

Sheyan Lalmohammed, Winnie Wang, Pranav Palleti
NETS 1500
May 1, 2023

USER MANUAL - Your Air Getaway

Program Description

The program for this project can be found in the submitted folder titled “FinalProject.py” which is a Python file that includes the GUI and the implementation of the project. This project is also dependent on the file titled “FinalFlightDataForProject.csv” which is used to create the graph for the project with the weights that are used to run the Dijkstra algorithm that comes with various weights depending on user preference.

This program is a combination of a graphing algorithm and a web scraping program. The initial goal of the program is to create a graph using the file mentioned earlier in which there are directed edges between different airports in the United States with flights being the directed edges between the airport nodes. The next part of the program uses a web scraper that actively scrapes flights between different places using a combination of selenium and beautiful soup in Python. The result is an output of a flight plan for an individual to take based on the information from the graph and the flights that could be found by the web scraper.

How to Use The Program

The following is a step-by-step process on how to use the program:

1. Run the file titled “FinalProject.py” in a code IDE
2. You will be prompted by 5 specific input values
 - a. The first input value is the departure airport from where you are leaving for your trip
 - i. Enter a 3-character airport code for this airport. An example is PHL for Philadelphia International Airport.
 - b. The second input is the arrival airport to which you are traveling for your trip
 - i. Enter a 3-character airport code for this airport. An example is ORD for Chicago O'Hare International Airport.
 - c. The third input is the date you would like to leave for your trip or vacation using a flight
 - i. Enter an 8-character input here. This should be in the form of YEAR-MONTH-DAY, specifically in the form of YYYY-MM-DD. An example is 2023-05-10 for May 10, 2023.

- d. The fourth input is the date you would like to leave to return back from the trip using a flight
 - i. Enter an 8-character input here. This should be in the form of YEAR-MONTH-DAY, specifically in the form of YYYY-MM-DD. An example is 2023-06-10 for June 10, 2023. Remember, this date should be strictly after the date you leave for the trip.
- e. The last input is the preference for how you would like to consider the plan given to you for your trip. Each example is detailed in-depth in the next section.
 - i. Option 1 - Departure Delays: This option refers specifically to the average amount of departure delay that you can experience with your flight. The path provided to you from this option will be one with the lowest possible amount of departure delay in all flights included combined. However, the path itself can take more time in other categories such as air time or total travel time.
 - ii. Option 2 - Arrival Delays: This option refers specifically to the average amount of arrival delay that can be experienced with the flight on a specific route to get to your destination. The path provided to you from this option will be the one with the lowest possible amount of arrival delay in all flights included combined. However, the path itself can take more time in other categories such as air time or total travel time.
 - iii. Option 3 - Elapsed Time: This option refers to specifically entire travel time on average during the trip. This includes boarding, on-ramp, take-off, landing, and unboarding time for a flight. The path provided to you from this option will be the one that has the lowest possible time in terms of total elapsed time having to do with the flight itself. However, it is possible that this path may not be the most efficient when it comes to distance or delays.
 - iv. Option 4 - Air Time: This option refers to the travel time that is spent specifically on average in the air throughout the duration of a specific flight. This means the time between takeoff and landing which is spent in the aircraft in the air. The path provided to you from this option will be the one that has the lowest possible time in terms of time spent in the air during the flight itself. However, it is possible that this path may not be the most efficient path in terms of delays.
 - v. Option 5 - Distance Traveled: This option refers to the shortest possible amount of distance being traveled through a flight to get between two different destinations on average. This means the distance traveled by the flights that travel between the airports. The path provided to you from these options will be the one with the shortest possible total distance

