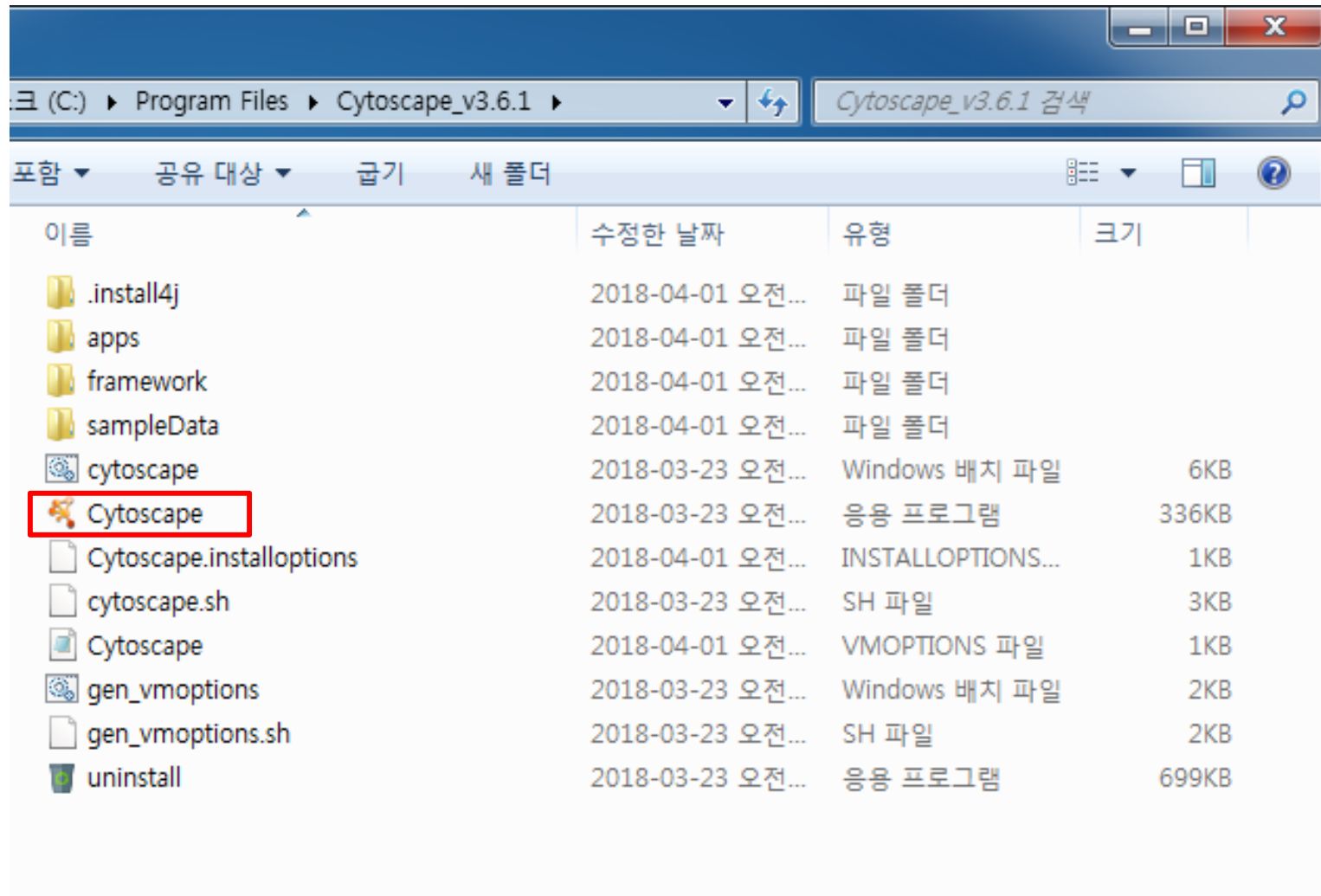


**Gene expression analysis**

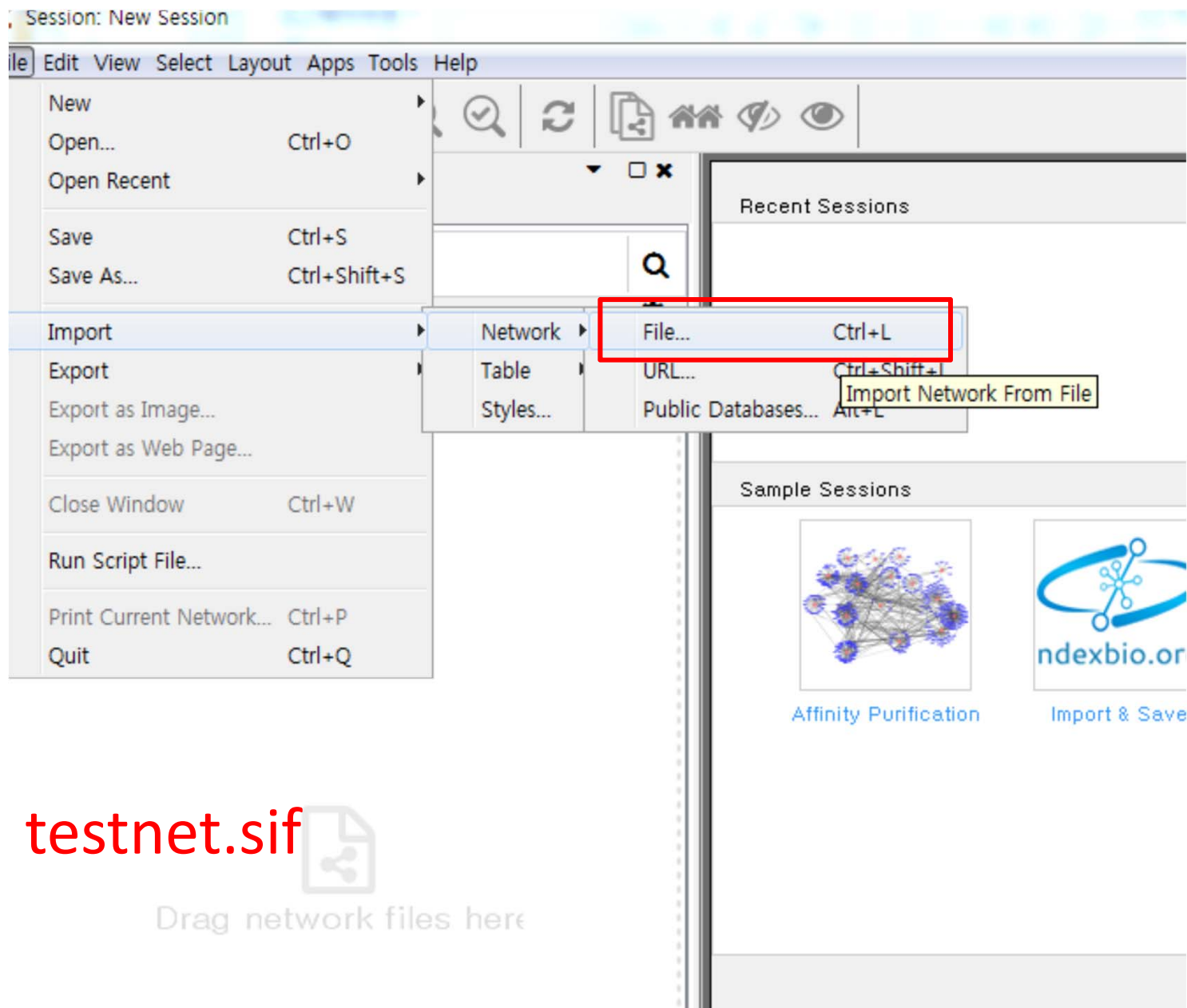


**Gene ontology analysis**

# Running Cytoscape



# Import network



# Import expression data

# DO\_breastcancer.pvals

The screenshot shows a software interface for network visualization. The main window displays a dense network graph with numerous nodes (represented by blue boxes) and edges (lines connecting the nodes). The nodes are labeled with gene symbols such as SOX9, CA9, AHSG, TNFRSF12A, LPAR1, FBLN1, and many others. A search bar at the top right contains the text "Enter search term...".

The "File" menu is open, showing options like "New", "Open...", "Save", "Import", "Export", etc. The "Import" option is selected, and a sub-menu is visible with the following items:

- Network
- Table
- File...
- Import Table From File
- Public Databases... Alt+T

The "Table Panel" at the bottom of the interface shows a table with two columns: "shared name" and "name". The table contains the following data:

shared name	name
SOX9	SOX9
CA9	CA9
AHSG	AHSG
TNFRSF12A	TNFRSF12A
LPAR1	LPAR1
FBLN1	FBLN1

At the bottom of the interface, there are tabs for "Node Table", "Edge Table", and "Network Table". The "Node Table" tab is currently active.





Enter search term...

Control Panel  
 Network Style Select

default

Properties

Def. Map. Byp.

