

SANJITHA R

22BRS1047

JESSEMAN DEVAMIRTHAM

22BRS1112

CODE:

```
# Install necessary packages
```

```
# You may need to install additional packages based on your environment and data format
```

```
# pip install pandas scikit-learn matplotlib numpy
```

```
import pandas as pd
```

```
import numpy as np
```

```
from sklearn.neighbors import BallTree
```

```
import matplotlib.pyplot as plt
```

```
# Function to calculate distances using BallTree
```

```
def calculate_distances(infected_coordinates, students_data):
```

```
    # Build BallTree using the infected person's path
```

```
    tree = BallTree(infected_coordinates)
```

```
    # Extract coordinates from student data
```

```
    student_coordinates = students_data[['X', 'Y']].values
```

```
    # Query the tree to find distances to the nearest point in the infected person's path
```

```
    distances, _ = tree.query(student_coordinates)
```

```
return distances
```

```
# Function for contact tracing
```

```
def contact_tracing(infected_person_path, students_data, threshold_distance):
```

```
    # Convert 'Timestamp' column to datetime
```

```
    infected_person_path['Timestamp'] =  
pd.to_datetime(infected_person_path['Timestamp'])
```

```
    students_data['Timestamp'] = pd.to_datetime(students_data['Timestamp'])
```

```
    # Extract coordinates from the infected person's path
```

```
    infected_coordinates = infected_person_path[['X', 'Y']].values
```

```
    # Calculate distances using the calculate_distances function
```

```
    distances = calculate_distances(infected_coordinates, students_data)
```

```
    # Identify potentially infected students based on the threshold distance
```

```
    infected_students = students_data[distances < threshold_distance]
```

```
    return infected_students
```

```
def preprocess_data(data):
```

```
    data['Timestamp'] = pd.to_datetime(data['Timestamp'])
```

```
    return data
```

```
def visualize_results(infected_person_path, students_data, infected_students):
```

```
plt.scatter(students_data['X'], students_data['Y'], label='Students')

plt.plot(infected_person_path['X'], infected_person_path['Y'], marker='o', color='red',
label='infected Person')

plt.scatter(infected_students['X'], infected_students['Y'], color='orange',
label='Potentially Infected')
```

```
plt.title('Contact Tracing Visualization')

plt.xlabel('X')

plt.ylabel('Y')

plt.legend()

plt.show()
```

```
infected_person_path_data = {
    'Timestamp': pd.to_datetime('today') + pd.to_timedelta(np.arange(3) * 15, unit='T'),
    'X': np.random.uniform(0, 10, 3),
    'Y': np.random.uniform(0, 10, 3),
}
```

```
students_data = {
    'StudentID': range(101, 351), # Changed from 101 to 351
    'Name': [f'Stu_{i}' for i in range(1, 251)], # Changed from 1 to 251
    'Timestamp': [pd.to_datetime('today')]*250, # Changed the date to today's date and
    reduced the number of students to 250
    'X': np.random.uniform(0, 10, 250), # Adjusted for 250 students
    'Y': np.random.uniform(0, 10, 250), # Adjusted for 250 students
}
```

```

# Set the distance threshold

THRESHOLD_DISTANCE = 3

# Data preprocessing

infected_person_path = preprocess_data(pd.DataFrame(infected_person_path_data))

students_data = preprocess_data(pd.DataFrame(students_data))


def visualize_results_with_background(infected_person_path, students_data,
infected_students, background_image_path):

    # Load the background image

    background_image = plt.imread("/Users/jesseman/Documents/Contact
Tracing/VITImage.jpg")


    # Plot the background image

    plt.imshow(background_image, extent=[0, 10, 0, 10])


    # Scatter plot for uninfected students

    plt.scatter(students_data['X'], students_data['Y'], label='Uninfected', color='blue')


    # Plot infected person's path

    plt.plot(infected_person_path['X'], infected_person_path['Y'], marker='o', color='red',
label='Infected Person')


    # Scatter plot for potentially infected students

    plt.scatter(infected_students['X'], infected_students['Y'], color='orange',
label='Potentially Infected')

