International Journal of Engineering Research and Science & Technology

www.ijerst.org

ISSN : 2319-5991

Vol. 22 No. 3 (2026)

ijerst.editor@gmail.com

editor@ijerst.com

ISSN 2319-5991 www.ijerst.com

Peer Reviewed, Referred & Indexed Journal

Research Paper

Online Weather Prediction Model

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Abstract

The Online Weather Prediction Model is a software application designed to provide users with weather information and predict future weather conditions for a selected location. Weather prediction is important for daily activities, agriculture, transportation, travel, disaster management, and other weather-dependent operations. Traditional weather information systems mainly provide current and previously recorded weather data, while accurate prediction requires analysis of multiple environmental factors.

The proposed system uses Artificial Intelligence (AI), Machine Learning (ML), and data analysis techniques to analyze weather parameters such as temperature, humidity, atmospheric pressure, wind speed, rainfall, and historical weather conditions. Based on these parameters, the model predicts upcoming weather conditions and presents the results through a simple and user-friendly interface. Users can select a location and obtain weather predictions for a specified period.

The system can collect historical weather data, preprocess the data, identify relevant patterns, train a prediction model, and generate future weather predictions. The predicted information can include temperature, rainfall probability, humidity, wind conditions, and general weather conditions. Graphs and visual indicators can be used to make the predicted results easier to understand.

The main objective of the Online Weather Prediction Model is to provide accessible, fast, and data-driven weather predictions through an online platform. The system can help users make better decisions based on expected weather conditions. In the future, the model can be enhanced with real-time weather APIs, deep learning algorithms, satellite data, severe-weather alerts, longer prediction periods, and location-based notifications.

I. Introduction

The Online Weather Prediction Model is a web-based application designed to provide weather information and predict future weather conditions for a selected location. Weather conditions have a significant impact on daily life, agriculture, transportation, tourism, construction, and many other activities. Accurate weather prediction helps individuals and organizations make better decisions and prepare for changing environmental conditions.

Traditional weather applications mainly provide current weather information and forecasts collected from weather stations or external services. However, weather conditions are constantly changing and depend on several factors such as temperature, humidity, atmospheric pressure, wind speed, rainfall, and historical weather patterns. An intelligent prediction system can analyze these factors to identify patterns and estimate future weather conditions.

The proposed system uses Machine Learning and data analysis techniques to process historical weather data and generate predictions. The collected data is first cleaned and prepared for analysis. Relevant weather parameters are then provided to a trained prediction model, which analyzes relationships between different environmental conditions and generates the expected weather outcome.

The system provides a simple online interface where users can select a location and view predicted weather information. The output can include temperature, humidity, rainfall, wind speed, atmospheric conditions, and predicted weather status. Graphs and charts can also be used to present weather trends in an easy-to-understand format.

II. Literature Survey

Several studies have been conducted on weather prediction and forecasting systems using statistical methods, machine learning, and artificial intelligence techniques. Traditional weather forecasting methods depend on observations collected from weather stations, satellites, radar systems, and numerical weather prediction models. These methods can provide useful forecasts, but processing large amounts of environmental data and identifying complex relationships between weather parameters can be challenging.

Machine Learning techniques have been increasingly applied to weather prediction because they can learn patterns from historical weather data. Algorithms such as Linear Regression, Decision Trees, Random Forest, Support Vector Machines, and Artificial Neural Networks have been used to predict parameters such as temperature, rainfall, humidity, and wind speed. These approaches can identify relationships between different weather variables and provide predictions based on previously observed conditions.

Recent research has explored deep learning models such as Recurrent Neural Networks (RNN), Long Short-Term Memory (LSTM), and other neural-network architectures for time-series weather forecasting. These models are useful for analyzing sequential weather observations and identifying temporal patterns. However, their performance depends on the availability and quality of historical datasets, appropriate feature selection, and model training.

Online weather applications have also integrated real-time weather data with prediction models to provide users with accessible forecasts. Such systems can display temperature, humidity, rainfall probability, wind speed, atmospheric pressure, and weather conditions through dashboards, graphs, and charts. However, prediction accuracy can vary depending on geographical location, data quality, forecasting period, and rapidly changing atmospheric conditions.

