

3rd Workshop on Computational Engineering 2014

Program



October 6 - 10, 2014

Stuttgart, Germany

Welcome Address

We welcome all participants of the 3rd Workshop on Computational Engineering to Stuttgart and wish you a good time yielding new insights, new contacts, and new ideas for your research.

The first two international Workshops on Computational Engineering have been held in Munich (2009)¹ and Darmstadt (2011)². The 3rd International Workshop on Computational Engineering aims at discussing the state of the art and the further evolution of numerical techniques for simulation in engineering and science. We bring together competences from related fields with computer science and mathematics as an important technical basis among others. We appreciate in particular the effort of the organizers of minisymposia with 4-7 speakers focussed on a topic related to their current research or to an important enabling methodology.

Motivated by current trends in numerical simulation in science and engineering, new requirements arising from rapidly increasing parallelism in computer architectures, and novel mathematical approaches, the workshop focusses in particular on the subtopics

- scalable parallel algorithms,
- simulation-based optimization, and
- uncertainty quantification.

On Monday, October 6, and Tuesday, October 7, we offer several Tutorials presenting the state-of-the-art in current fields and enabling the participants to actively use the presented methods and tools in their research projects.

We are looking forward to all contributions to our workshop und hope that you enjoy tutorials, talks, and the conference dinner on Thursday evening with us,

Miriam Mehl, Manfred Bischoff, Kai-Uwe Bletzinger, Hans-Joachim Bungartz, Wolfgang Ehlers, Rainer Helmig, and Michael Schäfer

¹http://fsw.informatik.tu-muenchen.de/workshop/workshop2009_en.php

²<http://www.graduate-school-ce.de/index.php?id=328>

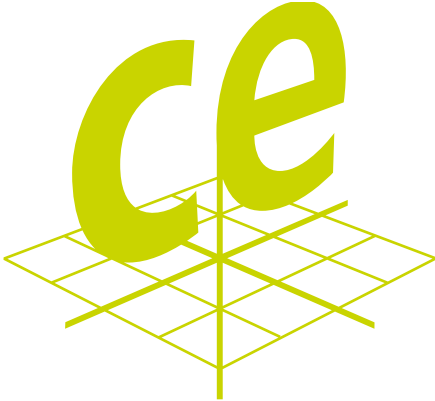
Sponsors



Cluster of Excellence in Simulation Technology and Graduate School GS SimTech, Universität Stuttgart



Informatik Forum Stuttgart



Graduate School Computational Engineering, Technische Universität Darmstadt



International Graduate School in Science and Engineering, Technische Universität München

Wireless LAN

During the conference free WiFi is provided. Besides the *eduroam* network there is also the possibility to access the network named *konferenz*. The required passphrase to access the latter network changes daily. The passphrases are

06.10.2014	896-487-617-336
07.10.2014	768-028-331-443
08.10.2014	546-795-968-522
09.10.2014	615-863-426-653
10.10.2014	549-019-447-865

Directions and Orientation

For orientation please refer to the maps on the next pages or the city map in your conference bag.

Conference Venue

The address of the venue is *Universitätsstraße 38, 70569 Stuttgart*.

By Train from Hotels in Vaihingen

From Vaihingen, take the commuter train (S-Bahn) **S1**, **S2** or **S3** to *Kirchheim, Schorndorf, Backnang* or *Esslingen*. Exit the train at station *Universität*.

Travel time approx.: 5 min.

By Train from Hotels in Stuttgart

From Stuttgart, take the commuter train (S-Bahn) **S1**, **S2** or **S3** to *Herrenberg, Flughafen/Messe, Filderstadt* or *Vaihingen*. Exit the train at station *Universität*.

Travel time approx.: 6 min (from train station *Feuersee*) to 10 min (from train station *Hauptbahnhof*)

By Car

There is free parking available close to the venue. We recommend to use the parking area marked on the map of the conference venue.

Conference Dinner, Thursday Oct 09

The Conference Dinner takes place in the Ristorante Da Signora (<http://dasignora.de/>) in the Motorworld in Böblingen, starting at 7 pm. To get there, take the commuter train S1 (direction Böblingen/Herrenberg) from Stuttgart Universität and exit in Böblingen (14 minutes). The trains are running at 5:30, 5:45, 6:00, 6:15, 6:30, 6:45. The restaurant is conveniently located near the station (on the right in travel direction, map at page 10). Trains back to Stuttgart Universität and further to Stuttgart central station (25 minutes) are running at –:30 and –:00 from platform 3.

Motorworld in Böblingen features various vendors and services for classic cars (<http://www.stuttgart-tourist.de/en/a-meilenwerk>) in the ambience of the historic buildings of the former airport Stuttgart-Böblingen (1925-1937). Thus, you might want to spend some time looking at the cars before our conference dinner.

