WEATHER FORECAST PREDICITON

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Guided by:
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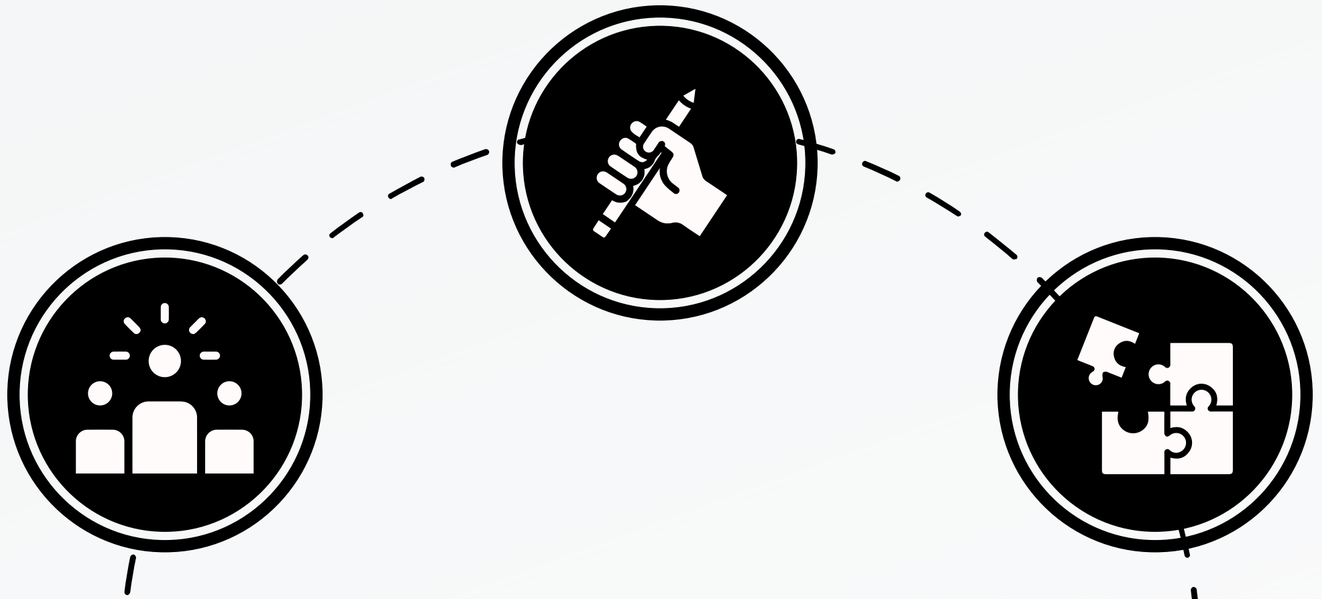
INTRODUCTION

Distinguished Professors, esteemed faculties, and fellow enthusiasts, welcome to our presentation delving into the convergence of cutting-edge technology and meteorology: "**Weather Forecast Prediction Using Machine Learning Approach.**" In the next few minutes, we will embark on a journey to explore how the fusion of machine learning and meteorology is reshaping the landscape of weather prediction, revolutionizing accuracy, and offering unparalleled insights into atmospheric dynamics

ABSTRACT

- Our project focuses on harnessing the power of machine learning to enhance weather forecasting accuracy.
- We aim to demonstrate how predictive models, coupled with comprehensive data analysis, can lead to more precise and reliable weather predictions.
- By implementing advanced algorithms and techniques, we strive to improve the lives of individuals, industries, and societies that rely on accurate weather forecasts.



LITERATURE REVIEW

Weather forecasting has become increasingly vital in recent times, as it plays a pivotal role in saving time, resources, and even lives. While India boasts numerous weather stations, they are primarily concentrated in densely populated areas like cities and suburbs, leaving remote regions with less precise forecasts. This can pose challenges, especially for professionals like farmers who heavily rely on weather predictions for their daily activities.

In this study, we employ a diverse set of machine learning techniques, encompassing both classification and regression methods, to predict weather patterns. We analyze various meteorological features, including temperature, apparent temperature, humidity, wind speed, wind bearing, visibility, and cloud cover. Our ensemble of machine learning methods comprises Random Forest, Decision Tree, MLP classifier, Linear Regression, and Gaussian Naive Bayes. Through extensive experimentation and analysis, we present our findings and insights derived from these methodologies.