Based on the study of existing approaches, the proposed Online Weather Prediction Model aims to provide an accessible platform for analyzing weather data and generating predictions using machine learning techniques. The system can collect historical weather information, preprocess the data, train a suitable prediction model, and present predicted weather conditions through an online interface. The platform can be further enhanced with real-time weather APIs, deep learning algorithms, satellite information, severe-weather alerts, location-based notifications, and improved long-term forecasting. Thus, the proposed system provides a practical approach to applying machine learning and data analysis techniques to online weather prediction.

III. System Analysis

System analysis is an important phase in the development of the Online Weather Prediction Model. The analysis focuses on identifying the requirements for collecting, processing, and predicting weather information. The system should allow users to select a location and obtain relevant weather predictions. Weather parameters such as temperature, humidity, atmospheric pressure, wind speed, and rainfall should be considered for prediction. Historical weather data is collected and prepared for analysis and model training. Data preprocessing is performed to handle missing values, incorrect records, and inconsistent data. Suitable machine learning algorithms are selected based on the prediction requirements. The trained model analyzes historical patterns and generates future weather predictions. The results should be displayed through a simple and user-friendly online interface. Graphs and charts can be used to represent weather trends clearly. The system should provide reliable performance while processing weather data and generating predictions. Overall, system analysis identifies the functional and technical requirements required to develop an effective weather prediction platform.

Existing System

In the existing system, weather information is generally obtained from weather stations, television reports, websites, mobile applications, and weather forecasting services. These systems collect weather observations from different sources and provide current conditions and forecast information to users. Traditional forecasting methods often depend on numerical weather prediction models and statistical analysis. Users generally receive predefined forecasts for selected locations rather than predictions generated specifically from a locally trained model. Weather forecasting requires processing large amounts of environmental and historical data. Rapid changes in atmospheric conditions can sometimes reduce prediction accuracy. Some basic systems provide limited visualization of historical weather trends. Users may also depend on external services for obtaining updated weather information. The availability and accuracy of forecasts can vary according to geographical location and data sources. Traditional systems may not provide sufficient tools for analyzing historical weather patterns. These limitations create a need for an intelligent and data-driven prediction approach. The proposed system aims to use machine learning techniques to analyze weather data and generate predictions through an online platform.

Disadvantages of Existing System

- Heavy dependence on external weather forecasting services.
- Prediction accuracy can vary between locations.
- Rapid weather changes can affect forecast accuracy.
- Limited customization for individual prediction requirements.
- Historical weather analysis may be limited.
- Large datasets require significant processing.
- Missing or incorrect weather data can affect predictions.
- Some systems provide limited visualization.
- Traditional methods can be computationally expensive.
- Long-term predictions may be less reliable.
- Limited integration of user-specific prediction requirements.
- Forecast information may not always be available for all locations.

Proposed System

The proposed Online Weather Prediction Model is an intelligent platform designed to analyze historical weather data and predict future weather conditions. The system allows users to select a location and obtain weather predictions through an online interface. Weather parameters such as temperature, humidity, pressure, wind speed, and rainfall are used as input features. Historical weather datasets are collected and preprocessed to remove missing, duplicate, and inconsistent values. Relevant features are selected and provided to a suitable machine learning algorithm for model training. The trained model learns patterns and relationships between different weather parameters. When new weather data is provided, the model generates predictions for the selected location. The system displays predicted temperature, rainfall, humidity, wind conditions, and general weather status. Graphs and charts can be used to present weather trends and prediction results clearly. The system can also compare predicted values with historical observations for better understanding. A modular architecture allows additional prediction algorithms and real-time data sources to be integrated. Overall, the proposed system provides a convenient and data-driven approach to online weather prediction.

