Course title: Network Analysis

Course code: 63545B

Professor: Lovro Šubelj

Master's program

Prerequisite knowledge:

Except for good programming skills in some general-purpose language (preferably Python), there are no specific prerequisites for the course. However, students will benefit from a solid knowledge of graph theory, probability theory and statistics, and linear algebra.

Short course decription:

- Introduction to network science. Graph theory. Real-world networks.
- Node position. Spectral and distance node centrality. Clustering coefficients. Link analysis algorithms.
- Link importance. Betweenness and bridgeness link centrality. Embeddedness and topological overlap.
- Node similarity. Local and global node similarity. Structural and regular equivalence.
- Node fragments. Egonets analysis. Network motifs and graphlets. Convex subgraphs. Node orbit distributions.
- Graph partitioning. Graph bisection. Spectral analysis. Hierarchical clustering. Core-periphery structure.
- Network clustering. Modularity optimization. Community detection. Blockmodeling.
- Network structure. Small-world and scale-free networks. Node mixing.
- Network modeling. Erdos-Renyi. Watts-Strogatz. Price, Barabasi-Albert and configuration models.
- Network abstraction. Network representations. Structural network comparison. Network sampling. Network layout algorithms. Network visualization.
- Network mining. Node classification and ranking. Network inference and link prediction. Machine learning with graphs.
- Selected applications of network analysis. Fraud detection. Software engineering. Information science