Elective Courses for the Winter Semester 2018/2019

A comprehensive presentation
Rules

• Every presenter has two minutes per lecture

• The presentation is ordered in the following way:
  1. Theoretical Comp. Science I
  2. Software- and Communication
  3. Data- and Informationmanagement
  4. Applied Comp. Science
  5. Theoretical Comp. Science II

• Slides will be uploaded
# Theoretical Computer Science I

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<td>Informatik 7</td>
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<td>Informatik 1</td>
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Complexity Theory

Questions

• Why are some problems so hard to solve, and others easy?
• Can we trade running time for memory?
• What about communication cost?
• Does randomness help?
• What does Botticelli‘s Venus have to do with all this?

Computational Complexity Theory studies the boundaries of efficient computation and the inherent complexity of algorithmic problems.

First lecture:
Thursday, Oct 11, 14:30, AH III

Further Info: L2P
Graph Decompositions and Algorithmic Applications

Topics

• Decompositions of graphs into small pieces: tree decompositions and tree width
• Decompositions of graphs into highly connected regions: brambles and tangles

• Algorithmic Paradigms: Dynamic Programming, Divide-And-Conquer
• Algorithms for computing decompositions
• Indecomposable graphs: expanders

First lecture:
Thursday, Oct 11, 12:30, 5056

Further Info: L2P
Topics

- Automata on infinite words and infinite trees
- How to solve infinite two-player games of infinite duration

First lecture:
Tuesday, Oct 9, 8:30, 5052

Further Info: L2P
Stochastic Games (V2/E1, 4CP)

New course for students with a clear interest in theory.

Topics
- Perfect information games with probabilistic transitions
- Foundations of probability and measure theory

First lecture:
Monday, Oct 15, 10:30, 5055

Further Info: L2P
Logic and Games (V4, Ü2)

Lecture: Start 9.10.  
Tue 10:30 - 12:00, AH I  
Thu 12:30 - 14:00, I

Tutorial: Start 19.10.  
Fri 14:30 - 16:00, AH III

Content:

▶ fundamental aspects of classical game theory  
▶ finite and infinite games  
▶ model-checking games  
▶ determinacy of games  
▶ complexity of definability of winning regions  
▶ multi-player games

More Information:
https://logic.rwth-aachen.de/Teaching/LS-WS19/index.html.en
Algorithmic Graph Theory

Language: English  Start: Tue 09.10.  Credits: 6

- **Problems:**
  - Independent Set
  - Separators
  - Treewidth
  - Coloring
  - Bandwidth
  - Recognition
  - Gossip
  - .......

- **Graphs:**
  - Planar Graphs
  - Intersection Graphs
  - Line Graphs
  - Perfect Graphs
  - Chordal Graphs
  - Bipartite Graphs
  - K-Trees
  - .......
Effiziente Algorithmen
Sprache: Deutsch    Start: Di 09.10. Credits: 6

• Probleme:
  • Maximale Flüsse
  • Matchings
  • Matroide
  • Matrix Multiplikation
  • LPs
  • ......

• Algorithmen:
  • Effiziente
  • Approximation
  • Randomisierte
  • Heuristiken
  • ......
Parameterized Algorithms (4+2 hours, 8 credits)

Master course in Computer Science
Instructor: Peter Rossmanith, LuFG Theoretische Informatik
Date and time: Tuesday and Thursday, 8:30–10:00 (5054)
Starts at: Thursday, October 11th
Tutorial: Monday, 15:30–17:00 (5056)

Techniques to solve and classify hard problems:
- Branching Algorithms
- Kernels
- Bidimensionality
- Advanced Algorithmic Techniques
- Lower Bounds
- Parameterized Complexity
# Software and Communication

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<td>LuFG I3</td>
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<td>Informatik 4</td>
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<td>Communication Systems Engineering</td>
<td>Informatik 4</td>
<td>Prof. Wehrle</td>
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<tr>
<td>Formal Methods for Logic Control Software</td>
<td>Informatik 11</td>
<td>Prof. Kowalewski</td>
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Compact Course Prof. Nagl WS 2018/2019 given in English and German

Software Architectures
March 2019

You learn about the importance of software architectures, how they are designed, how architectures look for “standard” systems, and why there is not one architecture.

