

General Information

The workshop will take place on June 10 + 11 at TU Braunschweig.

Workshop Location

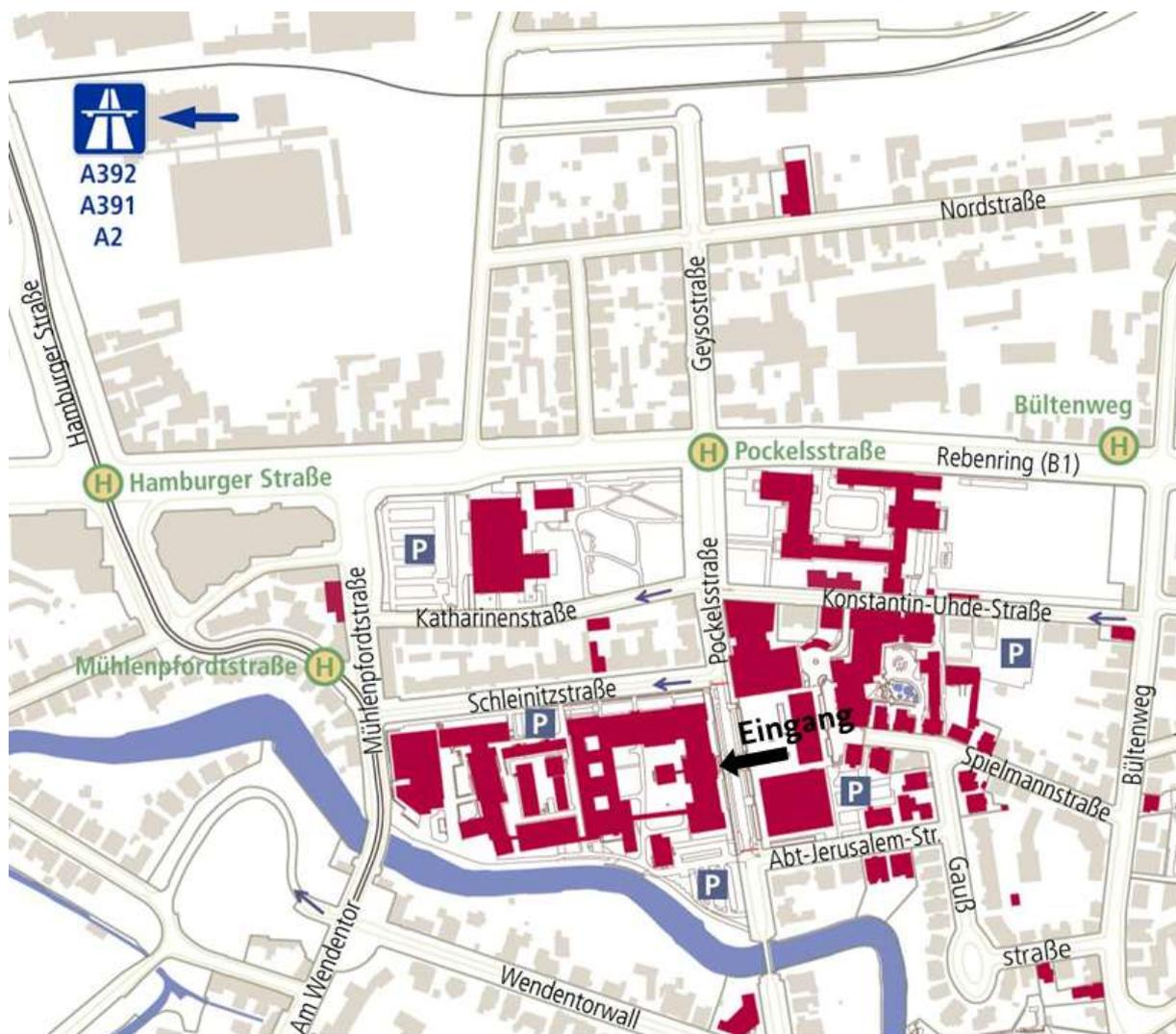
TU Braunschweig “**Altgebäude**” (historic main building)

Pockelsstraße 4

38106 Braunschweig

Specific Location: **Architecture pavillon** (straight ahead when entering through the main entrance)

[TU Braunschweig - Architekturpavillon - Google Maps](#)



Workshop Organization

Introductions

We invite all professors to briefly introduce themselves and the members of their team verbally.

