

# course *logistics*

advanced topics in *network science* (*ants*)

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University of Ljubljana  
spring 2019/20

# course *design*



## elective courses on **NETWORKS** in 2019/20

Networks or graphs are ubiquitous in everyday life. Examples include online social networks, the Web, references between WikiLeaks cables, Supervisor, terrorist affiliations, LPP bus map, plumbing systems and your brain. Many such real networks reveal characteristic patterns of connectedness that are far from regular or random. Networks have thus been a prominent tool for investigating real-world systems since the 18th century. However, while small networks can be drawn by hand and analyzed by a naked eye, real networks require specialized computer algorithms, techniques and models. This led to the emergence of a new scientific field about 20 years ago...

### INA

[Introduction to] Network Analysis

### MLG

Machine Learning with Graphs

### ANTS

Advanced Topics in Network Science

#### Network analysis concepts and techniques

Course code **63545B** | eUcilenica #**183**  
**MSc** students | Lecturer Lovro Šubelj  
**Summer semester** | Starts **Feb 17, 2020**  
Introductory 15 week course to get started

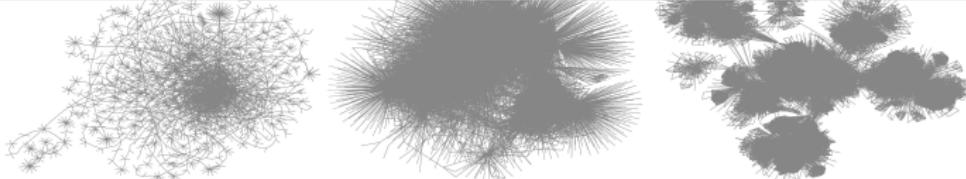
#### Modern analysis of large-scale real networks

Course code **63225B** | eUcilenica #**66**  
**MSc** students | Lecturer Jure Leskovec  
**Winter semester** | Starts **Sep 24, 2019**  
Fast pace 10 week course by a leading expert

#### Thorough review of modern network science

Course code **63835A** | eUcilenica #**170**  
**PhD** students | Lecturers Šubelj & Leskovec  
**Summer semester** | Starts **Mar 2, 2020**  
Research-oriented 12 week course & invited talks

Course enrollment is not possible in order from right to left | lovro.sobelj@fri.uni-lj.si

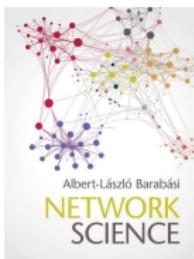


# course *overview*

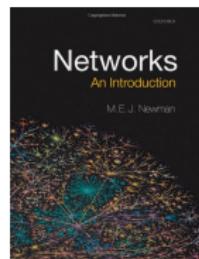
- main *course objective*
  - *graph theory* vs *network science*
  - present rich set of *network science tools*
  - *theoretical foundations* and *practical applicability*
- high-level *course outline*
  1. fundamental *concepts* and *techniques*
  2. selected *advanced topics* (not in-depth)
  3. *invited talks* (physics, mathematics, sociology)
- *prerequisites* and *background*
  - clearly identified *PhD topic* and problem
  - *linear algebra*, *probability theory* and *statistics*
  - good *programming skills* (C/C++, Python, Java)

# course *literature*

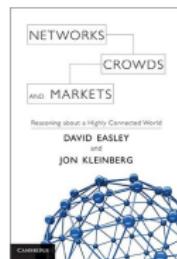
- *handouts/printouts* as *notes*
- *book chapters* as *background reading*
- *scientific papers* as *further readings*



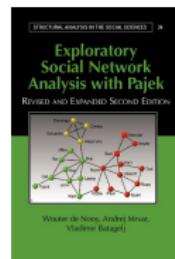
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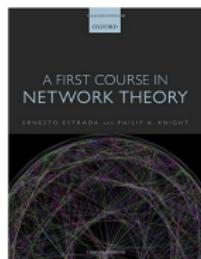
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[EK10]



[dNMB11]



[EK15]

## course *schedule*

- course *syllabus* online
- weekly *course schedule*
  - *lectures* on *Thursdays at 4:00pm*
  - *consultations* on *Thursdays at 6:00pm*
  - *office hours* on *Thursdays at 3:00pm*
- course *communication*
  - classroom and consultations
  - *questions* and *comments* on *Piazza*
  - *announcements* on *eUcila*
  - avoid private e-mails!

## course *coursework*

- *course lectures and book chapters*
- keep *reading list* of *scientific papers*
- *ongoing topics* within *weekly challenges*
- substantial *course project*
  - network science applied to own PhD research
  - empirical evaluation, derivation or implementation
  - *project proposal*, *milestone report* and *final paper*
  - eight-page *scientific paper submitted* (to arXiv.org)
- informal *project presentations*
  - *PhD topic*, *project proposal* and *milestone report*
  - final *project presentation* (in front of *INA students*)
  - possible *faculty talk* (within *Cookie/AI* seminars)

## course *grading*

- course *grade breakdown*
  - 15% on *project proposal*
  - 25% on *project milestone*
  - 40% on *project paper*
  - 10% on *presentations*
  - 10% on *commitment*
  - possible *oral exam*
- course *assignments submission*
  - typed on computer in English
  - *hard-copy* in *submission box* (grading)
  - *electronic version* to eUcilaNica (archive)
  - *cover sheet* with signed *honor code*
  - *late days twice* in semester

# course *deadlines*

- *assignments* due on *Thursdays at 3:00pm*
- *late days* expire on *Tuesdays at 3:00pm*
- *presentations* on *Thursdays at 6:00pm*

week	lectures	presentations	assignments
1			
2			
3			
4			
5	<i>fundamentals of network science</i>	<i>PhD</i> (Mar 19th)	
6			
7		<i>proposal</i> (Apr 2nd)	
8			<i>proposal</i> (Apr 9th)
9			
10			
11	<i>advanced topics in network science</i>	<i>milestone</i> (Apr 30th)	
12			<i>milestone</i> (May 7th)
13			
14			
15	<i>applications of network science</i>	<i>project</i> (May 28th)	
16			<i>paper</i> (Jun 4th)
...			

# course *references*

-  A.-L. Barabási.  
*Network Science*.  
Cambridge University Press, Cambridge, 2016.
-  Wouter de Nooy, Andrej Mrvar, and Vladimir Batagelj.  
*Exploratory Social Network Analysis with Pajek: Expanded and Revised Second Edition*.  
Cambridge University Press, Cambridge, 2011.
-  David Easley and Jon Kleinberg.  
*Networks, Crowds, and Markets: Reasoning About a Highly Connected World*.  
Cambridge University Press, Cambridge, 2010.
-  Ernesto Estrada and Philip A. Knight.  
*A First Course in Network Theory*.  
Oxford University Press, 2015.
-  Mark E. J. Newman.  
*Networks: An Introduction*.  
Oxford University Press, Oxford, 2010.