Options for Dinner

If you are looking for a place for dinner at the remaining evenings, you can choose one from the following list:

- At the campus in Vaihingen:
Columbus Burger (<http://www.columbus-stuttgart.de/>),
La Bruschetta (<http://www.la-bruschetta-vaihingen.de/>)
- A nice 40 minutes walk from the campus:
Bärenschlössle (<http://www.baerenschloessle-stuttgart.de/>, map at 'Lage / Öffnungszeiten')
- In Stuttgart:
Stäffele (<http://www.staeffele.de/>, train station Feuersee, 6 minutes from Universität, any train with direction 'Hauptbahnhof'),
- Wasen
(http://en.wikipedia.org/wiki/Cannstatter_Volksfest, any train with direction 'Hauptbahnhof', exit in 'Bad Cannstatt and follow the crowds)

Of course, you find many additional restaurants in Stuttgart if you get on any train with direction 'Hauptbahnhof' and exit in 'Stadtmitte' or 'Hauptbahnhof'. The main shopping street and pedestrian area in Stuttgart is the Königstraße. Signs are leading you there from both stations.

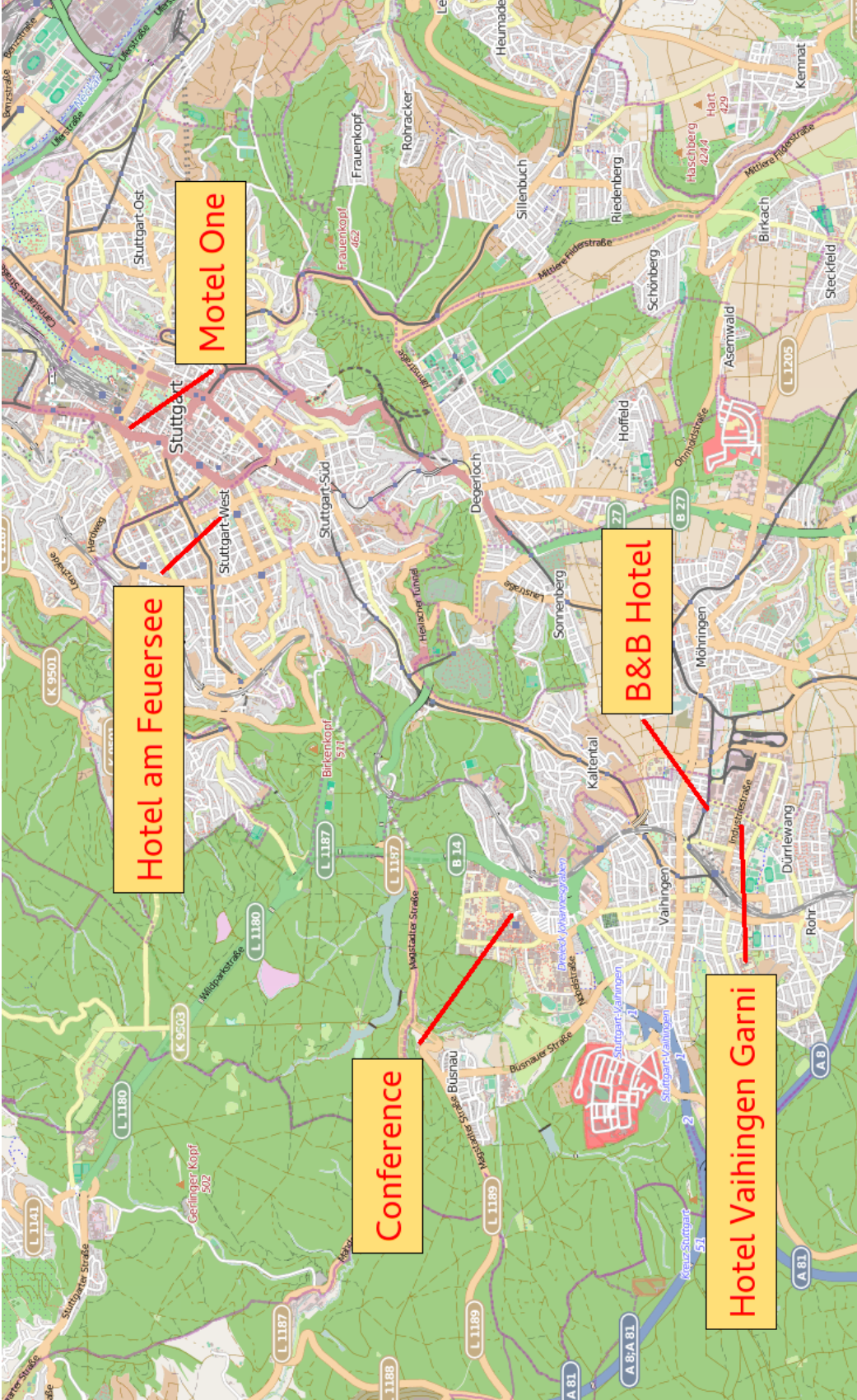
Sports

There are very nice running trails to which you can start directly from the campus, e. g., see <http://www.joggingroutes.org/2012/07/stuttgart-barensee-running-route.html> or from the city center, e.g., see <http://www.stuttgart.de/aktivstrecken?trackid=6> for an easy run in the Stadtpark. For swimming, you can go to the pool in Vaihingen (<http://www.schwimmbadcheck.de/en/stuttgart/hallenbad-vaihingen.html>, 20 minutes walk from the campus) or to the thermal bath Leuze (train station Bad Cannstatt, <http://www.stuttgart-tourist.de/en/a-the-leuze-mineral-spa>).