- traveled by aircraft. However, it is possible that this path may not be the most efficient in terms of delays.
- vi. Option 6 - Combination of Previous 5 Factors: If you are indifferent toward a previously mentioned factor and want an overall good experience on a flight, this option considers the average values of all 5 factors weighted equally against one another. The result is that the path provided to you contains the best possible score of the 5 factors being equally weighted across different flight paths.
3. Once you have inputted the information into the program, click enter each different time and if your information is invalid, the program will ask you to type in a valid information. You must then wait for somewhere between 20 seconds and 2 minutes for a response from the program depending on the length of the calculated path, during which you will see chrome tabs opened on your computer as the web scraper takes the calculated efficient path and attempts to find as many flights as possible that meet the requirements laid out by the path using selenium and beautiful soup.
 4. Once the web scraper has completed finding all the flights needed for a specific path, it will return to you the information for flights to take on the path and the path itself for both going to your destination and returning back to your home airport. The path provided by the program considers as many places as possible for which it can find flights on the path and gives those flights in a way such that there is a maximum of two flights that can be taken per day to avoid jet lag from the travel path. The output provides the date that each flight should be taken. The following is the information it gives on each flight in both the going and returning paths:
 - a. Airline Name: The airline that the flight is by on the specific day mentioned above the output. (Ex: American Airlines)
 - b. Time of the Flight: The time that the flight will be taking place on a specific day (Ex: 8:00 am - 2:00 pm)
 - c. Length of the Flight and Other Travel Procedures: Total time of travel for the specific flight (Ex: 2 h 20 m)
 - d. Price of the Flight: Total price needed to be paid for the specific flight that is being mentioned (Ex: \$350)

Examples of Uses for Each of The Preference Options

Option 1 - Departure Delays: The following example shows the shortest path in terms of departure delays to get from George Bush Intercontinental Airport in Houston, Texas to Los Angeles International Aiport from May 10, 2023 to June 10, 2023 with visualization to see the path:

Please Input the Three Character Code For Your Departure Airport (Ex: PHL)
IAH

Please Input the Three Character Code For Your Final Arrival Airport (Ex: ORD)
LAX

Please enter the start date of your travel dates for your trip in the form of YYYY-MM-DD (Ex: 2023-04-26). Keep in mind that the maximum number of flights recommended to you will be 2 per day starting from this travel date.

2023-05-10

Please enter the end date of your trip in the form of YYYY-MM-DD (Ex: 2023-04-26). Keep in mind that the maximum number of flights recommended to you will be 2 per day starting from this travel date.

2023-06-10

We recognize that every person values different things when going on a flight. We want to know what you value most from the following options:

1. Having Little Departure Delay
2. Having Little Arrival Delay
3. Having Short Total Elapsed Time
4. Having Short Air Time
5. Having Shortest Total Distance Traveled
6. A combination of all 5 factors

Please enter in the number of the parameter which you value most
1

Here is the Final Flight Schedule that you should follow to get from IAH to LAX starting from 2023-05-10 (Max 2 Flights Per Travel Day). The final flight path calculated for you was : IAH->MSN->LAX

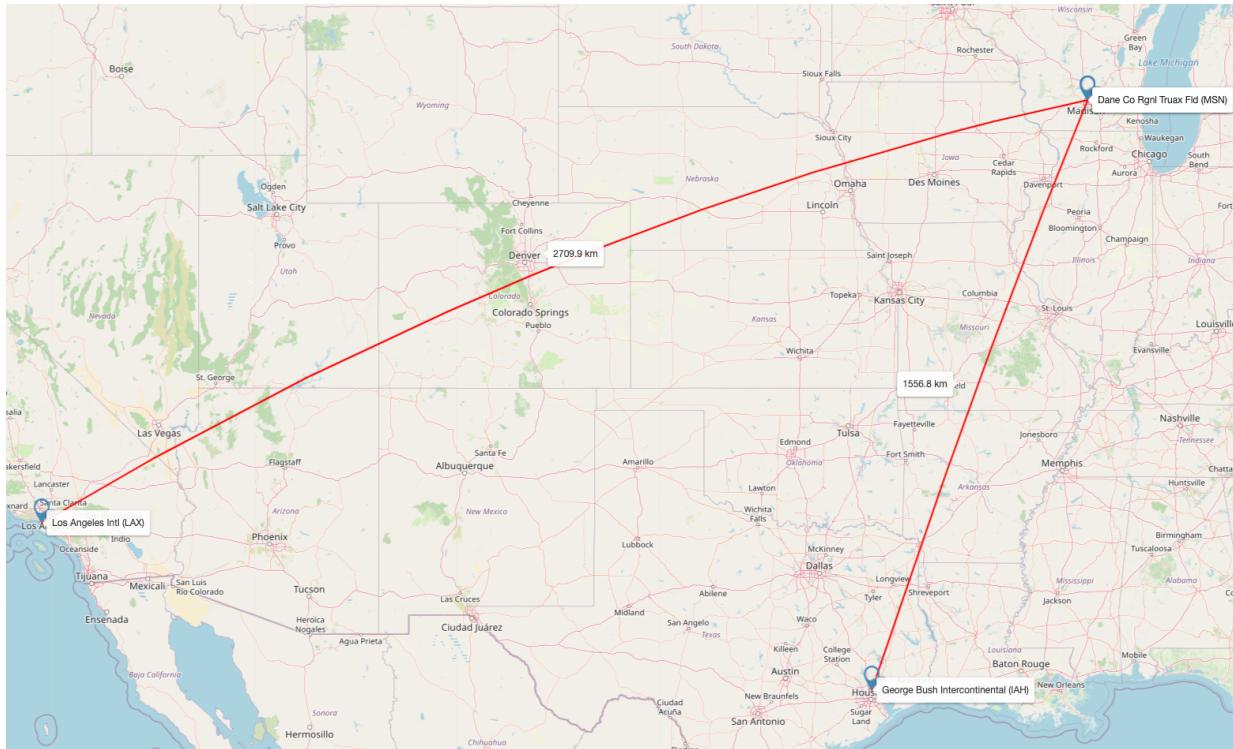
These are the flights you will take on 2023-05-10:

