ASSIGNMENT : PYTHON

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Problem 1: Real-Time Weather Monitoring System

Scenario:

You are developing a real-time weather monitoring system for a weather forecasting company.

The system needs to fetch and display weather data for a specified location.

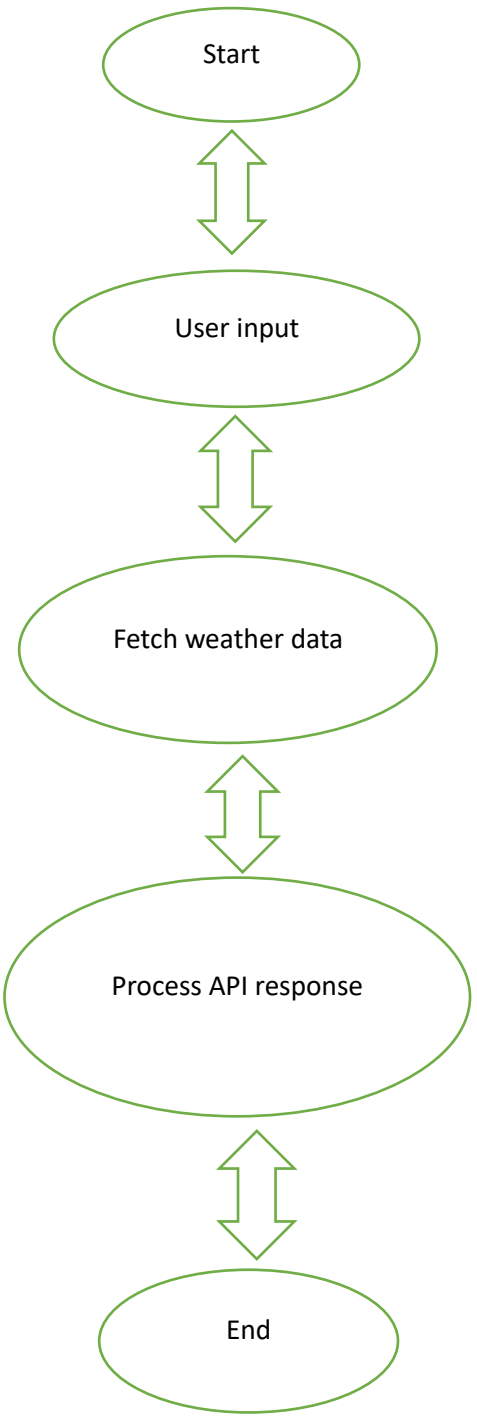
Tasks:

1. Model the data flow for fetching weather information from an external API and displaying it to the user.
2. Implement a Python application that integrates with a weather API (e.g., OpenWeatherMap) to fetch real-time weather data.
3. Display the current weather information, including temperature, weather conditions, humidity, and wind speed.
4. Allow users to input the location (city name or coordinates) and display the corresponding weather data.

Deliverables:

- Data flow diagram illustrating the interaction between the application and the API.
- Pseudocode and implementation of the weather monitoring system.
- Documentation of the API integration and the methods used to fetch and display weather data.
- Explanation of any assumptions made and potential improvements.

FLOW CHART



CODE:

```
import requests
def fetch_weather_data(api_key, location):
    base_url =
```