Border Paint

2.0 Border Width

Fill Color

Column LOG2FOLDexp

Mapping Type Continuous Mapping

Current Mapping

35.0 Height

Image/Chart 1

Label

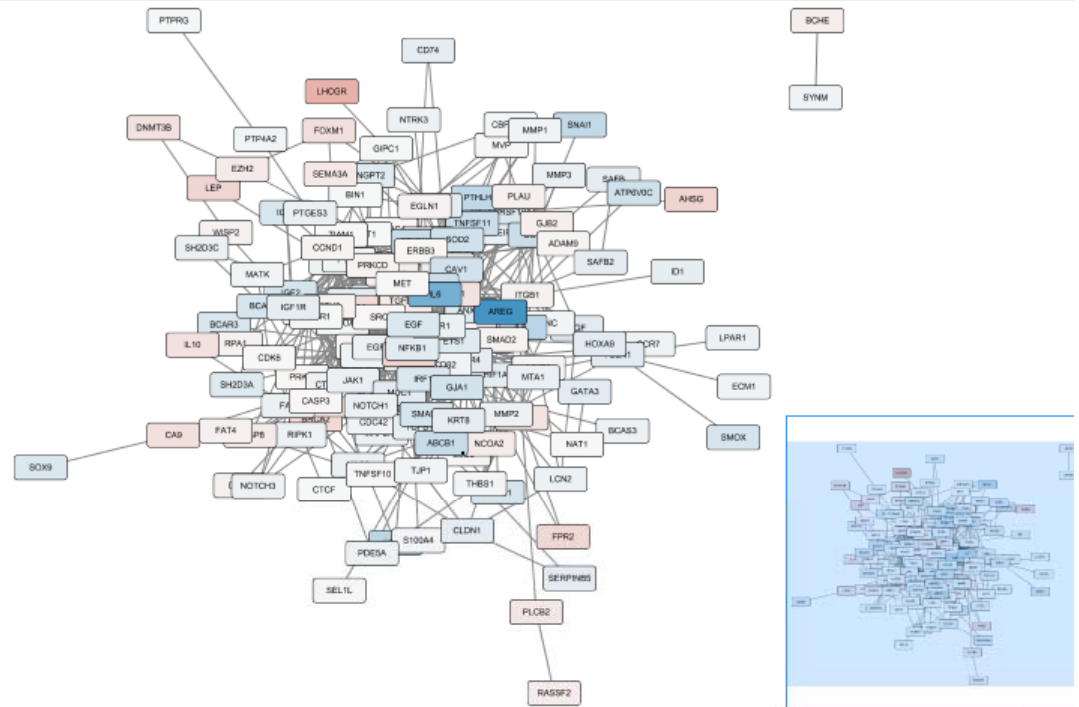
Label Color

12 Label Font Size

Shape

Size

255 Transparency



testnet.sif

Table Panel

shared name	name	NBSexp	NBSsig	TNBCex	TNBCsig	LOG2FOI	LOG2FOI
SOX9	SOX9	61,9038	0,05	11,3503	0,05	-2,44729	5,0E-5
CA9	CA9	0,853059	0,05	4,9453	0,05	2,53534	9,5E-4
AHSG	AHSG	0,0192584	0,05	0,26204	0,05	3,76623	1,0
TNFRSF12A	TNFRSF12A	160,485	0,05	24,3461	0,05	-2,72067	5,0E-5
LPAR1	LPAR1	13,0109	0,05	6,25104	0,05	-1,05756	0,014
FBLN1	FBLN1	149,738	0,05	38,5576	0,05	-1,95735	5,0E-5

Node Table Edge Table Network Table

Memory

Maximum color

Control Panel

Network Style Select

default

Properties

Def. Map. Byp.

Border Paint

2.0 Border Width

Fill Color

Column LOG2FOLDexp

Mapping Type Continuous Mapping

Current Mapping

35.0 Height

Image/Chart 1

Label

Label Color

12 Label Font Size

Shape

Size

255 Transparency

Node Edge Network

Session: New Session

File Edit View Select Layout Apps Tools Help

Enter search term...

Continuous Mapping Editor for Node Fill Color

Min-- 16.4719403

-4.00 0.00 4.00

LOG2FOLDexp

Max=16.4719403

Edit Handle Positions and Values

Handle Position: -4

Set Min and Max...

