ACE ENGINEERING COLLEGE

An Autonomous Institution

Predict the impact of climate change on Agriculture and Sea level

GUIDE :

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ABSTRACT

- Climate change poses significant risks to agriculture and coastal regions worldwide, particularly in countries like India. This project aims to predict the impact of climate change on agriculture and sea levels in India from 1970 to 2050 using machine learning techniques. By leveraging historical climate data, the project forecasts average temperature, average rainfall, crop yields, and sea level rise for selected year within this range.

- The predictive model employs linear regression algorithms to analyze climate patterns and their effects on agricultural output. Key factors considered in the model include historical temperature records, rainfall data, and crop production statistics. The predictions are intended to assist farmers, policymakers, and coastal communities in planning and adapting to the anticipated changes.

- A web-based interface facilitates user interaction, allowing users to select a year and receive detailed predictions. This interface is developed using Flask for the backend and HTML, CSS, and JavaScript for the frontend, ensuring an intuitive and responsive user experience. The results include graphical visualizations of crop yields providing clear and actionable insights.

Introduction

- Climate change is a critical global issue with far-reaching effects on the environment, economy, and human life. In countries like India, which has a diverse climate and extensive coastline, the impacts of climate change are particularly pronounced. Agriculture, a cornerstone of India's economy, is highly sensitive to climatic variations, with changes in temperature and rainfall patterns directly affecting crop yields. Additionally, rising sea levels pose significant threats to coastal regions, potentially leading to flooding, loss of land, and displacement of communities.

- This project aims to analyze and predict the impact of climate change on agriculture and sea levels in India from 1970 to 2050. By using historical climate data and machine learning algorithms, the project provides insights into future trends in temperature, rainfall, crop yields, and sea level rise. This information is crucial for farmers, policymakers, and coastal communities to develop strategies for adaptation and mitigation.

Proposed System

Working:

The proposed system aims to predict the impact of climate change on agriculture and sea levels in India using a linear regression model. The system will provide a web interface developed using Flask, which allows users to input a year. The system predict the average temperature, average rainfall, crop yield, and rise in sea level in user mentioned year. The crop yield predictions are visualized in the graphical views.

Advantages

- **User-Friendly Interface:** The use of Flask and front-end technologies ensures that the system is accessible and easy to use for a wide audience, including farmers, policymakers, and researchers.
- **Cost-Effective:** Using linear regression and a web-based interface helps in keeping the system cost-effective and resource-efficient compared to more complex climate models.
- **Security Alerts:** The system will offer security alerts based on predicted data to aid in necessary measures and precautionary actions.
- **Public Awareness and Engagement:** Raises awareness about climate change impacts through accessible and understandable predictions and visualizations.

Hardware Requirements

CPU: A multi-core processor with sufficient computational power to handle large datasets and perform model training efficiently. Recommended specifications include at least an Intel i5 or AMD Ryzen 5 processor.

RAM: At least 4GB of RAM, this is particularly important for running machine learning algorithms and handling complex climate data.

