## The data structure model

### Graph representation

* 1. The graph is represented using an adjacency matrix, with rows relating to the cargo flights and columns relating to the airports. A connection between a flight and an airport will be denoted as “1” in the relevant entry in the matrix. All the other entries will be set to “0” (i.e.: No connection) as default value. There are mainly two ways to represent matrix in python, using nested list or “numpy”. Since we are not allowed to use “numpy”, here a 2-D list is used (list of lists) to implement the adjacency matrix. Row and column indices will be used as flight and airport ids respectively. The variable name of the adjacency matrix in the code is “*adj\_matrix*”.

1. There are two other lists (“*flights\_list*” and “*airports\_list*”) used to keep the lists and ids of the flights and the airports. These 2 lists are mainly used to lookup for the ids of the flights and airports. However using dictionaries would be more efficient (O(1) lookup time complexity) rather than using lists(O(n) lookup time complexity). Since dictionaries aren’t allowed, we have used lists here.

#### Sample Input:

Indigo666 / Chennai / New Delhi

Indigo777 / Calcutta / New Delhi

Spicejet222 / Ahmedabad / Nagpur / Mumbai

AirIndia111 / Ahmedabad / New Delhi

Vistara555 / Vishakhapatnam / Hyderabad

#### Adjacency Matrix

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Flight ID | Chennai | New Delhi | Calcutta | Ahmedabad | Nagpur | Mumbai | Vishakhapatnam | Hyderabad |
| Airport ID |  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Indigo666 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Indigo777 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Spicejet222 | 2 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| AirIndia111 | 3 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| Vistara555 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |

#### Graph

Indigo666

Spicejet222

Vistara555

AirIndia111

Indigo777

#### Flight and Airport Lists

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Airport | Chennai | New Delhi | Calcutta | Ahmedabad | Nagpur | Mumbai | Vishakhapatnam | Hyderabad |
| ID | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Flight | Indigo666 | Indigo777 | Spicejet222 | AirIndia111 | Vistara555 |
| ID | 0 | 1 | 2 | 3 | 4 |

## Details of each operations

### def readAirportFlightfile(self, inputfile):