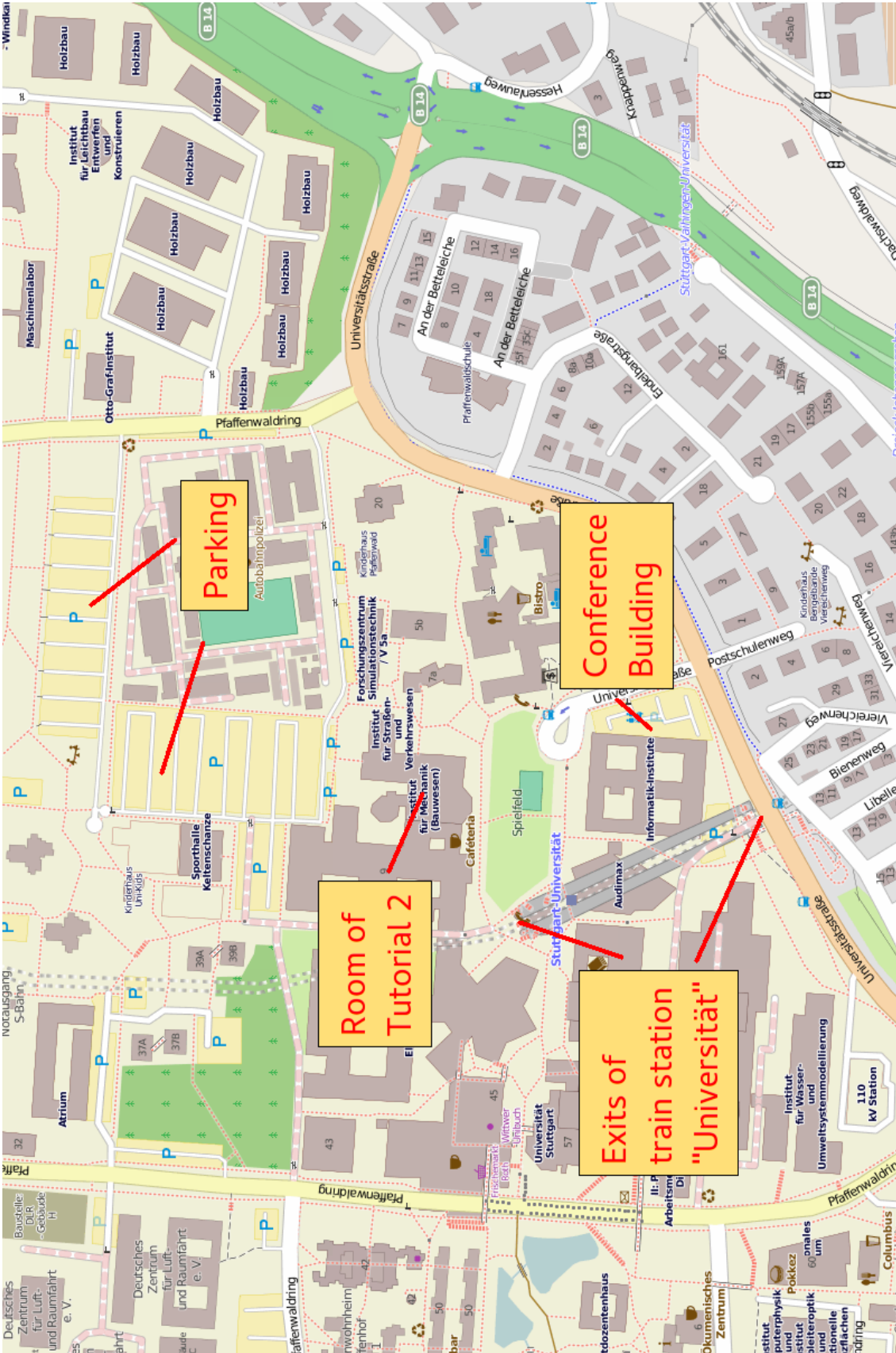
Other Activities

See <http://www.stuttgart-tourist.de/en> for further activities in Stuttgart.

