Project Report: Weather Forecast App

# 1. Introduction

The Weather Forecast App is a Java-based desktop application developed using JavaFX. It fetches and displays real-time weather information for any city using the OpenWeatherMap API. The project demonstrates the integration of APIs, parsing JSON responses, and presenting data in a GUI.

# 2. Objectives

- Fetch real-time weather information from a public API.  
- Display weather details such as temperature, condition, humidity, and wind speed.  
- Show icons representing current weather.  
- Handle errors such as invalid city names or missing API key.  
- Provide an interactive and user-friendly interface using JavaFX.

# 3. Tools and Technologies Used

- Programming Language: Java  
- GUI Framework: JavaFX  
- API: OpenWeatherMap API  
- JSON Parsing: Gson  
- IDE: Visual Studio Code  
- Build Tool: Maven

# 4. System Design

The system consists of the following components:  
1. API Integration: Connects with OpenWeatherMap to fetch real-time weather.  
2. JSON Parser: Extracts useful information such as temperature, humidity, and weather conditions.  
3. GUI: A JavaFX-based interface that allows users to input a city name and view weather details.  
4. Error Handling: Displays messages for invalid inputs or API errors.

# 5. Implementation

Step 1: Registered and obtained an API key from OpenWeatherMap.  
Step 2: Set up the Maven project in Visual Studio Code.  
Step 3: Implemented HTTP requests to fetch weather data.  
Step 4: Parsed JSON responses using the Gson library.  
Step 5: Displayed the data in a JavaFX interface with icons.  
Step 6: Added error handling for invalid inputs and incorrect API key.

# 6. Results

The application successfully displays real-time weather details for any entered city. It shows the temperature, weather condition, humidity, and wind speed along with relevant icons. Error messages are displayed when invalid inputs or incorrect API keys are used.

# 7. Screenshots

Below are sample screenshots of the Weather Forecast App:

✅ Successful Weather Fetch

✅ Invalid API Key Error

# 8. Conclusion

The Weather Forecast App demonstrates the integration of APIs with Java-based desktop applications. It provides users with a simple, interactive, and effective way to fetch and display weather data in real time. This project enhances skills in JavaFX, API handling, JSON parsing, and error handling.

# 9. Future Enhancements

- Add 5-day weather forecast.  
- Support for multiple languages.  
- Display additional details like sunrise, sunset, and feels-like temperature.  
- Improve UI design with charts and graphs.  
- Package the app as an executable installer.