International Symposium

Rail Transport Demand Management
RTDM 2018

Program Guide

October 24th – 25th, 2018
Darmstadt, Germany

TECHNISCHE UNIVERSITÄT DARMSTADT

Innovationsallianz DB & TU Darmstadt

Contents

Foreword

The international Symposium RTDM 2018 addresses, for the first time, the manifold aspects of Rail Transport Demand Management, including strategies, methods and digitalisation across all disciplines. The event is organised by Technische Universität Darmstadt in corporation with Deutsche Bahn AG (German Rail), and it takes place on 24th and 25th October 2018 in Darmstadt.

Efficient rail traffic management and high customer satisfaction do not only need an optimization of train operations but also a control of transport demand. Besides long-term and mid-term strategies to influence the demand, e.g. by ticketing and pricing strategies, also short-term measures are needed in cases of incidents to avoid overcrowded trains and to guide passengers towards the most suitable connection. The symposium addresses both, passenger and freight transport.

The focus of this symposium is on (but not limited to) the following interdisciplinary topics related to Rail Transport Demand Management:

Collection of travel demand data
- Methods to model and forecast rail transport demand
- Methods and technologies to collect train occupancy data

Strategies and measures
- Strategies for long-term and mid-term control of demand
- Strategies for cases of incidents
- Pricing strategies, traveller information systems and other measures to control demand
- Impacts of specific measures on demand
- Approaches to influence the decision-making behaviour of passengers

Acceptance of route suggestions
- Factors influencing the acceptance
- Modelling acceptance and traveller behaviour
- Influences of information quality and information media on acceptance
- Dependence of acceptance rates on traveller characteristics and situation characteristics

Digital transformation in rail transport
- Big data driven innovation of business models
- Artificial intelligence, autonomous driving and their influence on demand

Data driven services
- Technological advances, value creation and benefits for demand management
- Information systems and their influence on demand

The symposium addresses researchers and practitioners concerned with the manifold aspects of rail transport demand management and interested in discussing scientific and application-oriented approaches. Relevant disciplines are transport planning, railway engineering, information technology, economics, marketing, psychology and many others. Politicians, managers and representatives of public authorities are invited to benefit from the symposium as a platform for knowledge-exchange and transfer.
During the two-day symposium, distinguished speakers will address selected interdisciplinary topics in six different sessions and three invited lectures. Designated innovative research and practical

approaches will be presented in 15-minute talks. In addition, the best overall contributions to the symposium will be awarded as well as the best (post-)graduate student contribution. Furthermore, there is plenty of opportunity to network, especially at the symposium dinner which will be hosted at the end of the first symposium day.

The members of the RTDM 2018 Conference Board wish the symposium as a whole a good and sustained progress and welcome all participants in Darmstadt!

The Conference Board
Prof. Dr.-Ing. Manfred Boltze – Prof Dr. Peter Buxmann – Prof. Dr. Karsten Weihe

Conference Board

The members of the Conference Board welcome all participants of the Symposium on Rail Transport Demand Management – RTDM 2018.

Prof. Dr.-Ing. Manfred Boltze
Professor of Transport Planning and Traffic Engineering

Civil engineer by profession, Manfred Boltze became a research associate and obtained his doctoral degree for a study on optimal cycle times in Traffic Signal Control for Road Networks from TU Darmstadt in 1988. After working as Head of the Department of Transport Planning and Traffic Engineering for Albert Speer & Partner in Frankfurt he was appointed chair of the Institute for Transport Planning and Traffic Engineering at TU Darmstadt in 1997. Since his appointment, the institute´s activities cover, among others, interdisciplinary research fields such as environmentally induced traffic signal control, freight transport demand management, traffic and health or sustainable road freight traffic. As one of the leaders of the AG Connected Mobility, a working group of the innovation alliance with Deutsche Bahn AG (German Rail), he also supervises and researches in several research projects concerning rail transport related fields such as, for instance, passenger guidance, passenger information or the detection of train capacity utilisation.

