Gesellschaft für Operations Research e.V.

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Hilti Global Logistics
Advanced Business Analytics
Dr. Markus Frey

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GOR-AG:
Projektmanagement und Scheduling
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GOR-AG: Praxis der Mathematischen Optimierung
Dr. Jens Schulz

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Herewith, we invite you to the 105th meeting of the GOR working group "Real World Optimization" jointly with the GOR working group "Project management and Scheduling" and hosted by Hilti Global Logistics. This meeting is planned to be held in person (or virtually if circumstances enforce) with the topic

The logistics of value chains in the 21st century: Digital, sustainable and optimized

The workshop takes place on September 9th & 10th, 2021 on Thursday and Friday in Schaan, Liechtenstein. We plan for virtual presentation and on-site participation as well.
The working language will be preferably English as some speakers are expected from abroad.

Note that the participation in a GOR-AG-Workshop for non-members is subject to a registration fee, unless you are a speaker or a host. Given the uncertainty of Covid, travel restrictions, company policies, we strongly advise to book and prepare your stay accordingly. Cancellation of the on-site event may occur on short notice, and the organizers will not provide any refunds.

Please, register via https://www.redseat.de/pmo105/ before end of August.

The latest information on the meeting is available on the homepage of the GOR (http://www.gor-ev.de/arbeitsgruppen/praxis-der-mathematischen-optimierung).

Yours sincerely,

Jens Schulz, Julia Kallrath, Josef Kallrath (GOR AG)

Markus Frey (Hilti Corp.)

Dirk Briskorn (GOR AG)

Vorstand
Prof. Dr. Alf Kimms (Vorsitz)
Prof. Dr. Alexander Martin (Arbeitsgruppen)
Dr. Jens Schulz (Finanzen)
Prof. Dr. Peter Letmathe (Tagungen)

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The logistics of value chains in the 21st century: Digital, sustainable and optimized

Specific aims

This event is dedicated to all professionals and parties interested in advanced analytical methods. We aim to offer a discussion and exchange platform for experts in academia and industry applying advanced technologies or/and methodologies like mathematical optimization or machine learning to transform logistic processes into the digital century.

Delivering an ordered good, in the right amount, at the right time to the customer with the lowest costs are the challenges within an E2E logistics value chain. While time, speed, costs, reliability, availability, productivity and efficiency have always been major key drivers, environmental aspects, e.g. the reduction of the CO_2 footprint, must also be considered to take responsibility for our society and future generations. Only by leveraging data in combination with digital technologies and state-of-the-art methodologies, companies will be able to manage and balance those key drivers in a highly competitive and demanding environment.
We welcome talks that present success stories, and even more learnings and ambitions highlighting how digitalization helps to make the logistics value chain optimized and sustainable to be ready for 21st century.

About Hilti
The Hilti AG providing leading power tools for almost 80 years developed a stand-alone business model with an end-to-end value chain covering the manufacturing of, e.g. a drill, up to the delivery to the customer's door. To manage the complexity of the logistic processes satisfying all kind of business aspects while meeting a high customer service level, a data driven, holistic and integrated planning is key breaking the functional silos. By adding real-time data, e.g. by using *RFID* chips to track products, an automated sense-and-response approach provides the right answers to obtain the highest customers' service level. Advanced methods, like mathematical optimization, is thereby one of the foundations to achieve the most accurate and most robust solutions.

Hilti Global Logistics takes up the challenges of the revolutionary digital journey. Its ambition is thereby not only to be a user of the digital technologies, but to shape the transformation process for their customers and for the future.

