

# Vehicle Wash App

**Problem Statement :-** Develop a **Flask-based web dashboard** to analyze vehicle wash sales data (from a CSV dataset) and provide actionable insights.

**Name - Sumeeth K (20231CAI0085)**

**Email - [Sumeethk2802@outlook.com](mailto:Sumeethk2802@outlook.com)**

**Date - 17-07-2025**

## **Table of Contents**

1. Problem Statement
2. Project Overview
3. Dataset Description
4. Features Implemented
5. Technical Architecture
6. Code Walkthrough
7. Setup Instructions
8. Screenshots

## PROBLEM STATEMENT

Develop a **Flask-based web dashboard** to analyze vehicle wash sales data (from a CSV dataset) and provide actionable insights, including:

- Identifying **best/worst months** for discounts/surcharges,
- Detecting **inactive high-value customers** for retention campaigns,
- Visualizing **sales trends** via monthly reports and time-slot pie charts

## Project overview

The goal of this project is to develop a **web-based analytics dashboard** for a vehicle wash business to optimize pricing strategies, improve customer retention, and visualize sales trends. The system will process historical transaction data stored in a **CSV dataset** and generate actionable insights using **Python (Flask, Pandas, and Matplotlib)** with a **Bootstrap-based frontend**.

## Dataset Description

The dataset has been created newly using pandas, numpy and datetime Library.

The data can be generated using random function, where the data includes 5 Columns, namely, [SL No., Customer ID, Services, Date & Time, Amount for the service].

Later the data is converted to DataFrame and then to csv using pandas library.

## CODE:

```
import numpy as np
import pandas as pd
from datetime import datetime, timedelta

number_of_data = 800 # Setting data Limit.
services = ['Bike', 'Interior Car Wash', 'Exterior Car Wash', 'Both Interior and Exterior']
customer_id = [f"C{100 + i}" for i in range(1, 101)]
base_date = datetime(2024, 1, 1, 6, 0, 0) # Starts from 1st Jan 2024.

data = [] # Creating an empty list and then inserting random data.

for i in range(1, number_of_data + 1):
    cust_id = np.random.choice(customer_id)
    service = np.random.choice(services)

    date = base_date + timedelta(days = np.random.randint(0, 240), hours =
np.random.randint(0, 14), minutes = np.random.randint(0, 61), seconds =
np.random.randint(0,61)) # For a period of 8 months.

    amount = {
        'Bike': 200,
        'Interior Car Wash': 500,
        'Exterior Car Wash': 500,
        'Both Interior and Exterior': 800
    }[service]

    data.append([i, cust_id, service, date.strftime("%Y-%m-%d %H:%M:%S"),
amount]) # In what format the data should be.

df = pd.DataFrame(data, columns = ['SL No.', 'Cutomer ID', 'services', 'Date & Time',
'Amount (In ₹)']) # Converting list to dataFrame along with Headings.

df.to_csv("./car_wash_csv", index = False) # Then finally converting the dataFrame to
csv file.
```

# Features Implemented

The Vehicle Wash App includes the following key features:

## 1) Data Analysis Dashboard

- Displays monthly sales trends, best/worst months for discounts/surcharges, and service-wise revenue breakdowns.
- Visualizations include bar charts, line graphs, and pie charts for easy interpretation.

## 2) VIP Customers Insights

- Identifies high-value customers based on transaction history.
- Provides VIP Card and Discount Coupons.

## 3) Dynamic Pricing Optimization

- Analyzes historical data to view pricing for different services.

## 4) Interactive UI

- Bootstrap-based frontend with responsive design for seamless user experience.

## 5) CSV Data Integration

- Processes CSV files to generate real-time insights.

# Technical Architecture

The app follows a client-server architecture:

- **Frontend:**
  - Built with **HTML5, CSS3 (Bootstrap 5), and JavaScript (Chart.js)**
  - Responsive design ensures compatibility across devices.
- **Backend:**
  - **Flask (Python)** framework for handling HTTP requests and data processing.
  - **Pandas** for data manipulation and analysis.
  - **Matplotlib/Seaborn** for generating static visualizations.
- **Data Flow:**
  1. Used Dataset which is created on own.
  2. Flask backend processes data using Pandas.
  3. Visualizations are rendered dynamically via Matplotlib.

## Code Walkthrough

Key Components:

### 1) app.py (**Flask Backend**)

- Routes:
  - `/`: Renders the dashboard.
- Helper Functions:
  - `sales_distribution_sales()`: Aggregates sales by services.
  - `High_demand_months()`: shows the month which has highest number of sales.

