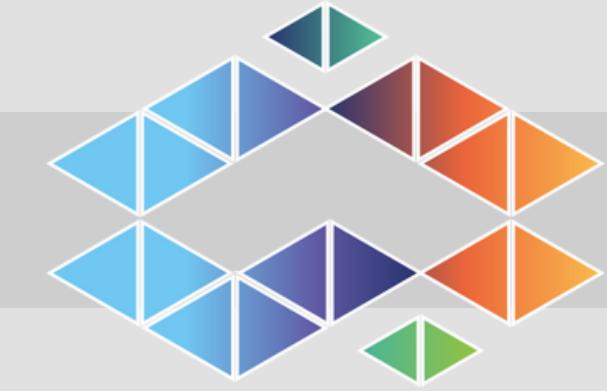


# Saudi Arabia Weather

DEEP LEARNING PROJECT





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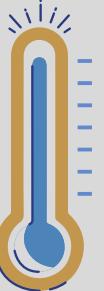
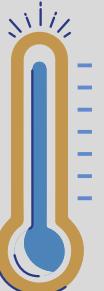
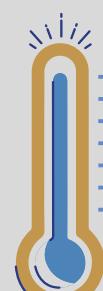
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YARA ALDOSSARI

NOURA ALOTABI

Project implementers

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# Introduction

Climate studies anywhere are one of the important studies on which geographical and non-geographical studies are based.

The Kingdom of Saudi Arabia has a changing climate throughout; Due to the vastness of its geographical area and the passage of many geological stages over it during the previous centuries , and what most distinguishes the Kingdom is the presence of various types of terrain in it, including mountains, plains, valleys and sand dunes.

The Kingdom's climate varies with different seasons. But in general, the climate is characterized by hot summer and cold and rainy winter.



# DataSet

The data set is from [kaggle](#) it's contain

**24K** rows

**15** columns

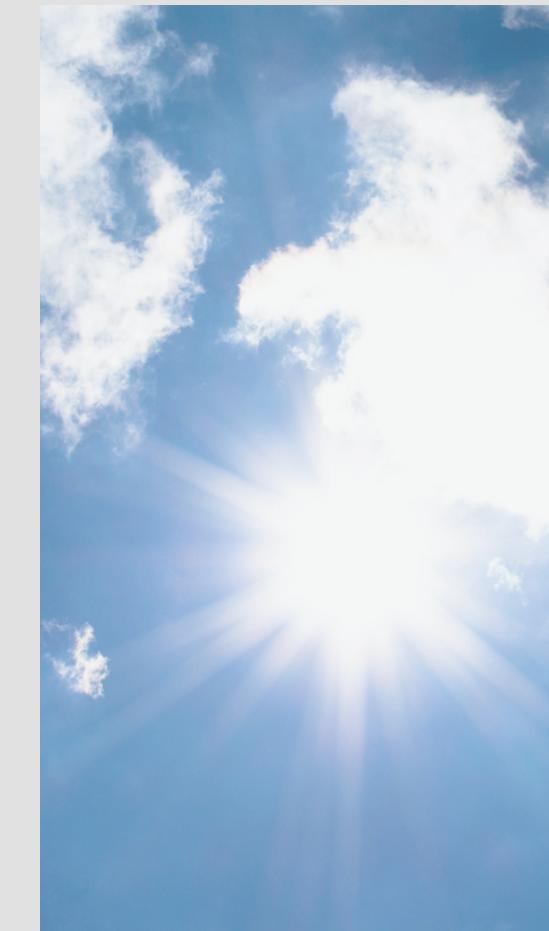
Its describe the kingdom's climate throughout the years of 2017-2019



# Goal

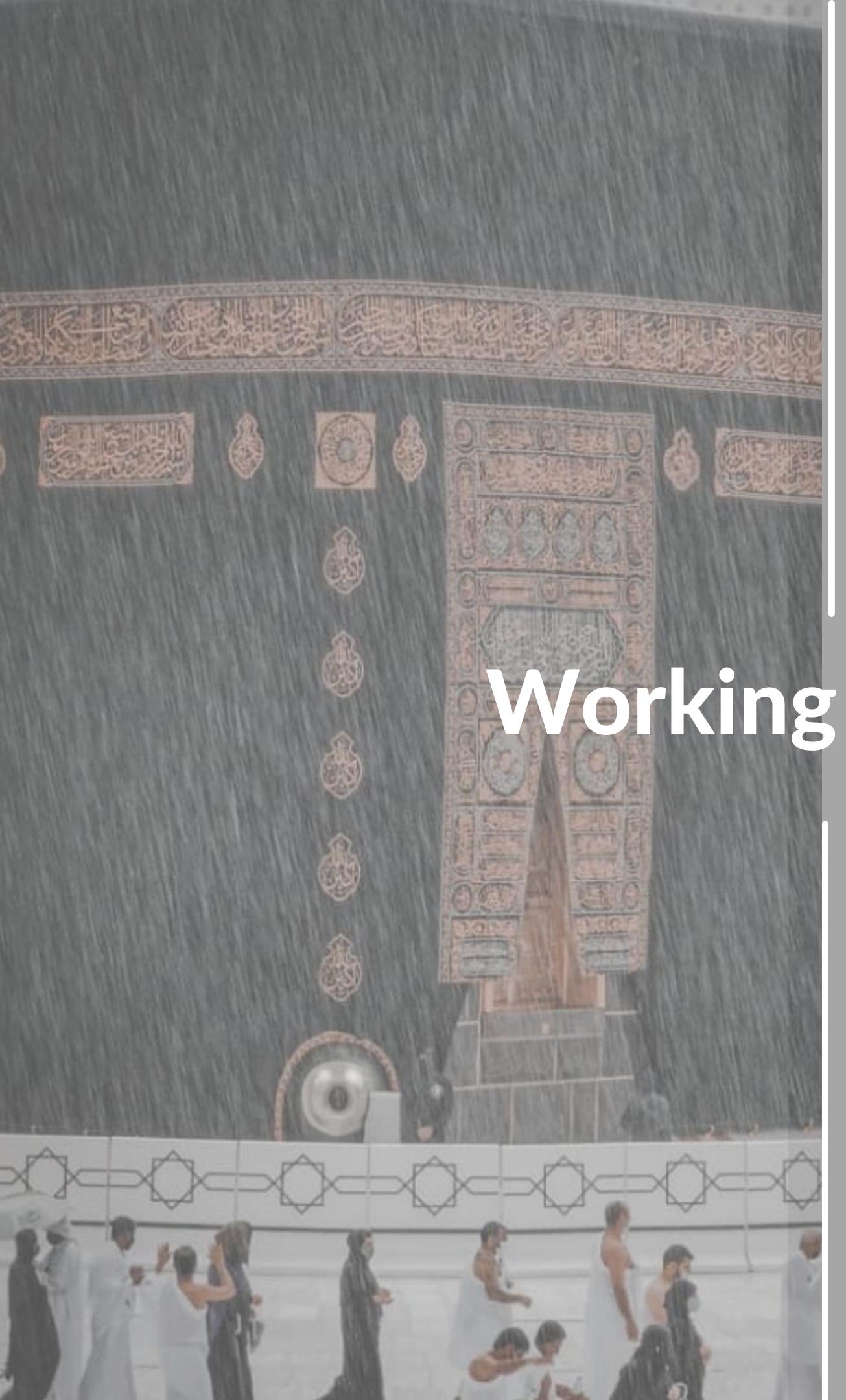
The goal of this project is to predict the temperature and the Weather in Makkah city.