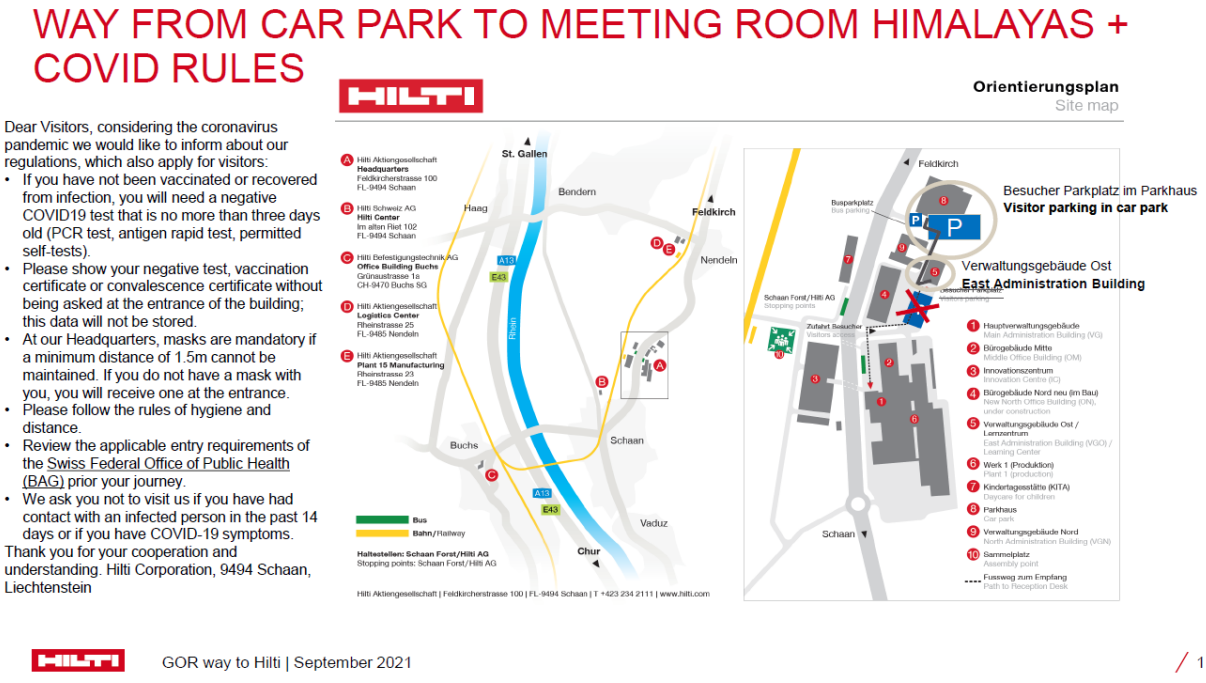
In talks of 25+5min or 40+5min duration, experts from practice and research will share their knowledge and learnings.

If you are willing to contribute a talk, please feel free to contact one of the organizers.

Dirk Briskorn (briskorn@uni-wuppertal.de)
Markus Frey (markus.frey@hilti.com)
Jens Schulz (schulz-gor 'at' gmx.net)

The Venue

Hilti AG, in Schaan, Liechtenstein.



The meeting room Himalayas is located in (1st floor) Admin.Building East (VGO);
Room 01/VGO 13.1.16

Travel

We recommend in most cases travelling by train or plane to Feldkirch where the hotels are located. Daily travel to the conference venue is best via public transport, car rental and car sharing.

Hotel

We have negotiated rates for this event that can be booked using the code “GOR-Hilti 2021”.

We recommend the Best Western Hotel in Feldkirch, Austria. Price per night and single person in double room is 95€, and 135€ for two people in double room.
On top comes a “Gasttaxe” of 1,20€ per night and person, and optional breakfast for 18,50€/day and person.

Another option is to stay in B-Smart Hotel in Bendern (Liechtenstein) or in any other close by.

Conference Dinner (Schlosswirtschaft Schattenburg)

Hilti cordially invites you to the conference dinner which will take place in the Schlosswirtschaft Schattenburg:
https://www.schattenburg.cc/
Burggasse 1, 6800 Feldkirch, Austria

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The following speakers are confirmed:

Roeland Baaijens (Hilti)
Towards a resilient supply chain at Hilti

Curt Cramer (Lidl) and Aljoscha Gruler (Lidl Analytics)
Optimization in the Lidl Supply Chain: Challenges and Opportunities

Ton De Kok (CWI)
Lost-sales or backlogging? That is the question

David Francas (Uni Heilbronn)
Reducing product complexity in life sciences: A conic-integer programing approach and heuristic solution techniques

