The Institute of Chartered Accountants of India

(Set up by an Act of Parliament)

Women Members Excellence Committee

Organises

यशस्विनी - An IDOL- Live Webinar

CA. Priti Paras Savla
Chairperson, WMEC, ICAI

CA. Kemisha Soni
Vice Chairperson, WMEC, ICAI

CA Asmita Phadke (FCA , DISA , FAFD) (ICAI)

Asmita has close to 5 years of IT and manufacturing experience as an Process specialist and process executive.

Asmita has an impressive track records of driving successful initiatives in conducting Webinars and seminars in technology and process domains.

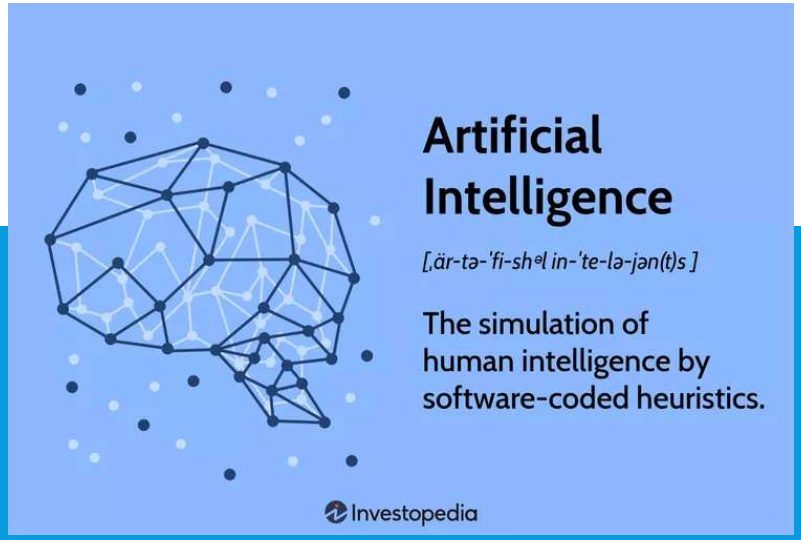
With her deep domain knowledge of Cyber security and Information systems Asmita has a core understanding of Technical concepts such as various emerging technologies like Artificial Intelligence/Machine Learning, cloud computing, Blockchain Technology ,etc

AGENDA

- What is AI?
- Algorithm Classification
- Machine Learning V/s Deep Learning
- Why Deep Learning
- Overview of Neural network
- Tensor Flow
- Responsible AI
- Generative AI – Chat GPT

Large Language Models

Prompt Engineering



WHAT IS ARTIFICIAL INTELLIGENCE?

- AI makes our life easier in day to day life.
- AI is software that automatically gathers and analyse data.
- Example- Facebook news feed which filters from the huge set of data and display only relevant information for us.
- Smart Phones
- Chat GPT
- Chat Bots
- Future of AI Is huge.

CONCEPTS/ PREREQUISITES

- Ability to implement classification , regression, clustering and recommendation system algorithms of machine learning using R or Python on Azure without programming .
- Ability to develop and deploy web service on Azure portal.
- Predicting the survival of passengers in Titanic disaster
- Predicting the future price of automobiles
- Organising groups of countries based on the food consumption
- Recommending restaurants for a specific user
- Integrating custom code in python or R

HTTPS://YOUTU.BE/L9XAIPHOAPG?SI=7BRC6FHXIYUKXMTO

https://youtu.be/gLnBoXB2F0I?si=GFTzjs6gK6f21mtl

CONTENTS

- Azure Machine Learning – Need
- Azure Machine Learning (ML) helps you to quickly create and deploy predictive models as analytics solution using built in algorithms.

CLASSIFICATION ALGORITHM

Example – Titanic Survival

You will be predicting the survival of passengers in titanic disaster using classification algorithm.

First Step – Data Preparation

1.Creating machine learning workspaces

2. Creating an experiment

3. Uploading the dataset to machine Learning Studio

4. Preprocessing the data

CLASSIFICATION ALGORITHM

- Second step – Modelling
- Create a model to predict the survival of passengers in Titanic disaster by dragging , dropping and connecting modules

- Third Step- Evaluate the model
- Predicted value can be in many different formats, depending on the model and your input data if you are using a classification model to create the scores , Score model outputs a predicted value for the class, as well as the probability of the predicted value.

