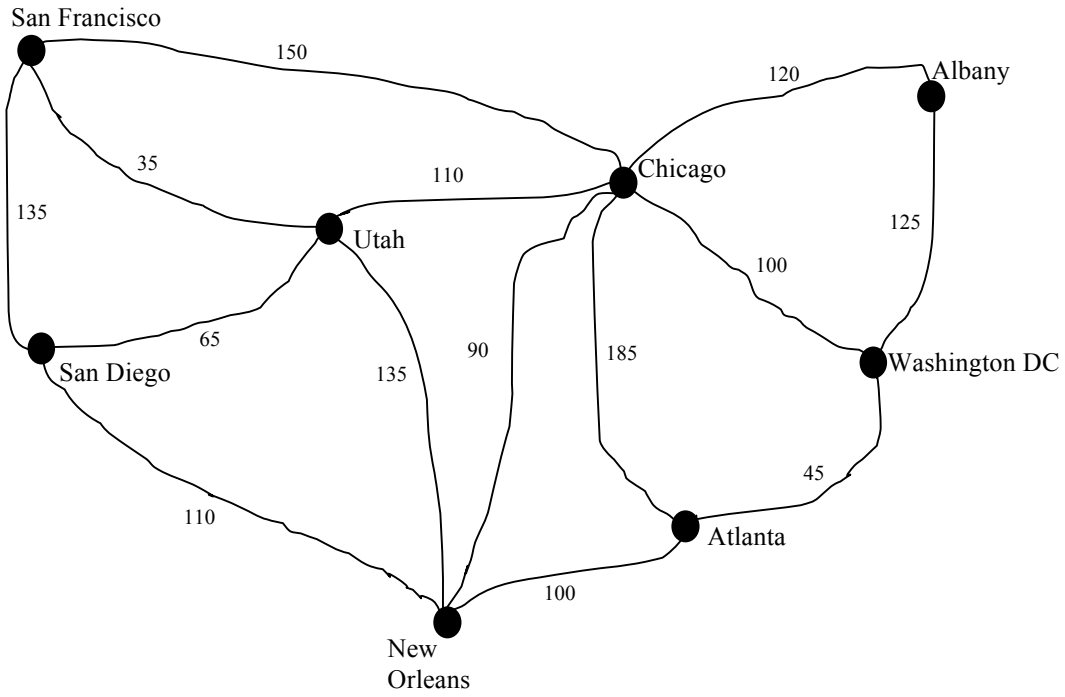
Graphs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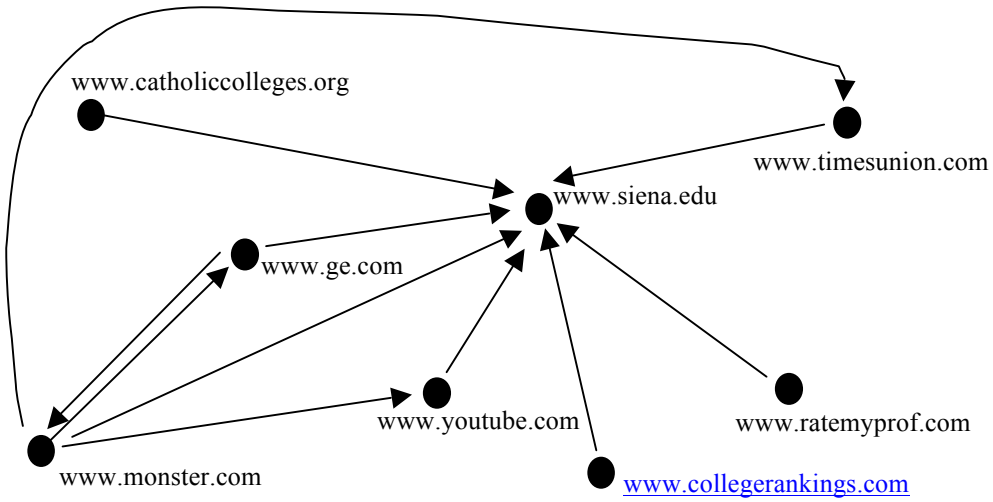
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Graph:

Directed graph:

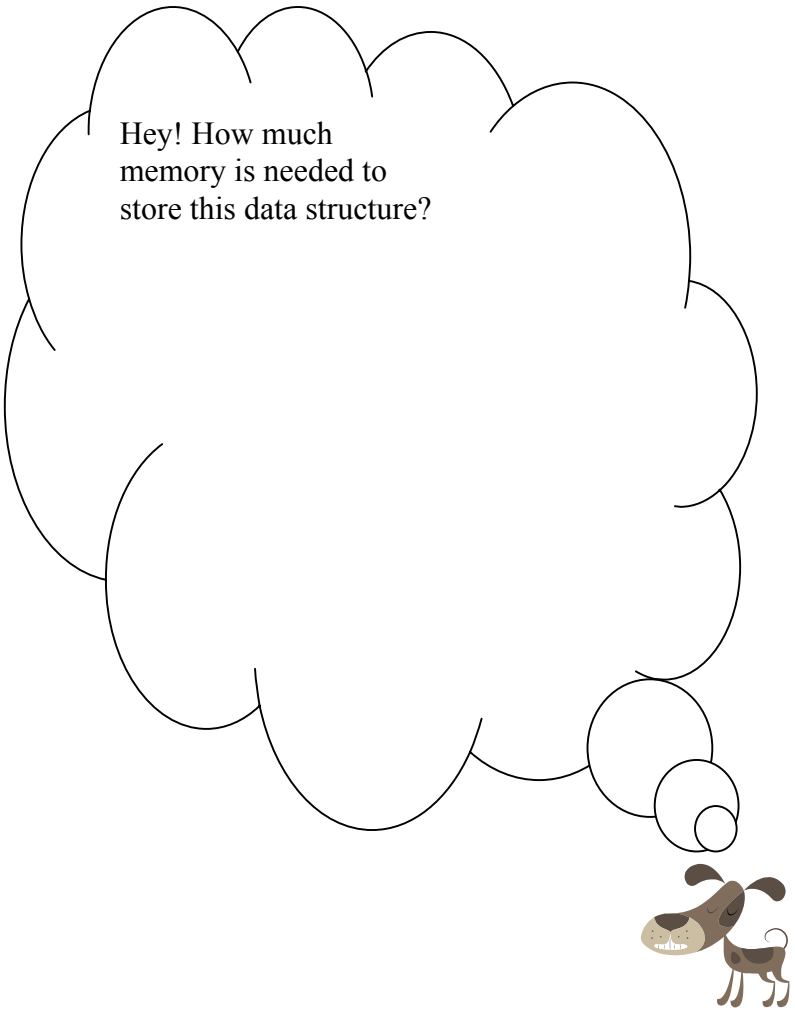
Undirected graph:

Weighted graph:

Adjacency Matrix Representation for Graphs

	0	1	2	3	4
0	F	T	F	T	F
1	T	F	T	T	F
2	F	T	F	T	F
3	T	T	T	F	T
4	F	F	F	T	F

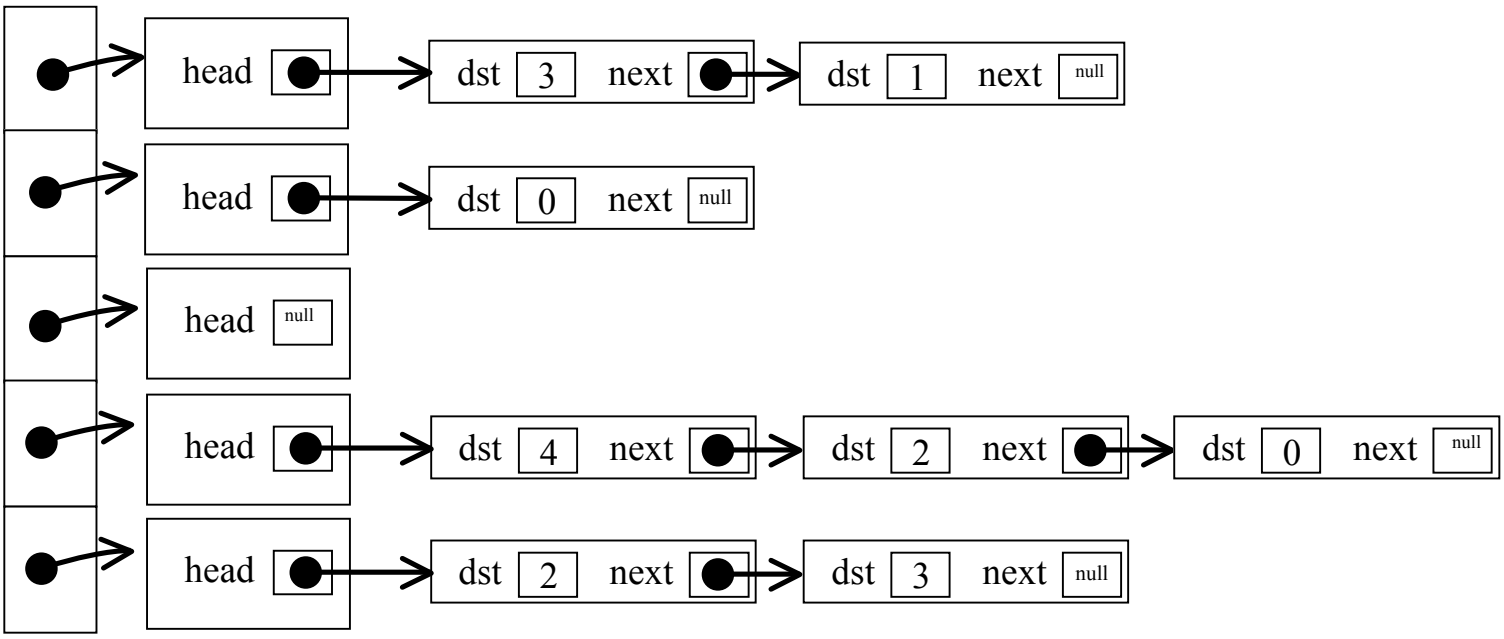
If adjmatrix[i][j] is true, then there is an edge from vertex i to vertex j. Below, draw the graph represented in the adjacency matrix above.



