1 Genetic Algorithms: the second best algorithm for all optimization problems

Time	May 29 - July 14, 2017 (Summer term 2017)
Course type	Elective course (Wahlpflichtfach), Summer School
Instructors	Prof. Dr. Alexander Asteroth, Alexander Hagg (M.Sc.)

2 Course content

Optimization problems can be found everywhere in science and engineering. From creating a controller for a hybrid car, optimizing the distribution of e-bike charging stations, designing a computer chip and scheduling a large number of complex interdependent loading tasks in a container terminal are just a number of examples of complex tasks. Often not all information that you would need to find an optimal solution is there, robustness towards unknown situations is demanded, or solutions are not as easy to come by due to the nature of the problem. This course will introduce you to a set of biologically inspired algorithms that use a digital version of evolution and genetics to evolve solutions to any optimization problem. As the subtitle of the course already hints, this set of algorithms, which is approximate in nature, is often the second best algorithm for any task. By visiting this course, you will get an introduction to a strong set of tools that can be used in really all fields of science and engineering. Topics include:

- Optimization problems
- Classical optimization algorithms like Newton's method
- Genetic algorithm basics
- Evolutionary multiobjective optimization
- Solution diversity maintenance

3 Course structure

A number of topics will be introduced during lecture. You will then receive an assignment, which you will solve using Matlab. There is a large number of lab hours that allow us to test your knowledge and most of all, help you solve the tasks.

- Lecture 3 hours/week
- Lab class 5 hours/week
- Off-campus workload 12 hours/week

The course is addressed to anyone who has ever written a program in any language. We will show you the strength of vectorization in Matlab, but of course the code will be usable in Octave as well, so you will always be able to reuse your code. The course is suitable for students enrolled in a bachelor's program in computer science. The language of instruction will be in english.