Prof. Dr. Peter Buxmann
Professor of Software and Digital Business

Peter Buxmann is head of the Software & Digital Business Group at Technische Universität Darmstadt, where he is also the director of the Startup and Innovation Centre HIGHEST (Home of Innovation, GrowtH, EntrepreneurShip and Technology Management). Peter Buxmann is member of numerous management and supervisory committees, including the Executive Board of the House of IT and the Steering Committee of the Techquartier in Frankfurt.His research focuses on the digitalization of business and society, methods and applications of artificial intelligence, entrepreneurship and the development of innovative business models, as well as the economics of cybersecurity and privacy. He is the author of more than 300 publications which are published in international journals (e. g. Information Systems Research, Journal of Information Technology, European Journal on Information Systems, Information Systems Journal) and conference proceedings (e. g. International Conference on Information Systems and European Conference on Information Systems).

Prof. Dr. Karsten Weihe
Professor of Algorithmics

Karsten Weihe is the head of the Algorithmics Group at the Department of Computer Science, TU Darmstadt. For more than twenty years, he has been supervising research projects in cooperation with Deutsche Bahn AG, which basically focus on all aspects of routing for travel information systems, including demand analysis.

Scientific Committee

The members of the Conference Board express their gratitude for the support of the following members of the Scientific Committee for RTDM 2018:

Prof. Dr. Kay W. Axhausen,

Eidgenössische Technische Hochschule Zürich, Institute for Transport Planning and Systems, Switzerland

Prof. Dr.-Ing. Manfred Boltze (Chair),

Technische Universität Darmstadt, Institute of Transport Planning and Traffic Engineering, Germany

Prof. Dr. Ralf Borndörfer,

ZIB – Zuse Institut Berlin, Mathematical Optimization and Scientific Information, Germany

Prof. Dr. Peter Buxmann (Co-Chair),

Technische Universität Darmstadt, Information Systems, Germany

Prof. Dr. Francesco Corman,

ETH Zürich, Institute for Transport Planning and Systems, Switzerland

Prof. Dennis Huisman,

Erasmus University Rotterdam, Department of Econometrics, The Netherlands

Prof. Dr. Eng. Bhargab Maitra,

Indian Institute of Technology Kharagpur, Civil Engineering Department, India

Prof. Dr.-Ing. Ullrich Martin,

Universität Stuttgart, Institute of Railway and Transportation Engineering, Germany

Prof. Dr. Fumihiko Nakamura,

Yokohama National University, Faculity of Engineering, Japan

Prof. Dr.-Ing. Andreas Oetting,

Technische Universität Darmstadt, Institute of Railway Engineering, Germany

Dr. Joaquim Rodriguez,

IFSTTAR, Villeneuve d'Ascq Cedex, Evaluation of Automated Transport Systems and their Safety Laboratory, France

Prof. Dr. Bernhard Schlag,

Technische Universität Dresden, Chair of Traffic and Transportation Psychology Germany

