Parameterized Algorithmics

Module title:	Credits:	Responsible person:
Parameterized Algorithmics	6	Niedermeier, Rolf
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Website:	Display language:	E-mail address:
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Learning Outcomes

On successful completion, students will be able to:

- apply the approach of parameterized complexity analysis to solve computationally hard (NP-hard) problems
- design and analyze parameterized algorithms
- identify practically relevant and tractable special cases of problems that are computationally hard in general
- use complexity-theoretic methods to determine the limits of parameterized algorithmics

Content

Particular topics include:

- algorithms for exactly solving NP-hard optimization problems by exploiting important problem parameters such as solution size or special structures in the input
- NP-hard computational problems on graphs and networks and on strings
- algorithmic techniques such as preprocessing by data reduction, depth-bounded search trees, color coding, iterative compression, tree decomposition of graphs, parameterized reductions

Module Components

Course Name	Type	Number	Cycle	SWS
Parameterized Algorithmics	IV	0434 L 220	k.A.	4

Workload and Credit Points

Parameterized Algorithmics (Integrierte Veranstaltung)	Multiplier	Hours	Total
Präsenzzeit	15.0	4.0h	60.0h
Vor-/Nachbereitung	15.0	6.0h	90.0h
			150.0h

Course-independent workload	Multiplier	Hours	Total
Prüfungsvorbereitung	1.0	30.0h	30.0h
			30.0h

The Workload of the module sums up to 180.0 Hours. Therefor the module contains 6 Credits.

Description of Teaching and Learning Methods

The course material is presented in lectures. The lectures are accompanied by tutorials in which distributed work sheets are solved together.

Requirements for participation and examination

Desirable prerequisites for participation in the courses:

Basic knowledge on algorithms

Mandatory requirements for the module test application:

No information

Module completion

Grading:	Type of exam:	Language:	Duration/Extent:
graded	Oral exam	English	30 min

Duration of the Module

This module can be completed in one semester.

Maximum Number of Participants

This module is not limited to a number of students.

Registration Procedures

Please register at QISPOS or directly at the examination office.

Recommended reading, Lecture notes

Lecture notes:

unavailable

Electronical lecture notes :

available

Additional information:

Slides will be made available during the lecture period:
http://www.isis.tu-berlin.de/

Recommended literature:

Jörg Flum, Martin Grohe: Parameterized Complexity Theory. Springer, Berlin 2006.

Marek Cygan, Fedor V. Fomin, Lukasz Kowalik, Daniel Lokshtanov, Dániel Marx, Marcin Pilipczuk, Michal Pilipczuk, Saket Saurabh: Parameterized Algortithms. Springer International Publishing, Cham 2015

Rod G. Downey, Michael R. Fellows: Fundamentals of Parameterized Complexity. Springer, New York 2013.

Rolf Niedermeier: Invitation to Fixed - Parameter Algorithms. Oxford Univ. Press, Oxford 2006.

Assigned Degree Programs

This module is used in the following modulelists:

- Computer Engineering (Master of Science)
  - StuPO 2015
    - Modullisten der Semester: SS 2017 WS 2017/18 SS 2018
- Computer Science (Informatik) (Master of Science)
  - StuPO 2015
    - Modullisten der Semester: SS 2017 WS 2017/18 SS 2018
- Double-Degree-Masterstudiengang ICT Innovation (Master of Science)
  - MSc ICT Innovation StuPO 2018
    - Modullisten der Semester:
  - Msc ICT Innovation PO 2014
    - Modullisten der Semester: SS 2017 WS 2017/18 SS 2018
  - MSc ICT Innovation StuPO 2016
    - Modullisten der Semester: SS 2017 WS 2017/18 SS 2018
  - Msc ICT Innovation StuPO 2017
    - Modullisten der Semester: WS 2017/18 SS 2018
- Elektrotechnik (Master of Science)
  - StuPO 2015
    - Modullisten der Semester: SS 2017 WS 2017/18 SS 2018
- Informatik (Master of Science)
  - MSc Informatik PO 2013
    - Modullisten der Semester: SS 2017 WS 2017/18 SS 2018
- Wirtschaftsinformatik / Information Systems Management (Master of Science)
  - StuPO 2017
    - Modullisten der Semester: WS 2017/18 SS 2018
- Wirtschaftsingenieurwesen (Master of Science)
  - StuPO 2015
    - Modullisten der Semester: WS 2017/18 SS 2018 WS 2018/19

Miscellaneous

This course is not offered regularly, you will find detailed information on our website: http://www.akt.tu-berlin.de/menue/teaching/