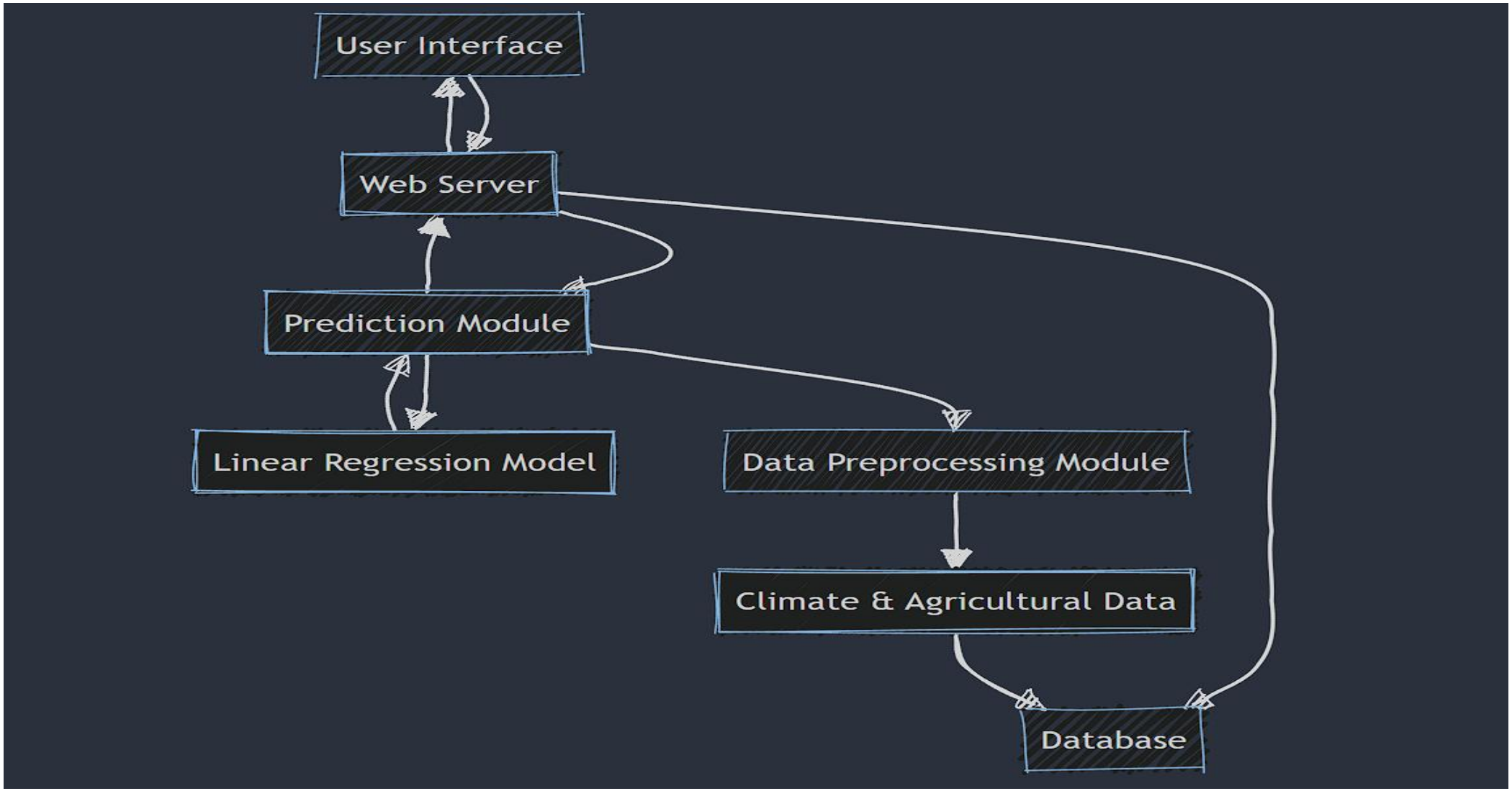
Storage:

- **Hard Drive:** A fast and reliable storage device with sufficient capacity (at least 500GB) to store historical climate data, feature sets, and trained models.
- **SSD:** SSDs are recommended for faster data retrieval and processing speeds, especially during real-time prediction and data visualization.

Software Requirements

- Operating System:
  Compatible with Windows, macOS, or Linux.
- Python Environment:
  Python 3.6 or later.
- Machine Learning Libraries:
  - scikit-learn
- Data Manipulation Libraries:
  - Pandas
  - NumPy
- Visualization Libraries:
  - Matplotlib
  - Chart.js
- Web Development Frameworks:
  - Flask
  - HTML/CSS/JavaScript
  - Bootstrap

Architectural Design



Screenshots

[681]:
```
X = sea[['Year']]
y = sea[['Sea Level']]
X_train, X_test, y_train, y_test = train_test_split(X, y, train_size=0.9, random_state=42, shuffle=True)
```

[682]:
```
SeaLevelPredictor = LinearRegression()
SeaLevelPredictor.fit(X_train,y_train)
```

[682]:
```
LinearRegression
LinearRegression()
```

[683]:
```
y_pred = SeaLevelPredictor.predict(X_test)
mse = mean_squared_error(y_test,y_pred)
rmse = np.sqrt(mse)
print(f" mae : {mean_absolute_error(y_test,y_pred)}\n rmse : {rmse}\nscore : {r2_score(y_test,y_pred)}")
```

```
 mae : 0.4897515488004123
 rmse : 0.602952372510386
score : 0.947944238304654
```

