IT377: MACHINE LEARNING & APPLICATIONS [ELECTIVE-II]

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	-	6	5
Marks	100	50	-	150	

A. Objective of the Course:

The main objectives for offering the course Artificial Intelligence are:

- To learn about the most effective machine learning techniques, and gain practice implementing them
- To able to effectively use the common neural network "tricks", including initialization, dropout regularization, Batch normalization, gradient checking,
- To understand industry best-practices for building deep learning applications.
- To learn how to quickly and powerfully apply these techniques to new problems.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to Machine Learning	08
2.	Supervised Learning	16
3.	Neural Networks and Deep Learning	12
4.	Unsupervised Learning	10
5	Model Evaluations	06
6.	Applications and Case Study	08

Total hours (Theory): 60
Total hours (Lab): 30
Total hours: 90

C. Detailed Syllabus:

1.	**Introduction to Machine Learning** Need for Machine Learning, Basic principles, Applications, Challenges, Types of Machine Leaning: Supervised Learning, Unsupervised Learning, Reinforcement Learning	08 Hours	13 %
2.	**Supervised Learning** Linear Regression, Logistic Regression, K Nearest Neighbours, Overfitting and Regularization, Support Vector Machines.	16 Hours	27 %
3.	**Neural Networks and Deep Learning** Perceptron Learning, Network Overview, Neural Network Representation, Need for Non-Linear Activation Functions, Cost Function, Back propagation, Training & Validation, Need for Deep representations, Building blocks of Deep Neural Networks, CNN	12 Hours	20 %
4.	**Model Evaluations** Training Testing sets, Learning Curves, Confusion Matrix, Gain and Lift Chart, Root Mean Squared Error, Cross Validation, ROC curves	10 Hours	17%
5.	**Unsupervised Learning** K-Means Clustering, Hierarchical Clustering, Association Rule Learning, Dimensionality Reduction (PCA, SVD)	06 Hours	10%
6.	**Applications and Case Study** Machine Learning Applications Across Industries (Healthcare, Retail, Financial Services, Manufacturing, Hospitality) ML offerings AI Startups (Tips, Tricks, Definitions)	08 Hours	13%

D. Instructional Method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.

- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.

- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.

- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.

- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.

- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able:

1. To solve difficult and complex problem of computer science using AI techniques.
2. To select any R&D field related to application of AI.
3. To understand soft computing and machine learning courses.
4. To develop software solution as per need of today's IT edge which requires high automation and less human intervention.
5. To demonstrate working knowledge in Python in order to write and explore more sophisticated Python programs
6. To apply knowledge representation, reasoning, and machine learning techniques to real-world problems

F. Recommended Study Material:

❖ **Text Books:**

1. Machine Learning, Tom Mitchell, McGraw Hill, 1997. ISBN 0070428077
2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 2004

❖ **Reference Books:**

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
2. Richard O. Duda, Peter E. Hart & David G. Stork, "Pattern Classification. Second Edition", Wiley & Sons, 2001.
3. Trevor Hastie, Robert Tibshirani and Jerome Friedman, "The elements of statistical learning", Springer, 2001.
4. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", MIT Press, 1998.

1. **Web Materials:**

1. https://www.youtube.com/watch?v=fgtUFzxNztA
2. http://nptel.iitm.ac.in/video.php?courseId=1041
3. http://www-formal.stanford.edu/jmc/whatisai/whatisai.html

4. http://www.webopedia.com/TERM/A/artificial_intelligence.html

5. http://en.wikipedia.org/wiki/Artificial_intelligence