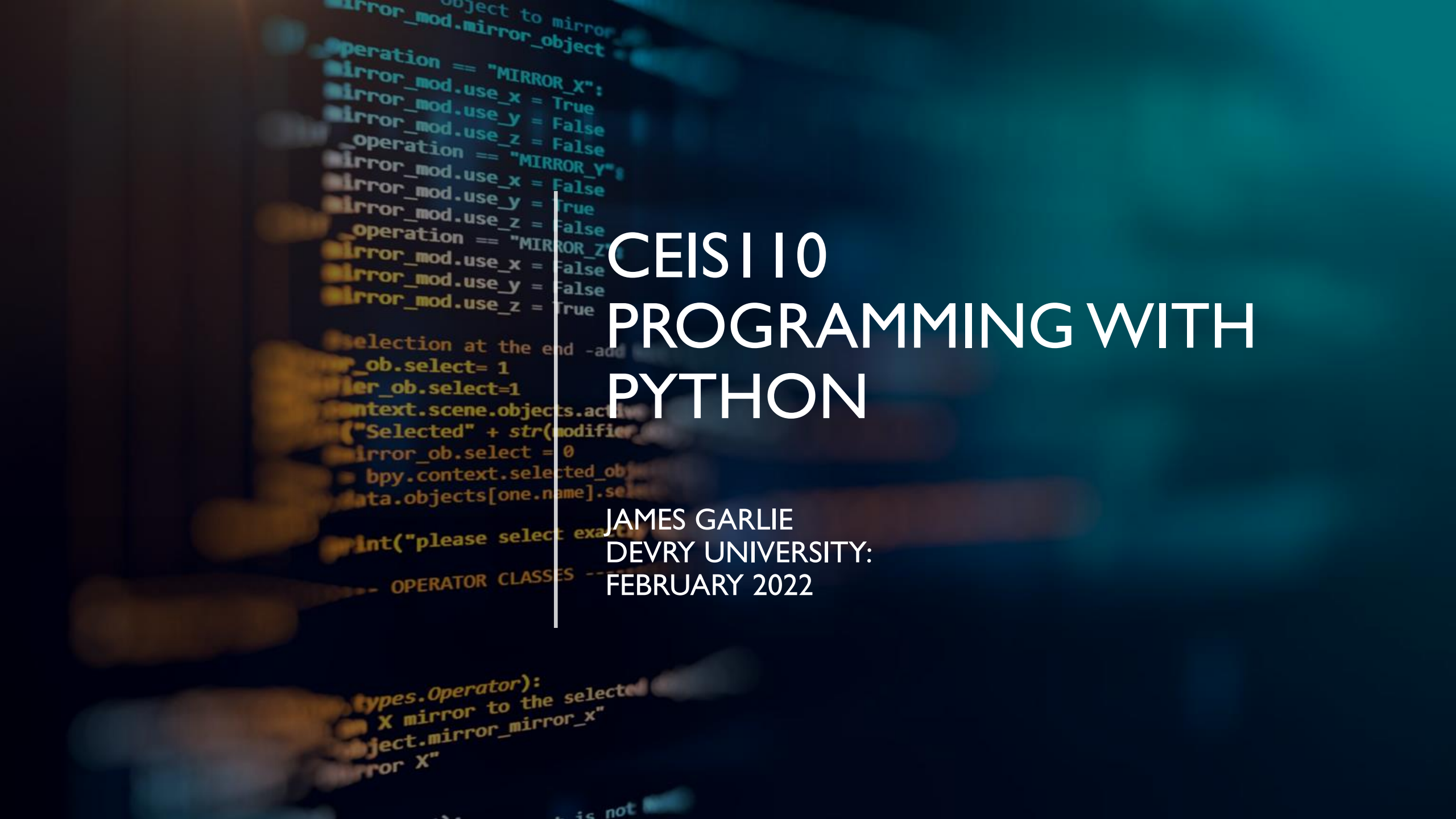


CEIS110 PROGRAMMING WITH PYTHON

JAMES GARLIE
DEVRY UNIVERSITY:
FEBRUARY 2022

INTRODUCTION

DATA IS GROWING EXPONENTIALLY.

THIS PROJECT USES A CLOUD-BASED SYSTEM TO GATHER TEMPERATURE AND HUMIDITY DATA.

THEN THE DATA IS ANALYZED USING PROGRAMMING AND DATA ANALYTICS.

SOFTWARE INVENTORY

BEFORE DEVELOPING THIS PROGRAMMING WITH DATA PROJECT, ALL SOFTWARE MUST BE DOWNLOADED AND INSTALLED.

SOFTWARE NEEDED, INCLUDED: SQLITE STUDIO, EXCEL, AND A PYTHON IDE - ANACONDA

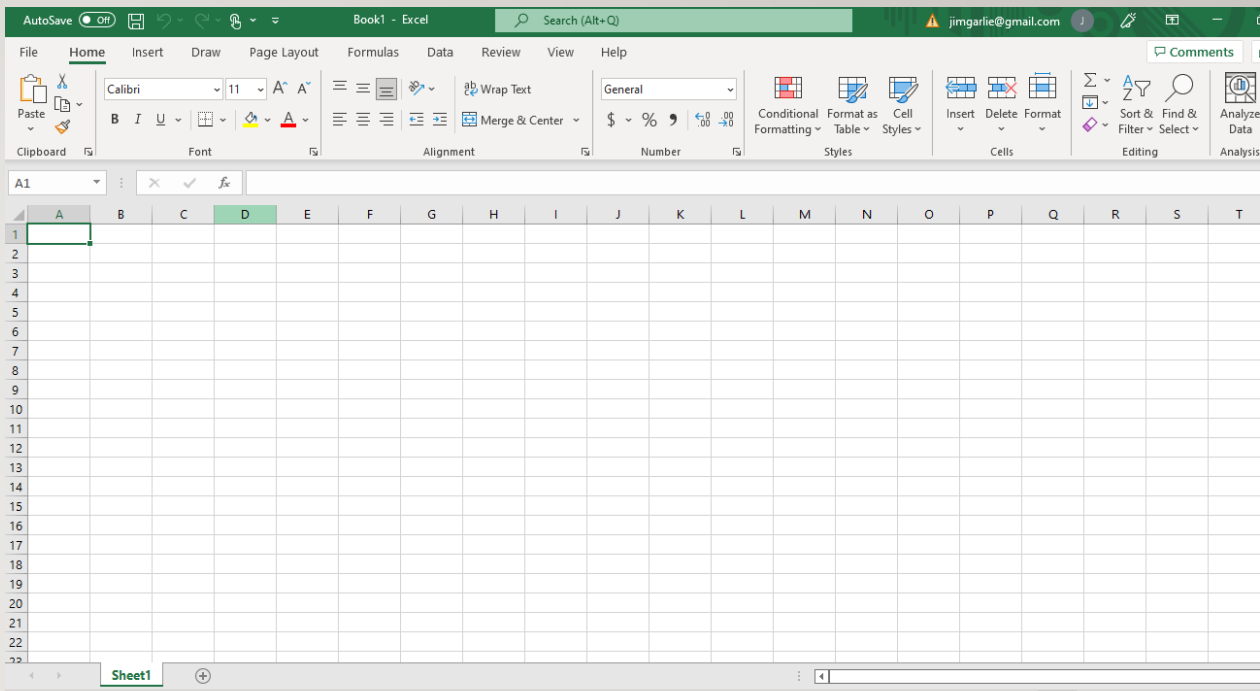
SOFTWARE

The software need for this project includes:

Microsoft Excel

SQLite

Anaconda Navigator with Spyder



SQLite

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What Is SQLite?