Maps
Overview

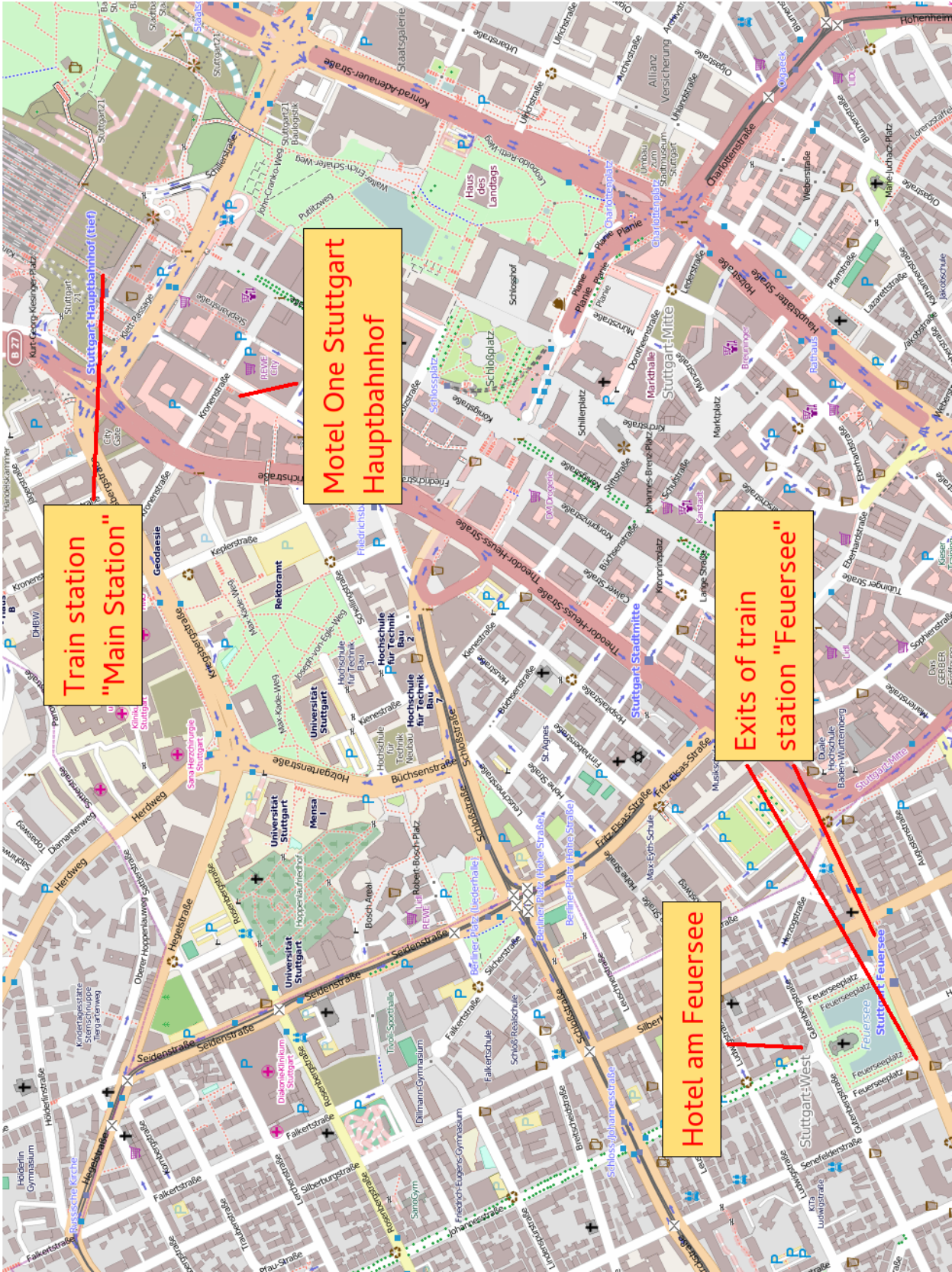


Conference Venue

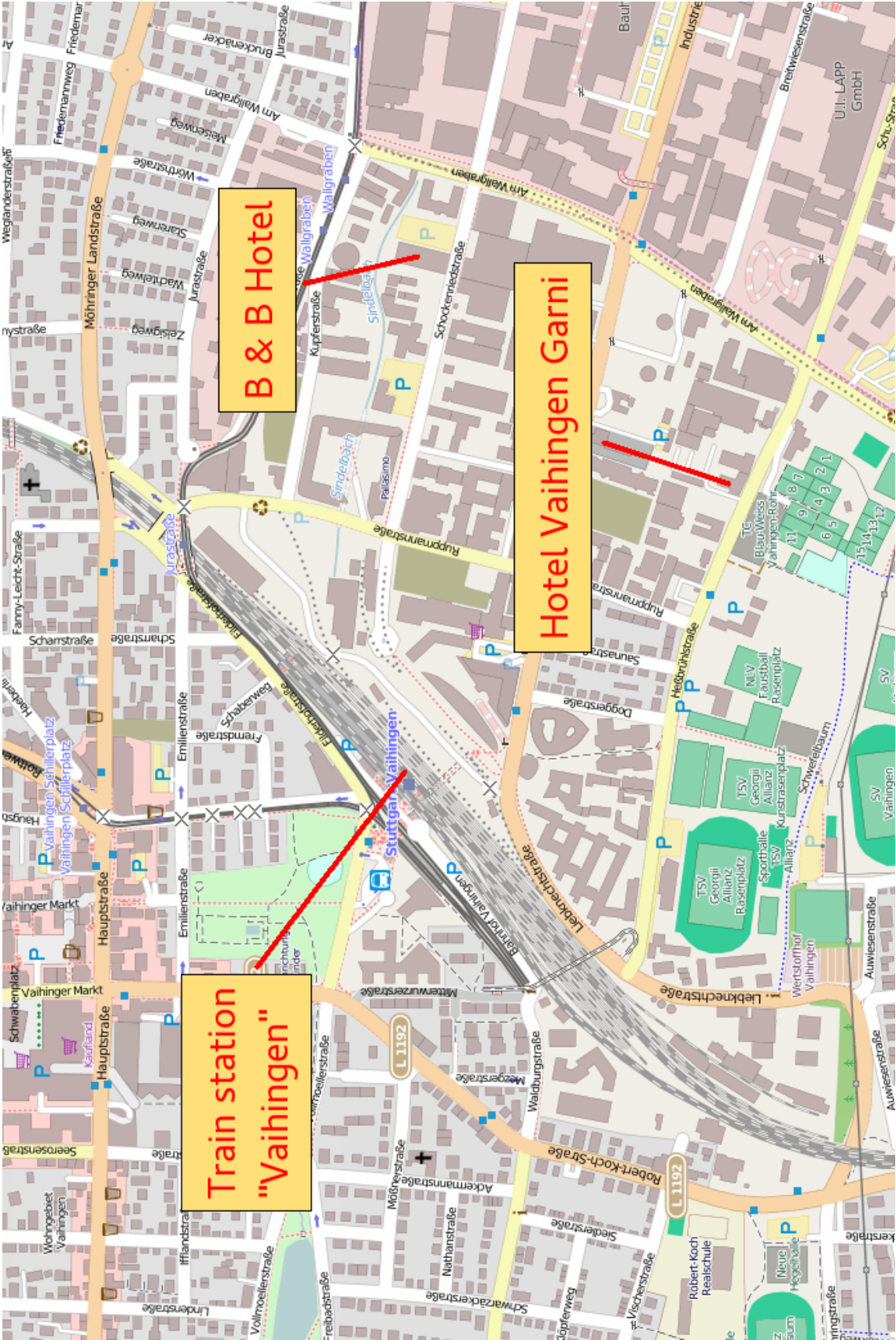


Hotels

Hotels in the center of Stuttgart

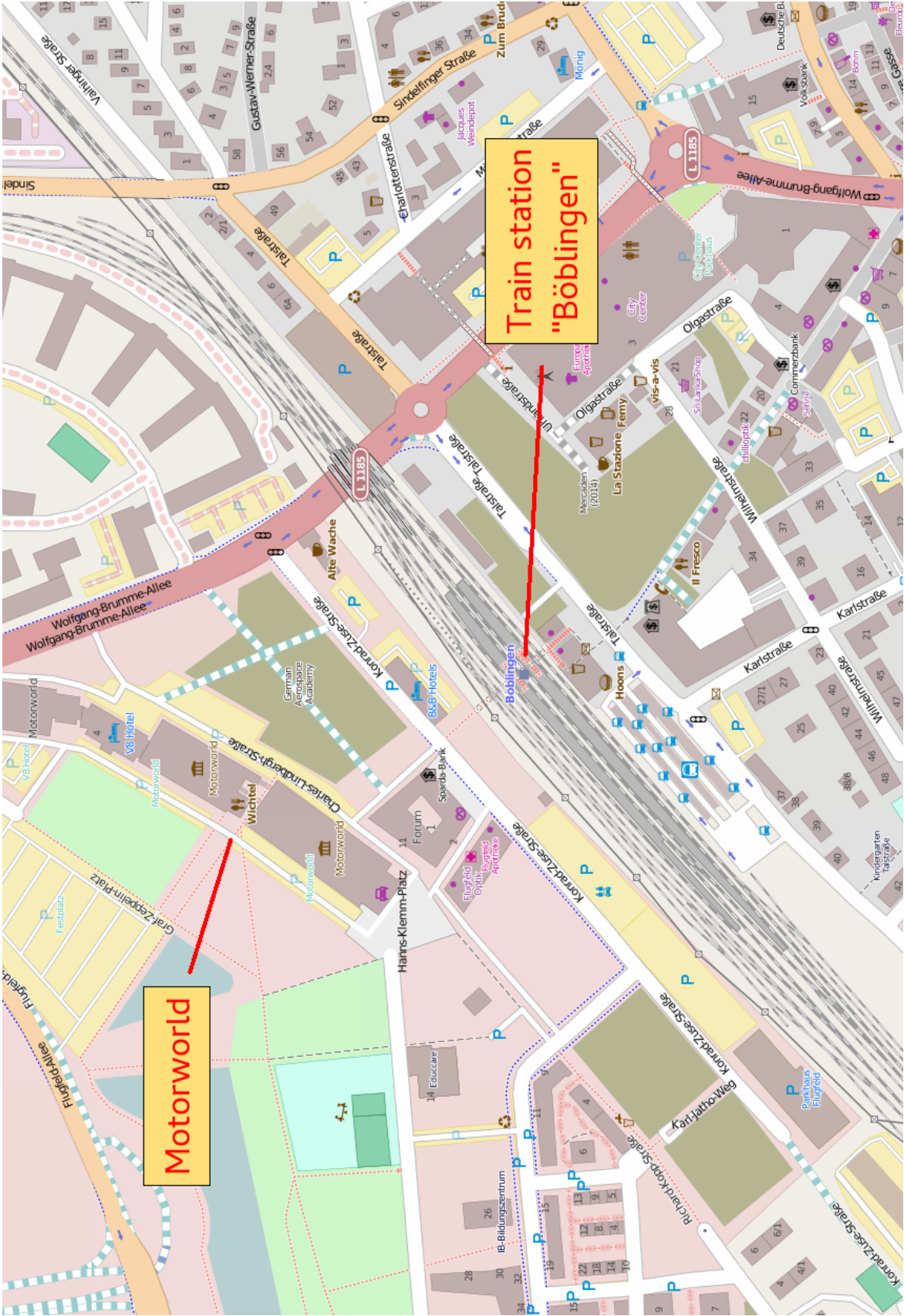


Hotels in Stuttgart Vaihingen



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Conference Dinner



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	Monday	Tuesday	Wednesday	Thursday	Friday
9:00 - 10:00			M. Ulbrich	G. Biros	Z. Yosibash
10:00 - 10:30			MS III/1	MS II/1	MS I/3
10:30 - 11:00			MS III/2	MS II/2	MS I/4
11:00 - 11:30		Tut 4	Coffee	Coffee	Coffee
11:30 - 12:00			MS III/3	MS II/3	MS I/5
12:00 - 12:30			MS III/4	MS II/4	MS I/6
12:30 - 13:00			MS III/5	C7	MS I/7
13:00 - 14:00		Lunch	Lunch	Lunch	Lunch
14:00 - 15:00			H. Bijl	B. Markert	
15:00 - 15:30			C 1	MS II/5	MS VI/1
15:30 - 16:00			C 2	MS II/6	MS VI/2
16:00 - 16:30		Tut 3	Coffee	Coffee	
16:30 - 17:00	Tut 1		C 3	MS I/1	MS VI/3
17:00 - 17:30			C 4	MS I/2	MS VI/4