```

```

# Annotate points with shortened student names

for index, student in infected_students.iterrows():

    plt.annotate(student['Name'], (student['X'], student['Y']), textcoords="offset points",
xytext=(0, 5), ha='center')


plt.title('Contact Tracing Visualization with Background Image')

plt.xlabel('X')

plt.ylabel('Y')

plt.legend()

plt.show()


# Specify the path to your background image

background_image_path = '/Users/jesseman/Documents/Contact Tracing/VITimage.jpg' #
Replace with the actual path to your image


infected_students = contact_tracing(infected_person_path, students_data,
THRESHOLD_DISTANCE)


# Add a column indicating infection status

students_data['InfectionStatus'] = 'Non-Infected'

students_data.loc[students_data['StudentID'].isin(infected_students['StudentID']),
'InfectionStatus'] = 'Potentially Infected'


# Save the result to a CSV file

output_filename = 'contact_tracing_results.csv'

```

```
students_data.to_csv(output_filename, index=False)
```

```
# Display a sample of the resulting DataFrame
```

```
print(students_data.head())
```

```
# Visualization with background image
```

```
visualize_results_with_background(infected_person_path, students_data,  
infected_students, background_image_path)
```

SCREENSHOT:

contact_tracing_results

StudentID	Name	Timestamp	X	Y	InfectionStatus
101	Stu_1	2024-04-29 12:57:06.003716	6.773282380987290	0.487693661322226	Non-Infected
102	Stu_2	2024-04-29 12:57:06.003716	9.109068694467020	4.492529518670420	Potentially Infected
103	Stu_3	2024-04-29 12:57:06.003716	0.9517921987471160	8.896070695580720	Non-Infected
104	Stu_4	2024-04-29 12:57:06.003716	6.9719943844269300	0.5664299335966310	Non-Infected
105	Stu_5	2024-04-29 12:57:06.003716	5.622981357890750	2.677832950709850	Potentially Infected
106	Stu_6	2024-04-29 12:57:06.003716	0.8528540741155340	4.489958933597110	Non-Infected
107	Stu_7	2024-04-29 12:57:06.003716	4.009805268320520	3.5668906710410000	Potentially Infected
108	Stu_8	2024-04-29 12:57:06.003716	1.6393418614871000	9.944869092283570	Non-Infected
109	Stu_9	2024-04-29 12:57:06.003716	2.4260330525947800	8.858381767190560	Non-Infected
110	Stu_10	2024-04-29 12:57:06.003716	8.52393579656923	3.4463015983472900	Potentially Infected
111	Stu_11	2024-04-29 12:57:06.003716	6.032401548679970	9.3500771705492	Non-Infected
112	Stu_12	2024-04-29 12:57:06.003716	1.5689595812609400	9.450128877764810	Non-Infected
113	Stu_13	2024-04-29 12:57:06.003716	4.07818837180976	9.564994346540060	Non-Infected
114	Stu_14	2024-04-29 12:57:06.003716	4.630361188489620	5.4045184480775700	Potentially Infected
115	Stu_15	2024-04-29 12:57:06.003716	5.1229236387718900	9.930840979228300	Non-Infected
116	Stu_16	2024-04-29 12:57:06.003716	3.1910486592470800	1.9185129866056100	Potentially Infected
117	Stu_17	2024-04-29 12:57:06.003716	0.04300862384019830	4.4606458063795200	Non-Infected
118	Stu_18	2024-04-29 12:57:06.003716	9.373161229014520	6.186574684284520	Non-Infected
119	Stu_19	2024-04-29 12:57:06.003716	0.09031596932348670	0.8380356389121620	Potentially Infected
120	Stu_20	2024-04-29 12:57:06.003716	1.6285470709663300	5.083914318216090	Potentially Infected
121	Stu_21	2024-04-29 12:57:06.003716	1.7355768398999600	8.979750116865970	Non-Infected
122	Stu_22	2024-04-29 12:57:06.003716	2.6380095489607600	2.2461614943052900	Potentially Infected
123	Stu_23	2024-04-29 12:57:06.003716	0.03344137693009010	6.840257347783730	Non-Infected
124	Stu_24	2024-04-29 12:57:06.003716	1.2684629235179100	6.139337069760740	Non-Infected
125	Stu_25	2024-04-29 12:57:06.003716	6.329011550634310	5.242732733153680	Non-Infected
126	Stu_26	2024-04-29 12:57:06.003716	8.113260974534660	0.5601416384138390	Potentially Infected
127	Stu_27	2024-04-29 12:57:06.003716	5.77719414657246	2.8885814214265700	Potentially Infected
128	Stu_28	2024-04-29 12:57:06.003716	3.570917349587730	9.850299923460920	Non-Infected
129	Stu_29	2024-04-29 12:57:06.003716	9.095574683084070	7.219030848129950	Non-Infected
130	Stu_30	2024-04-29 12:57:06.003716	2.011365182768420	4.528442638865810	Potentially Infected
131	Stu_31	2024-04-29 12:57:06.003716	4.992763038265820	6.418647598935540	Non-Infected
132	Stu_32	2024-04-29 12:57:06.003716	0.22867693073923	7.871175674977050	Non-Infected
133	Stu_33	2024-04-29 12:57:06.003716	1.7919096568730400	1.9943638509700300	Potentially Infected
134	Stu_34	2024-04-29 12:57:06.003716	9.103508591788090	7.691640232093220	Non-Infected
135	Stu_35	2024-04-29 12:57:06.003716	6.134815827189650	2.8062689671663500	Potentially Infected
136	Stu_36	2024-04-29 12:57:06.003716	3.8041207635648700	1.2448688805501500	Potentially Infected

