WeatherPy

June 9, 2024

1 WeatherPy

1.1 Starter Code to Generate Random Geographic Coordinates and a List of Cities

```
[1]: # Dependencies and Setup
     import matplotlib.pyplot as plt
     import pandas as pd
     import numpy as np
     import requests
     import time
     from scipy.stats import linregress
     from scipy import stats

     # Impor the OpenWeatherMap API key
     from api_keys import weather_api_key

     # Import citipy to determine the cities based on latitude and longitude
     from citipy import citipy

     # Get today's date as a string
     today = pd.Timestamp.today().strftime('%Y-%m-%d')
```

1.1.1 Generate the Cities List by Using the citipy Library

```
[2]: # Empty list for holding the latitude and longitude combinations
     lat_lngs = []

     # Empty list for holding the cities names
     cities = []

     # Range of latitudes and longitudes
     lat_range = (-90, 90)
     lng_range = (-180, 180)

     # Create a set of random lat and lng combinations
```

```python
lats = np.random.uniform(lat_range[0], lat_range[1], size=1500)
lngs = np.random.uniform(lng_range[0], lng_range[1], size=1500)
lat_lngs = zip(lats, lngs)

# Identify nearest city for each lat, lng combination
for lat_lng in lat_lngs:
    city = citipy.nearest_city(lat_lng[0], lat_lng[1]).city_name

    # If the city is unique, then add it to a our cities list
    if city not in cities:
        cities.append(city)

# Print the city count to confirm sufficient count
print(f"Number of cities in the list: {len(cities)}")

print(cities)
```

Number of cities in the list: 600
['avarua', 'port-aux-francais', 'roma', 'adamstown', 'jackson', 'dudinka',
'mount gambier', 'sitka', 'port macquarie', 'riachao das neves', 'mount isa',
'margaret river', 'bredasdorp', 'palikir - national government center', 'lihue',
'danli', 'edinburgh of the seven seas', 'puerto san carlos', 'invercargill',
'talnakh', 'choyr', 'isafjordur', 'chonchi', 'puerto natales', 'port-saint-
louis-du-rhone', 'santa elena de uairen', 'valparaiso', 'grytviken', 'beyneu',
'waitangi', 'colonia', 'andkhoy', 'shetpe', 'richards bay', 'port elizabeth',
'ust-nera', 'miri', 'dunda', 'dharmavaram', 'glace bay', 'port mathurin',
'borogontsy', 'utrik', 'bethel', 'tucumcari', 'college', 'chania',
'warrnambool', 'qurayyat', 'lerwick', 'vilyuchinsk', "'ohonua", "hayma'",
'greymouth', 'matsue', 'carloforte', 'yellowknife', 'lamu', 'taoudenni',
'aripuana', 'puerto aysen', 'beipiao', 'magadan', 'anadyr', 'hithadhoo',
'tongchuanshi', 'pacasmayo', 'iqaluit', 'tiksi', 'tamandare', 'saldanha', 'atafu
village', "st. john's", "verkhneural'sk", 'tolanaro', 'wailua homesteads', 'tres
lagoas', 'malango', 'bechar', 'hamilton', 'westport', 'west island', 'prachuap
khiri khan', 'blackmans bay', 'bartolome maso', 'shingu', 'cabo san lucas',
'twentynine palms', 'mejit', 'fauske', 'idri', 'polyarnyy', 'gadzhiyevo',
'santana', 'mincivan', 'thompson', 'constantia', 'rio preto da eva',
'ridgecrest', 'santiago de cao', 'kavieng', 'bogor', 'albany', 'revda', 'de
witt', 'punta arenas', 'vila franca do campo', 'faya-largeau', 'trelissac',
'ploneour-lanvern', 'taiohae', 'stanley', 'kodiak', 'puerto ayora', 'ushuaia',
'kone', 'nova vicosa', 'yorkton', 'qaqortoq', 'santa barbara', 'enewetak',
'markovci', 'fukuecho', 'thunder bay', 'hermanus', 'mossel bay', 'namibe',
'papatowai', 'tsimasham', 'as sulayyil', 'sumbe', 'new norfolk', 'hawaiian
paradise park', 'rio pardo', 'hun', 'saint-arnoult-en-yvelines', 'berezovyy',
'saipan', 'novodvinsk', 'tokmok', 'sinabang', 'bardai', 'schweizer-reneke',
'gamay', 'banda aceh', 'mili', 'areka', 'mata-utu', 'jamestown', 'bodaybo',
'rechytsa', 'kunashak', 'aykhal', 'tura', 'constitucion', 'lagoa', 'fale old
settlement', 'vadso', 'natchitoches', 'smirnykh', 'amahai', 'lata', 'twon-
brass', 'mersa matruh', 'zavetnoye', 'lisieux', 'ajdabiya', 'sinan', 'toga

village', 'tiszaalpar', 'kaliganj', 'langepas', 'south hedland', 'cedartown', 'nemuro', 'rabaul', 'port lincoln', 'al hazm', 'jiwani', 'san carlos de bariloche', 'red hill', 'manokwari', 'port alfred', 'moyale', 'longyearbyen', 'nyaungdon', 'pa sang', 'boyolangu', 'georgetown', 'itoman', 'weno', 'paka', 'keflavik', 'talcahuano', 'zhangye', 'remire-montjoly', 'olonkinbyen', 'semnan', 'tongliao', 'ellsworth', 'bobo-dioulasso', 'crestview', 'zhanaozen', 'baardheere', 'carnarvon', 'quellon', 'grand falls-windsor', 'phrai bueng', 'santa marta de ortigueira', 'hobyo', 'zhigalovo', "kapa'a", 'uvalde', 'mar del plata', 'kill devil hills', 'javea', 'ribeira grande', 'bilibino', 'ukata', 'lushun', 'tachilek', 'margate', 'viedma', 'altay', 'puerto colombia', 'iskateley', 'mega', 'luganville', 'muynoq', 'san patricio', 'calbuco', 'tukrah', 'dalbandin', 'luderitz', 'veinticinco de mayo', 'ilulissat', 'phalaborwa', 'inhambane', 'kenai', 'luwuk', 'chos malal', 'vorgashor', 'tanjung pandan', 'katsuura', 'burutu', 'childress', 'yuzhno-kurilsk', 'kiunga', 'nikolayevsk-on-amure', 'corinto', 'lebu', 'whitehorse', 'nasiriyah', 'udachny', 'okha', 'ahau', 'morehead city', 'dayr al balah', 'khandyga', 'copiapo', 'beas de segura', 'arraial do cabo', 'menongue', 'yanji', 'asau village', 'kamiiso', 'hammerfest', 'inirida', 'maun', 'bhag', 'lagos', 'nadym', 'mareeba', 'fort bragg', 'walvis bay', 'pacific grove', 'tralee', 'los osos', 'afaahiti', 'naze', 'meadow lake', 'victorica', 'tropea', 'ayaguz', 'labasa', 'santa cruz', 'kampene', 'kipushi', "nuku'alofa", 'seogwipo', 'eagle point', 'mutuali', 'astaneh-ye ashrafiyeh', "saint david's", 'hasaki', 'cole harbour', 'fortuna', 'chikwawa', 'sydney mines', 'rufino', 'surgana', 'sotouboua', 'vallenar', 'okhotsk', 'portland', 'kerikeri', 'port moresby', 'hinche', 'al jubayl', 'henderson', 'andergrove', 'vingt cinq', 'chardara', 'mongu', 'sanming', 'mogocha', 'yagry', 'porto novo', 'egilsstadir', 'chalus', 'constantina', 'sittwe', 'maitum', 'gornopravdinsk', 'aasiaat', 'antsiranana', 'taltal', 'jianshui', 'salahonda', 'north bend', "arkhangel'sk", 'kirakira', 'dalandzadgad', 'niafunke', 'machico', 'kalabo', 'sima', 'san luis de la loma', 'susuman', 'kalmunai', 'moussoro', 'el calafate', 'codrington', "satupa'itea", 'angaur state', 'al ghayzah', 'santa rosalia', 'asau', 'katsuren-haebaru', 'vilyuysk', 'ordos', 'chynadiyovo', 'ventnor', 'bovalino', 'radford', 'paranaiba', 'ciudad bolivar', 'eremo', 'guiria', 'ulsteinvik', 'sosnovoborsk', 'heinola', 'crane', 'tamanrasset', 'mersing', 'alice springs', 'lospalos', 'hirara', 'christchurch', 'kapuskasing', 'fort mcmurray', 'prince george', 'zvishavane', 'tofol', 'turtas', 'kitui', 'kajaani', 'puerto baquerizo moreno', 'simanggang', 'heber springs', 'kievka', 'wenling', 'forster', 'thoen', 'laojunmiao', 'saint-philippe', 'nam som', "l'isle-jourdain", 'kingston', 'nova sintra', 'el granada', 'queenstown', 'luanco', "'izbat al burj", 'uturoa', 'puerto lempira', 'aldinga beach', 'kankauli', 'nowshahr', 'ko pha ngan', 'kulia village', 'tuburan', 'east london', 'gavrilov posad', 'kulhudhuffushi', 'mogadishu', 'tosontsengel', 'fort st. john', 'leninskoye', 'srikakulam', 'akureyri', 'mbarara', 'sandnessjoen', 'lumphat', 'murakami', 'huocheng', 'novoishimskiy', "la'ie", 'touros', 'la ronge', 'pirallahi', 'benguela', 'yaren', 'mangrol', 'belmonte', 'petropavlovsk-kamchatsky', 'villa gesell', 'al bawiti', 'mala bilozerka', 'karyes', 'qarqaraly', 'hotan', 'fisterra', 'zachary', 'bushehr', 'goz beida', 'sucre', 'curitibanos', 'vila velha', 'shahrud', 'ljusdal', 'nadi', 'abdulino', 'sarangani', 'muli', 'tres arroyos',

```
'ukiah', 'nogliki', 'lazaro cardenas', 'acapulco de juarez', 'kargasok',
'cockburn town', 'aipe', 'zhob', 'digras', 'saint-francois', 'howrah',
'kostomuksha', 'konigsbronn', 'ishigaki', 'freetown', 'rio gallegos',
'hancheng', 'argo', 'anaconda', 'newman', 'huaraz', 'beja', 'asubulaq',
'acajutla', 'kailua-kona', 'ancud', 'brisas de zicatela', 'nouadhibou', 'i-n-
salah', 'redencao', 'shakawe', 'la quiaca', 'barra do garcas', 'heroica ciudad
de tlaxiaco', 'chiili', 'birjand', 'george town', 'cidreira', 'betio village',
'bel ombre', 'wanning', 'pangoa', 'sapucaia', 'al qadarif', 'zarand',
'riberalta', 'kindu', 'kuta', 'murashi', 'nova russas', 'quelimane',
'enriquillo', 'woolgoolga', 'tak', 'floro', 'praia da vitoria', 'mesquite',
'piti village', 'katima mulilo', 'caleta de carquin', 'bandarbeyla',
'ostersund', 'douz', 'gazojak', 'sainte-rose', 'port glaud', 'bubaque',
'balabac', 'port augusta', 'lompoc', 'ust-tsilma', 'aransas pass', 'hami',
'weyburn', 'borazjan', 'narimanov', "ust'-ordynskiy", 'carmi', 'ola', 'sanibel',
'bandar-e lengeh', 'huarmey', 'fuvahmulah', 'geraldton', 'svay rieng', 'abra
pampa', 'yigo village', 'fuglafjordur', 'karamay', 'yarkovo', 'san andres',
'we', 'port arthur', 'maumere', 'samarinda', 'khabarovsk', 'cluain meala',
'januaria', 'as saffaniyah', 'robertsport', 'shimoda', 'la passe', 'tamiahua',
'raigarh', 'puerto esperanza', 'tevriz', 'banamba', 'klyuchi', 'haiku-pauwela',
'karanpur', 'cannonvale', 'vorkuta', 'guskhara', 'machakos', 'barcelos', 'mount
pearl', 'ulladulla', 'kimbe', 'sisimiut', 'bamboo flat', 'nizhnesortymskiy',
'sur', 'santo antonio do ica', 'newcastle', 'zaranj', 'gaomi', 'onokhoy',
'dara', 'vyksa', "mil'kovo", 'alofi', 'nizhneudinsk', 'mirnyy', 'lensk',
'knysna', 'verkhnevilyuysk', 'alaghsas', 'ceeldheer', 'al kharj', 'pisco',
'riverton', 'tsengel', 'paita', "al 'alamayn", 'ritchie', 'mukalla', 'obihiro',
'sola', 'bulgan', 'ras gharib', 'berdigestyakh', 'chibougamau', 'hilo',
'noumea']
```