[684]:
```
mse = mean_squared_error(y_test,y_pred)
rmse =  np.sqrt(mse)
rmse
```

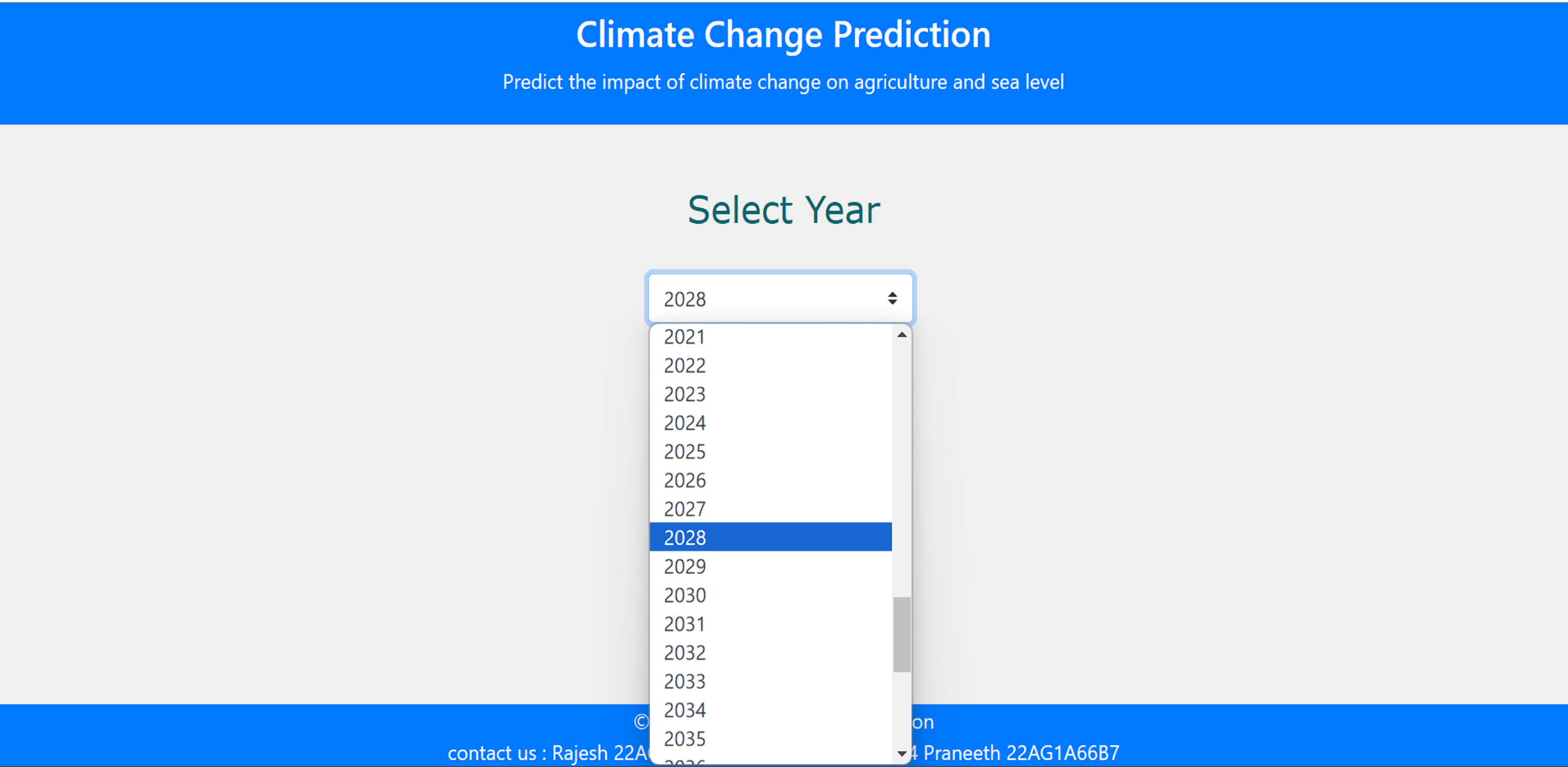
[684]:
```
0.602952372510386
```

[685]:
```
res = SeaLevelPredictor.predict([[2015],[2025],[2035],[2056]])
res
```

