Digital Transformation Courses

Artificial Intelligence (AI)

Syllabus

* **Learning Levels of the Syllabus**
* **Theory**

1. **Introduction of Artificial Intelligence**
2. **History of Artificial Intelligence**
3. **Artificial Intelligence Ethics**
4. **Critical Concerned raised by AI**
5. **Russell Norvig - general learning agent**
6. **Machine Learning**

**6.1. Introducing Machine Learning**

6.1.1. The Machine Learning Landscape

6.1.2. Different types of machine learning supervised learning semi-supervised and reinforcement learning

6.1.3. Batch and online learning

6.1.4. Machine learning libraries Keras Tensor flow Pytorch

6.1.5. Machine learning tools Watson Dialogflow Luis Azure cognitive service

6.1.6. The main challenge of ML

**6.2. Anaconda Introduction**

6.2.1. Anaconda Intro

6.2.2. Anaconda Installation

6.2.3. Overview of Anaconda Packages

6.2.4. Installation of Jupyter Notebook

6.2.5. Conda Libraries

**6.3. Python Introduction**

6.3.1. Python Intro

6.3.2. Python Installation

6.3.3. Overview of Python Packages

6.3.4. Numpy, Pandas, Lambda

6.3.5. Dealing with Missing Data

6.3.6. User Defined Functions, Classes and Objects

6.3.7. Visualization Intro

6.3.8. Seaborn, Matloblib, etc

**6.4. Statistics required for ML**

6.4.1. Probability and Prob Density Function

6.4.2. Statistics -  Methods

6.4.3. Types of Statistical Method

6.4.4. Conditional Probability

6.4.5. Standard Deviation and Coefficient Variation

6.4.6. Chebyshev Theorem

6.4.7. Empirical Rule

6.4.8. Five Number Summary and plots

6.4.9. Corelation Analysis

6.4.10. Rules for Computing Probability and Marginal Probability

6.4.11. Bayes Theorem

6.4.12. Binomial, Poisson and Normal Distribution

6.4.13. Hypothesis Formulation - Null and Alternalte Hypothesis

6.4.14. Type I and Type II Errors

6.4.15. T-test, F-test and  ANOVA

6.4.16. Chi Square

**6.5. Supervised Learning**

6.5.1. Lines Planes and Hyperplanes

6.5.2. Vector Algebra and Operations

6.5.3. Differential, Maxima and Minima of functions

6.6.4. Chain Rule, Maxima and Minima application in ML

6.6.5. Linear Regression - Part 1

6.6.6. Linear Regression - Part 2

6.6.7. Polynomial descent

6.6.8. Gradient curves

6.6.9. Multivariate Linear Regression

6.6.10. Categorical Independent Variables

6.6.11. Root mean square Error and Mean Absolute Error

6.6.12. Logistic Regression

6.6.13. Threshold Setup, Precision and Recall

6.6.14. Naïve Bayes

6.6.15. KNN

6.6.16. SVM

**6.6. Ensemble Techniques**

6.6.1. Decision Trees Intro

6.6.2. Decision Trees – CART

6.6.3. Ensemble Techniques

6.6.4. Random Forests

6.6.5. Bagging

6.6.6. Boosting

6.6.7. Stacking

**6.7. Unsupervised Learning**

6.7.1. Clustering Intro

6.7.2. Types of Clustering

6.7.3. Types of Clustering Algorithm

6.7.4. K Means Clustering

6.7.5. Importance of Scaling

6.7.6. K-means Clustering Pros and Cons

6.7.7. K means Silhouette coefficient

6.7.8. Dynamic Clustering

6.7.9. Hierarchical Clustering

6.7.10. Cophenetic Correlation

6.7.11. Principal Component Analysis

**6.8. Feature Engineering**

6.8.1. Regularization Models

6.8.2. Lasso and Ridge Regression

6.8.3. Feature Engineering Intro

6.8.4. Cross Validation (K-fold)

6.8.5. Bootstrap Sampling

6.8.6. Leave one out Cross Validation

6.8.7. Up Sampling and Down Sampling

6.8.8. Model Tuning and Performance

6.8.9. ROC and AUC

6.8.10. Hyper Parameters and Tuning

6.8.11. GridSearch

**6.9. Machine Learning Tools**

6.9.1. IBM Watson

6.9.2. Google Dialogflow

6.9.3. Microsoft Luis

1. **Image Processing**

7.1. Introducing Image Processing

7.2. Packages of Image Processing

7.3. Basic Operation on Image

7.4. Geometric Opeartion on Image

7.5. Radiometric Operation on Image

7.6. Object Detection using Image Processing

7.7. Live Image Capturing & Processing

7.8. Live Video Processing

7.9. Image Processing Tools

1. **Deep Learning**

8.1. Introduction on Deep Learning

8.2. Deep Learning Working Process

8.3. Packages Installation

8.4. Classification & Prediction

8.5. Underfitting & Overfitting

8.6. Encoding & Embedding

8.7. CNN

8.8. RNN

8.9. LSTM

8.10. VAE

8.11. Basic of GAN

1. **Neural Network**

9.1. Introduction on Neural Network

9.2. Neural Network Working Process

9.3. Packages Installation

9.4. Layers of Neural Network

9.5. Activation Function

9.6. ReLU

