Online Value Added Course on Foundations of Machine Learning and Deep Learning

Conducted by

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#iitKLIV
Kharagpur Learning, Imaging and Visualization Research Group
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Contents

Instructor's Overview

Anupam Borthakur
Ph.D. Candidate, IIT Kharagpur
Area of Research: Privacy, Deep Learning, Machine Learning
Know more at:
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Sista Raviteja
Ph.D. Candidate, IIT Kharagpur
Area of Research: Surgical Video Analytics, Knowledge Graphs, Deep Learning
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Course Overview

Weeks	Broad Topic	Delivery	Mode
Module 1	Introduction to Machine Learning	Theory + Hands on	Online
Module 2	Introduction to Deep learning		
Module 3	Introduction to Convolution Neural Networks		
Module 4	Complexity Analysis of Deep Neural Networks		
Module 5	Selecting a Deep Neural Network		

Course Contents

Broad Topic	Topic	Description
Introduction to Machine Learning	Intution to Learning	0. Course overview
		1. Learning
		2. Human Vs Machine perspectives
		3. Formulation
		4. Relation to AI/ML
	Basics of L -1 (pipeline overview)	1. Inputs, W/B Box, Outputs
		2. Types of inputs
		3. Types of W/B Boxes
		4. Type of Outputs
		5. Relation to Learning
	Basics of L -2 (types of learning)	1. Supervised
		2. Unsupervised
		3. Semi-supervised
		4. Self Supervised
	Hands on basics 1	Hands on implentation of Basics of L1
	Hands on basics 2	Hands on implentation of Basics of L2

Module 1

Course Contents

Introduction to Deep learning	Perceptron Theory and Working	1. Perceptron - neurons
		2. Perceptron I/o Relations
		3. Perceptron working (with backpropagation)
		4. Non-linearity (touch up)
	Non-linearity	1. Need for nonlinearity
		2. Types of nonlinearities
		3. NN as a non linear system proof
	MLP	1. Introduction to MLP
		2. Flow on information in MLP
		4. Weight update eqns
		3. Applications of MLP
	Hands on	Introduction to Pytorch Framework
	Hands on	MLP tutorial

Module 2

Course Contents

Complexity Analysis of Deep Neural Networks	Linear Layers	1. Space and Compute Complexity derivations
	Convolution Layers	1. Space and Compute Complexity derivations
	Activation and Pooling Functions	1. Space and Compute Complexity derivations
	Hands on	Hands on example for proving space and compute complexity (FC)
	Hands on	1. Hands on example for proving space and compute complexity (CNN)

Module 3

Selecting a Deep Neural Network	Network Complexity	1. space and compute complexity b/w 2 sample networks
	Performance	1. performance metrics
		2. train-validation curves
		3. bias-variance trade off
	Hyperparameters	1. Hyperparameters
		2. Choosing the right hyperparameters
		3. Impact of hyperparameters
	Hands on	popular networks space and compute complexity
	Hands on	performance metrics and hyperparameters

Module 4

General Instructions

Class Streaming:

- Google Meet (Primary)

Students can communication via email

- Tophat
- anupamborthakur@kgpian.iitkgp.ac.in
- sista.raviteja@kgpian.iitkgp.ac.in

Slides and Tutorials :

- Website and android application: https://tophat.com/
- Course Code: 981780
- Tutorials: https://github.com/anupam-kliv/Foundatations_of_ML_DL_Down_Town_University

Attendance

- Google form attendance Link (Will contain a few questions)

Coding Instructions

Software and platforms

- PyTorch
- Anaconda
- Collaboratory
- Always use comment at appropriate places

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Prof. Pranveer Singh
Pro Vice-Chancellor
Assam down town University

Dr. T V V L N Rao
Professor & Dean, Faculty of Engineering
Assam down town University

Dr. Aniruddha Deka
Associate Professor, **Faculty of Engineering**
Assam down town University

Thank You

For your Attention!

Any Questions?