1. A bank wants to predict whether a loan applicant will default based on credit score, income, and past loan history. What type of ML problem is this, and what steps would you take to solve it?  
   **Answer:**

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### **Predicting Loan Default**

**Scenario:** A bank wants to predict whether a loan applicant will default based on credit   
 score, income, and past loan history.

**a. Identify the problem type:** Classification  
 **b. Step-by-step logic:**

**Collect Data** – Gather customer financial history, credit scores, and loan repayment records.

**Preprocess Data** – Handle missing values, normalize numerical features, and encode categorical variables.

**Split Dataset** – Divide the dataset into training and testing sets.

**Choose Algorithm** – Use Logistic Regression, Decision Trees, or Random Forest.

**Train Model** – Fit the model using labeled loan default data.

**Evaluate Performance** – Use AUC-ROC, Precision, Recall, and F1-score.

**Make Predictions** – Predict loan default for new applicants.

1. A retail store wants to predict the demand for different products to optimize inventory levels. What type of ML problem is this, and what steps would you take to solve it?  
   **Answer:**

**Forecasting Demand for a Retail Store**

**Scenario:** A retail store wants to predict the demand for different products to optimize inventory levels.  
 **a. Identify the problem type:** Regression  
 **b. Step-by-step logic:**

**Collect Data** – Gather past sales data, seasonal trends, and product demand.

**Preprocess Data** – Handle missing values, normalize numerical data, and remove outliers.

**Split Dataset** – Divide the data into training and testing sets.

**Choose Algorithm** – Use Linear Regression, Random Forest Regression, or XGBoost.

**Train Model** – Fit the model using historical demand data.  
**Evaluate Performance** – Use RMSE and R² score.

**Make Predictions** – Forecast demand for upcoming sales periods.

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1. A factory wants to detect whether a manufactured product is defective based on sensor readings and quality control data. What type of ML problem is this, and what steps would you take to solve it?  
   **Answer:**

**Detecting Defective Products in Manufacturing**

**Scenario:** A factory wants to detect whether a manufactured product is defective based on sensor readings and quality control data.  
 **a. Identify the problem type:** Classification  
 **b. Step-by-step logic:**

**Collect Data** – Gather sensor readings, production details, and defect labels.

**Preprocess Data** – Handle missing values, normalize numerical values, and encode categorical features.

**Split Dataset** – Divide the data into training and testing sets.

**Choose Algorithm** – Use Decision Trees, Support Vector Machines, or Neural Networks.

**Train Model** – Fit the model using labeled defect data.

**Evaluate Performance** – Use accuracy, precision, recall, and F1-score.

**Deploy Model** – Detect defective products in real time.

1. A healthcare provider wants to analyze patient symptoms and classify them into different disease categories. What type of ML problem is this, and what steps would you take to solve it?  
   **Answer:**

**Classifying Medical Diagnoses**

**Scenario:** A healthcare provider wants to classify patient symptoms into different disease categories.  
 **a. Identify the problem type:** Classification  
 **b. Step-by-step logic:**

**Collect Data** – Gather patient records with symptoms and diagnoses.

**Preprocess Data** – Handle missing values, normalize medical test results, and encode categorical features.

**Split Dataset** – Train-test split.

**Choose Algorithm** – Use Random Forest, Naive Bayes, or Gradient Boosting.

**Train Model** – Fit the model using labeled medical data.

**Evaluate Model** – Use accuracy, confusion matrix, and F1-score.

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**Make Predictions** – Predict disease category based on patient symptoms

1. An e-commerce company wants to identify and remove fake reviews posted by bots or fraudsters. What type of ML problem is this, and what steps would you take to solve it?  
   **Answer:**

**Identifying Fake Online Reviews**

**Scenario:** An e-commerce company wants to detect fake reviews posted by bots or fraudsters.  
 **a. Identify the problem type:** Classification  
 **b. Step-by-step logic:**

**Collect Data** – Gather a dataset of real and fake reviews.

**Preprocess Data** – Tokenize text, remove stopwords, and vectorize using TF-IDF.

**Feature Engineering** – Identify suspicious patterns like repetitive words, unnatural phrasing, and review frequency.

**Split Dataset** – Divide data into training and testing sets.

**Choose Algorithm** – Use Naive Bayes, Logistic Regression, or Transformer models.

**Train Model** – Fit the model on labeled review data.

**Evaluate Performance** – Use accuracy, F1-score, and confusion matrix.

**Make Predictions** – Detect fake reviews in real-time.

1. A financial firm wants to predict stock price movements based on historical price data and market indicators. What type of ML problem is this, and what steps would you take to solve it?  
   **Answer:**

