Machine Learning: Evolutionary Algorithms

Module-No./Abbreviation CE-W05/ML:SM	Credits 6 CP	Workload 180 h	Term 2nd Sem.	Frequency Summer term	Duration 1 Semester
Courses Machine Learning: Evolutionary Algorithms			Contact hours 4 SWS/ 60h	Self-Study 80 h	Group Size: No Restrictions

Prerequisites

The course requires basic mathematical tools from linear algebra, calculus, and probability theory. More advanced mathematical material will be introduced as needed. The practical sessions involve programming exercises in Python. Participants need basic programming experience. They are expected to bring their own devices (laptops).

Learning goals / Competences

After successful completion of the course,

- participants know the most important classes of direct search methods and their components,
- participants have a deep understanding of evolutionary algorithms, especially for continuous problem,
- participants know typical problem difficulties and the corresponding algorithmic components addressing these,
- participants can perform elementary runtime analysis of randomized optimization methods and know the most relevant classes of convergence speeds,
- participants can implement optimization methods and apply them to solve new problems.

Content

Broad overview of optimization methods.

Evolutionary optimization methods for black-box optimization.

Algorithmic components for ill-conditioning, multi-modality, noise, constraint handling, and multiobjective optimization.

Convergence and runtime analysis.

Teaching methods

Block seminar (equivalent to 2 SWS)

Mode of assessment

Final oral test of 30 minutes (100%)

Requirement for the award of credit points

Passed oral test

Module applicability

MSc. Computational Engineering

Weight of the mark for the final score

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Module coordinator and lecturer(s)

Prof. Dr. rer. nat. K. Hackl, Dr.-Ing. J. Franke

Further information