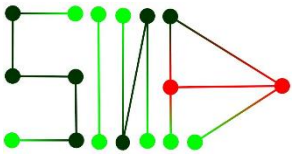

SINA - Social and Information Network Analysis

(Spring 2017)

We are surrounded by networks – networks of friendship, networks of communication, and networks of roads are just to name a few. Can we learn anything from these networks? Are all network similar? Can we find which friend is more influential in my friendship network? Which road may results extreme traffic jams in a city, if blocked? How does your position in a social network may (dis)advantage you? The answers of such questions exist in the literature of Network Science.

The emerging field of Network Science aims to understand why many networks share these fascinating features and also to investigate that what properties consist by these networks in terms of the spread of diseases, routing information, and ranking of the vertices present in the network.

This course will cover computer science topics and other relevant material of field Network Science. The scope of this course is limited to Social and Information Networks as there are many other kind of networks like Biological Networks and Economic Networks.

Aims:

This course aims to introduce basic theoretical background of complex networks along with the knowledge of tools to handle such networks and its application to real social and information networks.

Objectives:

On completion of this module students should be familiar with the most common metrics and techniques of complex network analysis and classification, as well as the most recent applications of these techniques in the area of social and information networks. Along this, we will also learn tools for visualization and analysis of large and complex networks.

Prerequisite

Knowledge of basic computer science principles at a level sufficient to write a reasonably non-trivial computer program.

Course Instructor

Muhammad Qasim Pasta,
Adjunct Faculty Member, PAF – KIET
CEO, Naveeta Enterprise

He will be available at PAF – KIET City Campus from 1800 – 2100 hours on Wednesday. You can also reach him at mqpasta@gmail.com

Coursework

- Reading Assignments (will be weighted in midterm and end term)
- 3 + 1 assignments – 15%
- 3 + n Quizzes – 5%
- 1 Project – 20%
- Midterm examination – 20%
- End term Examination – 40%

Course Project

- 1 course project
- Group projects – maximum (2) students in a group
- Real-world Network Analysis (further details will be added later)

Course Structure

- Basic Terminologies and concepts
- Basic network analysis
- Application of Network Analysis
- Extraction and processing of real-world networks
- Network Models
- What is not in the course?
    - Mathematical foundation and proves

Reference Materials:

1. Network Science (Cambridge University Press)
   Author: ALBERT-LÁSZLÓ BARABÁSI
2. Network Analysis - Methodological Foundations (Springer)
   Editors: Ulrik Brandes, Thomas Erlebach
3. Network, Crowds and Market (Cambridge University Press)
   Authors: David Easley, Jon Kleinberg
4. Dorogovtsev, S. N. & Mendes, J. F., Evolution of networks, Advances in physics, Taylor & Francis, 2002, 51, 1079-1187
5. Watts, D. J. & Strogatz, S. H. Collective dynamics of `small-world' networks, Nature, 1998, 393, 440-442
6. Barabási, A. L. & Albert, R., Emergence of scaling in random networks, Science, 1999, 286, 509-512
7. Louzada, V. H.; Daolio, F.; Herrmann, H. J. & Tomassini, M., Smart rewiring for network robustness, Journal of Complex Networks, Oxford University Press, 2013, 1, 150-159

Tentative Course Outline

Week	Lecture	Reference
1	Introduction to Course, Introduction to Networks, Overview of Network Science Field	
2	Representation of Network, Introduction to Tulip	Chapter #2, Network Science (AB)
3	Regular Graphs, Six Degree of Separation,	
4	ER Model, Degree Distribution **Finalization of Project Idea**	Chapter #3, Network Science (AB)
5	Network Measurements	Evolution in Networks[3]
6	Introduction to R Applying measurement in R	Handouts
7	Centrality I	Chapter #3, Network Analysis
8	Centrality II **Project Milestone I**	Chapter #3, Network Analysis
9	**Midterm Examination**	
10	Modeling Complex Systems, Network Models and Its applications, Model for Small-world networks	Collective dynamics of `small-world' networks[4]
11	Dynamics in evolution of networks, Variations of BA model **Project Milestone II**	Emergence of scaling in random networks Science[6]
12	Communities in networks	Chapter #9, Network Science
13	Network Robustness	Chapter #8, Network Science
14	Epidemic and Information Diffusion	Chapter #10, Network Science
15	**Project Presentations**	