Practical Deep Learning

Student2Intern (S2i) program
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Overview

Machine Learning, Deep Learning and A.I. are buzz words we hear since past five years. Almost all applications in our day to day life are being influenced by one or more of these applications.With time, their influence is projected to increase manyfolds. Literally millions of web pages pop up upon searching for any one of these.

This course intends to include the core concepts of Deep Learning from a CODE point of view. Because of the interdisciplinary nature of the material, this course makes few assumptions about the background of the learner. Instead, it introduces basic concepts from statistics, artificial intelligence, information theory, and other disciplines as the need arises, focusing on just those concepts most relevant to machine learning.The sessions will be strictly hands-on wherein the learner will be actively engaged in typing CODE in a Python environment using Cloud services. All content will be shared via a public GitHub repository.

Goals

1. Expose the learner to the intricacies of modern Deep Learning architectures and frameworks.
2. The learner achieves competency to work with pre -trained algorithms, modify and use transfer learning or curate all together customized ones.
3. He/She becomes eligible to take up any challenging production level code projects after successfully completing the course contents, quizzes and assignments.
4. Prepare the learner to be eligible to work in the position of a full time Deep Learning Intern.

Pre-prerequisites

- A deep desire to acquire new age skills and a will to work.
- Elementary Linear Algebra
- Basic Probability and Statistics
- Engineering Calculus
- Python

Mentoring

The course is designed with timely hand holding sessions as and when needed by the learner. This is with a clear understanding of the fact that every learner absorbs at a different pace for different topics.

Milestones - Timeline

- Week 1-2
  - Setting up the environments
    - Jupyter notebooks and google Colab
    - Using a GPU for Deep Learning
    - Importing Libraries - Dependencies
  - Fundamentals of Deep Learning- A.I., ML and DL
  - Relevance of Deep Learning now
  - Elements of Basic Mathematics for Deep Learning
    - Scalars
    - Vectors
    - Matrices
    - Tensors
    - Numpy arrays
    - Various Modalities of Data types
    - Tensor operations
      - Element wise operations
      - Broadcasting
      - Tensor dot product
      - Reshaping a Tensor
    - Derivative of a Tensor
    - Stochastic Gradient Descent
    - Backpropagation Algorithm

- Week 3-6

    - Introduction to Keras
    - Keras and TensorFlow - the inter connection
    - Building Blocks a Neural Network :: - LAYERS
    - Network of Layers :: - MODELS
    - Loss Functions
    - Optimizers
    - A warm up REGRESSION example- Boston Housing Data set
    - A warm up CLASSIFICATION examples
        - Binary Classification - IMDB movie data set
        - Multi-class Classification - Reuters Dataset
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- Week 6-9
    - Types of Machine Learning
        - Supervised
        - Unsupervised
        - Self-Supervised
        - Reinforced
    - Model Evaluation
        - Train, Validate and Test sets
    - Data Preprocessing
    - Feature Engineering
    - Overfitting and Underfitting
    - Machine Learning pipeline- general steps
        - Problem defining
        - Data collection
        - Choosing a Measure to decide a successful solution
        - Decide an evaluation process metric
        - Develop a MODEL
        - Regularization and Hyper Parameter tuning
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- Week 10-12
  - Deep Learning for TEXT data modality- LSTM
  - Deep Learning for SEQUENCE data modality - RNN
  - Deep Learning for IMAGE Data- CONVOLUTION
  - FUNCTIONAL API in KERAS- Introduction
  - Keras CALLBACKS
  - TensorBOARD visualisation

Course Project Assignment

All participants will be split into groups of 3 each and be given a set of problem statements as MINI Project. All groups will be presenting their RESULTS at the end semester assessment. Grading will comprise of weekly quiz marks, programing assignment marks and the MINI project marks.