



UNIVERSITÀ DEGLI STUDI DI TORINO

ID

VP10_DIP_INF

Visiting Professor Program Academic year 2019/2020

DEPARTMENT OF COMPUTER SCIENCE

TEACHING COMMITMENT: 16 hours

COURSE TITLE

Analysis and Visualization of Complex Networks

TEACHING PERIOD

2nd term

SCIENTIFIC AREA

Computer Science

LANGUAGE USED TO TEACH

English

COURSE SUMMARY

Complex Networks

- Introduction to complex networks
- Graph Theory and network metrics
- Strong and Weak Ties
- Structural Holes, Betweenness and Graph Partitioning
- Networks and Homophily
- A Spatial Model of Segregation
- Positive and Negative Relationships
- The Structure of the Web
- Link Analysis, PageRank, and HITS
- Spectral Analysis, Random Walks and Web Search
- Power Laws and Rich-Get-Richer Phenomena
- Long Tail and Analysis of Rich-Get-Richer Processes
- Game Theory
- Small World and Search

- Transportation Networks and Optimization
- Metabolic and River Networks
- Information Cascades
- Network Effects
- Epidemics
- Cascading Behavior in Networks

Network Analysis

- Elementary Networks and Tools (Python, NetworkX e Gephi)
- Networks Based on Explicit Relationships (e.g., social networks)
- Networks Measures and Centralities
- Structural Analysis
- Analysis of Networks Based on Co-Occurrences
- Analysis of Similarity Networks and Recommendation Systems
- Analysis of Directed Networks
- Analysis of Bipartite Networks

Information Visualization

- Basic Charts and Plots, Multivariate Data Visualization
- Principles of Perception, Color, Design, and Evaluation
- Text Data Visualization
- Interactivity and Animation
- Temporal Data Visualization
- Geospatial Data Visualization
- Hierarchical Data Visualization
- Network Data Visualization

LEARNING OBJECTIVES

This module introduces the fundamental concepts, principles and methods in the interdisciplinary field of network science, with a particular focus on analysis techniques, modeling, and applications for the World Wide Web and online social media.

Topics covered include graphic structures of networks, mathematical models of networks, common networks topologies, structure of large scale graphs, community structures, epidemic spreading, centrality measures, dynamic processes in networks, graphs visualization.

Another learning objective of this class falls in the field of scientific data visualization (quite differently w.r.t. MFN0954-"Complex Network"). Students will learn basic visualization design and evaluation principles, and learn how to acquire, parse, and analyze large datasets. Students will also learn techniques for visualizing multivariate, temporal, text-based, geospatial, hierarchical, and (above all) network/graph-based data. Additionally, students will utilize GePhi, D3, Py

VISITING PROFESSOR PROFILE

We are looking for candidates with the following profile.

Research:

We are looking for senior scientists with more than 10 years of experience after PhD with a strong background on computational social science, social media analytics, collective intelligence, informetrics, and digital libraries. The ideal candidate has a demonstrated record of independently designing and conducting research and publishing results in competitive conferences and journals. The candidate must also have a documented record of funded projects where she/he worked in as a PI or co-PI.

Teaching:

The candidate must have teaching experience, at both graduate and undergraduate levels.

CONTACT PERSON AT THE DEPARTMENT

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