

SAAST 2014 Engineering Complex Networks

-- Syllabus --

Mathematics of networks

- Networks and their representation
- The adjacency matrix
- Weighted and directed networks
- Hypergraphs. Bipartite networks, trees and planar networks
- Degree, paths, components
- Independent paths, connectivity, and cut sets

Measures and metrics

- Degree centrality, eigenvector centrality, katz centrality, PageRank
- Hubs and authorities, closeness centrality, betweenness centrality
- Transitivity, reciprocity, similarity, assortative Mixing

The large-scale structure of networks

- Components
- Shortest paths and the small-world effect
- Degree distributions. Power laws and scale-free networks
- Distributions of other centrality measures

Random graphs

- Random graphs
- Random graphs with general degree distributions
- Models of network formation