VIT CHENNAI - CAMPUS LAYOUT

Legend:

- Uninfected (Blue dot)
- Infected Person (Red line)
- Potentially Infected (Yellow dot)

The map displays the following locations and student counts:

Location	Student Count
Hostel A-Block	Stu 71, Stu 86, Stu 90, Stu 94, Stu 98, Stu 102, Stu 106, Stu 110, Stu 114, Stu 118, Stu 122, Stu 126, Stu 130, Stu 134, Stu 138, Stu 142, Stu 146, Stu 150, Stu 154, Stu 158, Stu 162, Stu 166, Stu 170, Stu 174, Stu 178, Stu 182, Stu 186, Stu 190, Stu 194, Stu 198, Stu 202, Stu 206, Stu 210, Stu 214, Stu 218, Stu 222, Stu 226, Stu 230, Stu 234, Stu 238, Stu 242, Stu 246, Stu 250, Stu 254, Stu 258, Stu 262, Stu 266, Stu 270, Stu 274, Stu 278, Stu 282, Stu 286, Stu 290, Stu 294, Stu 298, Stu 302, Stu 306, Stu 310, Stu 314, Stu 318, Stu 322, Stu 326, Stu 330, Stu 334, Stu 338, Stu 342, Stu 346, Stu 350, Stu 354, Stu 358, Stu 362, Stu 366, Stu 370, Stu 374, Stu 378, Stu 382, Stu 386, Stu 390, Stu 394, Stu 398, Stu 402, Stu 406, Stu 410, Stu 414, Stu 418, Stu 422, Stu 426, Stu 430, Stu 434, Stu 438, Stu 442, Stu 446, Stu 450, Stu 454, Stu 458, Stu 462, Stu 466, Stu 470, Stu 474, Stu 478, Stu 482, Stu 486, Stu 490, Stu 494, Stu 498, Stu 502, Stu 506, Stu 510, Stu 514, Stu 518, Stu 522, Stu 526, Stu 530, Stu 534, Stu 538, Stu 542, Stu 546, Stu 550, Stu 554, Stu 558, Stu 562, Stu 566, Stu 570, Stu 574, Stu 578, Stu 582, Stu 586, Stu 590, Stu 594, Stu 598, Stu 602, Stu 606, Stu 610, Stu 614, Stu 618, Stu 622, Stu 626, Stu 630, Stu 634, Stu 638, Stu 642, Stu 646, Stu 650, Stu 654, Stu 658, Stu 662, Stu 666, Stu 670, Stu 674, Stu 678, Stu 682, Stu 686, Stu 690, Stu 694, Stu 698, Stu 702, Stu 706, Stu 710, Stu 714, Stu 718, Stu 722, Stu 726, Stu 730, Stu 734, Stu 738, Stu 742, Stu 746, Stu 750, Stu 754, Stu 758, Stu 762, Stu 766, Stu 770, Stu 774, Stu 778, Stu 782, Stu 786, Stu 790, Stu 794, Stu 798, Stu 802, Stu 806, Stu 810, Stu 814, Stu 818, Stu 822, Stu 826, Stu 830, Stu 834, Stu 838, Stu 842, Stu 846, Stu 