CLASSIFICATION ALGORITHM

pclass	survived	sex	age	sibsp	parch	fare	embarked	Score labels	Scored probabilities
3	0	male	24	0	0	7.7958	S	0	0.125
2	1	female	30	3	0	21	S	1	0.625
1	1	male	54	1	0	55.4417	C	0	0.375

CLASSIFICATION ALGORITHM

- Interpretaion –
- This means for the first row , the male in 3rd class with the scored probability of 0.125 has 12.5% chance of survival and he is not survived.
- A woman in 2nd class has 62.5% chance of survival and she is survived.

- Note –
- After Evaluating the model, you need to deploy the application in Azure in the next step

CLASSIFICATION ALGORITHM-

- Fourth Step – Deployment of Model
- To publish the model as a webservice.

REGRESSION ALGORITHM-

- Example- Automobile Price Prediction
- First Step- Data Preparation
- 1. Creating Machine Learning workspace
- 2. Creating an Experiment
- 3. Preprocessing the Data
- 5.Defining the features

To prepare the data for predicting the price of an automobile , you need to create a machine learning workspace.

Getting data through various sample datasets included with machine learning studio that can be used and you can imprort data from many sources, you will use sample dataset "Automobile price data (raw)".

REGRESSION ALGORITHM

- A dataset usually requires some preprocessing before it can be analysed. You will remove unnecessary columns/ empty records which do not help in prediction. You will preprocess the data before analyzing.

Step 2- Modelling

You will use the data to train the model ,and then test the model to see how closely its able to predict prices. For this you will divide your data into two parts – a) Train Data b) Test Data

REGRESSION ALGORITHM

- Regression is used to predict a number, because you want to predict price, which is number, you will use a regression algorithm.

- After training the Azure Machine learning Regression algorithm using modelling, you need to evaluate the model. You will evaluate the automobile data to make price predictions.
- Third Step- Evaluation
- To evaluate the regression model
- The output shows the predicted values for price and the known values for the test data.

REGRESSION MODEL-

- To view the output evaluate the results of a sample output
- Automobile Price prediction> Evaluate Model >Evaluate results
- Metrics-
- Mean Absolute Error 1656.147651
- Root mean squared Err 2456.983209
- Relative Absolute Err 0.276606
- Relative squared error 0.089608
- Coefficient of determination 0.910392

REGRESSION CLASSIFICATION

- For each of the error statistics, smaller is better. A smaller value indicates that the predictions more closely match the actual values.
- For coefficient of determination, the closer its value is to one (1.0), the better the predictions-
- Mean Absolute Error- The average of absolute errors (an error is the difference between the predicted value and the actual value).
- Root Mean Squared Error- The square root of the average of squared error of predictions made on the test dataset.
- Relative absolute error- The average of squared errors relative to the squared difference between the actual values and average of all actual values.
- Coefficient of determination- Also known as the R squared value , this is a statistical metric indicating how well a model fits the data.
- After evaluating the model, you need to deploy the application in Azure.

REGRESSION MODEL-

- Fourth Step- Deployment
- You will publish the model as a web service and pass unknown data to this service so that it can predict the price of an automobile.
- You have understood-
- How to predict the price of an automobile using regression without writing any code
- How to use an existing sample dataset
- How to create a model
- How to evaluate unknow data from known
- How to deploy your full application as a web service

CLUSTERING ALGORITHM

- First Step- Data Gathering
- To prepare the data for organising groups of countries based on similar food eating habits.
- Create a new blank experiment , modify the experiment , name written on the top of the page (Experiment created date) with the text of the experiment, such as " grouping countries on Food consumption "
- You build a clustering model to group the dataset into 3 clusters based on the protein intakes of different countries from various types of sources.

CLUSTERING ALGORITHM

- Step 2- Modelling
- To organise the groups of countries based on protein intakes
- To perform modelling in Azure machine learning studio.
- To train the machine learning algorithm by creating a model to predict the cluster to which a country will belong .
- Step 3- Evaluation
- To evaluate the machine learning K means ++ algorithm by scoring the trained clustering model that predicts the clusters to which a country will belong

CLUSTERING ALGORITHM

- Step 4- Deployment
- You have learnt that-
- How to predict the cluster of a country using K means ++ clustering algorithm without writing any code
- How to import an existing sample dataset from a website URL
- How to train a clustering model
- How to score the model
- How to deploy the trained model as a web service.

RECOMMEND A SYSTEM

- To prepare data for recommending a given number of restaurants to a specific user.
- To create a machine learning workspace and to create an experiment or can use the already created ML workspace in the previous requirement. Create a new blank experiment called 'Restaurants recommended.'
- Search the sample data for restaurants by typing in search box-
- 1)Restaurant Customer Data
- 2)Restaurant Feature Data
- 3)Restaurant Ratings

RECOMMEND A SYSTEM

- Step two- Evaluation
- To recommend a system the evaluation metric Normalised Discounted Cumulative Gain (NDCG) is estimated from the ground truth ratings given in the test set. Its value ranges from 0.0 to 1.0 represents the most ideal ranking of the entities.

