Graphs:

* **Path**: Sequence of vertices w1, w2, … wn st (wi, wi+1) is a part of *E* for 1 i n
* **Simple Path**: a path w1,w2,…wn where wi =/= wk for any I,k; greater than 1, less than n
* **directed acyclic graph**: A special directed, no cycles, used in many problem solutions
* **Connected Graph**: A graph in which every node is connected to each other
* **Strongly connected**: There is an easy way to get to every node from any node (directed)
* **Weakly connected**: The directed graph is connected, but there are nodes you can get “stuck” in.
* **Complete graph**: Edge between every pair of nodes
* **Planar graph**: All edges can be drawn on a single plane, and none of the edges cross. 4 is the largest size that you can have a complete, planar, graph
* **Matrix representations**: Graphs can be represented as an adjacency matrix of (*n* **x** *n*) for a *n* node graph. If edges are weighted, you can also include weights in the matrix.

**Problems with adjacency matrix**:

* Wasted space: O(N2) space needed to describe N nodes
* If |E| ~= |v|2 it is dense
* If |E| << |v|2 it is sparse

With large chart (i.e. 1,000,000 nodes) you will have a LARGE adjacency matrix, which will likely remain unused.

Instead of using an adjacency matrix, we can use a hashmap of the edges for each node.