1. You will take a flight by United Airlines from IAH-MSN during 6:35 am-3:02 pm which will take you a total time of 8h 27m long and costs \$237
2. You will take a flight by Delta from MSN-LAX during 5:50 pm-12:38 am+1 which will take you a total time of 8h 48m long and costs \$367

Here is the Final Flight Schedule that you should follow to get from LAX to IAH starting from 2023-06-10 (Max 2 Flights Per Travel Day). The final flight path calculated for you was : LAX->MSN->IAH

These are the flights you will take on 2023-06-10:

1. You will take a flight by Delta from LAX-MSN during 12:25 am-9:55 am which will take you a total time of 7h 30m long and costs \$209
2. You will take a flight by Delta from MSN-IAH during 2:43 pm-9:30 pm which will take you a total time of 6h 47m long and costs \$223



Option 2 - Arrival Delays: The following example shows the shortest path in terms of arrival delays to get from Philadelphia International Airport to Chicago O'Hare International Airport from May 9, 2023 to June 10, 2023 with visualization to see the path:

Please Input the Three Character Code For Your Departure Airport (Ex: PHL)
PHL

Please Input the Three Character Code For Your Final Arrival Airport (Ex: ORD)
ORD

Please enter the start date of your travel dates for your trip in the form of YYYY-MM-DD (Ex: 2023-04-26). Keep in mind that the maximum number of flights recommended to you will be 2 per day starting from this travel date.
2023-05-09

Please enter the end date of your trip in the form of YYYY-MM-DD (Ex: 2023-04-26). Keep in mind that the maximum number of flights recommended to you will be 2 per day starting from this travel date.
2023-06-10

We recognize that every person values different things when going on a flight. We want to know what you value most from the following options:

1. Having Little Departure Delay
2. Having Little Arrival Delay
3. Having Short Total Elapsed Time
4. Having Short Air Time
5. Having Shortest Total Distance Traveled
6. A combination of all 5 factors

Please enter in the number of the parameter which you value most
2

Here is the Final Flight Schedule that you should follow to get from PHL to ORD starting from 2023-05-09 (Max 2 Flights Per Travel Day). The final flight path calculated for you was : PHL->ILM->ATL->HNL->ORD

These are the flights you will take on 2023-05-09:

1. You will take a flight by American Airlines from PHL-ILM during 8:59 am-10:45 am which will take you a total time of 1h 46m long and costs \$376
2. You will take a flight by Delta from ILM-ATL during 4:30 pm-6:10 pm which will take you a total time of 1h 40m long and costs \$394

These are the flights you will take on 2023-05-10:

1. You will take a flight by Delta from ATL-HNL during 10:15 am-2:01 pm which will take you a total time of 9h 46m long and costs \$890
2. You will take a flight by Delta from HNL-ORD during 5:25 pm-8:39 am+1 which will take you a total time of 1h 14m long and costs \$340