1.2   Requirement 1:   Create Plots to Showcase the Relationship Between Weather Variables and Latitude

1.2.1   Use the OpenWeatherMap API to retrieve weather data from the cities list generated in the started code

```
[3]:  # Set the API base URL
      url = "http://api.openweathermap.org/data/2.5/weather?"



      # Define an empty list to fetch the weather data for each city
      city_data = []

      # Print to logger
      print("Beginning Data Retrieval     ")
      print("-----------------------------")

      # Create counters
```

```python
record_count = 1
set_count = 1

# Loop through all the cities in our list to fetch weather data
for i, city in enumerate(cities):

    # Group cities in sets of 50 for logging purposes
    if (i % 50 == 0 and i >= 50):
        set_count += 1
        record_count = 0

    # Create endpoint URL with each city
    city_url = f"{url}appid={weather_api_key}&units=metric&q={city}"

    #print(city_url)

    # Get city weather response
    city_response = requests.get(city_url)
    #print(city_response)


    # Log the url, record, and set numbers
    print("Processing Record %s of Set %s | %s" % (record_count, set_count,
↪city))

    # Add 1 to the record count
    record_count += 1

    # Run an API request for each of the cities
    try:
        # Parse the JSON and retrieve data
        city_weather = requests.get(city_url).json()

        # Parse out latitude, longitude, max temp, humidity, cloudiness, wind
↪speed, country, and date
        city_lat = city_weather['coord']['lat']
        city_lng = city_weather['coord']['lon']
        city_max_temp = city_weather['main']['temp_max']
        city_humidity = city_weather['main']['humidity']
        city_clouds = city_weather['clouds']['all']
        city_wind = city_weather['wind']['speed']
        city_country = city_weather['sys']['country']
        city_date_unformatted = city_weather['dt']
        city_date_struct = time.localtime(city_date_unformatted) # Raw format
↪for the api call
        city_date = time.strftime('%Y-%m-%d', city_date_struct) # Formatted so
↪readable to humans
```

```python
        # Append the City information into city_data list
        city_data.append({"City": city,
                          "Lat": city_lat,
                          "Lng": city_lng,
                          "Max Temp": city_max_temp,
                          "Humidity": city_humidity,
                          "Cloudiness": city_clouds,
                          "Wind Speed": city_wind,
                          "Country": city_country,
                          "Date": city_date})

    # If an error is experienced, skip the city
    except:
        print("City not found. Skipping...")
    pass


# Indicate that Data Loading is complete
print("-----------------------------")
print("Data Retrieval Complete      ")
print("-----------------------------")
```

```
Beginning Data Retrieval
-----------------------------
Processing Record 1 of Set 1 | avarua
Processing Record 2 of Set 1 | port-aux-francais
Processing Record 3 of Set 1 | roma
Processing Record 4 of Set 1 | adamstown
Processing Record 5 of Set 1 | jackson
Processing Record 6 of Set 1 | dudinka
Processing Record 7 of Set 1 | mount gambier
Processing Record 8 of Set 1 | sitka
Processing Record 9 of Set 1 | port macquarie
Processing Record 10 of Set 1 | riachao das neves
Processing Record 11 of Set 1 | mount isa
Processing Record 12 of Set 1 | margaret river
Processing Record 13 of Set 1 | bredasdorp
Processing Record 14 of Set 1 | palikir - national government center
Processing Record 15 of Set 1 | lihue
Processing Record 16 of Set 1 | danli
Processing Record 17 of Set 1 | edinburgh of the seven seas
Processing Record 18 of Set 1 | puerto san carlos
City not found. Skipping…
Processing Record 19 of Set 1 | invercargill
Processing Record 20 of Set 1 | talnakh
Processing Record 21 of Set 1 | choyr
Processing Record 22 of Set 1 | isafjordur
```

```
Processing Record 23 of Set 1 | chonchi
Processing Record 24 of Set 1 | puerto natales
Processing Record 25 of Set 1 | port-saint-louis-du-rhone
Processing Record 26 of Set 1 | santa elena de uairen
Processing Record 27 of Set 1 | valparaiso
Processing Record 28 of Set 1 | grytviken
Processing Record 29 of Set 1 | beyneu
Processing Record 30 of Set 1 | waitangi
Processing Record 31 of Set 1 | colonia
Processing Record 32 of Set 1 | andkhoy
Processing Record 33 of Set 1 | shetpe
Processing Record 34 of Set 1 | richards bay
Processing Record 35 of Set 1 | port elizabeth
Processing Record 36 of Set 1 | ust-nera
Processing Record 37 of Set 1 | miri
Processing Record 38 of Set 1 | dunda
Processing Record 39 of Set 1 | dharmavaram
Processing Record 40 of Set 1 | glace bay
Processing Record 41 of Set 1 | port mathurin
Processing Record 42 of Set 1 | borogontsy
Processing Record 43 of Set 1 | utrik
Processing Record 44 of Set 1 | bethel
Processing Record 45 of Set 1 | tucumcari
Processing Record 46 of Set 1 | college
Processing Record 47 of Set 1 | chania
Processing Record 48 of Set 1 | warrnambool
Processing Record 49 of Set 1 | qurayyat
Processing Record 50 of Set 1 | lerwick
Processing Record 0 of Set 2 | vilyuchinsk
Processing Record 1 of Set 2 | 'ohonua
City not found. Skipping…
Processing Record 2 of Set 2 | hayma'
City not found. Skipping…
Processing Record 3 of Set 2 | greymouth
Processing Record 4 of Set 2 | matsue
Processing Record 5 of Set 2 | carloforte
Processing Record 6 of Set 2 | yellowknife
Processing Record 7 of Set 2 | lamu
Processing Record 8 of Set 2 | taoudenni
Processing Record 9 of Set 2 | aripuana
Processing Record 10 of Set 2 | puerto aysen
Processing Record 11 of Set 2 | beipiao
Processing Record 12 of Set 2 | magadan
Processing Record 13 of Set 2 | anadyr
Processing Record 14 of Set 2 | hithadhoo
Processing Record 15 of Set 2 | tongchuanshi
Processing Record 16 of Set 2 | pacasmayo
Processing Record 17 of Set 2 | iqaluit
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Processing Record 18 of Set 2 | tiksi
Processing Record 19 of Set 2 | tamandare
Processing Record 20 of Set 2 | saldanha
Processing Record 21 of Set 2 | atafu village
Processing Record 22 of Set 2 | st. john's
Processing Record 23 of Set 2 | verkhneural'sk
Processing Record 24 of Set 2 | tolanaro
Processing Record 25 of Set 2 | wailua homesteads
Processing Record 26 of Set 2 | tres lagoas
Processing Record 27 of Set 2 | malango
Processing Record 28 of Set 2 | bechar
Processing Record 29 of Set 2 | hamilton
Processing Record 30 of Set 2 | westport
Processing Record 31 of Set 2 | west island
Processing Record 32 of Set 2 | prachuap khiri khan
Processing Record 33 of Set 2 | blackmans bay
Processing Record 34 of Set 2 | bartolome maso
City not found. Skipping…
Processing Record 35 of Set 2 | shingu
Processing Record 36 of Set 2 | cabo san lucas
Processing Record 37 of Set 2 | twentynine palms
Processing Record 38 of Set 2 | mejit
Processing Record 39 of Set 2 | fauske
Processing Record 40 of Set 2 | idri
Processing Record 41 of Set 2 | polyarnyy
Processing Record 42 of Set 2 | gadzhiyevo
Processing Record 43 of Set 2 | santana
Processing Record 44 of Set 2 | mincivan
Processing Record 45 of Set 2 | thompson
Processing Record 46 of Set 2 | constantia
Processing Record 47 of Set 2 | rio preto da eva
Processing Record 48 of Set 2 | ridgecrest
Processing Record 49 of Set 2 | santiago de cao
Processing Record 0 of Set 3 | kavieng
Processing Record 1 of Set 3 | bogor
Processing Record 2 of Set 3 | albany
Processing Record 3 of Set 3 | revda
Processing Record 4 of Set 3 | de witt
Processing Record 5 of Set 3 | punta arenas
Processing Record 6 of Set 3 | vila franca do campo
Processing Record 7 of Set 3 | faya-largeau
Processing Record 8 of Set 3 | trelissac
Processing Record 9 of Set 3 | ploneour-lanvern
Processing Record 10 of Set 3 | taiohae
City not found. Skipping…
Processing Record 11 of Set 3 | stanley
Processing Record 12 of Set 3 | kodiak
Processing Record 13 of Set 3 | puerto ayora
```

