Optimization using metaheuristics

Doctoral course - 6 credits

Course description

Kenneth Sörensen, University of Antwerp

Academic year 2020–2021

1 General aims

Metaheuristics are high-level algorithmic frameworks that provide guidelines for the design of heuristic optimization algorithms. Research in this field focuses on the development of effective methods for various challenging optimization problems. For many real-life optimization problems, metaheuristics are the best, or even the only choice if one wishes to develop state-of-the-art approaches that are able to tackle problems of real-life size and complexity.

This course aims to deepen the participants' knowledge into this challenging research field. In five sessions, the participants will be introduced to the most important methods that have been developed in the literature, and learn how they can be effectively applied. The course will give ample attention to the various pitfalls that "metaheuristicians" must overcome when developing an effective optimization method. The course will focus on applications in logistics, such as vehicle routing, facility location, production scheduling, …

2 Practical information

Due to the corona measures, the course will most likely take place online (via Facebook). This may change, however, as the situation evolves.

3 Evaluation

Evaluation will be based on an assignment prepared by the student. The assignment consists of two parts:

1. A *literature assignment*, in which the student reviews a paper on metaheuristics

2. A *development assignment*, in which the student develops an actual metaheuristic for a specific optimization problem, tests his/her approach and reports its results

For both assignments, both a written report is submitted, as well as a recorded presentation.

The report on the development assignment contains detailed explanations of:

1. the problem that is solved;
2. the heuristic that is developed;
3. the instances that were used for testing;
4. the results of the tests on the instances.

It is encouraged to write the report in the format of a scientific journal article.

The paper review report contains the following items:

1. short summary of the paper;
2. major remarks;
3. minor remarks;
4. a recommendation.

Both assignments are additionally presented by the student in a single recorded presentation of about 30 minutes. The format of the recording can be freely chosen (e.g., recording of the student presenting, screencast, animated video, document cam, ...).

The average student without prior experience in metaheuristics (but with some programming experience) should count on at least four weeks of development time. Students without programming experience should add the time necessary to acquire the necessary programming skills.

4 Deadlines

Deadlines are flexible. If the student wishes to graduate from the course during the academic year 2020–2021, the report and presentation need to be submitted before 1 June 2021. Otherwise, submission at a later date is possible (to be agreed).

5 Contact

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