CORSI DI LAUREA MAGISTRALE IN
INGEGNERIA INFORMATICA

SOCIAL NETWORKS ANALYSIS

Course Presentation

Teachers: Vincenzo Auletta
Diodato Ferraioli

Logistics

- Lecture Schedule
  - Monday 11.00 - 12.40 - room 21
  - Wednesday 10.10 - 12.40 - room 21

1 academic hour = 50 minutes
All lectures will be offered in presence

- Office Hours (see at rubrica.unisa.it)
  - Due to security prescriptions office hours will be done only online
  - You're suggested to ask for an appointment by e-mail

- Contact informations available on the rubrica di Ateneo
  - Auletta: http://docenti.unisa.it/vincenzo.auletta
  - Ferraioli: http://docenti.unisa.it/diodato.ferraioli

How to Contact Us

- During the lectures' breaks
- In the office hours
- Forum on the elearning platform
- By email
  - Request for an appointment
  - Request for explanations
  - Request for anything related to the course
    - We cannot guarantee an answer, it depends on the question!!
  - **We don't answer to messages that are not signed**

Learning Objectives

- The course aims to give students tools and methodologies to better understand and control phenomena in highly connected networks, with particular emphasis on online social and information networks

- Main tools
  - Graph Theory to describe and analyze the structure of the networks
  - Game Theory to model strategic behaviours of agents
  - Coding in Python to run experiments on API and datasets publicly available on the Internet

- Knowledge and understanding
  - Network mining: techniques to automatically extract information on the network from its structure;
  - Web searching and the role of the search engines;
  - Online advertisement, auctions, markets;
  - Social learning and its manipolation
  - Spread of information and/or innovation in networks, cascading behaviours, voting;

- Applying knowledge and understanding
  - Analyze, understand and drive processes in a social context;
  - Design applications for social networks
  - Mining information from networks

Prerequisites

- To successfully achieve learning objectives, students are required to have good competence on
  - design and analysis of algorithms
  - Programming techniques
  - Python language

- Basic competence on Probability Theory and Linear Algebra is required

Sketch of Program

- Network analysis (6 hours)
- Game Theory (8 hours)
- Web searching and Sponsored search (8 hours)
- Network dynamics (10 hours)
- Lab programming in Python (16 hours)

Course Organization

- The course consists of both lectures and guided programming activities in lab

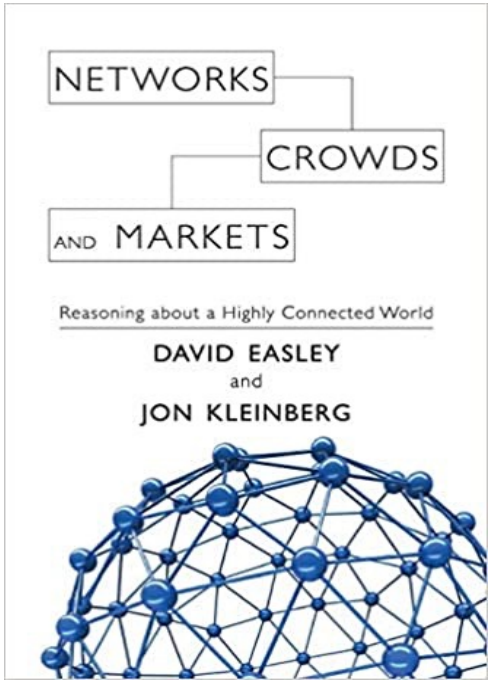
- In the lectures we present
  - models to represent social networks and describe global phenomena in the network in terms of the local behaviours of the agents
  - algorithms to represent such phenomena and mining information from networks of large size

- In the guided exercises students are divided in groups of 4 elements and each group is assigned a project-work
  - The project-work is finalized to apply social network analysis methods and mining real-networks of large size