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# Working with Time Series Large Amount of Models



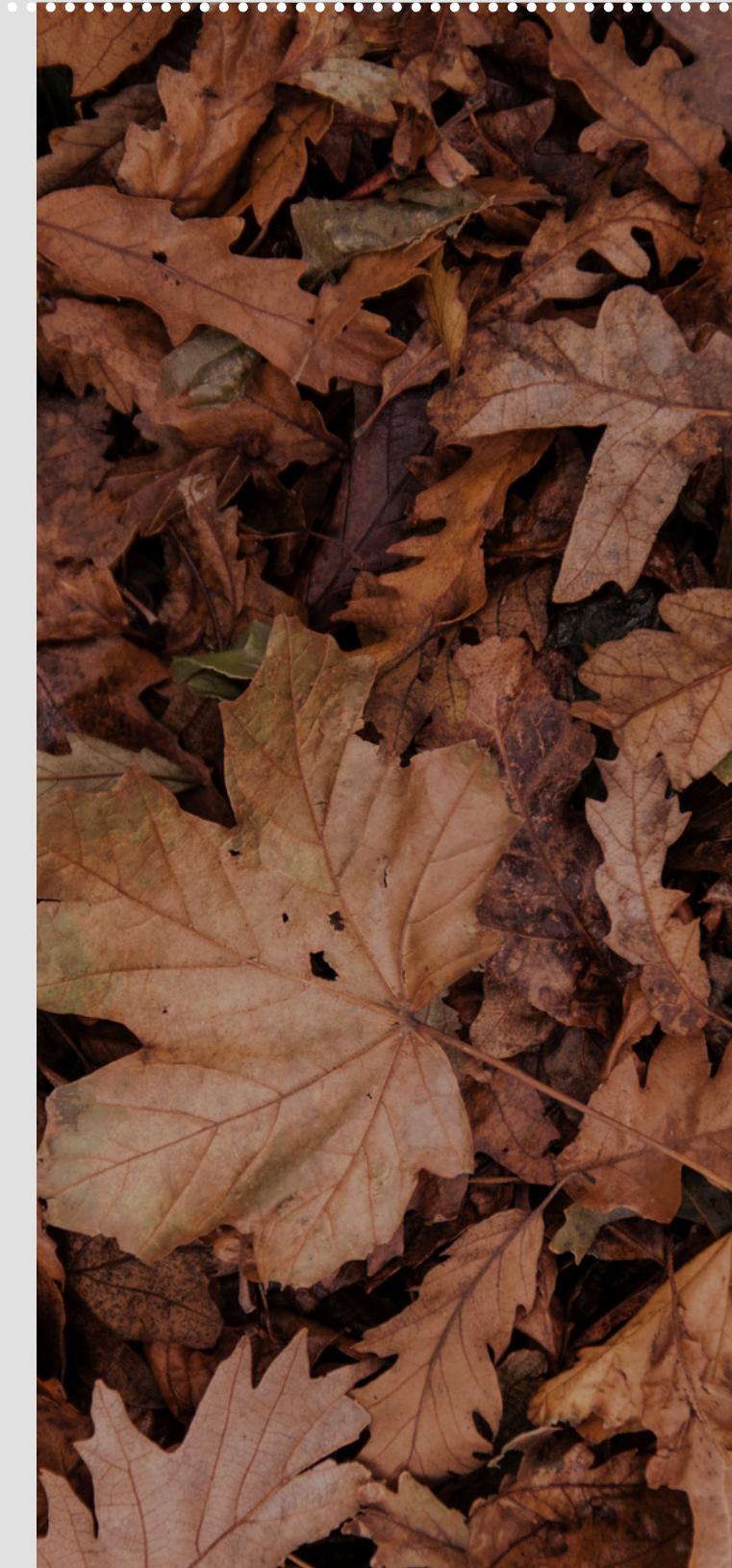
# Tech Technologies

**Python**

**Jupyter notebook**

**Google colab**

# Tools



# Libraries

**Pandas , NumPy ,Math**

**Matplotlib ,Seaborn, rcParams**

**Sklearn-Scikit**

**Tensorflow**

**Keras**

**scipy**

**statsmodels**

**calendar**

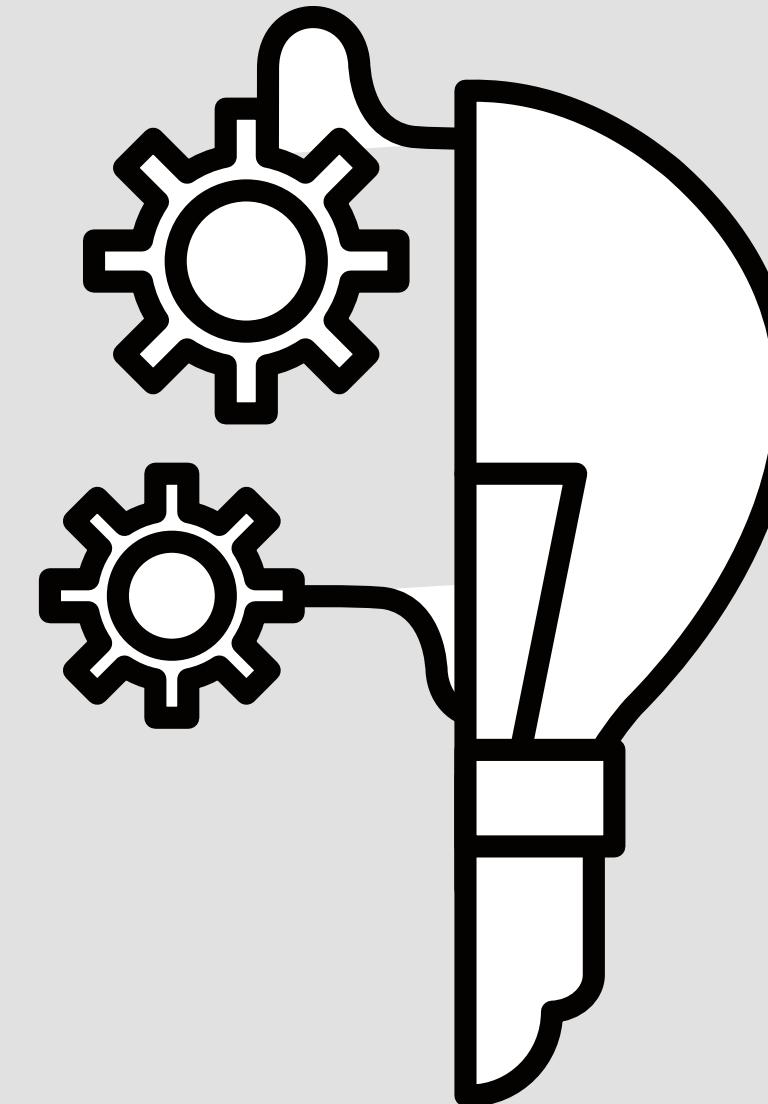
# Preprocessing.

