Departamento de Electrónica, Telecomunicações e Informática da Universidade de Aveiro

Algoritmos Avançados

2022/2023 — 1º Semestre

2nd Project — Randomized Algorithms for Combinatorial Problems

Deadline: December 8, 2022

Objectives

Design and test a **randomized algorithm** to solve the **combinatorial problem** that was **assigned to you** in the **first project**.

Devise and/or adapt strategies for:

- **Iterating through the randomly generated candidate solutions and keeping the best feasible solution computed.**
- **Ensuring that no such solutions are tested more than once.**
- **Deciding when to stop testing candidate solutions of a certain size and start testing larger or smaller solutions.**
- **Deciding when to stop testing altogether: e.g., after a given number of candidate solutions, or after spending a certain amount of computation time, etc.**

Graphs for the Computational Experiments

In addition to the graph instances already used in the first project, you should **run all your algorithms on example and benchmark graph instances available on the Web.**

Pointers for such graph instances will be given on the course page on E-Learning.

Performance Analysis

Afterwards, analyze the performance of the developed strategy. To accomplish that:

a) Perform a formal computational **complexity analysis** of the randomized algorithm.

b) Devise and carry out a sequence of **experiments, for successively larger problem instances**, to register and analyze (1) the **number of basic operations** carried out, (2) the **execution time** and (3) the **number of solutions / configurations** tested.

c) Analyze the **accuracy of the obtained solutions** by comparing them with the solutions obtained with the algorithms of the first project.

d) Compare the results of the **experimental** and the **formal analysis**.

e) Determine the **largest graph** that you can process on your computer, without taking too much time.

f) Estimate the execution time that would be required by **much larger problem instances**.

g) Write a report (8 pages, max.).

J. Madeira, November 8, 2022