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Processing Record 14 of Set 3 | ushuaia
Processing Record 15 of Set 3 | kone
Processing Record 16 of Set 3 | nova vicosa
Processing Record 17 of Set 3 | yorkton
Processing Record 18 of Set 3 | qaqortoq
Processing Record 19 of Set 3 | santa barbara
Processing Record 20 of Set 3 | enewetak
Processing Record 21 of Set 3 | markovci
Processing Record 22 of Set 3 | fukuecho
Processing Record 23 of Set 3 | thunder bay
Processing Record 24 of Set 3 | hermanus
Processing Record 25 of Set 3 | mossel bay
Processing Record 26 of Set 3 | namibe
Processing Record 27 of Set 3 | papatowai
Processing Record 28 of Set 3 | tsimasham
Processing Record 29 of Set 3 | as sulayyil
Processing Record 30 of Set 3 | sumbe
Processing Record 31 of Set 3 | new norfolk
Processing Record 32 of Set 3 | hawaiian paradise park
Processing Record 33 of Set 3 | rio pardo
Processing Record 34 of Set 3 | hun
Processing Record 35 of Set 3 | saint-arnoult-en-yvelines
Processing Record 36 of Set 3 | berezovyy
Processing Record 37 of Set 3 | saipan
Processing Record 38 of Set 3 | novodvinsk
Processing Record 39 of Set 3 | tokmok
Processing Record 40 of Set 3 | sinabang
Processing Record 41 of Set 3 | bardai
Processing Record 42 of Set 3 | schweizer-reneke
Processing Record 43 of Set 3 | gamay
Processing Record 44 of Set 3 | banda aceh
Processing Record 45 of Set 3 | mili
Processing Record 46 of Set 3 | areka
Processing Record 47 of Set 3 | mata-utu
Processing Record 48 of Set 3 | jamestown
Processing Record 49 of Set 3 | bodaybo
Processing Record 0 of Set 4 | rechytsa
Processing Record 1 of Set 4 | kunashak
Processing Record 2 of Set 4 | aykhal
Processing Record 3 of Set 4 | tura
Processing Record 4 of Set 4 | constitucion
Processing Record 5 of Set 4 | lagoa
Processing Record 6 of Set 4 | fale old settlement
Processing Record 7 of Set 4 | vadso
Processing Record 8 of Set 4 | natchitoches
Processing Record 9 of Set 4 | smirnykh
Processing Record 10 of Set 4 | amahai
Processing Record 11 of Set 4 | lata
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Processing Record 12 of Set 4 | twon-brass
Processing Record 13 of Set 4 | mersa matruh
Processing Record 14 of Set 4 | zavetnoye
Processing Record 15 of Set 4 | lisieux
Processing Record 16 of Set 4 | ajdabiya
Processing Record 17 of Set 4 | sinan
Processing Record 18 of Set 4 | toga village
City not found. Skipping…
Processing Record 19 of Set 4 | tiszaalpar
Processing Record 20 of Set 4 | kaliganj
Processing Record 21 of Set 4 | langepas
Processing Record 22 of Set 4 | south hedland
Processing Record 23 of Set 4 | cedartown
Processing Record 24 of Set 4 | nemuro
Processing Record 25 of Set 4 | rabaul
Processing Record 26 of Set 4 | port lincoln
Processing Record 27 of Set 4 | al hazm
Processing Record 28 of Set 4 | jiwani
Processing Record 29 of Set 4 | san carlos de bariloche
Processing Record 30 of Set 4 | red hill
Processing Record 31 of Set 4 | manokwari
Processing Record 32 of Set 4 | port alfred
Processing Record 33 of Set 4 | moyale
Processing Record 34 of Set 4 | longyearbyen
Processing Record 35 of Set 4 | nyaungdon
Processing Record 36 of Set 4 | pa sang
Processing Record 37 of Set 4 | boyolangu
Processing Record 38 of Set 4 | georgetown
Processing Record 39 of Set 4 | itoman
Processing Record 40 of Set 4 | weno
Processing Record 41 of Set 4 | paka
Processing Record 42 of Set 4 | keflavik
Processing Record 43 of Set 4 | talcahuano
Processing Record 44 of Set 4 | zhangye
Processing Record 45 of Set 4 | remire-montjoly
Processing Record 46 of Set 4 | olonkinbyen
Processing Record 47 of Set 4 | semnan
Processing Record 48 of Set 4 | tongliao
Processing Record 49 of Set 4 | ellsworth
Processing Record 0 of Set 5 | bobo-dioulasso
Processing Record 1 of Set 5 | crestview
Processing Record 2 of Set 5 | zhanaozen
Processing Record 3 of Set 5 | baardheere
Processing Record 4 of Set 5 | carnarvon
Processing Record 5 of Set 5 | quellon
Processing Record 6 of Set 5 | grand falls-windsor
Processing Record 7 of Set 5 | phrai bueng
Processing Record 8 of Set 5 | santa marta de ortigueira
```

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Processing Record 9 of Set 5 | hobyo
Processing Record 10 of Set 5 | zhigalovo
Processing Record 11 of Set 5 | kapa'a
Processing Record 12 of Set 5 | uvalde
Processing Record 13 of Set 5 | mar del plata
Processing Record 14 of Set 5 | kill devil hills
Processing Record 15 of Set 5 | javea
Processing Record 16 of Set 5 | ribeira grande
Processing Record 17 of Set 5 | bilibino
Processing Record 18 of Set 5 | ukata
Processing Record 19 of Set 5 | lushun
Processing Record 20 of Set 5 | tachilek
City not found. Skipping…
Processing Record 21 of Set 5 | margate
Processing Record 22 of Set 5 | viedma
Processing Record 23 of Set 5 | altay
Processing Record 24 of Set 5 | puerto colombia
Processing Record 25 of Set 5 | iskateley
Processing Record 26 of Set 5 | mega
Processing Record 27 of Set 5 | luganville
Processing Record 28 of Set 5 | muynoq
Processing Record 29 of Set 5 | san patricio
Processing Record 30 of Set 5 | calbuco
Processing Record 31 of Set 5 | tukrah
Processing Record 32 of Set 5 | dalbandin
Processing Record 33 of Set 5 | luderitz
Processing Record 34 of Set 5 | veinticinco de mayo
Processing Record 35 of Set 5 | ilulissat
Processing Record 36 of Set 5 | phalaborwa
Processing Record 37 of Set 5 | inhambane
Processing Record 38 of Set 5 | kenai
Processing Record 39 of Set 5 | luwuk
Processing Record 40 of Set 5 | chos malal
Processing Record 41 of Set 5 | vorgashor
Processing Record 42 of Set 5 | tanjung pandan
Processing Record 43 of Set 5 | katsuura
Processing Record 44 of Set 5 | burutu
Processing Record 45 of Set 5 | childress
Processing Record 46 of Set 5 | yuzhno-kurilsk
Processing Record 47 of Set 5 | kiunga
Processing Record 48 of Set 5 | nikolayevsk-on-amure
Processing Record 49 of Set 5 | corinto
Processing Record 0 of Set 6 | lebu
Processing Record 1 of Set 6 | whitehorse
Processing Record 2 of Set 6 | nasiriyah
Processing Record 3 of Set 6 | udachny
Processing Record 4 of Set 6 | okha
Processing Record 5 of Set 6 | ahau
```

```
City not found. Skipping…
Processing Record 6 of Set 6 | morehead city
Processing Record 7 of Set 6 | dayr al balah
Processing Record 8 of Set 6 | khandyga
Processing Record 9 of Set 6 | copiapo
Processing Record 10 of Set 6 | beas de segura
Processing Record 11 of Set 6 | arraial do cabo
Processing Record 12 of Set 6 | menongue
Processing Record 13 of Set 6 | yanji
Processing Record 14 of Set 6 | asau village
City not found. Skipping…
Processing Record 15 of Set 6 | kamiiso
Processing Record 16 of Set 6 | hammerfest
Processing Record 17 of Set 6 | inirida
Processing Record 18 of Set 6 | maun
Processing Record 19 of Set 6 | bhag
Processing Record 20 of Set 6 | lagos
Processing Record 21 of Set 6 | nadym
Processing Record 22 of Set 6 | mareeba
Processing Record 23 of Set 6 | fort bragg
Processing Record 24 of Set 6 | walvis bay
Processing Record 25 of Set 6 | pacific grove
Processing Record 26 of Set 6 | tralee
Processing Record 27 of Set 6 | los osos
Processing Record 28 of Set 6 | afaahiti
Processing Record 29 of Set 6 | naze
Processing Record 30 of Set 6 | meadow lake
Processing Record 31 of Set 6 | victorica
Processing Record 32 of Set 6 | tropea
Processing Record 33 of Set 6 | ayaguz
City not found. Skipping…
Processing Record 34 of Set 6 | labasa
Processing Record 35 of Set 6 | santa cruz
Processing Record 36 of Set 6 | kampene
Processing Record 37 of Set 6 | kipushi
Processing Record 38 of Set 6 | nuku'alofa
Processing Record 39 of Set 6 | seogwipo
City not found. Skipping…
Processing Record 40 of Set 6 | eagle point
Processing Record 41 of Set 6 | mutuali
Processing Record 42 of Set 6 | astaneh-ye ashrafiyeh
Processing Record 43 of Set 6 | saint david's
Processing Record 44 of Set 6 | hasaki
Processing Record 45 of Set 6 | cole harbour
Processing Record 46 of Set 6 | fortuna
Processing Record 47 of Set 6 | chikwawa
Processing Record 48 of Set 6 | sydney mines
Processing Record 49 of Set 6 | rufino
```

```
Processing Record 0 of Set 7 | surgana
Processing Record 1 of Set 7 | sotouboua
Processing Record 2 of Set 7 | vallenar
Processing Record 3 of Set 7 | okhotsk
Processing Record 4 of Set 7 | portland
Processing Record 5 of Set 7 | kerikeri
Processing Record 6 of Set 7 | port moresby
Processing Record 7 of Set 7 | hinche
Processing Record 8 of Set 7 | al jubayl
Processing Record 9 of Set 7 | henderson
Processing Record 10 of Set 7 | andergrove
Processing Record 11 of Set 7 | vingt cinq
City not found. Skipping…
Processing Record 12 of Set 7 | chardara
Processing Record 13 of Set 7 | mongu
Processing Record 14 of Set 7 | sanming
Processing Record 15 of Set 7 | mogocha
Processing Record 16 of Set 7 | yagry
City not found. Skipping…
Processing Record 17 of Set 7 | porto novo
Processing Record 18 of Set 7 | egilsstadir
Processing Record 19 of Set 7 | chalus
Processing Record 20 of Set 7 | constantina
Processing Record 21 of Set 7 | sittwe
Processing Record 22 of Set 7 | maitum
Processing Record 23 of Set 7 | gornopravdinsk
Processing Record 24 of Set 7 | aasiaat
Processing Record 25 of Set 7 | antsiranana
Processing Record 26 of Set 7 | taltal
Processing Record 27 of Set 7 | jianshui
Processing Record 28 of Set 7 | salahonda
Processing Record 29 of Set 7 | north bend
Processing Record 30 of Set 7 | arkhangel'sk
Processing Record 31 of Set 7 | kirakira
Processing Record 32 of Set 7 | dalandzadgad
Processing Record 33 of Set 7 | niafunke
Processing Record 34 of Set 7 | machico
Processing Record 35 of Set 7 | kalabo
Processing Record 36 of Set 7 | sima
Processing Record 37 of Set 7 | san luis de la loma
Processing Record 38 of Set 7 | susuman
Processing Record 39 of Set 7 | kalmunai
Processing Record 40 of Set 7 | moussoro
Processing Record 41 of Set 7 | el calafate
Processing Record 42 of Set 7 | codrington
Processing Record 43 of Set 7 | satupa'itea
City not found. Skipping…
Processing Record 44 of Set 7 | angaur state
```

```
Processing Record 45 of Set 7 | al ghayzah
Processing Record 46 of Set 7 | santa rosalia
Processing Record 47 of Set 7 | asau
Processing Record 48 of Set 7 | katsuren-haebaru
Processing Record 49 of Set 7 | vilyuysk
Processing Record 0 of Set 8 | ordos
City not found. Skipping…
Processing Record 1 of Set 8 | chynadiyovo
Processing Record 2 of Set 8 | ventnor
Processing Record 3 of Set 8 | bovalino
Processing Record 4 of Set 8 | radford
Processing Record 5 of Set 8 | paranaiba
Processing Record 6 of Set 8 | ciudad bolivar
Processing Record 7 of Set 8 | eremo
Processing Record 8 of Set 8 | guiria
City not found. Skipping…
Processing Record 9 of Set 8 | ulsteinvik
Processing Record 10 of Set 8 | sosnovoborsk
Processing Record 11 of Set 8 | heinola
Processing Record 12 of Set 8 | crane
Processing Record 13 of Set 8 | tamanrasset
Processing Record 14 of Set 8 | mersing
Processing Record 15 of Set 8 | alice springs
Processing Record 16 of Set 8 | lospalos
Processing Record 17 of Set 8 | hirara
Processing Record 18 of Set 8 | christchurch
Processing Record 19 of Set 8 | kapuskasing
Processing Record 20 of Set 8 | fort mcmurray
Processing Record 21 of Set 8 | prince george
Processing Record 22 of Set 8 | zvishavane
Processing Record 23 of Set 8 | tofol
Processing Record 24 of Set 8 | turtas
Processing Record 25 of Set 8 | kitui
Processing Record 26 of Set 8 | kajaani
