RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

25 years OF ACADEMIC EXCELLENCE

Department of Computer Science and Engineering

MENSTRUAL CYCLE PREDICTION USING MACHINE LEARNING

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Problem Statement and Motivation

The menstrual cycle is a vital indicator of reproductive health, yet many women face challenges in accurately predicting their cycle phases, leading to missed cycles, unexpected symptoms, and overlooked health concerns. Traditional tracking methods often fail to account for variability in cycle length, mood fluctuations, cramp intensity, and other influential factors. The Menstrual Cycle Prediction system leverages advanced algorithms like XGBoost and Streamlit to analyze comprehensive data such as average cycle length, period length, mood, cramp level, and BMI to predict upcoming menstrual cycles and provide insightful predictions for the next three months. By forecasting cycles, visualizing trends, and storing historical data, the system empowers women to better understand their reproductive health, proactively manage symptoms, and potentially detect early signs of health concerns.

Existing System

Current menstrual cycle tracking systems primarily rely on basic calendar-based tracking, focusing mainly on average cycle length without considering factors like mood fluctuations, cramp intensity, or luteal phase length. While some apps incorporate user-reported symptoms, they lack predictive algorithms that analyze multiple features such as BMI, peak days, and intensity scores. Most systems provide only single-cycle predictions and do not offer multi-month forecasts or trend visualizations, limiting their effectiveness for long-term health monitoring. Additionally, existing systems rarely store historical data in a structured format, preventing comprehensive trend analysis and early anomaly detection, thereby restricting deeper reproductive health insights for users.

Objectives

- Develop a menstrual cycle prediction system using XGBoost to forecast the next menstrual cycle and upcoming cycles for the next three months.
- Implement a user-friendly interface using Streamlit for inputting features such as average cycle length, period length, mood, cramp level, BMI, and more.
- Analyze historical data to identify patterns in cycle length, mood fluctuations, and cramp intensity.
- Provide personalized health insights based on user-specific data to predict potential irregularities or cycle anomalies.
- Store prediction history for easy access and analysis.
- Visualize trends for cycle patterns, mood, and cramp intensity.

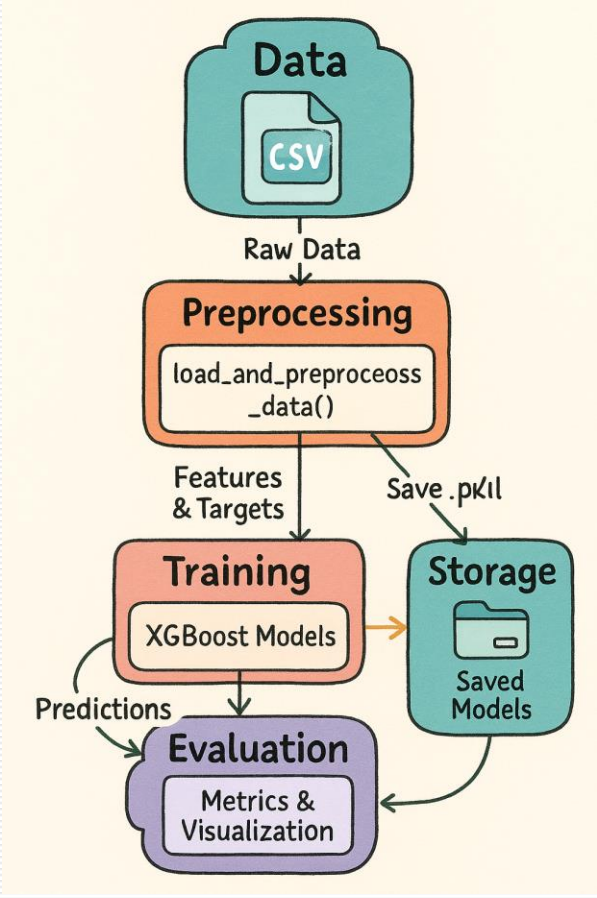
Abstract

The Menstrual Cycle Prediction system leverages advanced machine learning to forecast menstrual cycles based on key input features such as cycle length, period duration, mood, cramp intensity, BMI, and age. Implemented using XGBoost and Streamlit, the system predicts the next cycle and upcoming cycles for three months, providing personalized health insights, early anomaly detection, and data-driven recommendations. By analyzing historical data, the system identifies patterns in cycle fluctuations, mood variations, and cramp levels, presenting users with visual trend analysis. Additionally, prediction history is securely stored for comprehensive monitoring, enabling users to track changes over time effectively. This data-driven approach not only enhances cycle tracking accuracy but also promotes proactive reproductive health management through timely notifications, predictive analytics, and trend visualization.

