DISCIPLINE SPECIFIC ELECTIVE COURSES

DISCIPLINE SPECIFIC ELECTIVE COURSE: Social Network Analytics

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Social Network Analytics	**4**	**3**	**0**	**1**	Pass in Class XII	DSC 01 Programming using Python, DSC03 Mathematics for Computing

Learning Objectives

The course introduces basic graph theory and draws distinction between graph as an abstract structure and real-life situation modelled as network. This course aims to expose the students to the strengths and capabilities of network analysis and their applications through the use of open source software.

Learning outcomes

On successful completion of the course, students will be able to :

- Model real life situation as networks
- Identify and apply quantitative network measures to characterize social networks at the local and global level
- Generate synthetic networks that satisfy properties of real world networks
- Discover, analyse and evaluate the intrinsic community structure of networks
- Model an information diffusion process for predictive analysis of networks

SYLLABUS OF DSE

Unit 1 (7 Hours)

Introduction to Social Network Analysis: Graph theory, random walk, degree distribution, mapping of real world situation into networks and applications of social network analysis, types of networks

Unit 2 (10 Hours)

Network Measures: Centrality measures, Page Rank, Hubs and Authority, Assortativity, Transitivity and Reciprocity, Similarity and Structural Equivalence

Unit 3 (10 Hours)

Network Models: Properties of Real-World Networks, Random Network Model, Small World Network Model, Preferential Attachment Model

Unit 4 (10 Hours)

Community Structure in Networks: Types of Communities, Community Detection algorithms and evaluation of communities obtained

Unit 5 (8 Hours)

Information Diffusion in Social Media: Information Cascades, Diffusion of Innovations, Basic Epidemic Models

Essential/recommended readings

1. Chakraborty T. *Social Network Analysis*, 1st edition, Wiley India Pvt. Ltd., 2021.
2. Zafarani R., Abbasi M. A., Liu H. *Social Media Mining: An Introduction*, 1st edition, Cambridge University Press, 2014.
3. Barabási A. L. , Pósfai M. *Network Science*, 1st edition, Cambridge University Press, 2016.

Additional References

1. Easley, Kleinberg J. *Networks, Crowds, and Markets: Reasoning About a Highly Connected World*, 1st edition, Cambridge University Press, 2012.

Suggested Practical List :

Practical exercises such as

Python Packages like igraph, NetworkX, NDlib etc. may be used for programming

1. Plot a weighted directed network such that node size and edge width is proportional to their degree and edge weight respectively
2. Compute and plot degree distribution of a real-world network. Also compute its local and global properties.
3. Generate three networks of 1000 nodes each using Random Network Model, Small World Network Model, Preferential Attachment Model and compare their characteristics.
4. Compute different centrality measures to identify top-N nodes and compare their ranks with those obtained by PageRank method.
5. Apply community detection algorithms on a small real-world network (e.g. Karate club) and compare modularity using bar plot. Also plot the communities revealed with different colors.
6. Simulate diffusion trends for different epidemic models and present results using appropriate visuals.