(1) What is well posed problem? Explain.

if it has → 1. solution
→ 2. Uniqueness
→ stability.

→ A "well-Posed problem" refers to a problem that meets certain criteria, making it possible to solve it effectively using machine learning algorithms.

* A well-posed problem has the following characteristics:

1. clear objective.
2. Relevant data
3. Consistent evaluation metric
4. Feasible solution.
5. No ambiguity:

* Examples of well-posed problems in machine learning:

1. Image classification.
2. Sentiment Analysis
3. Recommendation systems:

* On the other hand, an ill posed problem may have:

1. Unclear objective
2. Insufficient data
3. Ambiguous evaluation metric
4. No feasible solution
5. Ambiguity

② List and explain applications of machine learning in diverse fields.

Healthcare:
1. Disease Diagnosis
2. Personalized Medicine.
3. Predictive Analytics.

Finance:
1. Risk Management
2. Portfolio Optimization
3. Credit Scoring.

Retail and Marketing
1. Recommendation Systems
2. Customer Segmentation.
3. Demand forecasting

Education:
1. Personalized Learning
2. Intelligent Tutoring Systems.
3. Automated Grading.

Transportation and Logistics:
1. Route Optimization
2. Predictive Maintenance
3. Autonomous vehicles

Environmental Sustainability:

1. Climate Modeling
2. Wildlife Conservation
3. Sustainable Resource Management

Cybersecurity:

1. Intrusion Detection.
2. Malware Detection
3. predictive Analytics.

Manufacturing and Quality Control:

1. predictive maintenance.
2. Quality Control
3. Supply chain Optimization.

(3) State the differences between structured and unstructured data.

Structured Data

1. Organized Format
2. Well-Defined schema
3. Easy to Analyze
4. Examples.
   - customer information, sensor readings.

Unstructured Data:

1. Unorganized format:
2. No predefined schema
3. Requires specialized techniques
4. Examples: emails, social media posts.

Key differences:

1. Format
2. Schema
3. Analyzability.
4. Examples:
   - structured data includes customer information and transactional data, while unstructured data includes social media posts and images.

(4) Label the applications of linear algebra functions in machine learning techniques.

Here are the applications

Linear Transformations:

1. Data preprocessing
2. Feature Extraction.

Vector Spaces:

1. Text Analysis
2. Image Processing

Eigenvalue Decomposition:

1. principal Component Analysis
2. Singular value Decomposition

Matrix Operations

1. Neural Networks
2. Linear Regression

Determinants and Inverses.

1. Linear Regression
2. Neural Networks.

6) Discuss about common data mining techniques used in Machine learning.

dataMiningtechniques

* classificationTechniques
  1. Decision Trees
  2. Random Forest
  3. Support Vector Machines (SVMs)
  4. k. Nearest Neighbours (KNN)

* Regression Techniques
  1. Linear Regression
  2. polynomial Regression
  3. Ridge Regression
  4. Lasso Regression.

* Clustering Techniques.
  1. k. Means clustering
  2. Hierarchical clustering
  3. DBSCAN.

* Association Rule Mining Techniques
  1. Apriori Algorithm
  2. Eclat Algorithm

* Anomaly Detection Techniques:
  1. k-Nearest Neighbours (KNN)
  2. Local Outlier factor (LOF)
  3. One-class SVM.

* Dimensionality Reduction Techniques:

1. principal Component Analysis (PC
2. t - Distributed stochastic Neighbor Embedding (t-SNE)
3. Linear Discriminant Analysis (LDA)

* Other Techniques:

1. Text Mining
2. Time Series Analysis
3. Ensemble Learning.

① What is Machine learning:

→ Machine learning is a subset of Artificial Intelligence (AI) that involves training algorithms to learn from data and make predictions, decisions or recommendations without being explicitly programmed.

* Key characteristics of Machine Learning:

1. Learning from Data.
2. Improving performance.
3. Predictive modeling

* Types of Machine learning *

1. supervised learning
2. Unsupervised learning
3. Reinforcement learning.

* Applications:

1) Image Recognition.
2) Natural langage processing.
3) ~~Predictive~~ predictive Analytics.

* Benefits of ML:

1. Improved Accuracy
2. Increased Efficiency
3. Personalization

(7) Compare Machine learning and data mining.

Similarities:

1. Data driven
2. Pattern Discovery
3. Automated Analysis

Differences:

1. Goals
2. Approach
3. Output.

Machine learning

1. focus
2. Techniques
3. Applications

Data Mining:

1. focus
2. Techniques
3. Applications.

* Relationship Between Machine learning and Data mining:

1. Data mining feeds machine learning
2. Machine learning enhances Data Mining.