

Homework II

Description

You need to make a research to compare the working time of the **spanning tree finding**:

1. Prim's algorithm
2. Kruskal's algorithm
3. Boruvka's algorithm

Write a report based on the results you get. You are not given input or output format, or any template, so you can choose any you want to.

You need to implement the algorithms mentioned above, write a tester which compare results of algorithms to prove it's correctness, measure the time of working, and write a report.

Your work should consist of two parts:

- 1) Files contains algorithms and code that measures working time.
- 2) A report where you analyse and prove time complexity for the each algorithm and explain the results you get. A .cpp file must be runnable and reproduces the results you describe in the report.

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What you have to do step by step for the code part:

- 1) **Implement algorithms:** Prim's algorithm, Kruskal's algorithm, Boruvka's algorithm
- 2) **Write a tester** that validates your implementation works correct. You should compare the output of the algorithms if they are all the same. Run the tester on random generated graphs.
- 3) Write a **benchmarker** that runs your algorithms on different size inputs and measure the computation time. Approximately 50 measurements for each algorithms

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What you have to do step by step:

4) Analyse and **prove** the time complexity for each of the algorithms, **compare** the working time of algorithms you implemented and explain it

In your report you **have to answer** the following questions:

4.1) What is the time complexity of **each** version of the algorithm? **Why?**

4.2) What is the working time of each version of the algorithms on **different inputs**?

Try graphs of different sizes from very small to very large. Build charts with your measurements

4.3) What **input size** you can see the **difference** in working time for each of the algorithms?

5) **Write down** your thoughts and answers in your **Jupyter notebook** report. Use **Jupyter notebook** to draw charts and write the proofs.

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How to pass the homework:

- 1) Commit your code to hwtask1 branch in your repo on <http://gitlab.atp-fivt.org>
- 2) **Create a merge request** from task1hw to master branch

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The evaluation rules

The deadline for the problem is 18 **April 23:59**. The deadline counted by the time of your **merge request**.

Your work will be evaluated based on your **code style**, **code structure**, **correctness**, and **completeness** of the report.

You will get feedback on gitlab. You have 1 week to improve your code after getting feedback. After that your mark will be fixed.