Technology
Arts Sciences
TH Köln

Course
CI - Computational Intelligence

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General information

Long name	Computational Intelligence
Approving CModule	CI MaTIN
Responsible	Prof. Dr. Rainer Bartz Professor Fakultät IME
Level	Master
Semester in the year	summer semester
Duration	Semester
Hours in self-study	78
ECTS	5
Professors	Prof. Dr. Rainer Bartz Professor Fakultät IME
Requirements	vector functions, gradient
Language	German, English if necessary
Separate final exam	Yes

Final exam

Details

written exam

Minimum standard

roughly 50%

Exam Type

written exam

Lecture / Exercises

Learning goals

Knowledge

Optimization strategies
- classification of problems
- gradient algorithms
- simplex algorithm
- multiobjective optimization and Pareto approach

Artificial neural networks
- artificial neurons
- neural network structures
- training algorithms

Fuzzy logic
- fuzzification
- inference
- defuzzification

Evolutionary algorithms
- genome representations
- selection mechanisms
- recombination operators
- mutation operators

Skills

The students acquire fundamental knowledge on theory and applications of computational intelligence

The students know about typical classes of optimization tasks and how to map a specific problem to those classes

They know the simplex algorithm and can transform problems into the standard form to find the solutions

The students can classify artificial neural networks and determine their applicability for specific tasks

They can vary the parameters of neural networks and rate their impact on the results

They can classify training algorithms and understand the backpropagation algorithm

They know about the fuzzy logic approach, can apply it to specific problems and justify the resulting system behavior

The students know how evolutionary algorithms work and can distinguish the variants

They can transform a problem specification into a representation appropriate for an evolutionary algorithm

They can rate selection strategies and define suitable algorithms

The students can solve linear problems with the use of the simplex algorithm

They can apply artificial neural networks to solve problems of modeling and classification

They can define fuzzy logic systems to solve imprecise and vague tasks

They can solve difficult problems heuristically using evolutionary algorithms

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	2
Exercises (whole course)	1
Exercises (shared course)	0
Tutorial (voluntary)	0

Separate exam

none

Practical training

Learning goals

Knowledge

Application of artificial neural networks to a classification task

Variation and multiobjective optimization of neural network parameters

Fuzzy-based closed loop control of a system with two inputs

Skills

The students are familiar with tools supporting computational intelligence

The students can vary system parameters, perform test series, and evaluate, present and discuss the results

The students are able to understand, present, analyze and discuss scientific publications

The students are able to solve problems in small teams

They can tackle optimization tasks in a structured and systematic way

They can rate the behavior of a system with regard to objectives and study and improve the behavior through parameter variations

They are able to cope with international scientific publications, understanding, presenting and discussing them in their context

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Practical training	1
Tutorial (voluntary)	0

Separate exam

none