Informatik (B.Sc.)
Informatik (M.Sc.)
Software Systems Engineering (M.Sc.)
Technik-Kommunikation (M.Sc.)

Anmeldung über campusOffice: WS 2018/2019
There you see details of place and time:
http://www.se-rwth.de/teaching/ws1819/pig/

Kontakt bei Interesse / Please contact
Deni Raco
raco@se-rwth.de
Start
March 2019 (Start: TBA), 09:00 Uhr
Room TBA
Object Oriented Software Construction (3+2)

Much more than programming!

Prof. H. Lichter - https://www.swc.rwth-aachen.de/
Object Oriented Software Construction (3+2)

- How to apply and combine core object oriented concepts?
- How to identify classes based on a systematic analysis?
- How can we improve the design of existing applications?
- How to model an application domain?
- What are components and component models?
- How can we combine design patterns and frameworks?
Advanced Internet Technology (3+1 SWS)
Advanced Internet Technology (3+1 SWS)

- Reliability
- Scalability
- Security
- Performance
- Mobility
- Adaptability
Advanced Internet Technology (3+1 SWS)

- Reliability
- Mobility
- Security
- Adaptability
- Scalability
- Performance
- Quality of Service
- Peer-to-Peer Systems
- Cloud Computing
- Cyber-Physical Systems
- Internet of Things
- Software Defined Networking
Advanced Internet Technology Schedule

- **Lecture**
  - Mon 12:30 – 14:00, AH 1
  - Wed 10:30 – 12:00, AH 1

- **Exercise**
  - Fri 12:30 – 14:00, AH 2

- **First lecture**
  - Mon 15\textsuperscript{th} October

- **For…**
  - Bachelor & Master students
• Content of the lecture (3+1 SWS)
  ▶ Foundations and technologies for the engineering of modern communication systems
    ■ Communication systems implementation
    ■ Protocol design patterns, verification and testing
    ■ Performance Evaluation: local evaluation, simulations, Internet-scale evaluation
Communication Systems Engineering Schedule

- **Lecture & Exercises**
  - Mon 08:30 – 10:00, AH 4
  - Wed 08:30 – 10:00, AH 2
  - Thu 10:30 – 12:00, AH 1

- **First lecture**
  - Wed 10^{th} October

- **For…**
  - Bachelor & Master students
Security & Privacy Lunch

• Not an official course, but informal meetings
  ▶️ https://www.comsys.rwth-aachen.de/teaching/ws-1819/security-and-privacy-lunch/
  ▶️ Bring your lunch and watch current scientific talks with us!
  ▶️ Each Thursday, 12:30 - 13:15 (Start: 11th October)
  ▶️ Mailing list: https://lists.comsys.rwth-aachen.de/listinfo/sp-lunch

• Who can join?
  ▶️ Bachelor & Master students
  ▶️ No credits, thus you cannot take it as kind of elective…
  ▶️ … but if you are interested in current Security & Privacy research, just step in!
Course schedule

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<th>Winter</th>
<th>Formal Methods for Logic Control Software</th>
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<td>Summer</td>
<td>(Introduction to) Embedded Systems</td>
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<td></td>
<td>Functional Safety and System Dependability</td>
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Formal Methods for Logic Control Software (MSc.)

Language: English or German
- English slides
- English exam

Contents:
- Introduction to PLCs
- Dataflow Analysis
- Abstract Interpretation
- SAT/SMT-Encodings
- Software Model Checking
- Concolic Testing
Formal Methods for Logic Control Software (MSc.)

