5-Week Deep Learning Bootcamp  
DETAILED SYLLABUS

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# 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 (Release on 18th March)** | | |
| --- | --- | --- |
| 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 (Release on 25th March)** | | |
| --- | --- | --- |
| 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 (Release on 1st April)** | | |
| --- | --- | --- |
| 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 (Release on 8th April)** | | |
| 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