

Capita Selecta in Soft Computing (C001719)

Course size (nominal values; actual values may depend on programme)

Credits	6.0	Study time	165 h	Contact hrs	45.0 h
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Course offerings and teaching methods in academic year 2018-2019

A (semester 2)	Dutch	project	15.0 h
		lecture	30.0 h

Lecturers in academic year 2018-2019

Cornelis, Chris	WE02	lecturer-in-charge
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Offered in the following programmes in 2018-2019

	crdts	offering
Master of Science in Computer Science	6	A
Master of Science in Mathematics	6	A

Teaching languages

Dutch

Keywords

Fuzzy relations, fuzzy relational calculus, fuzzy topology, alternative models for representing imprecise information

Position of the course

The concept of a relation is fundamental, in a sense that sometimes science is described as the discovery of relations between objects, systems and structures. In this course we will give an overview of the recent developments in the classical relational calculus and its extension to imprecise relationships, the so-called fuzzy relational calculus. In parallel to defining and studying the theoretical concepts, we will illustrate them in many practical contexts. The term soft computing refers to a collection of models for representing and processing imprecise information. We will therefore also give a short overview of some of these models and describe their relationship with the most prominent among them, namely fuzzy set theory.

This fits within the following learning outcomes of the master programme: 1.1, 1.4, 1.7, 2.1, 2.3, 2.7, 3.2, 5.2.

Contents

1. Recent developments in relational calculus
 - 1.1 Basic concepts
 - 1.2 Operations
 - 1.3 Classical images
 - 1.4 New images and their properties
 - 1.5 Special relations
 - 1.6 Classical composition
 - 1.7 New compositions and their properties
 - 1.8 Application: formal concept analysis and rough set theory
2. Fuzzy relational calculus
 - 2.1 Basic concepts
 - 2.2 Operations
 - 2.3 Classical fuzzy images
 - 2.4 New images and their properties
 - 2.5 Approximate equality and similarity
 - 2.6 Classical fuzzy composition
 - 2.7 New compositions and their properties
 - 2.8 Application: fuzzy rough set theory

3. Introduction to fuzzy topology

4. Applications, including for example to machine learning and data analysis, artificial intelligence, personalization, decision theory ...

Initial competences

A positive attitude w.r.t. a mathematical approach. Basic notions of fuzzy set theory are introduced and/or recalled at the start of the course.

Final competences

- 1 The students should be familiar with fuzzy relational calculus and its applications.
- 2 They should be capable of initiating independent research in this area.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, project

Extra information on the teaching methods

The learning material is provided in Dutch and English.

Learning materials and price

The learning material is electronically available (free of charge), using the Minerva website.

References

R. Boete, Vaagrelaties - Fundamenten en Toepassingen, masterproef, Universiteit Gent, 2013 (in Dutch).

E.E. Kerre, Fuzzy Sets and Approximate Reasoning, Xian Jiaotong University Press, 1998.

E.E. Kerre, Introduction to the Basic Principles of Fuzzy Set Theory and Some of its Applications, Communication and Cognition, 1993.

Course content-related study coaching

Students can ask questions during lectures or via e-mail.

Evaluation methods

end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Written examination with open questions

Examination methods in case of periodic evaluation during the second examination period

Written examination with open questions

Examination methods in case of permanent evaluation

Assignment

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

Theory: periodical evaluation (written examination with closed book)

Exercises: permanent evaluation (project, individual or in group, in which the theory is applied to a specific application domain)

Calculation of the examination mark

The project counts for 10 points out of 20, the written exam counts for 10 points out of 20.