GUJARAT TECHNOLOGICAL UNIVERSITY
Master of Engineering
Subject Code: 3735904
Semester – III
Subject Name: Machine Learning

Type of course:

Prerequisite: Data Structures, Basics of Probability and Statistics

Rationale: Machine learning is a method of data analysis that automates analytical model building. It is a branch of artificial intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention. This subject will help students to learn patterns and concepts from data without being explicitly programmed in various IOT nodes and also motivates them to design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE(E)	PA (M)	PA (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Content:

Sr. No	Content	Total Hrs	% Weightage
1	**Supervised Learning (Regression/Classification)** Basic methods**:** Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes Linear models: Linear Regression, Logistic Regression, Generalized Linear Models Support Vector Machines, Nonlinearity and Kernel Methods Beyond Binary Classification: Multi-class/Structured Outputs, Ranking	10	15%
2	**Unsupervised Learning** Clustering**:** K-means/Kernel K-means Dimensionality Reduction: PCA and kernel PCA Matrix Factorization and Matrix Completion Generative Models (mixture models and latent factor models)	7	15%
3	Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)	6	20%
4	Sparse Modelling and Estimation, Modelling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning	9	20%
5	Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference	9	20%
6	Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.	5	10%

References:

1. Machine Learning: A Probabilistic Perspective, Kevin Murphy, MIT Press, 2012.
2. The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer 2009 (freely available online)
3. Machine Learning in Action, Peter Harrington, Manning, dreamtech press
4. Machine Learning for Big Data, Jason Bell, Wiley
5. Machine Learning in Python, Michael Bowles, Wiley
6. Machine Learning with TensorFlow for dummies, Matthew Scarpino, Wiley
7. Python Machine Learning By Example, Yuxi Liu, Packt
8. Advance Machine Learning with Python, John Hearty, Packt
9. Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press
10. Pattern Recognition and Machine Learning, Christopher Bishop, Springer, 2007.

Course Outcome:

List of Experiments:

- Minimum 10 experiments based on the contents.
- Mini Project in a group of max. 3 students
- Writing a research paper on selected topic from content with latest research issues in that topic

Major Equipments:

- Modern System with related software

List of Open Source Software/learning website:

https://www.analyticsvidhya.com/blog/2016/01/complete-tutorial-learn-data-science-python-scratch-2/

https://www.rstudio.com/online-learning/