TOPICS

Nonlinear Optimization
Optimal Control
Optimization with PDE
Mixed-Integer Optimization
Model Predictive Control
Dynamical Systems

PROGRAM

Lecture Courses

M. Gerdts (Uni Bw München)
R. Herzog (TU Chemnitz)
S. Leyffer (Argonne National Laboratory)

Speakers

M. Dellnitz (University of Paderborn)
S. Gros (Chalmers Univ. of Tech.)
S. Sager (University of Magdeburg)
J. Starke (University of Rostock)
A. Walther (University of Paderborn)
H. Zidani (ENSTA ParisTech)

Mathematical City Tour

Poster Session & Reception

Joint Dinner

IMPORTANT DATES

Opening of Registration

March 1st, 2018

Closing of Registration

May 31st, 2018

Notice of Acceptance

June 7th, 2018

ORGANIZERS

Research Training Group π^3
University of Bremen

Christof Büskens
Kathrin Flaßkamp
Jens Rademacher

DFG

RTG 2224

SUMMER SCHOOL

OPTIMIZATION OF DYNAMICAL SYSTEMS

LECTURERS

MATTHIAS GERDTS
UNI BW MÜNCHEN

SVEN LEYFFER
ARGONNE NATIONAL LABORATORY

ROLAND HERZOG
TU CHEMNITZ

September 3 - 7, 2018

Universität Bremen

www.math.uni-bremen.de/zetem/ods18

ods18@uni-bremen.de

Timetable
Summer School "Optimization of Dynamical Systems", Sept 03-07, 2018
RTG 2224, University of Bremen, Building MZH, Rooms 1460 & 1470 (Exercises in 0220 & 0240)

	Monday	Tuesday	Wednesday	Thursday	Friday
08:30-10:00	(9:00) Registration (Coffee will be provided)	Leyffer II	Gerdts I	Gerdts III	Herzog II
10:00-10:30	Welcome	Coffee Break	Coffee Break	Coffee Break	Coffee Break
10:30-12:00	Leyffer I	Leyffer III	Gerdts II	Herzog I	Herzog III
12:00-13:30	Lunch	Lunch	Lunch	Lunch	Lunch
13:30-15:00	Starke	Gros	Sager	Zidani	Closing
15:00-15:30	Coffee Break	Coffee Break	Coffee Break	Coffee Break	
15:30-17:00	Walther	City Tour	Dellnitz	Excursions	
From 17:00	Poster Session		(~18:30) Dinner		

Moin![1]

We are delighted to host this summer school on **optimization and dynamical systems**. It is organized by the **Research Training Group 2224** on Parameter Identification and takes place at the **University of Bremen, September 03 - 07, 2018**. It aims at giving a broad overview on the rich fields of optimization, dynamical systems, their intersections (as optimal control), and corresponding real-world applications. We are therefore glad to announce **Matthias Gerdts, Roland Herzog, and Sven Leyffer** as main lecturers, who will not only provide an introduction into these fields, but also give an insight into current research areas. Further speakers will give different perspectives and a deeper insight to more specialized topics. The program is completed by a **poster session** and extracurricular activities.

Organizers

Research group Optimization & Optimal Control, Center for Industrial Mathematics

Prof. Dr. Christof Büskens
Dr. Kathrin Flaßkamp

O^2C **Optimization & Optimal Control**

Drs.-Ing. Mitja Echim	Wiebke Heins	Malin Lachmann
Christian Meerpohl	Margareta Runge	Kai Schäfer

Research Group **Applied Analysis**
www.anan.math.uni-bremen.de
Spectral Theory · Dynamical systems · Pattern formation

Research group Applied Analysis, Department Mathematics/Computer Science

Prof. Dr. Jens Rademacher

Lars Siemer   Miriam Steinherr

Research Training Group π^3 University of Bremen

RTG 2224

Zentrum für Technomathematik

---
[1]Local form of greeting

Scientific Program

Series of lectures and exercises

Matthias Gerdts	Universität der Bundeswehr München (DE)
Roland Herzog	Technische Universität Chemnitz (DE)
Sven Leyffer	Argonne National Laboratory (US)

