Algorithms that changed the world

Internet routing algorithm

October 3, 2023

1 Introduction

The aim of this workshop is to implement the Dijkstra's algorithm to find the *optimal paths* from a source node to all other nodes within the Internet.

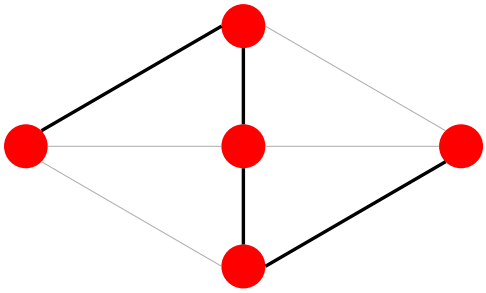

Figure 1: Optimal path between two nodes

A Jupyter notebook stub with a few drawing functions are provided to assist you. You can use a programming language of your choice.

2 Tasks

- **Task 1**

  Draw a simple graph that has more than 3 nodes, which should have been connected by edges that have positive cost to create a connected graph.

  Use $G = (\mathcal{N}, \mathcal{E})$ to represent this graph. Write the sets of $\mathcal{N}$ and $\mathcal{E}$.

- **Task 2**

  Read the pseudo code of the Dijkstra's algorithm and identify the two procedures - what are they?

  Which step is similar in both procedures? Describe the function of this step.

  What is the distance updating rule?

- **Task 3**

  Draw the Dijkstra's algorithm table and show how to run the algorithm using this table.

- **Task 4**

  Download the Jupyter notebook template and complete the algorithm. You will see some comments in the notebook for guidance. If you get into trouble, ask the TA.

  Write down your final result printed on the screen here.