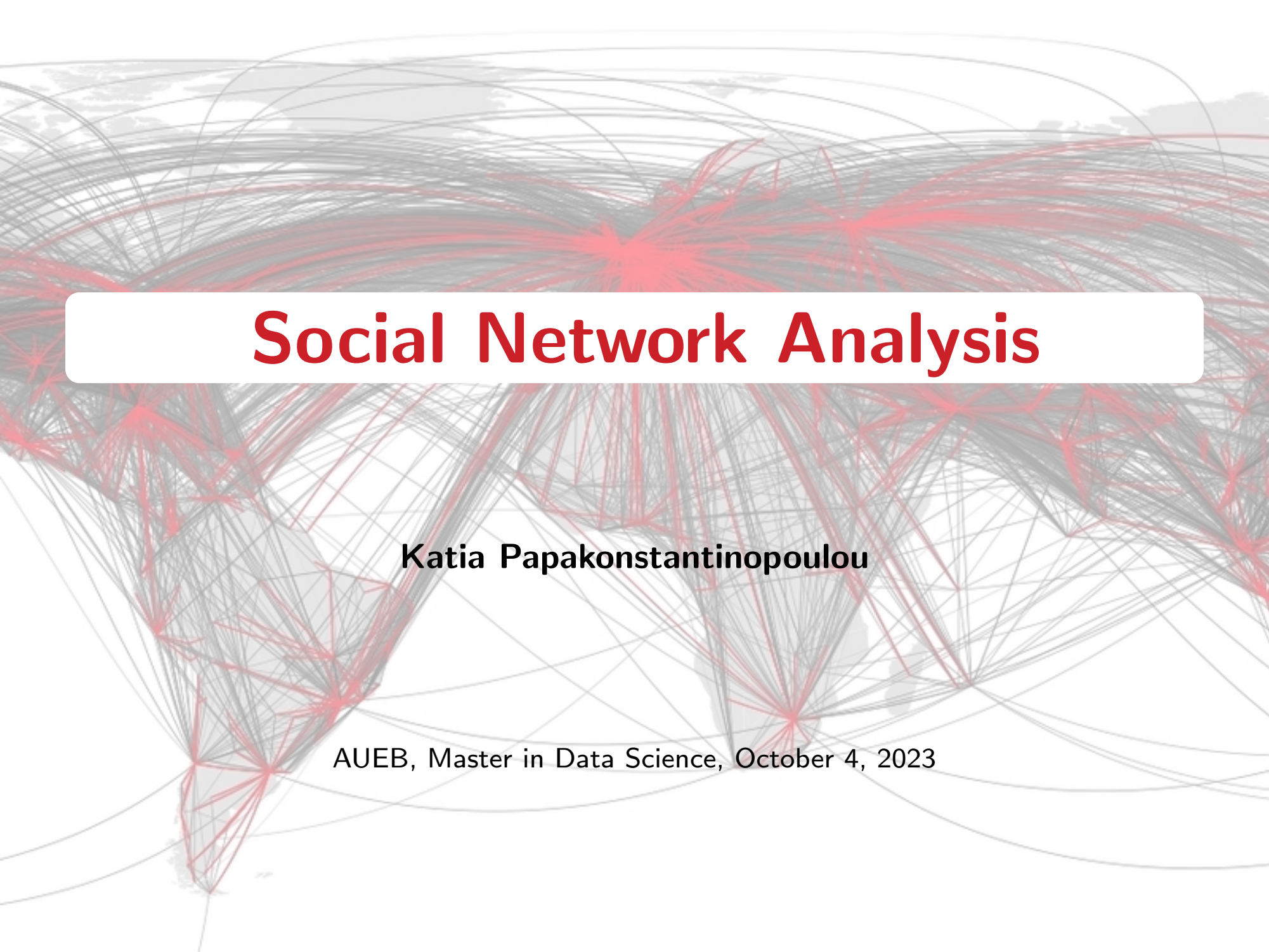

Social Network Analysis

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Overview

This course covers data analysis on social networks, focusing on ways to handle large-scale networks efficiently.

The course provides the main theoretical results in social network mining as well as hands-on practice on key issues in the area.

Key Outcomes

By completing the course you will be able to:

- understand the basic concepts of social networks,
- understand the fundamental concepts in analyzing the large-scale data that are derived from social networks,
- implement mining algorithms for social networks,
- perform mining on large social networks and illustrate the results.

Structure of the Course

Unit 1 Introduction to Social Network Analysis, Graph Models and Node Metrics

Unit 2 Social-Network Graph Analysis

Unit 3 Social-Network Graph Analysis (cont.)

Unit 4 Information Diffusion in Social Networks

Unit 5 Dynamic Social Networks, Applications and Research Trends

Unit 1: Introduction, Graph Models and Node Metrics

- Introduction,
- Basic network properties,
- Social network structure – social networks as graphs
- Random network models,
- Small world phenomena,
- Power laws and rich-get-richer phenomena,
- Stochastic block model, Kronecker graphs
- Node based metrics,
- Ranking algorithms (PageRank)
- **Lab session**: Practice with Gephi

Unit 2: Social-Network Graph Analysis

- Network centrality measures,
- Community structure in networks
- Network community detection,
- **Lab session**: Practice with SNAP

Unit 3: Social-Network Graph Analysis (cont.)

- Overlapping communities in networks,
- Counting triangles in graphs
- **Lab session**: Practice with Pregel paradigm and Apache Giraph

Unit 4: Information Diffusion in Social Networks

- Epidemics and information diffusion through networks,
- Cascading behavior (decision based and probabilistic models),
- Influence maximization,
- Strategic network formation,
- Contagion,
- Games on networks,
- Opinion formation,
- Coordination and cooperation

Unit 5: Applications and Research Trends

- Network resilience,
- Link prediction and network inference,
- Social learning in networks,
- Applications of SNA

Course materials

There is no official text for this course. The lecture slides enriched with notes and comments will be posted periodically on the course website.

The following books are recommended as optional reading:

- Easley, David, and Jon Kleinberg, Networks, crowds, and markets, Cambridge University Press, 2010.
- Leskovec, Jure, Anand Rajaraman, and Jeffrey David Ullman, Mining of massive datasets, Cambridge University Press, 2014.
- Mark Newman, Networks: An introduction, Oxford University Press; 1st edition (May 20, 2010).

Grading

The evaluation of your overall performance will be based on:

- 3 homework assignments requiring coding and theory (60%)
- in-class final exam (38%)
- in-class contribution (2%)

Note that one needs to get at least 5 (out of 10) in the final exam not to fail the course!

Course Information

Instructor: Katia Papakonstantinopoulou
Office hours: Wednesdays 3:30PM-5:30PM,
Office: Room 5, 5th floor, Kodrigktonos 12 building and via Teams

Lectures: Wednesdays 6:00PM-9:00PM in Room 710 (Evelpidon 47A & Lefkados)

Website: `https://eclass.aueb.gr/courses/INF322/`

Contact: E-mail me at: `katia@aueb.gr`
Post questions at eclass: `https://eclass.aueb.gr`