Processing Record 27 of Set 8 | puerto baquerizo moreno
Processing Record 28 of Set 8 | simanggang
Processing Record 29 of Set 8 | heber springs
Processing Record 30 of Set 8 | kievka
Processing Record 31 of Set 8 | wenling
Processing Record 32 of Set 8 | forster
Processing Record 33 of Set 8 | thoen
Processing Record 34 of Set 8 | laojunmiao
Processing Record 35 of Set 8 | saint-philippe
Processing Record 36 of Set 8 | nam som
Processing Record 37 of Set 8 | l'isle-jourdain
Processing Record 38 of Set 8 | kingston
Processing Record 39 of Set 8 | nova sintra
Processing Record 40 of Set 8 | el granada
```

```
Processing Record 41 of Set 8 | queenstown
Processing Record 42 of Set 8 | luanco
Processing Record 43 of Set 8 | 'izbat al burj
City not found. Skipping…
Processing Record 44 of Set 8 | uturoa
Processing Record 45 of Set 8 | puerto lempira
Processing Record 46 of Set 8 | aldinga beach
Processing Record 47 of Set 8 | kankauli
Processing Record 48 of Set 8 | nowshahr
Processing Record 49 of Set 8 | ko pha ngan
Processing Record 0 of Set 9 | kulia village
City not found. Skipping…
Processing Record 1 of Set 9 | tuburan
Processing Record 2 of Set 9 | east london
Processing Record 3 of Set 9 | gavrilov posad
Processing Record 4 of Set 9 | kulhudhuffushi
Processing Record 5 of Set 9 | mogadishu
Processing Record 6 of Set 9 | tosontsengel
Processing Record 7 of Set 9 | fort st. john
Processing Record 8 of Set 9 | leninskoye
Processing Record 9 of Set 9 | srikakulam
Processing Record 10 of Set 9 | akureyri
Processing Record 11 of Set 9 | mbarara
Processing Record 12 of Set 9 | sandnessjoen
Processing Record 13 of Set 9 | lumphat
Processing Record 14 of Set 9 | murakami
Processing Record 15 of Set 9 | huocheng
City not found. Skipping…
Processing Record 16 of Set 9 | novoishimskiy
Processing Record 17 of Set 9 | la'ie
Processing Record 18 of Set 9 | touros
Processing Record 19 of Set 9 | la ronge
Processing Record 20 of Set 9 | pirallahi
Processing Record 21 of Set 9 | benguela
Processing Record 22 of Set 9 | yaren
Processing Record 23 of Set 9 | mangrol
Processing Record 24 of Set 9 | belmonte
Processing Record 25 of Set 9 | petropavlovsk-kamchatsky
Processing Record 26 of Set 9 | villa gesell
Processing Record 27 of Set 9 | al bawiti
Processing Record 28 of Set 9 | mala bilozerka
Processing Record 29 of Set 9 | karyes
Processing Record 30 of Set 9 | qarqaraly
Processing Record 31 of Set 9 | hotan
Processing Record 32 of Set 9 | fisterra
Processing Record 33 of Set 9 | zachary
Processing Record 34 of Set 9 | bushehr
Processing Record 35 of Set 9 | goz beida
```

```
Processing Record 36 of Set 9 | sucre
Processing Record 37 of Set 9 | curitibanos
Processing Record 38 of Set 9 | vila velha
Processing Record 39 of Set 9 | shahrud
Processing Record 40 of Set 9 | ljusdal
Processing Record 41 of Set 9 | nadi
Processing Record 42 of Set 9 | abdulino
Processing Record 43 of Set 9 | sarangani
Processing Record 44 of Set 9 | muli
Processing Record 45 of Set 9 | tres arroyos
Processing Record 46 of Set 9 | ukiah
Processing Record 47 of Set 9 | nogliki
Processing Record 48 of Set 9 | lazaro cardenas
Processing Record 49 of Set 9 | acapulco de juarez
Processing Record 0 of Set 10 | kargasok
Processing Record 1 of Set 10 | cockburn town
Processing Record 2 of Set 10 | aipe
Processing Record 3 of Set 10 | zhob
Processing Record 4 of Set 10 | digras
Processing Record 5 of Set 10 | saint-francois
Processing Record 6 of Set 10 | howrah
Processing Record 7 of Set 10 | kostomuksha
Processing Record 8 of Set 10 | konigsbronn
Processing Record 9 of Set 10 | ishigaki
Processing Record 10 of Set 10 | freetown
Processing Record 11 of Set 10 | rio gallegos
Processing Record 12 of Set 10 | hancheng
Processing Record 13 of Set 10 | argo
Processing Record 14 of Set 10 | anaconda
Processing Record 15 of Set 10 | newman
Processing Record 16 of Set 10 | huaraz
Processing Record 17 of Set 10 | beja
Processing Record 18 of Set 10 | asubulaq
Processing Record 19 of Set 10 | acajutla
Processing Record 20 of Set 10 | kailua-kona
Processing Record 21 of Set 10 | ancud
Processing Record 22 of Set 10 | brisas de zicatela
Processing Record 23 of Set 10 | nouadhibou
Processing Record 24 of Set 10 | i-n-salah
Processing Record 25 of Set 10 | redencao
Processing Record 26 of Set 10 | shakawe
Processing Record 27 of Set 10 | la quiaca
Processing Record 28 of Set 10 | barra do garcas
Processing Record 29 of Set 10 | heroica ciudad de tlaxiaco
Processing Record 30 of Set 10 | chiili
City not found. Skipping…
Processing Record 31 of Set 10 | birjand
Processing Record 32 of Set 10 | george town
```

```
Processing Record 33 of Set 10 | cidreira
Processing Record 34 of Set 10 | betio village
Processing Record 35 of Set 10 | bel ombre
Processing Record 36 of Set 10 | wanning
Processing Record 37 of Set 10 | pangoa
Processing Record 38 of Set 10 | sapucaia
Processing Record 39 of Set 10 | al qadarif
Processing Record 40 of Set 10 | zarand
Processing Record 41 of Set 10 | riberalta
Processing Record 42 of Set 10 | kindu
Processing Record 43 of Set 10 | kuta
Processing Record 44 of Set 10 | murashi
Processing Record 45 of Set 10 | nova russas
Processing Record 46 of Set 10 | quelimane
Processing Record 47 of Set 10 | enriquillo
Processing Record 48 of Set 10 | woolgoolga
Processing Record 49 of Set 10 | tak
Processing Record 0 of Set 11 | floro
Processing Record 1 of Set 11 | praia da vitoria
Processing Record 2 of Set 11 | mesquite
Processing Record 3 of Set 11 | piti village
Processing Record 4 of Set 11 | katima mulilo
Processing Record 5 of Set 11 | caleta de carquin
Processing Record 6 of Set 11 | bandarbeyla
Processing Record 7 of Set 11 | ostersund
Processing Record 8 of Set 11 | douz
Processing Record 9 of Set 11 | gazojak
Processing Record 10 of Set 11 | sainte-rose
Processing Record 11 of Set 11 | port glaud
City not found. Skipping…
Processing Record 12 of Set 11 | bubaque
Processing Record 13 of Set 11 | balabac
Processing Record 14 of Set 11 | port augusta
Processing Record 15 of Set 11 | lompoc
Processing Record 16 of Set 11 | ust-tsilma
Processing Record 17 of Set 11 | aransas pass
Processing Record 18 of Set 11 | hami
Processing Record 19 of Set 11 | weyburn
Processing Record 20 of Set 11 | borazjan
Processing Record 21 of Set 11 | narimanov
Processing Record 22 of Set 11 | ust'-ordynskiy
Processing Record 23 of Set 11 | carmi
Processing Record 24 of Set 11 | ola
Processing Record 25 of Set 11 | sanibel
Processing Record 26 of Set 11 | bandar-e lengeh
Processing Record 27 of Set 11 | huarmey
Processing Record 28 of Set 11 | fuvahmulah
City not found. Skipping…
```

```
Processing Record 29 of Set 11 | geraldton
Processing Record 30 of Set 11 | svay rieng
Processing Record 31 of Set 11 | abra pampa
Processing Record 32 of Set 11 | yigo village
Processing Record 33 of Set 11 | fuglafjordur
Processing Record 34 of Set 11 | karamay
City not found. Skipping…
Processing Record 35 of Set 11 | yarkovo
Processing Record 36 of Set 11 | san andres
Processing Record 37 of Set 11 | we
City not found. Skipping…
Processing Record 38 of Set 11 | port arthur
Processing Record 39 of Set 11 | maumere
Processing Record 40 of Set 11 | samarinda
Processing Record 41 of Set 11 | khabarovsk
Processing Record 42 of Set 11 | cluain meala
Processing Record 43 of Set 11 | januaria
Processing Record 44 of Set 11 | as saffaniyah
Processing Record 45 of Set 11 | robertsport
Processing Record 46 of Set 11 | shimoda
Processing Record 47 of Set 11 | la passe
Processing Record 48 of Set 11 | tamiahua
Processing Record 49 of Set 11 | raigarh
Processing Record 0 of Set 12 | puerto esperanza
Processing Record 1 of Set 12 | tevriz
Processing Record 2 of Set 12 | banamba
Processing Record 3 of Set 12 | klyuchi
Processing Record 4 of Set 12 | haiku-pauwela
Processing Record 5 of Set 12 | karanpur
Processing Record 6 of Set 12 | cannonvale
Processing Record 7 of Set 12 | vorkuta
Processing Record 8 of Set 12 | guskhara
Processing Record 9 of Set 12 | machakos
Processing Record 10 of Set 12 | barcelos
Processing Record 11 of Set 12 | mount pearl
Processing Record 12 of Set 12 | ulladulla
Processing Record 13 of Set 12 | kimbe
Processing Record 14 of Set 12 | sisimiut
Processing Record 15 of Set 12 | bamboo flat
Processing Record 16 of Set 12 | nizhnesortymskiy
Processing Record 17 of Set 12 | sur
Processing Record 18 of Set 12 | santo antonio do ica
Processing Record 19 of Set 12 | newcastle
Processing Record 20 of Set 12 | zaranj
Processing Record 21 of Set 12 | gaomi
Processing Record 22 of Set 12 | onokhoy
Processing Record 23 of Set 12 | dara
Processing Record 24 of Set 12 | vyksa
```

```
Processing Record 25 of Set 12 | mil'kovo
Processing Record 26 of Set 12 | alofi
Processing Record 27 of Set 12 | nizhneudinsk
Processing Record 28 of Set 12 | mirnyy
Processing Record 29 of Set 12 | lensk
Processing Record 30 of Set 12 | knysna
Processing Record 31 of Set 12 | verkhnevilyuysk
Processing Record 32 of Set 12 | alaghsas
Processing Record 33 of Set 12 | ceeldheer
Processing Record 34 of Set 12 | al kharj
Processing Record 35 of Set 12 | pisco
Processing Record 36 of Set 12 | riverton
Processing Record 37 of Set 12 | tsengel
Processing Record 38 of Set 12 | paita
Processing Record 39 of Set 12 | al 'alamayn
City not found. Skipping…
Processing Record 40 of Set 12 | ritchie
Processing Record 41 of Set 12 | mukalla
Processing Record 42 of Set 12 | obihiro
Processing Record 43 of Set 12 | sola
Processing Record 44 of Set 12 | bulgan
Processing Record 45 of Set 12 | ras gharib
City not found. Skipping…
Processing Record 46 of Set 12 | berdigestyakh
Processing Record 47 of Set 12 | chibougamau
Processing Record 48 of Set 12 | hilo
Processing Record 49 of Set 12 | noumea
----------------------------
Data Retrieval Complete
----------------------------
```

```
[4]: # Convert the cities weather data into a Pandas DataFrame
     city_data_df = pd.DataFrame(city_data)

     # Show Record Count
     city_data_df.count()

     print(city_data_df)
```

```
                 City      Lat        Lng  Max Temp  Humidity  Cloudiness  \
0              avarua -21.2078 -159.7750     22.03        60          20
1    port-aux-francais -49.3500   70.2167      6.42        98         100
2                roma  43.2128  -75.4557     14.42        94          75
3           adamstown -25.0660 -130.1015     22.34        77          19
4             jackson  42.4165 -122.8345     20.93        54           0
..                ...      ...        ...       ...       ...         ...
569             bulgan  48.8125  103.5347     26.94        23          80
570        berdigestyakh  62.0989  126.6992     24.75        23          27
```

```
571         chibougamau  49.9168  -74.3659      12.79       100        100
572                hilo  19.7297 -155.0900      25.85        79        100
573              noumea -22.2763  166.4572      25.00        99        100

     Wind Speed Country        Date
0          2.57      CK  2024-06-08
1         13.24      TF  2024-06-08
2          0.89      US  2024-06-08
3          5.28      PN  2024-06-08
4          1.54      US  2024-06-08
..          ...      ...         ...
569        3.64      MN  2024-06-08
570        2.88      RU  2024-06-08
571        3.09      CA  2024-06-08
572        2.06      US  2024-06-08
573        1.29      NC  2024-06-08

[574 rows x 9 columns]
```