Partecipation to Class Activities

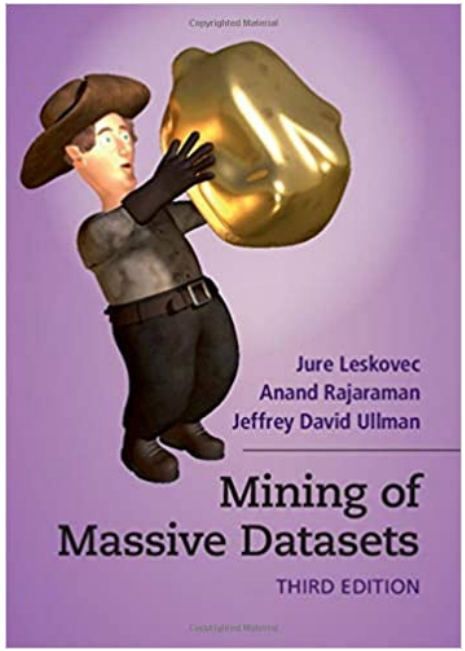
- The partecipation to classes is not due but highly recommended
- We ask for an active partecipation
  - Much better to clarify your ideas in class than hard work at home on unclear notes
  - If something is unclear or you have a comment to do, please raise your hand and you will be the possibility to talk
  - Each academic hour consists of an exposition part (20-25 minutes), a discussion part (20-25 minutes) and a 10 minute break
- Guided lab activities are interactive and students are actively involved in the solution design process
  - You will be asked both to present you solution to the class or to contribute to the discussion from your seat
  - To profitably take part in the practical exercises the use of a PC is highly recommended

Reference books



Networks, Crowds and Markets: reasoning about a highly connected world
Authors: D. Easley, J. Kleinberg
Cambridge University Press 2010
ISBN: 978-1118290279

Mining Massive Data Sets (III ed.)
Authors: J.Leskovec, A. Rajamaran, J. Ullman
Cambridge University Press 2020
ISBN: 978-1108476348



Suggested Readings

- M. Jackson, “Social and Economic Networks”, Princeton University Press, 2010
- M.E.J. Newman, “Networks: an introduction”, Oxford University Press, 2010
- F. Menczer, S. Fortunato, C.A. Davis , “ A First Course in Network Science”, Cambridge University, Press, 2020
- A. Barabasi, “Network Science”, Cambridge University, Press, 2016
- R. Pass, “ A Course in Networks and Markets: Game-Theoretic Models and Reasoning “, MIT Press, 2019

Documentation on Python

- Python official site
  - https://docs.python.org/3/index.html
- Python tutorial
  - https://docs.python.org/3/tutorial/
- Documentation in italian
  - http://docs.python.it/

Online Tools

- A company Web Site is published on the UNISA e-learning platform http://elearning.unisa.it/
  - Course name **SOCIAL NETWORK ANALYSIS [0622700060*63884]**
  - Access with unisa credentials

- For accessing the service you need to ask for the registration

How to Register for Online Teaching

In order to register for online teaching:

- Go to the online tools for teaching page
- Search for the course you are interested in and select the Moodle tool
  - You have to wait for the instructors acceptance

- The registration service is available only to students that are present in the Esse3 information system

Site Organization

- What you can find on the site
  - Calendar of the lectures
  - Syllabus and a detailed program
  - Slides
  - Exercises and exams
  - Teaching material
  - News and announcements
  - Exams' results
  - Forum

- All the material is organized by weeks
  - For each week you can find links to all the material related to the lectures of the week

Teaching Material

- Slides presented in class are published on the Moodle class (at least) the day before the lecture

- We remark that slides are only a support to help your participation to lectures and study
  - You don't waste your time in writing what is presented on the screen and you are totally concentrated on the discussion
  - You can put short notes on your copy

- To successfully study you have to refer to the textbooks and integrate them with the slides and your personal notes

How the Exam is Run

- The final exam is designed to evaluate as a whole
  - The knowledge and understanding of the concepts presented in class
  - The ability to apply such knowledge in designing algorithms and implementing them in an object-oriented programming language to solve non trivial combinatorial problems

- The exam consists of the discussion of a project work and a final test (usually oral but it can be also written)
  - The project work assesses your ability of applying knowledge of the methods and algorithms proposed in class and mining networks data
  - the discussion aims to assess the acquired knowledge on social networks analysis and ability to understanding.

Project Works

Every team has to present two mini-projects proposed during the semester

- Delivery time two weeks starting from the assignment day
  - deadline not mandatory
- A team consists of (at most) 2 students
  - Workload for each student: 15 hours (10 hours of autonomous work and 5 hours for team coordination)
- Tentative schedule of assignments
  - 6^{td} week
  - 11^{th} week
- All the project works will be discussed within the month of July

Grading

- Grades expressed in thirties

50% project
40% discussion
10% active partecipation

- The cum laude may be given to students who demonstrate that they can apply the knowledge autonomously even in contexts other than those proposed in the course