Prof. Dr. Anita Schöbel, Universität Göttingen,

Institute for Numerical and Applied Mathematics, Germany

Prof. Dr. Karsten Weihe (Co-Chair),

Technische Universität Darmstadt, Field of Algorithmics, Germany

List of Participants

Last Name	Name	Organisation	Department
Boltze	Manfred	TU Darmstadt	Transport Planning and Traffic Engineering
Borndörfer	Ralf	Zuse Institut Berlin	Mathematical Optimization
Brauner	Anna-Katharina	Technische Universität Darmstadt	Institut für Bahnsysteme
Buetzberger	Patrick	SBB AG	Passenger Transport, Service Planning
Buxmann	Peter	TU Darmstadt	Wirtschaftsinformatik
Dahlhaus	Elias		
Knappe	Robert	Hochschule für Wirtschaft und Recht Berlin	Allgemeine Verwaltung
Fahnenschreiber	Sebastian	Technische Universität Darmstadt	Algorithmik
Flamm	Leander	Deutsches Zentrum für Luft- und Raumfahrt e.V.	Institut für Verkehrssystemtechnik
Fornauf	Leif	Deutsche Bahn AG - DB Regio AG	CIO, IT, Digitalisation
Gillich	Kim	TU Darmstadt	Transport Planning and Traffic Engineering
Grimm	Boris	Zuse Institute Berlin	Optimization
Gündling	Felix	Technische Universität Darmstadt	Algorithmik
Hainz	Svenja	Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)	Institut für Verkehrssystemtechnik
Hartleb	Johann		
Herzog	Eva	Deutsche Bahn AG	Recruiting Trainees und Studenten Infrastruktur und Personenverkehr - HS.MA(1)
Hofmann	Dominic	Frankfurt University of Applied Sciences	Fachbereich 1, Fachgruppe Neue Mobilität
Kämmerling	Nicolas	TU Dortmund University	Institute of Transport Logistics
Koenen	Christa	Deutsche Bahn AG	Chair of the Board of Managing Directors, DB Systel CIO, DB Group
Köhler	Thomas	Deutsche Bahn AG	Head of Group-wide IT-Projects
Kröger	Lars	DLR Institute of Transport Research	Passenger Transport
Lecheheb	Mostefa	University Center Abdelhafid Boussouf Mila. Algeria	Science and Technology Department
Lefeld	Michael	DB Fernverkehr AG	Marktanalysen und -prognosen
Lieberhett	Johannes	ttools gmbh	
Luther	Bernhard	Hochschule für Wirtschaft und Recht Berlin	

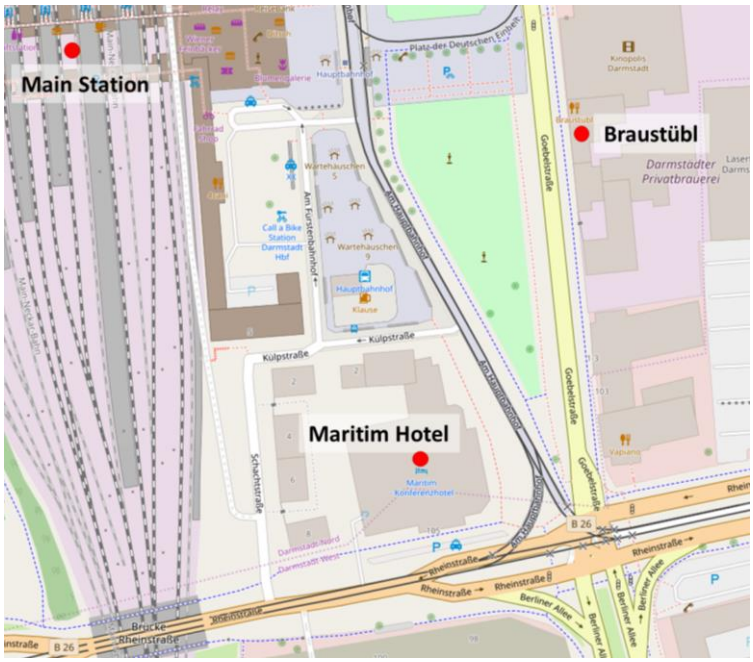
Last Name	Name	Organisation	Department
Mahlmann	Peter	Deutsche Bahn AG	DB IT Projekt- und Programmmanagement (TS.OP)
Maitra	Bhargab	Indian Institute of Technology Kharagpur	Civil Engineering
MANNINO	CARLO	SINTEF DIGITAL	Applied Mathematics
Monzert	Tobias	TU Darmstadt	Transport Planning and Traffic Engineering
Müller-Hannemann	Matthias	Martin-Luther-Universität Halle-Wittenberg	Institut für Informatik
Niedderer	Gösta	SMA und Partner AG	
Nökel	Klaus	PTV Planung Transport Verkehr AG	
Oetting	Andreas	TU Darmstadt	Railway Engineering
Olt	Christian	TU Darmstadt	Wirtschaftsinformatik
Ozturk	Ozgur	TU Darmstadt	Transport Planning and Traffic Engineering
Ramond	François	SNCF	Innovation & Research
Riedel	Hagen	TU Dresden	Professur für Bahnverkehr, öffentlicher Stadt- und Regionalverkehr
Stelzer	Anselmo	Deutsche Bahn AG	Reisendeninformation
Sterbak	Yves	Thales Deutschland GmbH	Strategy
Terschluesen	Carla	Deutsche Bahn AG	DB Analytics
Thust	Martin	DB Fernverkehr AG	Business Intelligence Marketing
von Mörner	Moritz	Technische Universität Darmstadt	Transport Planning and Traffic Engineering
Weihe	Karsten	TU Darmstadt	Fachbereich Informatik
Winter	Thomas	Beuth Hochschule für Technik Berlin	Fachbereich 2