Proposed System

The proposed Menstrual Cycle Prediction system utilizes XGBoost to predict upcoming menstrual cycles based on comprehensive input data, including cycle length, period duration, mood, cramp intensity, BMI, and age. Implemented using Streamlit, the system provides a user-friendly interface for data entry and visual trend analysis. It forecasts the next cycle and subsequent cycles for three months while storing prediction history for long-term monitoring. By analyzing historical data, the system identifies patterns in cycle variability, mood changes, and cramp severity, offering personalized health insights and early anomaly detection. Additionally, it presents visual graphs for trend analysis, enabling users to better understand their reproductive health and manage symptoms proactively through data-driven insights and timely notifications.

System Architecture



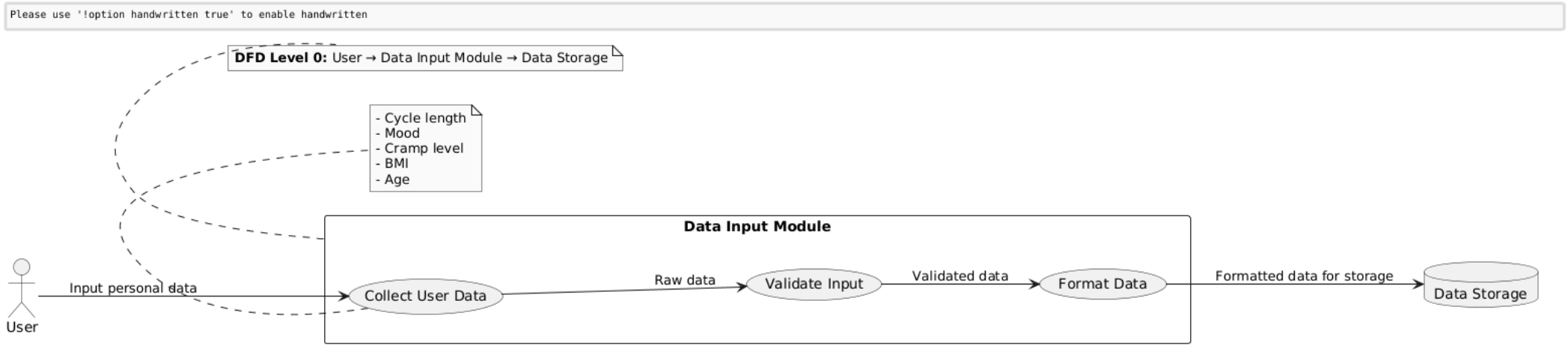
List of Modules

- **Data Input Module:** Collects user data (cycle length, mood, cramp level, BMI, age).
- **Data Preprocessing:** Cleans and prepares data for model training.
- **Prediction Module:** Predicts upcoming cycles using XGBoost.
- **Trend Analysis:** Visualizes cycle patterns and mood trends.
- **History Module:** Stores prediction data for monitoring.
- **User Interface:** Streamlit-based interface for data input and results display.

Functional Description for each modules with DFD and Activity Diagram

1) Data Input Module

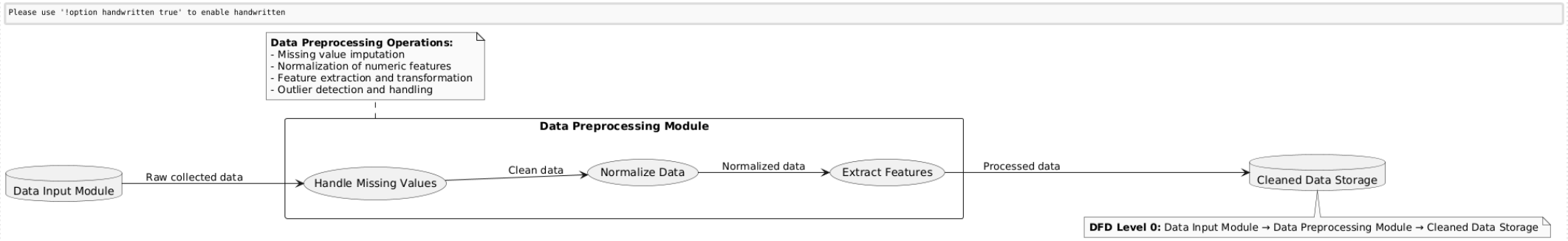
- **Function:** Collects user data including cycle length, mood, cramp level, BMI, and age. Data is entered through the Streamlit interface and stored for further processing.