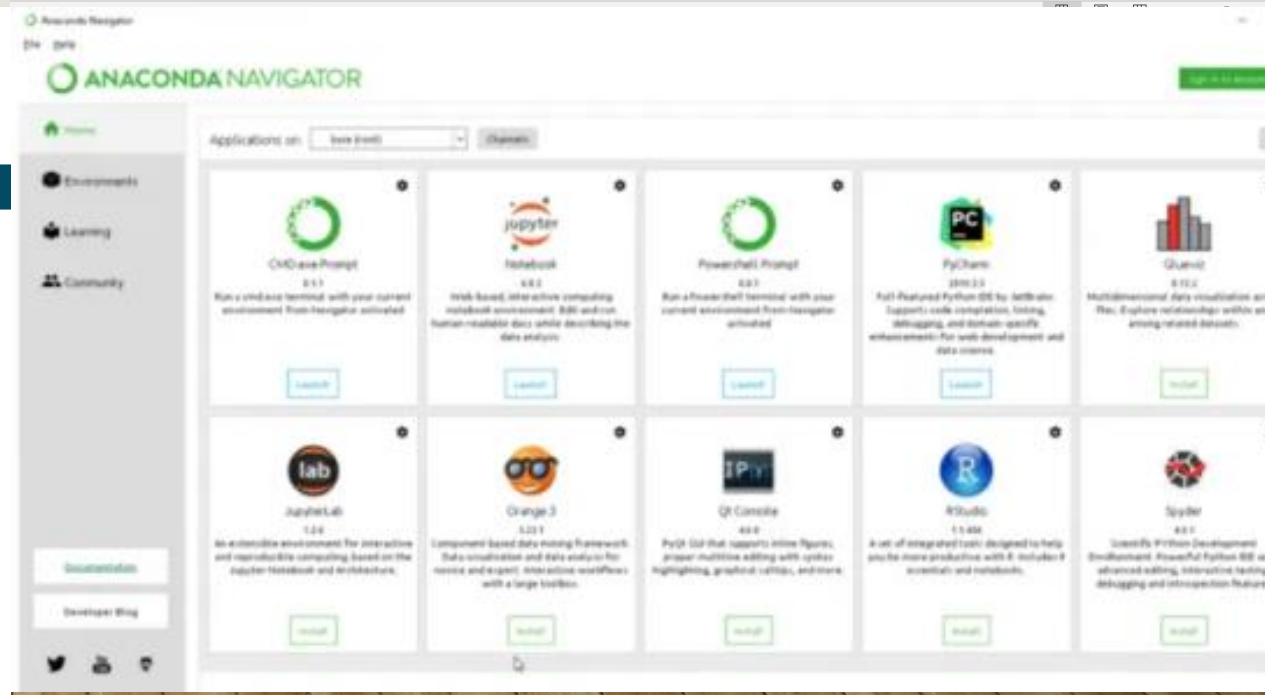
SQLite is a C-language library that implements a small, fast, self-contained, high-reliability, full-featured, SQL database engine. SQLite is the most used database engine in the world. SQLite is built into all mobile phones and most computers and comes bundled inside countless other applications that people use every day. More Information...

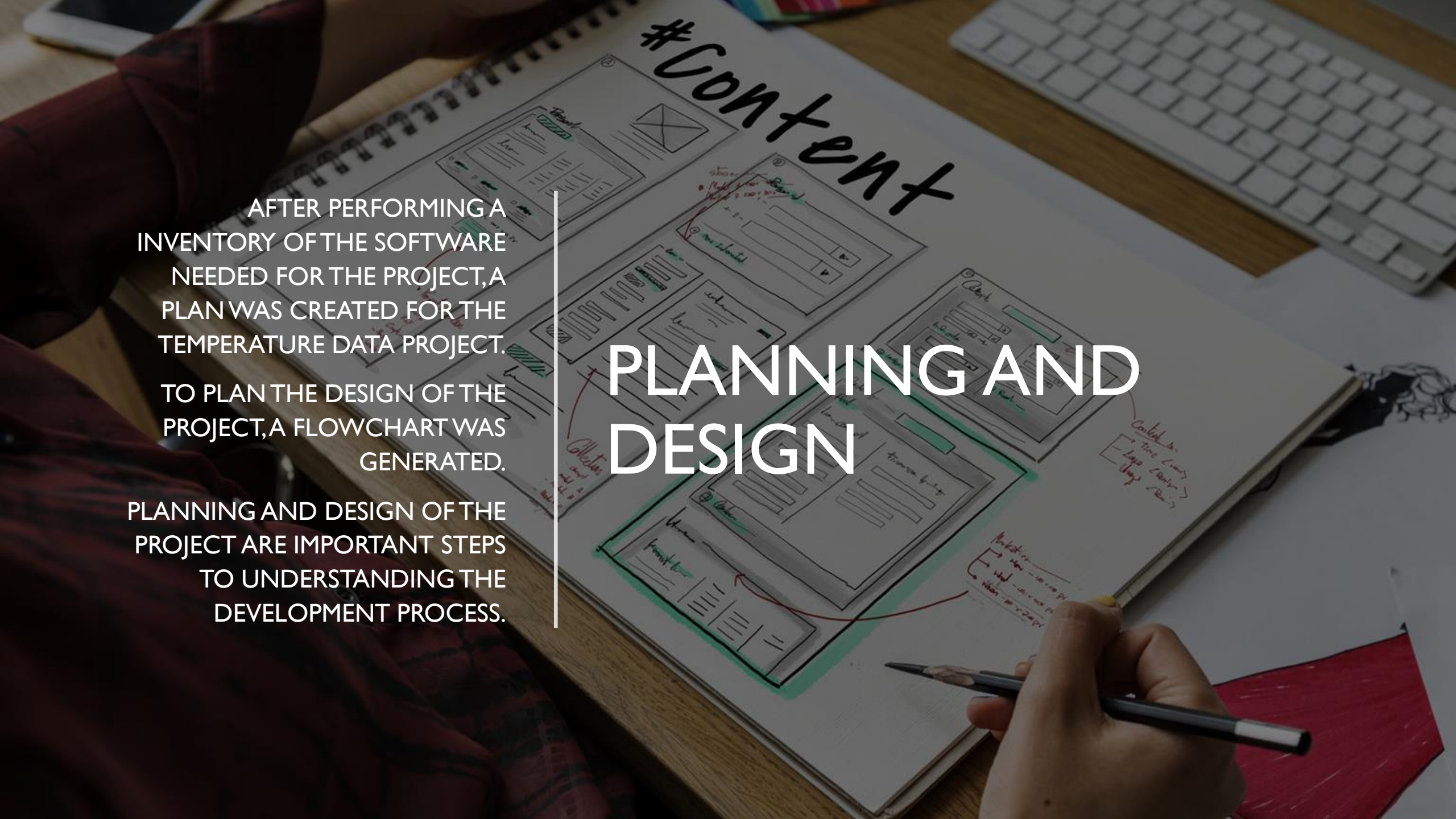
The SQLite file format is stable, cross-platform, and backwards compatible and the developers pledge to keep it that way through the year 2050. SQLite database files are commonly used as containers to transfer rich content between systems [1] [2] [3] and as a long-term archival format for data [4]. There are over 1 trillion (1e12) SQLite databases in active use [5].