[5]:
```python
# Display sample data
city_data_df.head()
```

[5]:
```
                  City      Lat       Lng  Max Temp  Humidity  Cloudiness  \
0               avarua -21.2078 -159.7750     22.03        60          20
1    port-aux-francais -49.3500   70.2167      6.42        98         100
2                 roma  43.2128  -75.4557     14.42        94          75
3            adamstown -25.0660 -130.1015     22.34        77          19
4              jackson  42.4165 -122.8345     20.93        54           0

   Wind Speed Country        Date
0        2.57      CK  2024-06-08
1       13.24      TF  2024-06-08
2        0.89      US  2024-06-08
3        5.28      PN  2024-06-08
4        1.54      US  2024-06-08
```

[6]:
```python
# Export the City_Data into a csv
city_data_df.to_csv("output_data/cities.csv", index_label="City_ID")
```

[7]:
```python
# Read saved data
city_data_df = pd.read_csv("output_data/cities.csv", index_col="City_ID")

# Display sample data
city_data_df.head()
```

[7]:
```
                  City      Lat       Lng  Max Temp  Humidity  Cloudiness  \
City_ID
0               avarua -21.2078 -159.7750     22.03        60          20
```

```
1     port-aux-francais -49.3500   70.2167       6.42         98          100
2                  roma  43.2128  -75.4557      14.42         94           75
3            adamstown -25.0660 -130.1015      22.34         77           19
4              jackson  42.4165 -122.8345      20.93         54            0


         Wind Speed Country         Date
City_ID
0              2.57      CK  2024-06-08
1             13.24      TF  2024-06-08
2              0.89      US  2024-06-08
3              5.28      PN  2024-06-08
4              1.54      US  2024-06-08
```
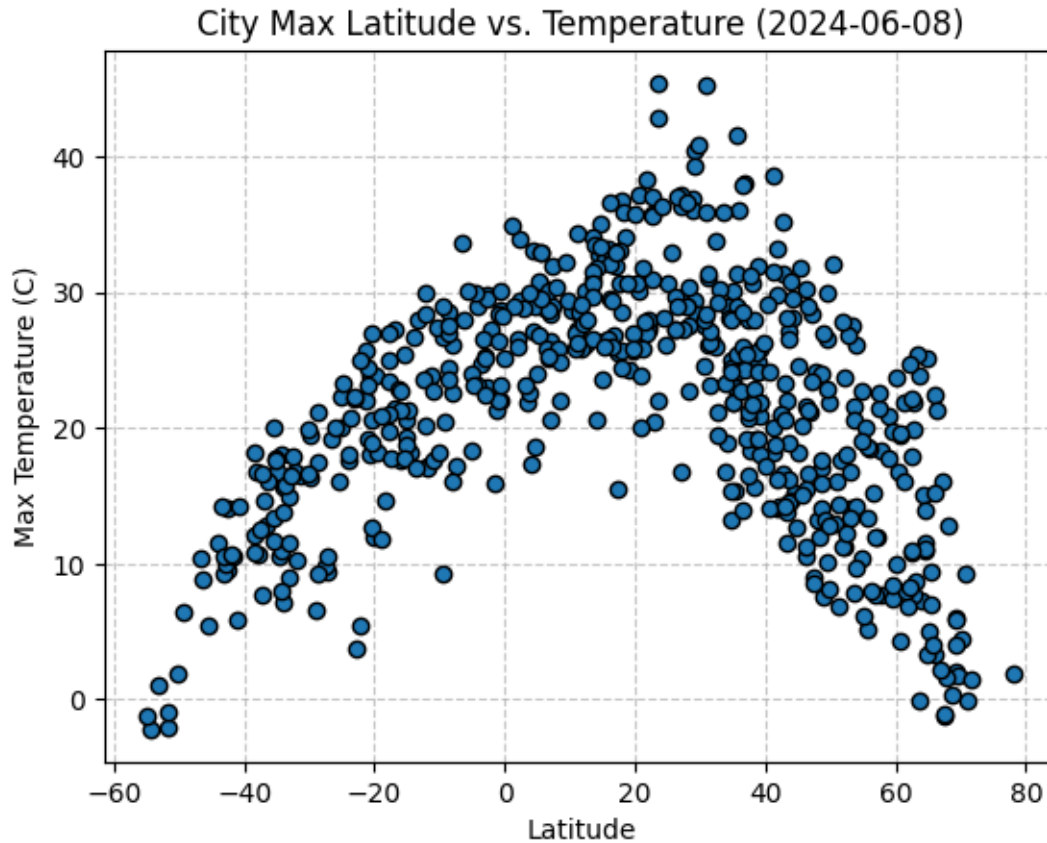
1.2.2 Create the Scatter Plots Requested

Latitude Vs. Temperature

```python
[8]: # Build scatter plot for latitude vs. temperature
x_values = city_data_df['Lat']
y_values = city_data_df['Max Temp']

# Incorporate the other graph properties
plt.scatter(x_values,y_values, edgecolors='black')
plt.title(f"City Max Latitude vs. Temperature ({today})")
plt.xlabel('Latitude')
plt.ylabel('Max Temperature (C)')
plt.grid(linestyle='--', alpha=0.7)
plt.gca().set_axisbelow(True)

# Save the figure
plt.savefig("output_data/Fig1.png")

# Show plot
plt.show()
```
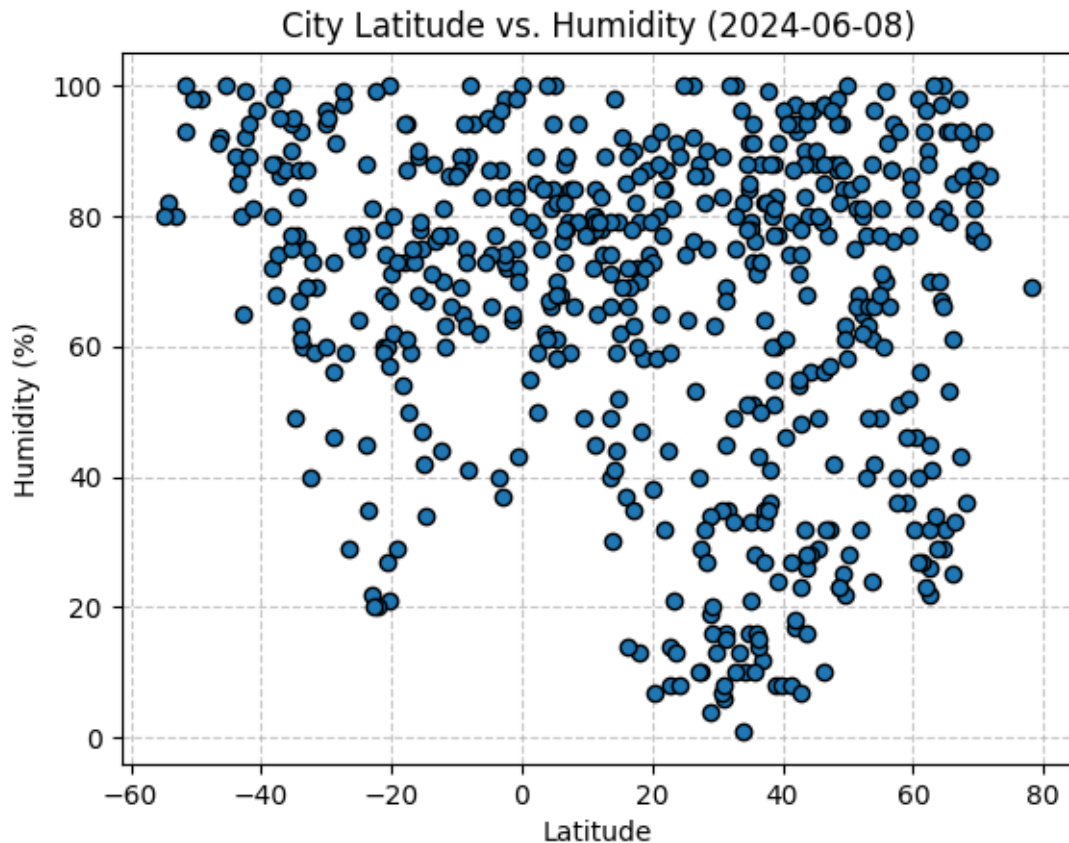
City Max Latitude vs. Temperature (2024-06-08)

Latitude Vs. Humidity

```
[9]:  # Build the scatter plots for latitude vs. humidity
      x_values = city_data_df['Lat']
      y_values = city_data_df['Humidity']

      # Incorporate the other graph properties
      plt.scatter(x_values,y_values, edgecolors='black')
      plt.title(f"City Latitude vs. Humidity ({today})")
      plt.xlabel('Latitude')
      plt.ylabel('Humidity (%)')
      plt.grid(linestyle='--', alpha=0.7)
      plt.gca().set_axisbelow(True)

      # Save the figure
      plt.savefig("output_data/Fig2.png")

      # Show plot
      plt.show()
```
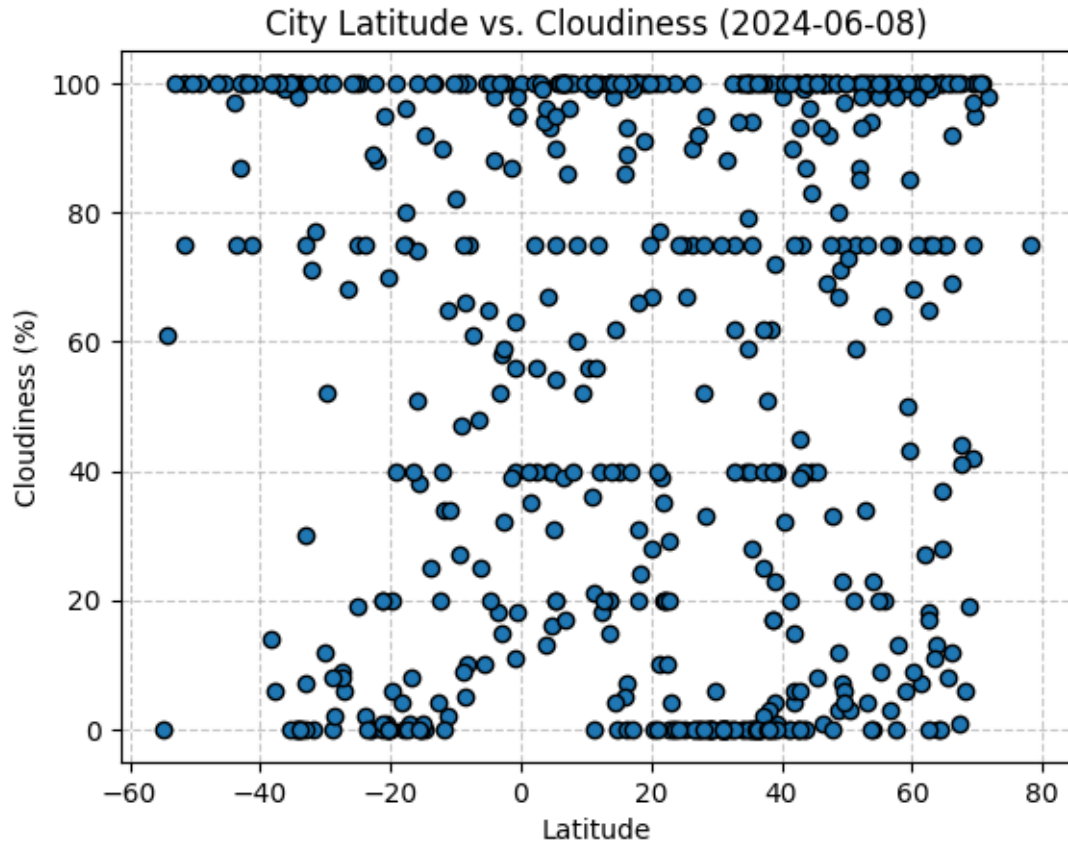
City Latitude vs. Humidity (2024-06-08)