CHALLENGES TO ADDDRESS

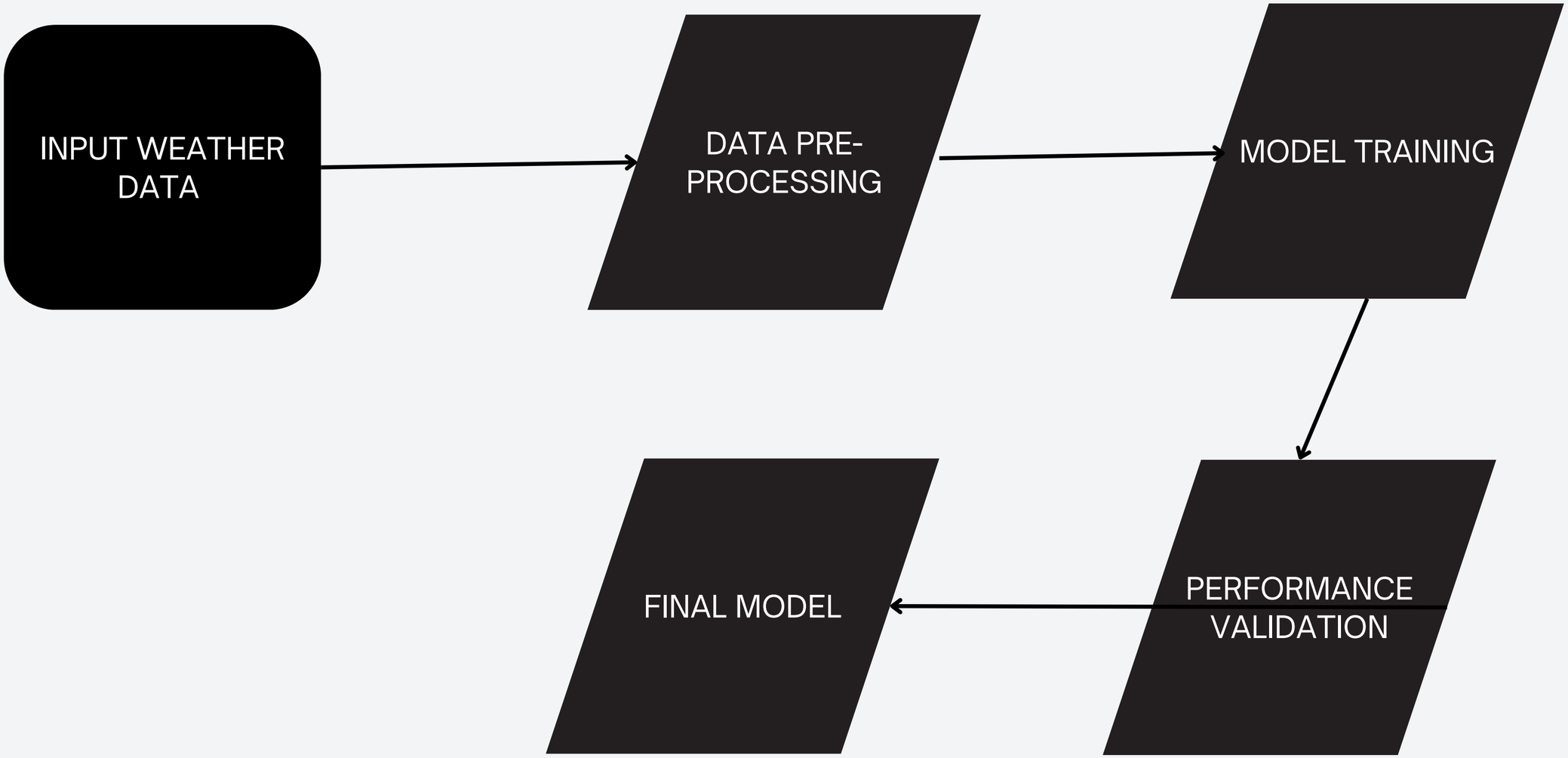
- **Data Availability and Quality:** Obtaining access to high-quality and comprehensive weather data can be difficult, especially for historical and real-time data.
- **Complexity of Weather Phenomena:** Weather patterns are complex, with numerous variables and interactions that can be challenging for beginners to model accurately.
- **Model Selection and Tuning:** Choosing the right machine learning algorithm and tuning hyperparameters for optimal performance can be challenging, especially without prior experience.
- **Computational Resources:**Training machine learning models, especially deep learning models, can require substantial computational resources.

