NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ACADEMIC SESSION January-May 2020

Course and Evaluation Plan:

1. Course Code	**: EE871**	*2. Course Title*	**: *Machine Learning***
3. L-T-P Credits	**: 3-1-2 (5)**	*4. Teaching Dept.*	**: Electrical and Electronics Engineering**
5. Course Category	**: EL**	*6. Course Instructor*	**: Dr. JORA M. GONDA, *Associate Professor***

7. Course Contents:

Introduction, linear classification, perceptron update rule; Perceptron convergence, generalization; Maximum margin classification; Classification errors, regularization, logistic regression; Linear regression, estimator bias and variance, active learning; Active learning, non-linear predictions, kernals; Support vector machine (SVM) and kernels, kernel optimization; Model selection, Model selection criteria; Description length, feature selection; Combining classifiers, boosting, Boosting, margin, and complexity; Margin and generalization, mixture models, Mixtures and the expectation maximization (EM) algorithm, regularization, clustering; Spectral clustering, Markov models, Hidden Markov models (HMMs), Bayesian networks, Learning Bayesian networks, Probabilistic inference. Simulation exercises covering the theory.

8. Objectives of the Course:

- Statistical Machine Learning and Artificial Neural Network based Machine Learning.
- Supervised and Unsupervised Learning, and Concept learning
- Classification, Clustering, Function Approximation, Prediction
- **Business Analytics**
- Developing Skill for using R and Python for Model Building, analysis, and Decision making.

9. ***Course Plan:***

Module	***Topics***	***Schedule Dates***
M01	Introduction to Course, Course plan and Evaluation Plan	07-01-2020
M02	Nonlinear Optimization	09-01-2020
M03	Linear Optimization: Predictive Analytics	14-01-2020
M04	Artificial Neural Network – Classifier/Function Approximation	23-01-2020
M05	Artificial Neural Network – Clustering and Self Organising Maps, RBF	30-01-2020
M06	Artificial Neural Network – Associative Memory: Hopfield Networks	06-02-2020 (5 weeks)
	Mid-Semester Examination (10-02-2020 to 14-02-2020)	(1 week)
M07	Statistical Machine Learning – Basics	27-02-2020
M08	Statistical Machine Learning – Bayesian	12-03-2020

M09	Statistical Machine Learning – Frequentist	19-03-2020
M10	Statistical Machine Learning – Regression	26-03-2020
M11	Statistical Machine Learning – Clustering	02-04-2020
M12	Statistical Machine Learning – Text Analysis	09-04-2020
M13	Decision Tree: Concept Learning	16-04-2020 (9 weeks)

10.References:

1. Bishop, Christopher: Neural Networks for Pattern Recognition, New York, NY Oxford University Press, 1995.
2. Duda, Richard, Peter Hart, and David Stork: Pattern Classification, 2nd ed. New York, NY Wiley-Interscience, 2000.
3. MacKay, David: Information Theory, Inference, and Learning Algorithms, Cambridge, UK Cambridge University, 2003.
4. Mitchell, Tom. Machine Learning: New York, NY McGraw-Hill, 1997.
5. T. Hastie, R. Tibshirani, J. Friedman: The Elements of Statistical Learning, Springer 2e, 2008.
6. Christopher Bishop: Pattern Recognition and Machine Learning. Springer, 2006 .
7. U Dinesh Kumar: Business Analytics: The Science of Data-Driven Decision Making, Wiley, 2017
8. Manaranjan Pradhan, U Dinesh Kumar: Machine earning with Python, Wiley, 2019
9. Simon Haykins: Neural Networks and Learning Machines, 3rd Edition, Pearson Education, NJ, 2009.
10. Brett Lantz: Machine Learning with R: PACKT Open Source Publishing, 2013.

11.Course Evaluation Plan:

Sl. No.	Component	Weight	Syllabus	Schedule
1	Lab/ Assignments/ Quizzes/ Tests	60 (%)	Generally that of inter events; specifics as per announcements – as and when manifest, may be surprises. Evaluation based on regular meetings, and presentations. Topics discussed upto the last day before the beginning of Mid Semester examination interval. **<u>Scaling the evaluations to 60%</u>.**	Completed until March 12th 2020
2	MidSem Exam			
3	**EndSem Exam**	**40 (%)**	**Only remaining [M09-M13] contents to be covered through online mode; continuous evaluation with Assignments, tests, and quizzes.**	**On or before 20-06-2020**
Note: All tests and examinations will require Laptop with R, Libreoffice/MS Office, and Python				

12.Grading: Class Performance **<u>Distribution</u>** Based.

13. No. of. Registrants: *73*

14. Total No. of Contact Hours: *52* [Contact Sessions] +14 week Lab Sessions

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JORA M. GONDA
Course Instructor, Dept of E&E

Approved

Chairman, DPGC, Dept of E&E