

Parul University
Faculty of Engineering and Technology
Parul Institute of Technology
Machine Learning (303105353)
Assignment No. - 03

1. How does K-NN perform in different learning scenarios, and what challenges arise with high-dimensional data?

2. **Logistic Regression and Probabilistic Learning:**

A healthcare analyst is building a model to predict whether a patient has diabetes (Yes/No) based on factors like age, BMI, and glucose levels. The analyst wants not only predictions but also confidence levels (probabilities) for each case.

Question: Why is logistic regression suitable for this classification task, and how does its probabilistic nature benefit decision-making in such medical applications?

3. How does the perceptron learning rule work, and what are its theoretical limitations?
4. Why are multi-layer networks (MLPs) essential in deep learning compared to single-layer perceptron's?

5. **Support Vector Machine (SVM):**

You are developing a face recognition model using SVM. You notice that increasing the margin between classes improves the model's robustness to noisy data.

Question: How does SVM maximize this margin, and why does a larger margin generally lead to better generalization performance?

6. When should a linear model (e.g., logistic regression, linear SVM) be preferred over non-linear models (e.g., deep networks, kernel SVMs)?

7. **Semi-Supervised Learning (SSL):**

A company has 10,000 product reviews but only 500 of them are labeled as "positive" or "negative." Labeling all reviews manually would be time-consuming and expensive.

Question: How can semi-supervised learning leverage both the labeled and unlabeled data to improve sentiment classification accuracy, and why is this approach beneficial in such real-world cases?

Date: 26/01/2026

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Note: Submit the assignment on or before 31/01/2026.