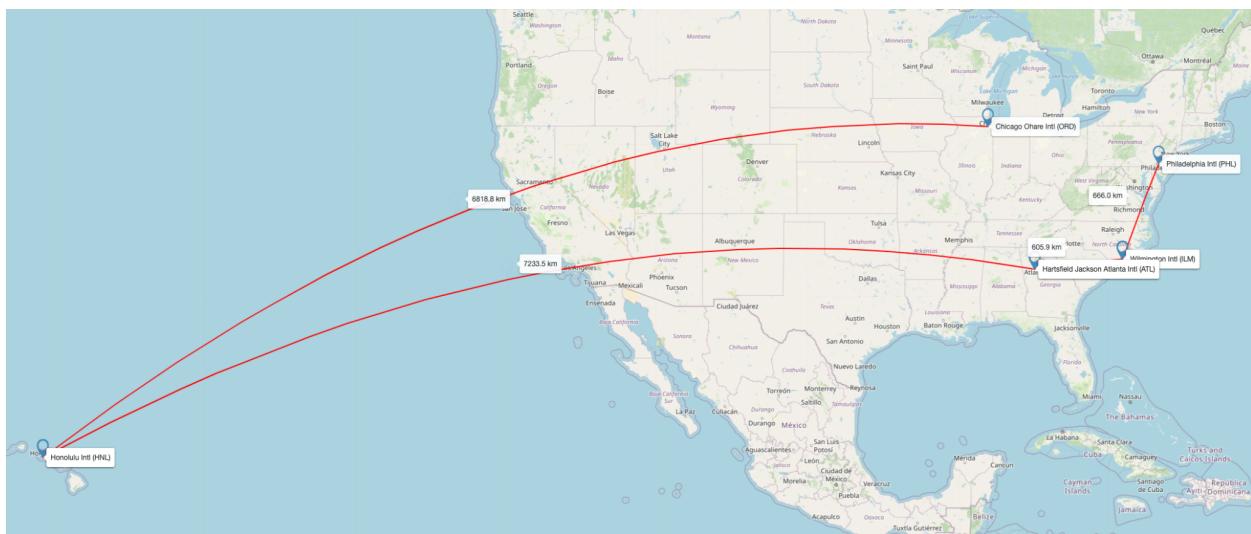
Here is the Final Flight Schedule that you should follow to get from ORD to PHL starting from 2023-06-10 (Max 2 Flights Per Travel Day). The final flight path calculated for you was : ORD->EYW->DCA->BGR->PHL

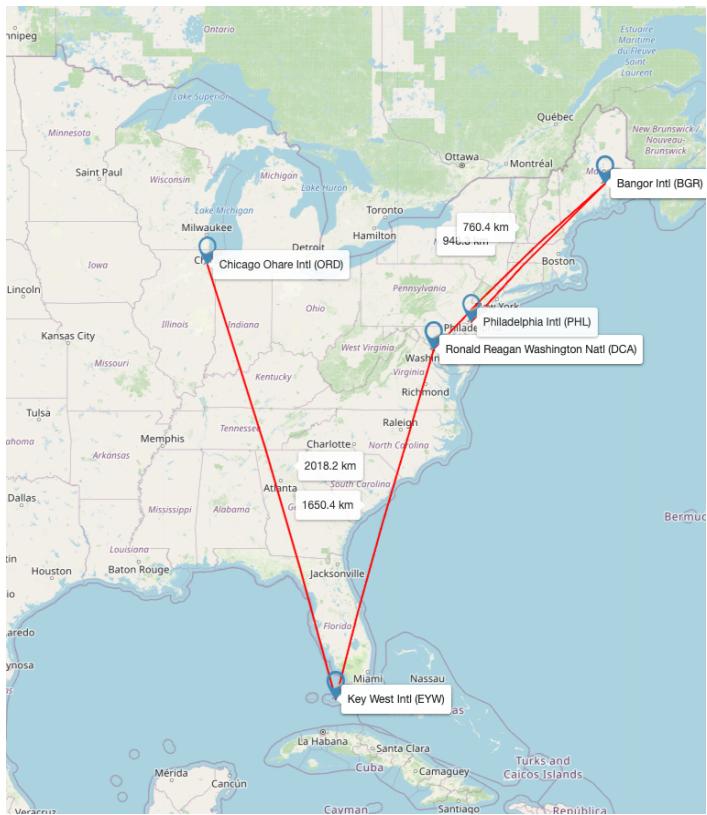
These are the flights you will take on 2023-06-10:

1. You will take a flight by Delta from ORD-EYW during 9:30 am-5:05 pm which will take you a total time of 6h 35m long and costs \$309
2. You will take a flight by Delta from EYW-DCA during 6:05 pm-11:30 pm which will take you a total time of 5h 25m long and costs \$329

These are the flights you will take on 2023-06-11:

1. You will take a flight by American Airlines from DCA-BGR during 8:30 am-2:05 pm which will take you a total time of 5h 35m long and costs \$463
2. You will take a flight by American Airlines from BGR-PHL during 3:59 pm-5:44 pm which will take you a total time of 1h 45m long and costs \$365





Option 3 - Total Elapsed Time: The following example shows the shortest path in terms of total elapsed time to get from Corpus Christi International Airport to Seattle-Tacoma International Airport from May 10, 2023 to June 10, 2023 with visualization to see the path:

Please Input the Three Character Code For Your Departure Airport (Ex: PHL)
CRP

Please Input the Three Character Code For Your Final Arrival Airport (Ex: ORD)
SEA

Please enter the start date of your travel dates for your trip in the form of YYYY-MM-DD (Ex: 2023-04-26). Keep in mind that the maximum number of flights recommended to you will be 2 per day starting from this travel date.

2023-05-10

Please enter the end date of your trip in the form of YYYY-MM-DD (Ex: 2023-04-26). Keep in mind that the maximum number of flights recommended to you will be 2 per day starting from this travel date.
2023-06-10

We recognize that every person values different things when going on a flight. We want to know what you value most from the following options:

1. Having Little Departure Delay
2. Having Little Arrival Delay
3. Having Short Total Elapsed Time
4. Having Short Air Time
5. Having Shortest Total Distance Traveled
6. A combination of all 5 factors

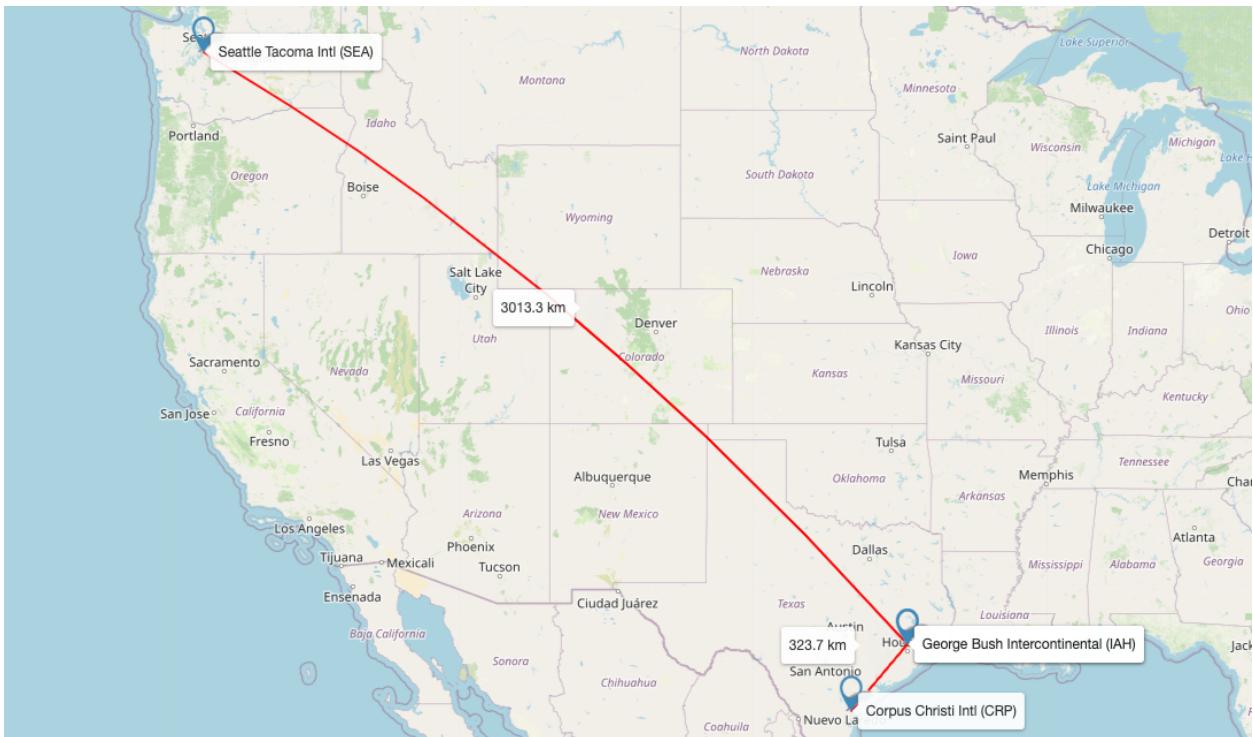
Please enter in the number of the parameter which you value most
3