Venue and Conference Dinner

The symposiums venue is the **Maritim Hotel Darmstadt**. The hotel is centrally located at the main railway station and close to the Autobahn A5. Frankfurt Airport can be reached easily via Taxi or the Airliner Bus, which travels between the main station, Darmstadt city centre and the airport.

The address of the Hotel is:
Maritim Hotel Darmstadt
Rheinstraße 105
64295 Darmstadt

Not far from the Maritim Hotel the restaurant **Braustüb'l** is located. The privately owned brewery will host the conference dinner on Wednesday evening. The Braustüb'l once opened in 1847 with the name "Zur Eisenbahn" which translates freely into "To the railway". Therefore, the Braustüb'l complements the RTDM 2018 as a well suited venue for the symposiums conference dinner and invites for more interesting discussions and conversations with local drinks and traditional dishes from South Hesse.



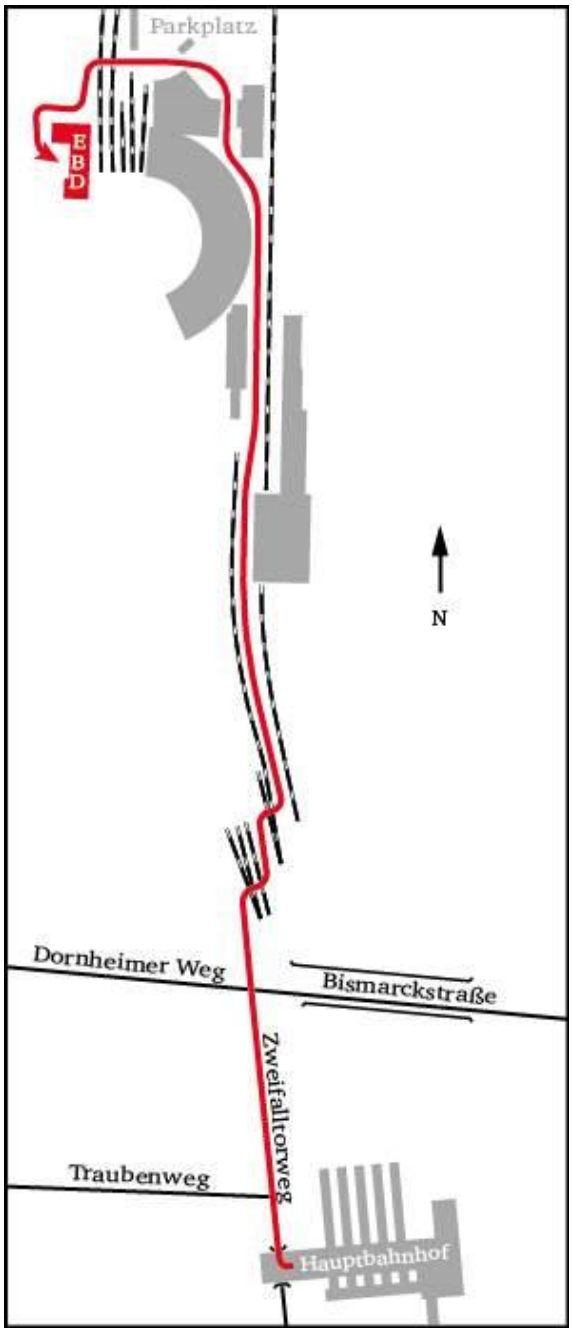
The address of the Braustüb'l is:
Braustüb´l - Wild Taste! GmbH
Goebelstraße 7
64293 Darmstadt