SQLite source code is in the public-domain and is free to everyone to use for any purpose.

Latest Release

Version 3.37.2 (2022-01-06). Download Prior Releases





PLANNING AND DESIGN

AFTER PERFORMING A INVENTORY OF THE SOFTWARE NEEDED FOR THE PROJECT, A PLAN WAS CREATED FOR THE TEMPERATURE DATA PROJECT.

TO PLAN THE DESIGN OF THE PROJECT, A FLOWCHART WAS GENERATED.

PLANNING AND DESIGN OF THE PROJECT ARE IMPORTANT STEPS TO UNDERSTANDING THE DEVELOPMENT PROCESS.

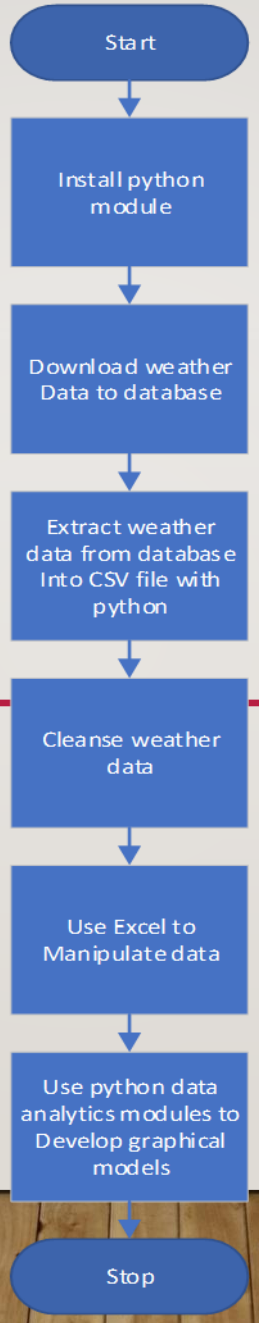
WHAT ARE FLOWCHARTS?

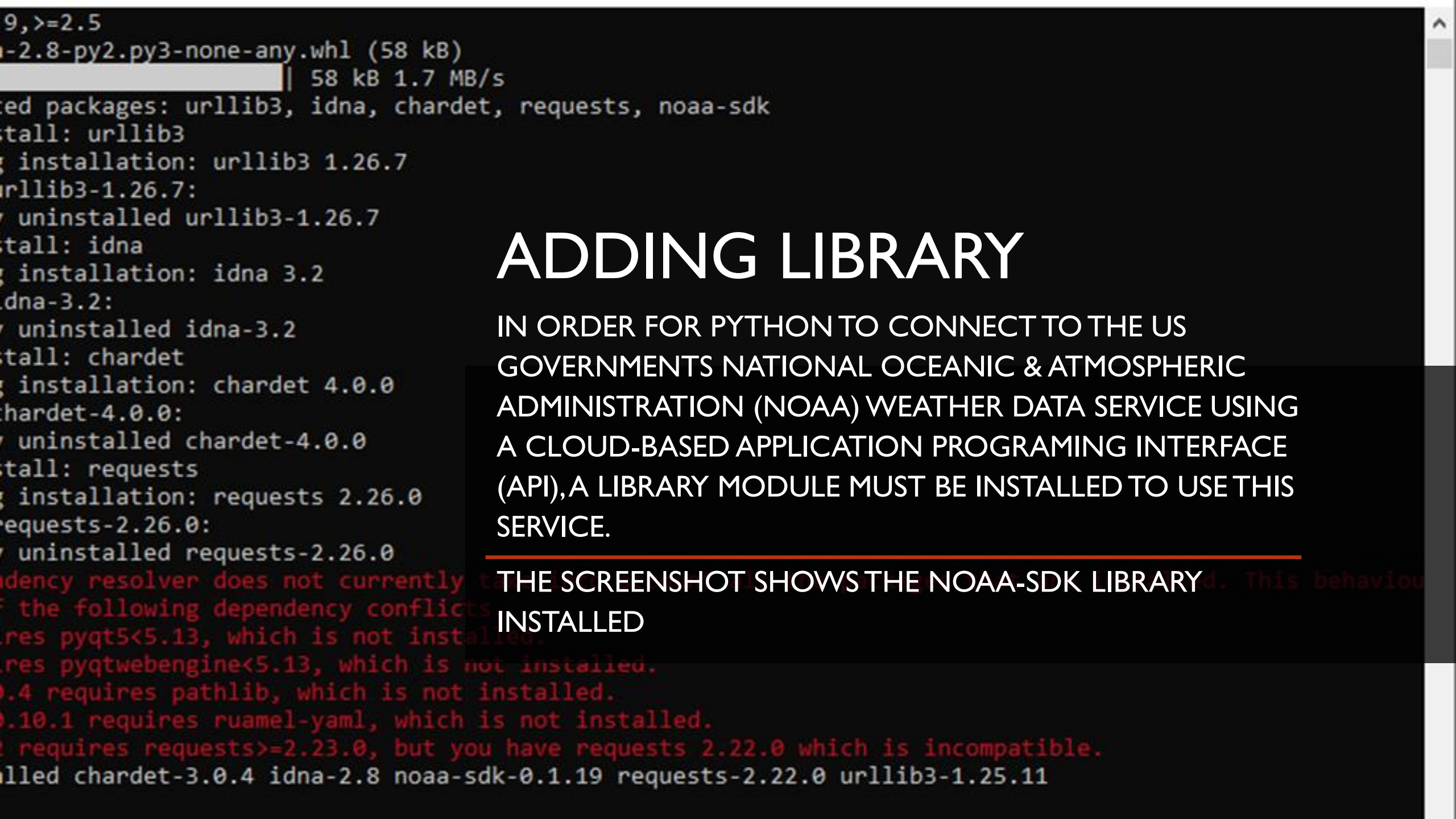
FLOWCHARTS ARE GRAPHICAL PRESENTATIONS OF PROCESSES OR WORKFLOWS, AND THE FLOWCHART DEVELOPED ILLUSTRATES THE PROCESS AND OUTPUT OF THIS SOFTWARE DEVELOPMENT PROJECT.

MANY COMPANIES USE FLOWCHARTS AS SIMPLE NARRATIVES.

FLOWCHART

- Install python
- Download weather data to a database
- Extract weather data from database into a comma separated file with python
- Cleanse weather data
- Use Excel to manipulate data
- Use python data Analytics modules to develop graphical models





ADDING LIBRARY

IN ORDER FOR PYTHON TO CONNECT TO THE US GOVERNMENTS NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION (NOAA) WEATHER DATA SERVICE USING A CLOUD-BASED APPLICATION PROGRAMING INTERFACE (API), A LIBRARY MODULE MUST BE INSTALLED TO USE THIS SERVICE.

THE SCREENSHOT SHOWS THE NOAA-SDK LIBRARY INSTALLED

GATHERING TEMPERATURE & HUMIDITY DATA

AFTER PLANNING AND DESIGN, THE CODE WAS DEVELOPED TO DOWNLOAD A SET OF WEATHER OBSERVATIONS.