- Festival\_sales\_comparison(): shows the festival prices and how much sales made during festivals.
- Customer\_growth\_trend(): shows the new number of customers visited every month.
- Top\_customer\_vip(): shows top 5 vip customers and their total sales.

## 2) templates/index.html (**Frontend**)

- Dynamic charts using pandas, matplotlib and rendering it to html using flask.

## 3) static/style.css

- Unique designs and animations given to html.

# Setup Instructions

## Prerequisites:

- Python 3.8+
- Pip package manager

## Steps:

### 1. Clone the repository:

```
git clone <repository_url>  
cd vehicle-wash-app
```

### 2. Install dependencies:

```
pip install flask pandas matplotlib
```

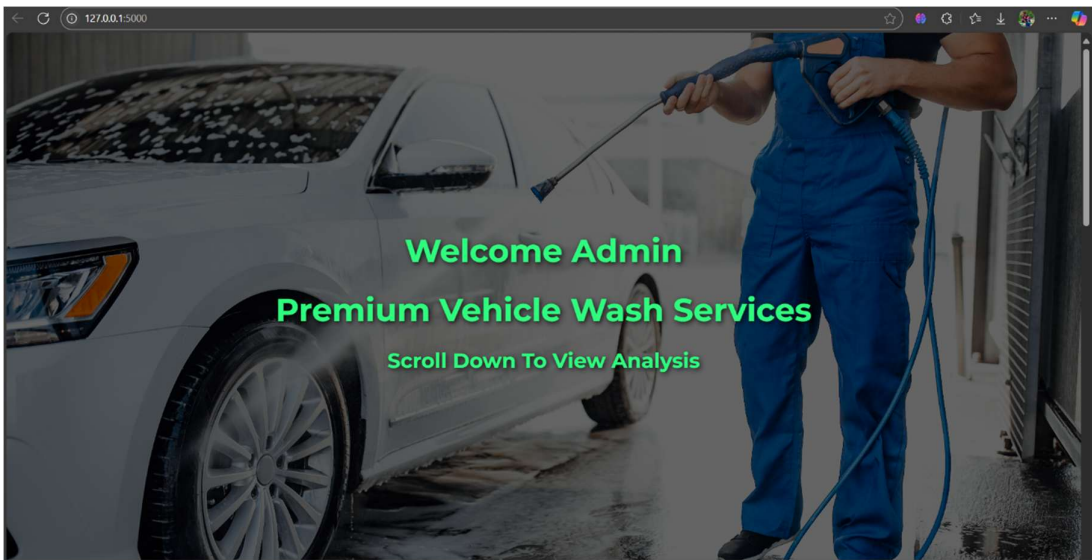
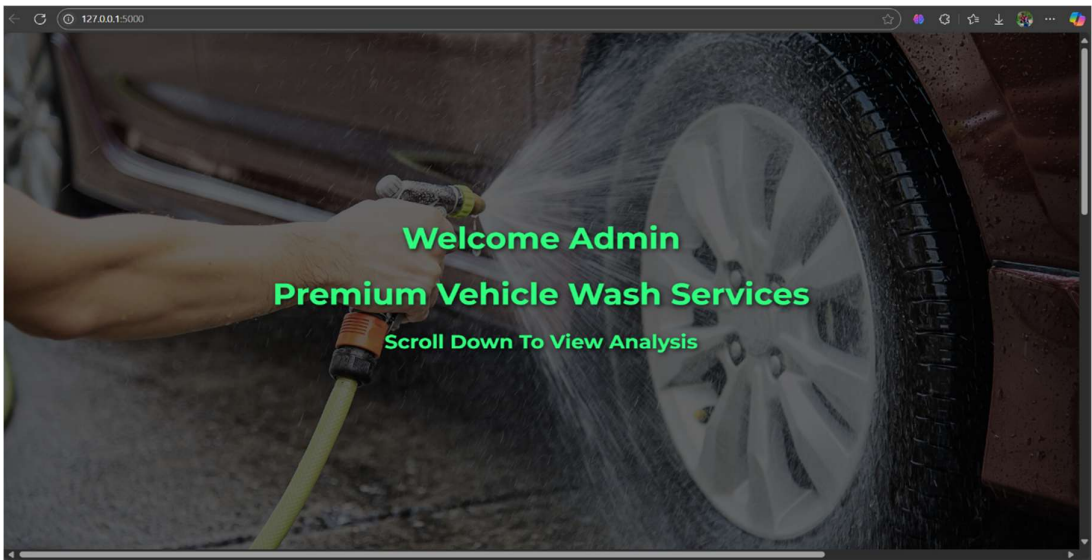
### 3. Run the app:

```
python app.py
```