Thus you have learnt to use built in recommender modules to suggest at least three restaurants to users based on their ratings and features and customers data.

DEEP LEARNING USING AZURE

- Deep learning these days is getting more attention due to its impact in computer vision and Natural Language processing. This is due to few factors such as-
- 1. Deep Learning methods are more accurate than before with more available data.
- Setting up the infrastructure on- premise to perform deep learning is very costly and time consuming as the servers need to have the GPU(Graphics Processing Unit) capability.
- Azure ML and AI services provide the required infrastructure and tools in the form of a VM to perform deep learning analytics.

In this course we will learn to perform deep learning over MNIST data using tools such as cognitive Toolkit (CNTK) and Tensor Flow using Python.

WHY DEEP LEARNING

- DL is a ML technique that uses an artificial Neural Network (NN) with several hidden layers representing feature hierarchies from the underlying data.
- Here higher levels of the hierarchy are formed by the composition of lower level features that enable automatic feature extraction and predictions with new data. Data can be images, documents or sound.
- Artificial Intelligence (AI) is a field of computer science that attempts to create machines that tries to act rationally in response to the environment.
- Machine Learning (ML) is a type of AI using which we teach machines how to solve problems without explicitly programming them.
- **Essentially AI is a Superset of ML and ML is a super set of DL.**

DEEP LEARNING

- Deep Learning is
- 1. Input Layers – Hidden Layers – Output Layers
- 2. Synonymous with artificial Neural Network (ANN)
- Deep here means , depth of the network-

Input Layer Hidden Layers Output Layers

In the next video you will get the importance of deep neural networks.

NEURAL NETWORK

- Neurons are trained to filter and detect specific features or patterns by receiving weighted input.
- Then it is transformed with the activation function and passed to the outgoing connections.
- In the video you have learnt how 784 number of inputs have been reduced to 10 outputs.

IDENTIFICATION OF HANDWRITTEN IMAGE USING CNTK

- The Microsoft CNTK – cognitive toolkit is an open source toolkit for commercial grade distributed deep learning.
- It describes neural networks as a series of computational steps via a directed graph.
- CNTK allows the user to easily realise and combine popular model types such as feed forward neural networks (DNNs)
- Convolutional Neural Networks (CNNs)
- Recurrent Neural Networks (RNNs/LSTMs)
- CNTK implements stochastic gradient descent (SGD, error backpropagation) learning with automatic differentiation and parallelisation across multiple GPUs and servers.

CNTK

- 1. Creating VM (Virtual Machines)
- 2. Data preprocessing
- 3. Data Reading
- 4. Creating a model
- 5.Learning the model parameters
- 6.Evaluating

- How to set up the environment by creating a data science virtual machine.

TENSOR FLOW

- Various applications of Tensor Flow are as below-
- 1. smart replies in Gmail inbox , depending on the context
- 2. predicting the diabetic conditions
- 3.Composing music

- Advantages-
- 1. Easier to Use
- 2. Better performance

TENSOR FLOW-

- Tensor flow is an open source software library like CNTK, for high performance numerical computation.
- Tensor flow was developed by researchers from the google brain team internally. It has strong support for machine learning and deep learning. Its flexible numerical computation core is used for many scientific domains.
- Its architecture is flexible .it allows easy deployment of computations to perform such as CPUs and GPUs.

IDENTIFICATION OF HANDWRITTEN IMAGES USING TENSOR FLOW

- 1. Creating a data science Virtual machine
- - Simple MNIST – without hidden layers
- - Deep MNIST- with hidden layers

RESPONSIBLE AI

- Responsible AI – It is strategy for creating and implementing Artificial Intelligence systems that prioritizes ethical and legal considerations.
- Objective of Responsible AI- The objective of Responsible AI is to utilise AI technology in a manner that is safe, reliable and morally sound.
- Responsible AI refers to the ethical and accountable development, deployment and usage of artificial intelligence systems.
- It involves designing and implementing AI technologies that align with societal values, preserve human rights and avoid unintended biases and discriminatory impacts.
- Responsible AI principles are guidelines or frameworks developed to ensure the ethical and responsible use of AI.