Add Delete

Node Fill Color:

OK Cancel

Gene	Value 1	Value 2	Value 3	Value 4	Value 5	Value 6	Value 7
SOX							
CA9	CA9	0,853059	0,05	4,9453	0,05	2,53534	9,5E-4
AHSG	AHSG	0,0192584	0,05	0,26204	0,05	3,76623	1,0
TNFRSF12A	TNFRSF12A	160,485	0,05	24,3461	0,05	-2,72067	5,0E-5
LPAR1	LPAR1	13,0109	0,05	6,25104	0,05	-1,05756	0,014
FBLN1	FBLN1	149,738	0,05	38,5576	0,05	-1,95735	5,0E-5

Node Table Edge Table Network Table

Memory

Control Panel

default

Properties

Def. Map. Byp.

Fill Color

Column: LOG2FOLDexp

Mapping Type: Continuous Mapping

Current Mapping: -16.47 to 16.47

35.0 Height

Image/Chart 1

Label

Label Color

12 Label Font Size

Shape

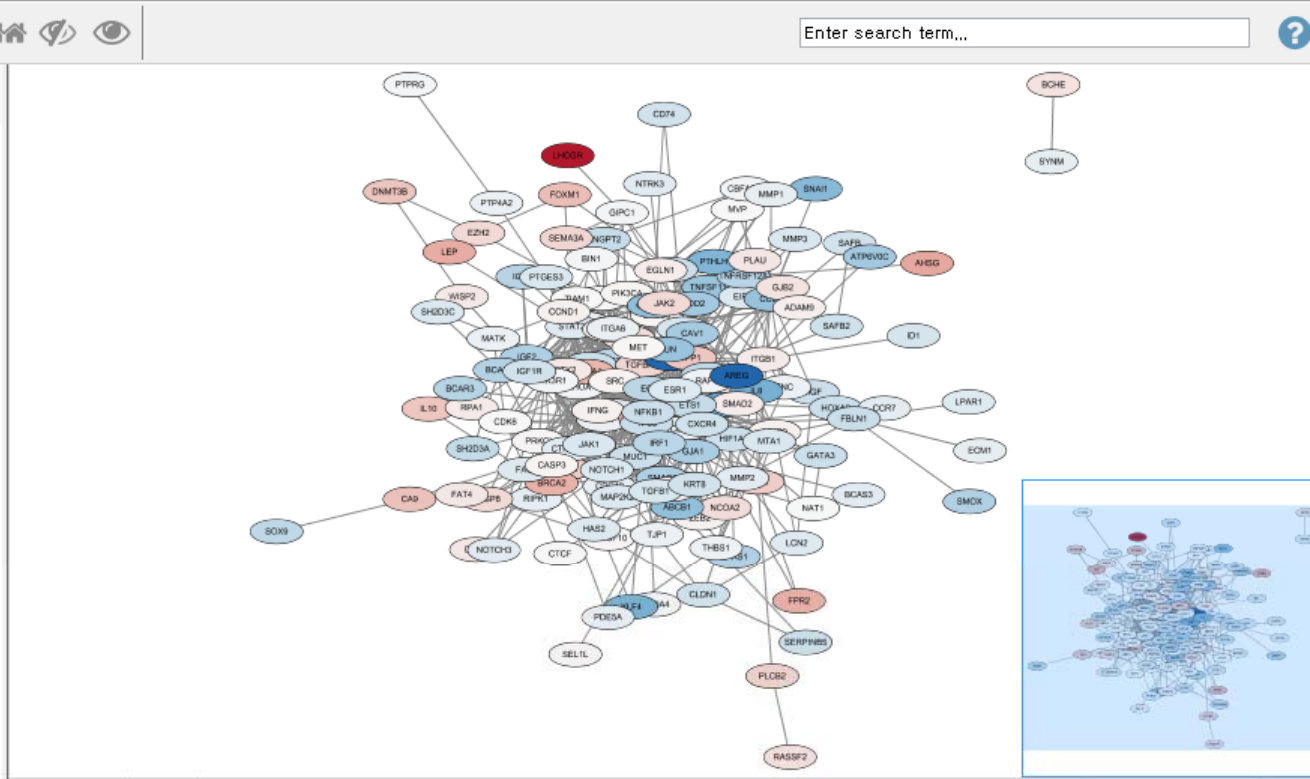
Size

255 Transparency

75.0 Width

Lock node width and height

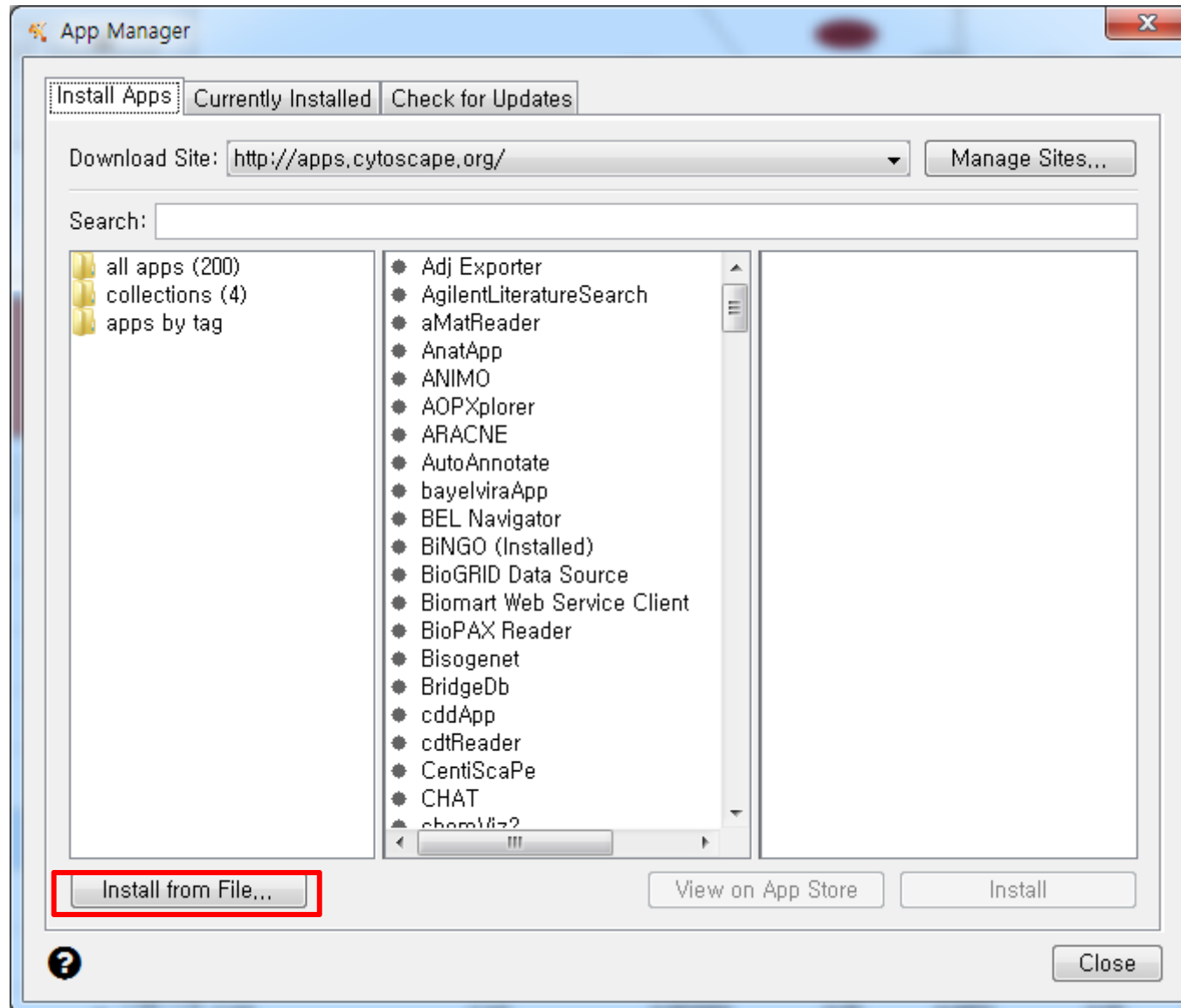
Node Edge Network



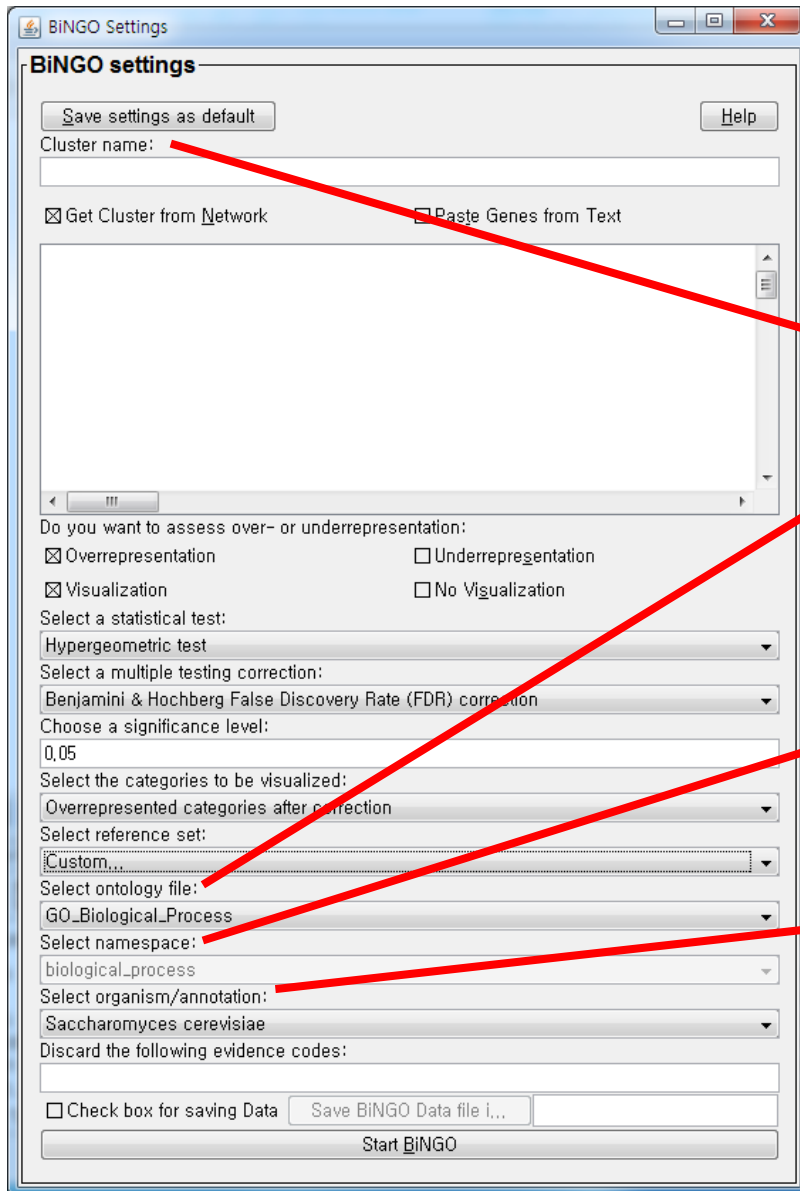
shared name	name	NBSexp	NBSsig	TNBCex	TNBCsig	LOG2FOI	LOG2FOI
SOX9	SOX9	61,9038	0,05	11,3503	0,05	-2,44729	5,0E-5
CA9	CA9	0,853059	0,05	4,9453	0,05	2,53534	9,5E-4
AHSG	AHSG	0,0192584	0,05	0,26204	0,05	3,76623	1,0
TNFRSF12A	TNFRSF12A	160,485	0,05	24,3461	0,05	-2,72067	5,0E-5
LPAR1	LPAR1	13,0109	0,05	6,25104	0,05	-1,05756	0,014
FBLN1	FBLN1	149,738	0,05	38,5576	0,05	-1,95735	5,0E-5

# Installing BINGO

1. Apps → App manager → Install from File → BINGO.jar



# Running BINGO



1) Select all genes in the network (Ctrl + A)

2) Apps → BINGO

3) BiNGO settings

Type cluster name : any names

Select ontology file : →  
custom : " file gene\_ontology\_ext.obo"

Select namespace → ---

Select organism/annotation →  
custom " file : GOBP.BiNGO.txt"

Session: New Session

File Edit View Select Layout Apps Tools Help

Control Panel

Network Style Select

Enter search terms for NDEx...

