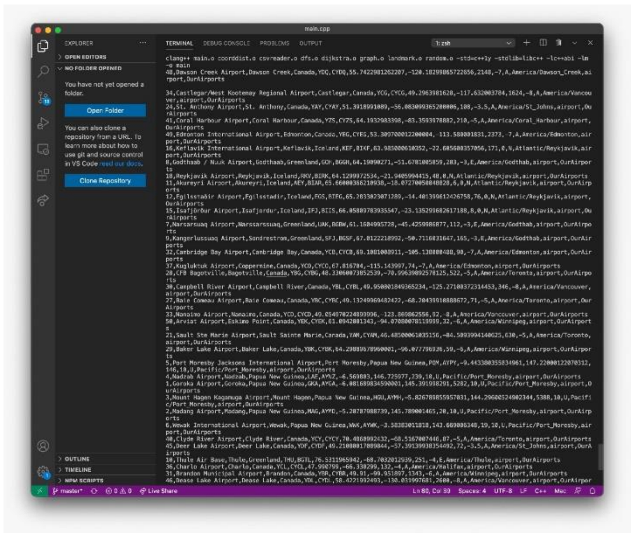
# CS 225 Final Project Results

With our project, we wanted to complete our goals, which are to be able to traverse through the graph using DFS, find the shortest path using Dijkstra's shortest path as well as the Landmark Path problem. Because of this, we started to write the code to first complete the traversal, since this is the basic. After completing the traversal, we decided to work on Dijkstra's algorithm first because this algorithm would then be used later.

First with the DFS, we had to try and test them manually using our own data. After thoroughly testing, we found that it worked locally. However, when we used the airport dataset, it did not work due to the way we accessed the data; the delimiter did not work because some of the airport names contains the delimiter we used. Because of this, we decided to just use a subset of the data and with that, we fixed it. As seen on the image on the right, the program would traverse through all of the airports and print their information. When running DFS, it would print the airports ID, location, name, coordinates, et cetera. As seen on the terminal, it worked.



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clang++ main.o coorddist.o csvreader.o dfs.o dijkstra.o graph.o landmark.o random.o -std=c++1y -stdlib=libc++ -lc++abi -lm
-o main
48,Dawson Creek Airport,Dawson Creek,Canada,YDQ,CYDQ,55.7422981262207,-120.18299865722656,2148,-7,A,America/Dawson_Creek,ai
rport,OurAirports