- V2/Ü2 (6 ECTS)
- Master CS
- Schedule:
  - Monday, 10:30-12:00, AH II (2350|111)
  - Wednesday, 10:30-12:00, AH II (2350|111)
- Begin: 08.10.2018
## Data- and Information-Management

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<td>Introduction to Data Science</td>
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<td>Einführung in Webtechnologien (in German)</td>
<td>LuFG I9</td>
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<td>Social Data Science</td>
<td>Chair for Computational Social Sciences and Humanities</td>
<td>Prof. Strohmaier</td>
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IT-Security 1

**Network Security**
- DNSSec
- SSH
- PGP/SMIME
- OTR
- Kerberos
- TLS/SSL
- IPsec

**Cryptographic Basics**

**Authentication and Key Agreement**
- Certificates and PKIs
- Passwords
- Challenge-Resp. Authentication
- Diffie-Hellman

**Symmetric Encryption**
- DES
- AES

**Integrity Protection**
- MD5
- SHA-1

**Asymmetric Crypto**
- RSA
- DSS
IT-Security 1 – Organizational Information

- Lecture
  - Mondays 12:30 – 14:00 AH IV
  - Bi-weekly on Fridays 10:30 – 12:00 AH VI
  - First lecture: Friday, October 12th

- Exercise
  - Bi-weekly on Fridays 10:30 – 12:00 AH VI
Intro. to Artificial Intelligence

The course introduces basic concepts found in many AI systems:

• Agent architectures
• Heuristic Search
• Playing games (like chess)
• Knowledge Representation and Reasoning
• Planning a course of actions
Intro. to Artificial Intelligence

- Reasoning under uncertainty
- Learning: Decision trees and Neural Networks
- Robotics

Prerequisites: none
Starts Monday, October 15, 14:30h, AH IV
Introduction to Data Science – Powered by PADS

- New research group, chaired by prof. Wil van der Aalst
- AvH Professorship, Fraunhofer Interplay between Process Science and Data Science
- Rapidly growing interest in industry (25+ software vendors based on process mining research done before)
- Scientifically challenges & huge practical relevance
- Where you can make a difference (also many HiWi positions)
Introduction to Data Science - Topics

- Infrastructure
  - "volume and velocity"
  - big data infrastructures
  - distributed systems
  - data engineering
  - programming
  - security
  - ... 

- Analysis
  - "extracting knowledge"
  - statistics
  - data/process mining
  - machine learning
  - artificial intelligence
  - visualization
  - ... 

- Effect
  - "people, organizations, society"
  - ethics & privacy
  - IT law
  - operations management
  - business models
  - entrepreneurship
  - ... 

- Mechanical engineering
- Medicine
- Social sciences
- Logistics
- Scientific workflows
- Energy
- High-tech systems
- IT law
- Social sciences
The course starts **10-10-2018**.

Lectures are on **Wednesdays and Thursdays** from **8.30 to 10.00** in **2352|021 (Aula 2)**.

Instructions are on **Fridays** from **8.30 to 10.00** in **2352|021 (Aula 2)**.

Involves using **software** and **real data** covering the whole Data Science spectrum.

Examination: Two more practical assignments and a written final exam.

6 ECTS Master level (Data Science, Informatik, Media Inf., Software Syst.).
Learning Technologies
LuFG Informatik 9
Prof. Dr. Ulrik Schroeder

Einführung in Webtechnologien (WebTech1) (V3 Ü2, 6 ECTS)

L:  Tue. 10:30 – 12:00  AH II
L:  Thu. 10:30 – 12:00  AH II
E:  Wed. 16:30 – 18:00  5054/5056

Start L:  11.10.2018
Start E:  17.10.2018

Lecture: German
LuFG Informatik 9

E-Learning & Web-Technologies

PRiME - Future Teaching & Learning

AIX - Future Teaching & Learning

TABULA

Bild der Informatik bei Kindern & Jugendlichen

Learning Analytics

(mobile) Learning in Context

Open Learning / Assessment

Online-Kurse / Lernspiele

E-Learning in der Schule

Informatik für Kinder & Jugendliche

powered by

LeBiAC

MOOCs

Palm

Vermittlung der Objektorientierten Programmierung
The Web is Everywhere...
The Web is Everywhere...