Advantages of Proposed System

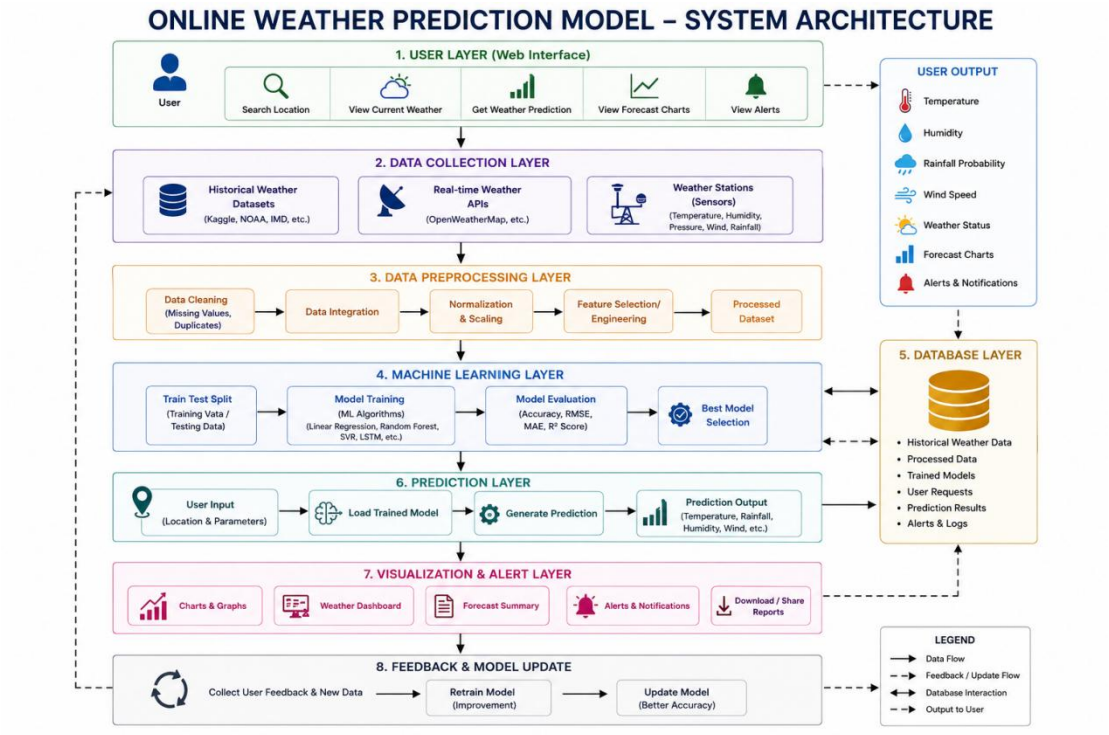
- Uses machine learning for weather prediction.
- Provides data-driven prediction results.
- Analyzes historical weather patterns.
- Provides an easy-to-use online interface.
- Supports multiple weather parameters.
- Can display predictions using graphs and charts.
- Reduces manual weather-data analysis.
- Can be integrated with real-time weather APIs.
- Can support different locations.
- Historical data can be continuously updated.
- The model can be improved with additional training data.
- Can be extended with weather alerts and notifications.

IV. Methodology

The methodology describes the systematic approach followed for developing the Online Weather Prediction Model. The process begins by identifying the weather parameters required for prediction. Historical weather data is collected from suitable datasets or weather data sources. The collected dataset is analyzed to understand the relationship between different weather parameters. Data preprocessing is then performed to handle missing values, duplicate records, outliers, and inconsistent data. Relevant features such as temperature, humidity, pressure, wind speed, and rainfall are selected for model training. The processed dataset is divided into training and testing datasets. Suitable machine learning algorithms are selected and trained using the historical weather data. The trained models are evaluated using appropriate performance measures to determine their prediction capability. The best-performing model is integrated into the online application. Users can select a location and provide or retrieve the required weather parameters. The prediction model processes the input and generates the expected weather conditions. Finally, the predicted results are displayed through the user interface using values, charts, and graphical representations.