PROBLEM STATEMENT AND OBJECTIVE

Predict tomorrow's maximum temperature for a specific location using historical weather data, with the goal of developing a simple machine learning model for daily temperature forecasts, evaluated primarily using Mean Absolute Error.

Develop and deploy a machine learning-based weather prediction system that provides accurate and reliable forecasts for various meteorological parameters, such as temperature, precipitation, wind speed, and humidity, to assist individuals and organizations.

BLOCK DIAGRAM



MODULES

01 DATA COLLECTION AND RETRIEVAL MODULE

02 DATA PREPROCESSING MODULE

03 MACHINE LEARNING MODEL TRAINING MODULE

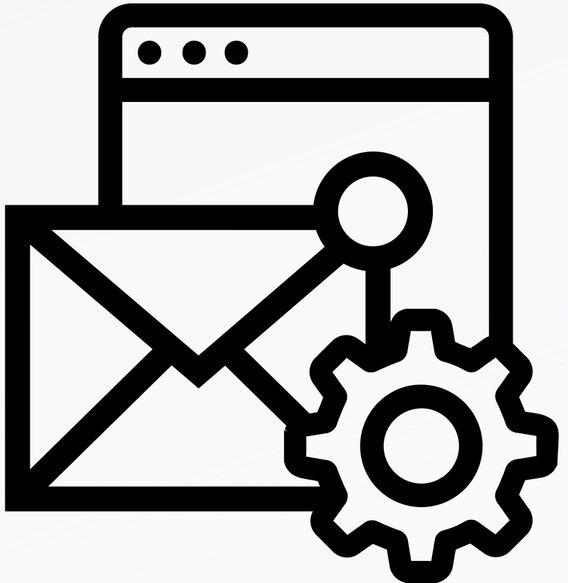
04 VISUALIZATION AND REPORTING MODULE

DATA COLLECTION AND RETRIVAL MODULE

- This module is responsible for collecting weather-related data from various sources, including meteorological stations, satellites, weather APIs, or historical weather databases.
- It may involve data scraping, data acquisition from sensors, or interfacing with weather data providers.

DATA PRE-PROCESSING MODULE

- This module focuses on cleaning, transforming, and preparing the collected data for analysis.
- Tasks may include data cleaning (handling missing values, outliers), data normalization, feature engineering (extracting relevant features), and data augmentation (if needed).