17:30 - 18:00					
				Conference Dinner	

Monday, 6 Oct – Tutorials

Tutorial 1

Continuum Mechanics of Multi-Component and Multiphasic Materials

Wagner, Arndt and Ehlers, Wolfgang

14:00 - 18:00 Room 0.124, Universitätsstraße 38

Tutorial 2

Isogeometric Analysis

Bischoff, Manfred

14:00 - 18:00 Room 1.155, Pfaffenwaldring 7

Tuesday, 7 Oct – Tutorials

Tutorial 3

Introduction to the Parallel Solution of Partial Differential Equations with DUNE-PDELab

Ippisch, Olaf and Müthing, Steffen

9:00 - 13:00 Room 0.124, Universitätsstraße 38

14:00 - 18:00 Room 0.452, Universitätsstraße 38

Tutorial 4

GPU Programming

Burger, Michael

9:00 - 13:00 Room 0.452, Universitätsstraße 38

Wednesday, 8 Oct

9:00-10:00 Invited Presentation (Lecture Hall 2)

- 09:00-10:00 **Efficient Solution of Optimization Problems with PDEs and Pointwise Constraints**
Ulbrich, Michael

10:00-13:00 Parallel Sessions

MS III: Towards Exascale Simulations and Applications (Lecture Hall 2)

organized by Philipp Neumann and Alfredo Parra Hinojosa, Technische Universität München

- 10:00 - 10:30 **Towards a Fault-Tolerant, Scalable Implementation of GENE**
Hinojosa, Alfredo Parra, Heene, Mario, Kowitz, Christoph, and Pflüger, Dirk
- 10:30 - 11:00 **New Approaches to Nonlinear Domain Decomposition**
Klawonn, Axel, Lanser, Martin, and Rheinbach, Oliver
- 11:00 - 11:30 *Coffee*
- 11:30 - 12:00 **Towards Fluid-Acoustics Interaction on Massively Parallel Systems**
Gatzhammer, Bernhard, Klimach, Harald, Krupp, Verena, Lindner, Florian, Mehl, Miriam, Roller, Sabine, and Uekermann, Benjamin
- 12:00 - 12:30 **Node-Level Performance Optimization of the Fast Multipole Method**
Beckmann, Andreas and Kabadshow, Ivo
- 12:30 - 13:00 **Node-Level Performance Engineering for an Advanced Density Driven Porous Media Flow Solver**
Müthing, Steffen, Bastian, Peter, Göddeke, Dominik, and Ribbrock, Dirk

