**CIS 449 Assignment 9: Wanna Get Away?**

Due: August 9, 2020 @ 11:59 PM

Now that classes are almost over, we are going to use R to look at something pretty cool: going on vacation. You have been provided with a dataset that lists all the airports serviced by Spirit Airlines. This airline is being used simply because the amount of flights to encode is manageable. Using this dataset, your goal is to explore the network and/or igraph packages to help answer a few questions about Spirit’s flight network.

To do this, please read in the attached file and use it as an edge list to create a directed graph with weighted edges. Once you have done that, you may proceed.

Here’s what you will do:

* Visualize the flight network using the plot feature of **network**
* Visualize the flight network using the tkplot feature of **igraph**, trying to keep track of the spatial component (does not have to be exact), which will make it look a bit more intuitive for you (in other words, try to put the nodes where they would be on the map)
* Determine which airports have the largest amount of flights that originate there.
* Determine which airports have the largest amount of flights that land there.
* Are all of the airports balanced?
* Add a vertex attribute that includes the city name of the airport. If you search google, you can find the airport cities.
* Add a weight attribute to the edges from the provided text file.
* Calculate the path of lowest air travel time between each city
* Determine if the flight network is connected (namely you can get from every city to every other city somehow)
* Add a few flights of your choice that will connect certain cities and use the following calculator to put in the flight time as an attribute of the edge (<https://flighttime-calculator.com/>). You may add different airports. Remember that you will need to add an edge weight for each one you add.
* Recalculate the path of lowest air travel time between each city
* Remove a few flights from the airport FLL (Miami- Fort Lauderdale). This is a hub airport for that airline
* Determine if the flight network is still connected
* Recalculate the path of lowest air travel time between each city

This assignment is very different from the others we have seen so far based on what it is using. To give you a heads up, this sort of idea is very important relative to some large areas of applications that some of you might be interested in. For instance, if you were doing social media analysis, this is important (we will revisit some of this at the end of the course). If you were doing networking things, this would be important to help manage traffic. If you were looking at anything that involves the interconnectedness of things, this would be important.

As a general note, if these types of problems interest you, they are discrete mathematics problems. We touch on them in CIS 354: Algorithms and Data Structures.