Single talks

Michael Dellnitz	University of Paderborn (DE)
Sébastien Gros	Chalmers University of Technology (SE)
Sebastian Sager	Otto-von-Guericke-Universität Magdeburg (DE)
Jens Starke	University of Rostock (DE)
Andrea Walther	University of Paderborn (DE)
Hasnaa Zidani	ENSTA ParisTech (FR)

Optimal Control, Dynamical Systems, Optimization

Venue

The venue for this summer school is the

MZH building, Bibliothekstraße 5, 28359 Bremen

on the campus of the University of Bremen. The courses take place in the lecture hall 1470 (on the first floor), exercise sessions in 0220 and 0240 (ground floor). Coffee breaks take place in room 1460. For lunch, you can go the university mensa. The registration takes place in front of rooms 1460/1470.

Universität Bremen

Extracurricular Events

All of the social events are included in the summer school fee. There are parallel excursions on Thursday (see below), please register for one of them at the registration desk (the number of participants is limited, first come first serve).

- The **reception** will be in room 1460 on Monday evening. There will be some snacks. Note that the poster session is part of the reception.

- The **mathematical city tour** starts on Tuesday at 15:30 on the *Marktplatz* (market square) in the city center near the statue of *Roland*[2] in front of the *Rathaus* (town hall). You can accompany us to the meeting point. Our guide is Matthias Knauer.

- The **summer school dinner** on Wednesday (at around 18:30) will be at the traditional restaurant *Bremer Ratskeller*[3] in the city center. The conference fee includes the menu and two beverages.

- The **guided tours** on Thursday at 15:30 are offered by the DLR and the DFKI. You have to decide which tour you would like to attend.

  - The German Aerospace Center (**DLR**) in Bremen houses the Institute of Space Systems. The main focus there is on spaceflight systems analysis, topology and spaceflight applications. We will be guided through its laboratories and get an insight into their work. (Robert-Hooke-Straße 7, 28359 Bremen)

  - The German Research Center for Artificial Intelligence GmbH (**DFKI**) houses the research departments Cyber-Physical Systems and Robotics Innovation Center of which we will visit the latter one to see how robot systems are developed for complex tasks on land, under water, in the air, and in space. (Robert-Hooke-Straße 1, 28359 Bremen)

---

[2]Statue in the middle of the place *Am Markt* (Am Markt, 28195 Bremen)
[3]Am Markt 1, 28195 Bremen, www.ratskeller-bremen.de

Daily Program

Monday, September 03

09:00–10:00	Registration (Coffee will be served)	
10:00–10:30	Welcome	Room 1470
10:30–12:00	*Mixed-Integer Nonlinear Optimization: Modeling and Methods for Convex Problems*	
	Sven Leyffer	Room 1470
12:00–13:30	Lunch	
13:30–15:00	*Multiscale Analysis of Macroscopic Behavior in Complex Systems*	
	Jens Starke	Room 1470
15:00–15:30	Coffee Break	
15:30–17:00	*Algorithmic Differentiation for Optimal Control Problems*	
	Andrea Walther	Room 1470
From 17:00	Poster Session and Reception	Room 1460

Tuesday, September 04

Time	Session		
08:30–10:00	*Methods for Nonconvex Mixed-Integer Nonlinear Optimization*		
	Sven Leyffer	Room 1470	
10:00–10:30	Coffee Break		
10:30–12:00	*Mixed-Integer PDE Constrained Optimization*		
	Sven Leyffer	Room 1470	
12:00–13:30	Lunch		
13:30–15:00	*Direct Optimal Control: Introduction and some recent results & applications*		
	Sébastien Gros	Room 1470	
15:00–15:30	Coffee Break		
15:30–17:00	*Mathematical City Tour*		
	Matthias Knauer	Marktplatz	

Wednesday, September 05

Time	Session		
08:30–10:00	*Optimal Control for Ordinary Differential Equations and Differential Algebraic Equations – Part I*		
	Matthias Gerdts	Room 1470	
10:00–10:30	Coffee Break		
10:30–12:00	*Optimal Control for Ordinary Differential Equations and Differential Algebraic Equations – Part II*		
	Matthias Gerdts	Room 1470	
12:00–13:30	Lunch		
13:30–15:00	*Mixed-integer optimal control*		
	Sebastian Sager	Room 1470	
15:00–15:30	Coffee Break		
15:30–17:00	*Set Oriented Numerical Methods for Dynamical Systems*		
	Michael Dellnitz	Room 1470	
From 18:30	Summer School Dinner	Ratskeller	

