CITS4403 Computational Modelling

Semester 1, 2019

Project Description

Project Details

- Worth: 30% of the final grade
- Due: Wednesday May 24 2019 (before 11:59pm AWST)

  via LMS
- Must be undertaken in groups of 2-5 (discuss with the coordinator if group size may differ from the specified)
- Submit Zipped Folder containing: Jupyter notebook version (including output), PDF version of report, presentation slides, and supporting data
- We will have 10 minute presentations in class in the last 2 weeks of classes

Project Description

- Your task is to identify a scientific publication and write your own new study (reproduce researchers' findings or a portion of their findings) in roughly the same format as your book chapters. In other words, discuss a natural or theoretical phenomenon, your model of it, briefly mention other possible approaches, an implementation of your model (via Python), some experiments conducted via computational modelling, observations and any big picture remarks.

  Report length: 6-10 pages.

- 10 minute presentation in the last 2 weeks of classes

More descriptions

- Your project must be in Complexity Science
- present a paper, reimplement an important experiment, discuss the results, and explain their context. Original research is not necessary, but you could try extend existing results.
- Alternatively, feel free to construct your own model of a phenomenon but check what similar research has been done.

Make sure you include

- Use Jupyter notebook to combine your report, code, explanations, results, and observations.

  If you need to use another language, such as R if you are working with VIPER discuss with the coordinator!
- If you use an algorithm or data structure make sure to make a comment and discuss it in the report
- If you use a feature of Python or a module you should discuss it
- acknowledge clearly the use of any code from the textbook, internet or elsewhere

Marking Criteria

- Correctness - Design, Implementation, Experiment Details, Documentation and Reproducibility: 50%
- Discussion - References and Background, Discussion of Experiments, Conclusions, next steps, Bigger Picture: 30%
- Presentation (Written, Seminar): 20%

Where to look

- Barabasi's Lab Publications (many to choose from!):

  http://barabasi.com/publications
- VIPER: http://wiki.c2b2.columbia.edu/workbench/index.php/Viper_Analysis#Alvarez
- http://snap.stanford.edu/
- Natalia Komarova: https://www.math.uci.edu/~komarova/
- Cesar Hidalgo: https://www.media.mit.edu/people/hidalgo/publications/
- Conference on Complex Systems: https://necsi.edu/iccs-2018#speakers

- Data is commonly provided in Supplementary Files
- https://www.ncbi.nlm.nih.gov/pubmed

Where to look

Dynamic molecular changes during the first week of human life follow a robust developmental trajectory

Amy H. Lee [1], Casey P. Shannon [2], Nelly Amenyogbe[3,25], Tue B. Bennike [4,5,6], Joann Diray-Arce[5,6],

Functional characterization of somatic mutations in cancer using network-based inference of protein activity

Mariano J Alvarez[1,2,9], Yao Shen[1,2,9], Federico M Giorgi[1], Alexander Lachmann[1], B Belinda Ding[3], B Hilda Ye[3] & Andrea Califano[1,4–8]

SCENIC: single-cell regulatory network inference and clustering

Sara Aibar[1,2], Carmen Bravo González-Blas[1,2], Thomas Moerman[3,4], Vân Anh Huynh-Thu[5], Hana Imrichova[1,2], Gert Hulselmans[1,2], Florian Rambow[6,7], Jean-Christophe Marine[6,7], Pierre Geurts[5], Jan Aerts[3,4], Joost van den Oord[8], Zeynep Kalender Atak[1,2], Jasper Wouters[1,2,8] & Stein Aerts[1,2]

What's next

- In Week 5 – identify a project (eg: paper and data) and discuss the feasibility with the lecturer
- We will allocate 15-20 min at the end of class in Week 5, we can continue discussing during the Workshop time

- In Week 6 – provide a written project description (no more than 1 page)
- Problem overview, why it is important (maybe to you only), what you will do, what data is available, links to the publication (if applicable), link(s) to the data

- Week 7 – In-class Test 1!