MACHINE LEARNING MODEL TRAINING MODULE

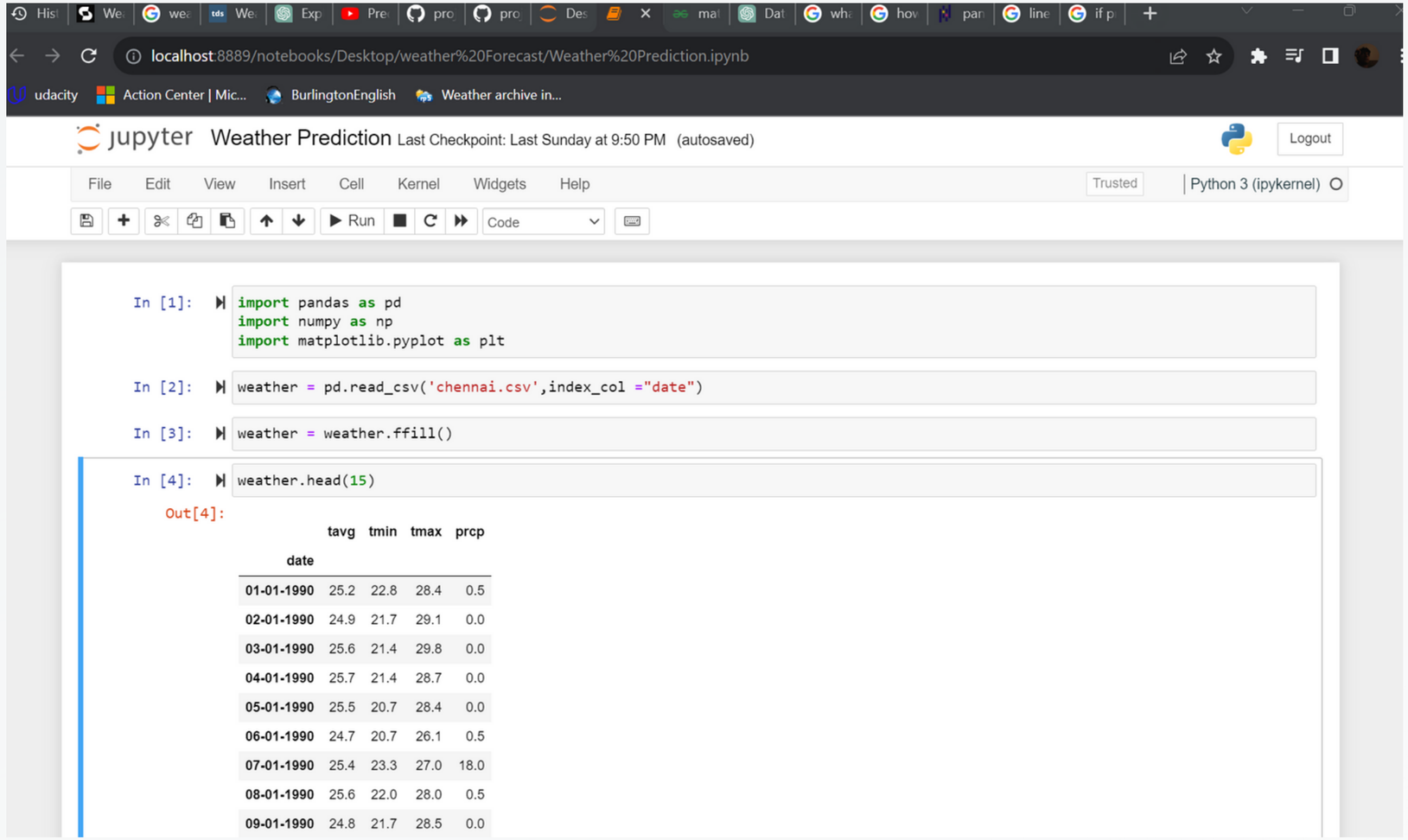
LARANA, INC.

- *This is the core module where you train machine learning models using historical weather data.*
- *You can experiment with various algorithms (e.g., regression, decision trees, neural networks) and tune hyperparameters for optimal performance.*

VISUALIZATION AND REPORTING MODULE

- This module generates visualizations and reports to communicate the model's predictions and performance to stakeholders or end-users.
- Common visualizations include time series plots, weather maps, and prediction confidence intervals.

IMPLEMENTATION



date	tavg	tmin	tmax	prcp
01-01-1990	25.2	22.8	28.4	0.5
02-01-1990	24.9	21.7	29.1	0.0
03-01-1990	25.6	21.4	29.8	0.0
04-01-1990	25.7	21.4	28.7	0.0
05-01-1990	25.5	20.7	28.4	0.0
06-01-1990	24.7	20.7	26.1	0.5
07-01-1990	25.4	23.3	27.0	18.0
08-01-1990	25.6	22.0	28.0	0.5
09-01-1990	24.8	21.7	28.5	0.0

IMPLEMENTATION

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Run Code

In [9]:
```
weather.index.year.value_counts().sort_index()
```

Out[9]:

1990	365
1991	365
1992	366
1993	365
1994	365
1995	365
1996	366
1997	365
1998	365
1999	365
2000	366
2001	365
2002	365
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2012	366
2013	365
2014	365
2015	365
2016	366
2017	365

