CS2302 Data Structures

Spring 2020

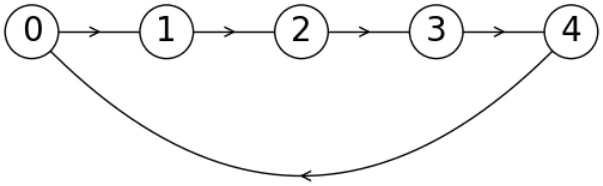
Exercises - Graphs

1. Write the function *num_vertices(G)* that receives a graph *G* represented as an adjacency list and returns the number of vertices in *G*.

2. Write the function *count_edges(G)* that receives a graph *G* represented as an adjacency list and returns the number of edges in *G*. Make sure your function works for directed and undirected graphs.

3. Write the function *highest_weight_edge(G)* that receives a weighted directed graph *G* represented as an adjacency list and returns a list of length 3 representing the highest-weight edge in *G* using the format [source, destination, weight] (break ties arbitrarily).

4. A circle graph with n vertices is an unweighted directed graph that has an edge going from vertex 0 to vertex 1, an edge going from vertex 1 to vertex 2, etc., and an edge going from vertex n-1 to vertex 0. The image below shows a circle graph with 5 vertices. Write the function *circle_graph(n)* that receives an integer *n* and returns a circle graph with *n* vertices represented as an adjacency list.



5. The out-degree of a vertex *v* in a directed graph *G=(V,E)* is the number of edges going out from *v* in *G*. Write the function *out_degrees(G)* that receives a graph *G* represented as an adjacency list and returns a list of length |*V*| containing the out-degrees of the vertices in *V*.

6. The in-degree if a vertex *v* in a directed graph *G=(V,E)* is the number of edges going into *v*. Write the function *in_degrees(G)* that receives a graph *G* represented as an adjacency list and returns a list of length |*V*| containing the in-degrees of the vertices in *V*.