```
/**
 * @Author: Shivam Patel
 * @Andrew_ID: shpatel
 * @Course: 95-771 Data Structures and Algorithms for Information
Processing
 * @Project_Number: Project 4
 * @File: shpatel_Screenshots_Project4
 */
```

Note: Since my output for each part of the project did not fit into one screenshot, I could not just have three screenshots in total. Thus, I have added them all in here.

Project 4 – Part 1 Screenshots

```
Enter number of test cases: 3


******** Enter details for Test Case 1 ********


Enter start date:
1/1/90
Enter end date:
1/1/90

Crime records between 1/1/90 and 1/1/90
1348656.471,399538.5342,32874,100 BONIFAY ST,ROBBERY,1/1/90,160600,40.40865518,-79.9760891
1359951.481,410726.1273,32874,320 SCHENLEY RD,ROBBERY,1/1/90,140100,40.44013011,-79.93653583
1357049.25,418429.9175,32874,4779 LIBERTY AV,ROBBERY,1/1/90,80900,40.46107271,-79.94764804
1361745.729,419343.2848,32874,5600 PENN AV,AGGRAVATED ASSAULT,1/1/90,111500,40.46389868,-79.93085611

Hamiltonian Cycle (not necessarily optimum):
0 1 2 3 0
Length Of cycle: 9.972129467002567 miles
```

```
******** Enter details for Test Case 2 ********


Enter start date:
1/14/90
Enter end date:
1/15/90

Crime records between 1/14/90 and 1/15/90
1340358.516,418063.7574,32887,1 ALPINE ST,AGGRAVATED ASSAULT,1/14/90,250300,40.45891236,-80.00757768
1351183.029,410482.0054,32888,211 BURROWS ST,AGGRAVATED ASSAULT,1/15/90,51000,40.43886004,-79.968006
1346775.118,410574.5466,32888,1600 FIFTH AV,AGGRAVATED ASSAULT,1/15/90,10300,40.43880904,-79.98384521
1346775.118,410574.5466,32888,1600 FIFTH AV,ROBBERY,1/15/90,10300,40.43880904,-79.98384521
1375199.387,415958.6475,32888,8100 FRANKSTOWN AV,AGGRAVATED ASSAULT,1/15/90,130600,40.45551239,-79.88222498
1342709.971,416295.7223,32888,609 E OHIO ST,ROBBERY,1/15/90,230400,40.45422538,-79.99896828
1341087.095,417642.7939,32888,1400 SANDUSKY ST,AGGRAVATED ASSAULT,1/15/90,220600,40.45780829,-80.00492164
1370004.246,420807.4845,32888,6628 BRAINARD ST,AGGRAVATED ASSAULT,1/15/90,120300,40.46847265,-79.90131253
1355089.881,420937.5121,32888,422 FORTY-FOURTH ST,ROBBERY,1/15/90,90200,40.46781983,-79.95491236

Hamiltonian Cycle (not necessarily optimum):
0 6 5 2 1 3 8 7 4 0
Length Of cycle: 16.85546767366496 miles
```

```
******** Enter details for Test Case 3 ********


Enter start date:
1/17/90
Enter end date:
1/17/90

Crime records between 1/17/90 and 1/17/90
1338569.087,405039.0892,32890,5 PENELOPE ST,RAPE,1/17/90,191400,40.4230457,-80.01280699
1352559.371,410320.7755,32890,3335 FIFTH AV,AGGRAVATED ASSAULT,1/17/90,40200,40.43851237,-79.9630484
1328031.491,414080.5063,32890,1400 CRUCIBLE ST,ROBBERY,1/17/90,281400,40.44710868,-80.05148886
1364383.259,423416.6316,32890,1142 N ST CLAIR ST,ROBBERY,1/17/90,110200,40.47525495,-79.92173984

Hamiltonian Cycle (not necessarily optimum):
0 1 2 3 0
Length Of cycle: 20.641155236609652 miles

Process finished with exit code 0
```

