

Sona College of Technology (Autonomous), Salem – 636 005

Department of Information Technology

ADVANCED DIPLOMA / CERTIFICATION PROGRAMME

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

CURRICULUM & SYLLABI

Academic year – 2021-22

Semester 1:

S.NO	Topics Covered	Credits
1	Introduction to AI	1
2	Python for Data Science	2
3	Data Wrangling Techniques	2
4	Introduction to Neural Networks	1
5	TensorFlow & Keras	2
6	Capstone Project I	2
Total		10

Semester 2:

S.NO	Topics Covered	Credits
1	Convolutional Neural Networks	2
2	Recurrent Neural Networks	2
3	Natural Language Processing	2
4	Build & Deploy an AI Application	1
5	Practical AI Example	1
6	Capstone Project II	2
Total		10

Semester 3:

S.NO	Topics Covered	Credits
1	Fundamentals of Machine Learning	2
2	Mathematics and Statistics	2
3	Methods and Algorithms in ML (Supervised Learning)	4
4	Capstone Project III	2
Total		10

Semester 4:

S.NO	Topics Covered	Credits
1	Methods and Algorithms in ML (Unsupervised)	3
2	Hyperparameter Tuning and Validation	3
3	Recommendations Systems	2
4	Capstone Project IV	2
Total		10

ADVANCED DIPLOMA / CERTIFICATION PROGRAMME
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
SYLLABUS

Semester I:

Module 1: Introduction to Artificial Intelligence:

- Introduction to AI
- Intelligent Agents
- Search Methods and Knowledge Representation
- Use Cases of Artificial Intelligence
- Role of Machine Learning Engineer
- Machine Learning Tools & Packages

Module 2: Python for Data Science

- Python Data Structures
- Python Programming Fundamentals
- Conditions and Branching
- Loops
- Functions
- Python Packages
- Working with NUMPY
- Working with Pandas
- Introduction to Data Visualization
- Introduction to Matplotlib and Seaborn
- Basic Plotting with Matplotlib and Seaborn

Module 3: Data Wrangling Techniques

- Introduction to Data pre-processing
- Importing the Dataset
- Handling Missing data
- Working with Categorical Data
- Splitting the data into Train and Test set
- Feature Scaling

Module 4: Introduction to Neural Networks

- The Neuron
- The Activation Function
- How do Neural Networks work?
- How do Neural Networks learn?
- Gradient Descent
- Stochastic Gradient Descent
- Backpropagation

Module 5: TensorFlow & Keras

- Introduction to TensorFlow & Keras Framework
- Introduction to the Sequential Mode
- Activation functions
- Layers
- Training
- Loss function
- Building ANN Using Tensor flow
- Evaluating Improving and Tuning ANN

Capstone Project I

Semester II

Module 6: Convolutional Neural Networks

- Introduction to Convolutional Neural Networks
- What are convolutional neural networks?
- Step 1 - Convolution Operation
- Step 1(b) - ReLU Layer
- Step 2 - Pooling
- Step 3 - Flattening
- Step 4 - Full Connection Classification of images using CNN

- Evaluating, Improving, and Tuning the CNN

Module 7: Recurrent Neural Networks

- Introduction to Recurrent Neural Networks
- The idea behind Recurrent Neural Networks
- The Vanishing Gradient Problem
- LSTMs
- LSTM Variations Predicting Google stock prices using RNN
- Evaluating, Improving, and Tuning the RNN

Module 8: Natural Language Processing

- Introduction to Natural Language Processing
- Introduction to NLTK
- Bag of Words model
- Natural Language Processing in Python
- Sentiment analysis using Natural Language Processing

Module 9: Practical AI Examples:

- Fare Prediction for Uber
- Test bench time reduction for Mercedes-Benz
- Products rating prediction for Amazon
- Demand Forecasting for Walmart
- Improving customer experience for Comcast
- Attrition Analysis for IBM
- NYC 311 Service Request Analysis
- Movie Lens Dataset Analysis
- Stock Market Data Analysis

Module 10: Build & Deploy an AI Application

- Introduction to different modes of Deployments
- Working with Flask framework
- Building an application with Flask Framework

- Integrating Deep learning model with Web Application

Capstone Project II

Semester III

Module 11: Fundamentals of Machine Learning

- Usecase1: Facebook Auto-Tagging/Face Recognition in Mobiles
- Usecase2: Google Assistant
- Usecase3: Youtube/Netflix/Amazon Recommendation Systems
- Usecase4: Dynamic Pricing in Travel
- Usecase5: Google Translate
- Usecase6: Gmail Spam Detection
- Usecase7: Sophia a social humanoid robot

Module 12: Mathematics & Statistics

- Introduction to Probability
 - Mean, Median, Mode, Variance, Standard Deviation
 - Quantiles
 - Gaussian (Normal) Distribution, Skew Distribution
- Covariance and Correlation
 - Linear Regression
 - Logistic Regression
 - Naïve Bayes Classifier
 - Bias-variance trade-off
 - Dimensionality reduction using Principal component Analysis
 - Time Series Forecasting
 - Hands-on Lab

Module 13: Methods and Algorithms in Machine Learning Part I (Supervised Learning)

- Supervised Learning
- Regression

- Simple Linear Regression
- Multi Linear Regression
- Polynomial Regression
- Decision Tree
- Random Forest
- Classification
 - Logistic Regression
 - K-Nearest Neighbours
 - Support Vector Machine
 - Naive Bayes
 - Decision Tree
 - Random Forest
- Hands-on Lab

Capstone Project III

Semester IV

Module 14: Methods and Algorithms in Machine Learning (PART-2)

- Unsupervised Learning
- K-Means Clustering
- Hierarchical Clustering
- Ridge Regression
- XGBoost Algorithm
- Hands-on Lab

Module 15: Hyper parameters Tuning & Validation

- Grid Search
- Randomized Search
- Cross Validation
- Hyperparameter Tuning and Model Selection

- Hands-on Lab

Module 16: Recommendation Systems

- Collaborative Recommender System
- Content Based Recommender System
- Hands-on Lab

Capstone Project IV