Latitude Vs. Cloudiness

```
[10]:  # Build the scatter plots for latitude vs. cloudiness
       x_values = city_data_df['Lat']
       y_values = city_data_df['Cloudiness']

       # Incorporate the other graph properties
       plt.scatter(x_values,y_values, edgecolors='black')
       plt.title(f"City Latitude vs. Cloudiness ({today})")
       plt.xlabel('Latitude')
       plt.ylabel('Cloudiness (%)')
       plt.grid(linestyle='--', alpha=0.7)
       plt.gca().set_axisbelow(True)

       # Save the figure
       plt.savefig("output_data/Fig3.png")

       # Show plot
       plt.show()
```
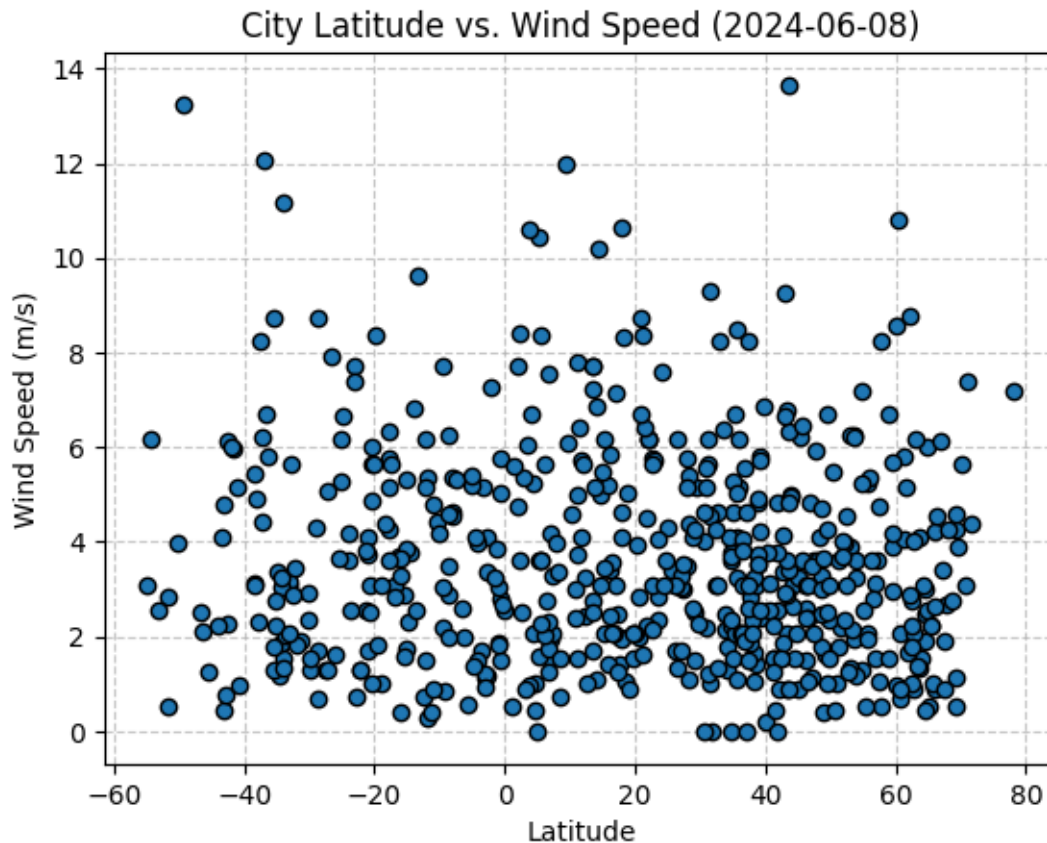
City Latitude vs. Cloudiness (2024-06-08)

Latitude vs. Wind Speed Plot

```
[11]:  # Build the scatter plots for latitude vs. wind speed
       x_values = city_data_df['Lat']
       y_values = city_data_df['Wind Speed']

       # Incorporate the other graph properties
       plt.scatter(x_values,y_values, edgecolors='black')
       plt.title(f"City Latitude vs. Wind Speed ({today})")
       plt.xlabel('Latitude')
       plt.ylabel('Wind Speed (m/s)')
       plt.grid(linestyle='--', alpha=0.7)
       plt.gca().set_axisbelow(True)

       # Save the figure
       plt.savefig("output_data/Fig4.png")

       # Show plot
       plt.show()
```

City Latitude vs. Wind Speed (2024-06-08)

1.3 Requirement 2: Compute Linear Regression for Each Relationship

```
[12]:  # Define a function to create Linear Regression plots

       def create_linear_regression(x, y, x_titles, y_titles):
           # Perform linear regression
           slope, intercept, r_value, p_value, std_err = stats.linregress(x, y)


           print("r-value  : ", r_value, "\np-value  : ", p_value, "\nstd-error: ",
       ↪std_err)


           regress_values = x * slope + intercept
           #print(regress_values)

           line_eq = "y = " + str(round(slope,2)) + "x + " + str(round(intercept,2))
           print(line_eq)
```

```python
# Create Plot
    plt.scatter(x,y, edgecolors='black')
    plt.title(f"{x_titles} vs. {y_titles} ({today})")
    plt.plot(x,regress_values,"r-")

# Label plot and annotate the line equation
    plt.xlabel(x_titles)
    plt.ylabel(y_titles)
    plt.grid(linestyle='--', alpha=0.7)
    plt.gca().set_axisbelow(True)
    plt.annotate(line_eq,(20,5),fontsize=15,color="red")

# Show plot
    plt.show()
```

[13]:
```python
# Create a DataFrame with the Northern Hemisphere data (Latitude >= 0)
northern_hemi_df = city_data_df[city_data_df['Lat'] >=0]

# Display sample data
northern_hemi_df.head()
```

[13]:

	City	Lat	Lng	Max Temp \
City_ID				
2	roma	43.2128	-75.4557	14.42
4	jackson	42.4165	-122.8345	20.93
5	dudinka	69.4058	86.1778	2.01
7	sitka	57.0531	-135.3300	11.94
13	palikir - national government center	6.9248	158.1611	26.41

	Humidity	Cloudiness	Wind Speed	Country	Date
City_ID					
2	94	75	0.89	US	2024-06-08
4	54	0	1.54	US	2024-06-08
5	84	42	1.14	RU	2024-06-08
7	76	75	3.60	US	2024-06-08
13	89	100	1.54	FM	2024-06-08

[14]:
```python
# Create a DataFrame with the Southern Hemisphere data (Latitude < 0)
southern_hemi_df = city_data_df[city_data_df['Lat'] < 0]

# Display sample data
southern_hemi_df.head()
```

[14]:

	City	Lat	Lng	Max Temp	Humidity	Cloudiness \
City_ID						
0	avarua	-21.2078	-159.7750	22.03	60	20
1	port-aux-francais	-49.3500	70.2167	6.42	98	100

```
3              adamstown  -25.0660  -130.1015      22.34           77            19
6          mount gambier  -37.8333   140.7667      10.64           68             6
8         port macquarie  -31.4333   152.9167      16.43           69            77

          Wind Speed Country        Date
City_ID
0               2.57       CK  2024-06-08
1              13.24       TF  2024-06-08
3               5.28       PN  2024-06-08
6               2.30       AU  2024-06-08
8               1.90       AU  2024-06-08
```
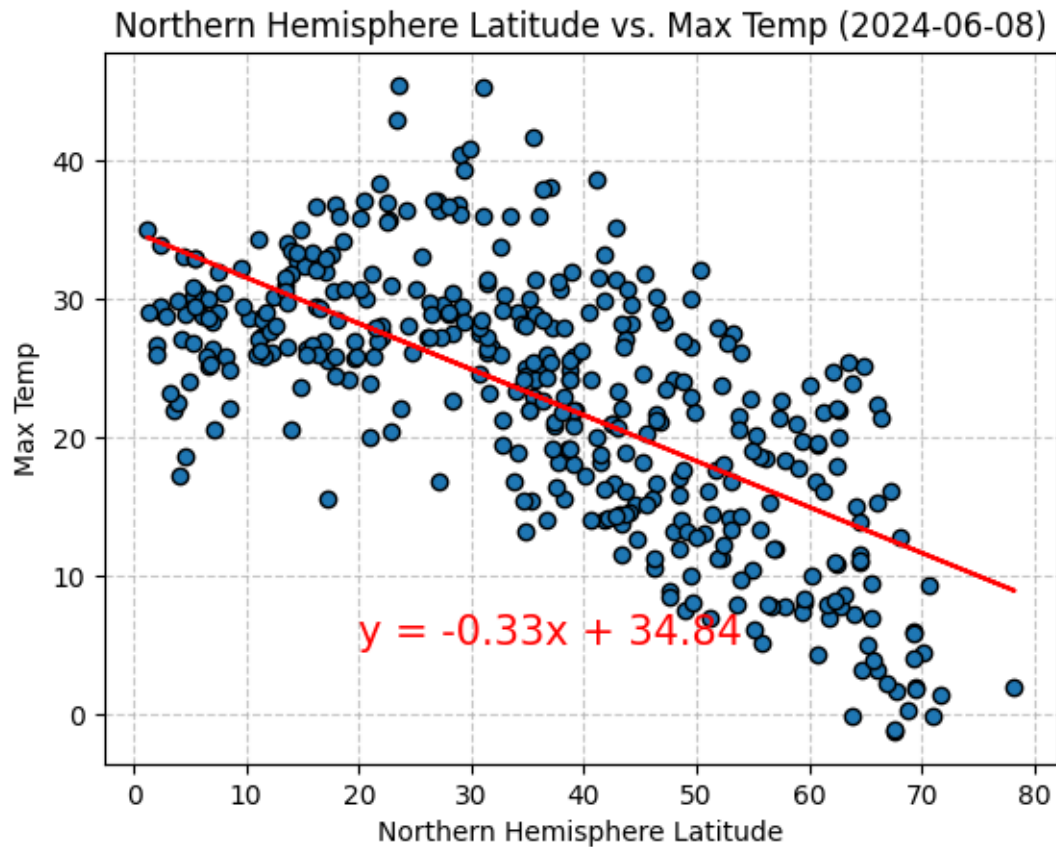
1.3.1 Temperature vs. Latitude Linear Regression Plot

```python
[15]:  # Linear regression on Northern Hemisphere
       x_values = northern_hemi_df['Lat']
       y_values = northern_hemi_df['Max Temp']

       create_linear_regression(x_values, y_values, 'Northern Hemisphere Latitude',␣
        ↪'Max Temp' )
```
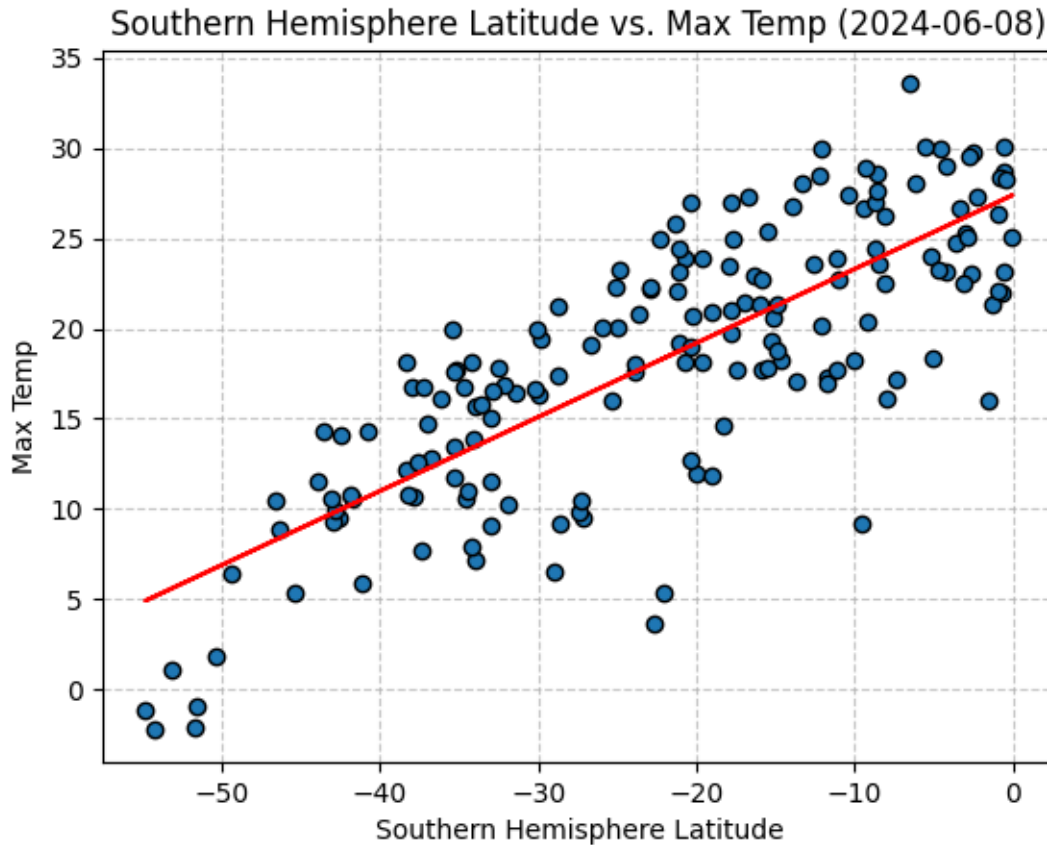
```
r-value  :  -0.680638779261373
p-value  :  3.8205946104209614e-56
std-error:  0.0178004272540714
y = -0.33x + 34.84
```