Project 4 – Part 2 Screenshots

```
Enter number of test cases: 3


******** Enter details for Test Case 1 ********


Enter start date:
1/1/90
Enter end date:
1/1/90

Crime records between 1/1/90 and 1/1/90
1348656.471,399538.5342,32874,100 BONIFAY ST,ROBBERY,1/1/90,160600,40.40865518,-79.9760891
1359951.481,410726.1273,32874,320 SCHENLEY RD,ROBBERY,1/1/90,140100,40.44013011,-79.93653583
1357049.25,418429.9175,32874,4779 LIBERTY AV,ROBBERY,1/1/90,80900,40.46107271,-79.94764804
1361745.729,419343.2848,32874,5600 PENN AV,AGGRAVATED ASSAULT,1/1/90,111500,40.46389868,-79.93085611

Hamiltonian Cycle (not necessarily optimum):
0 1 2 3 0
Length Of cycle: 9.972129467002567 miles
```

```
Looking at every permutation to find the optimal solution
The best permutation
0 1 3 2 0

Optimal Cycle length = 9.499048743818799 miles
```

```
******** Enter details for Test Case 2 ********


Enter start date:
1/14/90
Enter end date:
1/15/90

Crime records between 1/14/90 and 1/15/90
1340358.516,418063.7574,32887,1 ALPINE ST,AGGRAVATED ASSAULT,1/14/90,250300,40.45891236,-80.00757768
1351183.029,410482.0054,32888,211 BURROWS ST,AGGRAVATED ASSAULT,1/15/90,51000,40.43886004,-79.968006
1346775.118,410574.5466,32888,1600 FIFTH AV,AGGRAVATED ASSAULT,1/15/90,10300,40.43880904,-79.98384521
1346775.118,410574.5466,32888,1600 FIFTH AV,ROBBERY,1/15/90,10300,40.43880904,-79.98384521
1375199.387,415958.6475,32888,8100 FRANKSTOWN AV,AGGRAVATED ASSAULT,1/15/90,130600,40.45551239,-79.88222498
1342709.971,416295.7223,32888,609 E OHIO ST,ROBBERY,1/15/90,230400,40.45422538,-79.99896828
1341087.095,417642.7939,32888,1400 SANDUSKY ST,AGGRAVATED ASSAULT,1/15/90,220600,40.45780829,-80.00492164
1370004.246,420807.4845,32888,6628 BRAINARD ST,AGGRAVATED ASSAULT,1/15/90,120300,40.46847265,-79.90131253
1355089.881,420937.5121,32888,422 FORTY-FOURTH ST,ROBBERY,1/15/90,90200,40.46781983,-79.95491236
```

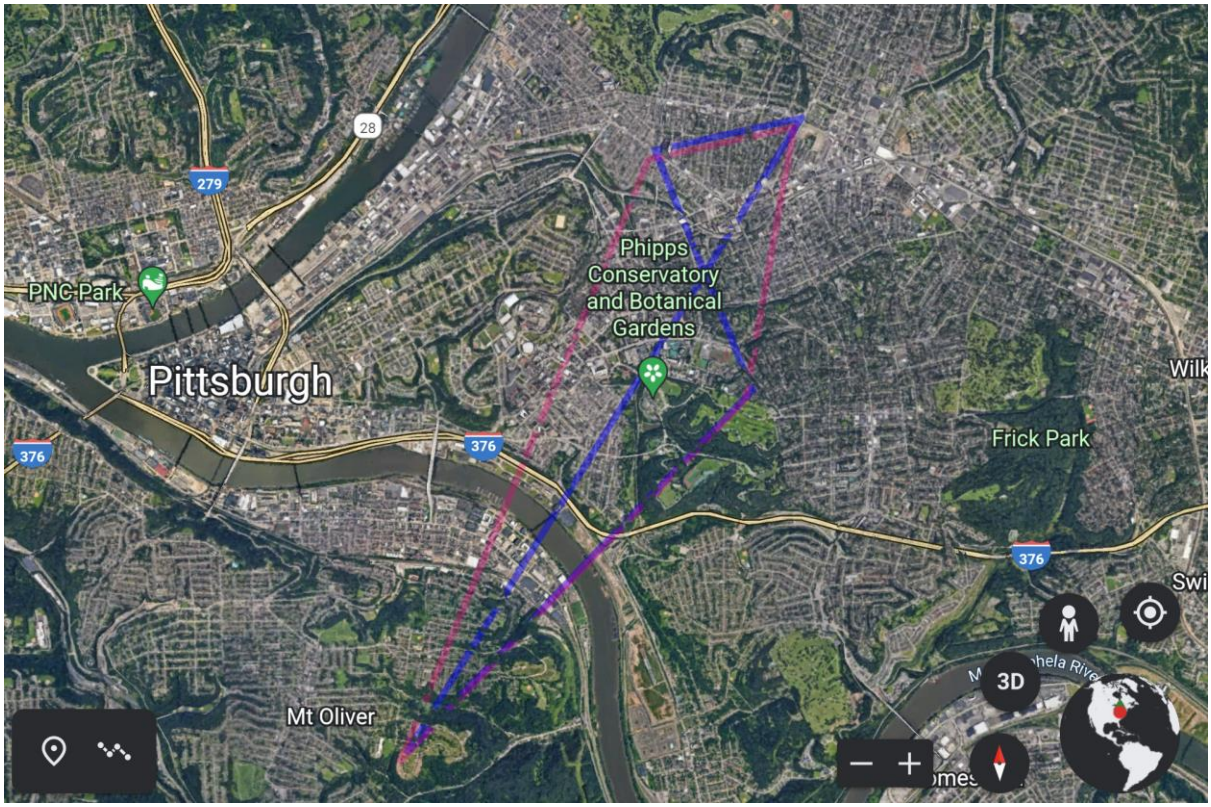
```
Hamiltonian Cycle (not necessarily optimum):
0 6 5 2 1 3 8 7 4 0
Length Of cycle: 16.85546767366496 miles

Looking at every permutation to find the optimal solution
The best permutation
0 8 7 4 1 2 3 5 6 0

Optimal Cycle length = 14.401413183926355 miles
```

```
******** Enter details for Test Case 3 ********


Enter start date:
1/17/90
Enter end date:
1/17/90

Crime records between 1/17/90 and 1/17/90
1338569.087,405039.0892,32890,5 PENELOPE ST,RAPE,1/17/90,191400,40.4230457,-80.01280699
1352559.371,410320.7755,32890,3335 FIFTH AV,AGGRAVATED ASSAULT,1/17/90,40200,40.43851237,-79.9630484
1328031.491,414080.5063,32890,1400 CRUCIBLE ST,ROBBERY,1/17/90,281400,40.44710868,-80.05148886
1364383.259,423416.6316,32890,1142 N ST CLAIR ST,ROBBERY,1/17/90,110200,40.47525495,-79.92173984

Hamiltonian Cycle (not necessarily optimum):
0 1 2 3 0
Length Of cycle: 20.641155236609652 miles
```