Functional Description for each modules with DFD and Activity Diagram

2) Data Preprocessing Module

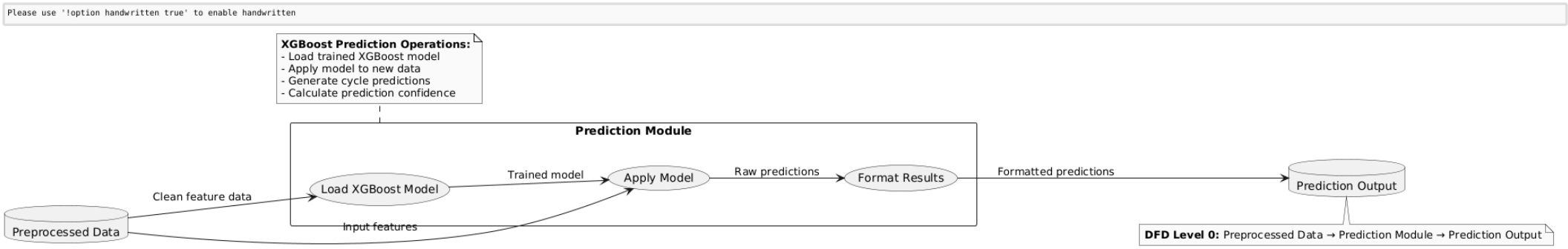
- **Function:** Cleans and processes the collected data for model training and prediction. Handles missing values, normalization, and feature extraction.



Functional Description for each modules with DFD and Activity Diagram

3) Prediction Module

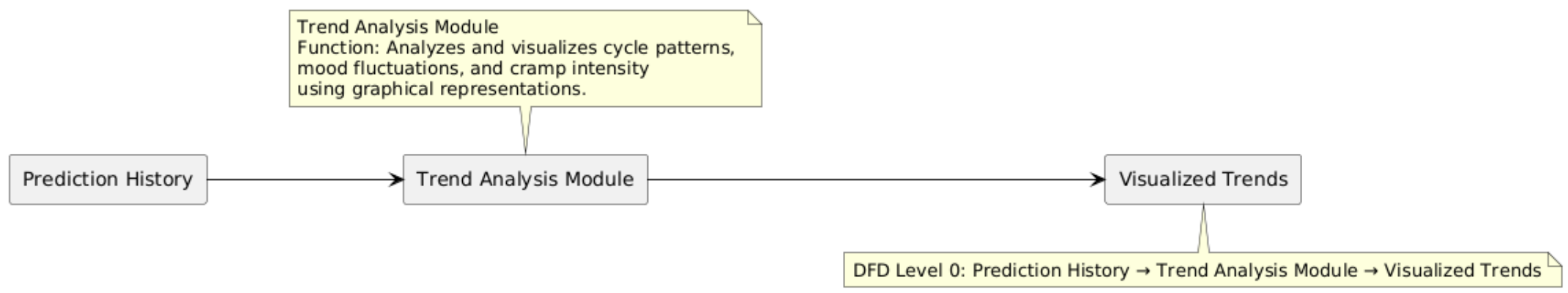
- **Function:** Implements the XGBoost algorithm to predict upcoming menstrual cycles based on processed data.