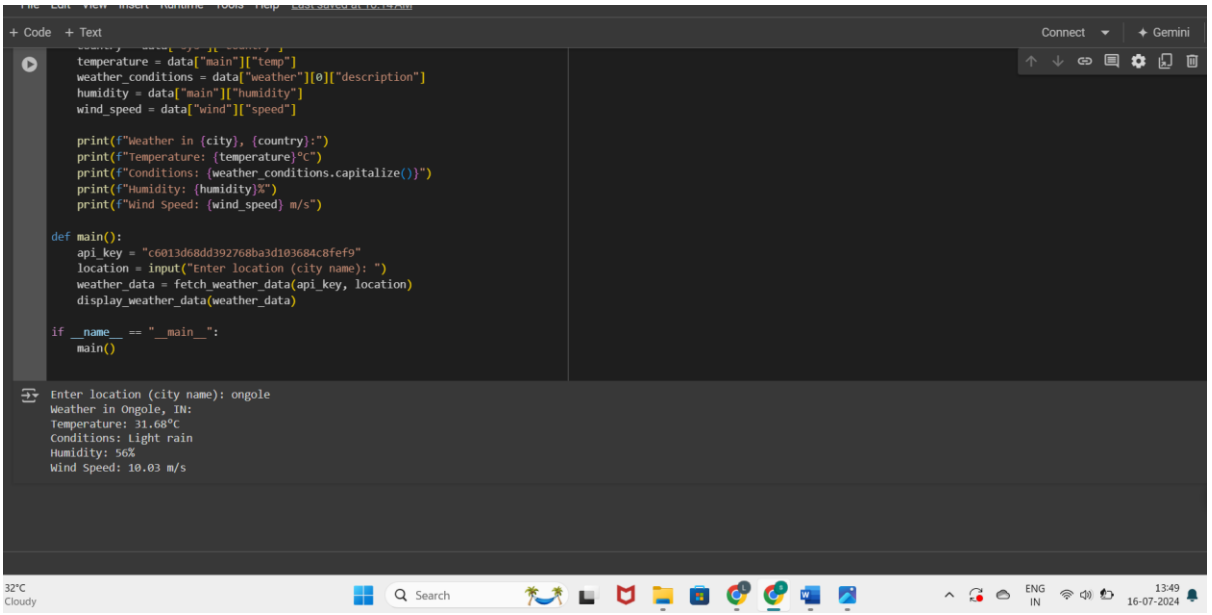
```
"https://api.openweathermap.org/data/2.5/weather?lat={lat}&lon={lon}&appid"
    params = {
        'q': location,
        'appid': api_key,
        'units': 'metric'
    }
    try:
        response = requests.get(base_url, params=params)
        data = response.json()
        if data["cod"] == 200:
            weather_info = {
                'location':data['name'],
                'temperature': data['main']['temp'],
                'weather': data['weather'][0]['description'],
                'humidity': data['main']['humidity'],
                'wind_speed': data['wind']['speed']
            }
            return weather_info
        else:
            return None
    except Exception as e:
        print(f"Error fetching weather data: {e}")
        return None
def display_weather(weather_info, location):
    if weather_info:
        print(f"Weather in {location}:")
        print(f"Temperature: {weather_info['temperature']} °C")
        print(f"Weather: {weather_info['weather']}")
        print(f"Humidity: {weather_info['humidity']}%")
        print(f"Wind Speed: {weather_info['wind_speed']} m/s")
    else:
        print(f"Failed to fetch weather data for {location}")
def main():
    api_key = "ed7c18d0f1024da78bf89f147ccd9bca"
    location = input("Enter city name or coordinates (latitude,longitude): ")
    weather_info = fetch_weather_data(api_key, location)
    display_weather(weather_info, location)
if __name__ == "__main__":
    main()
```

INPUT :

Enter city name or coordinators(latitude, longitude): chennai

OUTPUT :

Enter city name or coordinates (latitude,longitude): chennai
Weather in chennai:
Temperature: 30.79 °C
Weather: broken clouds
Humidity: 74%
Wind Speed: 6.17 m/s



Problem 2: Inventory Management System Optimization

Scenario:

You have been hired by a retail company to optimize their inventory management system. The company wants to minimize stockouts and overstock situations while maximizing inventory turnover and profitability.

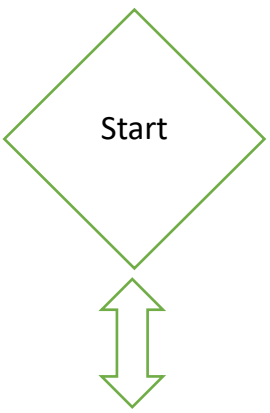
Tasks:

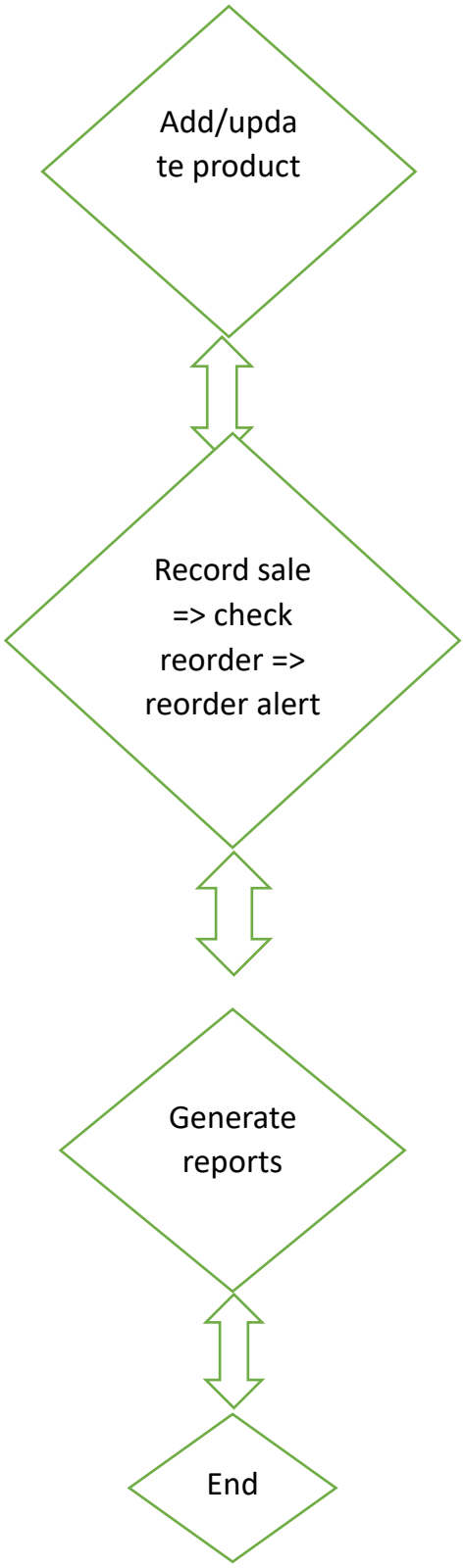
1. **Model the inventory system**: Define the structure of the inventory system, including products, warehouses, and current stock levels.
2. **Implement an inventory tracking application**: Develop a Python application that tracks inventory levels in real-time and alerts when stock levels fall below a certain threshold. 3. **Optimize inventory ordering**: Implement algorithms to calculate optimal reorder points and quantities based on historical sales data, lead times, and demand forecasts. 4. **Generate reports**: Provide reports on inventory turnover rates, stockout occurrences, and cost implications of overstock situations.
5. **User interaction**: Allow users to input product IDs or names to view current stock levels, reorder recommendations, and historical data.

Deliverables:

- **Data Flow Diagram**: Illustrate how data flows within the inventory management system, from input (e.g., sales data, inventory adjustments) to output (e.g., reorder alerts, reports).
- **Pseudocode and Implementation**: Provide pseudocode and actual code demonstrating how inventory levels are tracked, reorder points are calculated, and reports are generated.
- **Documentation**: Explain the algorithms used for reorder optimization, how historical data influences decisions, and any assumptions made (e.g., constant lead times). • **User Interface**: Develop a user-friendly interface for accessing inventory information, viewing reports, and receiving alerts.
- **Assumptions and Improvements**: Discuss assumptions about demand patterns, supplier reliability, and potential improvements for the inventory management system's efficiency and accuracy.

