Q1.

Explain the following with an example :

```
    - Artificial Intelligence
    - Machine Learning
    - Deep Learning
```

- Artificial Intelligence :

  - Artificial Intelligence refers to the development of computer systems that can perform tasks that typically require human intelligence.
  - Virtual Personal assistants like Siri or Google Assistant.
- Machine Learning :

  - Machine Learning is a subset of AI that focuses on the development of algorithms and statistical models that enable computers to improve their performance on a specific task through learning from data
  - Netflix , recommendation systems.
- Deep Learning :

  - Deep Learning is a subfield of machine learning that involves artificial neural networks, particularly deep neural networks with multiple layers.
  - Image recognitaion using CNN.

Q2.

What is Supervised Learning ? List some examples of supervised learning.

- Supervised learning is a type of machine learning where the algorithm is trained on a labeled dataset, meaning that each input in the training data is associated with a corresponding output.

- Examples :

  - Image Classification
  - Speech Recognition
  - Credit Scoring

Q3.

What is unsupervised Learning ? List some examples of unsupervised learning.

- Unsupervised learning is a type of machine learning where the algorithm is given unlabeled data and must find patterns, relationships, or structures within that data without explicit guidance or labeled outputs.

- Examples :

  - Clustering
  - Anomaly Detection
  - Generative Models

Q4.

What is the difference between AI , ML , DL and DS ?

- AI is the overarching field focused on creating intelligent machines.

- ML is a subset of AI that emphasizes learning from data.

- DL is a specialized form of ML involving deep neural networks.

- DS is a broader field that encompasses the entire data analysis process.

Q5.

What are the main differences between supervised , unsupervised and semi-supervised leaning ?

- Supervised learning requires labeled data.

- Unsupervised learning operates on unlabeled data to discover patterns.

- Semi-supervised learning combines both labeled and unlabeled data to leverage the benefits of both approaches.

Q6.

What is train , test and validation split ? Explain the importance of each term.

- Training Set :

  - The training set is used to train the machine learning model.
  - The training set is crucial for building a model that generalizes well to new, unseen data.

- Test Set :

    - The test set is reserved for evaluating the performance of the trained model.
    - The test set provides an unbiased evaluation of the model's generalization to new data.

- Validation Set :

    - The validation set is an additional subset, distinct from the training and test sets.
    - The validation set is crucial for preventing overfitting, where a model performs well on the training set but fails to generalize to new data.

Q7.

How can unsupervised learning be used in anomaly detection ?

- because it allows the algorithm to identify patterns and structures within data without requiring labeled examples of anomalies.

Q8.

List down some commonly used supervised learning algorithms and unsupervised learning algorithms.

- Supervised Algorithms :

    - Linear Regression
    - Logistic Regression
    - Decision Trees
    - Random Forest
    - Neural Networks

- Unsupervised Algorithms :

    ```
    - K-Means Clustering
    - Hierarchical Clustering
    - Mean Shift
    - PCA
    - Isolation Forest
    ```