**ML Assignment\_3**

**1.Explain the term machine learning, and how does it work? Explain two machine learning applications in the business world. What are some of the ethical concerns that machine learning applications could raise?**

Machine learning is **a form of artificial intelligence (AI) that teaches computers to think in a similar way to how humans do: Learning and improving upon past experiences**. It works by exploring data and identifying patterns, and involves minimal human invention.

Machine Learning in finance helps in **portfolio management, algorithmic trading, loan underwriting, and fraud detection**. However, future applications of Machine Learning in finance will include Chatbots and other conversational interfaces for security, customer service, and sentiment analysis.

**The following list enumerates all the ethical issues that were identified from the case studies and the Delphi study, totalling 39.**

* Cost to innovation.
* Harm to physical integrity.
* Lack of access to public services.
* Lack of trust.
* “Awakening” of AI.
* Security problems.
* Lack of quality data.
* Disappearance of jobs
* Power asymmetries
* Negative impact on health
* Problems of integrity
* Lack of accuracy of data
* Lack of privacy
* Lack of transparency
* Potential for military use
* Lack of informed consent
* Bias and discrimination
* Unfairness
* Unequal power relations
* Misuse of personal data
* Negative impact on justice system
* Negative impact on democracy
* Potential for criminal and malicious use
* Loss of freedom and individual autonomy
* Contested ownership of data
* Reduction of human contact
* Problems of control and use of data and systems
* Lack of accuracy of predictive recommendations
* Lack of accuracy of non-individual recommendations
* Concentration of economic power
* Violation of fundamental human rights in supply chain
* Violation of fundamental human rights of end users
* Unintended, unforeseeable adverse impacts
* Prioritisation of the “wrong” problems
* Negative impact on vulnerable groups
* Lack of accountability and liability
* Negative impact on environment
* Loss of human decision-making
* Lack of access to and freedom of information

**2. Describe the process of human learning:**

**i. Under the supervision of experts**

In supervised learning, the training data provided to the machines work as the supervisor that teaches the machines to predict the output correctly. It applies the same concept as a student learns in the supervision of the teacher

**ii. With the assistance of experts in an indirect manner**

**Indirect guidance** is provided through learners actively observing, listening, and engaging with social practices and norms, which serve to furnish models and goals for performance and individuals' learning. The exercise of learner agency is a defining quality of guided learning

**iii. Self-education**

Self-learning is **an approach to learning where the individual makes the effort to identify their own learning needs, set learning goals, find the necessary resources, and evaluate their own knowledge**.

**3. Provide a few examples of various types of machine learning.**

**Example of Supervised Learning Algorithms:**

* Linear Regression.
* Logistic Regression.
* Nearest Neighbor.
* Gaussian Naive Bayes.
* Decision Trees.
* Support Vector Machine (SVM)
* Random Forest.

**4. Examine the various forms of machine learning.**

These are three types of machine learning: **supervised learning, unsupervised learning, and reinforcement learning**

**5. Can you explain what a well-posed learning problem is? Explain the main characteristics that must be present to identify a learning problem properly.**

The formal definition of Well posed learning problem is, “**A computer program is said to learn from Experience E when given a task T, and some performance measure P.** **If it performs on T with a performance measure P, then it upgrades with experience E.**

**6. Is machine learning capable of solving all problems? Give a detailed explanation of your answer.**

Most people reading this are likely familiar with machine learning and the relevant algorithms used to classify or predict outcomes based on data. However, it is important to understand that **machine learning is not the answer to all problems**.

**7. What are the various methods and technologies for solving machine learning problems? Any two of them should be defined in detail.**

Machine learning uses two types of techniques: supervised learning, which trains a model on known input and output data so that it can predict future outputs, and unsupervised learning, which finds hidden patterns or intrinsic structures in input data

**8. Can you explain the various forms of supervised learning? Explain each one with an example application.**

**Types of Supervised Learning:**

**A. Classification:**It is a Supervised Learning task where output is having defined labels(discrete value). For example in above Figure A, Output – Purchased has defined labels i.e. 0 or 1; 1 means the customer will purchase, and 0 means that the customer won’t purchase. The goal here is to predict discrete values belonging to a particular class and evaluate them on the basis of accuracy.   
It can be either binary or multi-class classification. In **binary** classification, the model predicts either 0 or 1; yes or no but in the case of **multi-class** classification, the model predicts more than one class. **Example:** Gmail classifies mails in more than one class like social, promotions, updates, and forums.

**B. Regression:**It is a Supervised Learning task where output is having continuous value.   
For example in above Figure B, Output – Wind Speed is not having any discrete value but is continuous in a particular range. The goal here is to predict a value as much closer to the actual output value as our model can and then evaluation is done by calculating the error value. The smaller the error the greater the accuracy of our regression model

**9. What is the difference between supervised and unsupervised learning? With a sample application in each region, explain the differences.**

To put it simply, **supervised learning uses labeled input and output data, while an unsupervised learning algorithm does not**. In supervised learning, the algorithm “learns” from the training dataset by iteratively making predictions on the data and adjusting for the correct answer

**10. Describe the machine learning process in depth.**

**a. Make brief notes on any two of the following:**

**MATLAB is one of the most widely used programming languages.**

Deep learning is **a branch of machine learning that teaches computers to do what comes naturally to humans: learn from experience**. Deep learning uses neural networks to learn useful representations of features directly from data.

**ii. Deep learning applications in healthcare**

Heart disease, cancer, and brain tumors are diagnosed using medical imaging procedures such as MRI scans, CT scans, and ECG. As a result, deep learning **assists doctors in better analyzing diseases and providing the best treatment to patients**.

**iii. Study of the market basket**

Market Basket Analysis, also known as Affinity Analysis, is **a modeling technique based on the theory that if you buy a certain group of items, you're more likely to purchase another group of items**. For example, someone purchasing peanut butter and bread is far more likely to also want to purchase jelly

**iv. Linear regression (simple)**

What is simple linear regression? Simple linear regression is **a regression model that estimates the relationship between one independent variable and one dependent variable using a straight line**. Both variables should be quantitative

**11. Make a comparison between:-**

1. **Generalization and abstraction**

Abstraction is the skill of understanding the world by thinking about the characteristics that things possess rather than those things themselves. Generalization is the application of abstract characteristics to an entire class of things. Generalization allows us to make broad claims about the natural world

1. **Learning that is guided and unsupervised**

Supervised learning technique deals with the labelled data where the output data patterns are known to the system. As against, the unsupervised learning works with unlabeled data in which the output is just based on the collection of perceptions.

**3. Regression and classification**

The main difference between Regression and Classification algorithms that Regression algorithms are used to predict the continuous values such as price, salary, age, etc. and Classification algorithms are used to predict/Classify the discrete values such as Male or Female, True or False, Spam or Not Spam, etc