Birla Institute of Technology and Science Pilani

K.K. Birla Goa Campus

AY 2017–18, Semester I

Course Handout

Course metadata

Course: Neural Networks and Fuzzy Logic (BITS F312)
Instructor-in-charge/Instructor: Tirtharaj Dash
Chamber No.: C. Ex-2
Lecture time: Monday, Wednesday, Friday; Slot 7 (2PM–3PM)

Scope and Objective of the course

Deep learning has had a long and rich history, but has gone by many names like cybernetics (1940s–1960s), connectionisms (1980s–1990s), presently named so since 2006, reflecting different philosophical viewpoints. This course on Neural Networks would focus on the conceptual foundation of Deep Learning along with computational investigations of various models as a part of laboratory experiments or projects. At the end of the course, students should be able to propose solutions to the real-world problems that involves learning machines to generate almost-exact (or, best approximate) solutions.

Books

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, *Deep Learning*, MIT Press.
2. Simon Haykin, *Neural Networks and Learning Machines*, Third Edition, Pearson.

Course Notices

All the announcement will be made in LMS, in class, and via e-mail.

Make-up Policy

- Make-up shall be granted only in genuine cases based on individual's need and circumstances.
- No marks will be awarded without make-up for that component

Chamber Consultation Hour

No specific time. Please let me know the topic of discussion and time. I will be sharing my present semester time schedule with you.

Table 1: **Course Plan**

#	**Learn. objective**	**Coverage**	**Week**
0	Course introduction	ML basics: types of learning algorithms, hyperparameters,. . ., challenges	1
1	Not-so-Deep Learner	Perceptron, Convergence proof, Failure of perceptron	2
2	Learnability in HD space	Transformation of input space to HD space, impact on learnability (separability of patterns)	3
3	Support Vector Machine	VC-dimension, SVC, SVM	4
4	Optimization and DL	Derivative based Optimization, Stochastic Grad. Descent, Multilayer Perceptron (MLP)	5, 6
5	Regularization	Improving learning and generalization in MLP	7
6	Optimization for DL	Initialization strategies, Strategy, Meta-algorithm Adaptive learning rate	8
7	Convolutional Networks	Conv. operation, Pooling, Variants of conv. function	8, 9
8	Recurrent and Recursive Nets	RNN, BackProp through Time (BPTT)	9, 10
9	RNN	RNN with LSTM cells, Gated RNN etc.	10, 11
10	Autoencoders	2-3 variants of autoenncoders	12, 13
11	Advanced DL	Advanced DL topics: RBM, Deep Gen. Models Application of DL (contemporary research)	14, 15

Table 2: **Evaluation Scheme**

Component	**Mark**	**Type**
Assumed Knowledge Test	10	CB
Mid-sem test	30	CB
Lab (incl. project)	20	OB
Comprehensive test	40	CB

Tirtharaj Dash
Instructor-in-charge
BITS F312