34,Castlegar/West Kootenay Regional Airport,Castlegar,Canada,YCG,CYCG,49.2963981628,-117.632003784,1624,-8,A,America/Vancou
ver,airport,OurAirports
24,St. Anthony Airport,St. Anthony,Canada,YAY,CYAY,51.3918991089,-56.083099365200006,108,-3.5,A,America/St_Johns,airport,Ou
rAirports
41,Coral Harbour Airport,Coral Harbour,Canada,YZS,CYZS,64.1932983398,-83.3593978882,210,-5,A,America/Coral_Harbour,airport,
OurAirports
49,Edmonton International Airport,Edmonton,Canada,YEG,CYEG,53.309700012200004,-113.580001831,2373,-7,A,America/Edmonton,air
port,OurAirports
16,Keflavik International Airport,Keflavik,Iceland,KEF,BIKF,63.985000610352,-22.605600357056,171,0,N,Atlantic/Reykjavik,air
port,OurAirports
8,Godthaab / Nuuk Airport,Godthaab,Greenland,GOH,BGGH,64.19090271,-51.6781005859,283,-3,E,America/Godthab,airport,OurAirpor
ts
18,Reykjavik Airport,Reykjavik,Iceland,RKV,BIRK,64.1299972534,-21.9405994415,48,0,N,Atlantic/Reykjavik,airport,OurAirports
11,Akureyri Airport,Akureyri,Iceland,AEY,BIAR,65.66000366210938,-18.07270050048828,6,0,N,Atlantic/Reykjavik,airport,OurAirp
orts
12,Egilsstaðir Airport,Egilsstadir,Iceland,EGS,BIEG,65.2833023071289,-14.401399612426758,76,0,N,Atlantic/Reykjavik,airport,
OurAirports
15,Ísafjörður Airport,Isafjordur,Iceland,IFJ,BIIS,66.05809783935547,-23.135299682617188,8,0,N,Atlantic/Reykjavik,airport,Ou
rAirports
7,Narsarsuaq Airport,Narssarssuaq,Greenland,UAK,BGBW,61.1604995728,-45.4259986877,112,-3,E,America/Godthab,airport,OurAirpo
rts
9,Kangerlussuaq Airport,Sondrestrom,Greenland,SFJ,BGSF,67.0122218992,-50.7116031647,165,-3,E,America/Godthab,airport,OurAir
ports
32,Cambridge Bay Airport,Cambridge Bay,Canada,YCB,CYCB,69.1081008911,-105.138000488,90,-7,A,America/Edmonton,airport,OurAir
ports
37,Kugluktuk Airport,Coppermine,Canada,YCO,CYCO,67.816704,-115.143997,74,-7,A,America/Edmonton,airport,OurAirports
28,CFB Bagotville,Bagotville,Canada,YBG,CYBG,48.33060073852539,-70.99639892578125,522,-5,A,America/Toronto,airport,OurAirpo
rts
30,Campbell River Airport,Campbell River,Canada,YBL,CYBL,49.950801849365234,-125.27100372314453,346,-8,A,America/Vancouver,
airport,OurAirports
27,Baie Comeau Airport,Baie Comeau,Canada,YBC,CYBC,49.13249969482422,-68.20439910888672,71,-5,A,America/Toronto,airport,Our
Airports
33,Nanaimo Airport,Nanaimo,Canada,YCD,CYCD,49.054970224899996,-123.869862556,92,-8,A,America/Vancouver,airport,OurAirports
50,Arviat Airport,Eskimo Point,Canada,YEK,CYEK,61.0942001343,-94.07080078119999,32,-6,A,America/Winnipeg,airport,OurAirport
s
21,Sault Ste Marie Airport,Sault Sainte Marie,Canada,YAM,CYAM,46.48500061035156,-84.5093994140625,630,-5,A,America/Toronto,
airport,OurAirports
29,Baker Lake Airport,Baker Lake,Canada,YBK,CYBK,64.29889678960001,-96.077796936,59,-6,A,America/Winnipeg,airport,OurAirpor
ts
5,Port Moresby Jacksons International Airport,Port Moresby,Papua New Guinea,POM,AYPY,-9.443380355834961,147.22000122070312,
146,10,U,Pacific/Port_Moresby,airport,OurAirports
4,Nadzab Airport,Nadzab,Papua New Guinea,LAE,AYNZ,-6.569803,146.725977,239,10,U,Pacific/Port_Moresby,airport,OurAirports
1,Goroka Airport,Goroka,Papua New Guinea,GKA,AYGA,-6.081689834590001,145.391998291,5282,10,U,Pacific/Port_Moresby,airport,O
urAirports
3,Mount Hagen Kagamuga Airport,Mount Hagen,Papua New Guinea,HGU,AYMH,-5.826789855957031,144.29600524902344,5388,10,U,Pacifi
c/Port_Moresby,airport,OurAirports
2,Madang Airport,Madang,Papua New Guinea,MAG,AYMD,-5.20707988739,145.789001465,20,10,U,Pacific/Port_Moresby,airport,OurAirp
orts
6,Wewak International Airport,Wewak,Papua New Guinea,WWK,AYWK,-3.58383011818,143.669006348,19,10,U,Pacific/Port_Moresby,air
port,OurAirports
40,Clyde River Airport,Clyde River,Canada,YCY,CYCY,70.4860992432,-68.5167007446,87,-5,A,America/Toronto,airport,OurAirports
45,Deer Lake Airport,Deer Lake,Canada,YDF,CYDF,49.21080017089844,-57.39139938354492,72,-3.5,A,America/St_Johns,airport,OurA
irports
10,Thule Air Base,Thule,Greenland,THU,BGTL,76.5311965942,-68.7032012939,251,-4,E,America/Thule,airport,OurAirports
36,Charlo Airport,Charlo,Canada,YCL,CYCL,47.990799,-66.330299,132,-4,A,America/Halifax,airport,OurAirports
31,Brandon Municipal Airport,Brandon,Canada,YBR,CYBR,49.91,-99.951897,1343,-6,A,America/Winnipeg,airport,OurAirports
46,Dease Lake Airport,Dease Lake,Canada,YDL,CYDL,58.4221992493,-130.031997681,2600,-8,A,America/Vancouver,airport,OurAirpor
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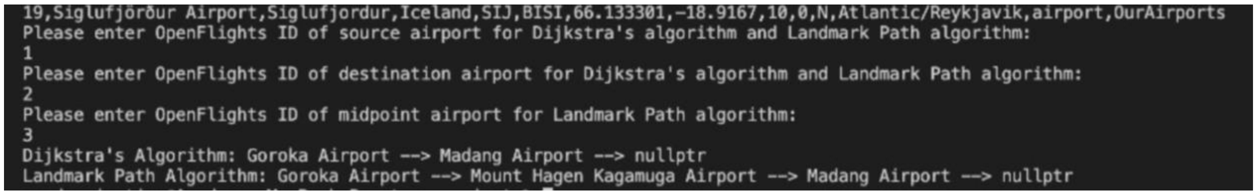
With Dijkstra's Algorithm, we let it run on the subset of the airport dataset that we chose. The dataset was much smaller than the original data because it takes a long time to test and process with 15000 airports. In addition to this, some airports causes processing problem, so the dataset used was smaller. In this case Dijkstra's algorithm is used to print the shortest path chosen from a source to a destination. As seen on the output below, after inputting the airport ID below, it processes it and outputs the shortest path. This works for both the landmark path problem Dijkstra. However, we found that if the path was not connected, it did not work. Because of this, for testing purposes, we only used 1, 2, and 3 because after manually reading and checking the data, these airports were connected. If the path was not connected, the algorithm would not find a path from the source to the destination. This is because these airports are a directed graph. Just because airports are connected, it does not mean that the path goes both ways. In some cases, the path only goes one way, so the flight is not connected in this smaller subset of data. However, in the case that we use all of the airports, both the algorithm would work. For our case specifically, because we used a smaller subset, not all airports are connected. With landmark algorithm, it also works, where the third input would be the midpoint used for the path taken.



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19,Siglufjörður Airport,Siglufjordur,Iceland,SIJ,BISI,66.133301,-18.9167,10,0,N,Atlantic/Reykjavik,airport,OurAirports
Please enter OpenFlights ID of source airport for Dijkstra's algorithm and Landmark Path algorithm:
1
Please enter OpenFlights ID of destination airport for Dijkstra's algorithm and Landmark Path algorithm:
2
Please enter OpenFlights ID of midpoint airport for Landmark Path algorithm:
3
Dijkstra's Algorithm: Goroka Airport --> Madang Airport --> nullptr
Landmark Path Algorithm: Goroka Airport --> Mount Hagen Kagamuga Airport --> Madang Airport --> nullptr
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In conclusion, the algorithms that we implemented works. If the graph that was loaded into the program contains all of the airports, the program would run perfectly. In this case, the improvements that we have is to try and fix the csvreader. The csvreader was quite difficult for us as it was completely new, and the traditional method of using a delimiter didn't work.