

Annexure – III

Artificial Intelligence and Machine Learning

Course Code: UCST00031T

Course Title: Artificial Intelligence and Machine Learning

Semester: I

Credits: 04

Rationale

Artificial intelligence (AI) is playing a very prominent role, and of late, this term has been gaining popularity due to the recent advances in the field of intelligent computing. Machine learning (ML) is that sphere of artificial intelligence where the machines are responsible for ending daily chores and are believed to be smarter than humans. These machines tend to speed up your tasks and processes along with a guaranteed level of precision and accuracy, and therefore these are what make them a useful and important tool.

Contents	No. of Lectures
<p style="text-align: center;"><u>Unit-I</u></p> <p>Data Science, AI & ML: Application areas, Introduction to AI-Problem formulation, Problem Definition, Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics, Heuristic functions Hill Climbing, Depth first and Breath first, Constraints satisfaction, Related algorithms, Measure of performance and analysis of search algorithms. Introduction to Knowledge representation. Machine learning techniques and applications.</p>	10
<p style="text-align: center;"><u>Unit - II</u></p> <p>Data pre-processing: Data reading and handling with different formats, treating missing values, data visualization (Numpy, pandas and Matplotlib libraries). Supervised Learning (Regression/Classification): Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Baye's. Linear models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Nonlinearity and Kernel Methods, Beyond. Binary Classification: Multi-class/Structured Outputs, Ranking.</p>	10
<p style="text-align: center;"><u>Unit -III</u></p> <p>Unsupervised Learning: Clustering: K-means/Kernel K-means, Dealing with continuous, categorical values in K-Means. Dimensionality Reduction: PCA and kernel PCA Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models).</p>	10
<p style="text-align: center;"><u>Unit - IV</u></p> <p>Model evaluation and validation: Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods</p>	10

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(Boosting, Bagging, Random Forests). Limitations and solution of handcrafted machine learning.	
<p style="text-align: center;"><u>Unit - V</u></p> <p>Deep Learning: Deep Learning and Feature Representation Learning, Convolutional Neural Networks(CNN), Image classification, Image classification and hyper-parameter tuning, Text classification, Recurrent Neural Networks(RNN), Auto-encoders, Generative Adversarial Networks(GANs), Long Short-Term Memory (LSTM), Counter measuring over fitting and under fitting: Regularization, Dropout and Batch normalization, Overview of attacks on Deep Neural Networks.</p>	10

Course Outcomes

Upon successful completion of this course, candidates will be able to:

- Analyse various AI problem-solving approaches and knowledge representations.
- Compare and contrast the pros and cons of various machine learning techniques and get an insight into when to apply a particular machine learning approach.
- Apply machine learning for image and text classification.
- Design intelligent systems that learn automatically.
- Design deep learning-based models for automatic classification.

Text books

1. Peter Jackson. "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.
2. Kevin Murphy. Machine Learning: A Probabilistic Perspective, MIT Press, 2012

Reference books

1. Deepak Khemani "Artificial Intelligence", Tata Mc Graw Hill Education 2013.
2. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill- 2008.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009
4. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