Communication
(E-Mail, Social Networks, ...
The Web is Everywhere...

Communication
(E-Mail, Social Networks, ...)

Buying/Selling
The Web is Everywhere...

Communication
(E-Mail, Social Networks, ...)

Music

Buying/Selling
The Web is Everywhere…

Communication
(E-Mail, Social Networks, …)

Music

Buying/Selling

Games
The Web is Everywhere...

Communication (E-Mail, Social Networks, ...)

Booking

Music

Buying/Selling

Games
The Web is Everywhere...

Communication (E-Mail, Social Networks, ...)

Booking

Music

Buying/Selling

Games

Movies
The Web is Everywhere...

Communication (E-Mail, Social Networks, ...)
Research
Games
Booking
Music
Buying/Selling
Movies
Web Technologies
Web Technologies

Search Engines
Web Technologies

Search Engines

Online-Shops
Web Technologies

- Search Engines
- Online-Gaming-Platforms
- Online-Shops
Web Technologies

Search Engines

Social Networks

Online-Gaming-Platforms

Online-Shops
Multiple web technologies combined allow creating dynamic web application.
You will learn the foundations of web technologies...
Web Technologies

You will learn the foundations of web technologies...

... and develop your own dynamic web application!
Concept & Content

- **Lecture**
  - Foundations of web communication
  - Client and server technologies and development tools
  - Security

- **Exercise**
  - Apply the gathered knowledge in a small project

- **Project**
  - Combine self chosen technologies in an own web application
Chair for Computational Social Sciences and Humanities

Prof. Dr. Markus Strohmaier

- Newly established research group since June 2017
- Located in HumTec, Theaterplatz 14, 3rd floor
- Interdisciplinary research: Computer- and Social Sciences

http://cssh.rwth-aachen.de
# Computational Social Sciences and Humanities

## Computational studies of human behavior

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<th>Social issues</th>
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Social Data Science (WS 2018/19)

Understanding social data

• Course topics:
  – What characterizes social data? How can it be obtained?
  – What kind of biases exist in social data?
  – How to do causal inference?
  – What is discrimination aware machine learning, how does it work?
  – How can we detect communities and model time series in social and temporal networks?
  – and many others!

• Course logistics:
  – starting TUE Oct 9th (you can still join next week)
  – TUE 10:30-12:00 (2 VO) and THU 10:30-13:15 (1 VO + 2 UE)
  – classes take place at Theaterplatz 14, #303, 3rd floor
  – for master students
Chair for Computational Social Sciences and Humanities

website: [http://cssh.rwth-aachen.de](http://cssh.rwth-aachen.de)

Location: HumTec Center, Theaterplatz 14, 3rd Floor, Classes: room #303
## Applied Computer Science

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<td>Prof. Kobbelt</td>
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<td>Informatik 8</td>
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<td>Physically-Based Animation</td>
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<td>Prof. Müller</td>
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Basic Techniques in Computer Graphics

Informatik 8 – Prof. Dr. Leif Kobbelt
Rendering
Perspective
Textures
Light & Shadow

1st Pass

2nd Pass

3rd Pass

16th Pass

Visual Computing Institute | Prof. Dr. Leif Kobbelt
Computer Graphics and Multimedia
Basic Techniques in Computer Graphics
Basic Techniques in Computer Graphics

Lecture

• Tuesdays, 14:30, AH V
• Thursdays 14:30, AH V

Tutorial

• Mondays, 14:15, AH III

More Information

• graphics.rwth-aachen.de/course/161/
• Weekly assignments: theoretical & programming
• This lecture is the basis for all of our advanced courses
Real-Time Graphics - Content (1)
Real-Time Graphics - Content (2)
Real-Time Graphics - Content (3)
Real-Time Graphics - Organization

• Lecture
  • Wed, 14:30 – 16:00 in AH V, starting 17.10.18
  • Thu, 16:30 – 18:00 in AH V, starting 11.10.18
  • 6 ECTS