FLOW CHART





CODE:

```
import numpy as np
class Product:
```

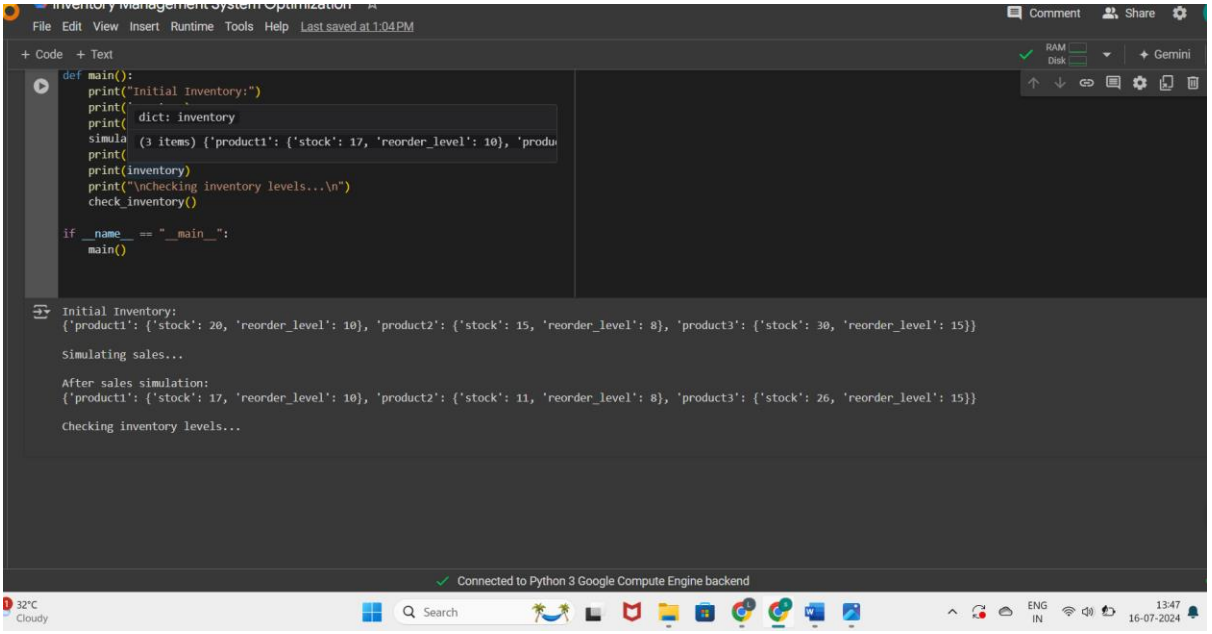
```
    def __init__(self, id, name, stock_level, reorder_point, reorder_quantity):
        self.id = id
        self.name = name
        self.stock_level = stock_level
        self.reorder_point = reorder_point
        self.reorder_quantity = reorder_quantity
class Warehouse:
    def __init__(self):
        self.products = {}
    def add_product(self, product):
        self.products[product.id] = product
    def update_stock(self, product_id, quantity):
        if product_id in self.products:
            self.products[product_id].stock_level += quantity
            if self.products[product_id].stock_level < self.products[product_id].reorder_point:
                print(f"Alert: Reorder needed for product {self.products[product_id].name}")
        else:
            print("Product not found in warehouse")
def calculate_reorder_point_and_quantity(sales_data, lead_time, safety_stock):
    average_daily_demand = np.mean(sales_data)
    reorder_point = (average_daily_demand * lead_time) + safety_stock
     reorder_quantity = average_daily_demand * (lead_time + 7) # Assume a 7-day buffer
    return reorder_point, reorder_quantity
def generate_reports(warehouse):
    inventory_turnover_rate = calculate_inventory_turnover_rate(warehouse)
```

```
    stockout_occurrences = calculate_stockout_occurrences(warehouse)
    overstock_costs = calculate_overstock_costs(warehouse)
    print("Inventory Turnover Rate:", inventory_turnover_rate)
    print("Stockout Occurrences:", stockout_occurrences)
    print("Cost Implications of Overstock:", overstock_costs)
def calculate_inventory_turnover_rate(warehouse):
    return 0
def calculate_stockout_occurrences(warehouse):
    return 0
def calculate_overstock_costs(warehouse):
    return 0
def main():
    warehouse = Warehouse()
    sales_data = [10, 12, 8, 15, 7, 9, 11]
    lead_time = 5
    safety_stock = 20
    product1 = Product(id=1, name="Product A", stock_level=50, reorder_point=0,
reorder_quantity=0)
    product1.reorder_point, product1.reorder_quantity =
calculate_reorder_point_and_quantity(sales_data, lead_time, safety_stock)
    warehouse.add_product(product1)
    warehouse.update_stock(product_id=1, quantity=-30)
    generate_reports(warehouse)
if __name__ == "__main__":
    main()
```

INPUT :

OUTPUT :

Alert: Reorder needed for product Product A
Inventory Turnover Rate: 0
Stockout Occurrences: 0
Cost Implications of Overstock: 0



Problem 3: Real-Time Traffic Monitoring System

Scenario:

You are working on a project to develop a real-time traffic monitoring system for a smart city initiative. The system should provide real-time traffic updates and suggest alternative routes.