Thursday, September 06

08:30–10:00	*Optimal Control for Ordinary Differential Equations and Differential Algebraic Equations – Part III*	
	Matthias Gerdts	Room 1470
10:00–10:30	Coffee Break	
10:30–12:00	*Optimization with Partial Differential Equations - Theory and Numerical Solution – Part I*	
	Roland Herzog	Room 1470
12:00–13:30	Lunch	
13:30–15:00	*Control problems of ordinary differential equations: Maximum Principle and Dynamic Programming approaches*	
	Hasnaa Zidani	Room 1470
15:00–15:30	Coffee Break	
15:30–17:00	Guided Tours *DLR* & *DFKI*	Technologiepark

Friday, September 07

08:30–10:00	*Optimization with Partial Differential Equations - Theory and Numerical Solution – Part II*	
	Roland Herzog	Room 1470
10:00–10:30	Coffee Break	
10:30–12:00	*Optimization with Partial Differential Equations - Theory and Numerical Solution – Part III*	
	Roland Herzog	Room 1470
12:00–13:30	Lunch	
13:30–15:00	Closing	Room 1470

Poster Session

An iterative control algorithm with optimal measurement times
Eva Dierkes . . . . University of Bremen

Device-to-Device Communications and Radio Access Network Slicing in 5G
Mohamed Elshatshat . . . . Foundation for Research & Technology - Hellas

Systematic methods for the optimal design of reactors for (bio)pharmaceutical manufacturing
Victor Nnamdi Emenike . . . . TU Braunschweig

Locomotion Adaptation Over Soft Terrain for Legged Robots
Shamel Fahmi . . . . Italian Institute of Technology

A Dynamic Programming Trajectory Planning and MPC Approach
Henrik Harms . . . . University of Bremen

Optimal Design of an Energy Network including Renewable Energies
Kristina Janzen . . . . TU Darmstadt

Artificial Neural Network-Based Modeling for Multi-scroll Chaotic Systems
Mohammed-Amin Khelifa . . . . Université Mouloud Mammeri de Tizi-Ouzou

Computational approaches to shape optimization
Karen Estefania Loayza Romero . . . . Technische Universität Chemnitz

Nonlinear Model Predictive Control and Moving Horizon Estimation of Dual-Airfoil Airborne Wind Energy Systems
Alina Pätzold . . . . University of Bremen

Control of Residential Energy Systems using Energy Storages & Controllable Loads
Philipp Sauerteig . . . . Technische Universität Ilmenau

How can I get around in Bremen? Public transport by tram and bus brings you almost everywhere. The station at the university is called "Universität/Zentralbereich", the tram going there (e.g. from the main station, the airport and the city center) is tram number 6. Information and schedules can be found under
`https://www.bsag.de/en/information.html`

Is it possible to pay with a credit/debit card or should I take cash with me? In the cafeterias of the university you will be asked to use cash. In all supermarkets (certain) cards are accepted. In restaurants cards are usually accepted. If you buy the public transport tickets in the tram or bus, then you will need cash. If you buy them in a BSAG-Center, then you can use the card. In addition, as (almost) everywhere, cash dispensers can be found in the whole city.

I am vegan. Will I starve in Bremen? Absolutely not! First of all, in the cafeteria of the university there is always a vegan option. You can check the menu on the following website:
`https://www.stw-bremen.de/en/food-and-drink/uni-mensa`
If you do not find something you may want for lunch, then you can also try another cafeteria
(`https://www.stw-bremen.de/en/food-and-drink`).
In these web pages a symbol preceding each dish can be found, which indicates if it is vegan, vegetarian, etc. To have dinner in the city is also not a problem, since many restaurants are vegan friendly and there are also several which are vegan, like ZeN, Vegefarm or Veganbar. In supermarkets, plenty of vegan products are available. You can try Edeka and Aldi, for example. If you go to Rewe (and maybe others), then pay special attention when buying some bread, since there are, occasionally, types which include pieces of ham.