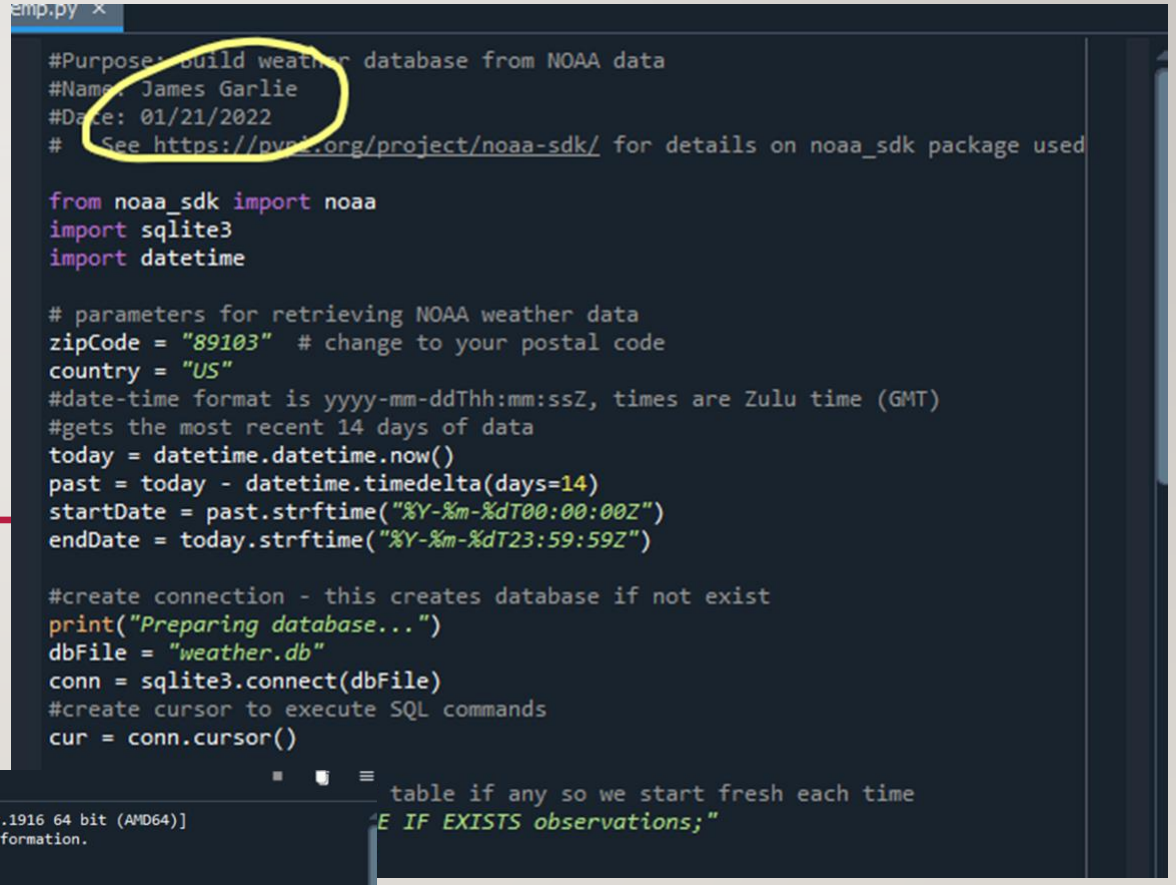
THIS DATA WAS STORED ON A LOCAL DATABASE IN A TABLE FOR LATER ANALYSIS.

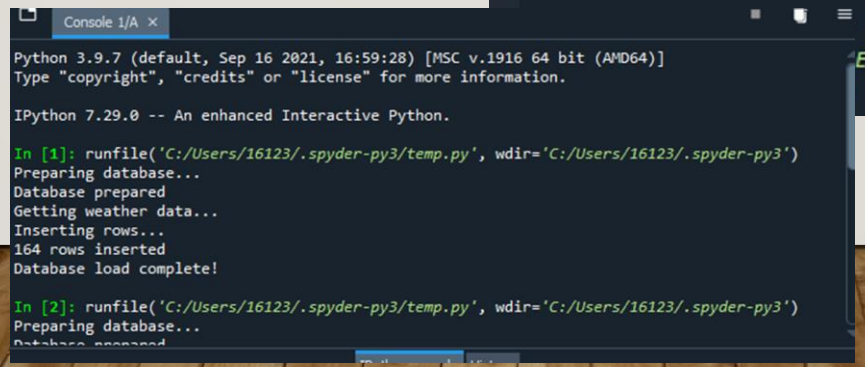
BUILDWEATHERDB.PY CODE (SCREENSHOT)

The code will create a table named Observations with the fields: timestamp, windSpeed, temperature, relativeHumidity, windDirection, barometricPressue, visibility, and textDescription.

The database will be named weather.db and stored in the same directory as the python code.

The screenshots are of the code and output in Spyder.





WEATHER.DB FILE (SCREENSHOT)

THE SCREENSHOT BELOW SHOWS THE WEATHERDB.PY FILE WAS CREATED AND IS STORED IN WINDOWS EXPLORER.