# Preprocessing

Checking Null

Checking Duplicate

Drop Some columns



Converting data Type for some columns

Filling missing values

Stripping

Feature Engineering

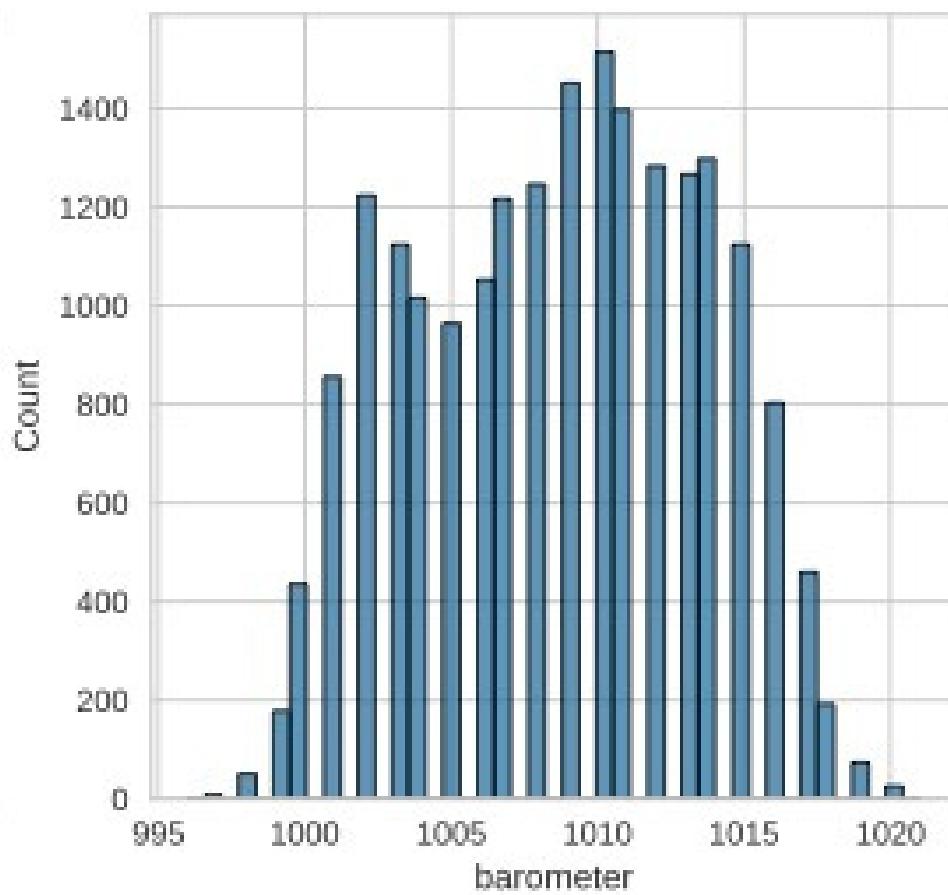
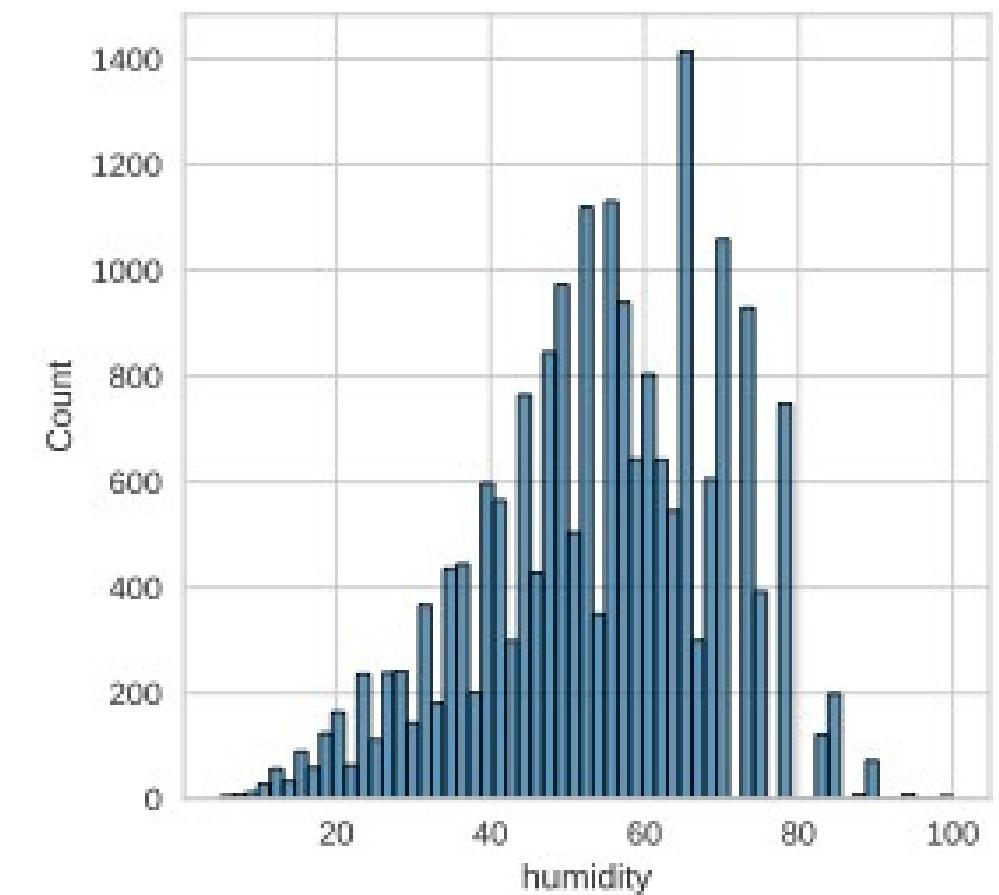
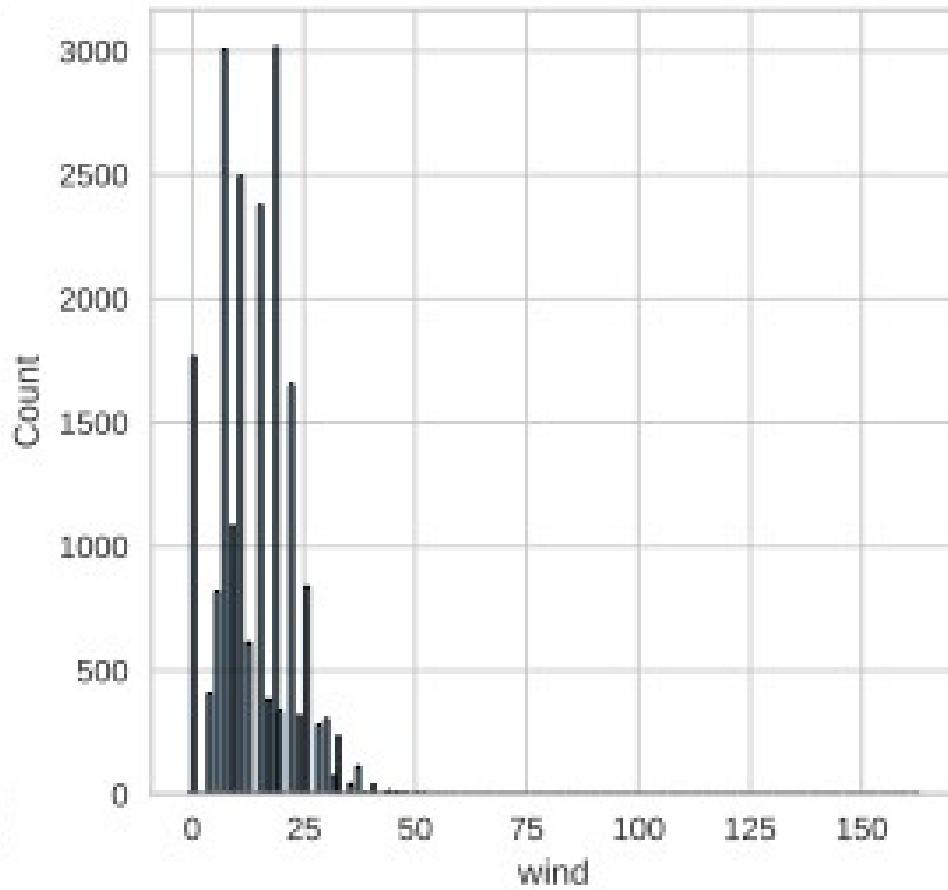
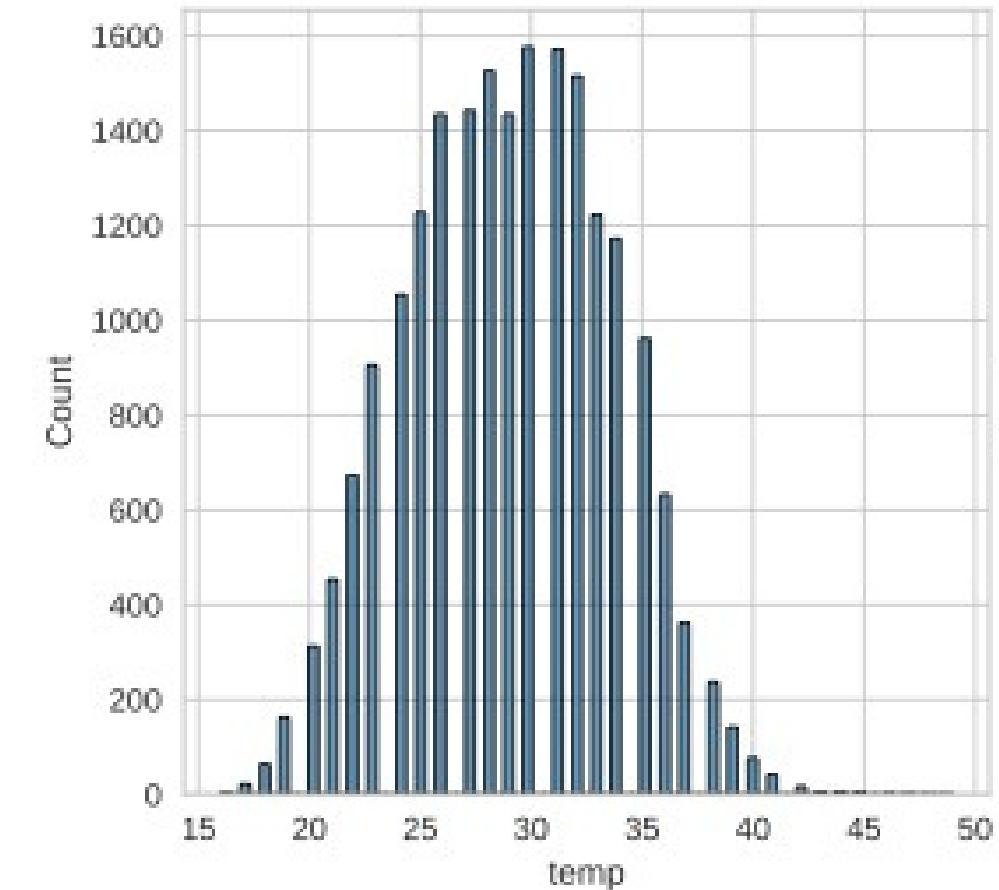