1 of 2 Networks selected

- testnet.sif
  - testnet.sif 156 616
- cococo
  - cococo 1184 2158

Table Panel

cococo

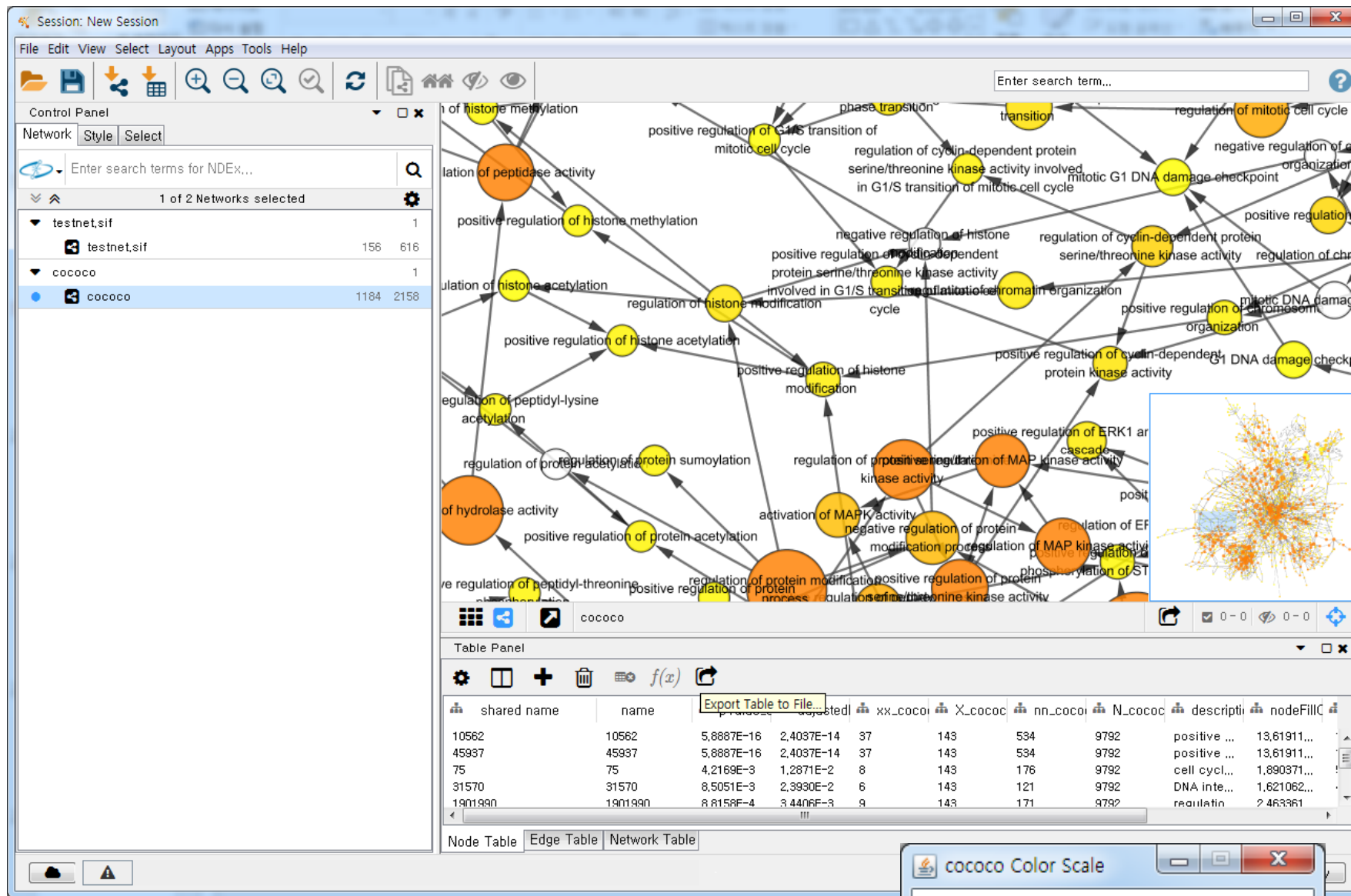
BINGO output

cococo

GO: Homo sapiens. Biological Process. unknown. unknown close

GO-ID	Description	p-val	corr p-val	cluster freq	total freq	genes
<input type="checkbox"/> 48522	positive regulation of cellular process	1.3329E-30	3.3190E-27	95/143 66.4%	2140/9792 ...	ITGB1 CDKN1A ECM1 PTEN BRCA1 CTCF BRCA2 FOXM1 ETS1 TNF I...
<input type="checkbox"/> 48518	positive regulation of biological process	1.6067E-27	2.0004E-24	97/143 67.8%	2439/9792 ...	ETS1 TNF IGF1R GJA1 CCND1 CHEK2 TNFSF10 AKT1 TNFSF11 SOX9...
<input type="checkbox"/> 42221	response to chemical	1.1041E-26	9.1640E-24	84/143 58.7%	1831/9792 ...	BCAR3 ITGB1 CDKN1A PTEN BRCA1 ETS1 TNF IGF1R CASP8 CCND1...
<input type="checkbox"/> 70887	cellular response to chemical stimulus	6.1062E-25	3.8011E-22	70/143 48.9%	1313/9792 ...	CDKN1A PTEN BRCA1 TNF IGF1R CASP3 AKT1 TNFSF11 CA9 SOX9 ...
<input type="checkbox"/> 10033	response to organic substance	4.0282E-24	2.0060E-21	66/143 46.1%	1194/9792 ...	CDKN1A PTEN BRCA1 TNF IGF1R CASP8 CASP3 AKT1 TNFSF11 SOX...
<input type="checkbox"/> 48583	regulation of response to stimulus	1.8223E-23	7.5624E-21	78/143 54.5%	1742/9792 ...	ITGB1 CDKN1A ECM1 PTEN BRCA1 FOXM1 TNF IGF1R GJA1 CASP8 ...
<input type="checkbox"/> 48584	positive regulation of response to stimulus	5.2031E-23	1.7482E-20	56/143 39.1%	876/9792 8...	ECM1 PTEN BRCA1 FOXM1 TNF GJA1 CASP8 TNFSF10 TNFSF11 CC...
<input type="checkbox"/> 71310	cellular response to organic substance	5.9655E-23	1.7482E-20	60/143 41.9%	1021/9792 ...	CDKN1A PTEN BRCA1 TNF IGF1R CASP3 AKT1 TNFSF11 SOX9 RAC1...
<input type="checkbox"/> 71363	cellular response to growth factor stimulus	1.5612E-22	3.2395E-20	46/143 32.1%	576/9792 5...	CDKN1A SRC PTEN PIK3R1 GATA3 BRCA1 TNF PRKCZ THBS1 EGFR ...
<input type="checkbox"/> 9611	response to wounding	8.6795E-23	2.1612E-20	47/143 32.8%	597/9792 6...	ITGB1 SRC TNC CXCR4 FPR2 PIK3R1 GATA3 TNF PRKCZ THBS1 CD...
<input type="checkbox"/> 70848	response to growth factor	1.0775E-22	2.4390E-20	41/143 28.6%	435/9792 4...	CDKN1A NOTCH1 SRC PTEN PIK3R1 PRKCZ EGFR ERBB3 CASP3 ER...