MS IV: Optimal Control Based on Reduced Order Models (Lecture Hall 3)

organized by Stefan Ulbrich and Jane Ghiglieri, Technische Universität Darmstadt

- 10:00 - 10:30 **Optimal Flow Control Based on POD and MPC and an Application to the Cancellation of Tollmien-Schlichting Waves**
Ghiglieri, Jane and Ulbrich, Stefan
- 10:30 - 11:00 **Parameter Identification for Nonlinear Elliptic-Parabolic Systems**
Lass, Oliver and Volkwein, Stefan
- 11:00 - 11:30 *Coffee*
- 11:30 - 12:00 **A-Posteriori Error Analysis and Optimality-System POD for Constrained Optimal Control**
Grimm, Eva, Gubisch, Martin, and Volkwein, Stefan
- 12:00 - 12:30 **Interfacing between Dynamics and Optics for Reduced Models of Deformable Optical Elements**
Wengert, Nicolai and Eberhard, Peter
- 12:30 - 13:00

13:00-14:00 Lunch

14:00-15:00 Invited Presentation (Lecture Hall 2)

14:00 - 15:00 **Simulation of Unsteady Flows and Fluid-Structure Interactions**
Bijl, Hester

15:00-17:30 Parallel Sessions

Contributed Talks (Lecture Hall 2)

15:00 - 15:30 **Extrapolation in Time in Thermal Fluid Structure Interaction**
Birken, Philipp, Gleim, Tobias, Kuhl, Detlef, and Meister, Andreas

15:30 - 16:00 **Parallel Algorithm for Solution-Adaptive Grid Movement in the Context of Fluid Structure Interaction**
Kneißl, Stefan, Sternel, Dörte C., and Schäfer, Michael

16:00 - 16:30 *Coffee*

16:30 - 17:00 **Simulation of Wave Propagation and Impact Damage in Brittle Materials Using the Peridynamics Technique**
Diehl, Patrick and Schweitzer, Marc Alexander

17:00 - 17:30 **Using Instancing to Efficiently Render Super Carbon Nanotubes**
Burger, Michael and Bischof, Christian

MS IV: Optimal Control Based on Reduced Order Models (Lecture Hall 3)

organized by Stefan Ulbrich and Jane Ghiglieri, Technische Universität Darmstadt

15:00 - 15:30 **Fast Evaluation of Implied Volatility Surfaces with Reduced Order Models**
Sachs, Ekkehard and Schneider, Marina

15:30 - 16:00 **Certified Parameter Optimization for Parametrized PDEs with Reduced Basis Surrogate Models**
Dihlmann, Markus and Haasdonk, Bernard

16:00 - 16:30 *Coffee*

Contributed Talks (Lecture Hall 3)

16:30 - 17:00 **An Efficient Algorithm to Include Sub-Voxel Information in FFT-Based Homogenization**
Merkert, Dennis, Andrä, Heiko, Kabel, Mathias, Schneider, Matti, and Simeon, Bernd

17:00 - 17:30 **A Multi Scale Model for Mass Transport in Arteries and Tissue**
Köppl, Tobias

Thursday, 9 Oct

9:00-10:00 Invited Presentation (Lecture Hall 2)

- 9:00 - 10:00 **Parallel Algorithms for Kernel Sums in Computational Science and Statistical Inference**
Biros, George

10:00-13:00 Parallel Sessions

MS II: Get in Shape - Algorithms and Data Structures for Complex, Changing Domains on Adaptive Cartesian Meshes (Lecture Hall 2)

organized by Tobias Weinzierl, Tomasz Koziara, Durham University and Martin Ruess, TU Delft

- 10:00 - 10:30 **Coupling and Boundary Constraints for a NURBS-Based Immersed Boundary Approach**
Ruess, Martin and Guo, Yujie
- 10:30 - 11:00 **A Task-Based Finite Cell Implementation on Xeon Phis**
Weinzierl, Tobias
- 11:00 - 11:30 *Coffee*
- 11:30 - 12:00 **Mesh-to-Particle Coupling for Hybrid Molecular-Continuum Simulations**
Neumann, Philipp
- 12:00 - 12:30 **Local Time-Stepping Along Coastlines for Tsunami Simulations**
Unterweger, Kristof and Wittmann, Roland
- 12:30 - 13:00

MS V: High Order Methods for Unsteady Flows (Lecture Hall 3)

organized by Andrea Beck and Thomas Bolemann, University of Stuttgart

- 10:00 - 10:30 **On the Aliasing of Discrete Kinetic Energy in a Nodal Discontinuous Galerkin Method**
Gassner, Gregor J.
- 10:30 - 11:00 **GPU-Accelerated High-Order Aeroacoustics Using the Flux Reconstruction Approach**
Ntemos, George and Vincent, Peter E.
- 11:00 - 11:30 *Coffee*
- 11:30 - 12:00 **Development of a High-Resolution, Scalable DGM Solver for DNS and LES of Turbomachinery Flows**
Carton de Wiart, Corentin and Hillewaert, Koen
- 12:00 - 12:30 **An Application of High-Order DGSEM to Large Eddy Simulation**
Bolemann, Thomas, Beck, Andrea D., and Munz, Claus-Dieter