**EDA**

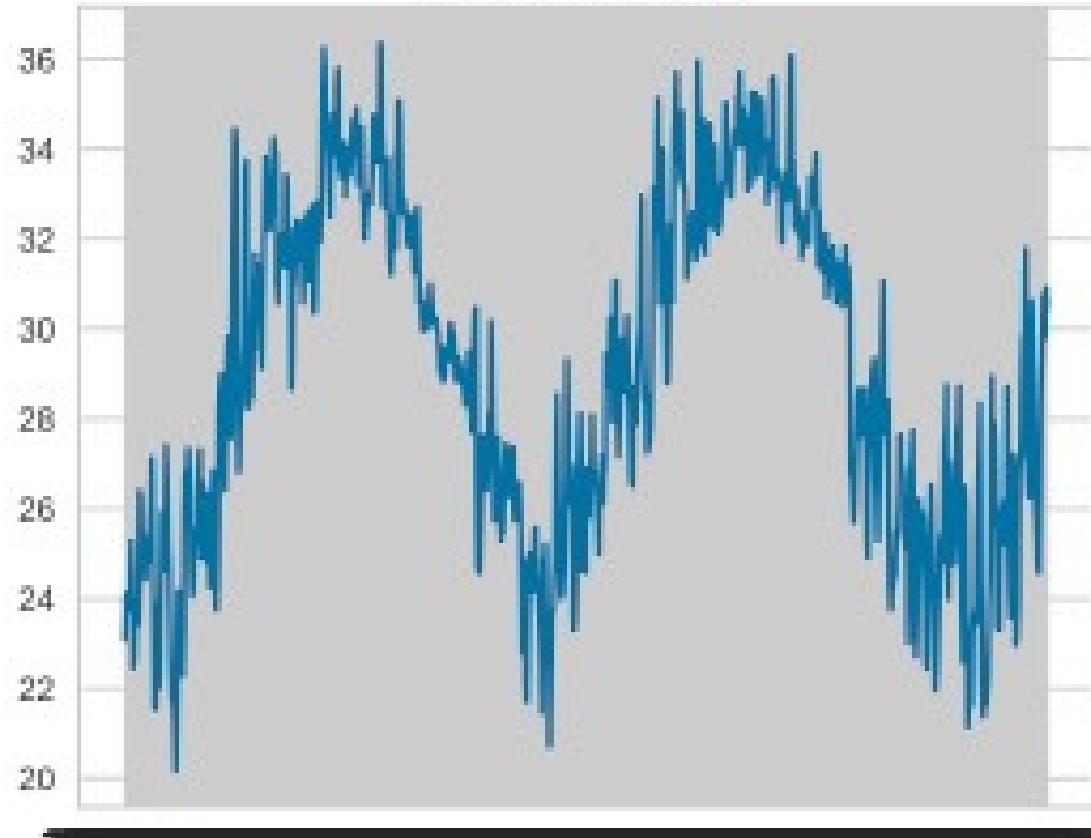
Ausfahrt



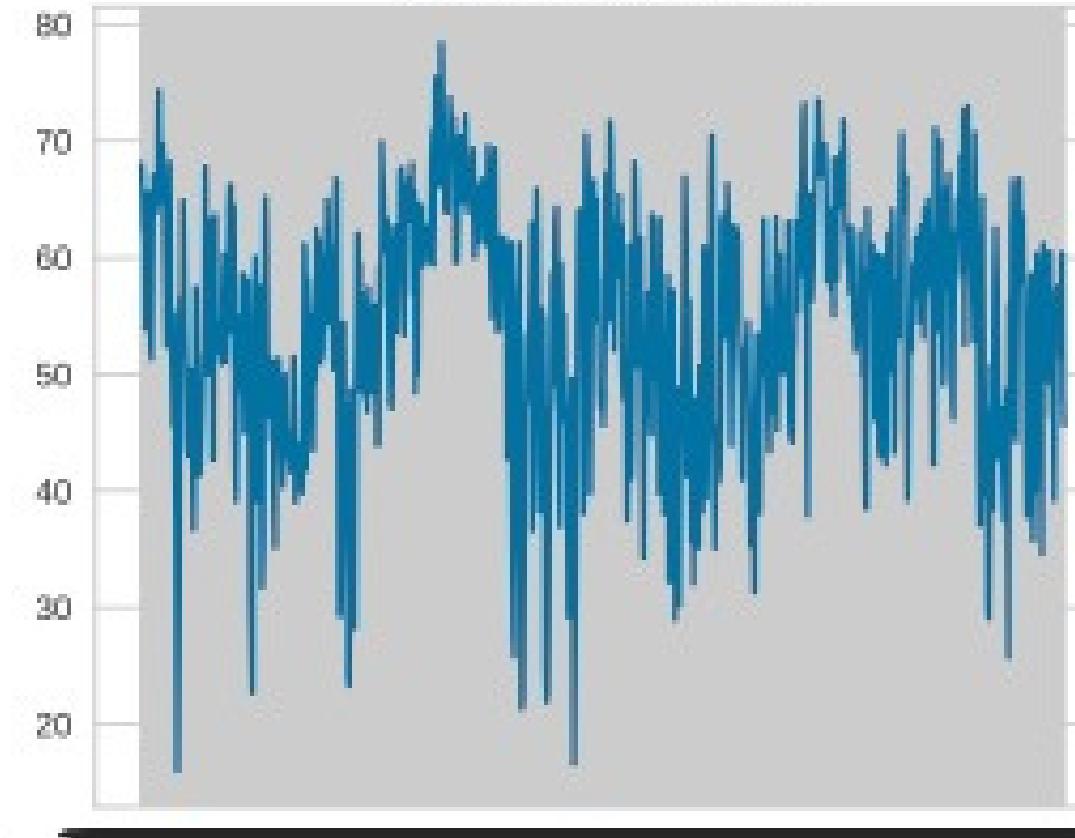
The figure shows the distribution of  
(Temperture , Wind , Humidity & Barometer)