The technical tour of the RTDM 2018 will take place at the EBD Railway Research Centre (Eisenbahnbetriebsfeld). The EBD is operated by a collaboration of the DB Training, the 'Railways' Academic Working Group (AKA Bahn) and the Institute of Railway Engineering at TU Darmstadt.
The jointly operated simulation facility is used, among others, for testing new operational principles and exploring new approaches for the interaction between traffic controllers and electronic interlocking. Moreover, dispatching tools and methods are developed further.

Directions to the Eisenbahnbetriebsfeld Darmstadt

By foot from the main station (ca. 15 min):

- Leave the main station at the western exit of the main station (NOT the main exit)
- Step on the street, turn left and follow the street "Zweifalltorweg" (go "up") until you reach "Dornheimer Weg"
- Right across "Dornheimer Weg", you see stairs and a sign marked "Eisenbahnbetriebsfeld"
- Walk down the stairs and follow the signs marked "Eisenbahnbetriebsfeld" Please make sure that no trains are circulating when you cross the railway tracks!
- Follow the sidewalk until you reach the administration building (large straiways)
- Pass the lime tree on the left and the "Ausbildungszentrum" (building shaped like a semi-circle)
- Cross the tracks and you reach the Eisenbahnbetriebsfeld Darmstadt



By car:

- When driving on A5 / E451 (Frankfurt – Basel), take exit Weiterstadt (Nr. 25)
- Follow the B42 (Gräfenhäuser Straße) towards Darmstadt inner city (Innenstadt)
- After passing the railway bridge, at the large signalled intersection, turn right into Pfnorstrasse (on the signs it reads "Industriegebiet" – industrial area)
- Turn right into Pallaswiesenstraße
- Directly after the turn right, turn left into the premises of the Deutsche Bahn (DB)
- Follow the signs "Eisenbahnbetriebsfeld" until you reach the designed parking area

Invited Lectures

Distinguished speakers address selected interdisciplinary topics in three invited lectures. Beneath, you can find more information on the speakers who will certainly give you new insights during RTDM.

Christa Koenen
Chair of the Board of Managing Directors, DB Systel
CIO, DB Group

Christa Koenen has been working for Deutsche Bahn AG since 2004, first in corporate development and later in the service division. In August 2011 she became CFO at DB Kommunikationstechnik GmbH. In May 2014 Christa Koenen joined DB Systel as Managing Director. She initially took over the position of CFO. On May 1, 2015 she became CEO. Since October 2015, she has been exclusively Chair of the Board of Management. In addition to this role, she was appointed in April 2018 as “CIO DB Group”.

Prof. Dr. Bhargab Maitra
Professor in Civil Engineering, Indian Institute of Technology Kharagpur

Dr. Bhargab Maitra is currently a Professor in Civil Engineering Department, Indian Institute of Technology Kharagpur, India. He has published nearly 100 technical papers and case studies in various journals and proceedings of conferences, seminars and workshops on several topics such as traffic congestion, public transportation system, traffic and parking management, travel behavior, transport policy, etc. He has carried out several sponsored research and consultancy projects in the area of traffic and transportation system.

