5-Week Deep Learning Bootcamp

DETAILED SYLLABUS

Overview

In our endeavour to build data culture and democratize Data Science learning, we are launching a 5-week Deep Learning Bootcamp with the help of resources contributed by academia and industry experts. The online bootcamp will have a series of day-wise learning modules along with intuitive practice quizzes/challenges.

This is a community initiative, driven by experts and mentors, and you have the opportunity to attend it for free.

Prerequisites

- Python
- Numpy
- Pandas
- Linear Algebra
- Jupyter Notebook/ Google Colab
- Passion for learning :)

Format

Tutors will provide learners with guided learning paths, resources and exercises to solve. The entire schedule, practical details, registration details will be put up very soon. A brief summary of the format can be found below:

- **Day-wise modules:** Trainers will post day-wise challenges and learning modules (mostly some of the best-curated content available on the internet that would allow you to have a structured learning path)
- **For real-time communication**, we will be using Slack. This medium will help learners to clear doubts on a real-time basis if they are stuck somewhere. In addition, this will also allow learners to interact with the mentors and fellow learners
- **Live doubt clearing and mentorship sessions** will be organized every week based on the requirements of the learners

Schedule

Refresh your data science basics that will be useful across the whole Bootcamp.

LEARNING MODULES	LEARNING OUTCOMES	DETAILED TOPICS
Module 0	**Data Science Refresher**	• Numpy and Pandas fundamentals • Linear Algebra fundamentals • Jupyter notebook/Anaconda/Google Colab • Visualization fundamentals • Refresher of Machine Learning Concepts

Bootcamp begins

Week 1		
Module 1	**Introduction to Deep Learning, Neural Network**	• What is DL and why is it so popular? • Comparison between ML and DL • Real-life applications of DL • Deep Learning Frameworks • Introduction to NN • **Recorded Session on Introduction to Neural Networks & its working** • Keras and Tensorflow • Tensors

Module 2	**Neural Network for Regression and Multi-Layer Perceptron**	• Regression model with tf.Keras
		• Epochs
		• Learning Rate
		• Batch Size
		• Hyperparameter Tuning
		• **Recorded Session on Introduction to Neural Networks for Regression**
		• Neural Network Architecture
		• NN Working:
		  ○ Feedforward intuition
		  ○ Gradient Descent
		  ○ Backpropagation intuition
		• The 5 step model life cycle

Week 2		

Module 3	**Neural networks for classification problems**	• Building a Deep Learning Model on binary classification problem
		• Compiling a model
		  ○ Loss Functions
		  ○ Optimizers
		• Activation functions
		• **Recorded Session on Introduction to Neural Networks for Classification**
		• Building a Deep NN on MNIST Dataset (i.e. multi-class problems)
		  ○ Pre-processing techniques
		  ○ Deciding Loss and Optimization Functions
		• Train, Validation and Test Set

		• Training the model • Hyperparameter Tuning • Testing the model • Saving and Loading Models
Module 4	**Optimizing a Neural Network**	• Overfitting and Underfitting • Early Stopping • Regularization • Dropout • Local and Global Minima • Batch vs Stochastic Gradient Descent • Random Initialization/Restart • Vanishing Gradient • Other Activation Functions • Recorded Session: Dive Deep into Vanilla Neural Networks

Week 3		

Module 5	**Digital Image Processing**	• How are images interpreted and modelled?
		• What are pixels, spatial and intensity resolution, and image matrices?
		• "Spatial image transformations and morphology
		  ○ Image rotation
		  ○ Subsampling techniques
		  ○ Oversampling techniques"
		• Image histogram
		• Image comparison metrics (MSE)
		• OpenCV Fundamentals

Module 6	**Convolutional Neural Networks (CNN)**	• Applications of CNNs
		• How CNNs solve the problem with MLP
		• CNN Architecture
		  ○ Kernel
		  ○ Filters
		  ○ Convolution Layer
		• Stride and Padding
		• Pooling Layer
		• Fully Connected Layer

		• Increasing Depth • Implementing a CNN in Tensorflow • Image Augmentation
Week 4		
Module 7	**Generative Adversarial Network (GAN)**	• What is GAN in Machine Learning? • Understanding GANs through real life application • Deep Fake • How do GANs work? - Intuition • GANs Architecture • **Live Session on GANs and applications**

Datathon (Week 4 & 5): Get your hands dirty with applied problem solving