DS303

Lecture Schedule : Slot 5
Venue : Taught online
Instructor : Biplab Banerjee
TA : Pranjal Jain, Ruchika Chavhan, Manas Vashistha, Yash Khemchandani, Anwesh Mohanty, Yash Jain

Email to reach all TAs and Instructors

For questions of general interest to the class, use moodle / MS Teams.

Syllabus and week-wise calendar: Will be mentioned in the first class

Course description

- The course deals with the introduction of machine learning techniques. We will discuss about the supervised, unsupervised, semi-supervised ML algorithms in detail. Introduction to CNN and RNN/LSTM as popular deep learning tools will also be covered. We plan to go into both the theoretical as well as applied aspects.

Topics intended to be covered

- Introduction to ML
- Idea of supervised, unsupervised, semi-supervised, reinforcement learning
- Linear regression
- Idea of model complexity, generalization, bias-variance trade-off, regularization
- Cross validation, VC dimension
- Supervised classification algorithms: K nearest neighbor, LDA, Decision Tree, SVM and kernel methods, Neural Network, Naive Bayes', Gaussian discriminant analysis, Ensemble methods etc.
- More on probabilistic learning models: Parameter estimation using MLE, MAP, GMM, EM algorithm
- Unsupervised learning: Clustering and kernel density estimation, K-means, DBSCAN, Parzen window technique etc.
- Dimensionality reduction using PCA and kernel PCA
- Intro to reinforcement learning
- Intro to deep learning and convolutional networks, recurrent networks

- Some advanced learning topics if time permits

Eligibility

- The course is open to all BTech students.

Prerequisites

- CS101. Plus math courses like linear algebra, probability, calculus will be helpful.

Credit/Audit Requirements

- **Approximate** credit structure
- Will be discussed in the class

Text References

- Pattern Recognition and Machine Learning, by Christopher Bishop, Springer 2011
- The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Second Edition, by Trevor Hastie and Robert Tibshirani (Springer Series in Statistics) 2016
- Supplementary material available online, e.g. Dive into Deep Learning by Aston Zhang, Zack C. Lipton, Mu Li and Alexander Smola, 2020 (https://d2l.ai)