Here is the Final Flight Schedule that you should follow to get from CRP to SEA starting from 2023-05-10 (Max 2 Flights Per Travel Day). The final flight path calculated for you was : CRP->HOU->SEA
These are the flights you will take on 2023-05-10:

1. You will take a flight by United Airlines from CRP-IAH during 4:20 pm-5:24 pm which will take you a total time of 1h 04m long and costs \$229
2. You will take a flight by Alaska Airlines from IAH-SEA during 5:25 pm-8:10 pm which will take you a total time of 4h 45m long and costs \$419

Here is the Final Flight Schedule that you should follow to get from SEA to CRP starting from 2023-06-10 (Max 2 Flights Per Travel Day). The final flight path calculated for you was : SEA->HOU->CRP
These are the flights you will take on 2023-06-10:

1. You will take a flight by Alaska Airlines from SEA-IAH during 10:50 pm-5:00 am+1 which will take you a total time of 4h 10m long and costs \$169
2. You will take a flight by United Airlines from IAH-CRP during 4:46 pm-5:51 pm which will take you a total time of 1h 05m long and costs \$104



Option 4 - Air Time: The following example shows the shortest path in terms of air time to get from Columbus Airport in Columbus, Georgia to Baltimore-Washington International Airport from May 10, 2023 to June 10, 2023 with visualization to see the path:

Please Input the Three Character Code For Your Departure Airport (Ex: PHL)
CSG

Please Input the Three Character Code For Your Final Arrival Airport (Ex: ORD)
BWI

Please enter the start date of your travel dates for your trip in the form of YYYY-MM-DD (Ex: 2023-04-26). Kee
p in mind that the maximum number of flights recommended to you will be 2 per day starting from this travel da
te.
2023-05-10

Please enter the end date of your trip in the form of YYYY-MM-DD (Ex: 2023-04-26). Keep in mind that the maxim
um number of flights recommended to you will be 2 per day starting from this travel date.
2023-06-10

We recognize that every person values different things when going on a flight. We want to know what you value
most from the following options:
1. Having Little Departure Delay
2. Having Little Arrival Delay
3. Having Short Total Elapsed Time
4. Having Short Air Time
5. Having Shortest Total Distance Traveled
6. A combination of all 5 factors
Please enter in the number of the parameter which you value most
4

Here is the Final Flight Schedule that you should follow to get from CSG to BWI starting from 2023-05-10 (Max 2 Flights Per Travel Day). The final flight path calculated for you was : CSG->ATL->BWI

