Deep Learning Training

1. Day 1 Session 1

    a. **Introduction**
        i. Introduction to machine learning
        ii. Supervised learning
        iii. Unbalanced data
        iv. Unsupervised learning
        v. Reinforcement learning
        vi. What is deep learning?
        vii. Artificial neural networks
        viii. The biological neurons
        ix. The artificial neuron
        x. How does an ANN learn?
        xi. ANNs and the backpropagation algorithm
        xii. Weight optimization
        xiii. Stochastic gradient descent
        xiv. Neural network architectures
        xv. Deep Neural Networks (DNNs)
        xvi. Multilayer perceptron
        xvii. Deep Belief Networks (DBNs)
        xviii. Convolutional Neural Networks (CNNs) AutoEncoders
        xix. Recurrent Neural Networks (RNNs)
        xx. Emergent architectures
        xxi. Deep learning frameworks

2. Day 1 Session 2

    a. **Introduction to TensorFlow**
        i. A First Look at TensorFlow
        ii. A general overview of TensorFlow
        iii. What's new from TensorFlow v1.6 forwards?
        iv. Nvidia GPU support optimized
        v. Introducing TensorFlow Lite
        vi. Eager execution
        vii. Optimized Accelerated Linear Algebra (XLA)
        viii. Installing and configuring TensorFlow
        ix. TensorFlow computational graph
        x. TensorFlow code structure
        xi. Eager execution with TensorFlow

b. Tensors and Data Types

i. Data model in TensorFlow
ii. Tensor
iii. Rank and shape
iv. Data type
v. Variables
vi. Fetches
vii. Feeds and placeholders
viii. Visualizing computations through TensorBoard
ix. How does TensorBoard work?
x. Linear regression and beyond
xi. Linear regression revisited for a real dataset

3. Day 2 Session 1

a. Neural Networks

i. Feed-Forward Neural Networks with TensorFlow
ii. Feed-forward neural networks (FFNNs)
iii. Feed-forward and backpropagation
iv. Weights and biases
v. Activation functions
vi. Using sigmoid
vii. Using tanh
viii. Using ReLU
ix. Using softmax
x. Implementing a feed-forward neural network
xi. Exploring the sample dataset Softmax classifier
xii. Implementing a multilayer perceptron (MLP)
xiii. Training an MLP
xiv. Using MLPs
xv. Dataset description
xvi. Pre-Processing
xvii. A TensorFlow implementation of MLP for client-subscription
xviii. assessment
xix. Deep Belief Networks (DBNs)
xx. Restricted Boltzmann Machines (RBMs)
xxi. Construction of a simple DBN
xxii. Unsupervised pre-training
xxiii. Supervised fine-tuning

xxiv. Implementing a DBN with TensorFlow for client-subscription
xxv. assessment
xxvi. Tuning hyperparameters and advanced FFNNs
xxvii. Tuning FFNN hyperparameters
xxviii. Number of hidden layers
xxix. Number of neurons per hidden layer
xxx. Weight and biases initialization
xxxi. Selecting the most suitable optimizer
xxxii. Grid Search and randomized search for hyperparameters tuning
xxxiii. Regularization
xxxiv. Dropout optimization

4. Day 2 Session 2

   a. **Convolutional Neural Networks**
      i. Main concepts of CNNs
      ii. CNNs in action
      iii. LeNet5
      iv. Implementing a LeNet-5 step by step
      v. AlexNet
      vi. Transfer learning
      vii. Pretrained AlexNet
      viii. Dataset preparation
      ix. Fine-tuning implementation
      x. VGG
      xi. Artistic style learning with VGG-19
      xii. Input images
      xiii. Content extractor and loss Style extractor and loss
      xiv. Merger and total loss
      xv. Training
      xvi. Inception-v3
      xvii. Exploring Inception with TensorFlow
      xviii. Emotion recognition with CNNs

5. Day 3 session 1

   a. **Autoencoders**
      i. How does an autoencoder work?

ii. Implementing autoencoders with TensorFlow
iii. Improving autoencoder robustness
iv. Implementing a denoising autoencoder
v. Implementing a convolutional autoencoder
vi. Encoder
vii. Decoder
viii. Fraud analytics with autoencoders
ix. Description of the dataset
x. Problem description
xi. Exploratory data analysis
xii. Training, validation, and testing set preparation
xiii. Normalization
xiv. Autoencoder as an unsupervised feature learning algorithm
xv. Evaluating the model

6. Day 3 Session 2

a. Recurrent Neural Networks

i. Working principles of RNNs
ii. Implementing basic RNNs in TensorFlow
iii. RNN and the long-term dependency problem
iv. Bi-directional RNNs
v. RNN and the gradient vanishing-exploding problem
vi. LSTM networks
vii. GRU cell
viii. Implementing an RNN for spam prediction
ix. Data description and pre-processing
x. Developing a predictive model for time series data
xi. Description of the dataset
xii. Pre-processing and exploratory analysis LSTM predictive model
xiii. Model evaluation
xiv. An LSTM predictive model for sentiment analysis
xv. Network design
xvi. LSTM model training
xvii. Visualizing through TensorBoard
xviii. LSTM model evaluation
xix. Human activity recognition using LSTM model
xx. Dataset description
xxi. Workflow of the LSTM model for HAR
xxii. Implementing an LSTM model for HAR

7. Day 4 Session 1

    a. **Advanced topics**
        i. TF estimator
        ii. Estimators
        iii. Graph actions
        iv. Parsing resources
        v. Flower predictions
        vi. TF Learn
        vii. Installation
        viii. Titanic survival predictor Pretty Tensor
        ix. Chaining layers
        x. Normal mode
        xi. Sequential mode
        xii. Branch and join
        xiii. Digit classifier
    b. **Keras**
        i. Keras programming models
        ii. Sequential model
        iii. Sentiment classification of movie reviews
        iv. Functional API
        v. Squeeze Net

8. Day 4 session 2

    a. **Case Studies**
        i. Getting Dataset
        ii. Data Visualization
        iii. Data Cleaning
        iv. Feature Engineering and Extraction
        v. Creating the Deep Learning Model
        vi. Model Training
        vii. Evaluating the model
        viii. Ensemble
        ix. Calculate accuracy and Mean Error
        x. Deployment