Practical 2

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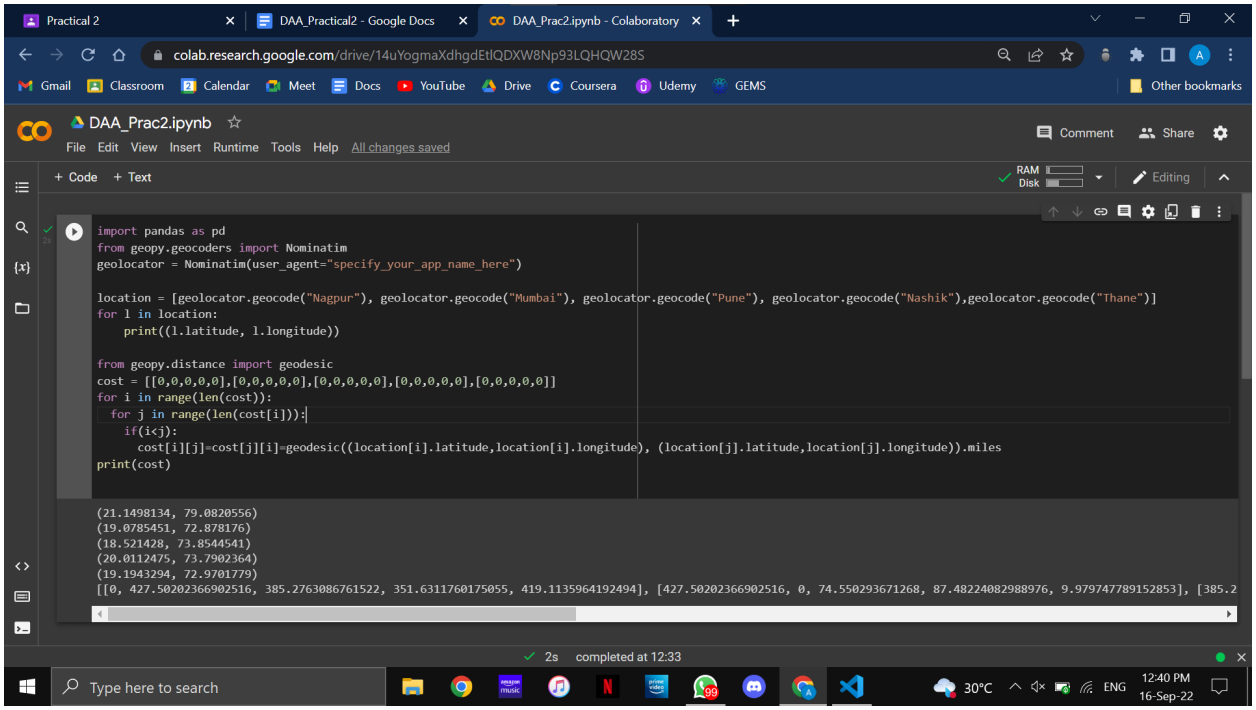
Subject: DAA Lab

Problem Statement:

A telecommunications organization has offices spanned across multiple locations around the globe. It has to use leased phone lines for connecting all these offices with each other.The cost (in units) of connecting each pair of offices is different. Calculate the cost of connecting each pair of offices. The organization, thus, wants to use minimum cost for connecting all its offices. This requires that all the offices should be connected using a minimum number of leased lines so as to reduce the effective cost.

Code in Python to calculate the distance between points in Google Map:

```
import pandas as pd
from geopy.geocoders import Nominatim
geolocator = Nominatim(user_agent="specify_your_app_name_here")

location = [geolocator.geocode("Nagpur"), geolocator.geocode("Mumbai"),
geolocator.geocode("Pune"),
geolocator.geocode("Nashik"),geolocator.geocode("Thane")]
for l in location:
    print((l.latitude, l.longitude))

from geopy.distance import geodesic
cost = [[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0]]
for i in range(len(cost)):
  for j in range(len(cost[i])):
    if(i<j):

cost[i][j]=cost[j][i]=geodesic((location[i].latitude,location[i].longitude
), (location[j].latitude,location[j].longitude)).miles
print(cost)
```



