

CLIMATE CHANGE PREDICTION MODEL

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APPENDICES:

Appendix A: Code

Python Code

```
import pandas as pd
import numpy as np
from sklearn.ensemble import RandomForestRegressor
from sklearn.model_selection import train_test_split

# Load data
data = pd.read_csv('climate_data.csv')

# Preprocess data
X = data.drop(['temperature'], axis=1)
y = data['temperature']

# Split data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,
random_state=42)
```

```
# Train random forest model
```

```
model = RandomForestRegressor(n_estimators=100, random_state=42)
```

```
model.fit(X_train, y_train)
```

```
# Make predictions
```

```
y_pred = model.predict(X_test)
```

MATHEMATICAL DERIVATIONS:

The climate change prediction model is based on the following mathematical derivations:

- The temperature prediction model is based on the following equation:

$$T(t) = \beta_0 + \beta_1 * CO_2(t) + \beta_2 * CH_4(t) + \varepsilon(t)$$

where $T(t)$ is the temperature at time t , $CO_2(t)$ is the CO_2 concentration at time t , $CH_4(t)$ is the CH_4 concentration at time t , β_0 , β_1 , and β_2 are coefficients, and $\varepsilon(t)$ is the error term.

- The CO_2 concentration prediction model is based on the following equation:

$$CO_2(t) = \alpha_0 + \alpha_1 * T(t) + \alpha_2 * CH_4(t) + \eta(t)$$

where $CO_2(t)$ is the CO_2 concentration at time t , $T(t)$ is the temperature at time t , $CH_4(t)$ is the CH_4 concentration at time t , α_0 , α_1 , and α_2 are coefficients, and $\eta(t)$ is the error term.

Appendix B: Data Tables

Climate Data

Year	Temperature (°C)	CO2 Concentration (ppm)	CH4 Concentration (ppb)
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1900	13.5	295	850
1910	13.7	300	870
1920	14.0	310	900
...
2020	15.5	415	1870

Model Performance Metrics

Metric	Value
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Mean Absolute Error (MAE)	0.85°C
Mean Squared Error (MSE)	1.23°C
Coefficient of Determination (R-squared)	0.92
Root Mean Squared Error (RMSE)	1.11°C

Appendix C: Figures and Plots

Temperature Prediction Plot

A plot of the predicted temperature values against the actual temperature values.

CO2 Concentration Prediction Plot

A plot of the predicted CO2 concentration values against the actual CO2 concentration values.

Model Performance Plot

A plot of the model's performance metrics, including MAE, MSE, R-squared, and RMSE.

GITHUB LINK:

<https://github.com/astvu35535522u18105/CLIMATE-CHANGE-PREDICTION-MODEL>