राष्ट्रीय प्रौद्योगिकी संस्थान पटना / NATIONAL INSTITUTE OF TECHNOLOGY PATNA
(शिक्षा मंत्रालय, भारत सरकार के अधीन एक राष्ट्रीय महत्व का संस्थान / An Institute of National Importance under Ministry of Education, Gov. of India)
संगणक विज्ञान एवं अभियांत्रिकी विभाग / DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
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CSXX0245 : *Fraud Analytics Using Predictive and Social Network Techniques*

L-T-P-Cr: 3-0-0-3

Pre-requisites: Machine Learning

Objectives/Overview:

- Understand the fundamentals of fraud detection and the importance of data analytics in fraud prevention.
- Apply statistical and machine learning techniques to identify anomalies and fraud patterns.
- Employ network analysis to detect fraud using relationships and interactions.
- Develop fraud detection systems integrating predictive models and network approaches.
- Evaluate real-world fraud cases and build analytical solutions using tools and frameworks.

Course Outcomes:

At the end of the course, a student should:

Sl. No.	Outcome	Mapping to POs	Mapping to PEOs
1.	Describe key concepts of fraud, fraud types, and the analytics lifecycle.	PO5,PO6,PO8,PO12	PEO1, PEO4
2.	Use machine learning algorithms for detecting anomalies and fraud patterns.	PO5,PO12	PEO1, PEO2, PEO4
3.	Analyze social network data to discover hidden fraud communities.	PO5,PO6,PO8,PO9,PO12	PEO1, PEO2, PEO3, PEO4
4.	Design predictive models for fraud detection using real datasets.	PO5,PO9,PO10,PO11,PO12	PEO1, PEO2, PEO3, PEO4
5.	Critically assess fraud analytics tools and interpret their output.	PO5,PO6,PO8,PO9,PO10,PO11,PO12	PEO1, PEO2, PEO3, PEO4

UNIT I: Introduction to Fraud Analytics
Lectures: 4

Definition of fraud, types of fraud (transactional, financial, identity, etc.), Fraud triangle theory, Role of data analytics in fraud detection, Fraud analytics lifecycle and challenges

UNIT II: Data Preparation and Exploration Lectures: 6

Data quality issues, cleaning, transformation, Exploratory data analysis (EDA) Feature engineering for fraud detection, Handling imbalanced datasets (SMOTE, undersampling)

UNIT III: Predictive Techniques in Fraud Detection
Lectures: 7

Supervised learning (logistic regression, decision trees, random forest), Unsupervised learning (clustering, anomaly detection), Model evaluation metrics (Precision, Recall, ROC, AUC), Case study: Credit card fraud detection

UNIT IV: Social Network Analysis for Fraud Detection Lectures: 7

Introduction to social networks: nodes, edges, graphs, Network measures: centrality, modularity, cliques, community detection, Detecting collusion and organized fraud, Graph databases (Neo4j), case study: Telecom or insurance fraud detection

UNIT V: Tools, Techniques, and Applications
Lectures: 6

Fraud detection tools (KNIME, RapidMiner, Python libraries: scikit-learn, NetworkX),Fraud detection in banking, insurance, e-commerce, Ethics and legal aspects of fraud detection, Capstone project: Design and evaluate a fraud detection system

Text/Reference Books

1) *Delena D Spann – Fraud Analytics: Strategies and Methods for Detection and Prevention, Wiley*
2) *Bart Baesens – Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Wiley*
3) *Bhavani Thuraisingham – Data Mining for Security Applications*
4) *S. Rajasekaran and G.A. Vijayalakshmi Pai – Neural Networks, Fuzzy Logic and Genetic Algorithm*