• Exercise
  • Wed, 10:30 – 12:00 in Aula 2, starting 17.10.18
  • Weekly assignments, theoretical and practical (C++, OpenGL)

• Coding Project for Exam Bonus points

• Exam
  • 120 minutes, 20.02.19 (first), 16.03.19 (second)
  • ≥ 50% of exercise points required
Lecture: Physically-Based Animation

- Lecturer: Prof. Dr. Jan Bender
- Credits: 6 ECTS credits
- Dates:
  - Lecture: Tuesday, 10:30 – 12:00  E3 Room 9222
  - Lecture/Exercise: Tuesday, 14:30 - 16:00  E3 Room 9222
Lecture: Physically-Based Animation

- Hair
- Cloth
- Soft Bodies
- Rigid Bodies
- Fluids
- Collision Handling
Applications

Medical Simulation

Robotics

Virtual Prototyping

Games

Animation Movies

Special Effects
Computer Vision Group
Prof. Bastian Leibe
Visual Computing Institute

• Lecture: Machine Learning
  – Place & Time: Mon 10:30 – 12:00 room TEMP2
  – First lecture Thursday, 11.10.
  – Place & Time: Thu 10:30 – 12:00 room TEMP2

• Lecture: Computer Vision 2
  – Place & Time: Tue 10:30 – 12:00 room UMIC 025
  – Place & Time: Wed 08:30 – 10:00 room H10
  – First lecture Wednesday, 10.10.
Lecture Machine Learning (3V+1Ü)

• Goal
  – Build machines that learn to perform a task from experience

• Lecture
  – What does it mean to learn?
  – How can we make this computational?
  – Focus on statistical machine learning techniques
  – Deep Learning

• Many important real-world applications
  – Intelligent machines
  – Visual scene understanding
  – Autonomous driving
Lecture *Machine Learning* (3V+1Ü)

Deep Learning
Lecture *Machine Learning* (3V+1Ü)

- **Fundamentals**
  - Bayes Decision Theory
  - Probability Density Estimation

- **Classification Approaches**
  - Linear Discriminants
  - Support Vector Machines
  - Ensemble Methods & Boosting
  - Randomized Trees, Forests & Ferns

- **Deep Learning**
  - Foundations
  - Convolutional Neural Networks
  - Recurrent Neural Networks
Interested in how all of this works?

Come to our lecture!

Lecture:  *Machine Learning*
- Mon 10:30 – 12:00, room TEMP2
- Thu 10:30 – 12:00, room TEMP2

First lecture Thursday, 11.10.!
Computer Vision 1 Covered the Basics…

- Image Processing Basics
- Segmentation
- Local Features & Matching
- Object Recognition and Categorization
- 3D Reconstruction
Computer Vision 2 is all about motion…
Computer Vision 2 is all about motion…
Computer Vision 2 is all about motion…
Computer Vision 2 is all about motion…
Lecture *Computer Vision 2 (3V+1Ü)*

- Single-Object Tracking
  - Template-based Tracking
  - Tracking-by-Detection
  - Bayesian Filtering

- Multi-Object Tracking

- Visual Odometry / Visual SLAM

- Deep Learning for Video Processing
  - RNNs, LSTMs
  - Video Classification
  - Video Captioning
  - Video Object Segmentation

Image credit: Tobias Jaeggli, Kristen Graumann, Andrej Karpathy
Interested in how all of this works?

*Come to our lecture!*

**Lecture: Computer Vision 2**
- Tue 10:30 – 12:00, room UMIC 025
- Wed 08:30 – 10:00, room H10

First lecture Wednesday, 10.10.!
Designing Interactive Systems I

Human–Computer Interaction (HCI)

Usability

People!
Designing Interactive Systems I

• Design Thinking
• UI Design
• UI Prototyping
• UI Evaluation

flipped classroom

• Watch lecture material videos at home
• In class: Design Studio, work on group projects with individual feedback

http://hci.rwth-aachen.de/dis
Designing Interactive Systems I

- Design Thinking
- UI Design
- UI Prototyping
- UI Evaluation

Starts next Wednesday (10.10.), 10:00–12:00, room 5053.2a/b

Only 100 seats!!