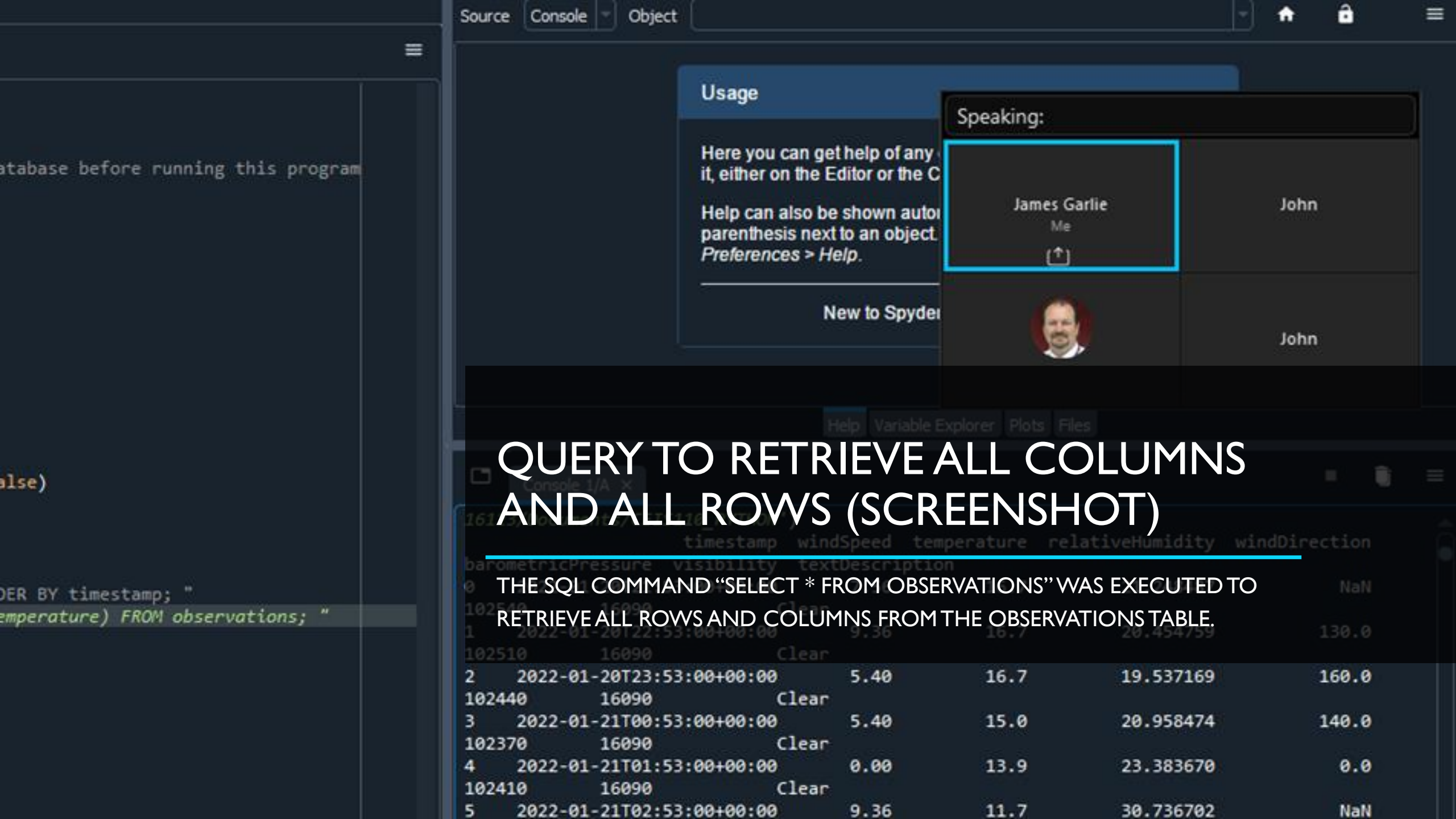
QUERYING THE DATABASE

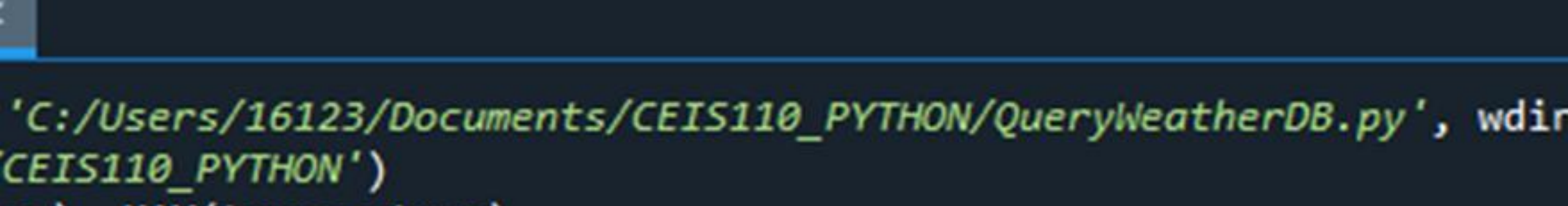
STRUCTURED QUERY LANGUAGE (SQL) IS A PROGRAMMING LANGUAGE USED FOR WORKING WITH RELATIONAL DATABASES.

SOLITESTUDIO WAS USED TO QUERY THE DATABASE AND VIEW THE RESULTS.

QUERY TO RETRIEVE ALL COLUMNS AND ALL ROWS (SCREENSHOT)

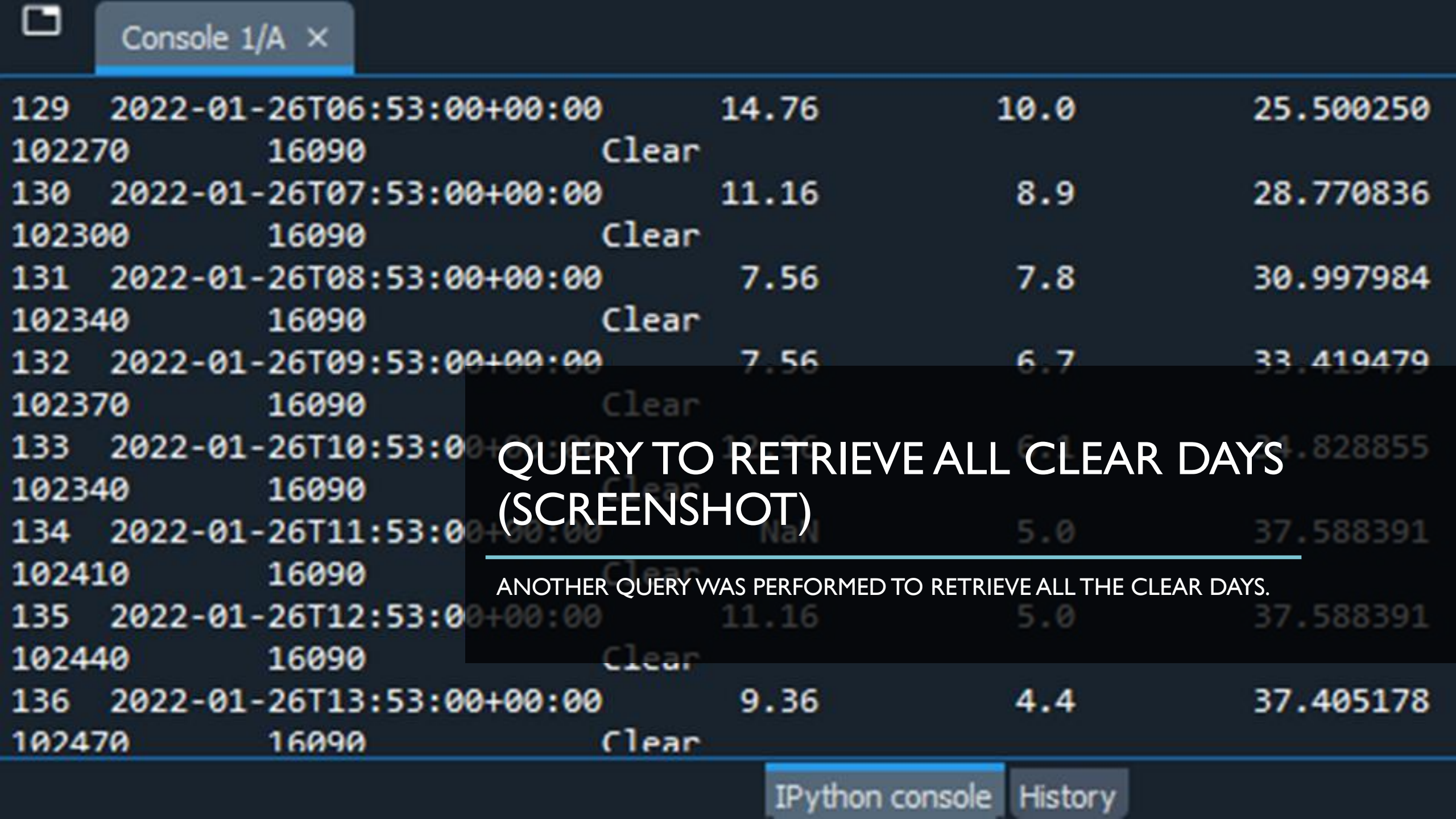
THE SQL COMMAND "SELECT * FROM OBSERVATIONS" WAS EXECUTED TO RETRIEVE ALL ROWS AND COLUMNS FROM THE OBSERVATIONS TABLE.





