VE477
Introduction to Algorithms

Lab 6

Manuel — UM-JI (Fall 2021)

Goals of the lab

- Course application
- Flow network
- Bipartite graphs

Unless specified otherwise, all the programs are expected to be completed in Python or O'caml.

1 Programming

In the following questions, represent the input graphs using the data structures developed in lab 5.

1. Implement the Breadth First Search algorithm;
2. Implement the Edmonds-Karp algorithm;
3. Implement an algorithm that solves the Maximum Bipartite Matching Problem and demonstrate its well functioning;

2 Interview Problems

- Given an array we want to determine the distance between two indices storing elements with same value.

  Example: on input $[1, 2, 2, 1, 4]$, return 3 for element 1 and 1 for element 2.

- A professor has noticed that many students get upset when attending his Office Hours (OH), due to the long waiting line. So he has decided to arrange his OH in a fair way:
  - All students are put in a queue;
  - Each student has exactly 5 minutes;
  - A student with a question taking less than 5 minutes to answer would still use up the 5 minutes;
  - At the end of the 5 minutes a student who still needs support reenters at the end of the queue;

  Student i asks all others in the queue how long they estimate their total time. How long will it take to student i before all his questions are answered?

  Example: on input $[1, 20, 10]$ and $i = 2$, return 35 minutes.