

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Industry Certified Value Added Course

on

**“ADVANCED AI: MASTERING COMPUTER VISION AND
NATURAL LANGUAGE PROCESSING”**

22-07-2024 to 26-07-2024

Advanced AI: Mastering Computer Vision and Natural Language Processing

45 HOURS

Objectives

- To understand the basic theory underlying Artificial intelligence in computer vision and natural language processing.
- To make use of python for text classification, semantic and sentiment analysis.
- To formulate deep learning techniques corresponding to different applications.
- To acquire knowledge about the utilization of Deep learning models and image, object tracking techniques in real time.
- To provide students with knowledge in deep learning models for computer vision.

UNIT 1: BASICS OF TEXT, NLP AND SPEECH TAGGING

(9 Hours)

Python Text Basics - Introduction to Python Text Basics - Working with Text Files with Python - Part One - Working with Text Files with Python - Part Two - Working with PDFs - Regular Expressions Part One - Regular Expressions Part Two - Python Text Basics - Assessment Overview - Python Text Basics - Assessment Solutions-Natural Language Processing Basics - Introduction to Natural Language Processing - Spacy Setup and Overview - What is Natural Language Processing? - Spacy Basics - Tokenization - Part One - Tokenization - Part Two - Stemming - Lemmatization - Stop Words - Phrase Matching and Vocabulary - Part One - Phrase Matching and Vocabulary - Part Two - NLP Basics Assessment Overview - NLP Basics Assessment Solution- Part of Speech Tagging and Named Entity Recognition - Introduction to Section on POS and NER - Part of Speech Tagging - Visualising Part of Speech - Named Entity Recognition - Part One - Named Entity Recognition - Part Two - Sentence Segmentation - Part Of Speech Assessment - Part Of Speech Assessment - Solutions

UNIT 2: TEXT CLASSIFICATION, SEMANTICS AND SENTIMENT ANALYSIS

(9 Hours)

Text Classification - Introduction to Text Classification - Machine Learning Overview
Classification Metrics - Confusion Matrix - Scikit-Learn Primer - How to Use SciKit-Learn -
Scikit-Learn Primer - Code Along Part One - Scikit-Learn Primer - Code Along Part Two - Text
Feature Extraction Overview - Text Feature Extraction - Code Along Implementations - Text
Feature Extraction - Code Along - Part Two - Text Classification Code Along Project - Text
Classification Assessment Overview - Text Classification Assessment Solutions - Semantics and
Sentiment Analysis - Introduction to Semantics and Sentiment Analysis - Overview of Semantics
and Word Vectors - Semantics and Word Vectors with Spacy - Sentiment Analysis Overview -
Sentiment Analysis with NLTK - Sentiment Analysis Code Along Movie Review Project -
Sentiment Analysis Project Assessment - Sentiment Analysis Project Assessment - Solutions

UNIT 3: TOPIC MODELING, DEEP LEARNING FOR NLP AND IMAGE BASICS

(9 Hours)

Topic Modelling - Introduction to Topic Modeling Section - Overview of Topic Modeling -
Latent Dirichlet Allocation Overview - Latent Dirichlet Allocation with Python - Part One -
Latent Dirichlet Allocation with Python - Part Two - Non-negative Matrix Factorization
Overview - Non-negative Matrix Factorization with Python - Topic Modeling Project - Overview
- Topic Modeling Project – Solutions- Deep Learning for NLP - Introduction to Deep Learning
for NLP - The Basic Perceptron Model - Introduction to Neural Networks - Keras Basics - Part
One - Keras Basics - Part Two - Recurrent Neural Network Overview - LSTMs, GRU, and Text
Generation - Text Generation with LSTMs with Keras and Python - Part One - Text Generation
with LSTMs with Keras and Python - Part Two - Text Generation with LSTMS with Keras - Part
Three - Chat Bots Overview - Creating Chat Bots with Python - Part One - Creating Chat Bots
with Python - Part Two - Creating Chat Bots with Python - Part Three - Creating Chat Bots with
Python - Part Four - Numpy and Image Basics - Introduction to Numpy and Image Section -
NumPy Arrays - What is an image? - Images and NumPy - NumPy and Image Assessment Test -
NumPy and Image - Assessment Test – Solutions- Image Basics with OpenCV - Introduction to
Images and OpenCV Basics - Opening Image files in a notebook - Opening Image files with
OpenCV - Drawing on Images - Part One - Basic Shapes - Drawing on Images Part Two - Text
and Polygons - Direct Drawing on Images with a mouse - Part One - Direct Drawing on Images
with a mouse - Part Two - Direct Drawing on Images with a mouse - Part Three - Image Basics
Assessment - Image Basics Assessment Solutions

UNIT 4: OBJECT DETECTION, TRACKING AND VIDEO BASICS

(9 Hours)

Object Detection with OpenCV and Python - Introduction to Object Detection - Template Matching - Corner Detection - Part One - Harris Corner Detection - Corner Detection - Part Two - Shi-Tomasi Detection - Edge Detection - Grid Detection - Contour Detection - Feature Matching - Part One - Feature Matching - Part Two - Watershed Algorithm - Part One - Watershed Algorithm - Part Two - Custom Seeds with Watershed Algorithm - Introduction to Face Detection - Face Detection with OpenCV - Detection Assessment - Detection Assessment Solutions - Object Tracking - Introduction to Object Tracking - Optical Flow - Optical Flow - Coding with OpenCV - Part Two - Optical Flow Coding with OpenCV - Part Two - MeanShift and CamShift Tracking Theory - MeanShift and CamShift Tracking with OpenCV - Overview of various Tracking API Methods - Tracking APIs with OpenCV - Video Files with Python and OpenCV - Introduction to Video Basics - Connecting to Camera - Using Video Files - Drawing on Live Camera - Video Basics Assessment - Video Basics Assessment Solutions

UNIT 5: DEEP LEARNING FOR COMPUTER VISION AND CAPSTONE PROJECT

(9 Hours)

Deep Learning for Computer Vision - Introduction to Deep Learning for Computer Vision - Machine Learning Basics - Understanding Classification Metrics - Introduction to Deep Learning Topics - Understanding a Neuron - Understanding a Neural Network - Cost Functions - Gradient Descent and Back Propagation - Keras Basics - MNIST Data Overview - Convolutional Neural Networks Overview - Part One - Convolutional Neural Networks Overview - Part Two - Keras Convolutional Neural Networks with MNIST - Keras Convolutional Neural Networks with CIFAR-10 - LINK FOR CATS AND DOGS ZIP - Deep Learning on Custom Images - Part One - Deep Learning on Custom Images - Part Two - Deep Learning and Convolutional Neural Networks Assessment - Deep Learning and Convolutional Neural Networks Assessment Solutions - Introduction to YOLO v3 - YOLO Weights Download - YOLO v3 with Python - CapStone Project - Introduction to CapStone Project - Capstone Part One - Variables and Background function - Capstone Part Two - Segmentation - Capstone Part Three - Counting and ConvexHull - Capstone Part Four - Bringing it all together

OUTCOMES

At the end of the course, the students will be able to

CO1: Apply various preprocessing steps to a given text

CO2: Implement various text classification algorithms, Semantic and Sentiment analysis

CO3: Make use of Recurrent Neural Networks (RNNs) for Natural Language Processing (NLP) tasks with optimization algorithms

CO4: Develop applications using moving object detection, image panorama and classification concepts

CO5: Construct deep learning models to various real-world applications, including image recognition and speech recognition