850, Stu 854, Stu 858, Stu 862, Stu 866, Stu 870, Stu 874, Stu 878, Stu 882, Stu 886, Stu 890, Stu 894, Stu 898, Stu 902, Stu 906, Stu 910, Stu 914, Stu 918, Stu 922, Stu 926, Stu 930, Stu 934, Stu 938, Stu 942, Stu 946, Stu 950, Stu 954, Stu 958, Stu 962, Stu 966, Stu 970, Stu 974, Stu 978, Stu 982, Stu 986, Stu 990, Stu 994, Stu 998, Stu 1002, Stu 1006, Stu 1010, Stu 1014, Stu 1018, Stu 1022, Stu 1026, Stu 1030, Stu 1034, Stu 1038, Stu 1042, Stu 1046, Stu 1050, Stu 1054, Stu 1058, Stu 1062, Stu 1066, Stu 1070, Stu 1074, Stu 1078, Stu 1082, Stu 1086, Stu 1090, Stu 1094, Stu 1098, Stu 1102, Stu 1106, Stu 1110, Stu 1114, Stu 1118, Stu 1122, Stu 1126, Stu 1130, Stu 1134, Stu 1138, Stu 1142, Stu 1146, Stu 1150, Stu 1154, Stu 1158, Stu 1162, Stu 1166, Stu 1170, Stu 1174, Stu 1178, Stu 1182, Stu 1186, Stu 1190, Stu 1194, Stu 1198, Stu 1202, Stu 1206, Stu 1210, Stu 1214, Stu 1218, Stu 1222, Stu 1226, Stu 1230, Stu 1234, Stu 1238, Stu 1242, Stu 1246, Stu 1250, Stu 1254, Stu 1258, Stu 1262, Stu 1266, Stu 1270, Stu 1274, Stu 1278, Stu 1282, Stu 1286, Stu 1290, Stu 1294, Stu 1298, Stu 1302, Stu 1306, Stu 1310, Stu 1314, Stu 1318, Stu 1322, Stu 1326, Stu 1330, Stu 1334, Stu 1338, Stu 1342, Stu 1346, Stu 1350, Stu 1354, Stu 1358, Stu 1362, Stu 1366, Stu 1370, Stu 1374, Stu 1378, Stu 1382, Stu 1386, Stu 1390, Stu 1394, Stu 1398, Stu 1402, Stu 1406, Stu 1410, Stu 1414, Stu 1418, Stu 1422, Stu 1426, Stu 1430, Stu 1434, Stu 1438, Stu 1442, Stu 1446, Stu 1450, Stu 1454, Stu 1458, Stu 1462, Stu 1466, Stu 1470, Stu 1474, Stu 1478, Stu 1482, Stu 1486, Stu 1490, Stu 1494, Stu 1498, Stu 1502, Stu 1506, Stu 1510, Stu 1514, Stu 1518, Stu 1522, Stu 1526, Stu 1530, Stu 1534, Stu 1538, Stu 1542, Stu 1546, Stu 1550, Stu 1554, Stu 1558, Stu 1562, Stu 1566, Stu 1570, Stu 1574, Stu 1578, Stu 1582, Stu 1586, Stu 1590, Stu 1594, Stu 1598, Stu 1602, Stu 1606, Stu 1610, Stu 1614, Stu 1618, Stu 1622, Stu 1626, Stu 1630, Stu 1634, Stu 1638, Stu 