Aalto University
School of Science
and Technology

CS-E5745
Mathematical Methods for Network Science

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Learning goals

- Knowledge of the most common mathematical methods in network science
- Improved skills for doing pen and paper calculations especially related to methods commonly used in network science
- Increased ability to justify the use of particular analytical techniques
- Increased confidense when reading more mathematical networks articles

Learning methods

- Learn by doing exercises!
  - Lots of hints and guidance: exercise seem very long
  - If you get stuck, ask help.
- Lectures support exercises, not vice versa.
  - Exercises are published before lectures, start working on them immediately
- Project: make sense of a relatively recent research paper
  - More info on the project later

Lecture topics

1. Basic models and the typical approaches in network science
2. Probability generating functions, Galton-Watson process, percolation threshold
3. Component size distributions (using PGF's)
4. Network evolution models and processes on networks
5. Exponential random graphs, block models
6. Special topics: multilayer networks (?)

Reading material

Main course book Networks: An Introduction, *M.E.J. Newman* (2010 or 2018)

More mathematical approach Random Graphs and Complex Networks, *R. van der Hofstad* (2016-2017)

`http://www.win.tue.nl/~rhofstad/NotesRGCN.html`

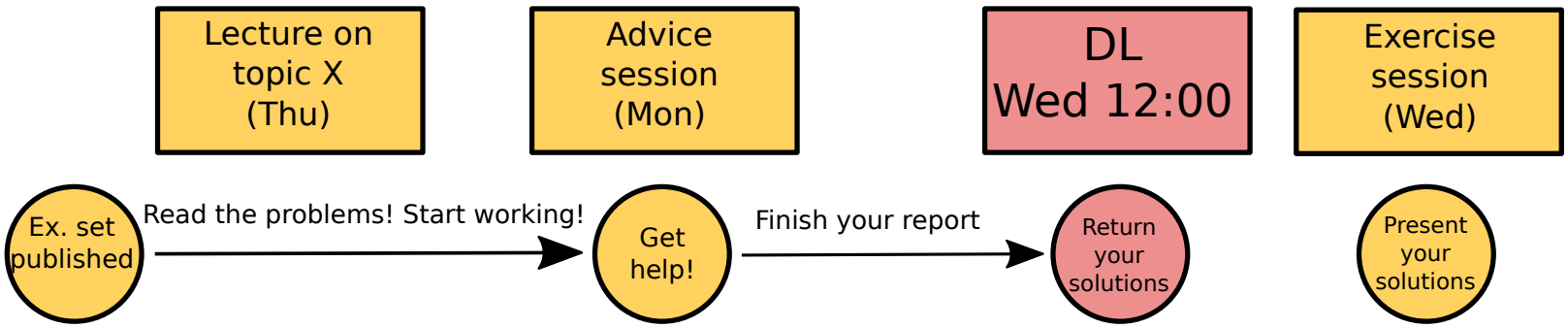
Exercise sessions

Monday session at 14.15: Assistant answers questions and gives help. Good time and place to work on the exercises, but maybe too late to start working on them!

Wednesday session at 12.15: Students present their solutions. **Mandatory pariticipation!** Only solutions which are returned before the deadline 12.00 on Wednesday *and* marked as (at least partially) done in the exercise session will be graded.

- Note that the course has no exam so all the work is in doing the exercises.

Weekly schedule



Information on the practicalities

- See the *practicalities* document in the MyCourses page.