# Weather Prediction System

**AI Mini-Project report**


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# 1. ntroduction

The Weather Prediction System presented here is designed to forecast weather conditions based on observed environmental factors. Leveraging first-order logic (FOL) reasoning and a graphical user interface (GUI) built with tkinter, this system offers a user-friendly way to predict weather outcomes. By inputting observed conditions such as sky condition, wind speed, temperature, humidity, and barometric pressure, users can obtain predictions for various weather conditions, from sunny to stormy.

# 2. Problem Context

Weather prediction is vital for daily life, impacting everything from outdoor plans to safety during extreme weather. Traditional forecasting methods are complex and often inaccessible. The Weather Prediction System simplifies this by offering an easy-to-use interface. By converting observed conditions into logical rules and using forward-chaining inference, it democratizes forecasting, making it accessible to all, what empowers users to make informed decisions, improving planning and safety across various activities and events, from outdoor gatherings to travel plans.

# 3. Inference Engine

The inference engine of the Weather Prediction System plays a crucial role in predicting weather conditions based on observed environmental factors. It operates on a set of rules expressed in first-order logic (FOL) and employs the forward-chaining inference algorithm to make predictions.

## 3.1. Functionality

• Knowledge Base Initialization: The engine starts with an empty knowledge base (kb = FolKB()), to which it adds first-order logic clauses representing rules and facts about weather conditions.

• Rule Application: The engine iterates over observed environmental conditions provided by the user and updates the knowledge base accordingly.

• Inference Process: Using the fol_fc_ask function from the aima.logic library, the engine performs forward chaining inference to predict weather conditions based on the observed conditions.

• Result Interpretation: The engine processes the inference results to extract predicted weather conditions, which are then returned to the user for further analysis or display.

## 3.2. Importance:

- Automated Decision Making: The inference engine automates the analysis of observed conditions and infers weather outcomes, streamlining prediction for accurate forecasts

.- Scalability: Its modular design accommodates adding new rules and facts, enhancing flexibility and scalability.

- Reliability: Leveraging established AI and logic programming principles, the engine ensures consistent predictions, building user trust in its capabilities.

# 4. Explanation System:

The Weather Prediction System's explanation feature clarifies the reasoning behind forecasted weather conditions, linking observed environmental factors to predicted outcomes. It offers:

- **Detailed Explanations**: Providing insights into how each environmental factor affects weather predictions.

- **Inference Justification:** Accompanying forecast results with explanations for each observed condition's impact.

- **User Understanding**: Enhancing comprehension of how observed conditions lead to forecasted outcomes, aiding informed decision-making.

# 5. User Interface

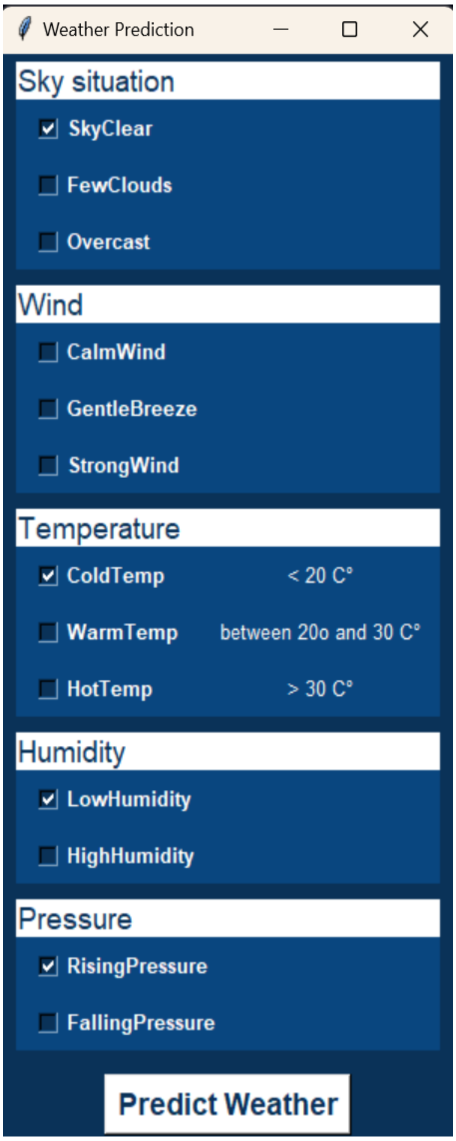
The user interface (UI) of the Weather Prediction System provides a user-friendly platform for inputting observed environmental conditions and viewing predicted weather outcomes and explanations. Implemented using the tkinter library, the UI enhances accessibility and usability, enabling users to interact with the system intuitively.

