

# Iris Classification Project Report

## Classification Report

### 1. Objective

The objective of this project is to build and evaluate machine learning models to classify Iris flower species based on their physical characteristics (sepal and petal measurements).

### 2. Dataset Overview

- Source: IRIS.csv
- Features:
  - SepalLengthCm
  - SepalWidthCm
  - PetalLengthCm
  - PetalWidthCm
- Target: Species (Setosa, Versicolor, Virginica)

No missing values were found, and the dataset was well balanced.

### 3. Models Implemented

#### a. Support Vector Machine (SVM)

- Model: SVC with kernel tuning
- Evaluation:
  - Confusion matrix and classification report used
  - Accuracy Score: ~97%

#### b. Neural Network (Sequential Model)

- Architecture:
  - Input Layer: 4 neurons
  - Hidden Layers: 2 Dense layers with ReLU activation

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- Output Layer: Softmax
- Optimizer: Adam
- Metrics: Accuracy, Precision, Recall
- Performance:
  - Test Accuracy: ~96%
  - F1 Score, Precision, and Recall show strong performance across all classes

## 4. Cross-Validation & Grid Search

- Stratified K-Fold cross-validation used
- GridSearchCV performed for hyperparameter tuning in the SVM
- Best parameters and cross-validation score were identified

## 5. Visualizations

- Confusion matrix plots
- ROC Curve with AUC scores
- Loss and Accuracy plots for neural network training

## 6. Key Findings

- Both SVM and Neural Networks are effective
- SVM slightly outperformed the neural network
- Feature scaling improved model performance
- Balanced dataset aided in stable training
- Generalization validated with cross-validation and test accuracy