Astrid Friedrich & Jasmin Krimm (Rentschler Biopharma SE)
Using a simulation model to optimize scheduling of a highly purified water system

Markus Frey (Hilti)
Advanced Business Analytics at Hilti

Torsten Gellert (Zalando)
Large Scale Discount Optimization with Business Targets

Josef Kallrath
The Representation of Time in Modeling and Optimizing Supply and Value Chains

Baris Cem Sal (Deutsche Post DHL)
Data Analytics & Operations Research to support DHL Mission 2050: Zero Emissions

Matthias Spreitzenbarth (Plannow)
A practice approach for the successful implementation of Data Science in manufacturing industry

Stephan Westphal (TU Clausthal)
Digitalization in the bread supply chain

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Speaker CVs

Roeland Baajens is the Executive Vice President Logistics of the Hilti Group. He has the global responsibility for all the logistics activities including transport, warehousing, materials management and customs. During the last 16 months he shared in many publications and webinars how Hilti successfully dealt with the crisis. Before Roeland joined Hilti he worked 13 years for Nestlé in the Netherlands and in the HQ in Switzerland. Roeland holds a master's degree in industrial engineering from the Eindhoven Technical University. He is also a graduate of the Program Executive Development (PED) from IMD.

Markus Frey studied mathematics and economics at the University of Augsburg. After receiving his PhD in Operations Research from the Technical University of Munich in 2015, he joined the Advanced Business Analytics group at BASF in Ludwigshafen. Markus already worked on analytical diverse topics in the area of supply chain management, manufacturing, health care management, airport operations, or the service industry. Some of the projects found their ways into scientific journals. In 2019, Markus changed to Hilti Group where he supports and drives digital advanced analytics within Hilti Global Logistics.

Torsten Gellert is a Senior Applied Scientist at Zalando, one of the largest fashion e-retailers of Europe. For the last two years, he has been developing algorithmic solutions for the Pricing and Forecasting Department. Prior, he was working for three years in the Logistics Department on efficient handling of customer orders in and between warehouses. Torsten is interested in complexity theory as well as practical heuristics for real world problems.

Ton de Kok received an MSc in Mathematics from Leiden University and a PhD in Mathematics from Vrije Universiteit in Amsterdam. He worked as an Operations research professional at Philips Electronics from 1985-1992. Since 1992 he is professor in Quantitative Analysis of Operational Processes at the Department of Industrial Engineering and Innovation Sciences at Eindhoven University of Technology. End of 2020 he was appointed as General Director of CWI, the Centre for Mathematics and Computer Science. Ton has published over 100 papers in international scientific journals on subjects like queuing theory, inventory theory, hierarchical planning, and vehicle routing.

Baris Cem Sal is the Lead Data Scientist for Operations Research in Deutsche Post DHL Group Data Analytics Center of Excellence. Baris holds a BS degree in Industrial Engineering from Bilkent University/Turkey. Working in IT, consulting and logistics, he has brought multiple Machine Learning and Operations Research use cases to production, focusing on topics like forecasting, pricing, inventory optimization, network design, and routing.

Curt Cramer is Global Head of Analytics and working for Lidl since 2019. Before he held positions at Roland Berger, Thomas Cook and Adello. He holds a PhD from University of Karlsruhe with a specialization in database systems, computer networking, distributed systems, and mathematical optimization.

Astrid Friedrich is head of Automation and Digitalization at Rentschler Biopharma SE, one of the leading biopharma CDMOs. Before she held positions at Baxter and Novartis, gaining expertise in a wide range of manufacturing techniques. She has brought many operational research use cases and new process analytical technologies to the shop floor, using statistics and/or mathematical optimization among others. She led many yield improvement projects, stabilized processes, reduced inventory, optimized supply chains to name a few. Her current focus is on automation architecture and how an automation platform improves important KPIs like time to market, an important differentiator for our customers.

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Aljoscha Gruler holds a PhD in Network and Information Technologies from Universitat Oberta de Catalunya. He is employed as Advanced Analytics Consultant at Lidl Analytics and before that worked at Accenture as Data Science Consultant.

