**Deep Dive: Deep Learning**

**Title: Fundamentals of Deep Learning**

**Duration:** 3 days

**Pre-requisite:** Basic Python Programming

**Short Description:**

This Deep Dive into Deep Learning class will provide you with a solid understanding of neural networks and their contributions to deep learning. You’ll get hands-on experience using TensorFlow to create Convolutional Neural Networks (CNN) for image recognition and Recurrent Neural Networks (RNN) for natural language processing. Deep Learning largely provides perception for Artificial Intelligence.

**Long Description:**

This Deep Dive into Deep Learning class will provide you with a solid understanding of neural networks and their contributions to deep learning. You’ll get hands-on experience using TensorFlow to create Convolutional Neural Networks (CNN) for image recognition and Recurrent Neural Networks (RNN) for natural language processing. Deep Learning largely provides perception for Artificial Intelligence.

We will begin by understanding neural networks and how they learn. We’ll discuss back propagation and some of the math behind neural networks. We’ll then code a neural network from scratch, for a fuller understanding, before coding one in TensorFlow. With this foundation, we’ll then delve into Convolutional Neural Networks which are used largely for computer vision. We’ll use this understanding to do an image recognition project. Next, we’ll turn to understanding sequence models and Recurrent Neural Networks. This will lead us into doing a project on natural language processing.

**Learning Objectives:**

After this course, you will be able to:

* Install Anaconda on a personal computer.
* Install TensorFlow
* Have a clear understanding of deep learning and its role in AI
* Understand neural networks
* Code a neural network from scratch
* Understand the architectural differences between deep neural networks and deep learning
* Use TensorFlow and Keras to apply deep learning
* Understand Convolutional Neural Networks
* Do image recognition tasks
* Understand Recurrent Neural Networks
* Do natural language processing
* Do sentiment analysis
* Understand use cases for Convolutional Neural Networks
* Understand use cases for Recurrent Neural Networks

**Topic Outline:**

**Day 1**

* Course Introduction
* Overview of Deep Learning
* Install Anaconda
* **Milestone 1**: Learn how to use Jupyter Notebooks
* Essential libraries
  + TensorFlow
  + Keras
  + Numpy
  + Scikit-learn
* Introduction to neural networks
* The math behind neural networks
* Back propagation
* Understanding the intuition behind neural networks
* **Milestone 2**: Coding a neural network from scratch
* Deep neural networks
* Understanding TensorFlow
* **Milestone 3**: Applying neural networks using TensorFlow/Keras

**Day 2**

* From Deep Neural Networks to Deep Learning
* Understanding unstructured data
* Image recognition
* Introduction to Convolutional Neural Networks (CNN)
* Convolutional layers
* Pooling layers
* Fully-connected layers
* **Milestone 4**: Using TensorFlow to create a CNN
* **Milestone 5**: Image recognition project

**Day 3**

* Understanding sequence models
* Introduction to Recurrent Neural Networks (RNN)
* Natural Language Processing (NLP)
* Text preprocessing
* Word embeddings
* Sentiment analysis
* **Milestone 6**: Using TensorFlow to create an RNN
* **Milestone 7**: Natural Language Processing project
* Introduction to AutoEncoders
* Introduction to Generative Adversarial Networks (GAN)

**Structured Activity/Exercises/Case Studies:**

Day 1:

* Milestone 1 – Learn how to use Jupyter Notebooks
* Milestone 2 – Coding a neural network from scratch
* Milestone 3 – Applying neural networks using TensorFlow/Keras

Day 2:

* Milestone 4 – Using TensorFlow to create a CNN
* Milestone 5 – Image recognition project

Day 3:

* Milestone 6 – Using TensorFlow to create an RNN
* Milestone 7 – Natural Language Processing project

**Training material provided:** Yes (Digital format)