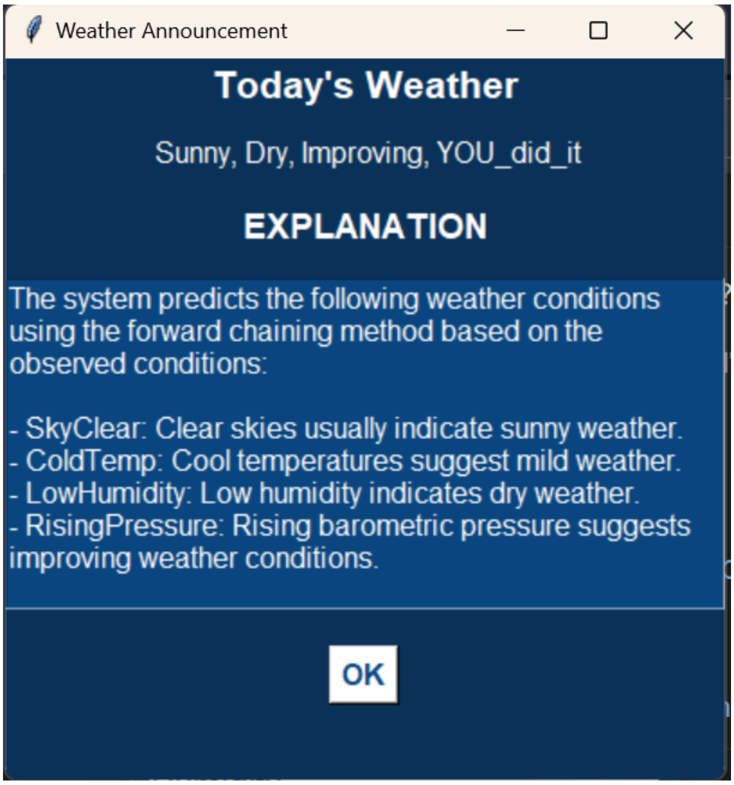
## 5.1. Functionality

• **Input Collection**: The UI collects observed environmental conditions from the user through checkboxes corresponding to various factors such as sky condition, wind speed, temperature, humidity, and barometric pressure.

• **Prediction Display**: Upon user input, the UI triggers the inference engine to predict weather conditions based on the observed factors. The predicted outcomes are displayed to the user forreview and analysis.

• **Explanatory Information**: The UI presents detailed explanations alongside predicted weather conditions, providing users with insights into the reasoning behind the predictions and the influe




### 5.2. Importance

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Overall, the Weather Prediction System's inference engine, explanation system, and user interface work synergistically to provide users with accurate weather forecasts and transparent insights into the prediction process, enhancing their ability to plan and adapt to changing weather conditions.

# 6. Working Memory:

Within the architecture of expert systems, the working memory serves as a dynamic repository of crucial data or facts actively utilized by the system to facilitate decision-making processes. In the context of this project, the observed_conditions list embodies the essence of working memory. It meticulously captures today4s weather conditions, including sky condition, wind, temperature, humidity, and pressure. These elements are continuously referenced and updated as the system navigates through its predictive tasks, ensuring that the most relevant information is readily available for informed decision-making.

# 7. Agenda

In expert systems, the agenda assumes a pivotal role as a strategic roadmap guiding the system's actions and priorities. As a prioritized task list, the agenda dictates the sequence in which tasks are addressed or goals are pursued, thereby directing the system's decision-making process. While the code of the project does not explicitly implement an agenda data structure, its functionality closely mirrors that of an agenda. Through sequential processing of observed conditions and subsequent weather prediction using forward chaining inference, the system effectively manages its tasks, ensuring a methodical and informed approach to weather prediction.

# 8. Conclusion

The weather prediction system, blending logic-based inference with user-friendly design, offers precise forecasts while enhancing accessibility. Its fusion of AI and intuitive interfaces empowers users plans. This interdisciplinary synergy underscores technology's role in fostering resilience and informed decision-making, paving the way for smarter solutions in an ever-changing world.

# 9. Bibliography


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