RESPONSIBLE AI

- It is crucial to follow responsible AI principles because AI technologies have the potential to influence many aspects of society, including employment, education , healthcare and social interactions. Without responsible practices, AI systems could lead to biased decision –making , privacy infringements, job displacements or even discriminatory treatment.
- Responsible AI is an umbrella team for aspects of making appropriate business and ethical choices when adopting AI in the organisation's context.
- These include business and societal value, risk, trust transparency, fairness, bias, mitigation, explainability, accountability, safety , privacy, regulatory compliance and others.
- Responsible AI is a part of digital ethics and the principles that apply to AI thereof fail under AI ethics.
- Society- Organisation – Customers
- Value Generation

RESPONSIBLE AI

- Importance of Principles- lets consider an example –
- Facial recognition technology has gained popularity, but it has also raised concerns about privacy and potential misuse. If a company decides to implement a facial recognition system without proper safeguards or oversights , it could lead to unauthorised surveillance or profiling of individuals.
- This might result in violation of privacy rights, potential discrimination or false identification leading

RESPONSIBLE AI

- Principles- The cornerstone of responsible AI lies in a collection of guiding principles and standards that advocate for the ethical and sustainable development and deployment of artificial intelligence technologies. These Principles establish a framework to guarantee that AI systems contribute positively to society while mitigating potential risks. Some of the core principles include-
- 1. Privacy
- 2.Accountability
- 3.Bias and Fairness
- 4.Explainability
- 5.Security
- 6.Accuracy
- 7.Human Controlled
- 8.Transparency

RESPONSIBLE AI-

- Who is responsible?
- How do I know intended purpose of this model?
- Business Sponsor (origination)
- Data Scientist (Model deployment)
- Validation Team (Model Validation)
- Compliance Team (Model Compliance)
- Business Ops (Model Approval)
- IT Team (Deployment)
- Ops Team (Production Monitoring)

RESPONSIBLE AI- GUARD DRAILS

- Guardrails refers to a set of guidelines, policies and practices , put in place to ensure that AI systems are developed, deployed and used in responsible and ethical manner. These guardrails act as boundaries or safety measures to prevent AI related risks, including ethical violations, biases, privacy breaches and other negative consequences.
- Guardrails help guide the development and deployment of AI technology within the organization and ensure that it aligns with ethical principles ,regulatory requirements and the organisations values.

RESPONSIBLE AI- TECHNICAL GUARDRAILS

- Technical guardrails refer to measures, controls or restrictions implemented within the technical infrastructure of AI systems to ensure ethical, fair and secure behaviour.

RAI ROLE ACROSS AI LIFECYCLE

- RAI Process-
- For any use case/AI solution to be built ,it needs to go through Responsible AI process, which is listed below step by step-
- 1) Identify and check the feasibility of the use case.
- 2) Explain the use case to Responsible AI committee/ RAI stakeholders (ISG,DPO,IC,IP cell,RAI)
- 3)Understand and take up the Risk Assessment (IC, RAI)
- 4)Get the Risk scoring and Risk classification done for the use case.(IC,RAI)
- 5)Identify the applicable RAI tenets for the use cases.
- 6)Follow the Mlops – RAI pipelines structure and embed it for the development of the use case using AI cloud/AI Platform (RAI,AI Plat, AI Cloud)
- 7)Identify the Mitigation strategy with responsible AI committee/RAI stakeholders if High or Critical risk use case(IC,ISG,DPO,Ipcell,RAI)
- 8)Apply the mitigation strategy to the use case.
- 9)Test the use
- 10)Apply Final RAI Pipeline before deployment (RAI,AI Plant)
- 11) Go through SAST/DAST/Black duck/Fortify and other applicable vulnerability scans (IP)

GENERATIVE AI

- AI models use AI technology to produce new contents.
- Powered by AI /ML algorithms recognise patterns in inputs, produce similar, high quality outputs.
- Generative AI models use AI technology to produce new contents.
- Trained on Large sets of data creates art, music, images and text.

HUMANKIND – CREATIVE, GENERATIVE AND EVOLUTION

- Why not Machine can be creative?
- Traditional V/s Generative Ai
- -Discriminative learning and Generative learning
- Discriminative modelling is used to classify existing data points
- - Estimate the probability of x belongs to y
- Use tags
- Ex **images of cats and dogs** into respective categories
- Supervised learning
- Generative will generate Black Cat V/s White Cat and Black dog Vs White Dog

GENERATIVE AI- TYPES OF AI

- Text Code Image Video Audio

CHAT GPT 3.5/ 4.0

- Unsupervised data i.e. outcome is not defined – General Purpose data
- Prompt Engineering
- Giving question in such a way that what task is that??
- Specific tasks
- Large Language Model