Iris Classification

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## Project Overview:-

This project focuses on classifying Iris flower species based on petal and sepal dimensions using machine learning. The model is trained, evaluated, and deployed via a Flask web application. Visualization and exploratory analysis help in understanding feature importance and patterns.

## 1. Problem Statement:-

• Objective: To classify iris flowers into Setosa, Versicolor, or Virginica species.  
• Deliverables:  
 - Trained classification model using KNN  
 - Visualizations for EDA  
 - Flask-based interactive web app for classification

## 2. Dataset Details:-

• Source: UCI Machine Learning Repository  
• Format: CSV  
• Features:  
 - SepalLengthCm, SepalWidthCm  
 - PetalLengthCm, PetalWidthCm  
 - Species (Target)

## 3. Data Preprocessing & Feature Engineering:-

• Label encoded species column to convert it into numeric.  
• Used StandardScaler to normalize the feature space.  
• Split dataset into 80% train and 20% test sets.

## 4. Exploratory Data Analysis:-

• Pairplots were used to visualize class separation.  
• Boxplots showed feature distribution across species.  
• Correlation heatmaps were used to find important features.

## 5. Machine Learning Model:-

• Model Used: K-Nearest Neighbors (KNN)  
• Hyperparameters tuned using GridSearchCV  
• Final model: KNeighborsClassifier(n\_neighbors=9)

## 6. Model Evaluation:-

• Accuracy achieved: ~100.0%  
• Evaluation Metrics: Confusion matrix and accuracy score

## 7. Web Application (Flask):-

• Inputs: Sepal length, Sepal width, Petal length, Petal width  
• Outputs:  
 - Predicted species  
 - Data visualization plots (pairplot, boxplot, heatmap)  
• Backend: Flask  
• Frontend: HTML form + Matplotlib image rendering

## 8. Key Insights & Takeaways:-

• Petal measurements are the most important features.  
• KNN performs well for this classification task with high accuracy.  
• Web deployment makes the solution user-friendly and interactive.

# File Structure:-

project/  
├── app.py  
├── Iris.csv  
├── templates/  
│ └── index.html  
├── static/  
│ ├── boxplot\_petal\_length.png  
│ ├── boxplot\_petal\_width.png  
│ ├── boxplot\_petal\_width.png

│ ├── boxplot\_sepal\_length.png

│ ├── boxplot\_sepal\_width.png

│ ├── confusion\_matrix.png

│ ├── correlation\_heatmap.png

│ ├── pairplot.png

│ ├── knn\_model.pkl

│ ├── label\_encoder.pkl

│ └── scaler.pkl