CS 60078 Complex Networks

(Spring Semester 2006)

OBJECTIVE

Study of the models and behaviors of networked systems.
Empirical studies of social, biological, technological and information networks.
Exploring the concepts of small world effect, degree distribution, clustering, network correlations, random graphs, models of network growth, and preferential attachment and dynamical processes taking place on networks.

CONTENT

Types of network
Social networks, Information networks, Technological networks, Biological networks.

Properties of network
Small world effect, transitivity and clustering, degree distribution, scale free networks, maximum degree; network resilience; mixing patterns; degree correlations; community structures; network navigation.

Random Graphs
Poisson random graphs, generalized random graphs, the configuration model, power-law degree distribution, directed graph, bipartite graph, degree correlations.

Models of network growth
Price's model, Barabasi & Albert's model, other growth models, vertex copying models.

Processes taking place on networks
Percolation theory and network resilience, Epidemiological processes.

Applications – search on networks, exhaustive network search, guided network search, network navigation; network visualization.