**Name of Department:- Computer Science and Engineering**

**Machine Learning**

TCS 509

1. Subject Code: Course Title:

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2. Contact Hours: L: T: P:

3. Semester: V

4. Pre-requisite: TCS201, TCS421

5. Course Outcomes: After completion of the course students will be able to

* 1. Haveagoodunderstandingofthefundamentalissuesandchallengesofmachine learning: data, model selection, model complexity,etc.
  2. Distinguishthestrengthsandweaknessesofmanypopularmachinelearningapproaches.
  3. Analyze the underlying relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervisedlearning.
  4. Utilize the structure and design concepts of neural networks applications to solve real lifeproblems
  5. Plan and execute successful machine learning and big data projects, including selecting an adequate process for the specific task and avoiding the machine learningpitfalls.
  6. Evaluate the issues raised by current research in the field of machinelearning

6.Detailed Syllabus

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| **UNIT** | **CONTENTS** | **Contact**  **Hrs** |
| **Unit – I** | **Review of Statistical Concepts:** Mean, Median, Mode, Outliers, Range, Average Deviation, Absolute Deviation, Squared Deviation, Standard Deviation, Total Sum of Squares.  **Review of Linear Algebra:** Vectors and Matrices, Addition and Multiplication of Scalars, Matrix Multiplication Properties, Inverse and Transpose.  **Introduction to Machine Learning:** What is Machine Learning, Introduction to ML's three approaches: Supervised, Unsupervised and Reinforcement Learning. | **10** |
| **Unit - II** | **Validation Techniques:** Hold out, K-Fold Cross Validation, Leave one out, Bootstrapping.  **Supervised Learning Algorithms:** Linear Regression, Logistic  Regression, Decision Trees, Random Forest, Support Vector Machine,K-  Nearest Neighbors, Naive Bayes, | **10** |
| **Unit – III** | **Ensemble Learning:** Bagging, Random Forest, AdaBoost, Bucket of  Models, Stacking  **Clustering:** K-means, Silhoutte Scores, Hierarchical Clustering, Fuzzy c- means, DBScan  **Association Rule Learning:** Support, Confidence, Lift, Conviction, Apriori  Algorithm, Eclat Algorithm. | **8** |
| **Unit – IV** | **Dimensionality Reduction:** Low Variance Filter, High Correlation Filter, Backward Feature Elimination, Forward Feature Selection,Principle Component Analysis, Projection Methods. | **14** |
| **Unit – V** | **The Rise of Deep Learning:** Mask R-CNN, Yolo, AlexNet, VGG, MobileNet, Deeplab, Fully Convolutional Networks, Image captioning (CNN+LSTM), Word2vec, Doc2Vec, Autoencoder. CNN Algorithm and Artificial Neural Networks  **Deep Learning Tools:** TensorFlow, PyTorch, Keras | **7** |
|  | **Total** | **49** |

**Text and Reference Books**

1. "Machine Learning For Dummies", John Paul Mueller and Luca Massaron
2. "A Course in Machine Learning", Hal Daumé III.
3. "Programming Collective Intelligence: Building Smart Web 2.0 Applications", Toby Segaran
4. "Building Machine Learning Systems with Python", WilliRichert and Luis Pedro Coelho
5. "Learning scikit-learn: Machine Learning in Python", Raúl Garreta and Guillermo Moncecchi
6. "Machine Learning in Action", Peter Harrington