

PROBLEM

There are many scientific groups developing long-term predictive algorithms, but a robust platform to deliver these results directly to users is missing. This gap makes it difficult for sectors like agriculture and travel to access and apply long-term weather predictions effectively.

SOLUTION

WeatherGuide addresses the gap in long-term weather forecasting by utilizing ERA5 data and advanced clustering algorithms to provide reliable predictions. Its user-friendly, intuitive interface ensures that users receive accurate, tailored weather forecasts designed to meet their specific needs.

METHOD

Our platform analyzes five years of historical weather data in two-week intervals, using clustering algorithms to identify patterns and calculate forecast probabilities, which are presented to users for informed decision-making.

Algorithms Used

K-Means Clustering:

Groups historical weather data into clusters of similar patterns (e.g., temperature, rainfall, wind) to identify the closest matching cluster for new data, allowing predictions based on past outcomes.

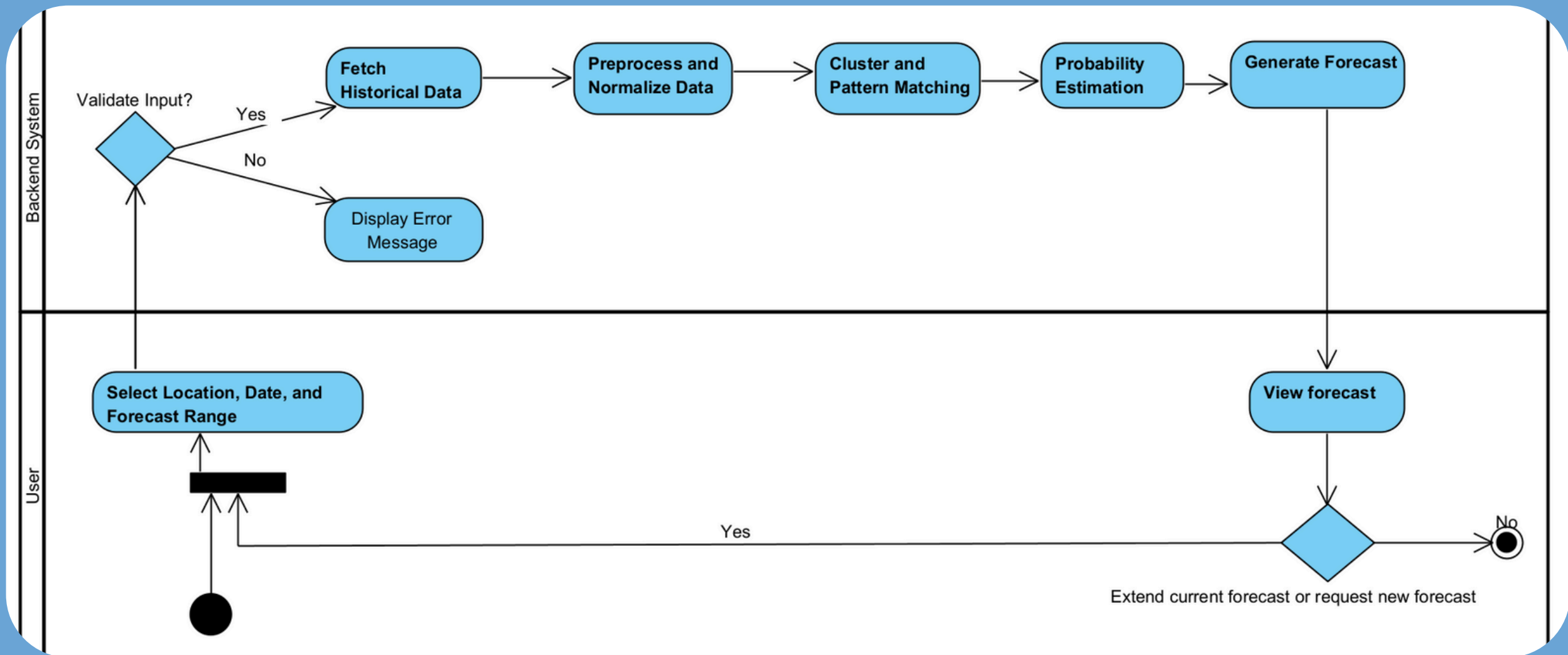
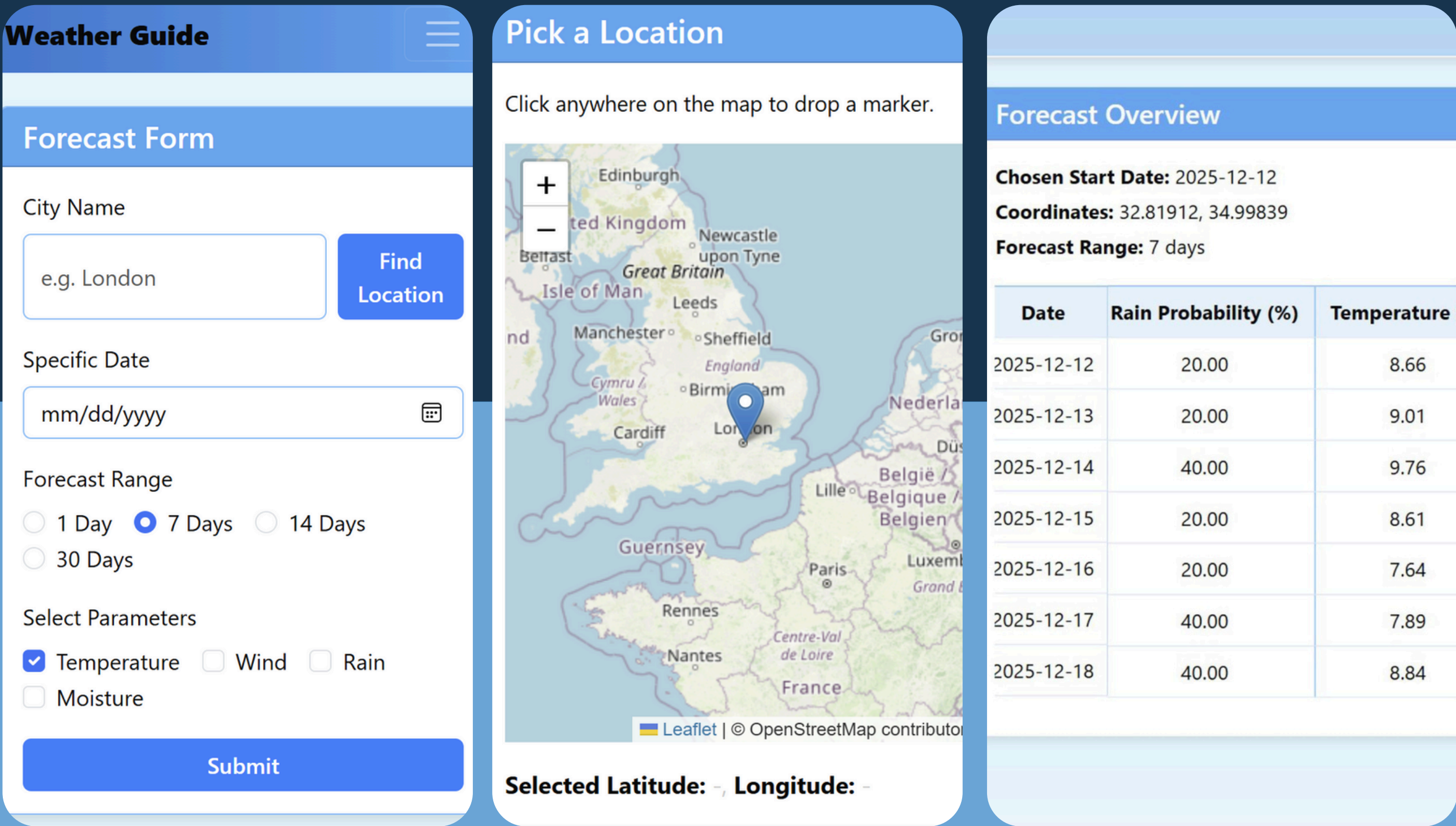
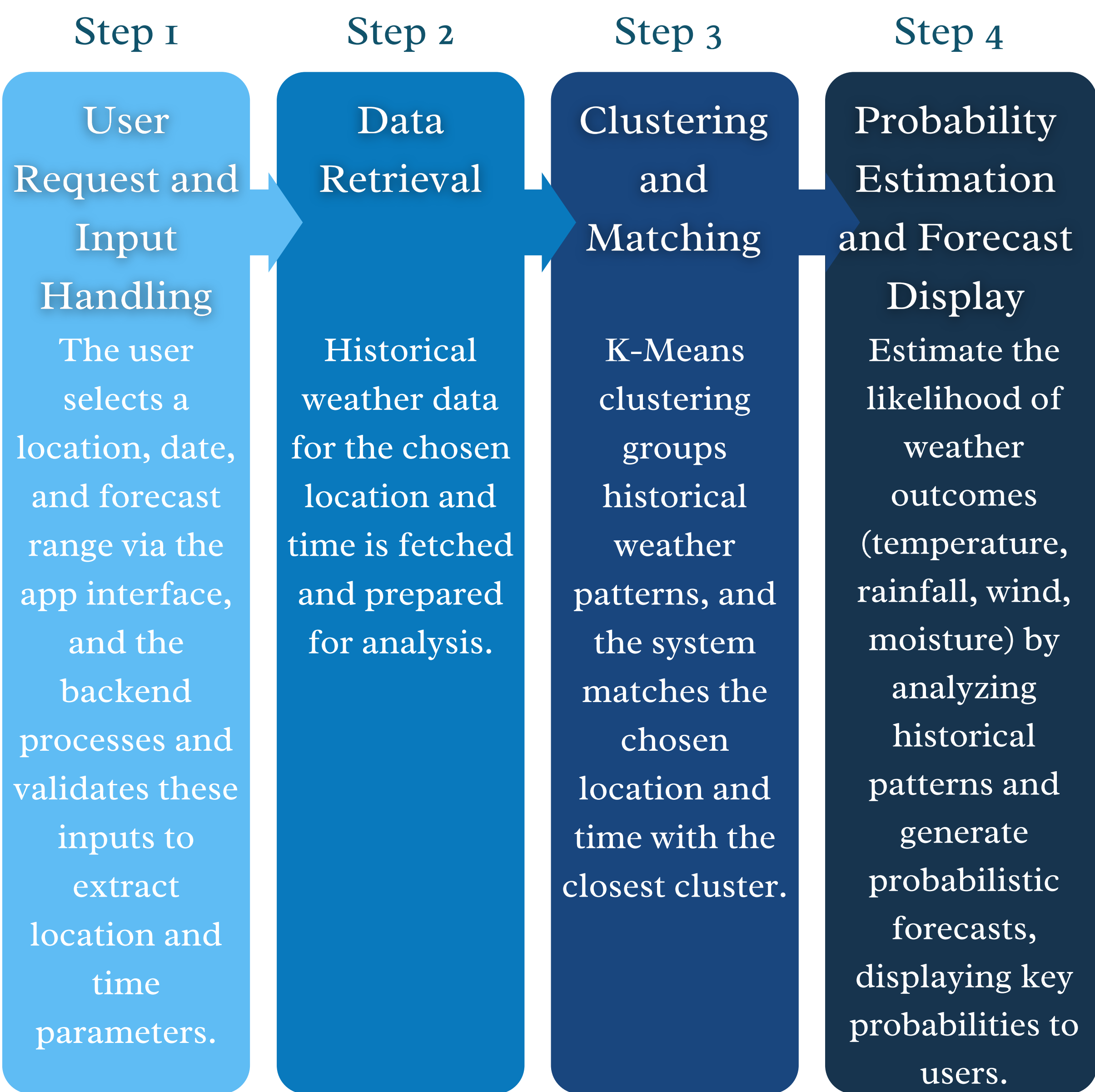
Data Normalization:

Scales weather parameters to a common range to ensure that no single variable dominates the clustering process, improving prediction accuracy.

Historical Pattern Matching and Probability Estimation:

The system identifies the most relevant cluster and estimates weather outcomes (temperature, rainfall, wind, moisture) based on similar past conditions. Rain probability is calculated using a rule-based algorithm, with plans for future enhancements using advanced models.

WORKFLOW



Results

WeatherGuide delivers long-term forecasts by integrating scientific prediction results into a user-focused platform. It processes large historical datasets to generate reliable probabilistic forecasts for key parameters like temperature, rainfall, wind, and moisture, making them easily accessible for users.

Technologies and Tools

React (Frontend):

- Used to build the user interface for selecting locations, dates, and displaying forecasts in a dynamic and interactive way.

2. Flask (Backend):

- Handles API requests, processes user inputs, and manages the connection between the frontend and backend systems.

3.Numpy and Pandas:

- Used for data manipulation, cleaning, and preparing large datasets efficiently.

Conclusion

WeatherGuide bridges the gap between scientific forecasting and practical applications by providing a robust platform. It offers reliable predictions through an intuitive interface, supporting better decision-making in sectors like agriculture and travel.