IMPLEMENTATION

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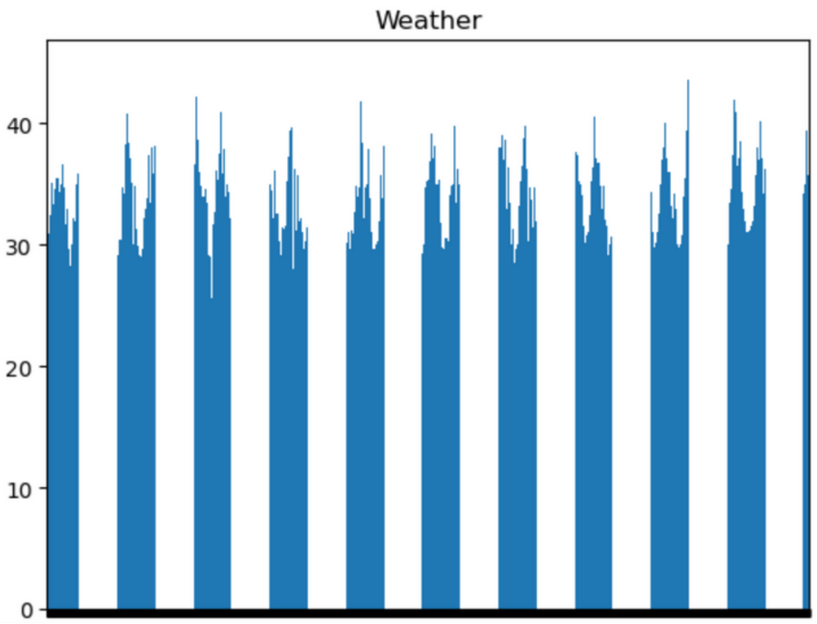
Run Code

```
2022    206
Name: date, dtype: int64
```

In [10]:
```
weather['tmax'].plot(kind="bar",title="Weather")
```

Out[10]: <Axes: title={'center': 'Weather'}, xlabel='date'>



IMPLEMENTATION

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Run Code

date

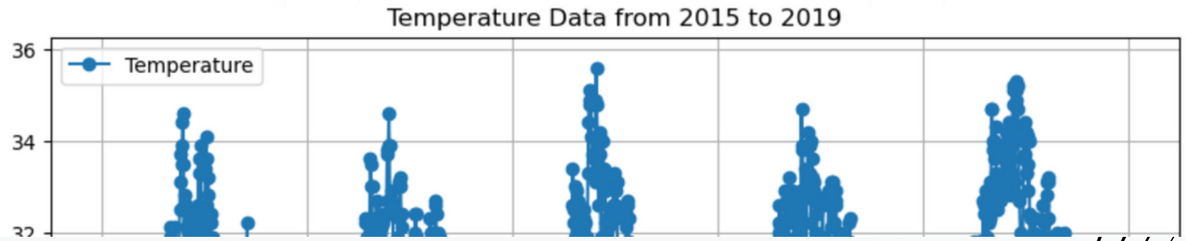
In [12]:

```
# Filter the DataFrame to include only data from 2015 to 2020
start_year = 2015
end_year = 2019
filtered_df = weather[(weather.index.year >= start_year) & (weather.index.year <= end_year)]

# Create a line plot of the temperature data
plt.figure(figsize=(10, 6))
plt.plot(filtered_df.index, filtered_df['tavg'], label='Temperature', marker='o', linestyle='-')

# Customize the plot
plt.title(f'Temperature Data from {start_year} to {end_year}')
plt.xlabel('Date')
plt.ylabel('Temperature')
plt.grid(True)
plt.legend()

# Show the plot
plt.show()
```