Northern Hemisphere Latitude vs. Max Temp (2024-06-08)

$y = -0.33x + 34.84$

[16]:
```python
# Linear regression on Southern Hemisphere
x_values = southern_hemi_df['Lat']
y_values = southern_hemi_df['Max Temp']

create_linear_regression(x_values, y_values, 'Southern Hemisphere␣
 ↪Latitude','Max Temp')
```

```
r-value  :  0.7891320264061686
p-value  :  1.3057465132791092e-37
std-error:  0.02455620526385686
y = 0.41x + 27.4
```

Southern Hemisphere Latitude vs. Max Temp (2024-06-08)

Discussion about the linear relationship:
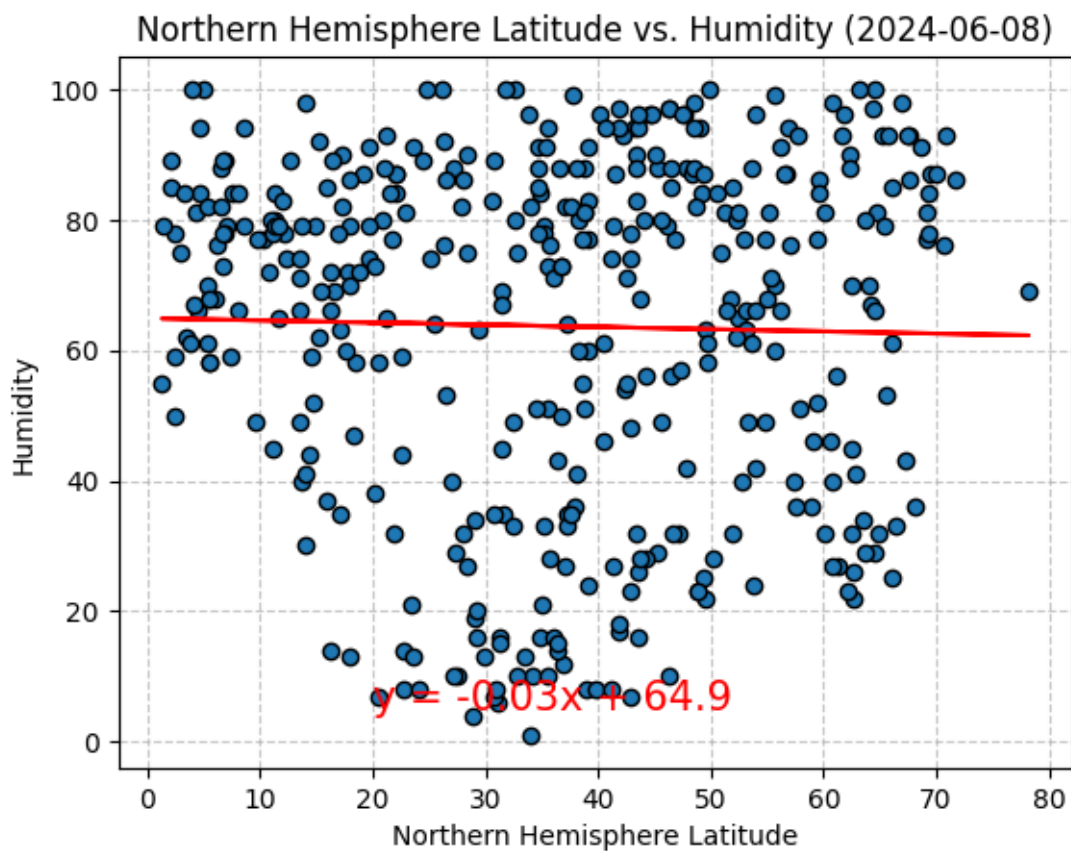
r-value (correlation coefficient):

Value: -0.680638779261373 for the Northern Hemisphere. This is a negative number close to 1, indicating a strong negative correlation between the latitude and max temperature. In simpler terms, as the values of latitude increase, the values of max temp tend to decrease as well. As latitudes increase (moving away from the equator towards the North Pole), the maximum temperatures tend to decrease as well. This again aligns with our expectation of colder temperatures at higher latitudes.

Value:0.7891320264061686 for the Southern Hemisphere. This is a positive number close to 1, indicating a strong positive correlation between the latitude and max temperature. In simpler terms, as the values of latitude increase, the values of max temp tend to increase as well. As latitudes increase (moving away from the equator towards the South Pole), the maximum temperatures tend to increase as well. This aligns with our general understanding that the equator is typically warmer than the poles.

1.3.2 Humidity vs. Latitude Linear Regression Plot

```
[17]:  # Northern Hemisphere
       x_values = northern_hemi_df['Lat']
       y_values = northern_hemi_df['Humidity']

       create_linear_regression(x_values, y_values, 'Northern Hemisphere Latitude',␣
         ↪'Humidity')
```
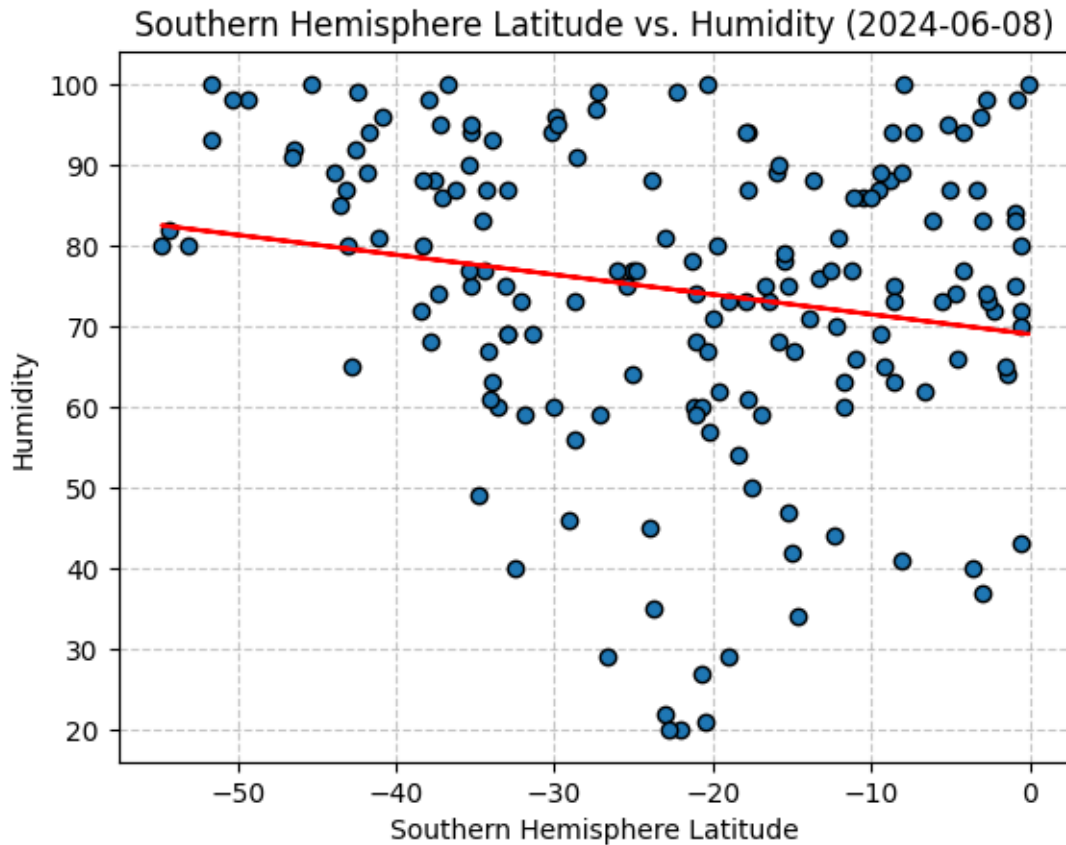
```
r-value  :  -0.02389558267347608
p-value  :   0.632451825274103
std-error:   0.07036452359285826
y = -0.03x + 64.9
```


Northern Hemisphere Latitude vs. Humidity (2024-06-08)

```
[18]:  # Southern Hemisphere
       x_values = southern_hemi_df['Lat']
       y_values = southern_hemi_df['Humidity']

       create_linear_regression(x_values, y_values, 'Southern Hemisphere␣
         ↪Latitude','Humidity')
```

```
r-value  :  -0.18600515774743093
p-value  :   0.01485938478386212
std-error:   0.09994732228667708
y = -0.25x + 68.99
```


Southern Hemisphere Latitude vs. Humidity (2024-06-08)

Discussion about the linear relationship:

r-value (correlation coefficient): (Northern Hemisphere) and (Southern Hemisphere). This value is very close to 0, signifying an almost negligible linear correlation and there's practically no linear trend between these variables based solely on the r-value.

p-value:(Northern Hemisphere) and (Souther Hemishere). A p-value this high (greater than 0.05) suggests that the observed r-value is likely due to random chance and not a true underlying relationship between latitude and humidity. There's weak evidence for a statistically significant connection.
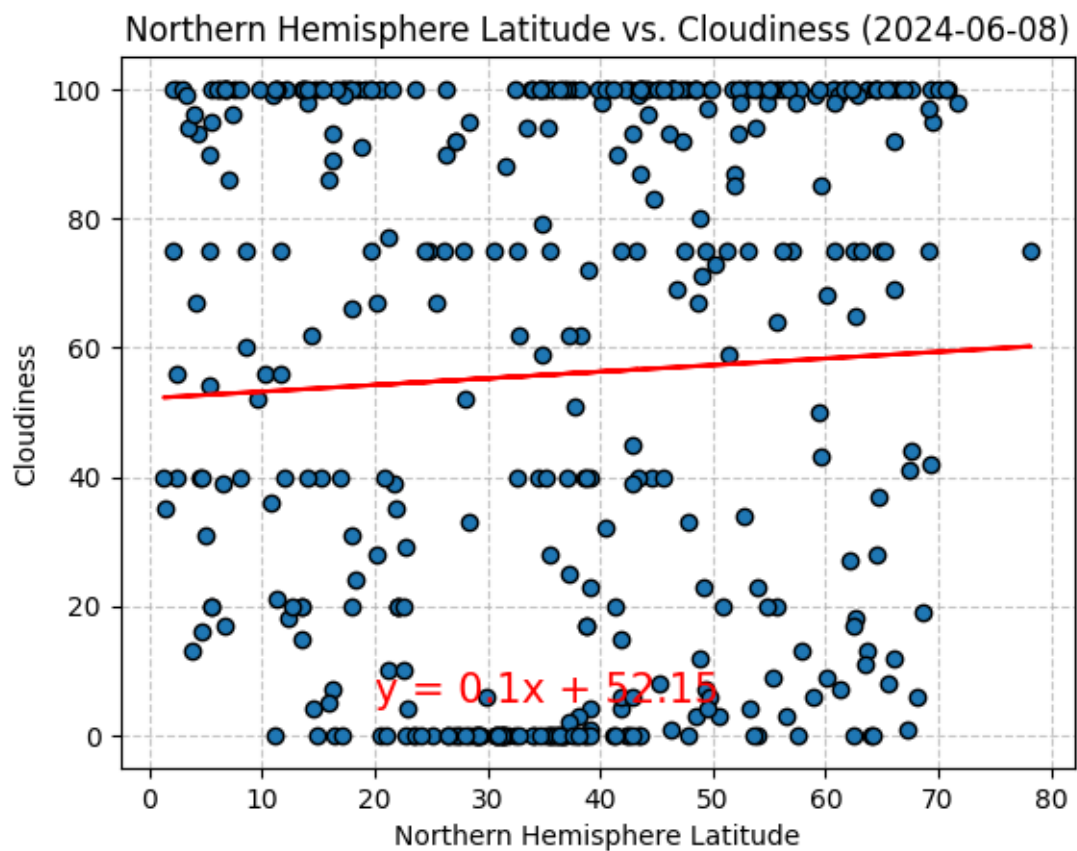
There's statistically no proof, based on these values, that increasing or decreasing latitude in the Northern Hemisphere has a corresponding linear increase or decrease in humidity.