### **Predicting Stock Market Trends**

**Scenario:** A financial firm wants to predict stock price movement based on   
 historical price data and market indicators.  
 **a. Identify the problem type:** Regression  
 **b. Step-by-step logic:**

**Collect Data** – Gather historical stock prices, trading volumes, and economic indicators.

**Preprocess Data** – Handle missing values, normalize price changes, and engineer features like moving averages.

**Split Dataset** – Train-test split.

**Choose Algorithm** – Use Random Forest Regression, LSTMs, or Gradient Boosting.

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**Train Model** – Fit the model on historical stock data.

**Evaluate Performance** – Use RMSE and directional accuracy.

**Make Predictions** – Forecast future stock price movements.

1. A social media platform wants to detect fake user accounts based on user activity and profile data. What type of ML problem is this, and what steps would you take to solve it?  
   **Answer:**

**Detecting Fake Social Media Accounts**

**Scenario:** A social media platform wants to identify and remove fake user accounts.  
 **a. Identify the problem type:** Classification  
 **b. Step-by-step logic:**

**Collect Data** – Gather account details, activity logs, and engagement patterns.

**Preprocess Data** – Handle missing values, engineer features like average post frequency and follower ratio.

**Split Dataset** – Divide into training and testing sets.

**Choose Algorithm** – Use Random Forest, Support Vector Machines, or XGBoost.

**Train Model** – Fit the model using labeled real and fake account data.

**Evaluate Performance** – Use Precision, Recall, and F1-score.

**Make Predictions** – Identify and flag fake accounts.

1. A marketing agency wants to segment customers into different groups based on their purchasing behavior. What type of ML problem is this, and what steps would you take to solve it?  
   **Answer:**

### **Optimizing Ad Targeting for Online Marketing**

**Scenario:** A digital marketing company wants to show the most relevant ads to users   
 based on their browsing behavior.  
 **a. Identify the problem type:** Clustering  
 **b. Step-by-step logic:**

**Collect Data** – Gather user click behavior, browsing history, and demographic information.

**Preprocess Data** – Convert categorical features into numerical format, handle missing data.

**Choose Algorithm** – Use K-Means or Hierarchical Clustering.

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**Determine Optimal Clusters** – Use the Elbow Method.

**Train Model** – Apply clustering algorithm to segment users.

**Analyze Clusters** – Identify user groups (e.g., "Tech Enthusiasts," "Fashion Lovers").

**Optimize Ads** – Deliver targeted ads based on cluster preferences.

1. A geospatial research team wants to analyze satellite images to classify different land types (forest, water, urban). What type of ML problem is this, and what steps would you take to solve it?  
   **Answer:**

**Classifying Land Cover in Satellite Images**

**Scenario:** A geospatial research team wants to classify different land types (forest, water, urban) using satellite images.  
 **a. Identify the problem type:** Classification  
 **b. Step-by-step logic:**

**Collect Data** – Use satellite images labeled with land types.

**Preprocess Data** – Normalize pixel values, remove noise, and extract image features.

**Split Dataset** – Divide into training and testing sets.

**Choose Algorithm** – Use Decision Trees, Support Vector Machines, or CNN-based models.

**Train Model** – Fit the model on labeled satellite images.

**Evaluate Performance** – Use accuracy and confusion matrix.

**Make Predictions** – Classify new satellite images into land cover types.

1. A streaming service wants to predict which users are likely to cancel their subscriptions. What type of ML problem is this, and what steps would you take to solve it?

**Answer:**

**Predicting Customer Churn for a Subscription Service**

**Scenario:** A streaming service wants to predict which users are likely to cancel their   
 subscriptions.

**a. Identify the problem type:** Classification  
 **b. Step-by-step logic:**

**Collect Data** – Gather user engagement data, subscription history, and interaction logs.

**Preprocess Data** – Handle missing values and encode categorical variables.

**Feature Engineering** – Create features like average watch time and last login frequency.

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**Split Dataset** – Train-test split.

**Choose Algorithm** – Use Logistic Regression, Random Forest, or Gradient Boosting.

**Train Model** – Fit the model using past churn data.

**Evaluate Performance** – Use AUC-ROC, Precision, and Recall.

**Make Predictions** – Identify customers likely to churn and apply retention strategies.