Tasks:

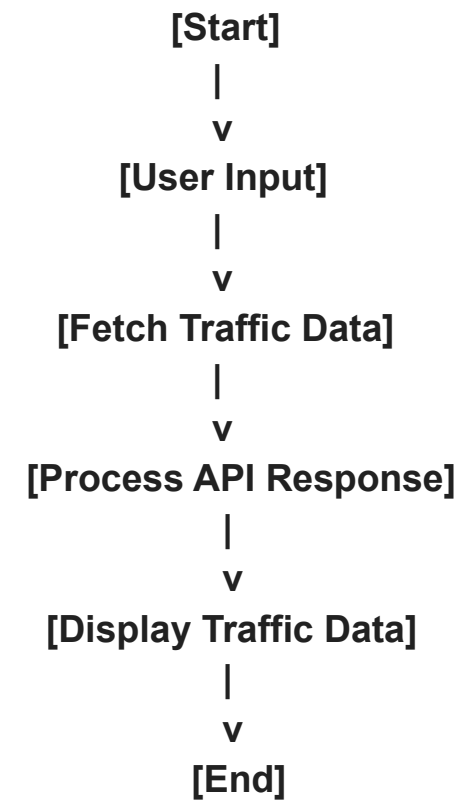
1. **Model the data flow for fetching real-time traffic information from an external API and displaying it to the user.**
2. **Implement a Python application that integrates with a traffic monitoring API (e.g., Google Maps Traffic API) to fetch real-time traffic data.**

3. **Display current traffic conditions, estimated travel time, and any incidents or delays.** 4. **Allow users to input a starting point and destination to receive traffic updates and alternative routes.**

Deliverables:

- Data flow diagram illustrating the interaction between the application and the API. •Pseudocode and implementation of the traffic monitoring system.
- Documentation of the API integration and the methods used to fetch and display traffic data.
- Explanation of any assumptions made and potential improvements.

FLOW CHART



CODE:

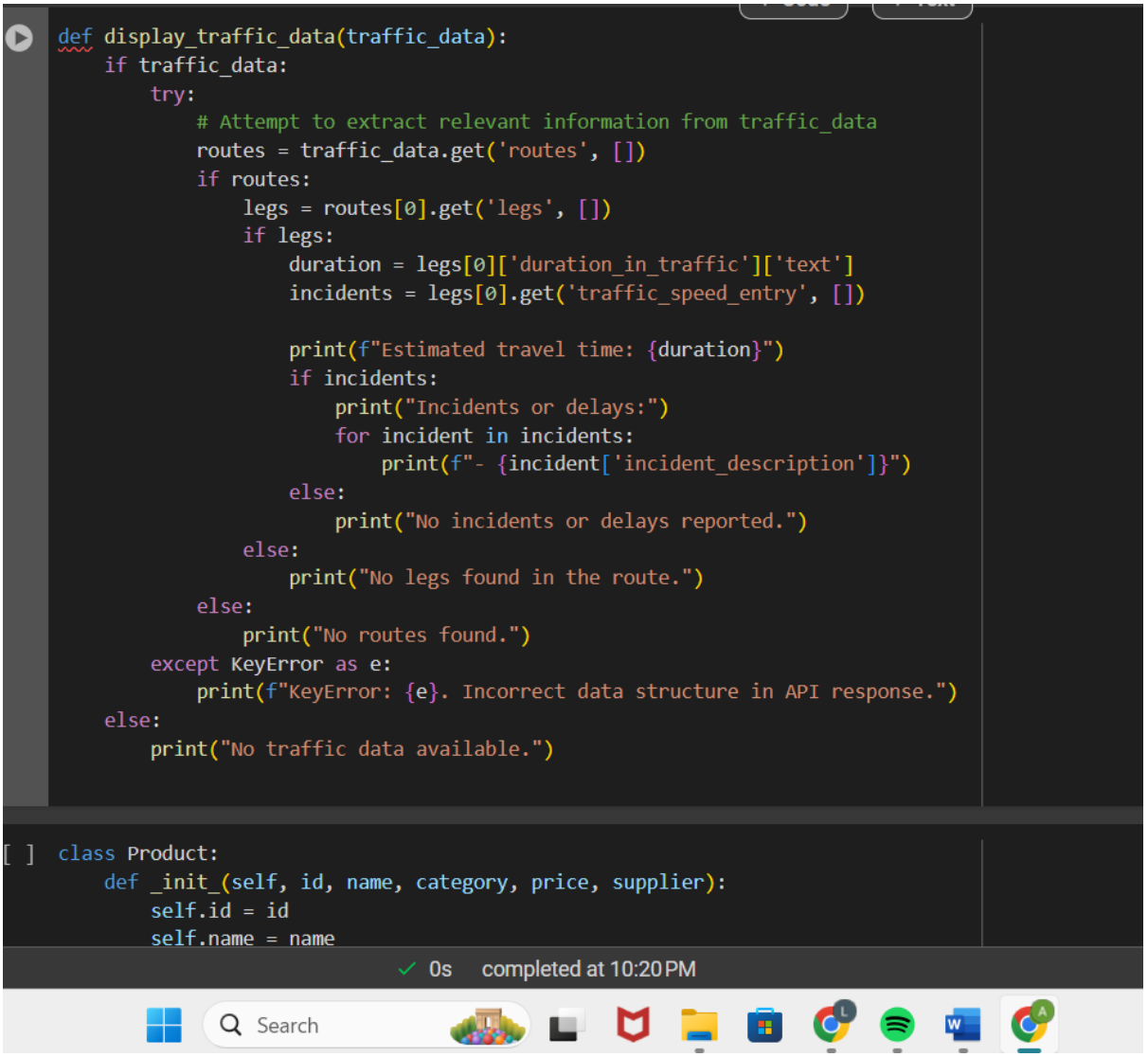
```
import requests
API_ENDPOINT = "https://maps.googleapis.com/maps/api/directions/json"
API_KEY = "https://places.googleapis.com/v1/places:searchNearby"
```

```
def fetch_traffic_data(starting_point, destination):
    try:
        url = f"{API_ENDPOINT}?origin={starting_point}&destination={destination}&key={API_KEY}"
        response = requests.get(url)
        response.raise_for_status()
        data = response.json()
        return data except
    requests.exceptions.RequestException as e:
        print("Error fetching data:", e)
        return None
def display_traffic_data(data):
    if data and data['routes']:
        route = data['routes'][0]
        print("Current Traffic Conditions:")
        print("Estimated Travel Time:", route['legs'][0]['duration']['text'])
        if 'traffic_speed_entry' in route['legs'][0]:
            print("Traffic Speed:", route['legs'][0]['traffic_speed_entry'][0]['speed']['text'])
        if 'warnings' in route:
            print("Incidents or Delays:", ", ".join(route['warnings']))
        print("Suggested Alternative Routes:")
        for alternative_route in data['routes'][1:]:
            print("Alternative Route - Estimated Travel Time:", alternative_route['legs'][0]['duration']['text'])
    else:
        print("No traffic data available for the given route")
def main():
    starting_point = input("Enter starting point: ")
    destination = input("Enter destination: ")
    data = fetch_traffic_data(starting_point, destination)
    if data:
        display_traffic_data(data)
    else:
        print("Failed to retrieve traffic data")
if __name__ == "__main__":
    main()
```