QUERY TO RETRIEVE LOWEST AND HIGHEST TEMPERATURES (SCREENSHOT)

THE MINIMUM AND MAXIMUM TEMPERATURES WERE RETRIEVED. THESE TEMPERATURES ARE CAPTURED BASED ON THE CELSIUS SCALE.



QUERY TO RETRIEVE ALL CLEAR DAYS (SCREENSHOT)

ANOTHER QUERY WAS PERFORMED TO RETRIEVE ALL THE CLEAR DAYS.

DATA CLEANSING

DATA OUTPUT FROM MACHINES MAY HAVE ERRORS OR EXTRANEOUS DATA. WHEN CLEANSING THE DATA, PROGRAMS CAN AUTOMATICALLY PUT IN THE FORMAT NEEDED TO BE READ BY OTHER PROGRAMS.

A PYTHON PROGRAM READING THE DATA OUTPUT BY THE PYTHON PROGRAM AND SAVING IT IN A CSV FILE SO THAT IT CAN BE READ BY EXCEL.

OFTEN DATA MUST BE CLEANSED OF SPURIOUS OR MISSING VALUES IN A DATASET. THE DATA MUST BE COMPLETE, VALID, AND STANDARDIZED.

```python
#convert Celsius temperature to Fahrenheit
def convertCtoF(tempC):
    return (tempC*9.0/5.0) + 32.0

#file names for database and output file
dbFile = "weather.db"
output_file_name='formatdata2.csv'

#connect to and query weather database and
dbFile = "weather.db"
conn = sqlite3.connect(dbFile)
#create cursor to execute SQL commands
cur = conn.cursor()
selectCmd = """ SELECT temperature, humidity FROM observations
                ORDER BY timestamp; """
cur.execute(selectCmd)
allRows = cur.fetchall()
#limit the number of rows output to half
rowCount = len(allRows)//2 # double slash does integer division
rows = allRows[rowCount:]

#write data to output file
```

EXTRACTING TEMPERATURE AND HUMIDITY USING PYTHON CODE

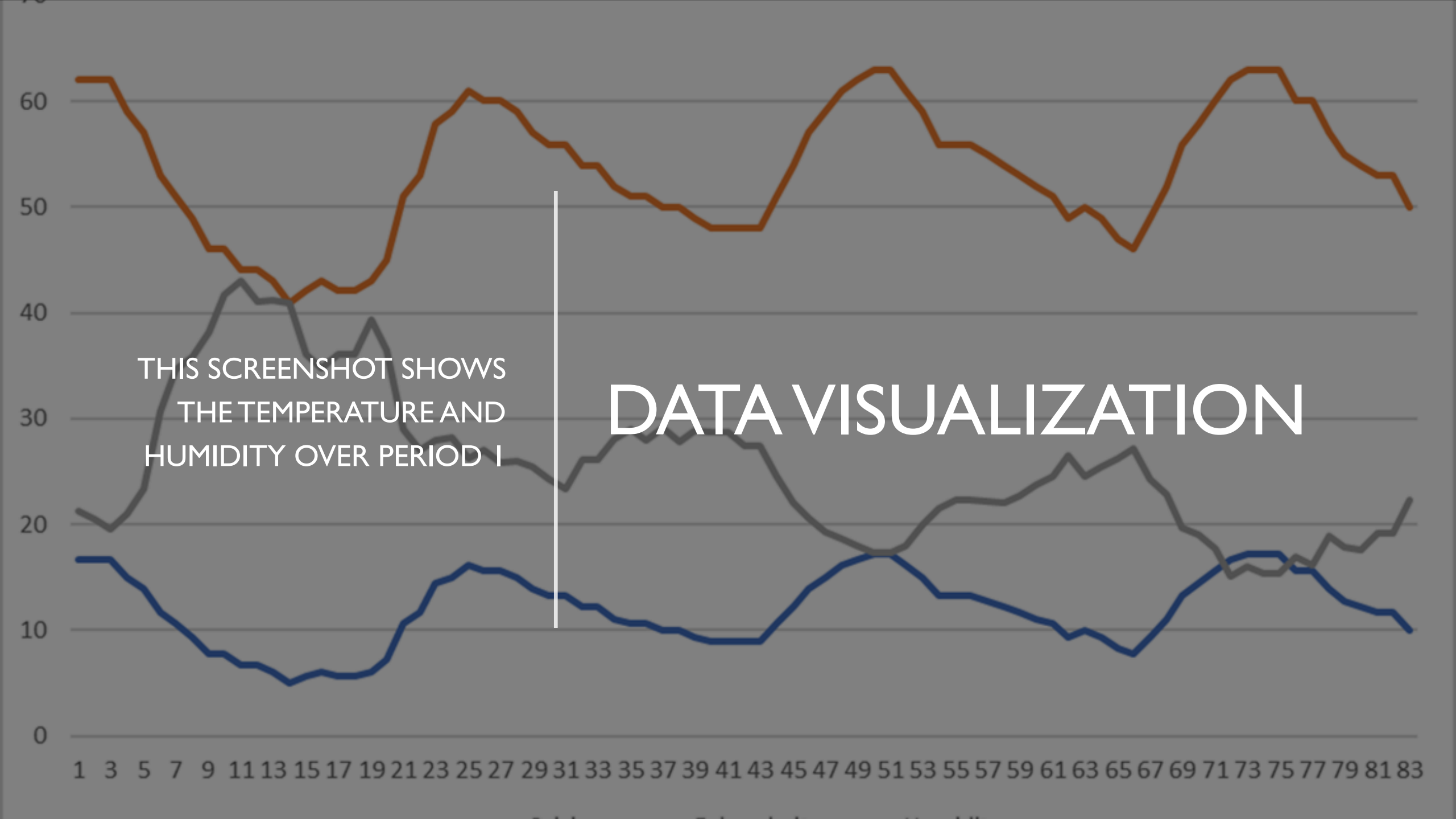
THE CODE USED RETRIEVES ONLY THE TEMPERATURE AND HUMIDITY VALUES, AND WRITES THEM TO A COMMA SEPARATED VALUES (CSV) FILE.

DATA FORMATTED IN AN EXCEL SPREADSHEET

THE PYTHON PROGRAM CREATED A FORMATDATA.CSV FILE

THIS FILE CONTAINS 3 COLUMNS: CELSIUS, FAHRENHEIT, AND HUMIDITY

STATISTICS CAN BE PERFORMED ON THIS SPREADSHEET


60
50
40
30
20
10
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83
THIS SCREENSHOT SHOWS THE TEMPERATURE AND HUMIDITY OVER PERIOD 1
DATA VISUALIZATION

