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)
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    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):
```

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    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'
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students_data.to_csv(output_filename, index=False)


# Display a sample of the resulting DataFrame

print(students_data.head())

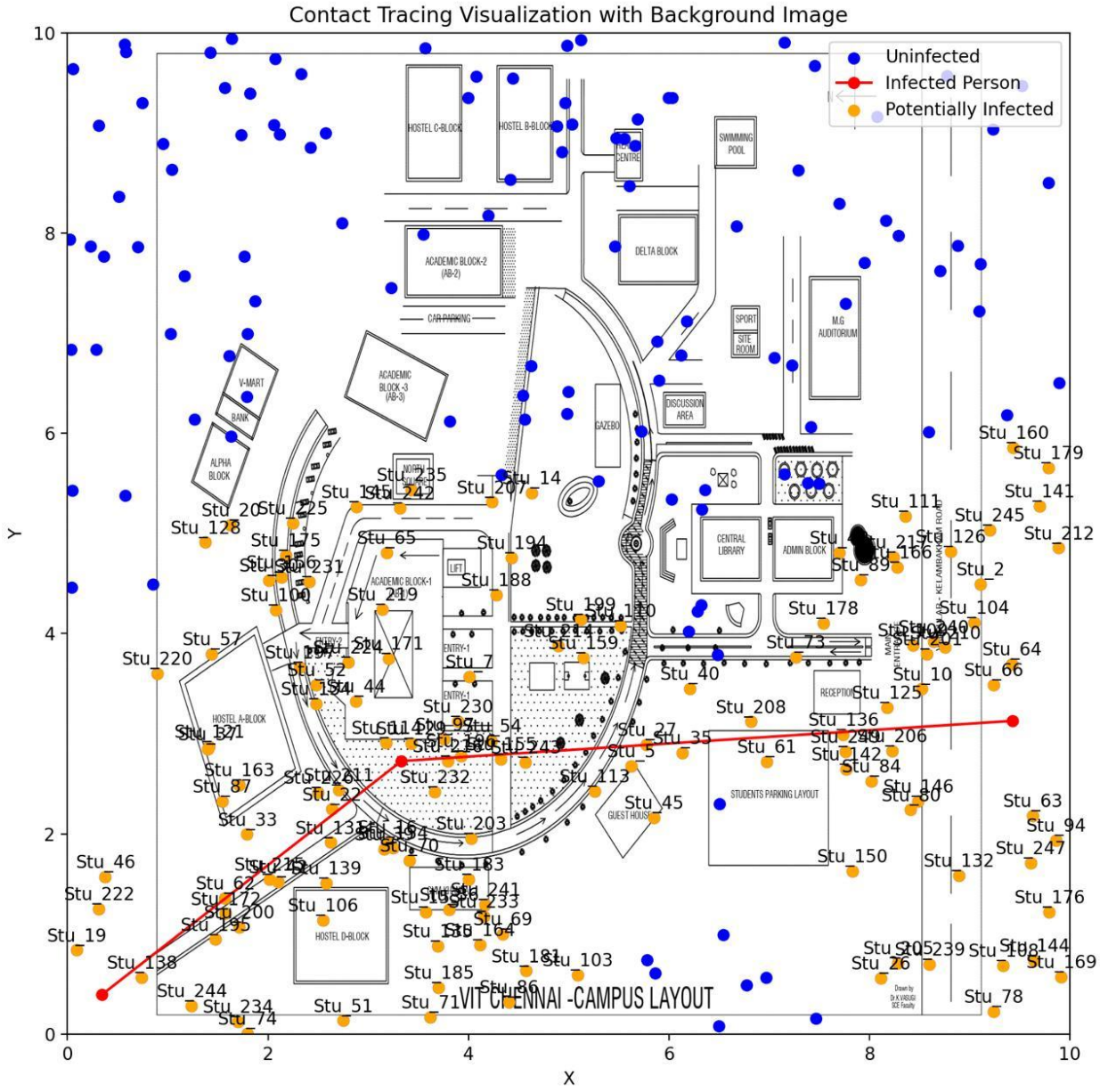

# Visualization with background image

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


Contact Tracing Visualization with Background Image
Uninfected
Infected Person
Potentially Infected
X
Y
VIT CHENNAI -CAMPUS LAYOUT
HOSTEL C-BLOCK
HOSTEL B-BLOCK
SWIMMING POOL
DELTA BLOCK
ACADEMIC BLOCK-2 (AB-2)
CAR PARKING
SPORT SITE ROOM
M.G AUDITORIUM
V-MART
BANK
ACADEMIC BLOCK -3 (AB-3)
GAZEBO
DISCUSSION AREA
ALPHA BLOCK
CENTRAL LIBRARY
ADMIN BLOCK
ACADEMIC BLOCK-1
LIFT
ENTRY-1
ENTRY-2
HOSTEL A-BLOCK
HOSTEL D-BLOCK
GUEST HOUSE
STUDENTS PARKING LAYOUT
RECEPTION