User Manual and Case Studies

**Drivergene.net: A Cytoscape app for the identification of driver nodes of large-scale complex networks and case studies in discovery of drug target genes.**

**Duc-Tinh Pham1,2*,*** **Tien-Dzung Tran1,3\***

1Complex Systems and Bioinformatics Lab, Hanoi University of Industry, Hanoi, Vietnam.

2Gruduate University of Science and Technology, Vietnam Academy of Science and Technology, Hanoi, Vietnam.

3Faculty of Information and Communication Technology, Hanoi University of Industry, Hanoi, Vietnam.

\*Corresponding: TD Tran ([trantd@](mailto:trantd.vn@)haui.edu.vn)

**Table of Contents**

[1. The computational speed of Drivergene.net on various biomolecular networks. 2](#_Toc166653193)

[2. Installation 2](#_Toc166653194)

[2.1. Install Cytoscape 2](#_Toc166653195)

[2.2. Install the Drivergene.net app 2](#_Toc166653196)

[2.3. Drivergene.net software interface 3](#_Toc166653197)

[2.4. Import example data 4](#_Toc166653198)

[2.5. Compute total support by Drivergene.net 5](#_Toc166653199)

[2.6. Output computation results 7](#_Toc166653200)

[2.7. Output data processing 8](#_Toc166653201)

# 1. The computational speed of Drivergene.net on various biomolecular networks.

|  |
| --- |
|  |
| Fig S1. The computational performance of Drivergene.net.  The computation is executed in two computation modes: sequential on the CPU and parallel on multi-core CPUs. The results show that the computational speed is improved significantly in the parallel algorithm. The x-axis is time and y-axis is geomean of node and edge. This graph help the users to know the effectiveness of software. |

# 2. Installation

## 2.1. Install Cytoscape

- Drivergene.net-1.0 can run on Cytoscape 3.7.1 (or later) platform, which has Automation features, therefore the user should download this version at <http://cytoscape.org/>

- Cytoscape needs JRE to run, therefore download JRE version 8. x or later from

<http://www.oracle.com/technetwork/java/index.html>and install it.

- Install Cytoscape to the root folder (e.g., /Applications/Cytoscape\_v3.7.1).

## 2.2. Install the Drivergene.net app

Download the Drivergene.net-1.0.jar file from https://github.com/tinhpd/Drivergene.git

Then, install it by going to Apps →App Manager…. After that, choose Install from file…, then browse the downloaded Drivergene.net-1.0.jar file. (Figure 1).

|  |
| --- |
|  |
| **Fig S3**. Install Drivergene.net app |

***Note that***: Drivergene.net-1.0 can work on Windows, Ubuntu and Mac OS. The following manual was prepared when running Drivergene.net on Windows.

# 2.3. Drivergene.net software interface

Drivergene.net is developed in a Java programming environment and is compiled and packaged separately as a plug-in for Cytoscape. Drivergene.net can be run on any system where Java Virtual Machine is installed, including Windows, Ubuntu, and Mac OS.

|  |
| --- |
| Graphical user interface, text, application  Description automatically generated |
| **Fig S2**. Screenshot of Drivergene.net. |

After installing, Drivergene.net will be automatically loaded in the App menu of Cytoscape.

|  |
| --- |
| Ảnh có chứa văn bản, ảnh chụp màn hình, phần mềm, Biểu tượng máy tính  Mô tả được tạo tự động |
| **Fig S4**. Drivergene.net loaded in the App menu of Cytoscape |

# 2.4. Import example data

The example data are made available at https://github.com/tinhpd/Drivergene.git

**Step 1**. Open Cytoscape

**Step 2**: Load data sets (target gene interactions network)

- From the Cytoscape menu, select submenu File -> Import -> Network from file ( Figure 3)

|  |
| --- |
|  |
| **Fig S5.** Load data sets |

- Select file → Open. (Fig 5)

|  |
| --- |
|  |
| **Fig S6**. Select and open file |

- Next, specify the Start and End columns for the data.

|  |  |
| --- | --- |
|  |  |
| **Fig S7**. Specify the Start and End columns for the data | |

# 2.5. Compute total support by Drivergene.net

**Step 1**. Select an example data set from the left panel

**Step 2**. Select Apps menu of Cytoscape→ submenu Drivergene → 1) Compute Total Support. (Figure 6)

|  |
| --- |
|  |
| **Fig S8**. Drivergene.net loaded in the App menu of Cytoscape |

**Step 3**. Choose an execution mode. (Figure 7)

Drivergene.net provides three execution modes

- Sequence: executing in sequential on CPU

- Parallel: executing in parallel on CPUs

- Multi-Parallel: executing in parallel on all computing devices

|  |
| --- |
|  |
| **Fig S9**. Choose execution modes |

**Step 4.** Click execute for computing

|  |
| --- |
|  |
|  |
|  |
| **Fig S10.** Computing the total support of nodes on the network to each network node. |

The actual computing time for the entire network is displayed after the computing is finished. (Figure 9).

|  |
| --- |
|  |
| **Fig S11.** The actual computing time for the entire network is displayed |

# 2.6. Output computation results

After the computing is finished, click Node table tap → Export Table to file. (Figure 10)

|  |
| --- |
|  |
| **Fig S12**. Export computation results |

Select the path and set the file name, the default file name is the import data file name with the extension is csv. (Figure 11)

|  |
| --- |
|  |
| **Fig S13**. Set the path and file name |

# 2.7. Output data processing

**Step 1**. Open file .csv

**Step 2**. Split data into columns: Select column data → select menu Data → Text to columns → Dilimited → Next → Other → input ‘;’ →Next → Finish

**Step 3**. Sort data descesding by total support columns value

|  |  |  |
| --- | --- | --- |
| Table  Description automatically generated  A | Table  Description automatically generated  B | A picture containing text, crossword puzzle  Description automatically generated  C |

**Fig S14**. Sort data descesding by total support value

A) Molecule Signal Network. B) Protein-protein Interaction Network. C) Gene Regulatory Network