1642, Stu 1646, Stu 1650, Stu 1654, Stu 1658, Stu 1662, Stu 1666, Stu 1670, Stu 1674, Stu 1678, Stu 1682, Stu 1686, Stu 1690, Stu 1694, Stu 1698, Stu 1702, Stu 1706, Stu 1710, Stu 1714, Stu 1718, Stu 1722, Stu 1726, Stu 1730, Stu 1734, Stu 1738, Stu 1742, Stu 1746, Stu 1750, Stu 1754, Stu 1758, Stu 1762, Stu 1766, Stu 1770, Stu 1774, Stu 1778, Stu 1782, Stu 1786, Stu 1790, Stu 1794, Stu 1798, Stu 1802, Stu 1806, Stu 1810, Stu 1814, Stu 1818, Stu 1822, Stu 1826, Stu 1830, Stu 1834, Stu 1838, Stu 1842, Stu 1846, Stu 1850, Stu 1854, Stu 1858, Stu 1862, Stu 1866, Stu 1870, Stu 1874, Stu 1878, Stu 1882, Stu 1886, Stu 1890, Stu 1894, Stu 1898, Stu 1902, Stu 1906, Stu 1910, Stu 1914, Stu 1918, Stu 1922, Stu 1926, Stu 1930, Stu 1934, Stu 1938, Stu 1942, Stu 1946, Stu 1950, Stu 1954, Stu 1958, Stu 1962, Stu 1966, Stu 1970, Stu 1974, Stu 1978, Stu 1982, Stu 1986, Stu 1990, Stu 1994, Stu 1998, Stu 2002, Stu 2006, Stu 2010, Stu 2014, Stu 2018, Stu 2022, Stu 2026, Stu 2030, Stu 2034, Stu 2038, Stu 2042, Stu 2046, Stu 2050, Stu 2054, Stu 2058, Stu 2062, Stu 2066, Stu 2070, Stu 2074, Stu 2078, Stu 2082, Stu 2086, Stu 2090, Stu 2094, Stu 2098, Stu 2102, Stu 2106, Stu 2110, Stu 2114, Stu 2118, Stu 2122, Stu 2126, Stu 2130, Stu 2134, Stu 2138, Stu 2142, Stu 2146, Stu 2150, Stu 2154, Stu 2158, Stu 2162, Stu 2166, Stu 2170, Stu 2174, Stu 2178, Stu 2182, Stu 2186, Stu 2190, Stu 2194, Stu 2198, Stu 2202, Stu 2206, Stu 2210, Stu 2214, Stu 2218, Stu 2222, Stu 2226, Stu 2230, Stu 2234, Stu 2238, Stu 2242, Stu 2246, Stu 2250, Stu 2254, Stu 2258, Stu 2262, Stu 2266, Stu 2270, Stu 2274, Stu 2278, Stu 2282, Stu 2286, Stu 2290, Stu 2294, Stu 2298, Stu 2302, Stu 2306, Stu 2310, Stu 2314, Stu 2318, Stu 2322, Stu 2326, Stu 2330, Stu 2334, Stu 2338, Stu 2342, Stu 2346, Stu 2350, Stu 2354, Stu 2358, Stu 2362, Stu 2366, Stu 2370, Stu 2374, Stu 2378, Stu 2382, Stu 2386, Stu 2390, Stu 2394, Stu 2398, Stu 2402, Stu 2406, Stu 2410, Stu 2414, Stu 2418, Stu 2422,