



DR. AKHILESH DAS GUPTA

INSTITUTE OF PROFESSIONAL STUDIES

(Formerly Dr. Akhilesh Das Gupta Institute of Technology & Management)

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Department of Artificial Intelligence & Data Science

Report on FDP on Network Science using Python

(13.05.2024 - 17.05.2024)

Venue: AI&DS Smart Room (2216)

Resource Persons:

1. Er. Shano Solanki (SS), Associate Professor, NITTTR, Chandigarh
2. Dr. Sarbjeet Singh, Professor, UIET, Panjab University, Chandigarh
3. Dr. Iqra Altaf Gillani, Assistant Professor, NIT, Srinagar
4. Dr. Mahipal Jadeja, Assistant Professor, MNIT, Jaipur
5. Dr. Gaurav Kumar, Managing Director, Magma Research and Consultancy Services, Ambala
6. Dr. Bhawna Saxena, Assistant Professor, Jaypee Institute of Information Technology, Noida
7. Dr. Rahul Saxena, Assistant Professor, Manipal University Jaipur, Rajasthan

Objectives:

The Faculty Development Program (FDP) aimed to:

- Introduce participants to the fundamental concepts of graph theory and network science.
- Equip participants with practical skills in using Python libraries for network analysis and visualization.
- Explore advanced topics such as social network analysis, influence maximization, and graph machine learning.
- Provide hands-on experience with tools like NetworkX, iGraph, and Gephi for network analysis and visualization.

Key Takeaways:

- **Fundamental Concepts:** Participants gained a strong foundation in graph theory and network science, essential for understanding complex networks in various domains.
- **Python Libraries:** Practical sessions on NetworkX and iGraph enabled participants to create, manipulate, and visualize networks effectively.
- **Social Network Analysis:** Insights into structural properties, information diffusion models, and influence maximization algorithms broadened participants' understanding of social networks.

- **Advanced Tools:** Exposure to advanced tools like Gephi for network visualization and graph machine learning techniques enriched participants' analytical capabilities.
- **Community Detection:** Participants learned about algorithms for community detection, enhancing their ability to identify significant clusters within networks.

Daily Sessions Overview:

13.05.2024 (Monday)

10:00 a.m. to 11:30 a.m.

Topic: Introduction to Graph Theory and Network Science

Speaker: Dr. Iqra Altaf Gillani

Summary: Dr. Gillani provided an extensive introduction to graph theory and network science, covering basic terminologies, the importance of networks in various domains, and the mathematical foundations of graph theory.

11:45 a.m. to 1:15 p.m.

Topic: Introduction to Python NetworkX Library for Creation and Visualization of Graphs

Speaker: Er. Shano Solanki

Summary: Er. Solanki demonstrated the use of the NetworkX library in Python for creating, manipulating, and visualizing graphs. Practical examples were provided to help participants understand the functionalities of NetworkX.

3:00 p.m. to 4:30 p.m.

Topic: Graph Data Representation using Various Data Structures and Graph File Formats and their Processing in Python

Speaker: Dr. Sarbjeet Singh

Summary: Dr. Singh discussed various data structures for graph representation, such as adjacency lists, adjacency matrices, and edge lists. He also covered different graph file formats and how to process them using Python.

14.05.2024 (Tuesday)

10:00 a.m. to 11:30 a.m.

Topic: Social Networks and Structural Properties Computation

Speaker: Er. Shano Solanki

Summary: This session focused on the structural properties of social networks. Er. Solanki explained key concepts like clustering coefficient, degree distribution, and shortest path length in the context of social networks.

11:45 a.m. to 1:15 p.m.

Topic: Information Diffusion on Social Networks Models and their Implementations

Speaker: Er. Shano Solanki

Summary: Participants learned about various models of information diffusion in social networks, including the Independent Cascade and Linear Threshold models. Er. Solanki illustrated these models with practical implementations in Python.

3:00 p.m. to 4:30 p.m.

Topic: Influence Maximization on Social Networks Algorithms

Speaker: Dr. Rahul Saxena

Summary: Dr. Saxena discussed algorithms for influence maximization in social networks. The session included the Greedy algorithm, CELF (Cost-Effective Lazy Forward), and their applications in real-world scenarios.