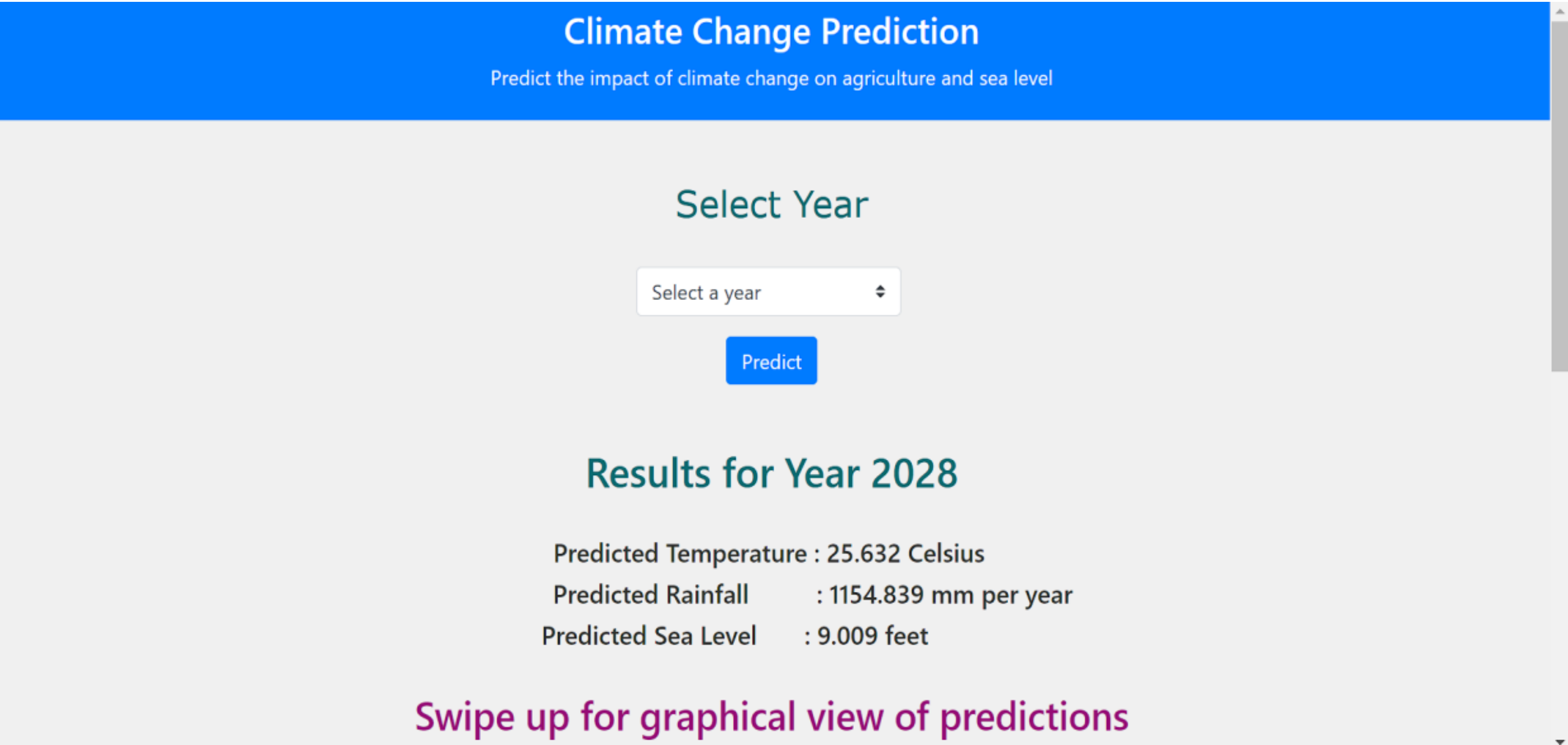
```
C:\Users\mail2\anaconda3\Lib\site-packages\sklearn\base.py:493: UserWarning: X does not have valid feature names, but LinearRegression was fitted with f
eature names
  warnings.warn(
```

