

# Home Assignment 6

## “Analyzing an Experimental Social Network”

20.11.2007

**Tasks:**

*Preparation:* Get familiar with [www.ning.com](http://www.ning.com)'s REST API, Pajek and the Pajek .net Format (for resources, see the lectures slides).

1. Develop a java program that accesses the entire social network's data (all nodes and edges) from [www.webscience.ning.com](http://www.webscience.ning.com) through Ning's REST API, and writes the graph into a Pajek entire-ws-network.net file. In all examples, the nodes' labels in Pajek should correspond to the Ning *UserIDs*. To construct the entire social network, you need to
  - Write an authentication service for webscience.ning.com
  - use the ning\_member\_list.txt file provided and query the network of each user
2. Develop a java program that creates the ego-centred network of your ning-userID (only your node, your friends' nodes and *all* corresponding edges), and writes the graph into an ego-centred-XYZ.net file (replace “XYZ” with your userID)
3. Load the two files into Pajek. Using Pajek, draw the network for both files and put their screenshots into a single screenshots.bmp file.
4. Using Pajek (“Net” menu entry) and your two Pajek files,
  - calculate the average degree  $k$  of entire-ws-network.net
  - draw the degree distribution of entire-ws-network.net  
*Hint: use Net --> Partitions --> Degree --> All. A new entry will appear in the Partition box. Save the partition information (save button) and import it subsequently into e.g. Excel*
  - calculate the diameter  $d$  (the longest shortest path) of entire-ws-network.net
  - calculate the clustering coefficient  $C$  (Pajek CC1) for your ego-centred-XYZ.net
5. Create a network entire-ws-network-directed.net derived from entire-ws-network.net where each undirected edge is replaced by a directed edge. The direction of the edge is determined by the alphanumeric order of ning-userIDs (e.g. “gabizp” → “mstrohm”, and “123MUSTERMAN” → “ALEXMUSTER”, but “456MUSTERMAN” ← “123MUSTERMAN”, ignoring upper and lower case)
6. Develop a java program that calculates the primitive PageRank over entire-ws-network-directed.net over 3 iterations ( $k_0$ - $k_2$ ), and write the results for all  $r_k(P_i)$  into a pageRank.txt file.
7. Using the configuration model, develop a java program that generates a simplified random network with the degree distribution listed below and writes the output into a random-network.net file.

Number of nodes (frequency)	With degree
1	0
1	1
2	3
1	4
5	5
3	6
4	7
4	8

**Bonus Tasks (no points):**

- be creative with layout parameters in your .net files (e.g. colors, etc)
- Develop a mash-up (a service combining other web services such as Google Maps) based on the webscience.ning.com data and API. For inspiration see <http://www.programmableweb.com/matrix>, <http://www.programmableweb.com/popular>

**Your submission must include:**

- All of your code
- The Pajek .net file that includes the entire social network data (entire-ws-network.net)
- The Pajek .net file that includes the ego-centred social network data related to your userID (ego-centred-XYZ.net) - replace “XYZ” with your userID
- A screenshot of both networks contained in entire-ws-network.net and ego-centred-XYZ.net in a single screenshots.bmp file
- Results of your calculations (results.txt, degreeDist.bmp)
- The Pajek .net file that includes the directed network entire-ws-network-directed.net
- Primitive PageRank results (pageRank.txt)
- At least two different simplified random graphs generated by your program (random-network1.net, random-network2.net)

**Prefix all of your submission and source code files** with your last name and Matrikelnummer (e.g. Musterman\_9945222\_entire\_ws\_network.net)

**Files provided:**

- Results.txt, containing a skeleton for structuring your calculation results
- Ning\_member\_list.txt, containing a list of all UserIDs that need to be considered
- WSWT\_HW6\_Skeleton.java, containing the skeleton for structuring your code

The files are available at:

[http://kmi.tugraz.at/staff/markus/courses/707.000\\_web-science/ha6.zip](http://kmi.tugraz.at/staff/markus/courses/707.000_web-science/ha6.zip)

**Policies:**

- All results have to be submitted in Java programming language, and need to be structured according to WSWT\_HW6\_Skeleton.java
- Keep the social graph unaltered - A penalty will apply for adding/deleting friendship relationships on webscience.ning.com after Nov 20<sup>th</sup>, 20:00
- Any potential changes to /clarifications of this assignment will be announced in the course newsgroup and on the course website. It is your responsibility to obtain them.
- **Deadline for submissions is January 8<sup>th</sup>, 2007, 14:15**  
Send an email to [gabriele.zorn-pauli@tugraz.at](mailto:gabriele.zorn-pauli@tugraz.at) with subject “[WSWT] HW 6 <Matr.nr>” including your results in an archive **WSWT\_HW6\_<Matr.nr>.zip**.  
If you have send a correct formatted email than you will receive an acknowledgement within a few minutes about your successful delivery.