DATA ANALYTICS

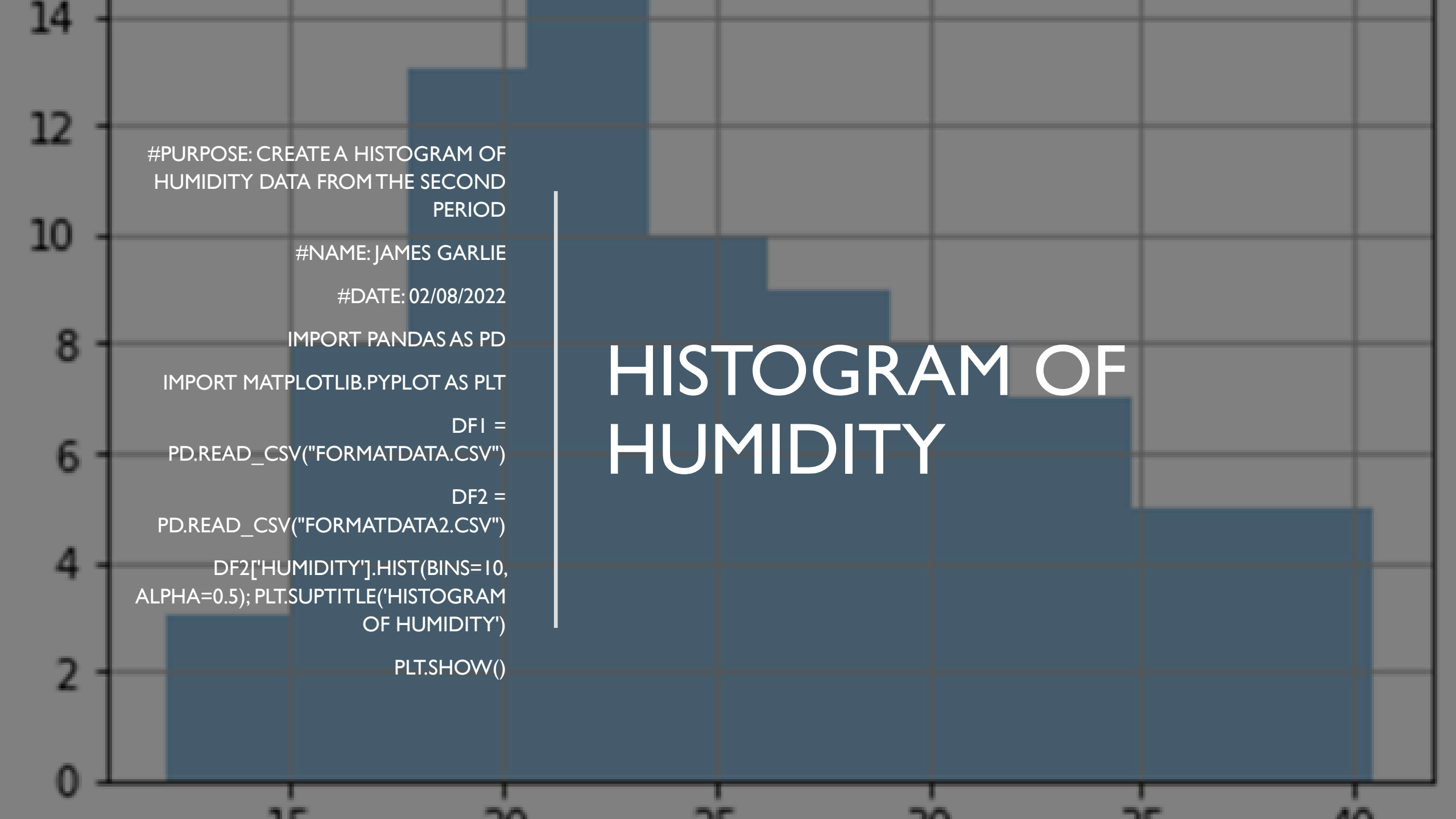
PYTHON DATA ANALYTICS MODULES ALLOW USERS TO DEVELOP CHARTS AND GRAPHS DEPICTING DATA.

THE DATA SETS ARE MANIPULATED AS WELL AND SAVED INTO TABULAR FORMAT.

THE DATA ANALYTICS MODULES ARE AVAILABLE AS PART OF ANACONDA.

SEVERAL PLOTS WERE GENERATED LOOKING AT HUMIDITY AND TEMPERATURE.

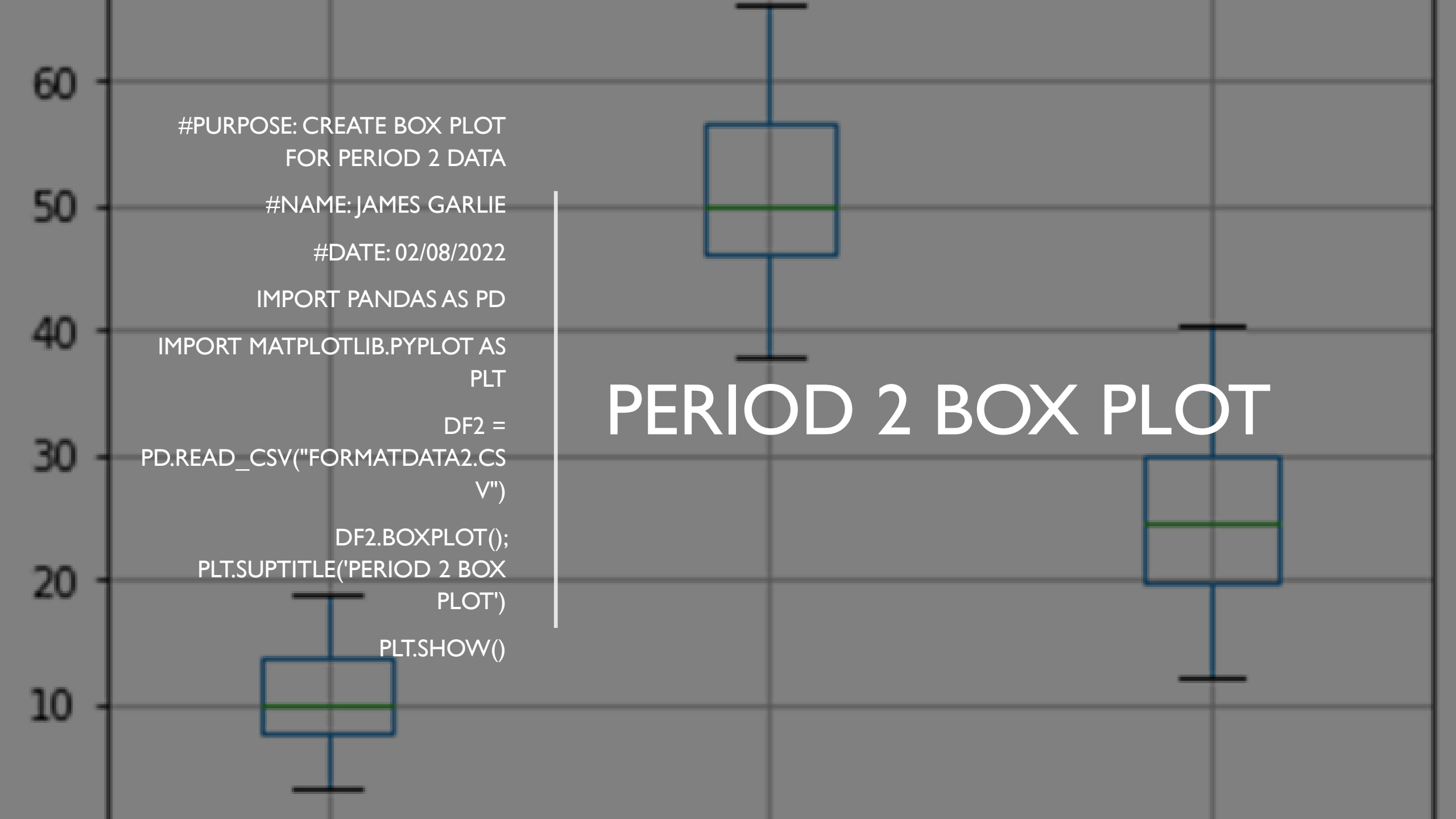
THEN A PREDICTION WAS MADE ABOUT THE DATA.




```
#PURPOSE: CREATE A HISTOGRAM OF HUMIDITY DATA FROM THE SECOND PERIOD

#NAME: JAMES GARLIE

#DATE: 02/08/2022

IMPORT PANDAS AS PD

IMPORT MATPLOTLIB.PYPLOT AS PLT

DF1 = PD.READ_CSV("FORMATDATA.CSV")

DF2 = PD.READ_CSV("FORMATDATA2.CSV")

DF2['HUMIDITY'].HIST(BINS=10, ALPHA=0.5); PLT.SUPTITLE('HISTOGRAM OF HUMIDITY')

PLT.SHOW()
```