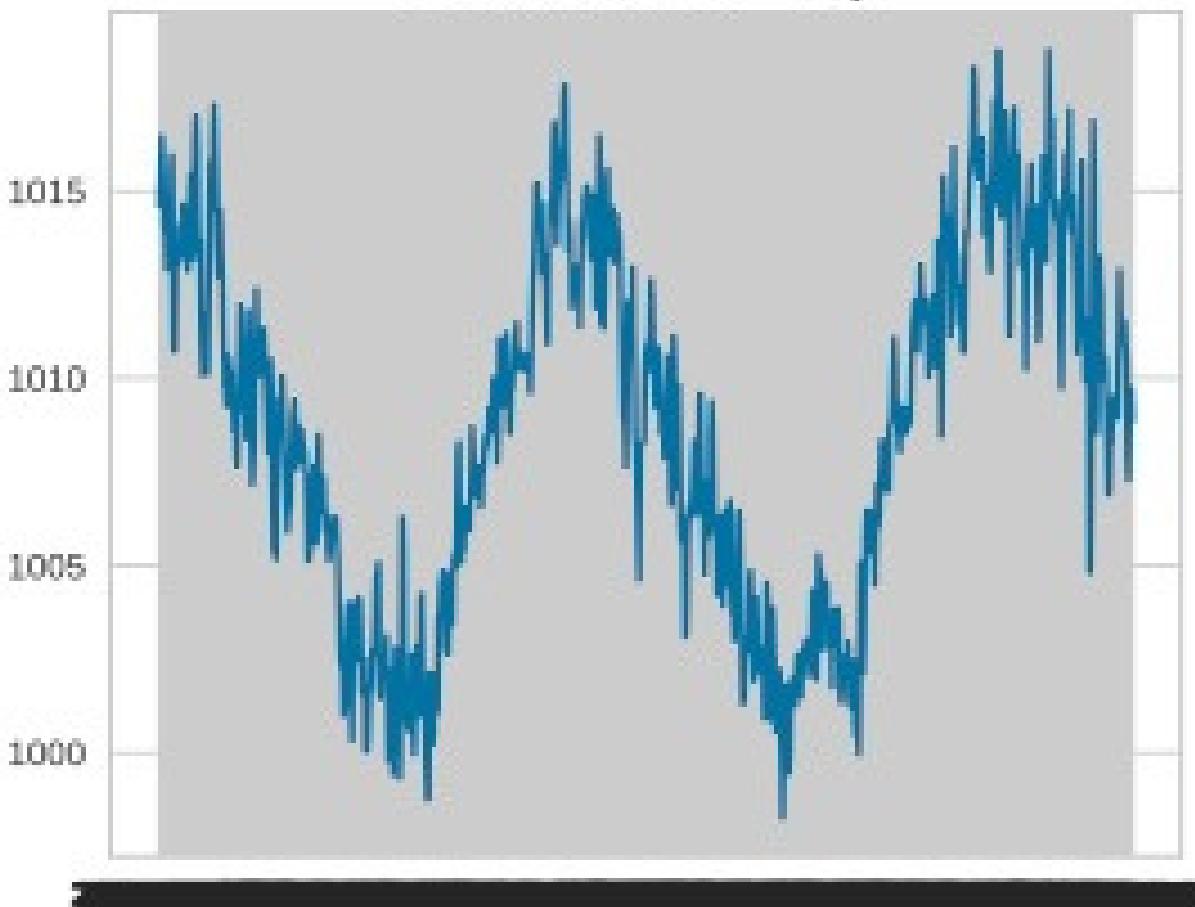
temp Mecca - daily



humidity Mecca - daily

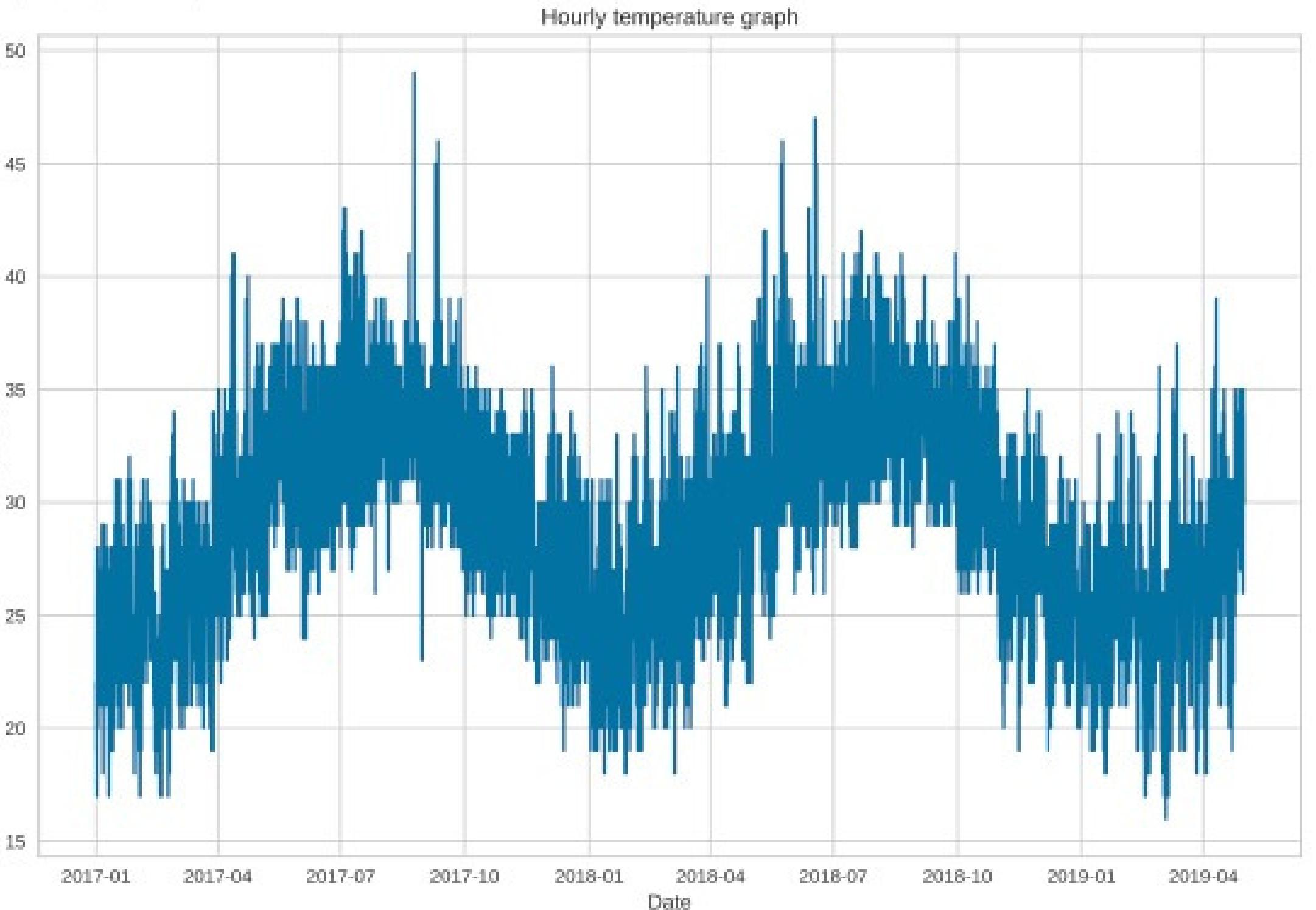


barometer Mecca - daily