Functional Description for each modules with DFD and Activity Diagram

4) Trend Analysis Module

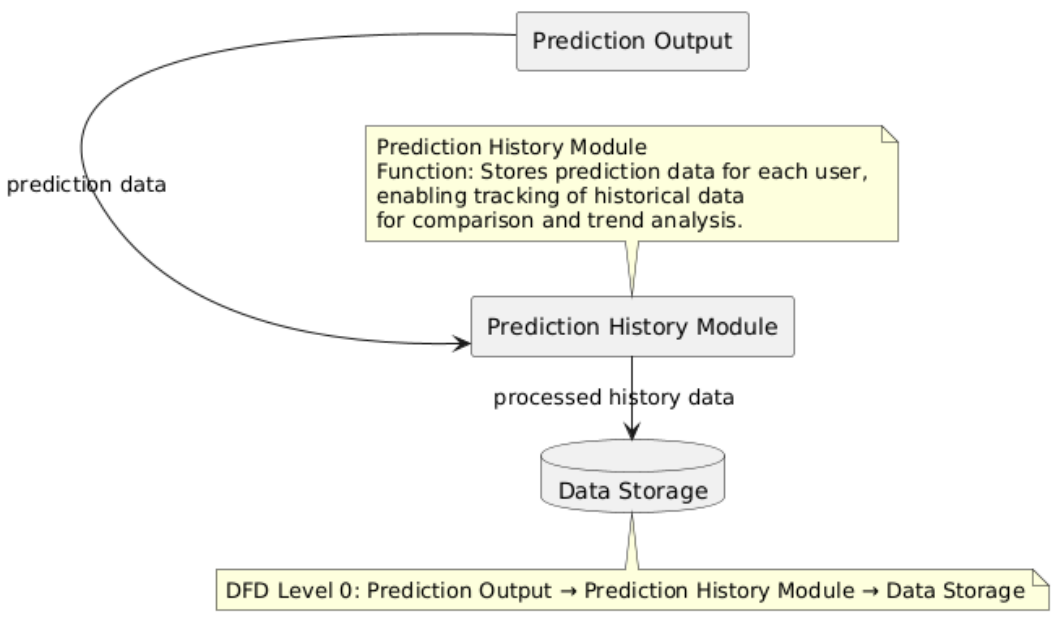
- **Function:** Analyzes and visualizes cycle patterns, mood fluctuations, and cramp intensity using graphical representations.



Functional Description for each modules with DFD and Activity Diagram

5) Prediction History Module

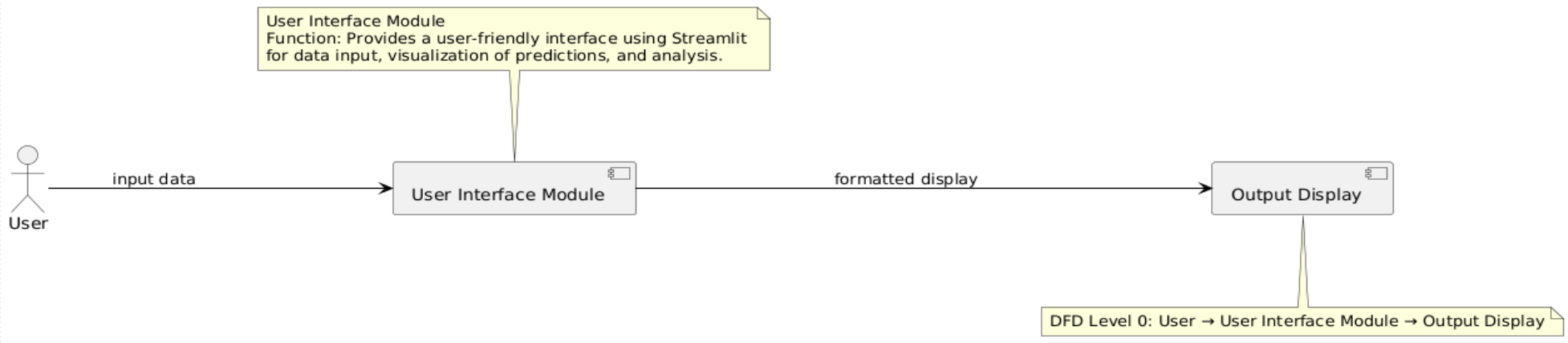
- **Function:** Stores prediction data for each user, enabling tracking of historical data for comparison and trend analysis.



