

# Project Report: Dimensionality Reduction & Stock Price Prediction.

## Objective:

This project comprises two major tasks:

1. Dimensionality Reduction – Reducing high-dimensional data for effective visualization using PCA.
2. Stock Price Prediction – Forecasting future stock prices using ARIMA-based time series analysis.

## Part 1: Dimensionality Reduction using PCA

### Dataset

- Dataset Used: Iris dataset (built-in from scikit-learn)
- Features: Sepal length, Sepal width, Petal length, Petal width
- Target: Iris species (Setosa, Versicolor, Virginica)

### Methodology

- Principal Component Analysis (PCA) was applied to reduce 4-dimensional data to 2 dimensions.
- A scatter plot was generated to visualize the data in 2D space while preserving as much variance as possible.

## Part 2: Stock Price Prediction using ARIMA

### Dataset

- File: stock\_prices.csv (generated sample)
- Features: Date, Open, Close, Volume
- Size: 200 daily records

### Preprocessing

- Converted Date column to datetime and set it as the index.
- Handled missing values using forward fill.

## Exploratory Data Analysis (EDA)

- Visualized Close prices over time to detect trends.
- Created lag features and rolling mean for trend detection and smoothing.

## Model: ARIMA

- Model Type: ARIMA (AutoRegressive Integrated Moving Average)
- Order: (5, 1, 0) after manual tuning
- Trained on 170 days of data and tested on the last 30 days.

## Evaluation

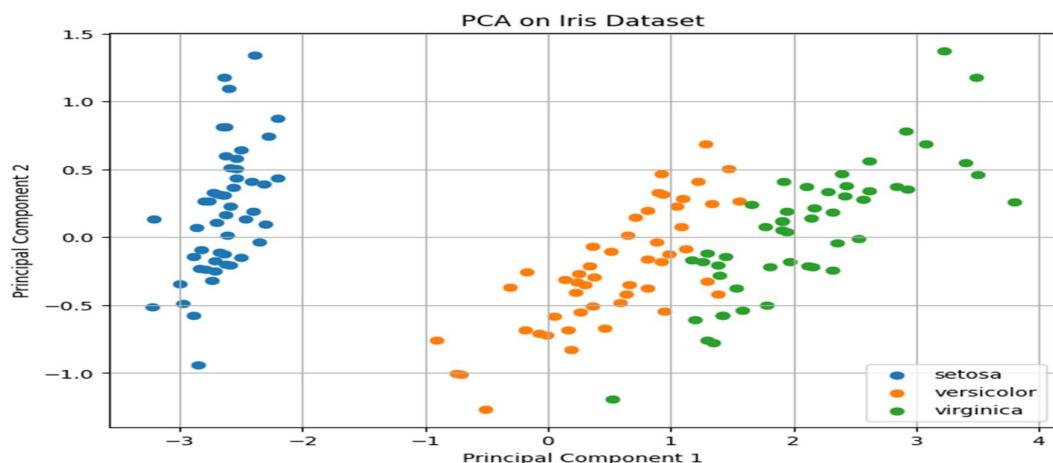
- Compared predicted vs. actual stock prices.
- Calculated:
  - MAE (Mean Absolute Error)
  - RMSE (Root Mean Squared Error)
- Visualized prediction results to analyze performance.

## Conclusion

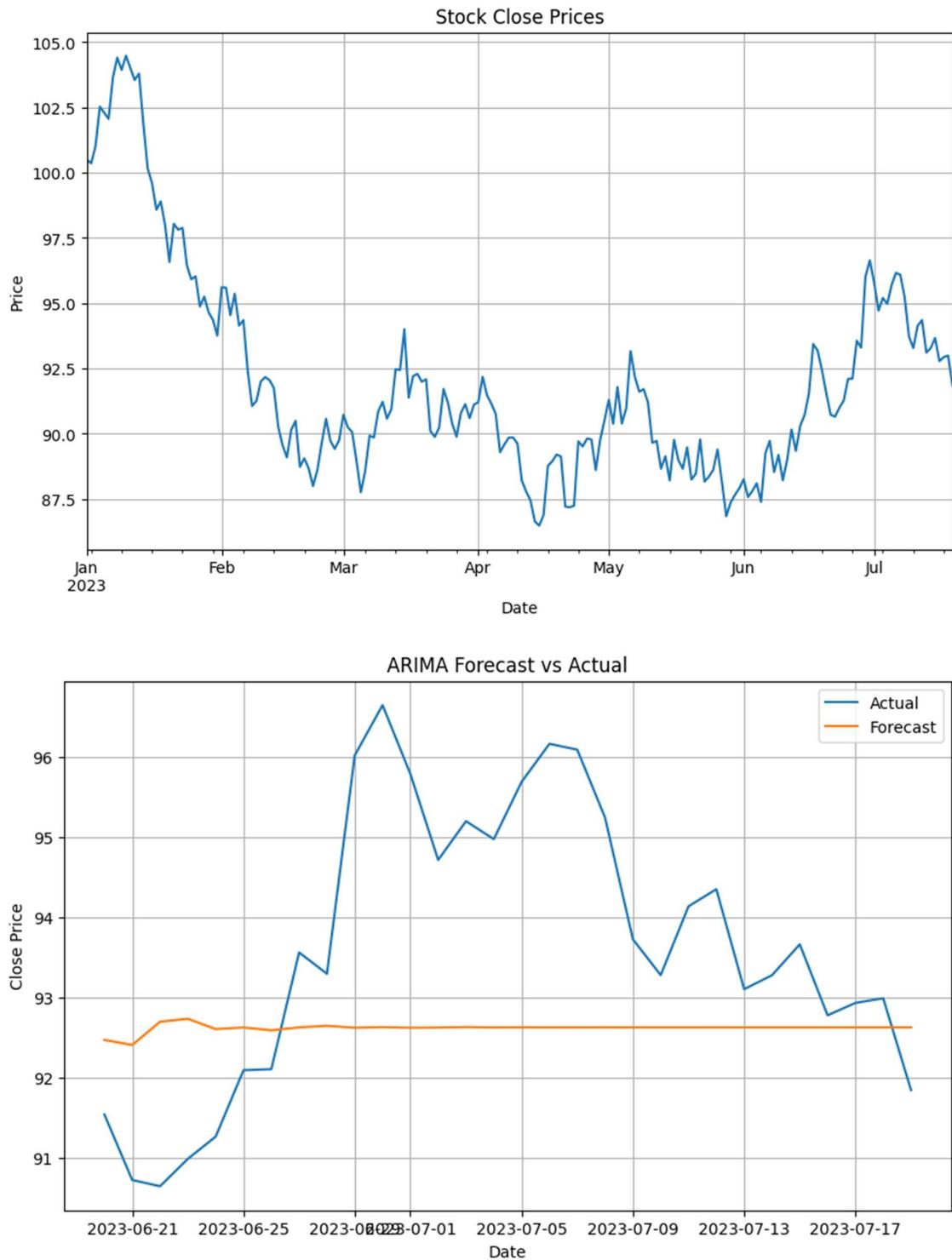
- PCA helped reduce dimensionality while preserving data structure, offering an interpretable 2D visualization of a complex dataset.
- ARIMA successfully modeled stock price trends and provided reasonable short-term predictions, demonstrating the importance of time series modeling in financial data.

## RESULTS:

### Part-1 : Dimensionality Reduction using PCA



## Part-2 : Stock Price Prediction using ARIMA



MAE: 1.64

RMSE: 1.99