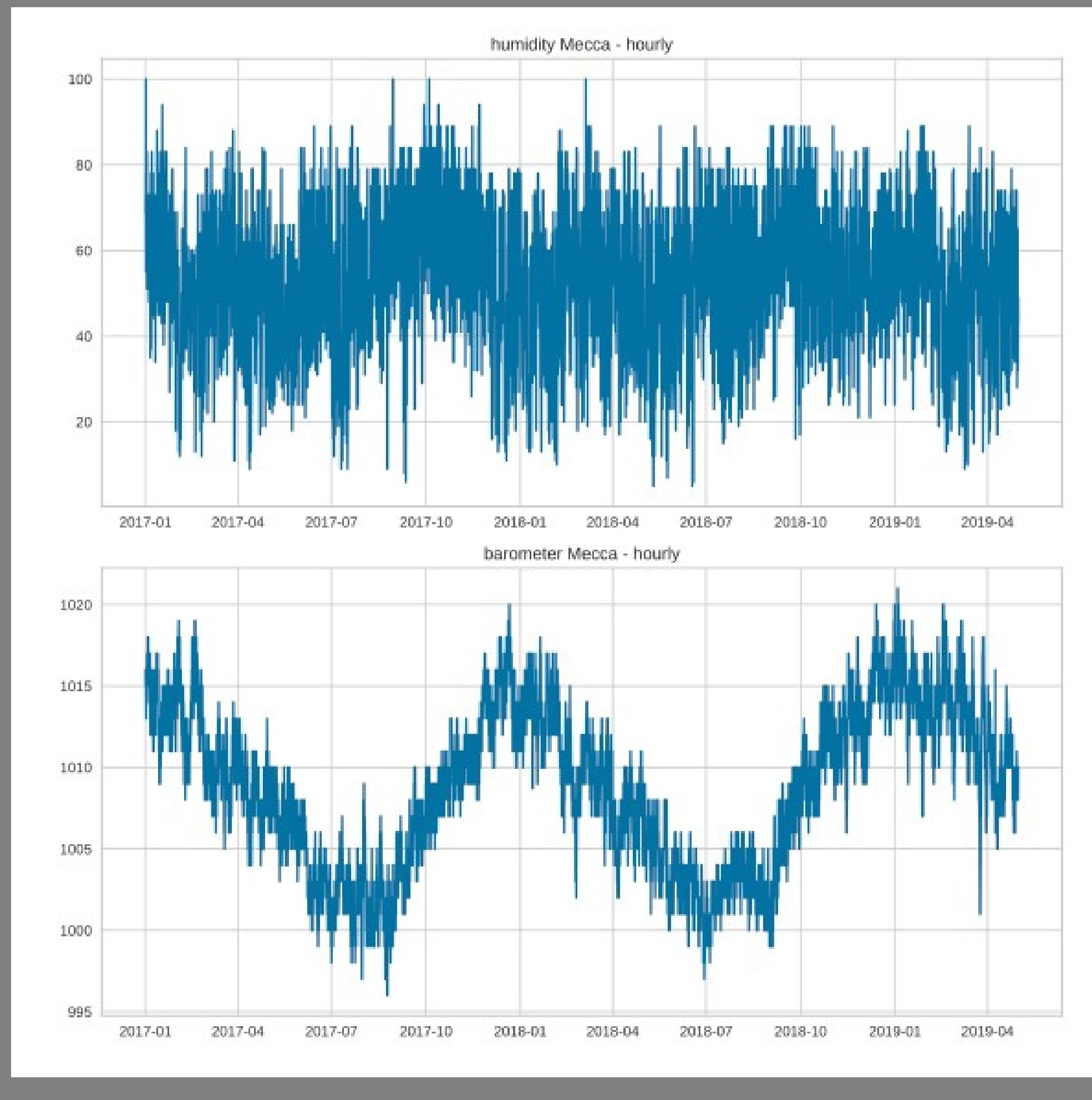


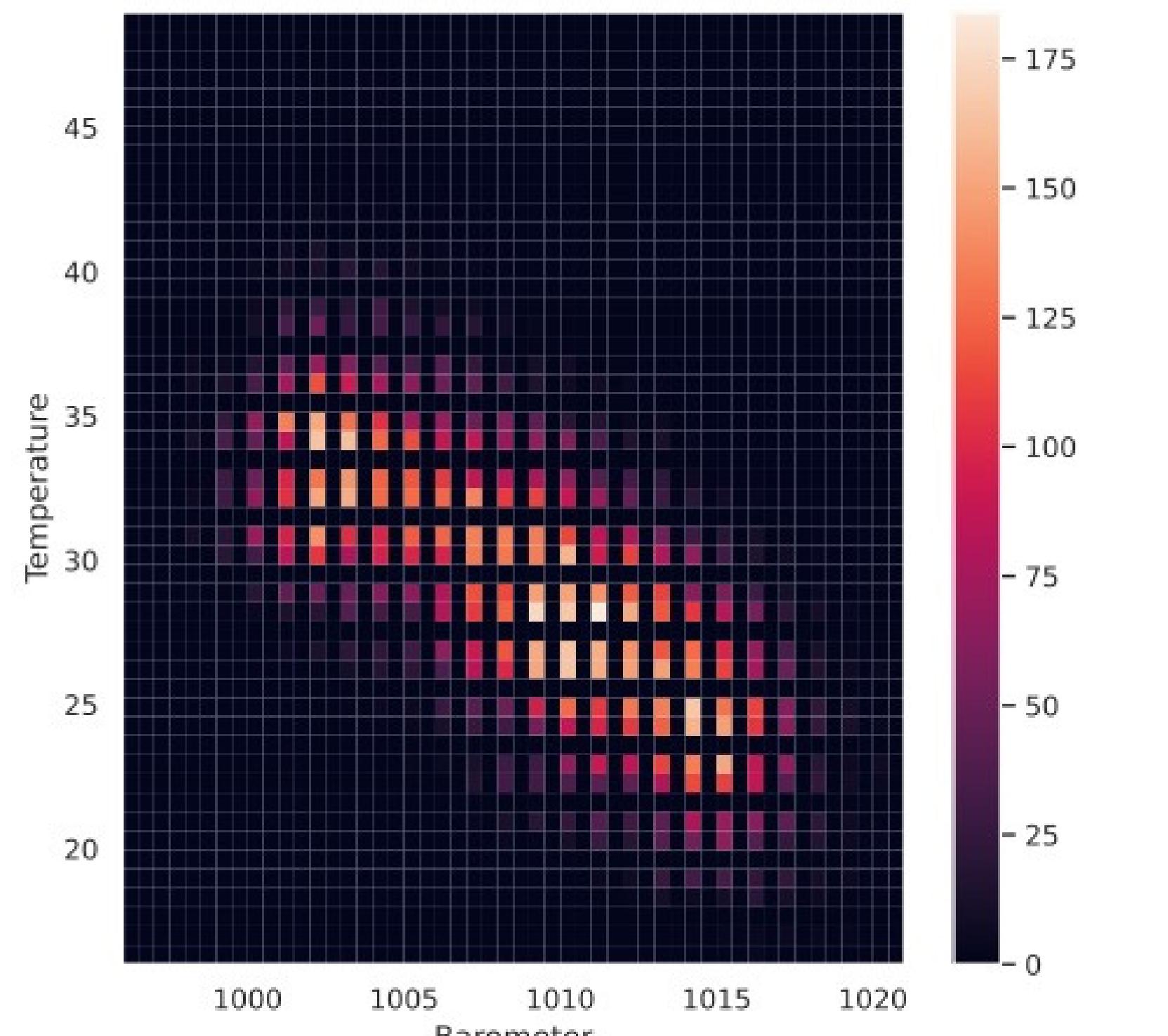
 Daily temperature Humidity  
& Barometer in Makkah

