Flight Route Planning using Weighted Directed Graph

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Introduction

The goal of this project was to create a program to assist in finding the shortest path between two airlines using Dijkstra's algorithm. The data set used comprised of 200 flights from an open-source data set from Kaggle. The program will display a visual representation of the created graph. It will also prompt the user for input. The user can find airports that have no incoming flights from a desired airport. They can find the shortest flight in miles from one airport to another. It will also output the top 5 airport hubs based on incoming and outgoing flights. Ideally, the program will assist in finding flights and planning trips.

Problems

1. Is there an available flight from one airport to another?

Useful to see if you can fly direct without stopping.

1. What’s the shortest flight from one airport to the other?

Used to find the quickest flight from one airport to another.

1. Which airports are hubs?

# A HUB is defined as airports with the most outgoing/incoming flights.

# Methodology

**Wrote out what I envisioned the program to do**

* Inputs and outputs
* Options available to the user

**Language:**

* Python

**Libraries Used:**

* Pandas (Used for parsing A CSV file of flight data)
* Networkx (Used to create the graph from the pandas dataframe)
* matplotlib.pyplot (Visual representation of the graph)

**Other tools:**

* Excel, Visual Studio Code

**Program usage and screenshots**

The first option you are presented with is to view the graph visually.

A screen shot of a computer program

Description automatically generated

**Output if yes:**

A computer screen shot of a network

Description automatically generated

You will then be asked to find the shortest flight from two airports.

You have the option to print all the available airports.

A screen shot of a computer

Description automatically generated

If you printed the choices:

A screenshot of a computer screen

Description automatically generated

You will be prompted to enter an outgoing airport and destination airport.

A screenshot of a computer screen

Description automatically generated

If no flight exists, you will get this output:

A screenshot of a computer screen

Description automatically generated

If a flight exists, you will get the output of the shortest path:

A screen shot of a computer

Description automatically generated

You will then be presented to enter an airport; it will output all the airports that do not have a direct flight:

A screenshot of a computer screen

Description automatically generated

Finally, it will output the top 5 airport hubs:

A screenshot of a computer program

Description automatically generated

**Graph Visualization**

**All Nodes and Edges**

**A close-up of a network

Description automatically generated**

**Zoomed in view of MCI**

**A network of lines and dots

Description automatically generated**

**Example of only incoming flight airports**

**A network of blue dots and lines

Description automatically generated**

References

**Data Set**

https://www.kaggle.com/datasets/flashgordon/usa-airport-dataset?resource=download

**MatPlotLIB (Graph Visualization)**

https://matplotlib.org/