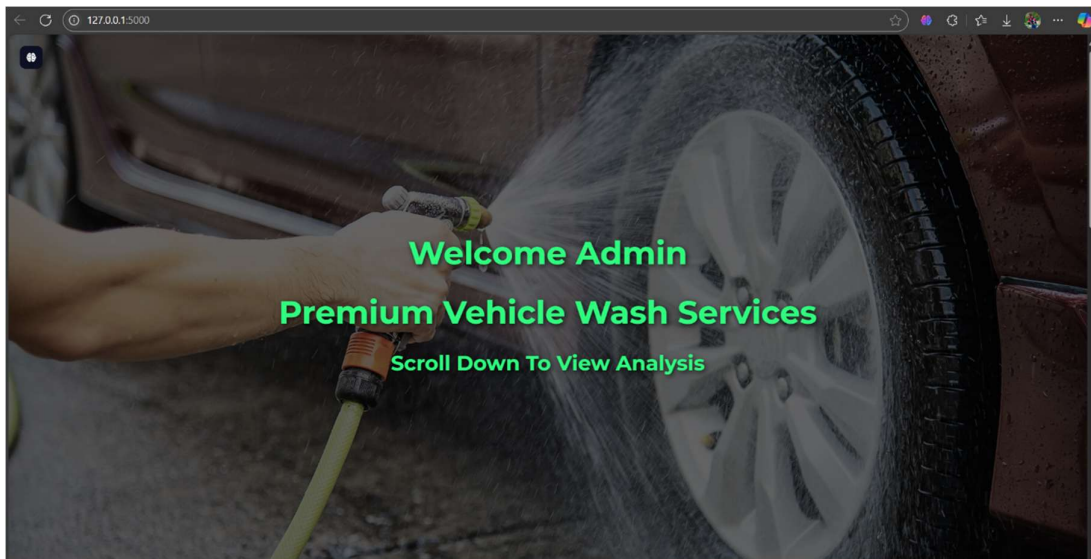
### 4. Access the dashboard at <http://localhost:5000>.

# Screenshots

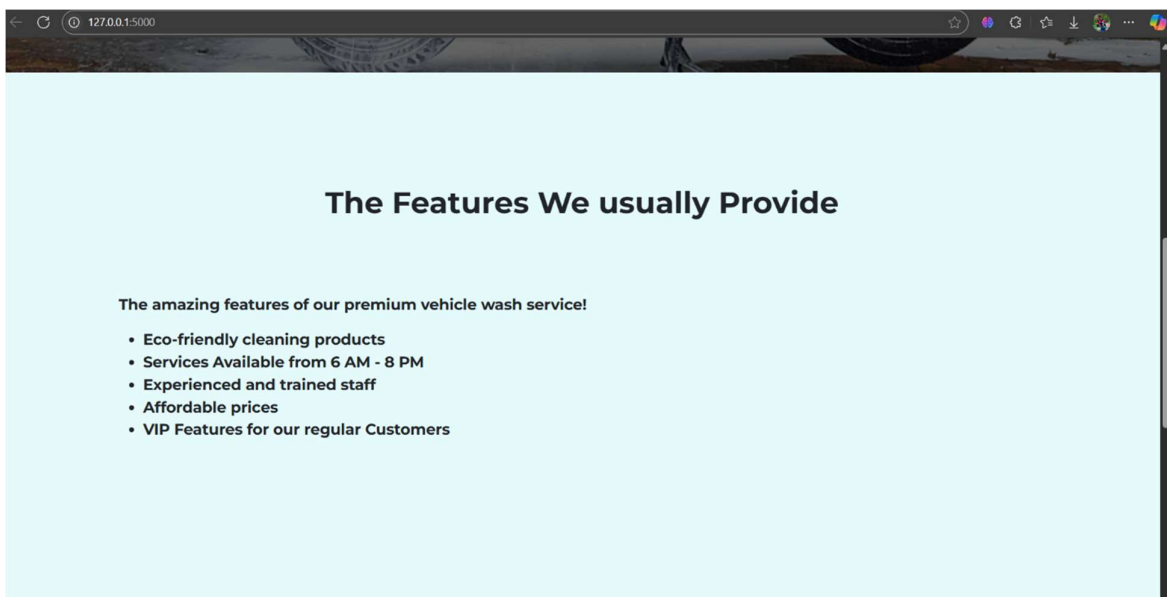
## Home Page







## Features Page



Analysis Page