# Hourly temperature graph

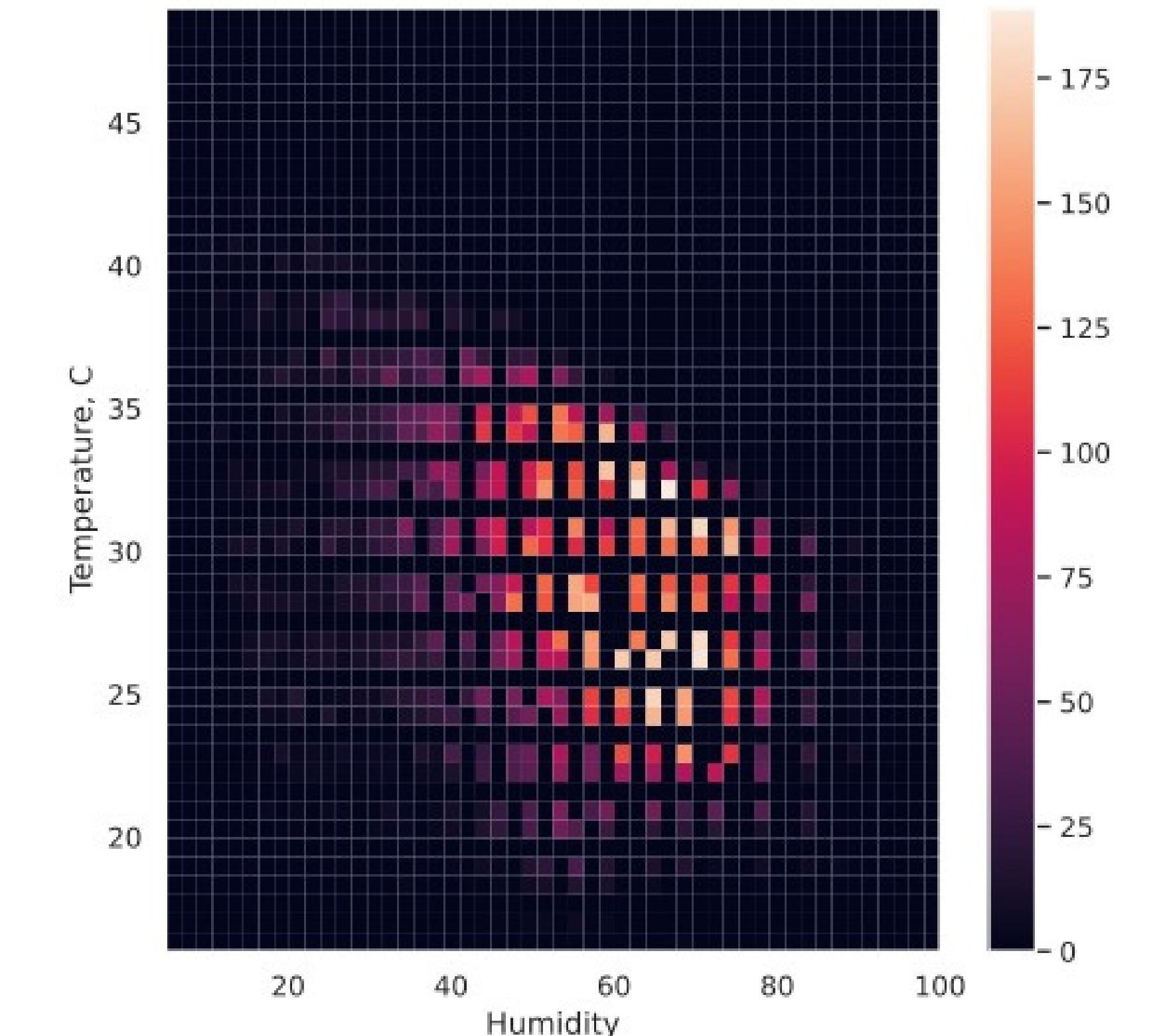


# Humidity & Barometer in Makkah





Correlation between temperature & Barometer

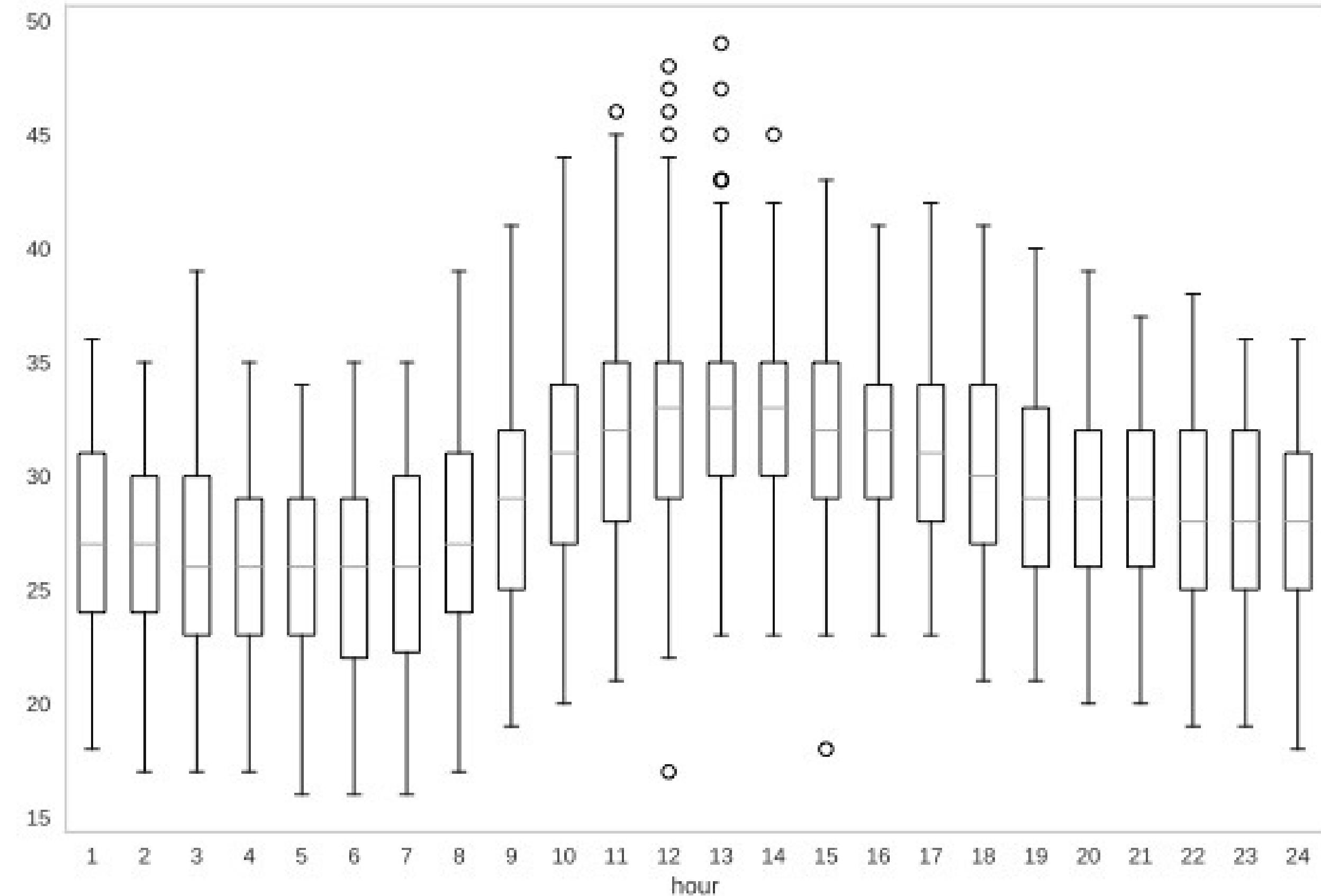


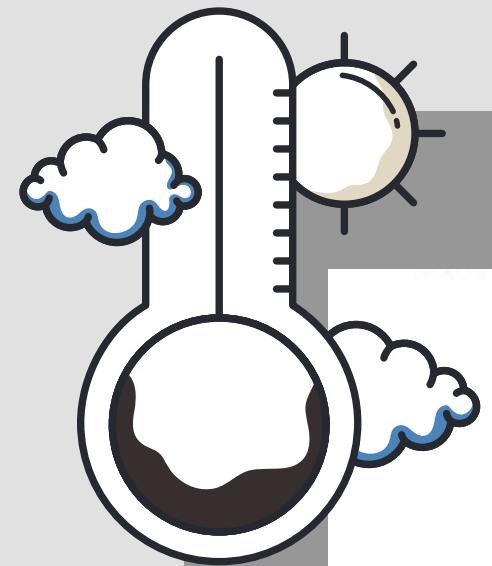
Correlation between temperature & Humidity

