Course Code	Course title	L	T	P	C
UCCA235E	AI and ML for Finance	2	0	2	3
Pre-requisite	NIL	Syllabus version			
		1.0			

Course Objectives

1. To gain understanding on the need and significance of Artificial intelligence technology.
2. To understand the basics of machine learning and tools.
3. To learn applications of AI & ML tools and techniques in financial data analysis

Course Outcomes

Upon Successful completion of this course, the students will be able to:

1. Develop basic understanding of AI & ML
2. Explore various ML tools and techniques.
3. Carry out model building and testing with real world data.
4. Obtain foundational knowledge of neural networks.
5. Apply AI & ML tools and techniques in stock prediction and bank fraud detection.
6. Demonstrate practitioner level data analyst skills.

Module:1	Introduction to AI	4 hours

Basic Definitions and Terminology, Foundation and History of AI, Overview of AI problems, Evolution of AI, - Applications of AI, Classification/Types of AI. Artificial Intelligence vs Machine learning. Artificial Intelligence is Changing Financial Services- Algo trading, fraud detection and Compliance and Chatbots and Robotic Advisory Services and other Applications of artificial intelligence.

Module:2	Overview of Machine Learning	4 hours

Introduction to Machine Learning: History of ML Examples of Machine Learning Financial Applications, Learning Types, ML Life cycle, AI & ML, dataset for ML, Data Pre-processing, Training versus Testing, Positive and Negative Class, Cross-validation. Generalization- Data, Models and Learning- Parameter Estimation- Probabilistic Modelling and Inference.Natural Language Processing - Problems and perspectives, Evaluation of NLP applications.

Module:3	Advanced concepts of Machine Learning	4 hours

Fundamentals of statistical learning theory- Convergence and learnability- Kullback-Leibler Information- Model selection and the bias variance trade-off- Cross-validation- Regularization- Generative vs Discriminative models.

Module:4	Neural Networks	4 hours

Neural Networks- The Perceptron- Feed-Forward Neural Networks- Back-propagation and stochastic gradient descent- Regularization and drop-out- Application to investment management.

Module:5	Supervised Learning	4 hours

Linear Regression- Parametric Problems- Decision trees- Random forests- Classifications- K Nearest Neighbors- Support Vector- Naive Bayesian Model.		
Module:6	**Unsupervised Learning**	**4 hours**
Clustering- K-Means clustering- Dimensionality Reduction- Principal Component Analysis- Hierarchical Clustering- DBSCAN- Semi-supervised learning- Reinforcement Learning.		
Module:7	**Advanced Neural Networks**	**4 hours**
Convolutional Neural Networks- Recurrent Neural Networks- Long Short-Term Memory (LSTM)- Autoencoders- Applying Learning to Real problems- Image Classification & Segmentation- Scoring Opinion and Sentiments- Recommending Products and Movies- Bitcoin Prediction- Predicting from the Limit Order Book.		
Module: 8	**Contemporary Issues**	**2 Hours**
Total Lecture hours		**30 hours**
Text Book(s)		
1.	Lopez de Prado, M. (2018). Advances in Financial Machine Learning.	
2.	Germany: Wiley.	
3.	Hilpisch, Y. (2020). Artificial Intelligence in Finance. United States: O'Reilly Media. J. Gabriel, Artificial Intelligence: Artificial Intelligence for Humans (Artificial Intelligence, Machine Learning), Create Space Independent Publishing Platform, First edition , 2019	
Reference Books		
1.	Machine Learning for Asset Management: New Developments and Financial Applications. (2020). United States: Wiley.	
2.	Guida, T., Coqueret, G. (2020). Machine Learning for Factor Investing: R Version. United States: CRC Press	
3.	Lookabaugh, B., Puri, S., Tatsat, H. (2020). Machine Learning and Data Science Blueprints for Finance. China: O'Reilly Media	
Lab Experiments		
Predictive Analytics for Stock Prices		4 hours
Fraud c in Credit Card Transactions		6 hours
Customer Churn Prediction		4 hours
Create a bivariate plot to find if there is a correlation between credit card limit and average purchase made on the card		4 hours
Lee notices that the tracker's battery dies every day at 7.00 PM. Lee discovers that in an average, he walks 2000 steps every day after 7.00 PM. Perform an appropriate operation on your array to add 2000 steps to all the observations		6 hours
Recurrent Neural Networks (RNNs)		6 hours
Mode of Evaluation: CAT, Quiz, Digital Assignments and FAT		
Recommended by Board of Studies	08.11.2023	
Approved by Academic Council	No.72 Date	30.11.2023