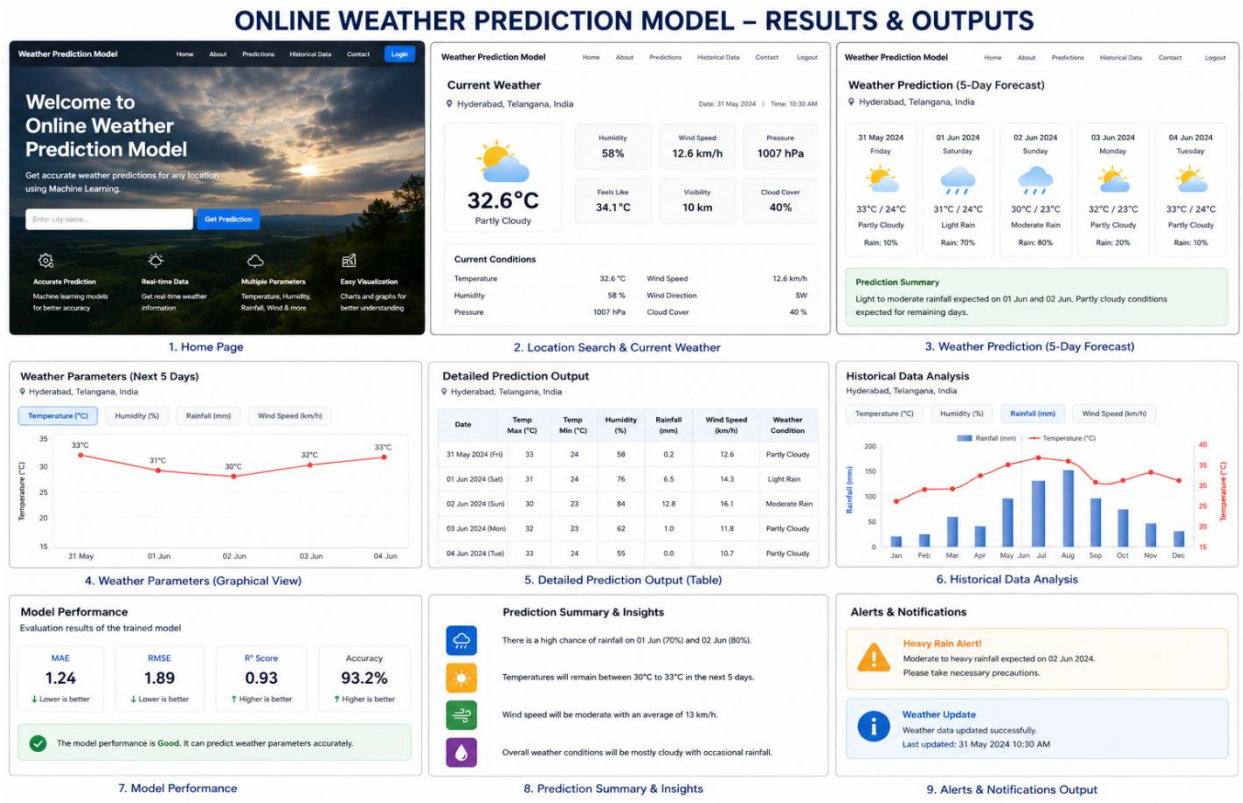
System Architecture

The system architecture defines the structure and interaction between the major components of the Online Weather Prediction Model. The proposed architecture consists of a user interface, data collection module, data preprocessing module, machine learning module, prediction module, database, and result visualization module. The user interface allows users to select a location and request weather predictions. The data collection module obtains historical weather data from datasets and can also connect to real-time weather APIs. The preprocessing module cleans the collected data and handles missing values, duplicates, and inconsistent records. The feature engineering module selects and prepares important weather parameters for prediction. The machine learning module trains and evaluates suitable prediction algorithms using historical data.



The trained model is stored and used by the prediction module to generate future weather conditions. The database stores historical weather records, model information, user requests, and prediction results when required. The visualization module presents predicted temperature, rainfall, humidity, wind speed, and other information using charts and tables. The system can provide alerts when significant weather conditions are predicted. The modular architecture makes the system easier to maintain, test, and extend. Overall, the architecture provides a structured foundation for developing an intelligent online weather prediction platform.

V. Result and Output



VI. Conclusion

The Online Weather Prediction Model successfully provides an efficient and user-friendly platform for predicting future weather conditions using historical and current weather data. The system analyzes important parameters such as temperature, humidity, rainfall, wind speed, and atmospheric pressure to generate weather predictions. Machine learning techniques help identify patterns in historical weather data and provide data-driven prediction results.

The system allows users to select a location and view current weather conditions, future forecasts, graphical representations, detailed prediction tables, and historical weather trends. The prediction results are presented in a simple and understandable format using charts, tables, and weather indicators. The system can also provide weather alerts and notifications when significant conditions such as heavy rainfall are predicted.

Overall, the proposed system reduces the effort required to analyze weather data manually and provides useful information for planning daily activities, agriculture, travel, and other weather-dependent operations. The system can be further improved by integrating real-time weather APIs, advanced deep learning models, satellite data, severe-weather detection, mobile notifications, and improved long-term forecasting. Thus, the Online Weather Prediction Model demonstrates the practical application of Machine Learning and data analysis in modern weather forecasting.

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