Guru Nanak Dev Engineering College, Ludhiana

Department of Information Technology

B. Tech (IT) Scheme 2018

Subject Code: PCIT-114

Subject Name: Introduction to Machine Learning

Programme: B.Tech.	**L:** 3 **T:** 1 **P:** 0
Semester: 6	**Teaching Hours:** 48
Theory/Practical: Theory	**Theory Credits:** 4
Internal Marks: 40	**Percentage of Numerical/DesignProblems:**20%
External Marks: 60	**Duration of End Semester Exam (ESE):** 3 Hours
Total Marks: 100	**Course Type:** Professional Core Course

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1	Apply Supervised Learning, Unsupervised learning, Deep Learning, Visualization Techniques.
2	Recognize and formalize a task as a machine learning problem.
3	Interpret and present the predicted model.
4	Identify suitable algorithms to tackle different machine learning problems.
5	Apply machine learning algorithms to real datasets.
6	Make powerful and accurate predictions.

Pre-requisites: Basics of Mathematics, AlgorithmsIntro-level algebra, Proficiency in programming basics.

Additional Material Allowed in ESE: NIL (Mention anything like graph, calculator etc, if required in exam)

Detailed Contents:

Part-A

Introduction to Machine Learning:

Difference between Machine Learning and traditional programming, Applications of Machine Learning, Why Machine Learning is the Future. [4L]

Regression:

Simple Linear Regression, Multiple Linear Regression, Polynomial Regression, Support Vector Regression, Decision Tree Regression, Random Forest Regression. [10L]

Classification :

Linear, Non-linear, Multi-class and Multi-label classification, Neural Networks: Introduction, Perceptron, Multilayer Perceptron, Logistic Regression, K-Nearest Neighbors (K-NN), Support Vector Machine (SVM), Naive Bayes, Decision Tree Classification, Random Forest Classification. [10L]

Part-B

Clustering:

Introduction to clustering, Hierarchical: AGNES, DIANA, Partitional: K-means clustering, K- Mode Clustering, Self-Organizing Map, Expectation Maximization, Gaussian Mixture Models. [12L]

Fuzzy Logic:

Introduction to Fuzzy Logic, Fuzzy Set, Fuzzification, Membership Functions: trimf, trapmf, gaussmf, gauss2mf,gbellmf, Defuzzification [12L]

Textbooks:

1. Jason Brownlee “Master Machine Learning Algorithms” Edition, v1.13, (2018).
2. Alpaydin E., Introduction to Machine Learning, MIT Press (2010).
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Francis Bach “Deep Learning (Adaptive Computation and Machine Learning series)” MIT Press (2017).
4. Aurelien Geron, “Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems”, Shroff/O'Reilly; First edition (2017).

Reference Books:

1. Michie D., Spiegelhalter D. J., Taylor C. C., Machine Learning, Neural and Statistical Classification. Overseas Press (2009).
2. N. J. Nilson, Introduction to Machine Learning, Stanford, Online Link http://robotics.stanford.edu/people/nilsson/mlbook.html (Accessed on 30 July 2020)

Online Learning Material:

1. Machine Learning A-Z™: Hands-On Python & R In Data Science Created by Kirill Eremenko, Hadelin de Ponteves, SuperDataScience Team, SuperDataScience Support https://www.udemy.com/machinelearning/ (Accessed on 30 July 2020)
2. The 5 Clustering Algorithms Data Scientists Need to Know https://towardsdatascience.com (Accessed on 03 July 2020)
3. Crash Cource on Machine Learning by Google https://developers.google.com/machine-learning/crash-course/ (Accessed on 03July 2020)

Guru Nanak Dev Engineering College, Ludhiana

Department of Information Technology

B. Tech (IT) Scheme 2018

Subject Code: LPCIT-114

Subject Name: Machine Learning Laboratory

Programme:B.Tech.	**L:** 3 **T:** 1 **P:** 0
Semester: 6	**Teaching Hours:** 24
Theory/Practical: Practical	**Practical Credits:** 1
Internal Marks:30	**Percentage of Numerical/DesignProblems:** 100%
External Marks: 20	**Duration of End Semester Exam (ESE):** 1.5Hours
Total Marks: 50	**Course Type:** Professional Core Course

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1	Collect data and apply pre-processing techniques
2	Implement and compare the relevant algorithms
3	Make robust Machine Learning models
4	Use Machine Learning for personal purpose
5	Formulate business problems as Machine Learning problems
6	Make powerful analysis

Pre-requisites: Basic programming skills, working of various Gates and computer fundamentals

Detailed Contents:

1. Implement Simple Linear Regression.
2. Implement Random Forest Regression.
3. Implement Logistic Regression.
4. Implement Decision Tree classification algorithms.
5. Implement k-nearest neighbours classification algorithms.
6. Implement Naive Bayes classification algorithms.
7. Implement K-means clustering to Find Natural Patterns in Data.
8. Implement K- Mode Clustering.
9. Evaluating Machine Learning algorithm with balanced and unbalanced datasets.
10. Compare various Machine Learning algorithms based on various performance metrics.

Mini project: By using various concepts of syllabus students required to prepare a project in a group of two to three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate the project as well as must give a presentation of the same.

Some if the projects can be:

- Implement the classification Machine Learning models on the dataset (Amazon food reviews dataset) using hyper-parameter tuning.
- Implement the clustering algorithm on the dataset using hyper parameter tuning.

- Try to solve the titanic dataset problem which is publically available on Kaggle with the use of the performance metrics (confusion matrix, classification report, AUC Roc curve) alongwith the visualizations.
- Explainable AI (Take a dataset from kaggle.com and implement the Explainable AI using SHAP or LIME).
- Try to implement the some kaggle problem.

Note:

- Any Programming languages can also be used for implementation
- It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester.
- This is only the suggested list of Practical's, Projects Instructor may also frame additional
- Practical's relevant to the course contents (if required)

Online Learning Material:

1. Virtual machine learning labs

http://vlabs.iitb.ac.in/vlabs-dev/labs/machine_learning/labs/index.php (Accessed 31 July 2020)

2. Tinker with a Neural Network Right Here in Your Browser

https://playground.tensorflow.org/ (Accessed 31 July 2020)

3. Machine Learning Playground

https://ml-playground.com/ (Accessed 31 July 2020)