PRIOR KNOWLEDGE

Team ID	PNT2022TMID22012
Project Name	A Novel Method For Handwritten Digit Recognition System

1.MACHINE LEARNING

Machine Learning is the field of study that gives computer the capability to learn without being explicitly programmed. ML is one of the most exciting technologies that one would have ever come across. As it is evident from the name, it gives the computer that makes it more similar to humans. Machine Learning is actively being used today, perhaps in many more places than one would expect.

TYPES OF MACHINE LEARNING

- Supervised learning
- Unsupervised learning
- Reinforcement learning

SUPERVISED LEARNING

In supervised learning, the computer is trained on a set of data inputs and outputs, with a goal of learning a general rule that maps the given inputs to the given outputs. Two main types of supervised learning are:

1) Classification – it entails the prediction of a class label
2) Regression – it entails the prediction of a numerical value

UNSUPERVISED LEARNING

In unsupervised learning, the learning algorithm is not given this type of guidance; instead, it works to discover the pattern or structure in the input on its own. Two main types of unsupervised learning are:

1) Clustering – it involves discovering groups within the dataset that share similar characteristics.
2) Density estimation – it involves evaluating the statistical distribution of the data set. Unsupervised learning methods also include visualization with the data and projection, which reduces the dimensions of the data, a form of simplification.

REINFORCEMENT LEARNING

In reinforcement learning, the computer and algorithms will confront a problem in a dynamic environment and as it works to perform a given goal, it will receive feedback (rewards), which will reinforce its learning and goal seeking effort. The example of AlphaGo is a case of reinforcement learning; reinforcement learning algorithms include Q-learning, temporal-difference learning, and deep reinforcement learning.

2. CLUSTERING, CLASSIFICATION AND REGRESSION

1. Clustering

Clustering is an unsupervised technique. With clustering, the algorithm tries to find a pattern in data sets without labels associated with it. This could be a clustering of buying behaviour of customers. Features for this would be the household income, age, … and clusters of different consumers could then be built.

2. Classification

Classification is a supervised technique. Classification algorithms look at existing data and predicts what a new data belongs to. Classification is used for spam for years now and these algorithms are more or less mature in classifying something as spam or not.

3. Regression

Regression is often confused with clustering, but it is still different from it. With a regression, no classified labels (such as good or bad, spam or not spam, …) are predicted. Instead, regression outputs continuous, often unbound, numbers. This makes it useful for financial predictions and alike. A common known sample is the prediction of housing prices, where several values (FEATURES!) are known, such as distance to specific landmarks, plot size,… The algorithms could then predict a price for your house and the amount you can sell it for.

3. ARTIFICIAL NEURAL NETWORKS

The term "Artificial Neural Network" is derived from Biological neural networks that develop the structure of a human brain. Similar to the human brain that has neurons interconnected to one another, artificial neural networks also have neurons that are interconnected to one another in various layers of the networks. These neurons are known as nodes.

An Artificial Neural Network in the field of Artificial intelligence where it attempts to mimic the network of neurons makes up a human brain so that computers will have an option to understand things and make decisions in a human-like manner.

Type of Neural networks:

- Perception
- Feed Forward Neural Network
- Multilayer Perceptron
- Convolutional Neural Network
- Radial Basis Functional Neural Network
- Recurrent Neural Network
- LSTM – Long Short-Term Memory

• Sequence to Sequence Models

4. CONVOLUTIONAL NEURAL NETWORKS

A convolutional neural network (CNN) is a type of artificial neural network used primarily for image recognition and processing, due to its ability to recognize patterns in images. A CNN is a powerful tool but requires millions of labelled data points for training.

Layers of CNN

The different layers of a CNN. There are four types of layers for a convolutional neural network: the convolutional layer, the pooling layer, the RLU correction layer and the fully-connected layer.

Components of CNN

1) Input layer
2) Output layer
3) One or more hidden layer

5. FLASK

Flask is a micro web framework written in Python. It is classified as a microframework because it does not require particular tools or libraries. It has no database abstraction layer, form validation, or any other components where pre-existing third-party libraries provide common functions.

WSGI

The Web Server Gateway Interface is a simple calling convention for web servers to forward requests to web applications or frameworks written in the Python programming language.

Jinja2

Jinja2 is a modern-day templating language for Python developers. It was made after Django's template. It is used to create HTML, XML or other markup formats that are returned to the user via an HTTP request.