9.7. Loss Function

9.8. Forward Propagation

9.9. Backward Propagation

1. **Sentiment Analysis**

10.1. Introduction to Sentiment Analysis

10.2. Package Installation

10.3. Sentiment Analysis of Movie Review

10.4. Twitter Sentiment Analysis

10.5. Emotion Detection using Sentiment Analysis

1. **Natural Language Processing**

11.1. Introduction on Natural Language Processing

11.2. Packages Installation

11.3. Text classification

11.4. Building a "fake news" classifier

1. **Speech Recognition**

12.1. Introducing Speech Recognition

12.2. Packages Installation

12.3. Speech to Text Conversion

12.4. Feature Extraction from Speech

12.5. Speech Recognizer

12.6. MY ASSISTENT Build up

1. **Case Studies**

13.1. Rolls-Royce And Google Partner To Create Smarter, Autonomous Ships Based On AI And Machine Learning

13.2. Microsft’s 2030 vision on Healthcare, Artificial Intelligence, Data and Ethics

13.3. The Incredible Ways John Deere Is Using Artificial Intelligence To Transform Farming

13.4. How McDonald's Is Getting Ready For The 4th Industrial Revolution Using AI, Big Data And Robotics

13.5. Google-Funded Company Uses Artificial Intelligence To Fight Against Fake News

13.6. Jaguar Land Rover Is Getting Ready For The 4th Industrial Revolution: AI & Autonomous Cars

13.7. The Amazing Ways Chinese Tech Giant Alibaba Uses Artificial Intelligence And Machine Learning

13.8. The Amazing Ways How Wikipedia Uses Artificial Intelligence

13.9. IBM Showcases Artificial Intelligence Superiority With Project Debater

13.10. How The UK Government Uses Artificial Intelligence To Identify Welfare And State Benefits Fraud

* **Practical**
* **Machine Learning**

1. Dealing with Missing Data
2. User Defined Functions, Classes and Objects
3. Visualization
4. Seaborn, Matplotlib, Pandas
5. Probability Density Function
6. Conditional Probability
7. Standard Deviation and Coefficient Variation
8. Chebyshev Theorem
9. Empirical Rule
10. Five Number Summary and plots
11. Correlation Analysis
12. Rules for Computing Probability and Marginal Probability
13. Marginal Probability
14. Bayes Theorem
15. Binomial Distribution, Poisson Distribution, Normal Distribution
16. Hypothesis Formulation - Null and Alternate Hypothesis
17. T-test, F-test and  ANOVA
18. Lines Planes and Hyperplanes
19. Maxima and Minima of functions
20. Chain Rule, Maxima and Minima application in ML
21. Linear Regression
22. Polynomial descent
23. Gradient curves
24. Multivariate Linear Regression
25. Root mean square Error and Mean Absolute Error
26. Logistic Regression
27. Threshold Setup, Precision and Recall
28. Naive Bayes
29. KNN
30. SVM
31. Decision Trees Intro
32. Decision Trees - CART
33. Random Forests
34. Bagging
35. Boosting
36. Stacking
37. Types of Clustering Algorithm
38. K Means Clustering
39. K means Silhouette coefficient
40. Hierarchical Clustering
41. Cophenetic Correlation
42. Principal Component Analysis
43. Lasso and Ridge Regression
44. Feature Engineering Intro
45. Cross Validation (K-fold)
46. Bootstrap Sampling
47. Leave one out Cross Validation
48. Up Sampling and Down Sampling
49. ROC and AUC
50. GridSearch
51. Visual Recognition using IBM Watson
52. Chatbot using Google Dialogflow
53. Chatbot using Microsoft LUIS
54. Appendix

* **Image Processing**

1. Basic Operation on Image
2. Geometric Opeartion on Image
3. Radiometric Operation on Image
4. Object Detection using Image Processing
5. Live Image Capturing & Processing
6. Live image capturing through Webcam
7. Video Feeding
8. Blurring
9. Color filtering
10. Edge Detection
11. Face & Eye Detection
12. Live Video Processing

* **Deep Learning**

1. Classification & Prediction
2. Underfitting & Overfitting
3. Encoding & Embedding
4. CNN
5. RNN
6. LSTM
7. VAE
8. GAN
9. Special of Deep Learning

* **Neural Network**

1. Complete Neural Network Building

* **Sentiment Analysis**

1. Simplifying Sentiment Analysis
2. Sentiment Analysis Walkthrough
3. Sentiment Analysis of Movie Review
4. Twitter Sentiment Analysis Type 1
5. Twitter Sentiment Analysis Type 2
6. Real Time Emotion Detection

* **Natural Language Processing**

1. Text classification
2. Building a "fake news" classifier

* **Speech Recognition**

1. Speech to Text Conversion
2. Feature Extraction from Speech
3. Speech Recognizer
4. My Assistant (Similar to Alexa, Google My Assistant)

