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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. INTRODUCTION

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x mirror to the select ject.mirror_mirror_x" ror X"

SOFTWARE

The software need for this project includes:

Microsoft Excel

SQLite

Anaconda Navigator with Spyder



Home About Documentation Download License Support Purchase

What Is SQLite?

SQLite is a C-language library that implements a <u>small</u>, <u>fast</u>, <u>self-contained</u>, <u>high-reliability</u>, <u>full-featured</u>, SQL database engine. SQLite is the <u>most used</u> 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. <u>More Information...</u>

The SQLite <u>file format</u> is stable, cross-platform, and backwards compatible and the developers pledge to keep it that way <u>through the year 2050</u>. 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

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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.

PLANNING AND DESIGN

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 dataAnalytics modules to

develop graphical models



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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**

Ch 15 not installed. ests 2.22.0 which is incompatible. lled chardet-3.0.4 idna-2.8 noaa-sdk-0.1.19 requests-2.22.0 urllib3-1.25.11

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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.

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In Real Bar

BUILDWEATHERDB.PY CODE (SCREENSHOT)

Preparing database... Database prepared Getting weather data... Inserting rows... 164 rows inserted Database load complete!

Preparing database...

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. Console 1/A ×

ouild weather database from NOAA data #Purpose> ames Garlie 01/21/2022 https://pypi.org/project/noaa-sdk/ for details on noaa sdk package used from noaa sdk import noaa import sqlite3 import datetime # parameters for retrieving NOAA weather data zipCode = "89103" # change to your postal code country = "US" #date-time format is yyyy-mm-ddThh:mm:ssZ, times are Zulu time (GMT) #gets the most recent 14 days of data today = datetime.datetime.now() past = today - datetime.timedelta(days=14) startDate = past.strftime("%Y-%m-%dT00:00:00Z") endDate = today.strftime("%Y-%m-%dT23:59:59Z") #create connection - this creates database if not exist print("Preparing database...") dbFile = "weather.db" conn = sqlite3.connect(dbFile) #create cursor to execute SQL commands cur = conn.cursor() table if any so we start fresh each time Python 3.9.7 (default, Sep 16 2021, 16:59:28) [MSC v.1916 64 bit (AMD64)] E IF EXISTS observations;" Type "copyright", "credits" or "license" for more information. IPython 7.29.0 -- An enhanced Interactive Python. [1]: runfile('C:/Users/16123/.spyder-py3/temp.py', wdir='C:/Users/16123/.spyder-py3') [2]: runfile('C:/Users/16123/.spyder-py3/temp.py', wdir='C:/Users/16123/.spyder-py3')



THE SCREENSHOT BELOW WEATHERDB.PY FILE WAS

CREATED AND IS STORED IN WINDOWS EXPLORER.

Date modified

Jes Project SHOWSTHE LINE AVEATHER.DB FILE AM (SCREENSHOT)

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ta.objects[ne] me
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QUERYING THE DATABASE

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OPERATOR 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.

x mirror to the selecter ject.mirror_mirror_x" ror X"

Object Source Console = Usage Speaking: Here you can get help of any atabase before running this program it, either on the Editor or the C James Garlie John Help can also be shown autor Me parenthesis next to an object. Preferences > Help. (1) New to Spyder John

alse)

)ER BY timestamp; " emperature) FROM observations; "

QUERY TO RETRIEVE ALL COLUMNS

AND ALL ROWS (SCREENSHOT)

imestamp windSpeed temperature relativeHumidity windDirection

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

102	510	16090					
2	2022-01	-20T23:53:00+	00:00	5.40	16.7	19.537169	160.0
102	440	16090	Clear				
3	2022-01	-21T00:53:00+0	00:00	5.40	15.0	20.958474	140.0
102	370	16090	Clear				
4	2022-01	-21T01:53:00+0	00:00	0.00	13.9	23.383670	0.0
102	410	16090	Clear				
5	2022-01	-21T02:53:00+0	00:00	9.36	11.7	30.736702	NaN



'C:/Users/16123/Documents/CEIS110_PYTHON/QueryWeatherDB.py', wdir 'CEIS110_PYTHON')
re) MAX(temperature)
3.3 18.9

QUERY TO RETRIEVE LOWEST AND HIGHEST TEMPERATURES (SCREENSHOT)

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



129 2022-0	1-26T06:53:00	+00:00	14.76	10.0	25.500250
102270	16090	Clear			
130 2022-0	1-26T07:53:00	+00:00	11.16	8.9	28.770836
102300	16090	Clear			
131 2022-0	1-26T08:53:00	+00:00	7.56	7.8	30.997984
102340	16090	Clear			
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			IPytho	on console History	

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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.

```
#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 S
                            EXTRACTING TEMPERATURE AND
cur = conn.cursor()
                           HUMIDITY USING PYTHON CODE
selectCmd = """ SELECT temp
               ORDER BY time
cur.execute(selectCmd)
                            THE CODE USED RETRIEVES ONLY THE TEMPERATURE AND HUMIDITY
allRows = cur.fetchall()
                            VALUES, AND WRITES THEM TO A COMMA SEPARATED VALUES (CSV) FILE.
#limit the number of rows o
rowCount = len(allRows)//2 # double slash does integer division
rows = allRows[rowCount:]
```

#write data to output file

51.08 34.5922 48.92 35.82567 DATA FORMATTED IN AN EXCEL

SPREADSHEET41.76861

43.03947

41.12616

44.06

44.06

10.6

THE PYTHON PROGRAM CREATED A FORMATDATA.CSV FILE THIS FILE CONTAINS 3 COLUMNS: CELSIUS, FAHRENHEIT, AND HUMIDITY

> STATISTICS CAN BE PERFORMED ON THIS SPREADSHEET



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.

HISTOGRAM OF HUMIDITY

30

200

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

12

10

8

6

#NAME: JAMES GARLIE

#DATE: 02/08/2022

IMPORT PANDAS AS PD

IMPORT MATPLOTLIB.PYPLOT AS PLT

DFI = ____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()

30

. . .



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

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

50

45

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65

60

55

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

period

period 2

ANALYSIS

Fahrenneit vs Humidity





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

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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.