

## **Module 5: Deep Learning (Supervised Modern Machine Learning)**

- 1 Deep Neural Networks.
  - 1.1 Different Regularization Schemes.
  - 1.2 Vanishing / Exploding gradients.
  - 1.3 Weight Initialization for Deep Networks.
  - 1.4 **Sample Python code demonstration along with detailed explanation for Coding Assignment.**
  - 1.5 **Coding Assignment 29.**
  - 1.6 Different new optimization Algorithms.
    - 1.6.1 Exponentially weighted averages.
    - 1.6.2 Gradient descent with momentum.
    - 1.6.3 RMSprop.
    - 1.6.4 Adam optimization algorithm.
- 2 Hyperparameter Tuning and Batch Normalization.
- 3 **Sample Python code (with TensorFlow) demonstration along with detailed explanation for Coding Assignment.**
- 4 **Coding Assignment 30.**
- 5 **Portfolio Mini Project 14 on Deep Neural Networks.**
- 6 Deep Learning for Computer Vision
  - 6.1 Convolutional Neural Networks
    - 6.1.1 Edge Detection.
    - 6.1.2 Padding.
    - 6.1.3 Strided Convolutions.
    - 6.1.4 One Layer of a Convolutional Network.
    - 6.1.5 Pooling Layers.
    - 6.1.6 Why Convolutions?
    - 6.1.7 Shallow Convolutional Neural Networks.
    - 6.1.8 **Sample Python code (with TensorFlow) demonstration along with detailed explanation for Coding Assignment.**
    - 6.1.9 **Coding Assignment 31.**
    - 6.1.10 Classic Networks.
    - 6.1.11 ResNet, Inception Net.
    - 6.1.12 Networks in Networks and 1x1 Convolutions.
    - 6.1.13 Transfer Learning on Neural Networks.
    - 6.1.14 **Sample Python code (with TensorFlow and Keras) demonstration along with detailed explanation for Coding Assignment.**
    - 6.1.15 **Coding Assignment 32.**
    - 6.1.16 Data Augmentation.
    - 6.1.17 Face Recognition
      - 6.1.17.1 One Shot Learning.
      - 6.1.17.2 Siamese Neural Network.
      - 6.1.17.3 Facial Verification.
- 7 **Portfolio Mini Project 15 on Convolutional Neural Networks.**
- 8 Deep Learning for Natural Language Processing
  - 8.1 Recurrent Neural Networks
    - 8.1.1 Sequence Models
    - 8.1.2 Recurrent Neural Network Model
    - 8.1.3 Backpropagation through time
    - 8.1.4 **Sample Python code (with TensorFlow) demonstration along with detailed explanation for Coding Assignment.**
    - 8.1.5 **Coding Assignment 33.**
    - 8.1.6 Different types of Recurrent Neural Networks.

- 8.1.7 Language model and sequence generation
- 8.1.8 Vanishing gradients in Recurrent Neural Networks.
- 8.1.9 Gated Recurrent Unit (GRU)
- 8.1.10 Long Short Term Memory (LSTM)
- 8.1.11 Deep Recurrent Neural Networks.
- 8.1.12 **Sample Python code (with TensorFlow) demonstration along with detailed explanation for Coding Assignment.**
- 8.1.13 **Coding Assignment 34.**
- 8.1.14 Word Representation
- 8.1.15 Word embeddings
- 8.1.16 Embedding matrix
- 8.1.17 Learning word embeddings
- 8.1.18 Word2Vec
- 8.1.19 Negative Sampling
- 8.1.20 GloVe word vectors
- 8.1.21 **Sample Python code demonstration along with detailed explanation for Coding Assignment.**
- 8.1.22 **Coding Assignment 35.**
- 8.1.23 Basic Models.
- 8.1.24 Picking the most likely sentence
- 8.1.25 Beam Search
- 8.1.26 Refinements to Beam Search

**9 Portfolio Mini Project 16 on Recurrent Neural Networks.**

**10 Portfolio Project 13 on Deep Learning.**