

Exercise Sheet 4: Diameter with iFUB

Published on 10.12.2025. Duration: 1 Week

In the previous exercise sheets, we have learned about locality and heterogeneity, which help predict the performance of our algorithms. We have also become familiar with network models that can represent the properties of real networks.

The goal of this exercise sheet is to do experiments with one more algorithm.

Exercise 1: Diameter

The *diameter* of a graph is defined as the maximum distance between any two vertices. Research the iFUB (iterative fringe upper bound) by Crescenzi et al. [1] (see also the lecture slides) and implement both the iFUB-hd (highest degree) and iFUB-2sweep variants.

Use your obtained knowledge and toolkit to study the runtime of the algorithm on both generated and real-world instances. Develop a suitable method to measure and normalize the runtime of the algorithm. Find out which network properties lead to a particularly fast/slow diameter computation.

Further optional questions: Do the two iFUB variants behave differently? Can you explain why the network properties lead to the observed effect?

Exercise 2: Clean-Up

Use this exercise sheet to optimize the code and workflow you use for conducting experiments. Some questions to ask yourself are:

- Is it easy to integrate another algorithm into your code?
- Is it easy to define measurements and plot them afterward?
- Is it easy to run experiments on new instances and visualize the results?
- Is it easy to generate realistic instances?

References

- [1] Pilu Crescenzi, Roberto Grossi, Michel Habib, Leonardo LANZI, Andrea Marino (2013) *On computing the diameter of real-world undirected graphs*, Theoretical Computer Science, doi:10.1016/j.tcs.2012.09.018.