Prof. Dr. Ralf Borndörfer
Head of Department Mathematical Optimization, Zuse Institute Berlin

He studied Mathematics and Econonomics at Universität Augsburg, and graduated and habilitated at Technische Universität Berlin; his work was awarded with several national and international prizes. He is currently a professor for Discrete Mathematics with a Focus on Traffic Optimization at Freie Universität Berlin, Head of the Division Mathematical Optimization and Scientific Information at Zuse Institute Berlin, Deputy Head of the Research Campus MODAL, Scientist in Charge and a permanent guest in the Board the of the Einstein Center for Mathematics Berlin, Chairman of the Supervisory Board of MODAL Mathematische Optimierung und komplexe Datenanalyse AG, Deputy Head of the Research Group Traffic and Logistics of the German Operations Research Society, and a member of heureka Foundation.

Schedule

Time	Wednesday 24th Oct.	Thursday 25th Oct.	Time
09:00			09:00
09:15			09:15
09:30		Welcome	09:30
09:45		Invited Lecture 3 - Ralf Borndörfer	09:45
10:00	Check-In and Welcome Coffee		10:00
10:15		Session 3: Demand Control I	10:15
10:30			10:30
10:45			10:45
11:00	Symposium Opening	*Coffee Break*	11:00
11:15			11:15
11:30	Invited Lecture 1 – Christa Koenen	Session 4: Demand Control II	11:30
11:45			11:45
12:00	Invited Lecture 2 - Bhargab Maitra		12:00
12:15			12:15
12:30	*Lunch-Break*	*Lunch Break*	12:30
12:45			12:45
13:00			13:00
13:15			13:15
13:30	Session 1: Transport Service Planning and Dispatching	Session 5: Measures for Demand Control	13:30
13:45			13:45
14:00			14:00
14:15			14:15
14:30		*Coffee Break*	14:30
14:45			14:45
15:00		Session 6: Reliability and Incident Management	15:00
15:15	*Coffee Break*		15:15
15:30			15:30
15:45	Session 2: Demand Estimation		15:45
16:00		Comprehensive Discussion & Research Needs	16:00
16:15			16:15
16:30		Closing of the Symposium	16:30
16:45			16:45
17:00	*Small Snacks*		17:00
17:15			17:15
17:30			17:30
17:45	Technical Tour EBD		17:45
18:00			18:00
18:15			18:15
18:30			18:30
18:45			18:45
19:00			19:00
19:15			19:15
19:30			19:30
19:45			19:45
20:00	Conference Dinner		20:00
20:15			20:15
20:30			20:30
20:45			20:45
21:00			21:00

Session Composition

Session 1			
Wednesday 24th October, 13:30 – 15:10.			
Related Topic	**Presentation Title**	**Authors**	**Institution**
Transport Service Planning and Dispatching	**Dispatch Optimization – Status of the Art, Impact in the Practice and Trends**	Prof. Carlo Mannino, PhD Leonardo Lamorgese	SINTEF DIGITAL (Norway), OptRail (Italy),
	Decision Support for Passenger-Oriented Train Disposition	Frank Berger, Ralf Rückert, Prof. Matthias Müller-Hannemann	Martin-Luther-Universität Halle-Wittenberg (Germany)
	The Rolling Stock Rotation Planning Problem under Revenue Considerations	Boris Grimm, Ralf Borndörfer, Christof Schulz, PhD Steffen Weider	Zuse Institute Berlin (Germany), LBW Optimization GmbH (Germany)
	An Incremental Model for Determining Railway Infrastructure Bottlenecks due to Strong Increases of Rail Freight Transport	Lars Kröger, PhD Christian Winkler	DLR Institute of Transport Research (Germany)
	Exact Algorithms for LCL Network Planning under Consideration of Demand Fluctuation	Nicolas Kämmerling	TU Dortmund University (Germany)

