DSCI 369
Lab 2

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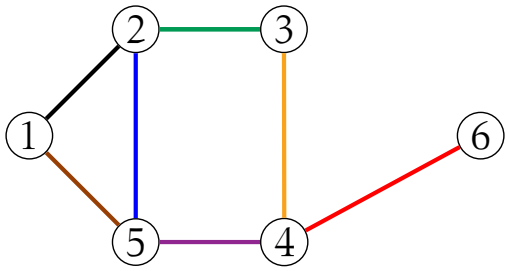
This file accompanies the labs since there are some things that can't be rendered in Matlab or Python.

The colors have no impact on the math; they are just used to help distinguish the edges or graphs.

Consider the unweighted, undirected graph/network that we saw in lecture:

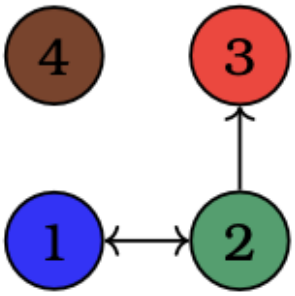


(Description of graph due to space limitations in alt text. A graph with six vertices. The neighbors of vertex one are vertices two and five; the neighbors of vertex two are vertices one, three, and five; the neighbors of vertex three are vertices two and four; the neighbors of vertex four are vertices three, five, and six; the neighbors of vertex five are vertices one, two, and four; the neighbor of vertex six is vertex four.)

Thus, the adjacency matrix is

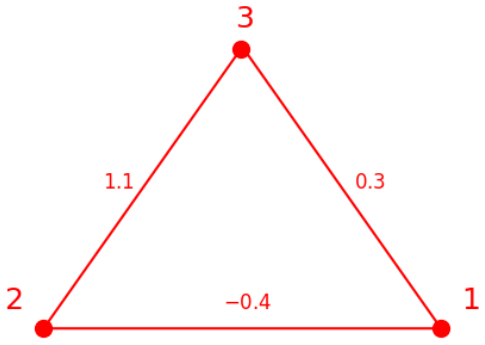
$$\begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{array} \begin{array}{c} \begin{array}{cccccc} 1 & 2 & 3 & 4 & 5 & 6 \end{array} \\ \begin{pmatrix} 0 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \end{pmatrix} \end{array}$$

Consider the unweighted, directed graph we saw in lecture and its adjacency matrix:



$$\begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

Finally, consider the follow weighted, undirected graph and its adjacency matrix:



$$\begin{pmatrix} 0 & -0.4 & 0.3 \\ -0.4 & 0 & 1.1 \\ 0.3 & 1.1 & 0 \end{pmatrix}$$

A weighted undirected graph on 3 vertices. The weight of the edge from 1 to 2 is -0.4, the weight of the edge from 2 to 3 is 1.1, and the weight of the edge from 3 to 1 is 0.3.

Exercises

You will need to code in Matlab/Python the adjacency matrices of the following three graphs/networks:

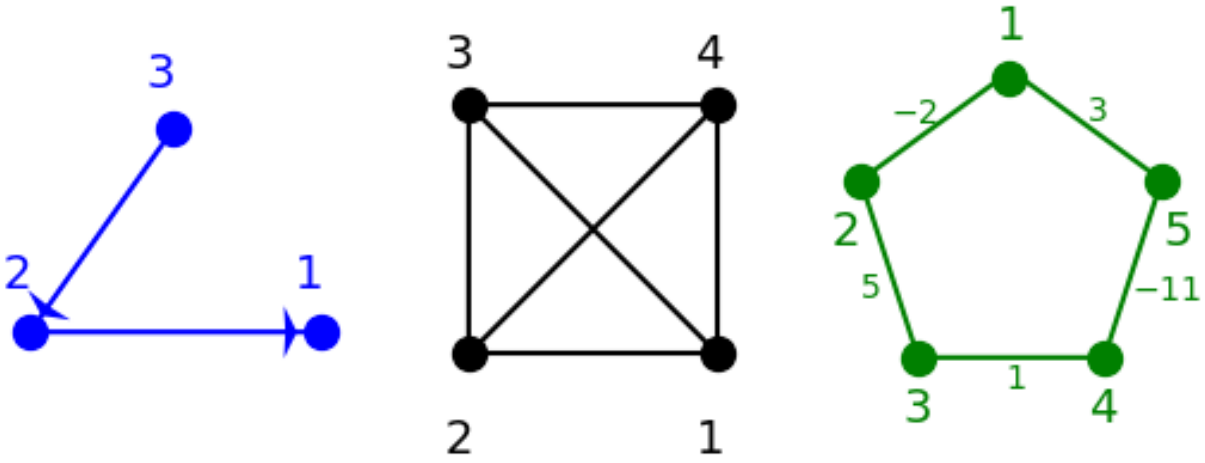


Figure 1: Left-to-right: a unweighted directed graph on 3 vertices in blue, an undirected unweighted graph on 4 vertices in black, a weighted undirected graph on 5 vertices in green