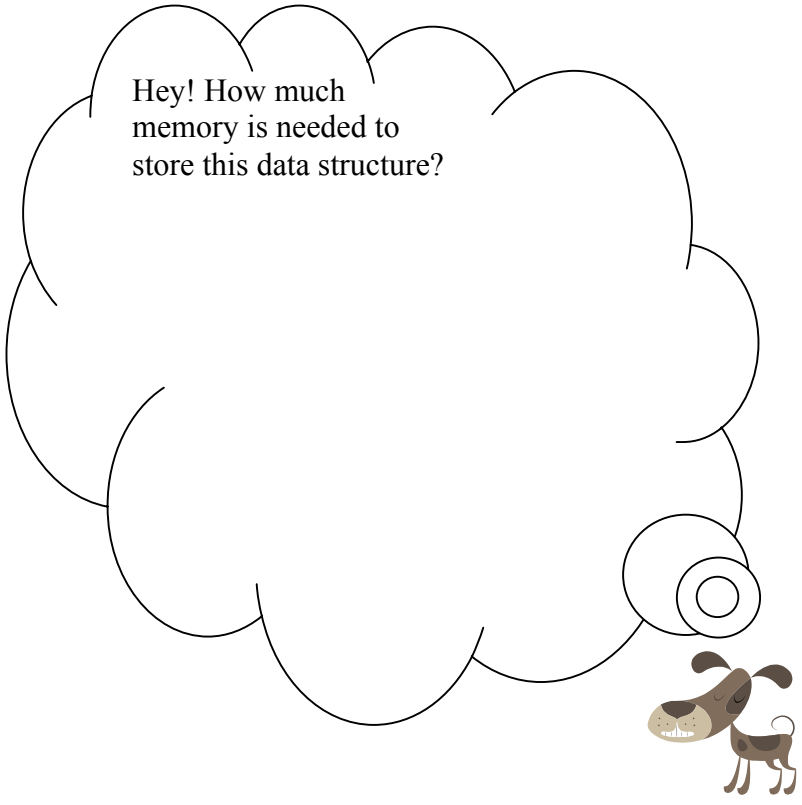
--- Implementation Adjacency Matrix ---

```
public class Digraph {
   private boolean[][] adjMatrix;


   public Digraph( int numVerts ) {









   }
   public void addEdge( int src, int dst ){









   }
   public void removeEdge( int src, int dst ) {









   }
```

Adjacency Lists Representation for Graphs



Each element in the 1D array represents a vertex in the graph. I.e., `vertices[i]` stores a reference to a Vertex object. The Vertex object stores a reference (called `head`) to the first node in a linked list; each node in the linked list represents a directed edge whose source vertex is `i` and whose destination vertex is stored in `dst`. Below, draw the graph represented by the adjacency lists data structure above.



--- Implementation Adjacency Lists ---

```
public class Digraph {
   private Vertex[] vertices;

   private class Vertex {
       private Edge head;
   }
   private class Edge {
       private int dst;
       private Edge next;
       private Edge(int d, Edge n) {dst=d; next=n;}
   }
```

Example of how the methods in this implementation of Digraph work:

```
Digraph g = new Digraph( 4 );
g.addEdge( 1, 3 );
g.addEdge( 1, 0 );
g.addEdge( 1, 2 );
g.removeEdge( 1, 0 );
```

--- Implementation Adjacency Lists ---


```
public class Digraph {
   private Vertex[] vertices;

   private class Vertex {
       private Edge head;
   }
   private class Edge {
       private int dst;
       private Edge next;
       private Edge(int d, Edge n) {dst=d; next=n;}
   }
   public Digraph( int numVerts ) {









   }
   public void addEdge( int src, int dst ) {









   }
```

--- Implementation Adjacency Lists ---

```
public void removeEdge( int src, int dst ) {
```

--- Implementation Adjacency Lists ---


```
public class Digraph {
   private Vertex[] vertices;

   private class Vertex {
       private Edge head;
   }
   private class Edge {
       private int dst;
       private Edge next;
       private Edge(int d, Edge n) {dst=d; next=n;}
   }
   public Digraph( int numVerts ) {









   }
   public void addEdge( int src, int dst ) {









   }
```

--- Implementation Adjacency Lists ---

```
public void removeEdge( int src, int dst ) {
```

	Adjacency Matrix	Adjacency Lists
memory		
addEdge(src,dst)		
removeEdge(src,dst)		