What is included in the summer school fee? The fee includes all lectures, talks and exercises, coffee breaks, joint summer school dinner, mathematical city tour, poster session with reception, the guided tours, a letter of attendance, and a payment confirmation.
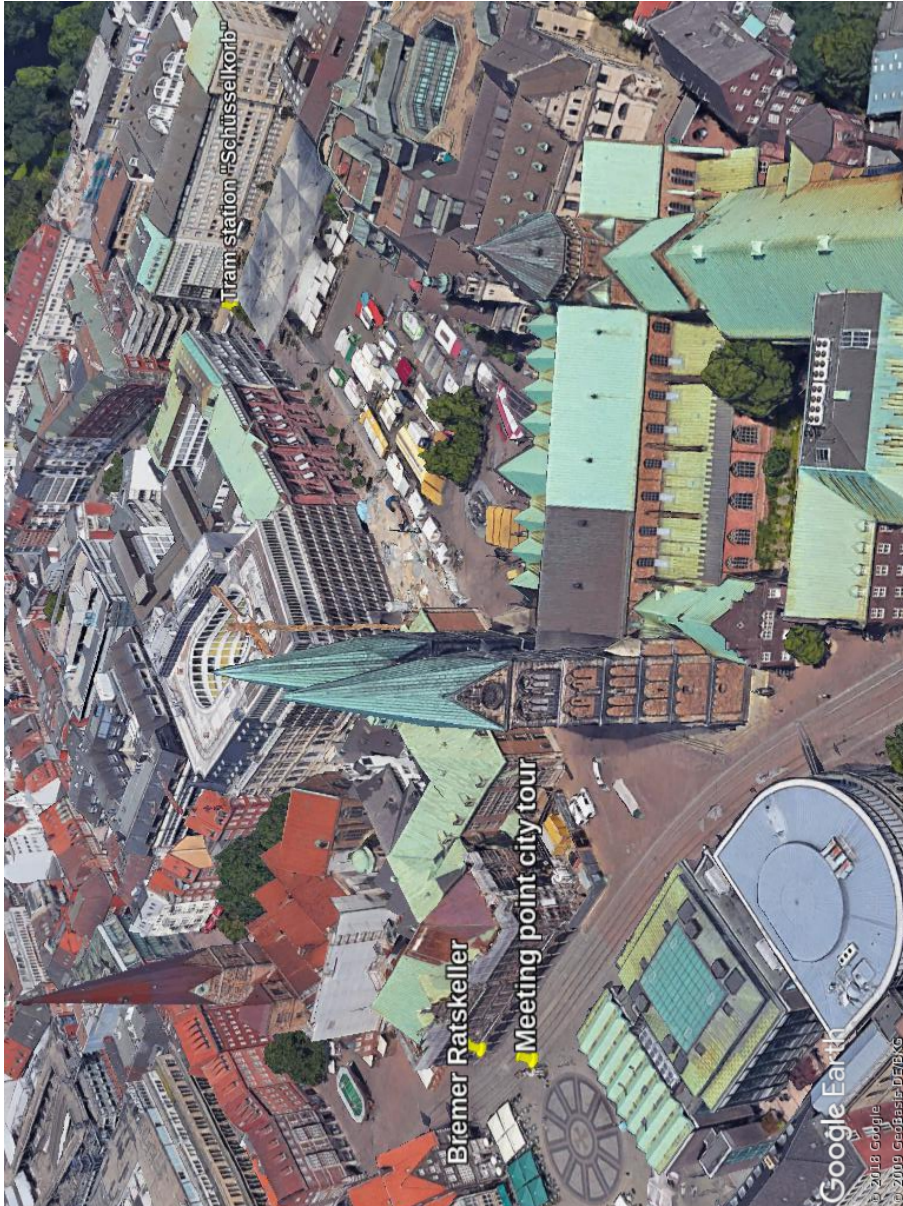
Please drop your badge (or at least its cover) at the registration desk when leaving. Thank you and goodbye!