7/4/25.

LAB-5

KNN and SVM

- KNN algorithm.

1. Choose the number of neighbours (K): Decide how many neighbors you want to consider for making the prediction.
2. Calculate the distance: between test instance and all training instances.
   - Evidence, Manhattan, Minkowski
3. Sort the distances: in ascending order
4. Select K nearest neighbours: choose the top K instances from the sorted list.
5. Vote for labels: - For classification tasks, perform a majority vote among the K neighbors to determine the predicted class label.
6. Return the prediction: Output the predicted class label or the predicted value

- SVM algorithm.

1. Select the Kernel: choose a Kernel function to transform the input data into a higher-dimensional space. including Linear, Polynomial, Radial Basis Function (RBF) Kernel.

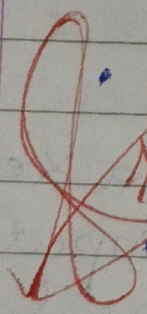
2. Formulate the optimization problem: the goal is to find the hyperplane that maximized the margin between the two classes. This can be formulated as a constraint optimization.

Minimize:- $\frac{\|w\|^2}{2}$

Subjected to $y_i(w \cdot x_i + b) \geq 1$

3. Use Lagrange multipliers:-
4. Solve the dual problem: to find the optimal value of the Lagrange multipliers
5. Determine the weights and bias:- Calculate the weight vector (w) and bias using the support vectors.
6. Make predictions:- For a new instance, compute the decision function

$$f'(x) = \frac{d}{dx}(w \cdot x + b)$$



classify the instance based on the sign of $f(x)$:

If $f(x) > 0$, classify as positive

If $f(x) < 0$, classify as negative

7. Return the prediction.