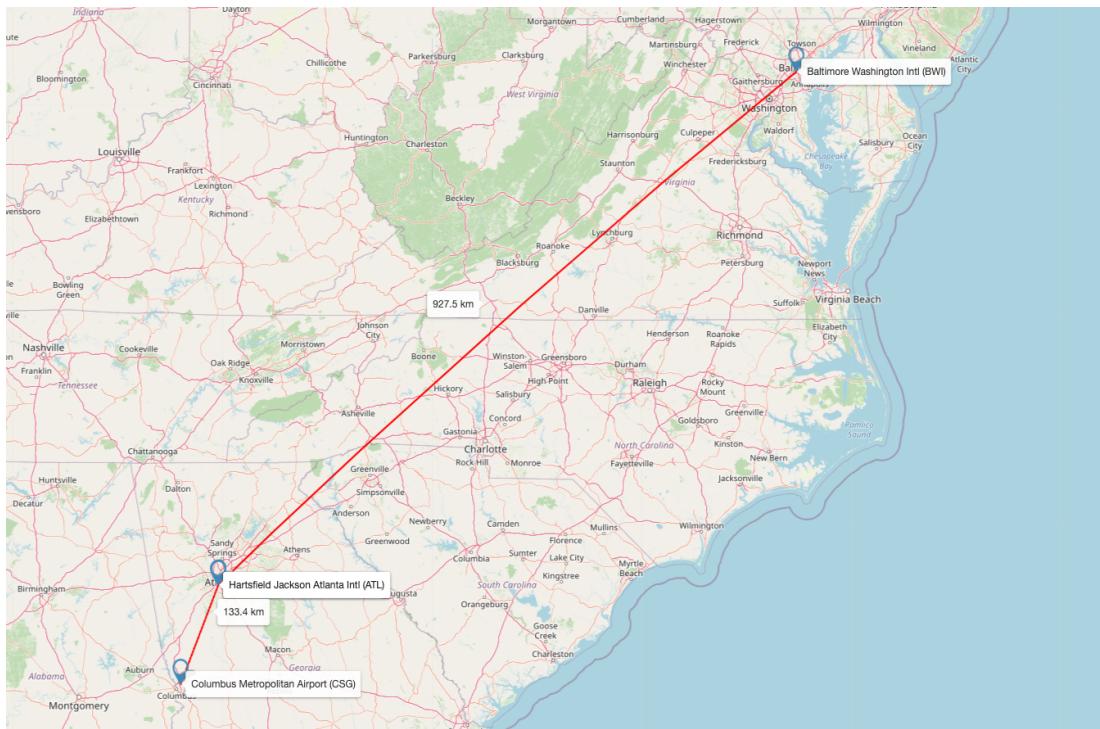
These are the flights you will take on 2023-05-10:

1. You will take a flight by Delta from CSG-ATL during 6:30 am-7:30 am which will take you a total time of 1h 00m long and costs \$245
2. You will take a flight by Delta from ATL-BWI during 10:20 am-12:14 pm which will take you a total time of 1 h 54m long and costs \$104

Here is the Final Flight Schedule that you should follow to get from BWI to CSG starting from 2023-06-10 (Max 2 Flights Per Travel Day). The final flight path calculated for you was : BWI->ATL->CSG

These are the flights you will take on 2023-06-10:

1. You will take a flight by Frontier from BWI-ATL during 11:44 am-1:38 pm which will take you a total time of 1h 54m long and costs \$41
2. You will take a flight by Delta from ATL-CSG during 8:45 pm-9:42 pm which will take you a total time of 0h 57m long and costs \$155



Option 5 - Distance Traveled: The following example shows the shortest path in terms of distance traveled to get from Sioux Gateway Airport in Sioux City, Ohio to University of Illinois Willard Airport in Tolono Township, Champaign County, Illinois from May 10, 2023 to June 10, 2023 with visualization to see the path:

Please Input the Three Character Code For Your Departure Airport (Ex: PHL)
SUX

Please Input the Three Character Code For Your Final Arrival Airport (Ex: ORD)
CMI

Please enter the start date of your travel dates for your trip in the form of YYYY-MM-DD (Ex: 2023-04-26). Keep in mind that the maximum number of flights recommended to you will be 2 per day starting from this travel date.

2023-05-10

Please enter the end date of your trip in the form of YYYY-MM-DD (Ex: 2023-04-26). Keep in mind that the maximum number of flights recommended to you will be 2 per day starting from this travel date.
2023-06-10

We recognize that every person values different things when going on a flight. We want to know what you value most from the following options:

1. Having Little Departure Delay
2. Having Little Arrival Delay
3. Having Short Total Elapsed Time
4. Having Short Air Time
5. Having Shortest Total Distance Traveled
6. A combination of all 5 factors

Please enter in the number of the parameter which you value most
5

Here is the Final Flight Schedule that you should follow to get from SUX to CMI starting from 2023-05-10 (Max 2 Flights Per Travel Day). The final flight path calculated for you was : SUX->ORD->CMI