HISTOGRAM OF HUMIDITY

```
#PURPOSE: CREATE BOX PLOT
FOR PERIOD 2 DATA

#NAME: JAMES GARLIE

#DATE: 02/08/2022

IMPORT PANDAS AS PD

IMPORT MATPLOTLIB.PYPLOT AS
PLT

DF2 =
PD.READ_CSV("FORMATDATA2.CS
V")

DF2.BOXPLOT();
PLT.SUPTITLE('PERIOD 2 BOX
PLOT')

PLT.SHOW()
```

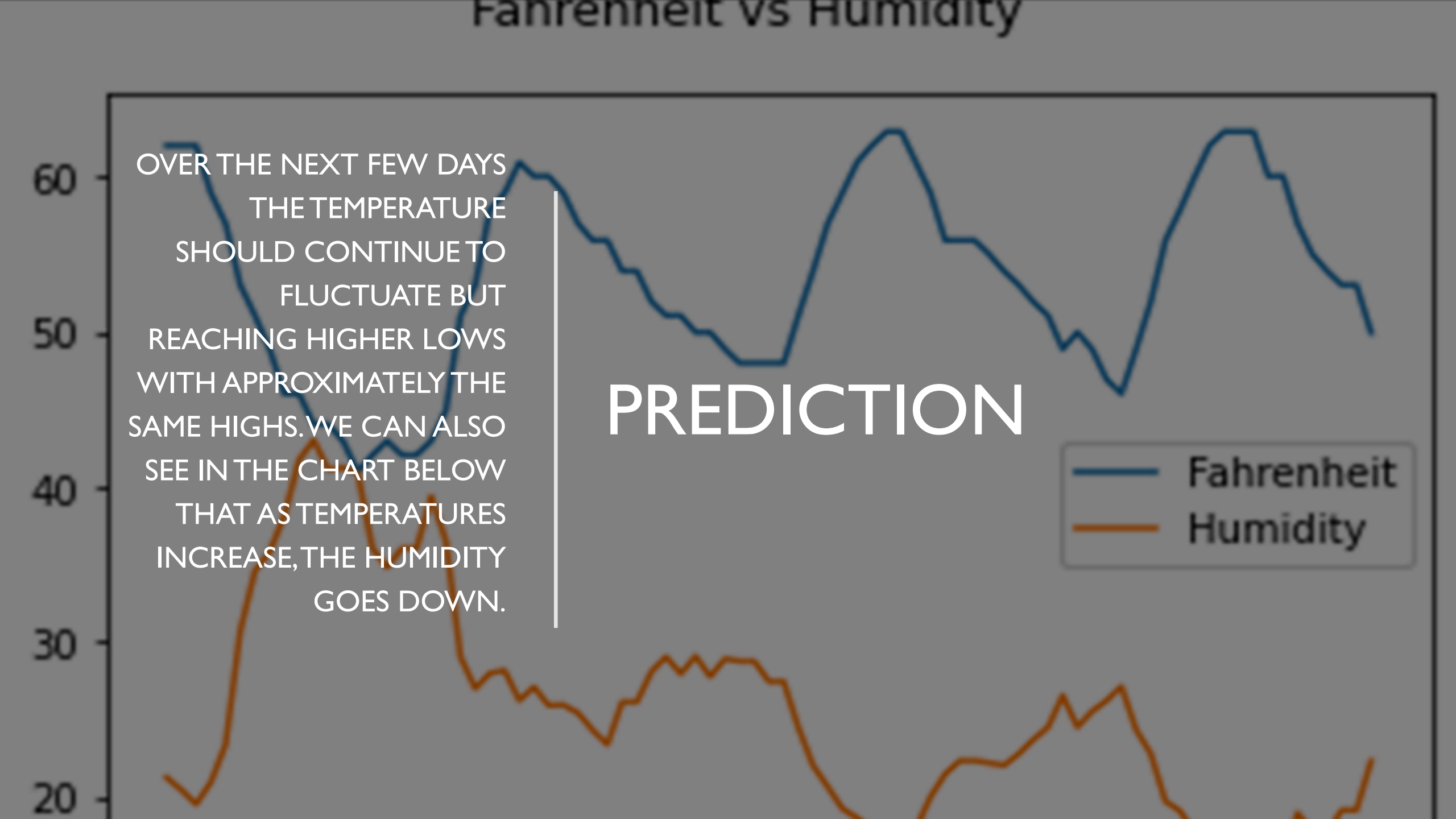


ANALYSIS

A LINE CHART SHOWING THE FLUCTUATIONS IN FAHRENHEIT FOR PERIOD 1 AND PERIOD 2.

WHAT TEMPERATURES IN FAHRENHEIT SHOW IN THE LINE GRAPH FOR THE TWO PERIODS.

THE LINE GRAPH SHOWS THE SAME FLUCTUATIONS, BUT THE TEMPERATURE HITS A HIGH OF OVER 65 DEGREES FAHRENHEIT IN PERIOD 2.


Fahrenheit Vs Humidity
60
50
40
30
20
OVER THE NEXT FEW DAYS THE TEMPERATURE SHOULD CONTINUE TO FLUCTUATE BUT REACHING HIGHER LOWS WITH APPROXIMATELY THE SAME HIGHS. WE CAN ALSO SEE IN THE CHART BELOW THAT AS TEMPERATURES INCREASE, THE HUMIDITY GOES DOWN.
PREDICTION
Fahrenheit
Humidity

CHALLENGES

WHEN CREATING THE PYTHON PROGRAM, I NEED TO RESET THE SPYDER TO PRINT THE OUTPUT.

LEARNING TO EDIT THE CODE PROPERLY TO MAKE CHANGES.

CAREER SKILLS

SEVERAL CAREER SKILLS WERE GAINED IN THIS PROJECT:

COMMUNICATION – CHARTS TO DEPICT THE PLAN OF A PROJECT

DATABASE DEVELOPMENT

PROGRAMMING USING PYTHON

TROUBLESHOOTING ERRORS IN THE CODE AND DATA CLEANSING

ANALYSIS – REVIEWING CHARTS AND GRAPHS TO MAKE PREDICTIONS ON THE DATA

CONCLUSION

THIS PROJECT COVERED FUNDAMENTAL TOPICS OF PROGRAMMING WITH DATA BY USING DATA GATHERING CLOUD SERVICE TO PERFORM DATA ANALYTICS OPERATIONS.

BUILDING THIS PROJECT PROVIDED A HANDS-ON LEARNING OPPORTUNITY TO PUT INTO PRACTICE THE TOPICS COVERED IN THIS COURSE.