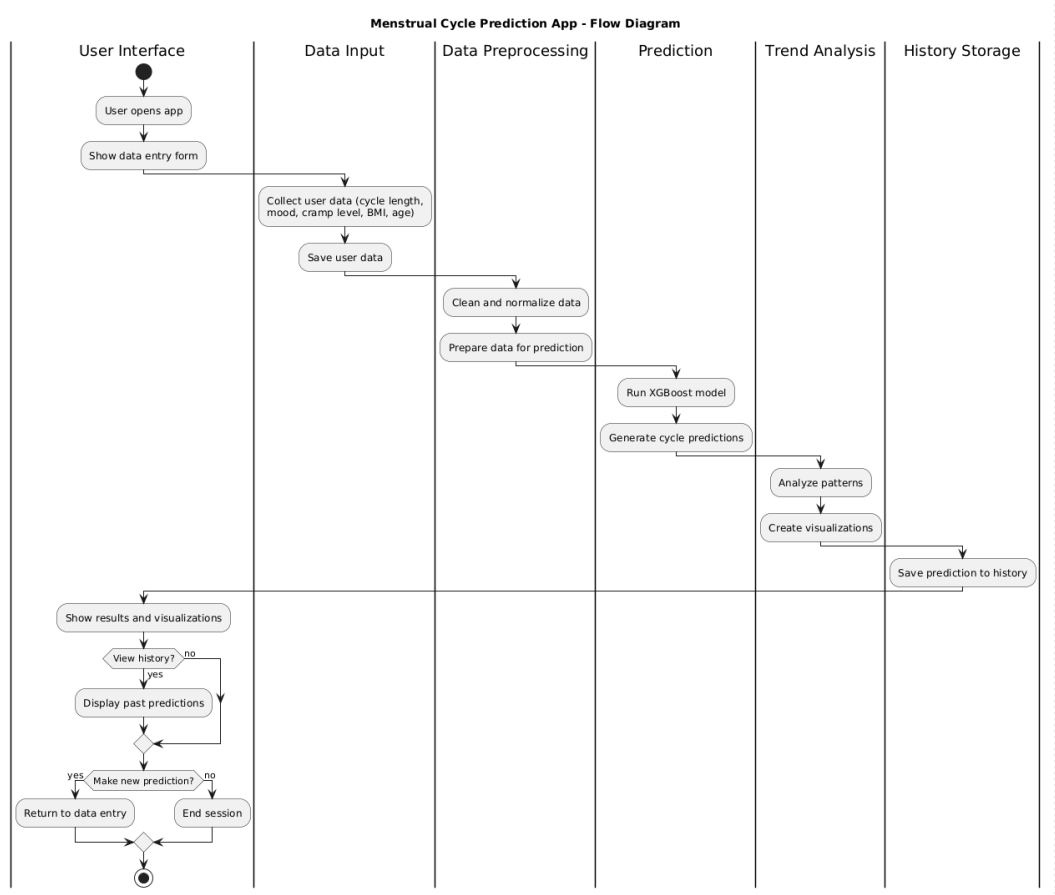
Functional Description for each modules with DFD and Activity Diagram

6) User Interface Module

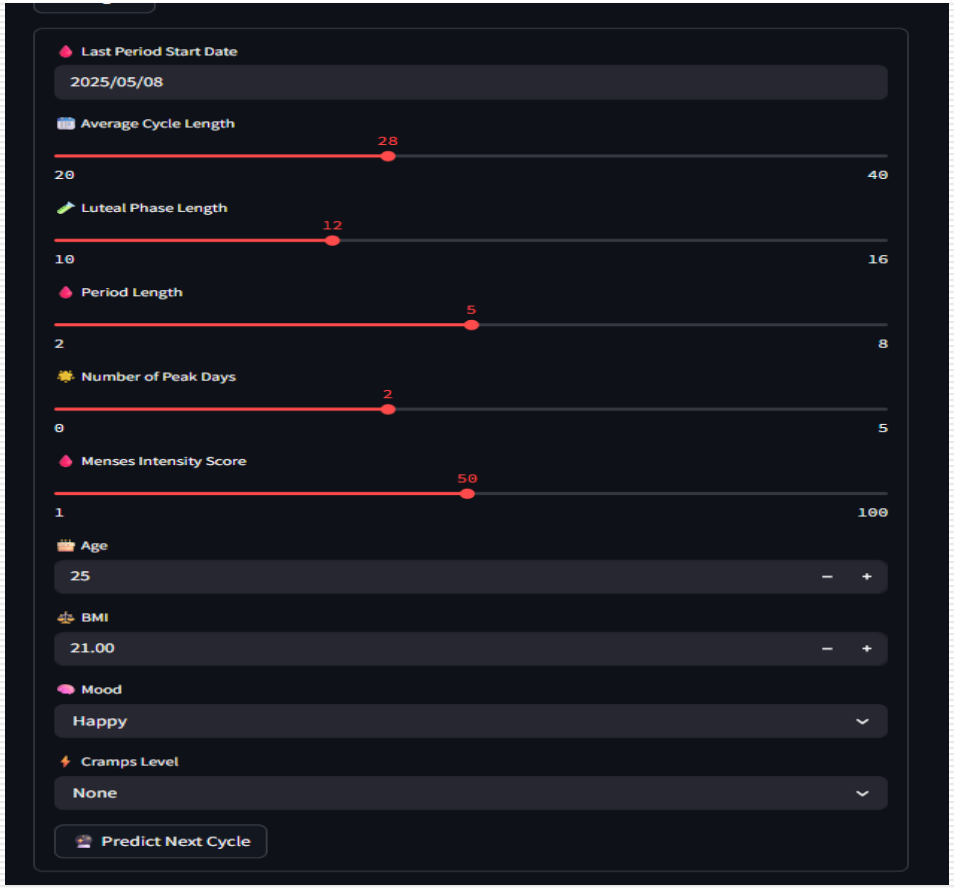
- **Function:** Provides a user-friendly interface using Streamlit for data input, visualization of predictions, and analysis.