http://hci.rwth-aachen.de/dis
iOS Application Development

Lecture + Seminar + Project
iOS Application Development

Lecture + Seminar + Project

Starts next Tuesday (09.10.), 10:30–12:00, room 2222

Limited Seats!
Hands-On Personal Digital Fabrication

3D printing, lasercutting, microcontrollers,…

Learn how to make almost anything

In Collaboration with
M.I.T. Professor Neil Gershenfeld

Very limited seats!
Contact: lahaye@cs.rwth-aachen.de
Lecture VR I: Introduction to Virtual Reality (V3Ü1)

• **Goal:**
  – Learn the basics of Virtual Reality and its use in scientific & technical applications!

• **Contents:**
  – Characteristics & History of VR
  – Immersive Displays: Head-Mounted Displays & CAVEs
  – Stereoscopic, egocentric projections
  – Motion Tracking & 3-D User Interfaces
  – Navigation in virtual environments
  – Collision Detection
  – VR in Simulation Science & Medicine
  – Demos in our VR lab
  – *A little bit of Computer Graphics*

(← VR I is held for multiple study programs)
Overview

Lecture: Tuesday, 10:30-12:00, AH VI
           Wednesday, 16:30-18:00, AH VI

Exercise: replacing lectures in a bi-weekly manner

Start: Tuesday, October 16

Teachers: Torsten W. Kuhlen, Jonathan Wendt

Credits: Master CS, SSE, MI
          Written Exam (90 minutes, Feb 6 and Mar 20)
Computational Differentiation

Function given as C code:

```c
double f(double x) {
    double y = 5 * x * x;
    return y;
}
```

Algorithmic differentiation:

```c
double df_ad(double x) {
    double dy = 5 * 2 * x;
    return dy;
}
```

Computer Science:
Source transformation
C++ operator overloading
Data flow graphs

Numerical Computation:
Continuous optimization
Adjoint methods
Differential equations
Computational Differentiation

Prof. Dr. Uwe Naumann

Lecture: Monday 10:30 - 12:00  AH III (2350|314.1)
Tutorial: Friday 10:30 - 12:00  AH III (2350|314.1)

Beginning: 08.10.2018 (12.10.2018)

Bachelor Informatik
SWS: 4 / ECTS Credits: 6
Language: English
High Performance Computing

Prof. Dr. Matthias Müller

Chair for High Performance Computing (Informatik 12)
www.hpc.rwth-aachen.de
contact@hpc.rwth-aachen.de
High Performance Computing

Simulation results

need time

→ Aim: faster execution
Simulation results

need time

Aim: faster execution

Quad-Core

270x

50x
```c
double CalcPi (int n) {
    const double fH = 1.0 / (double) n;
    double fSum = 0.0;
    double fX;
    int i;

    for (i = 0; i < n; i++) {
        fX = fH * ((double)i + 0.5);
        fSum += f(fX);
    }
    return fH * fSum;
}
```
Parallel Programming

double CalcPi (int n){
    const double fH = 1.0 / (double) n;
    double fSum = 0.0;
    double fX;
    int i;

    #pragma omp parallel for private(fX,i) reduction(+:fSum)
    for (i = 0; i < n; i++) {
        fX = fH * ((double)i + 0.5);
        fSum += f(fX);
    }
    return fH * fSum;
}
Lecture: Introduction to High Performance Computing (HPC)

• Content WS 2018/19
  – Parallel computer architectures
  – Parallelization strategies
  – Parallel algorithms
  – Parallel programming

• Outlook SS 2019
  – Lecture: Concepts and Models for Parallel and Data-centric Programming
  – Lecture: Performance & correctness analysis of parallel programs
  – Seminar: Current Topics in High Performance Computing
  – Software Lab: Parallelprogrammierung von Many-Core Architekturen mit OpenMP

www.hpc.rwth-aachen.de
contact@hpc.rwth-aachen.de
Lecture: Statistical Classification and Machine Learning