INPUT :

OUTPUT :

Enter starting point: chennai
Enter destination: ponamalli
No traffic data available for the given route



Problem 4: Real-Time COVID-19 Statistics Tracker

Scenario:

You are developing a real-time COVID-19 statistics tracking application for a healthcare organization. The application should provide up-to-date information on COVID-19 cases, recoveries, and deaths for a specified region.

Tasks:

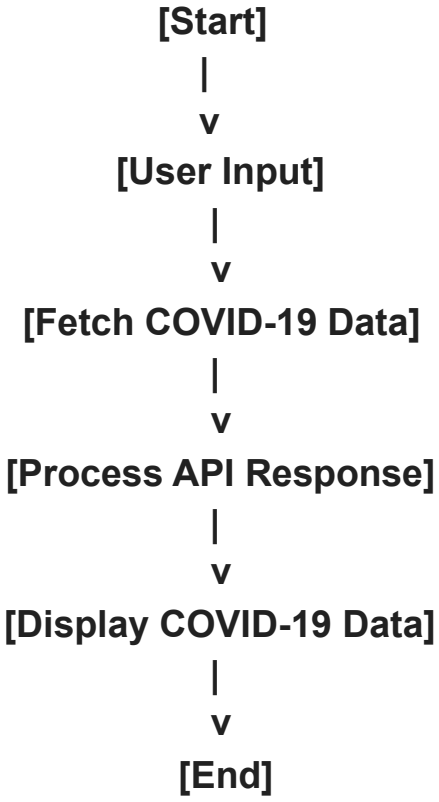
1. **Model the data flow for fetching COVID-19 statistics from an external API and displaying it to the user.**
2. **Implement a Python application that integrates with a COVID-19 statistics API (e.g., disease.sh) to fetch real-time data.**
3. **Display the current number of cases, recoveries, and deaths for a specified region.**

4. **Allow users to input a region (country, state, or city) and display the corresponding COVID-19 statistics.**

Deliverables:

- Data flow diagram illustrating the interaction between the application and the API. • Pseudocode and implementation of the COVID-19 statistics tracking application. • Documentation of the API integration and the methods used to fetch and display COVID 19 data.
- Explanation of any assumptions made and potential improvements.

