

# **Team Project – Data Structures**

Spring 2024

Section 02

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## Class Descriptions

- **Edge Class** – This class represents the edges between vertices for the graph. As each edge has two vertices, the Edge class has a start point and destination point. Each edge has two weights.
- **Graph Class** – This class is responsible for inserting edges and vertices at their correct locations. Its functions utilize the Vector library to add vertices and edges. It also has functions for traversing the graph by vertices.
- **MinHeap Class** – This class stores the data into a MinHeap organization via inserting elements into the given Binary Heap order and “heapifying” them.
- **Queue Class** – This class is for using queue data structure implementation in the project. It provides useful functions such as push, pop, and print.
- **Vertex Class** – This class holds data in the graph and is used for traversing said graph. It also has a Boolean value for returning whether a vertex has been visited in graph traversal.

## Time Complexity Analysis

- Algorithm 1:  $O(n)$
- Algorithm 2:  $O(n^2)$
- Algorithm 3:  $O(n^3)$
- Algorithm 4:  $O(n^2)$
- Algorithm 5:  $O(n^2)$
- Algorithm 6:  $O(n^2)$
- Algorithm 7:  $O(n^2)$
- Algorithm 8:  $O(n^2)$

## Code Sample Runs

```
const std::string AIRPORTSCSV = "airports.csv";  
  
Graph<std::string> airports = task_1(AIRPORTSCSV);  
airports.print();  
  
task_2(airports, "ATL", "MIA");  
task_2(airports, "PIT", "ACT");  
  
task_3(airports, "ATL", "FL");  
task_3(airports, "IAD", "FL");
```

```
task_4(airports, "IAD", "MIA", 3);
```

```
task_4(airports, "PIT", "ACT", 2);
```

```
task_5(airports);
```

```
Graph<std::string> unweight = task_6(airports);
```

```
task_7(unweight);
```

```
task_8(unweight);
```

- Edge Cases:

```
task_2(airports, "PIT", "ACT"); // Edge case for task 2 because there is no  
path that exists.
```

```
task_4(airports, "PIT", "ACT", 2); // Edge case for task 4 because there is  
no path that exists.
```