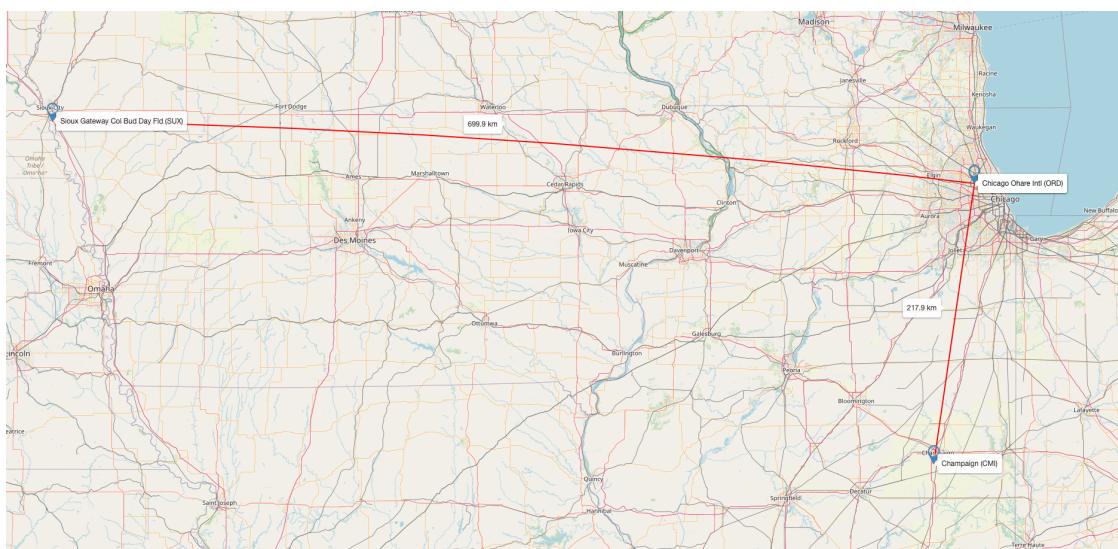
These are the flights you will take on 2023-05-10:

1. You will take a flight by United Airlines from SUX-ORD during 12:50 pm-2:34 pm which will take you a total time of 1h 44m long and costs \$170
2. You will take a flight by Amtrak from CHI-CMI during 4:05 pm-6:36 pm which will take you a total time of 2h 31m long and costs \$17

Here is the Final Flight Schedule that you should follow to get from CMI to SUX starting from 2023-06-10 (Max 2 Flights Per Travel Day). The final flight path calculated for you was : CMI->ORD->SUX

These are the flights you will take on 2023-06-10:

1. You will take a flight by American Airlines from CMI-ORD during 4:22 pm-5:27 pm which will take you a total time of 1h 05m long and costs \$265
2. You will take a flight by United Airlines from ORD-SUX during 5:55 pm-11:49 pm which will take you a total time of 5h 54m long and costs \$365



Option 6 - Combination of 5 factors: The following example shows the shortest path in terms of an equally weighted combination of all 5 previous factors to get from Ronald Reagan Washington National Airport to Austin-Bergstrom International Airport from May 10, 2023 to June 10, 2023 with visualization to see the path:

Please Input the Three Character Code For Your Departure Airport (Ex: PHL)
DCA

Please Input the Three Character Code For Your Final Arrival Airport (Ex: ORD)
AUS

Please enter the start date of your travel dates for your trip in the form of YYYY-MM-DD (Ex: 2023-04-26). Keep in mind that the maximum number of flights recommended to you will be 2 per day starting from this travel date.
2023-05-10

Please enter the end date of your trip in the form of YYYY-MM-DD (Ex: 2023-04-26). Keep in mind that the maximum number of flights recommended to you will be 2 per day starting from this travel date.
2023-06-10

We recognize that every person values different things when going on a flight. We want to know what you value most from the following options:

1. Having Little Departure Delay
2. Having Little Arrival Delay
3. Having Short Total Elapsed Time
4. Having Short Air Time
5. Having Shortest Total Distance Traveled
6. A combination of all 5 factors

Please enter in the number of the parameter which you value most
6

Here is the Final Flight Schedule that you should follow to get from DCA to AUS starting from 2023-05-10 (Max 2 Flights Per Travel Day). The final flight path calculated for you was : DCA->AUS

These are the flights you will take on 2023-05-10:

1. You will take a flight by American Airlines from DCA-AUS during 11:55 am-5:07 pm which will take you a total time of 6h 12m long and costs \$324

Here is the Final Flight Schedule that you should follow to get from AUS to DCA starting from 2023-06-10 (Max 2 Flights Per Travel Day). The final flight path calculated for you was : AUS->DCA

These are the flights you will take on 2023-06-10:

1. You will take a flight by American Airlines from AUS-DCA during 5:00 am-2:48 pm which will take you a total time of 8h 48m long and costs \$288