FLOW CHART



CODE:

```
import requests
# Define the API endpoint
```

```
API_ENDPOINT = "https://disease.sh/v3/covid-19/historical/all?lastdays=all"

def fetch_covid_data(region):
    try:
        # Construct the API URL with the specified region
        url = API_ENDPOINT + "all" if region.lower() == "global" else API_ENDPOINT +
"countries/" + region
        # Send a GET request to the API
        response = requests.get(url)
        response.raise_for_status()
        # Parse the JSON response
        data = response.json()
        return data
    except requests.exceptions.RequestException as e:
        print("Error fetching data:", e)
        return None
def display_covid_data(data):
    region_name = data.get('country', 'Global')
    cases = data.get('cases', 'N/A')
    recoveries = data.get('recovered', 'N/A')
    deaths = data.get('deaths', 'N/A')
    print(f"COVID-19 Statistics for {region_name}")
```

```
    print(f"Cases: {cases}")
    print(f"Recoveries: {recoveries}")
    print(f"Deaths: {deaths}")
def main():
    # Get user input for region
    region = input("Enter a region (country name or 'global' for worldwide statistics): ")
    # Fetch COVID-19 data for the specified region
    data = fetch_covid_data(region)
    if data:
        # Display the fetched data
        display_covid_data(data)
    else:
        print("Failed to retrieve data")
if __name__ == "__main__":
    main()
```

INPUT :

OUTPUT :

Enter a region (country name or 'global' for worldwide statistics): usa
COVID-19 Statistics for Global

Cases: **{'2/8/23': 672295338, '2/9/23': 672554241, '2/10/23': 672696324, '2/11/23': 672828531, '2/12/23': 672906177, '2/13/23': 673044131, '2/14/23': 673237731, '2/15/23': 673477639, '2/16/23': 673685532, '2/17/23': 673878833, '2/18/23': 673969796, '2/19/23': 674056229, '2/20/23': 674143589, '2/21/23': 674323721, '2/22/23': 674569824, '2/23/23': 674790916, '2/24/23': 674933342, '2/25/23': 674978793, '2/26/23': 675044414, '2/27/23': 675171439, '2/28/23': 675322238, '3/1/23': 675542852, '3/2/23': 675731911, '3/3/23': 675914580, '3/4/23': 675968775, '3/5/23': 676024901, '3/6/23': 676082941, '3/7/23':**

676213378, '3/8/23': 676392824, '3/9/23': 676570149}

Recoveries: **{'2/8/23': 0, '2/9/23': 0, '2/10/23': 0, '2/11/23': 0, '2/12/23': 0, '2/13/23': 0, '2/14/23': 0, '2/15/23': 0, '2/16/23': 0, '2/17/23': 0, '2/18/23': 0, '2/19/23': 0, '2/20/23': 0, '2/21/23': 0, '2/22/23': 0, '2/23/23': 0, '2/24/23': 0, '2/25/23': 0, '2/26/23': 0, '2/27/23': 0, '2/28/23': 0, '3/1/23': 0, '3/2/23': 0, '3/3/23': 0, '3/4/23': 0, '3/5/23': 0, '3/6/23': 0, '3/7/23': 0, '3/8/23': 0, '3/9/23': 0}**

Deaths: **{'2/8/23': 6851942, '2/9/23': 6854280, '2/10/23': 6855413, '2/11/23': 6856046, '2/12/23': 6856419, '2/13/23': 6857217, '2/14/23': 6858411, '2/15/23': 6859933, '2/16/23': 6862019, '2/17/23': 6863873, '2/18/23': 6864248, '2/19/23': 6864711, '2/20/23': 6865287, '2/21/23': 6866088, '2/22/23': 6867909, '2/23/23': 6869817, '2/24/23': 6870806, '2/25/23': 6871024, '2/26/23': 6871268, '2/27/23': 6871808, '2/28/23': 6872682, '3/1/23': 6874463, '3/2/23': 6876031, '3/3/23': 6877325, '3/4/23': 6877601, '3/5/23': 6877749, '3/6/23': 6878115, '3/7/23':**

6879038, '3/8/23': 6880483, '3/9/23': 6881802}