### **✅ Scenario 1: Selecting Key Features for Diabetes Prediction**

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👉 **Machine Learning Concept**: Feature Selection  
 👉 **Question:** A healthcare startup wants to build a model to predict the onset of diabetes. The dataset has 50 features, but the team wants to use only the most relevant ones. How can they apply feature selection effectively?

👉 **Steps to Achieve:**

* Collect data from patient health records (e.g., BMI, glucose, age, family history, etc.).
* Preprocess the data: handle missing values and scale features.
* Use correlation heatmaps to eliminate highly correlated features.
* Apply SelectKBest with mutual information to identify the top features.
* Optionally, apply Recursive Feature Elimination (RFE) with Logistic Regression.
* Train the model using selected features.
* Evaluate using Accuracy, ROC-AUC, and F1-Score.

### **✅ Scenario 2: Start a New Django Project**

### 👉 **Question:** **Start a New Django Project:** You're creating a new project for managing student data. The project name is student\_portal. What is the step-by-step command to start it?write logic for this django project.

### **Answer:** django-admin startproject student\_portal

### 👉 Step-by-Step Explanation:

### Open your terminal or command prompt.

### Navigate to the directory where you want your project.

### Run the command: → django-admin startproject student\_portal

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### This creates a folder named student\_portal with default Django files.

### **✅ Scenario 3: Feature Reduction in a High-Dimensional Marketing Dataset**

👉 **Machine Learning Concept**: Feature Selection  
 👉 **Question:** A company is analyzing customer purchase patterns with 200+ behavioral features. How can they reduce dimensionality without losing predictive power?

👉 **Steps to Achieve:**

* Collect and preprocess data (normalize values, handle missing data).
* Use PCA (Principal Component Analysis) to reduce dimensionality.
* Alternatively, apply embedded methods like Lasso Regression for feature elimination.
* Retain top components/features that explain most variance.
* Train the final model using these components.
* Evaluate using RMSE (if regression) or Accuracy (if classification).

### **✅ Scenario 4: Personalized Book Recommendation System**

👉 **Machine Learning Concept**: Collaborative Filtering  
 👉 **Question:** A digital library wants to recommend books to readers based on what similar readers liked. How should they design this system?

👉 **Steps to Achieve:**

* Build a user-item interaction matrix from user ratings.
* Calculate similarity between users (user-based CF) or books (item-based CF) using cosine similarity or Pearson correlation.

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* Recommend books that similar users liked but the target user hasn’t read yet.
* Handle sparsity using matrix factorization or KNN.
* Evaluate using RMSE and Recall@K.
* Update recommendations as new ratings come in.

### **✅ Scenario 5: Feature Selection for Credit Risk Assessment**

👉 **Machine Learning Concept**: Feature Selection  
 👉 **Question:** A bank wants to assess the risk level of credit applicants using only the most important financial indicators. How can they reduce the number of features?

👉 **Steps to Achieve:**

* Collect applicant data: income, credit score, employment length, etc.
* Preprocess: handle missing values, encode categoricals.
* Use tree-based models like Random Forest to compute feature importance.
* Drop low-importance features.
* Validate the reduced feature set with a classifier (e.g., Decision Tree).
* Evaluate using ROC-AUC, Precision, and Recall.

### **✅ Scenario 6: News Article Recommendation Based on Reading Behavior**

👉 **Machine Learning Concept**: Hybrid Recommendation System  
 👉 **Question:** A news app wants to recommend articles based on both article similarity and user reading history. How can they implement a hybrid system?

👉 **Steps to Achieve:**

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* Collect user reading behavior and article metadata (topics, source, etc.).
* Build a content-based recommender using TF-IDF on article content.
* Build collaborative filtering using user-article interaction matrix.
* Blend both recommenders using a weighted average of similarity scores.
* Evaluate using CTR (Click-through rate) and Time Spent.
* Continuously retrain as new users and articles arrive.

### **✅ Scenario 7: Feature Selection in Spam Email Detection**

👉 **Machine Learning Concept**: Feature Selection  
 👉 **Question:** You're building a spam detection model and have thousands of text features from emails. How do you identify the most useful ones?

👉 **Steps to Achieve:**

* Convert emails into TF-IDF vectors or word counts.
* Apply feature selection using chi-square test to select words most correlated with the label (spam or not spam).
* Optionally use embedded models like Lasso to reduce features.
* Train a classification model on selected features.
* Evaluate with Precision, Recall, and F1-Score.

### **✅ Scenario 8: Recommendation System for Online Learning Platform**

👉 **Machine Learning Concept**: Collaborative Filtering  
 👉 **Question:** An ed-tech platform wants to recommend courses based on what similar learners have enrolled in. What steps would you take?

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👉 **Steps to Achieve:**

* Build a user-course interaction matrix.
* Use collaborative filtering (matrix factorization like SVD or KNN) to find similar learners or courses.
* Recommend courses highly rated by similar users.
* Handle cold-start using popularity or content-based filtering.
* Evaluate with RMSE, Recall@K, and engagement rate.
* Update recommendations periodically as user behavior changes.

### **✅ Scenario 9: Identifying Key Features for Predicting Car Prices**

👉 **Machine Learning Concept**: Feature Selection  
 👉 **Question:** You’re developing a car price prediction tool. With 100+ features (e.g., brand, mileage, engine type), how do you reduce complexity?

👉 **Steps to Achieve:**

* Collect car listings and prices.
* Encode categorical features and normalize numerical ones.
* Apply correlation analysis to drop redundant features.
* Use feature importance from Gradient Boosting to rank features.
* Retain top 15–20 features and retrain the model.
* Evaluate using RMSE and R² score.

### **✅ Scenario 10: Cold-Start Recommendation for New Users in a Shopping App**

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👉 **Machine Learning Concept**: Recommendation System  
 👉 **Question:** How do you recommend products to new users who haven’t interacted with anything yet?

👉 **Steps to Achieve:**

* Use popularity-based recommendations (e.g., top trending or top-rated items).
* If user demographic info is available, recommend based on age/gender/location using filtered subsets.
* Use content-based filtering to match products to user's registration interests (if provided).
* Gradually switch to collaborative filtering once the user starts interacting.
* Evaluate based on user engagement and product click rate.