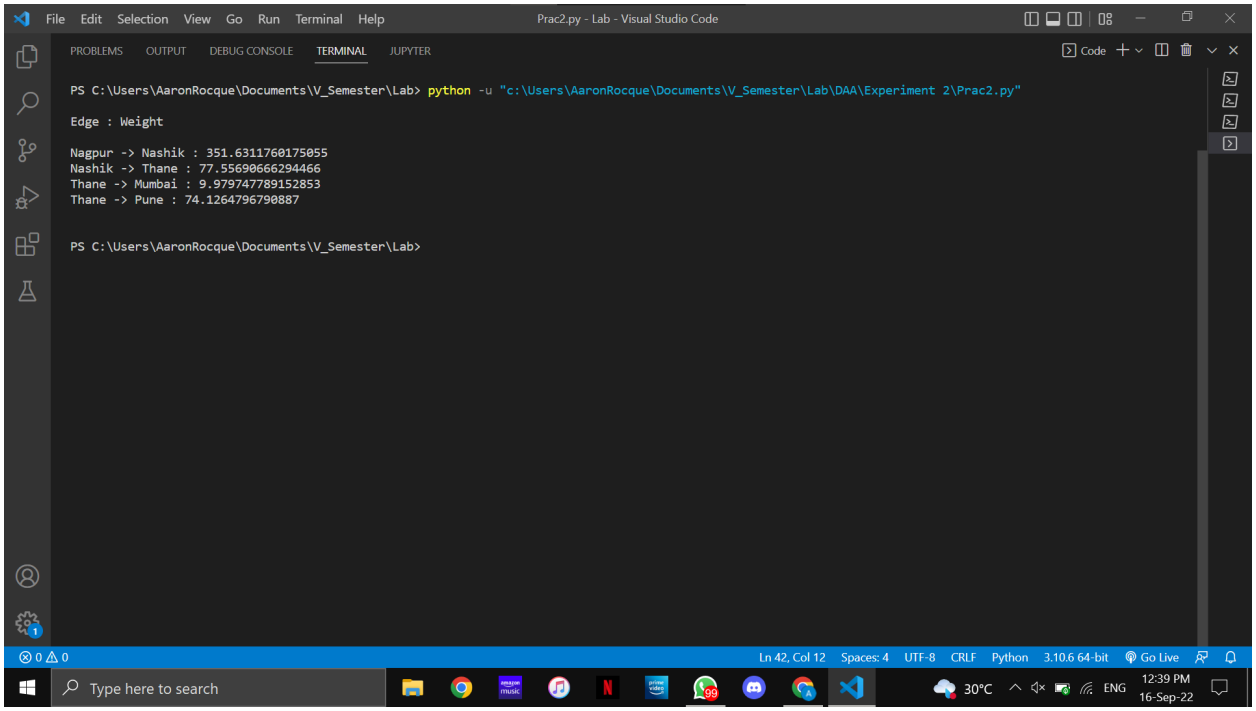
Code:

Prac2.py

```
INF = 9999999 #A very big number

no_of_cities = 5

distances = [
    [0.0, 427.50202366902516, 385.2763086761522, 351.6311760175055,
419.1135964192494],    #Nagpur
    [427.50202366902516, 0.0, 74.550293671268, 87.48224082988976,
9.979747789152853],      #Mumbai
    [385.2763086761522, 74.550293671268, 0.0, 102.55989455322387,
74.1264796790887],       #Pune
    [351.6311760175055, 87.48224082988976, 102.55989455322387, 0.0,
77.55690666294466],    #Nashik
    [419.1135964192494, 9.979747789152853, 74.1264796790887, 77.55690666294466,
0.0]       #Thane
   ]
```

```
cities = ['Nagpur', 'Mumbai', 'Pune', 'Nashik', 'Thane']

selected_city = [0, 0, 0, 0, 0, 0, 0]

selected_city[0] = 1

no_edge = 0


print("\nEdge : Weight\n")

while (no_edge < no_of_cities - 1):

    minimum = INF
    a = 0
    b = 0

    for m in range(no_of_cities):
        if selected_city[m]:
            for n in range(no_of_cities):
                if ((not selected_city[n]) and distances[m][n]):
                    if minimum > distances[m][n]:
                        minimum = distances[m][n]
                        a = m
                        b = n
    print(cities[a] + " -> " + cities[b] + " : " + str(distances[a][b]))
    selected_city[b] = True
    no_edge += 1

print("\n")
```

Output:


File Edit Selection View Go Run Terminal Help
Prac2.py - Lab - Visual Studio Code
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL JUPYTER
Code
PS C:\Users\AaronRocque\Documents\V_Semester\Lab> python -u "c:\Users\AaronRocque\Documents\V_Semester\Lab\DAA\Experiment 2\Prac2.py"
Edge : Weight
Nagpur -> Nashik : 351.6311760175055
Nashik -> Thane : 77.55690666294466
Thane -> Mumbai : 9.979747789152853
Thane -> Pune : 74.1264796790887
PS C:\Users\AaronRocque\Documents\V_Semester\Lab>
Ln 42, Col 12 Spaces: 4 UTF-8 CRLF Python 3.10.6 64-bit Go Live
Type here to search
30°C
ENG
12:39 PM
16-Sep-22