Presentations

Each speaker will be given a time window of 25 minutes in total. The speakers are asked to prepare a talk in English of about 20 minutes, leaving 5 minutes for short questions.

The “corner discussion” at the end of each session provides an opportunity for in-depth discussions of the session’s talks in small groups. The speakers are encouraged to bring a selection of their slides in printed form for the corner discussions.

WLAN Access

WLAN is accessible via eduroam.

Boating Tour Location

Floßstation GmbH

Am Fallersleber Tore 6

38100 Braunschweig

[Floßstation Braunschweig GmbH und Bootsverleih - Google Maps](#)

Dinner Location

Pizzawerk am botanischen Garten

Bültenweg 95a

38106 Braunschweig

[Das Pizzawerk Am Botanischen Garten - Google Maps](#)

Workshop Schedule

Tuesday, 10 June

12:00 – 13:00 **Arrival + Light Lunch**

13:00 – 13:30 **Welcome + Introductions**

Session 1

13:30 – 13:55 **Tom Bormann** (*University of Vienna*)
Modeling Complex Driver and Customer Dissatisfaction in
Routing and Scheduling Problems

13:55 – 14:20 **Noah Gollnick** (*TU Braunschweig*)
Offer ranking for ride-hailing meta-platforms

14:20 – 14:45 **Niels Wouda** (*Erasmus University Rotterdam*)
A priori route planning for service delivery with customer choice

14:45 – 15:05 Corner Discussion

15:05 – 15:15 **Coffee Break**

15:15 – 16:15 **Practice Session**
Dr. Volker Eckhardt
Sheepersharing – Automated Carsharing in Braunschweig

16:50 – 18:30 **Social Event**
Boating Tour on the Oker river

From 18:45 **Conference Dinner**

Wednesday, 11 June

09:00 – 09:30 **Welcome & Introductions**

Session 2

09:30 – 09:55 **Matthias Soppert** (*Bundeswehr Uni Munich*)
Dynamic delivery-task compensation optimization for occasional drivers
with uncertain availabilities and choice behaviors

09:55 – 10:20 **Jan Strackbein** (*University of Mannheim*)
On the economic performance of e-grocery delivery: growing profitable
or die trying?

10:20 – 10:40 Corner Discussion

10:40 – 10:50 **Coffee Break**

10:50 – 11:05 **Group Picture**

Session 3

11:05 – 11:30 **Gustavo Hurovich** (*Erasmus University Rotterdam*)
Real-Time Routing Cost Predictions for Time Slot Management

11:30 – 11:55 **Marlin Ulmer** (*Otto von Guericke University of Magdeburg*)
To Start Up a Start-Up - Embedding Strategic Demand Development in
Operational On-Demand Fulfillment via Reinforcement Learning with
Information Shaping

11:55 – 12:15 Corner Discussion

12:15 – 12:30 **Coffee Break**

12:30 – 12:45 **Workshop Debrief + Departure**

Abstracts

Tom Bormann (*University of Vienna*)

Modeling Complex Driver and Customer Dissatisfaction in Routing and Scheduling Problems

Tom Bormann, Jan Fabian Ehmke, Alexander Kleff

Effective routing and scheduling in transportation logistics often require balancing customer and driver dissatisfaction. In the literature on Vehicle Routing Problems (VRP), models often simplify customer dissatisfaction as a deviation from hard or soft time windows, overlooking the complexity of real-world preferences for the start of an ordered service. This research extends an approach from the literature by modeling customer dissatisfaction as a linear piecewise function aiming to account for a more customized and differentiated representation of customer dissatisfaction. In particular, the case when customers themselves are uncertain about their own preferences is addressed by introducing natural language-based modelling for customer dissatisfaction. Additionally, driver dissatisfaction, often neglected in VRPs, is incorporated as a critical factor to gain relevant insights into the interaction of these two and to reveal potential for improvement. Driver dissatisfaction is expressed as increasing workload measured as working time. The proposed framework allows for a flexible representation of customer preferences and driver considerations, overcoming the limitations of conventional VRP models. The problem is treated as a Traveling Salesman Problem with General Time Windows (TSPGTW) and solved using a dynamic programming algorithm. This exact solution approach aims to minimize the accumulated dissatisfaction value for all customers and a single driver while maintaining computational efficiency. Further, it enables the impact of different parameter settings and preference survey designs to be analyzed in detail and conclusions to be drawn for real-world applications. This research contributes to the VRP literature by (1) redefining customer dissatisfaction in a more realistic way beyond simplified time window constraints, (2) enabling the introduction of a multi-faceted dimension of driver dissatisfaction, and (3) offering a dynamic programming framework that combines these objectives.