IMPLEMENTATION

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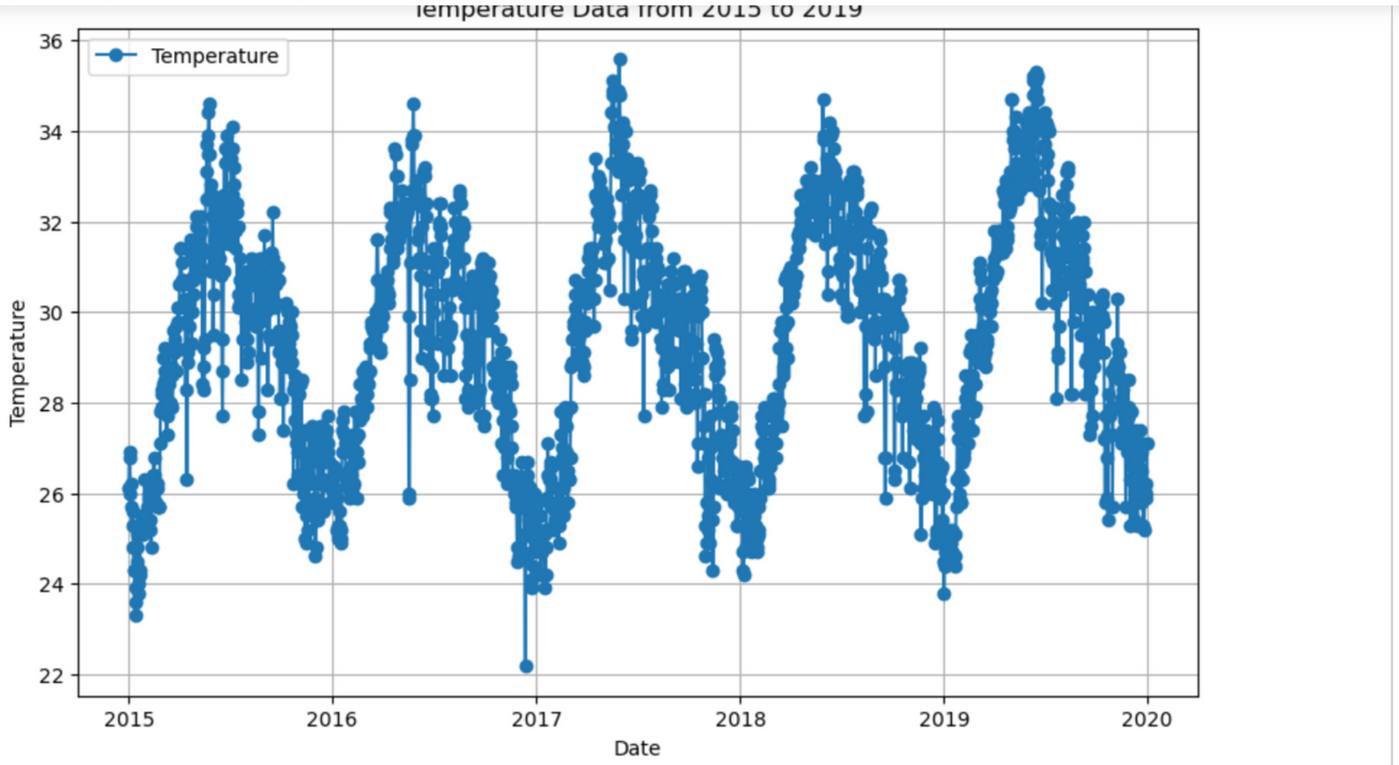

IMPLEMENTATION

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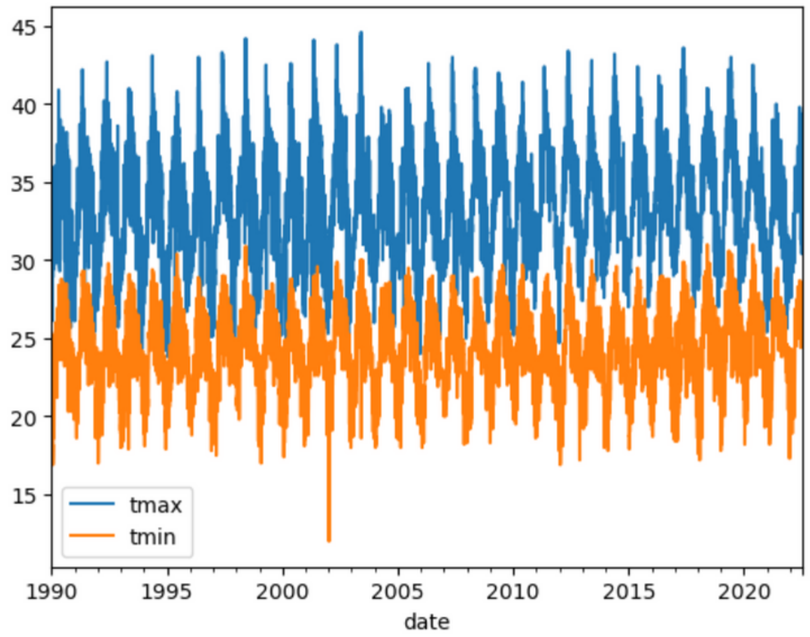
Run Code

```
In [13]: weather[["tmax", "tmin"]].plot()
```

```
Out[13]: <Axes: xlabel='date'>
```



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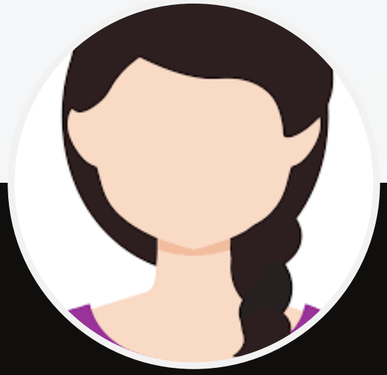

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