Session 2			
Wednesday 24th October, 15:45 – 17:05.			
Related Topic	**Title**	**Authors**	**Institution**
Demand Estimation	**Efficient Monitoring of Public Transport Journeys**	Felix Gündling, Prof. Karsten Weihe, Florian Hopp	TU Darmstadt (Germany)
	The Ridership of Metro Networks: Analysis of some Explanantory Variables	Juan A. Mesa, Natividad González-Blanco, Prof. Federico Perea	University of Seville (Spain), Technical University of Valencia (Spain)
	Micro Meets Macro: An Innovative Transport Model Architecture Aiming at Forecasting a Passenger Railway's Future	Patrick Buetzberger, Wolfgang Scherr	SBB AG (Switzerland)
	Traffic Demand and Revenue Control in Public Transport in an Evolving Metropolitan Area	Thomas Winter, Robert Knappe, Bernhard Luther, Prof. Nicola Winter, Irina Aßmann, PhD Anke Bytomski-Guerrier, Michael Pelligrini	Beuth University of Applied Sciences Berlin, HWR Berlin, BVG(Germany)

Session 3			
Thursday 25th October, 10:15-10:55.			
Related Topic	**Title**	**Authors**	**Institution**
Demand Control I	**Logistics 4.0 and Shift to Rail - Evolution Rather than Revolution**	Yves Sterbak	Protostellar GmbH / Thales (Germany)
	Situation- and Demand-Responsive Generation of Collective Passenger Information in Regional Trains	Tobias Monzert	TU Darmstadt (Germany)

Session 4			
Thursday 25th October, 11:30-11:50.			
Related Topic	**Title**	**Authors**	**Institution**
Demand Control II	**Infrastructure - Design - Emotions**	Dominic Hofmann	Frankfurt University of Applied Sciences (Germany)
	Passenger Demand in a Technical World	Svenja Hainz, PhD Michael Meyer zu Hoerste, PhD Ida Kristoffersson	Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) (Germany), VTI (Sweden)
	Dynamic Passenger Guidance in Rail Transport – Acceptance of Measures	Kim Gillich	TU Darmstadt (Germany)

Session 5			
Thursday 25th October, 13:30 – 14:30.			
Related Topic	**Title**	**Authors**	**Institution**
Measures for Demand Control	**Towards Cost-Optimal Road Transports for Individual Passengers on Broken Itineraries**	Igor Braun, Sebastian Fahnenschreiber, Felix Gündling	TU Darmstadt (Germany)
	Using Feeder Services with Autonomous Ridepooling Vehicles to Increase Rail Transport Demand.	Moritz von Mörner	TU Darmstadt (Germany)
	Impact of Passenger Assistance Systems on the Performance of Urban Rail Networks	PhD Christian Meirich; Leander Flamm	Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

Session 6			
Thursday 25th October, 15:00 – 16:00.			
Related Topic	**Title**	**Authors**	**Institution**
Reliability and Incident Management	**Valuing Passenger Risk of Missed Transfers in Rail Transportation**	PhD Michael Bundschuh, Klaus Noekel, Michael Lefeld, PhD Johannes Lieberherr	PTV AG (Germany), Deutsche Bahn AG (Germany), ttools GmbH (Switzerland)
	On the Consistency of Timetable Evaluation Functions	Johann Hartleb, Prof. Markus Friedrich, Junior Prof. Marie Schmidt Dennis Huisman	University of Stuttgart (Germany), Erasmus University Rotterdam (Netherlands)
	Customer-oriented Design and Evaluation of Disruption Programs in Commuter Railway Transport	Anna-Katharina Brauner	TU Darmstadt (Germany)

Contact

If you have any questions during the conference, please do not hesitate to talk to one of our numerous staff members. Staff members can be recognized as such by the word **Staff** on the conference name tag. Our staff members will surely help you out!

Listed below you can find the three executive assistants of the Conference Board with contacts in case of any emerging problem or question during your stay in Darmstadt and the course of the conference.

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Notes