

Dear Student of the Network Science course,

First of all, please note, that this is an e-course.

All course materials can be found here:

<http://www.linkgroup.hu/education.php>

For the completion of the course a 5 to 10 page essay is needed.

The deadline of submission of this essay is July 10th.

However, you may submit it any time before,

please do not leave the submission until the very last days.

Please find detailed instructions how to write this essay below.

1. Preparation to write the essay

To write the essay you should read these 3 basic papers/books first:

<http://barabasi.com/networksciencebook/>

http://linkgroup.semmelweis.hu/weaklinks_EN.php

<http://linkgroup.semmelweis.hu/docs/13PharmTher.pdf>

English slides of the lectures can be downloaded and the **voice recording of the lectures can be accessed here:** <http://www.linkgroup.hu/education.php>

The essay should use minimum 3 additional research paper references besides the 3 compulsory references listed above. You may explore these additional papers by finding the papers cited in the above 3 works, or by searching PubMed here:

<https://www.ncbi.nlm.nih.gov/pubmed/advanced>

(changing All Fields to Title+Abstract and using phrases in quotation marks, like "signaling network" will help to reduce the number of papers found)

or Google Scholar here <http://scholar.google.com>

Papers found can be downloaded from <http://scholar.google.com> or from <http://sci-hub.se>

2. Format requirements

Please note that larger font size than 12 and larger space between lines than double spaced, as well as larger margin than one inch (2.5 cm) can not be used. Also note, that the space of figures should be deducted from the length reaching the minimal 5 pages. Besides these there is no particular format-requirement of the essay. (However, well-formatted, "neat" essays will reach a higher grade.) Pictures and Tables are most welcome but please make sure that they are substantiating your message and are not just illustrations. Please cite the original source of Figure/Table. (If you make your own pictures and tables, these will upgrade the mark given to your work.)

If you want a higher mark, please make sure that you cited all references used in the paper and applied the same style for all references like e.g. this one:

1. Csermely P, Korcsmáros T, Kiss HJ, London G, Nussinov R. (2013) Structure and dynamics of molecular networks: a novel paradigm of drug discovery: a comprehensive review. *Pharmacol Ther.* 138: 333-408.

3. Definition of the „new idea” which should be included to the essay

Your essay MUST contain a new idea. "New idea" means that you should make a summary of a certain, network related-topic using your own words summing up related segments of the 3 papers above and combining the 3 additional research papers to your arguments.

Feel free to formulate open, research questions (you may find some of these open questions in my book, try to find similar ones), or expose an idea as a possible solution to a network-based problem, based on the literature evidence you read and cited in your essay. Please note that simple summaries of 3+3 papers will not be accepted. These also mean that the title and content of the essay is up to your decision. However, please note that the essay has to be linked to networks. Otherwise it will be rejected and you have to submit a new one, to get a valid mark.

Potential solutions to these requirements are found at the end of this description.

4. Definition of „network-related”

"Network-related" means here that you have to apply the basic concepts and definitions of network science found in the 3 intro papers above (such as hubs, small-world-ness, modules, bridges, bottlenecks, network core/periphery, hierarchy etc. etc.) to a specific network or a specific field described in the additional 3 papers as references.

5. Specific warning about copy-pasted sentences and copying essays

Essays which contain copy-paste parts of published material will be rejected. Please note that your essay should not contain ANY copy-pasted sentence from the internet. Please note that copying an essay of another student is a serious ethical misconduct for both the student who copied, and the student who allowed to get his/her essay to be copied. Therefore, the student whose essay was copied will have his/her formerly achieved mark revoked (please do not share your essay file; if you do this despite this warning please make sure that you warn the other student that copying any part of that is a serious ethical misconduct which will be penalized to both). In more serious cases an official report will be filed to the Dean of the respective Faculty asking for the start an official procedure by the university to examine the misconduct. **Please note that ALL essays submitted will be a subject of an automatic computerized cross-check against ALL essays submitted ever before in this course. Therefore copying any sentence from any former essay will be automatically detected.**

6. Sample essays receiving a mark "5" before

Please find at this webs page 5 sample essays receiving a mark "5" before:

<http://linkgroup.hu/education.php>

-----Addendum-----

In an ideal case, your essay containing novel idea should have 3 parts:

Part A sums up some major concepts of network structure or dynamics such as hubs, modules, bridges, hierarchy, core/periphery or network perturbations, spread in networks, jams in networks, damage of networks, attractor changes of networks etc. etc. This can be done using the 3 basic literature I gave. This should be 1 or 1.5 pages.

Part B sums up the properties of a selected network which may be chosen as a reference paper from the 3 basic literature or any other network of your choice including e.g. the network of your own friends. This is already a "new idea" since the selection and description of the real-world network is your own work. This should be 1 or 1.5 pages.

Part C is the really "new idea", where you apply the basic concepts described in part A to the network described in part B. If the network was analyzed in the original paper from one point of view already (like hubs) please extend your rational to judge the potential other properties

of the network like modules, bridges etc. If some of you may want to measure these (which is NOT necessary) you may download programs for this here <http://linkgroup.hu/links.php#Networkanalysis> and network data from here <http://linkgroup.hu/links.php#Networkdatasets>
Part C should be 2 to 3 pages.

Alternatively, you may assess some properties of a network. Network data can be found here <http://linkgroup.hu/links.php#Networkdatasets> (You may also evaluate your own friendship network, too.)
Network analysis methods can be found here <http://linkgroup.hu/links.php#Networkanalysis>
In this case please make some arguments evaluating the data you received.

Only a "soft copy" of your essay is needed to be sent to csermelynet@gmail.com until July 10th the latest. Please do not leave the submission to the last days you may submit your essay already tomorrow.

Do not hesitate to contact me at the above email address if you have further questions.

Prof. Peter Csermely