CS___: Social Network Analysis

Programme: B.Tech (CSE) **Year:** Third **Semester:** Sixth
Course: Program Elective **Credits:** 3 **Hours:** 40

Course Context and Overview:
This course shall focus on the different phenomena on online social networks and the ways to analyze them. This course is designed for students who have had little or no prior experience with Social Network Analysis. However the students are expected to be familiar with algorithmic thinking. This course is directed towards understanding the dynamics of online social networks and observing patterns of activities. Towards this, analysis of the structure of the network is introduced first, then the analysis of content is introduced. In the last part of the course we shall learn about various types of information cascading in the networks and we shall also study some algorithms to detect communities in the network. Knowledge of R and Python are required for the implementations.

Prerequisites Courses: Introduction to Data Science, Discrete Mathematics, Design and Analysis of Algorithms

Course outcomes (COs):

On completion of this course, the students will have the ability to:
CO1: Explain the graph based models of a social network.
CO2: Explain and implement various measures and models involved in describing online social networks.
CO3: Apply the basic NLP tools to do pre-processing and preliminary analysis on Text data.
CO4: Implement the algorithms to quantify some of the phenomena on the online social networks
CO5: Compare and contrast various types of information diffusion in online social network.

Course Topics

Contents	Lecture Hours
UNIT - 1 **Introduction**	**4**
Introduction to the course, Introduction to Social Networks, basic Graph Theory concepts and basic Graph algorithms	

UNIT –2 **Network Measures**	**7**
Various Centrality measures, Transitivity and Reciprocity, Balance and Status, Similarity, Strong and Weak Ties, Triadic Closure	
UNIT-3 **Network Models**	**8**
Properties of Real-world Networks, Random Graphs, Small-World Phenomena, Preferential Attachments Model, Homophily and Social Influence, Power laws	
UNIT-4 **Content Analysis**	**6**
PoS tagging, Word sense disambiguation, Text similarity measures (Character based, Term based, Corpus based), WordNet	
UNIT-5 **Information Diffusion in Social Networks**	**8**
Herd behavior, Information cascades, Diffusion of innovations, Emotion contagion, Epidemics	
UNIT-6 **Community Detection Methods**	**7**
Algorithm of Girvan and Newman, Walktrap, Fast greedy, Label propagation, Edge betweenness, Leading eigenvector	

Text books and reference books:

Text Book:

There is no official text book for this course.

Reference books:

1. Zafarani R, Abbasi MA, Liu H. Social Media Mining: An Introduction. Cambridge University Press; 2014 Apr 28.

2. Easley D, Kleinberg J. Networks, Crowds, and Markets: Reasoning About a Highly Connected World. Cambridge University Press; 2010 Jul 19.

3. Albert-Laszlo Barabasi. Network Science. Cambridge University Press; 2016.

4. Manning CD, Schütze H. Foundations of Statistical Natural Language Processing. Cambridge: MIT press; 1999 Jun 18.

5. Yang Z, Algesheimer R, Tessone CJ. A Comparative Analysis of Community Detection Algorithms on Artificial Networks. Scientific Reports. 2016 Aug 1; 6:30750.(This is a report. Not a book!)

Evaluation Methods:

Item	Weightage
Active participation in Class and Piazza	5%
Midsem	25%
Project presentation and report	25%
Endsem	45%

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