Contributed Talk (Lecture Hall 3)

- 12:30 - 13:00 **Centralized Adaptive Observation Strategy for Atmospheric Dispersion Process Estimation Using Mobile Sensors**
Ritter, Tobias, Euler, Juliane, Ulbrich, Stefan, and Stryk, Oskar von

13:00-14:00 Lunch

14:00-15:00 Invited Presentation (Lecture Hall 2)

14:00 - 15:00 **Coupled Multi-Field Continuum Methods for Porous Media Fracture**
Markert, Bernd and Heider, Yousef

15:00-17:30 Parallel Sessions

MS II: Get in Shape - Algorithms and Data Structures for Complex, Changing Domains on Adaptive Cartesian Meshes (Lecture Hall 2)

organized by Tobias Weinzierl, Tomasz Koziara, Durham University and Martin Ruess, TU Delft

15:00 - 15:30 **Spacetime-Based Adaptive Meshing of Complex Geometries**

Wittmann, Roland and Unterwiesing, Kristof

15:30 - 16:00 **Multi-Scale High-Performance Fluid Flow Simulations Through Porous Media**

Perović, Nevena, Frisch, Jérôme, Mundani, Ralf-Peter, Rank, Ernst, Salama, Amgad, and Sun, Shuyu

16:00 - 16:30 **Coffee**

MS I: Dummy Models Retired? Active Digital Human Models for Automotive Safety Research (Lecture Hall 2)

organized by Jörg Fehr and Syn Schmitt, University of Stuttgart

16:30 - 17:00 **Using Hill-Type Muscles to Drive Active Human Models Brings Low Level Motor Control for Free**

Blaschke, Julian and Schmitt, Syn

17:00 - 17:30 **A Comparison Between Dummy and Human Models for Crash Simulations of Side Impacts**

Kleinbach, Christian and Fehr, Jörg

MS VI: Simulation-Based Identification (Lecture Hall 3)

organized by Bastian von Harrach, University of Stuttgart

15:00 - 15:30 **Optimization of the Strainer Design in the Extrusion Process of Visco-Plastic Materials**

Hoffmann, Wolfgang

15:30 - 16:00 **Wavelet Methods for a Weighted Sparsity Penalty for Region of Interest Tomography**

Klann, Esther, Quinto, Eric Todd, and Ramlau, Ronny

16:00 - 16:30 **Coffee**

16:30 - 17:00 **Colored Buzz, or Glottal Inverse Filtering**

Siltanen, Samuli

17:00 - 17:30 **A Resolution Guarantee for Anomaly Detection within a Realistically Modeled EIT Setting**

Harrach, Bastian and Ullrich, Marcel

19:00 Conference Dinner (Motorworld Böblingen)

Friday, 10 Oct

9:00-10:00 Invited Presentation (Lecture Hall 2)

9:00 - 10:00 **Computational Bone-Mechanics on Orthopedists Cell Phone**
Yosibash, Zohar

10:00-13:00 Parallel Sessions

MS I: Dummy Models Retired? Active Digital Human Models for Automotive Safety Research (Lecture Hall 2)

organized by Jörg Fehr and Syn Schmitt, University of Stuttgart

- 10:00 - 10:30 **Uncertainty Quantification Associated with the Mechanical Response of Femurs**
Wille, Hagen, Yosibash, Zohar, Ruess, Martin, and Rank, Ernst
- 10:30 - 11:00 **Vehicle Safety Using the THUMS™ Human Models**
Fressmann, Dirk
- 11:00 - 11:30 *Coffee*
- 11:30 - 12:00 **THUMS User Community - Harmonising the Validation of Human Models for Crash Simulation**
Peldschus, Steffen and Fuchs, Therese
- 12:00 - 12:30 **Modeling Active Human Muscle Responses during Driver and Autonomous Avoidance Maneuvers**
Östh, Jonas, Ólafsdóttir, Jóna Marín, and Brodin, Karin
- 12:30 - 13:00 **On the Route to “Autonomous Driving” - A New Quality of Passive Safety and Its Numerical Development & Assessment Tools**
Mayer, Christian

Contributed Talks (Lecture Hall 3)

- 10:00 - 10:30 **Metaheuristic Based Methods for Optimum Design**
Bekdaş, Gebrail and Nigdeli, Sinan Melih
- 10:30 - 11:00 **Source Transformation for the Optimized Utilization of the Matlab Runtime System for Automatic Differentiation**
Hück, Alexander
- 11:00 - 11:30 *Coffee*
- 11:30 - 12:00 **Dynamic Two-Way Parallelization of Non-Intrusive Methods for Uncertainty Quantification**
Thiem, Christoph and Schäfer, Michael
- 12:00 - 12:30 **Data-Driven Uncertainty Quantification with Adaptive Sparse Grids in Sub-surface Flow Simulations**
Franzelin, Fabian, Oladyshkin, Sergey, Peherstorfer, Benjamin, and Pflüger, Dirk
- 12:30 - 13:00

13:00-14:00 Lunch

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