<input type="checkbox"/> 9719	response to endogenous stimulus	1.7359E-22	3.3248E-20	68/143 47.5%	1358/9792 ...	CDKN1A SRC PTEN PIK3R1 GATA3 BRCA1 TNF PRKCZ THBS1 EGFR ...
<input type="checkbox"/> 31325	positive regulation of cellular metabolic process	1.7359E-22	3.3248E-20	68/143 47.5%	1358/9792 ...	CDKN1A PTEN BRCA1 CTCF BRCA2 FOXM1 ETS1 TNF IGF1R CASP8...
<input type="checkbox"/> 50896	response to stimulus	3.6028E-22	6.1286E-20	114/143 79...	3949/9792 ...	TNC ETS1 TNF IGF1R CCND1 PLAU CHEK2 TNFSF10 AKT1 TNFSF11 ...
<input type="checkbox"/> 1902531	regulation of intracellular signal transduction	3.6920E-22	6.1286E-20	52/143 36.3%	775/9792 7...	ECM1 PTEN FOXM1 TNF IGF1R GJA1 CASP8 TNFSF10 TNFSF11 RAC...
<input type="checkbox"/> 9967	positive regulation of signal transduction	4.6197E-22	7.1894E-20	45/143 31.4%	562/9792 5...	ECM1 SRC FPR1 LPAR1 CXCR4 GATA3 TNF PRKCZ THBS1 EGFR G1...

Select All Unselect All Select nodes



Corrected p value

# Report

Assignment : Draw given Network with Cytoscape on your own.

## Things to include

1. Date of the experiment and the day (Tue, Wed, Thur, Fri)
2. Results with “figures of your own” (**1 network file with gradient color, 1 with BINGO output**)
3. Discussion
4. References

## Discussion should include :

- What the network visualization tells you.  
(What information does the network give you? What can you tell from the expression data and function enrichment analysis using Bingo?  
→ No correct answer for this. Just write what you think )
- Other type of visualization may give you additional points. If you have made modifications, describe what you have done in the report

Data to draw the network can be found in : [www.netbiolab.org](http://www.netbiolab.org) → teaching

Find Cytoscape at : [www.cytoscape.org](http://www.cytoscape.org)



# Report

Lab Address: Science Research Center (과학원) S323 Questions:

월, 목 분반: 조재원 (dreadcupper@naver.com)

화, 금 분반: 김찬영 (vxterran@gmail.com)

**Due date : Experiment date → Due date**

월요일 분반 (4/9) → 4/23 (18:00)

화요일 분반 (4/10) → 4/24 (18:00)

목요일 분반 (4/5) → 4/19 (18:00)

금요일 분반 (4/6) → 4/20 (18:00)