1.3.3 Cloudiness vs. Latitude Linear Regression Plot

```
[19]:  # Northern Hemisphere
       x_values = northern_hemi_df['Lat']
       y_values = northern_hemi_df['Cloudiness']

       create_linear_regression(x_values, y_values, 'Northern Hemisphere Latitude',␣
        ↪'Cloudiness')
```
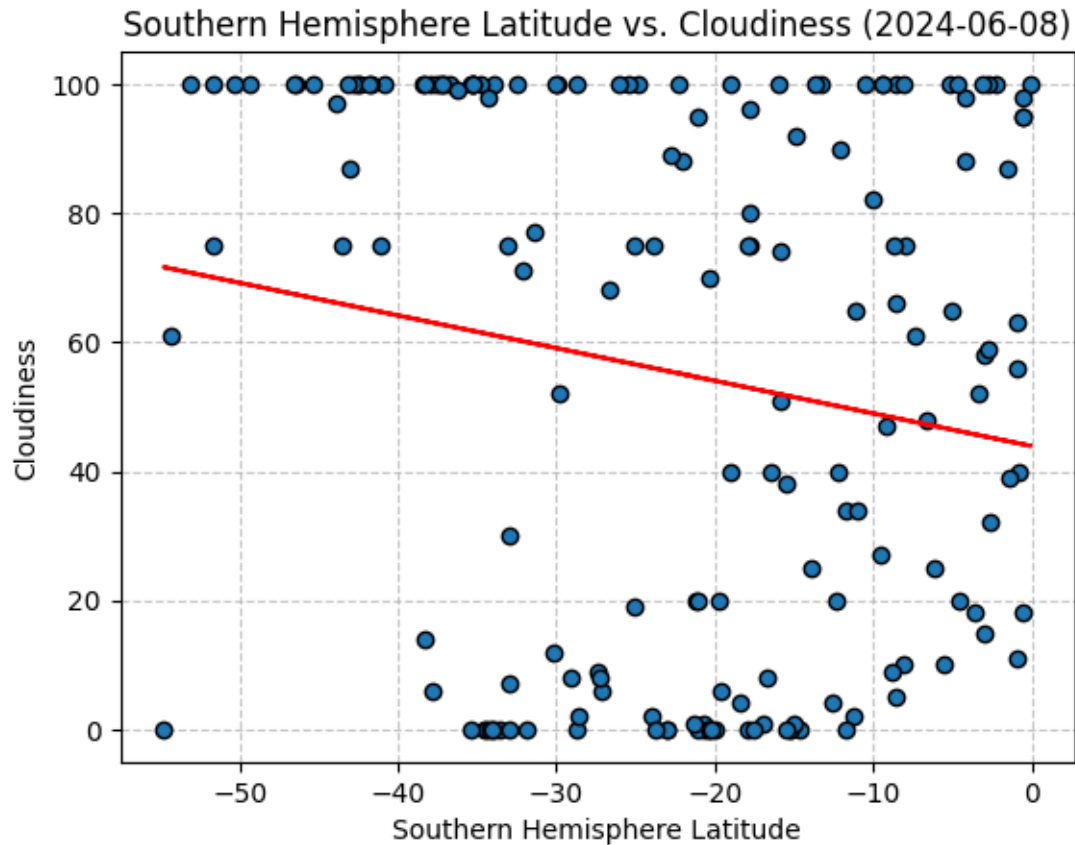
```
r-value  :  0.04735502293239958
p-value  :  0.3430151070775348
std-error:  0.10809727115848644
y = 0.1x + 52.15
```



```
[20]:  # Southern Hemisphere
       x_values = southern_hemi_df['Lat']
       y_values = southern_hemi_df['Cloudiness']

       create_linear_regression(x_values, y_values, 'Southern Hemisphere␣
        ↪Latitude','Cloudiness')
```

```
r-value   :  -0.17368876488808002
p-value   :   0.02309178370342836
std-error:   0.2205994471827265
y = -0.51x + 43.9
```


Southern Hemisphere Latitude vs. Cloudiness (2024-06-08)

Discussion about the linear relationship:

r-value (correlation coefficient): (Northern Hemisphere) and (Southern Hemisphere). This value signifies an almost negligible correlation, either positive or negative. In this case, the slightly negative sign suggests a very weak tendency for cloudiness to decrease as latitude increases, but the magnitude is so small it's practically irrelevant.
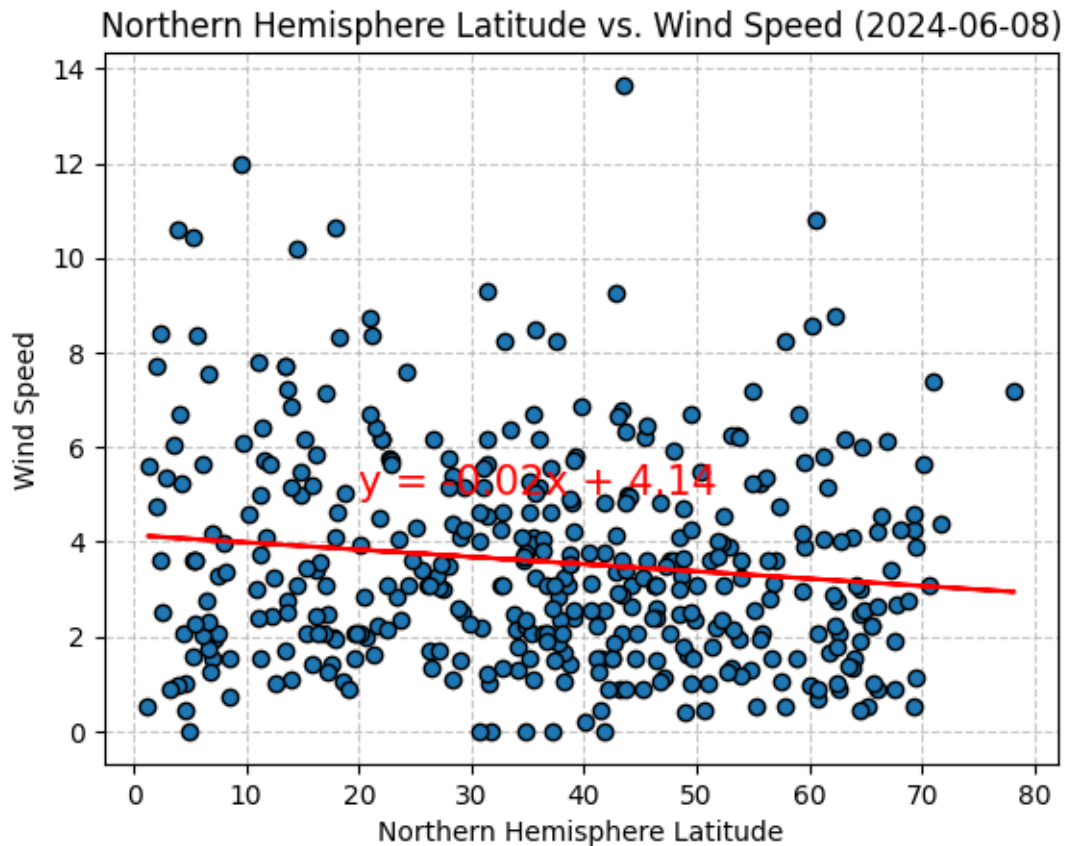
p-value: (Northern Hemisphere) and (Southern Hemisphere) . A p-value this high suggests that the observed r-value is very likely due to random chance and not a true underlying relationship between cloudiness and latitude. There's very weak evidence for a statistically significant connection.

1.3.4 Wind Speed vs. Latitude Linear Regression Plot

```
[21]: # Northern Hemisphere
      x_values = northern_hemi_df['Lat']
      y_values = northern_hemi_df['Wind Speed']
```

```
create_linear_regression(x_values, y_values, 'Northern Hemisphere Latitude',␣
  ↪'Wind Speed')
```
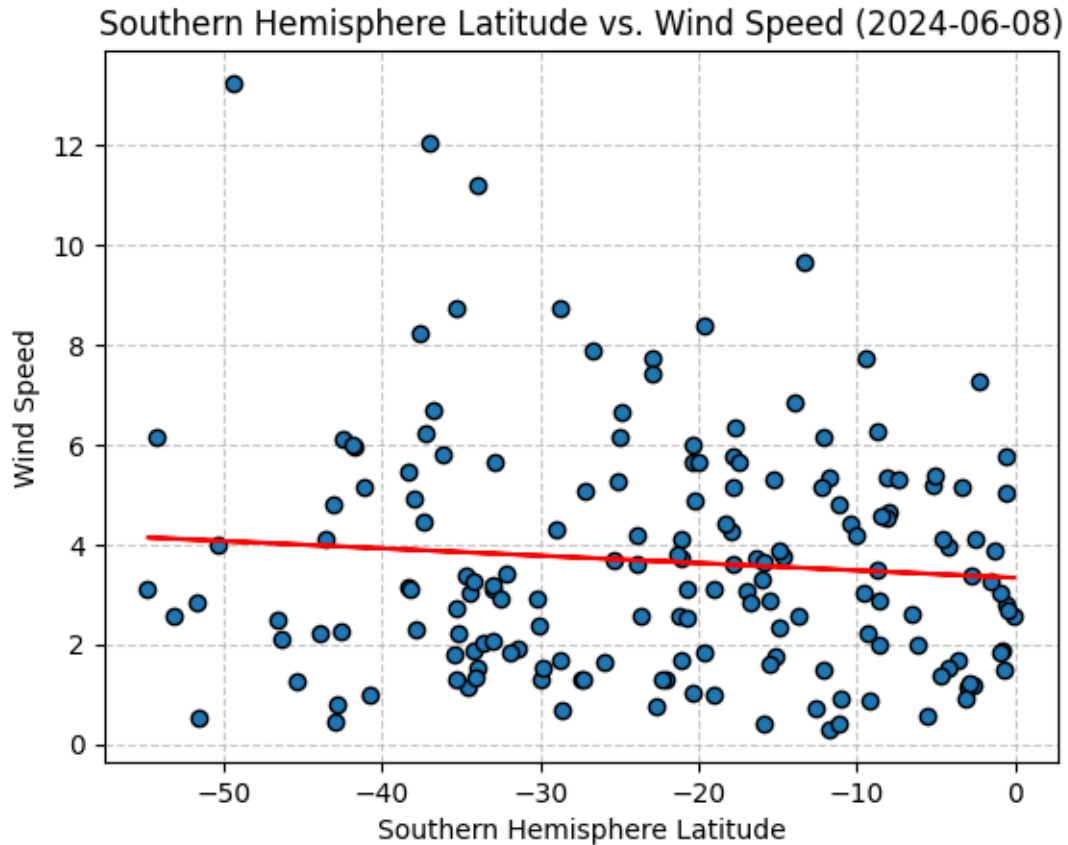
```
r-value  :  -0.12815585789284117
p-value  :  0.010013949511443977
std-error: 0.005912638673361516
y = -0.02x + 4.14
```


Northern Hemisphere Latitude vs. Wind Speed (2024-06-08)

[22]:
```
# Southern Hemisphere
x_values = southern_hemi_df['Lat']
y_values = southern_hemi_df['Wind Speed']

create_linear_regression(x_values, y_values, 'Southern Hemisphere␣
  ↪Latitude','Wind Speed')
```

```
r-value  :  -0.0896701549060034
p-value  :  0.243476960221522
std-error: 0.012570881017703707
y = -0.01x + 3.33
```

Southern Hemisphere Latitude vs. Wind Speed (2024-06-08)

Discussion about the linear relationship:

Lastly, for the correlaton between the latitude and wind speed values. r-value (correlation coefficient): (Northern Hemisphere) and (Southern Hemisphere). There's practically no linear relationship between the two variables based on these values. Any slight positive or negative trend is so weak that it's likely just a random fluctuation in the data, not a genuine association.