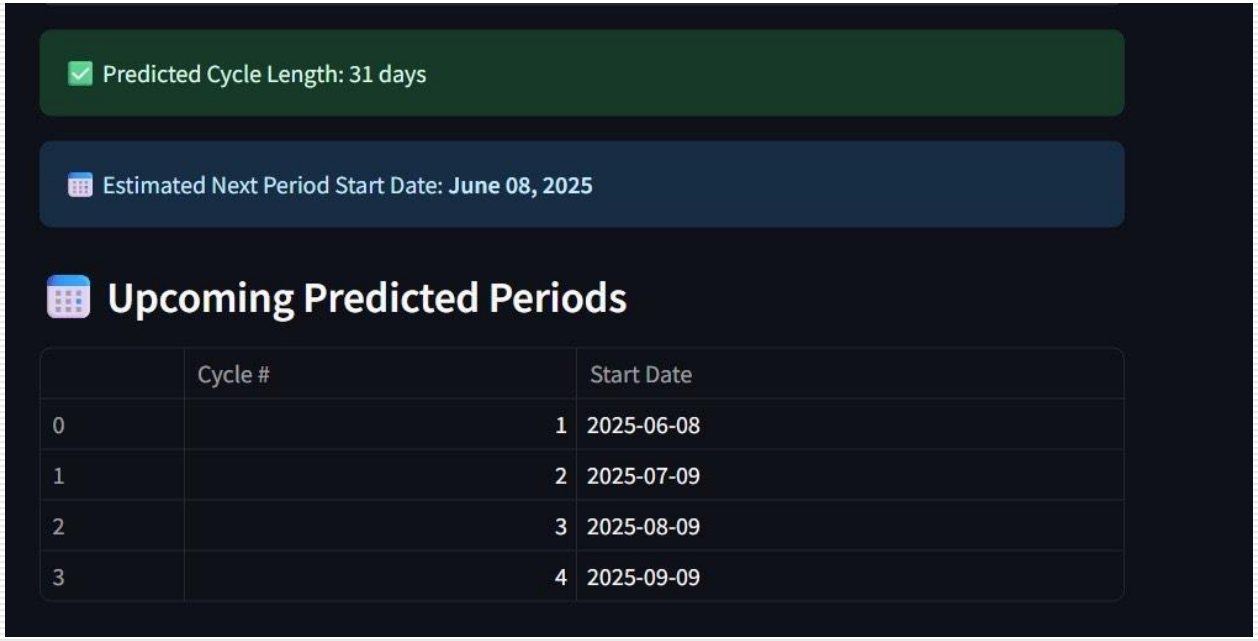


Activity Diagram

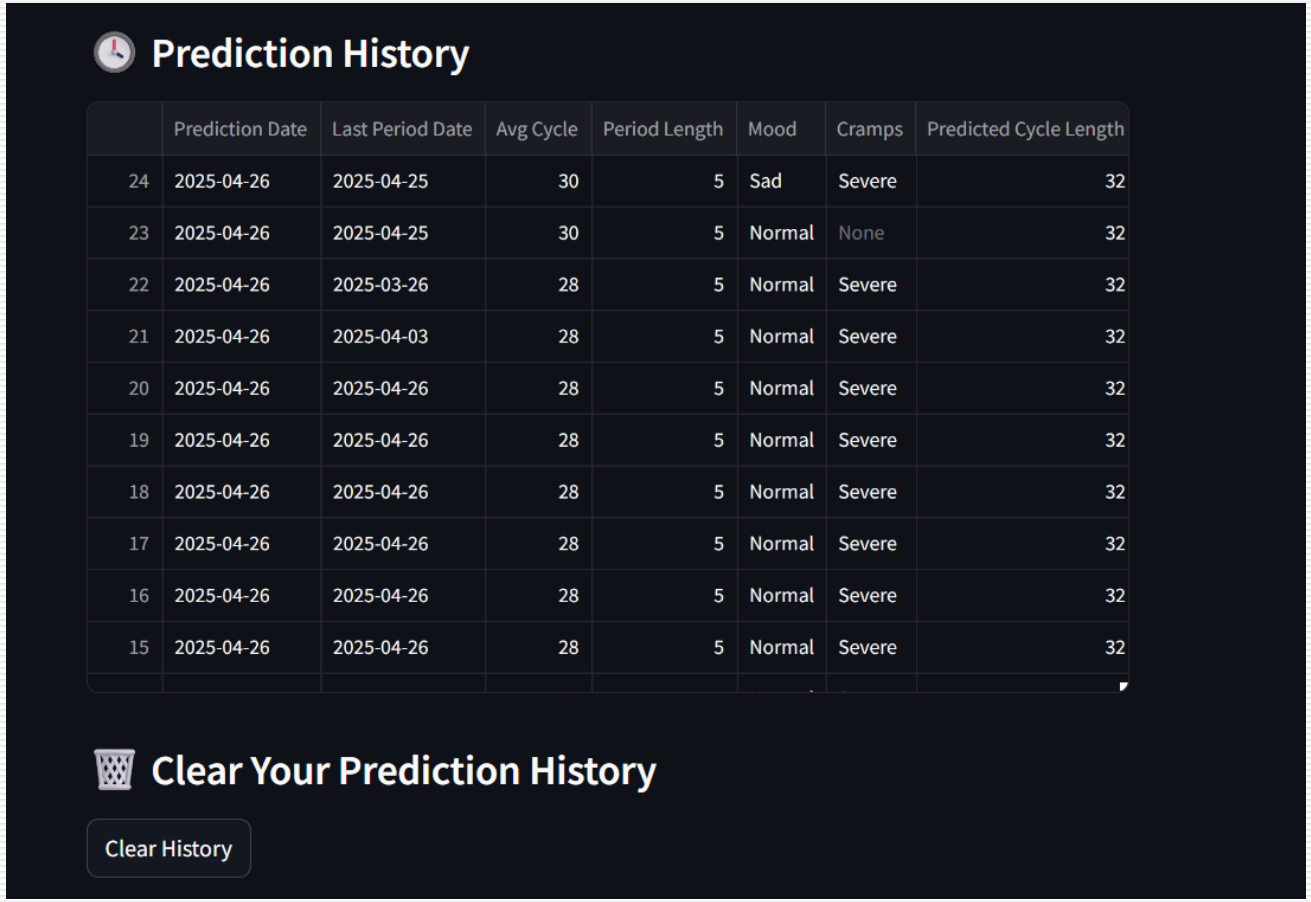


Implementation & Results of Module

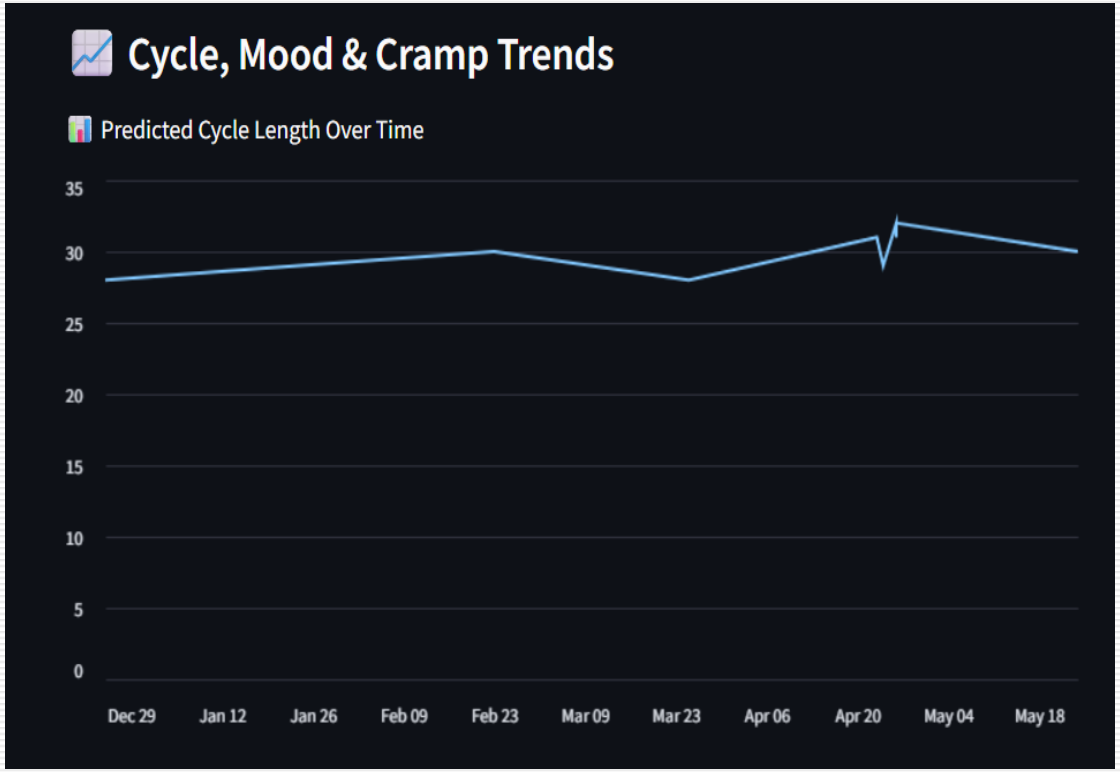


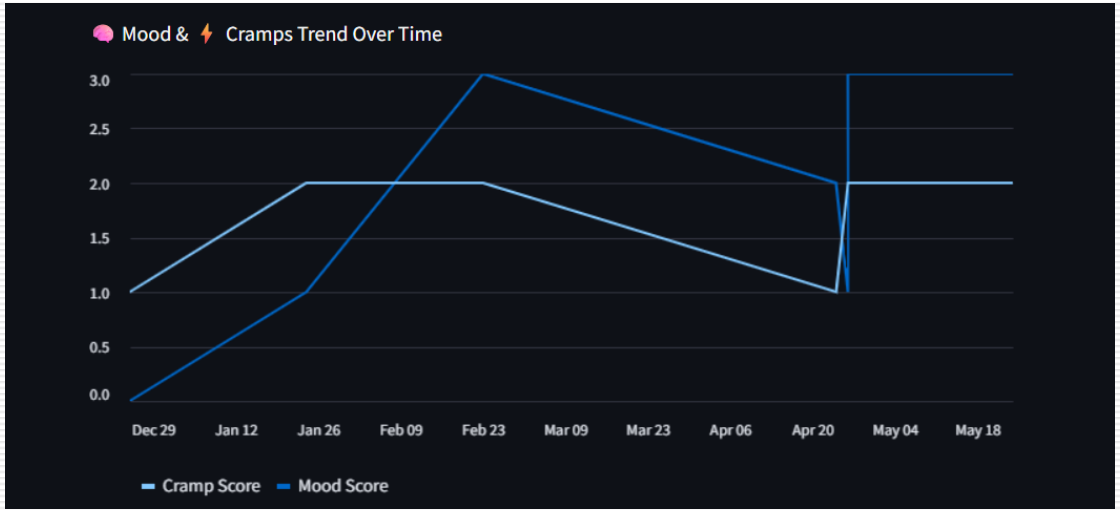


Implementation & Results of Module



Implementation & Results of Module





Conclusion & Future Work

The Menstrual Cycle Prediction system leverages XGBoost to accurately predict menstrual cycles based on user inputs such as cycle length, mood, cramp level, BMI, and age, providing forecasts for the next three months. The Streamlit interface enables intuitive data input, visualization, and trend analysis, aiding in proactive reproductive health management. By storing prediction history, the system helps users track cycle patterns over time, facilitating personalized health insights. Future work will focus on integrating real-time data from wearable devices, implementing sentiment analysis for mood and cramp tracking, and expanding the dataset to enhance prediction accuracy using advanced algorithms like LSTM, ultimately improving the system's predictive capabilities and user experience.

References

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- Zhang, Y., & Li, X. (2021). **Cycle Prediction and Health Monitoring Using XGBoost and Time-Series Analysis.** Journal of Computational Biology, 27(4), 389-397.
- Patel, M., & Singh, P. (2023). **Predictive Analytics for Menstrual Cycle Tracking Using Machine Learning Algorithms.** International Journal of Biomedical Data Science, 12(2), 134-142.

Thank You