Noah Gollnick (*TU Braunschweig*)

Offer Ranking for ride-hailing meta-platforms

Noah Gollnick, Florian Graf, Dirk Mattfeld

The fragmentation of app-based mobility markets such as ride-hailing leads to customers and service providers (drivers) not being able to find the options best suiting to their demand. Ride-hailing platforms prevent a fair competition by using their information advantage and the lack of platform user overview to induce subpar offer choices. A way to tackle these issues are meta-platforms, which create a centralized market to compare offers from different platforms. We provide a taxonomy of business models enabling meta-platforms as sustainable transaction participant creating market value. We look deeper into offer ranking, the ability to rank ride-hailing offers from different platforms according to customer preferences, which is one of the core meta-platform business models and value creation options. We provide literature-based insights on relevant factors impacting the decision between ride-hailing offers as well as an algorithmic model to anticipate individual customer choices and generalize a real-time offer ranking decision based on learning-to-rank algorithms. We present a case study delivering a proof-of-concept for the algorithmic model in a controlled environment setting ride-hailing meta-platform data derived from a berlin-based startup.

Niels Wouda (*Erasmus University Rotterdam*)

A priori route planning for service delivery with customer choice

We consider a setting in which a service provider offers specific (engineering) services at customer locations. The service provider offers these services both on a subscription and ad-hoc basis. Subscription-based customers are known to the provider and can be planned ahead of time. Customers with a subscription need to be offered at least two time slots on different days, from which they are free to choose one. Ad-hoc customers arrive dynamically over time and are offered time slots that are a good-enough fit. We propose a planning model that generates efficient a-priori routes for subscription-based customers by explicitly taking into account random customer choices from the offered time slots. The planning leaves sufficient slack to accommodate ad-hoc customers. We develop an exact method based on branch-and-price for the route planning problem, as well as a fast metaheuristic for practically-sized instances. We compare the performance of both methods on numerical benchmark instances, and also consider a case study using real-world data from an industry partner offering a tyre-changing service.

Matthias Soppert (*Bundeswehr Uni Munich*)

Dynamic delivery-task compensation optimization for occasional drivers with uncertain availabilities and choice behaviors

Matthias Soppert, Kai Winheller, Rouven Schur

To keep pace with the continuously growing e-commerce, many traditional brick-and-mortar retailers have launched online stores and home delivery services. However, despite substantial progress in the scientific literature, the last-mile delivery remains costly, eroding profit margins and undermining the scalability of such online store operation. In this context, the concept of occasional drivers, whereby in-store customers may occasionally become drivers who deliver to online customers, recently gained attention. However, existing approaches assume that the retailer possesses detailed information on potential occasional drivers, in particular their individual destinations after in-store shopping, their preferences, and that the retailers can assign them delivery tasks. In this work, we relax these key assumptions: First, we assume that the availability of potential occasional drivers, their destinations, and their choice behavior regarding offered delivery tasks are uncertain for the retailer. Second, we assume that retailers cannot assign tasks directly but can only adjust compensations dynamically to incentivize in-store customers. Thus, we define occasional drivers more narrowly. These broader assumptions result in a novel problem for which existing operational control approaches are inapplicable. Based on a Markov decision process formulation of the problem and its analytical analysis, we develop a scalable heuristic solution approach. We demonstrate the performance of the resulting policy in a comprehensive numerical study. Our results yield insights into the potential of engaging unknown in-store customers as occasional drivers and into designing effective compensation schemes.