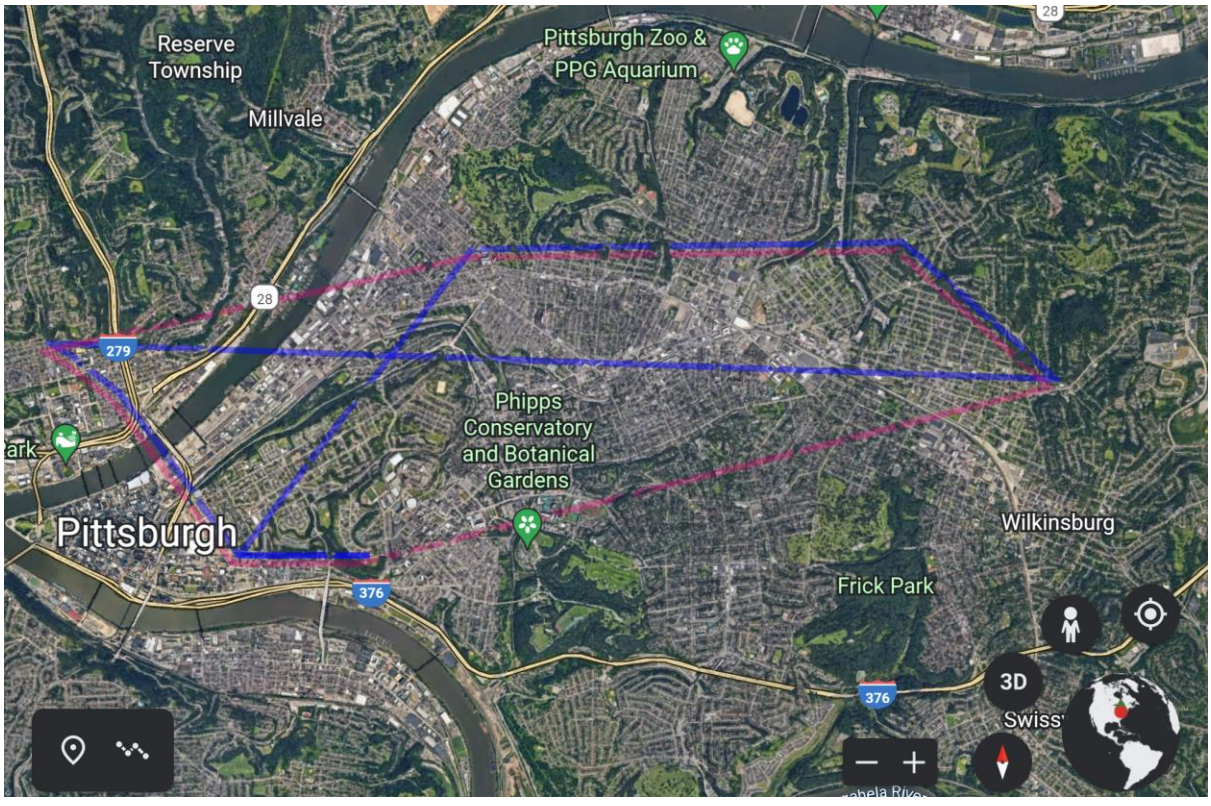
```
Looking at every permutation to find the optimal solution
The best permutation
0 1 3 2 0

Optimal Cycle length = 15.911460455945342 miles

Process finished with exit code 0
```

Project 4 – Part 3 Screenshots

PGHCrimesTestCase1.kml



PGHCrimesTestCase2.kml



PGHCrimesTestCase3.kml