- Introduction to
  - statistical pattern recognition
  - artificial neural networks and their relation to statistical classifiers
- Main topics:
  - statistical training and machine learning
  - model-free approaches
  - artificial neural networks and discriminative training
  - error integrals: properties and estimation
  - mixture densities and cluster analysis
  - expectation maximization algorithm and hidden Markov models
  - feature extraction and linear transformations
Lectures:
Mon 10.30 – 12.00 AH VI     Start:   15.10.2018
Wed 10.30 – 12.00 AH VI

Exercises:
Thu 16.30 – 18.00 AH VI     Start:  18.10.2018

• Teaching language: English
• Study programs (upon others):
  • Bachelor Informatik (V3/Ü2, 6 Credits)
  • Master Informatik, Media Informatics and Software Systems Engineering (V4/Ü2, 8 Credits)

www.hltp.rwth-aachen.de/web/Teaching/
Lecture: Automatic Speech Recognition

• Goal: extract spoken word sequence from speech audio signal
• Automatic speech recognition systems typically consist of four parts:
  • signal analysis: extracts time-dependent features from audio signal
  • acoustic model: link between features and words/phonemes
  • language model: syntactic and semantic constraints
  • search process: find best word sequence
Lectures:
Tue 10.30 – 12.00  5056     Start:   16.10.2018
Wed 08.30 – 10.00  AH VI

Exercises:
Mon 16.30 – 10.00  AH VI     Start:    22.10.2018

• Teaching language: English
• Study programs (upon others):
  • Bachelor Informatik (V3/Ü2, 6 Credits)
  • Master Informatik, Media Informatics and Software Systems Engineering (V4/Ü2, 8 Credits)

www.hltp.rwth-aachen.de/web/Teaching/
# Theoretical Computer Science II

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Verification with Uncertainties

“A promising new direction in formal methods research these days is the development of probabilistic models, with associated tools for quantitative evaluation of system performance along with correctness.”

Theory in Practice for System Design and Verification

Rajeev Alur
Univ. of Pennsylvania

Thomas A. Henzinger
IST Austria

Moshe Y. Vardi
Rice University

ACM SIGLOG News 2015
Verification with Uncertainties

System → Probabilistic State Machine Model

Requirements → $P_{\geq 0.95} \left[ \Box (\neg p \rightarrow \Diamond q) \land \ldots \right]$

Probabilistic Temporal Property

Model Checker

Results

Counterexample Trace
How does this work?

✓ Visit lecture on

**Modeling and Verification of Probabilistic Systems**

✓ When? Start: **October 8, 10:30.**

✓ Where? 5056.

✓ Who? Prof. Dr. **Joost-Pieter Katoen.**

✓ Needed: **logics, algorithms, automata, probability.**
Why Probabilistic Programming is the next big thing in Data Science

Who am i?

Peadar Coyle

Mailing List

September 9, 2018

What is Probabilistic Programming?

I recently wrote a course teaching this. Probabilistic Programming is a newish paradigm used in Quantitative Finance, Biology, Insurance and Sports Analytics –
Programming with Uncertainties

“There are several reasons why probabilistic programming could prove to be revolutionary for machine intelligence and scientific modelling.”

Probabilistic machine learning and artificial intelligence

Zoubin Ghahramani
How does this work?

✓ Visit lecture on

**Probabilistic Programming**

✓ When? Start: **October 11, 14:30.**

✓ Where? 5055.

✓ Who? Prof. **Joost-Pieter Katoen.**

✓ Needed: **programming, probability, theory.**
Compilers: From Source Code to Machine Code

**Course Compiler Construction**

- **Topic:** foundational methods and techniques for implementing compilers for high-level programming languages
- **Lecturer:** Thomas Noll
- **Mon/Fri 12:30–14:00 @ AH 6**
- **Initial lecture:** Mon, Oct 8
- **Prerequisites:** languages and automata, algorithms and data structures
That’s it.