15.05.2024 (Wednesday)

10:00 a.m. to 11:30 a.m.

Topic: Analyzing Large-Scale Social Networks with Python

Speaker: Dr. Bhawna Saxena

Summary: Dr. Bhawna Saxena demonstrated techniques for analyzing large-scale social networks using Python. Emphasis was placed on efficient data handling and the use of specialized libraries for large network analysis.

11:45 a.m. to 1:15 p.m.

Topic: Decoding Network Influence: Centrality Measures for Identifying Key Nodes

Speaker: Dr. Mahipal Jadeja

Summary: Dr. Jadeja covered various centrality measures such as degree, betweenness, closeness, and eigenvector centrality. He explained their significance in identifying influential nodes within a network.

3:00 p.m. to 4:30 p.m.

Topic: iGraph Essentials: Python's Toolkit for Network Analysts

Speaker: Dr. Mahipal Jadeja

Summary: This session introduced participants to the iGraph library in Python. Dr. Jadeja explained its key features and provided hands-on examples of network analysis using iGraph.

16.05.2024 (Thursday)

10:00 a.m. to 11:30 a.m.

Topic: Graph Machine Learning: From Theory to Practical Applications

Speaker: Dr. Mahipal Jadeja

Summary: Dr. Jadeja bridged the gap between graph theory and machine learning, discussing how graph-based features can be used in machine learning models. Practical applications and coding examples were provided.

11:45 a.m. to 1:15 p.m.

Topic: Community Detection on Social Networks – Algorithms and their Applications

Speaker: Er. Shano Solanki

Summary: Er. Solanki covered algorithms for community detection in social networks, such as the Girvan-Newman and Louvain methods. He demonstrated their applications with Python code.

3:00 p.m. to 4:30 p.m.

Topic: Gephi Tool for Visualization

Speaker: Dr. Gaurav Kumar

Summary: Dr. Kumar introduced the Gephi tool for network visualization. The session included practical examples of creating and manipulating network visualizations to uncover insights.

17.05.2024 (Friday)

10:00 a.m. to 11:30 a.m.

Quiz, Feedback, and Evaluation

Summary: The final session included a quiz to assess participants' understanding, followed by feedback and evaluation. Er. Solanki gathered insights on the effectiveness of the course and suggestions for improvement.

11:45 a.m. to 1:15 p.m.

Topic: Shortest Path Algorithms, Finding Minimum Spanning Tree using Python

Speaker: Dr. Gaurav Kumar

Summary: Dr. Kumar concluded the FDP with practical applications of shortest path algorithms and finding the minimum spanning tree using Python. The session included hands-on coding exercises.

Outcomes:

- **Enhanced Knowledge:** Participants left with a deeper understanding of graph theory, network analysis, and their applications.
- **Practical Skills:** Attendees gained hands-on experience with Python libraries and tools, enhancing their practical skills in network analysis.
- **Collaborative Learning:** The program fostered a collaborative learning environment, encouraging knowledge sharing and networking among participants and experts.
- **Real-World Applications:** The sessions highlighted practical applications of network science in various fields, enabling participants to apply these concepts in their research and professional work.

Conclusion:

The FDP on Network Science using Python provided a comprehensive overview of graph theory, network analysis, and practical applications using Python libraries. The diverse range of topics and expert speakers offered participants valuable insights and hands-on experience in the field of network science. The sessions were well-received, and the participants provided positive feedback, highlighting the practical utility of the course content and the effectiveness of the teaching methods.



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Computer Science & Engineering Department, NITTTR Chandigarh
 National Institute of Technical Teachers Training & Research, Chandigarh
 (Ministry of Education, Government of India)
 राष्ट्रीय तकनीकी शिक्षक प्रशिक्षण एवं अनुसंधान संस्थान, चंडीगढ़
 (शिक्षा, संचार तथा अंतर-संस्था)

Organizes

One Week Faculty Development Program on
“Network Science using Python”
from 13.05.2024 to 17.05.2024

#Shaping Generations

Local Co-Ordinator :
Mr. Ritesh Kumar
Assistant Professor

Convener :
Prof. (Dr.) Archana Kumar
Head of Department





Ritesh Kumar
Local Co-ordinator, FDP
Assistant Professor

Prof. (Dr.) Archana Kumar
Convener
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