Jan Strackbein (*University of Mannheim*)

On the economic performance of e-grocery delivery: growing profitable or die trying?

Jan K. Strackbein, Moritz Fleischmann

Industry experts and scholars commonly consider grocery home delivery (e-grocery) in developed economies as unprofitable. Nevertheless, both the number of companies offering e-grocery services as well as the share of online sales in the grocery market continue to grow. In this study, we investigate the interplay between growth and profitability of an e-grocery service. To this end, we develop an analytic model of the main profit drivers and evaluate it using publicly available real-life data. Capturing the economics of the delivery operations is at the heart of our model. We consider a two-echelon distribution network, reflecting a commonly observed fulfillment strategy, where orders are assembled in a central fulfillment center (FC) and delivered to (transshipment) hubs by truck. Larger order batches are broken down at the hub level and delivered to the customer locations in smaller delivery vans. We use continuous approximation to assess delivery distances in such a network and determine the profit of a given FC. We derive analytical results on the level of the service area as well as on a system level, concerning a growing number of orders and the spatial location the growth is associated with. In this process, we introduce and discuss internal and external constraints limiting the systems' growth potential. Subsequently, we calibrate the model by conducting numerical experiments using real-world data to quantitatively assess conditions for the e-grocery service to become profitable.

Gustavo Hurovich (*Erasmus University Rotterdam*)

Real-Time Routing Cost Predictions for Time Slot Management

Gustavo Hurovich, Lucas P. Veelenturf, Niels Agatz

In the context of online grocery delivery, last-mile operations are challenging and costly. It is common in e-grocery retailing to allow customers to select a delivery window from a menu of available options. The retailer may decide to incentivize those time slots that allow for a more efficient route plan. To make these decisions, the retailer must determine the cost of serving customers in each time slot. Determining this marginal detour cost is a computationally challenging problem because it involves solving a vehicle routing problem with time windows. In practice, the number of customer orders can be large and the available time extremely limited (<1 second). Therefore, it is common to use fast routing heuristics to estimate the "insertion cost". Here, we explore the use of machine learning models to better predict marginal routing costs.

Marlin Ulmer (*Otto von Guericke University Magdeburg*)

To Start Up a Start-Up - Embedding Strategic Demand Development in Operational On-Demand Fulfillment via Reinforcement Learning with Information Shaping

The last few years have witnessed rapid growth in the on-demand delivery market, with many start-ups entering the field. However, not all of these start-ups have succeeded due to various reasons, among others, not being able to establish a large enough customer base. In this paper, we address this problem that many on-demand transportation start-ups face: how to establish themselves in a new market. When starting, such companies often have limited fleet resources to serve demand across a city. Depending on the use of the fleet, varying service quality is observed in different areas of the city, and in turn, the service quality impacts the respective growth of demand in each area. Thus, operational fulfillment decisions drive the longer-term demand development. To integrate strategic demand development into real-time fulfillment operations, we propose a two-step approach. First, we derive analytical insights into optimal allocation decisions for a stylized problem. Second, we use these insights to shape the training data of a reinforcement learning strategy for operational real-time fulfillment. Our experiments demonstrate that combining operational efficiency with long-term strategic planning is highly advantageous. Further, we show that the careful shaping of training data is essential for the successful development of demand.

Participants

University of Augsburg



Robert Klein



David Fleckenstein



Vienna Klein



Daniela Sailer

Technical University of Braunschweig



Dirk Mattfeld



Noah Gollnick



Felix Spühler



Alexander Bosse

European University Viadrina Frankfurt (Oder)



Charlotte Köhler

Christian Albrecht University of Kiel



Xiaosu Li

Otto von Guericke University of Magdeburg



Marlin Ulmer



Charlotte Ackva



Florentin
Hildebrandt



Jonas Stein

University of Mannheim



Jan Strackbein



Katrin Waßmuth

Bundeswehr University Munich



Claudius Steinhardt



Matthias Soppert



Kilian Hein

Erasmus University Rotterdam



Remy Spliet



Niels Agatz



Gustavo Hurovich



Niels Wouda



Lucas Veelenturf

University of Vienna



Jan Fabian Ehmke



Tom Bormann