[685]:
```
array([[ 8.1624786 ],
       [ 8.81432265],
       [ 9.46616669],
       [10.8350391911])
```

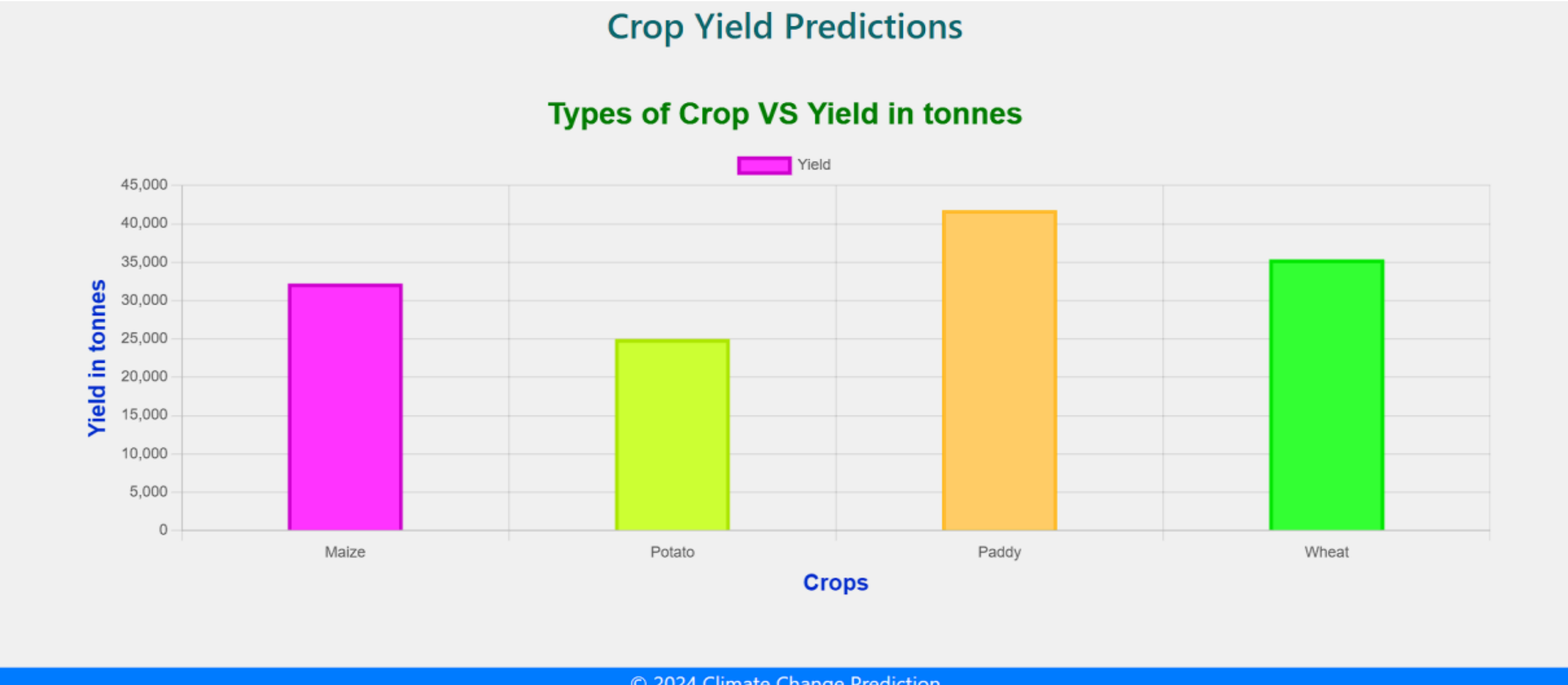
Screenshots



Screenshots



Screenshots



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Conclusion

In this project, we developed a comprehensive system to predict the impact of climate change on agriculture and sea levels in India using linear regression. The system integrates data preprocessing, model training, and real-time prediction capabilities, all accessible through a user-friendly web interface. By leveraging historical climate and agricultural data, the model provides valuable insights that can aid in planning and decision-making for farmers, policymakers, and stakeholders. The implementation showcases the potential of machine learning in addressing critical environmental challenges, contributing to enhanced food security and economic stability in the face of climate change.