## Relation between temperature and hours

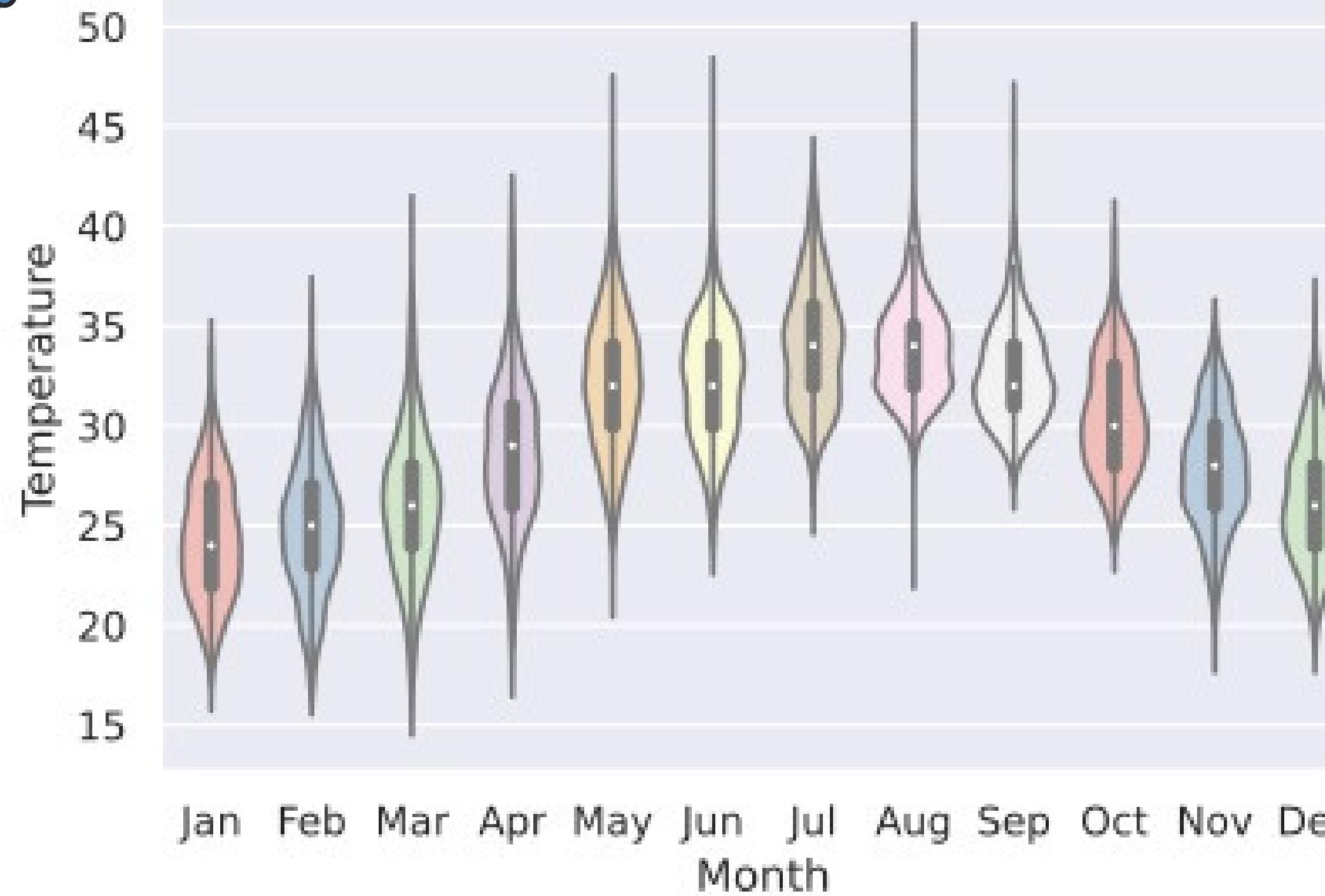
Boxplot grouped by hour

temp





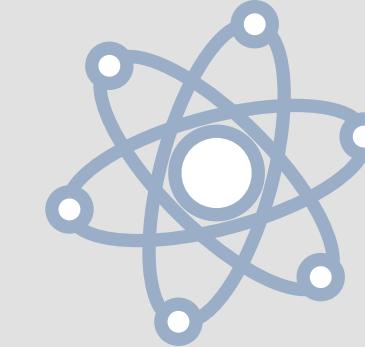
## Monthly Temperatures Distribution



# Time Series Models



# LSTM



## LSTM 1

n\_lag = 24  
n\_seq = 1  
n\_batch = 1  
n\_epoch = 20  
n\_neurons = 20



**RMSE : 0.126512**

## LSTM 2

n\_lag = 24  
n\_seq = 1  
n\_batch = 1  
n\_epoch = 20  
n\_neurons = 50



**RMSE: 0.150887**

## LSTM 3

n\_lag = 24  
n\_seq = 1  
n\_batch = 1  
n\_epoch = 20  
n\_neurons = 10



**RMSE: 0.122265**

## LSTM 4

n\_lag = 24  
n\_seq = 1  
n\_batch = 1  
n\_epoch = 20  
n\_neurons = 24



**RMSE: 0.137903**

# LSTM Stacked Small & Big

## Small

n\_lag = 24  
n\_seq = 1  
n\_batch = 1  
n\_epoch = 20  
LSTM Layers =2



RMSE: 0.210538

## Big

n\_lag = 24  
n\_seq = 1  
n\_batch = 1  
n\_epoch = 20  
LSTM Layers =4



RMSE: 0.116172

# Bi-directional LSTM

## Lstm bi

n\_lag = 24  
n\_seq = 1  
n\_batch = 1  
n\_epoch = 20  
n\_neurons = 20



**RMSE: 0.126762**

**RMSE: 0.155769**



## Lstm bi stacked small

n\_lag = 24  
n\_seq = 1  
n\_batch = 1  
n\_epoch = 20  
LSTM Layers = 2

# LSTM LSTM Encoder-Decoder

---

## Lstm encoder decoder 1

n\_lag = 24

n\_seq = 1

n\_batch = 1

n\_epoch = 20

n\_neurons = 50



**RMSE: 0.129345**

## Lstm encoder decoder 2

n\_lag = 24

n\_seq = 1

n\_batch = 1

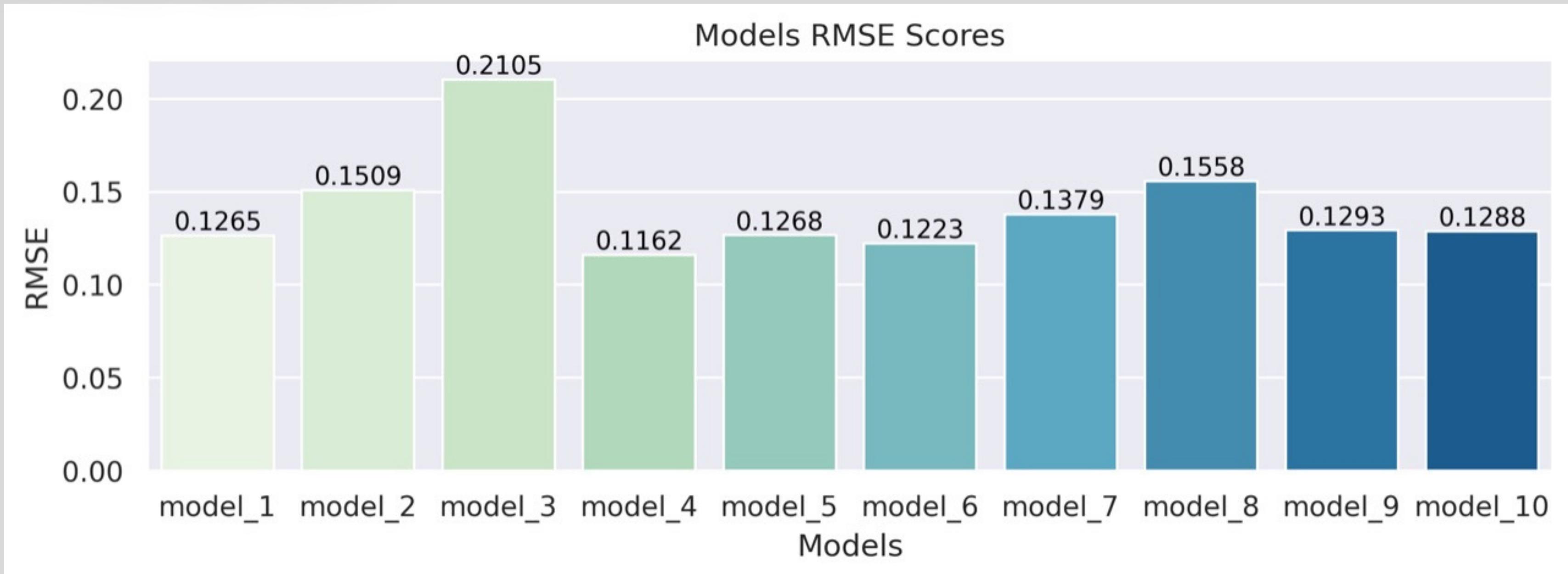
n\_epoch = 20

n\_neurons = 20



**RMSE: 0.128752**

# Best Model



From above we can say that the best model is model\_4  
The big stacked LSTM with the lowest RMSE (0.116172).



Deployment

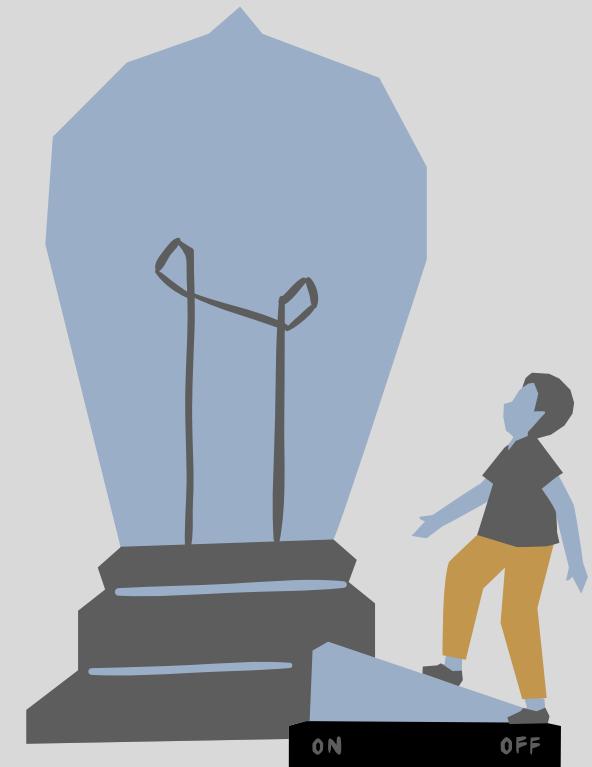
# Conclusion

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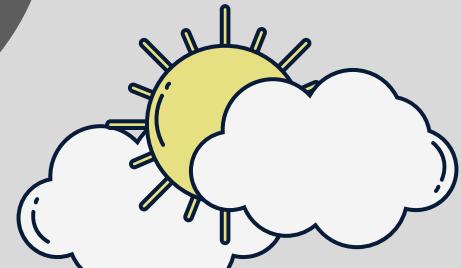
## In Future:

### Benchmarking with Established time series models :

- ARIMA
- Exponential Smoothing
- Facebook Prophet
- Apply multi-steps ahead forecasting
- Apply multivariate forecasting like (temperature for Mecca, temperature for Riyadh together).
- Working with more hyperparameters (epochs, optimizer, different past lags).
- Apply different models not tried in this project : CNN-LSTM , MLP.
- Include other variables, such a seasonal indicator or barometer or humidity.
- Try different architectures for the models we have tried .



*thank  
you*



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Any questions ?