Josef Kallrath has studied mathematics, physics, and astronomy in Bonn, where he received a doctorate in 1989 for his dissertation in astrophysics on the dynamics of colliding double stellar winds. He has worked in companies (BASF SE, Ludwigshafen; 1989–2019), has been freelancing since 1998 as a scientific consultant and lecturer, and solving practical problems in industry with scientific computing and operations research techniques, most of it being modeling and solving mathematical optimization problems. His work focuses on mathematical optimization to support decisions in process, paper, metal, and energy industry, as well as transport infrastructure and modeling physical systems. He has taught at the University of Heidelberg (1991–2001) and at the University of Florida in Gainesville/USA (since 1997). Since 2002, Prof. Kallrath has been heading the Mathematical Optimization Practice Group of the German Operations Research society (GOR).

Jasmin Krimm completed an undergraduate degree in bio- and process technology (B.Sc.) in combination with an apprenticeship as an electronics technician. Thereafter, she worked as a qualification and validation engineer. In this position, she gained first-hand experience in setting up a state-of-the-art filling and packaging plant for vaccines. At the moment, she is completing a postgraduate degree in environmental and process engineering (M.Eng.) at Augsburg University of Applied Sciences. During her studies, she has already focused on process simulation. As part of her master's thesis, she created a simulation model of the highly purified water system in operation at Rentschler Biopharma SE and investigated the potential for optimizing the system.

Matthias Spreitzenbarth is the Chief Advisor at PlanNow GmbH & Co.KG in Mannheim, Germany. Mr. Spreitzenbarth has led, designed and implemented digital transformation initiatives and projects in the areas of Customer Relationship Management (CRM), Supply Chain Management (SCM), Enterprise Resource Management (ERP), Enterprise Asset Management (EAM), Total Predictive Maintenance (TPM), Field Service Management (FSM), Advanced Planning and Scheduling (APS), Data Science and Sales & Operations Planning (S&OP) in the Food, Packaging, Paper, Metals, Pharmaceutical, Chemical and Automotive industries. Matthias Spreitzenbarth works as a management, technology and process optimization consultant and project manager in the pharma, food, automotive and software industries.

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Abstracts

Speakers: Roeland Baajens (Hilti)
Title: Towards a resilient supply chain at Hilti

The ongoing COVID-crisis brought resilience back to the top priorities to assess and improve for many companies – likewise for Hilti. Based on the experiences and learnings the Global Logistics strategy (GL2020+) and step changers have been critically reviewed. All principles and key elements are valid, but two potential areas for acceleration have been identified: digitalization and sustainability. Both have already been part of the strategy however need to be further prioritized. By extending visibility and flexibility in distribution, transparency and agility along the entire chain are further strengthened. This also prepares the way towards more distribution control, intelligent routings, carrier changes and overall a better utilization of transport capacity leading to reduced CO2 emissions.
One crucial aspect is to leverage potentials by means of data and state-of-the-art methodologies and technologies. GL further strengthened its digital and analytical competences by founding a team of experts in digitalization also including the sub-team Global Logistics Advanced Business Analytics. By applying advanced analytical method this team supports different functions in getting new insights into their data and process leading to improved decisions making. As data knows no functional boarder, Hilti Logistics seeks for holistic solutions which are applied and used cross-functional.
In this talk, we will give an overview about the strategic vision on digitalization and major topics Hilti Logistics initiated so far in this area. Thereby discuss targets, ambitions and opportunities but also show organizational, operational and technological challenges by going the digital and analytical path, which is essential to adapt and ensure a sustainable and resilient supply chain as key factor for future business success.

Speakers: Curt Cramer (Lidl) and Aljoscha Gruler (Lidl Analytics)
Title: Optimization in the Lidl Supply Chain: Challenges and Opportunities

Over the last few years, Lidl has rapidly expanded across Europe. This growth is represented by a large supply chain network combining over 11.000 stores in 28 European countries. Hereby, Optimization plays an important role in the creation of competitive and sustainable transportation & logistics activities. This talk highlights the specific challenges and opportunities faced by Lidl Analytics and other relevant stakeholders in the development and integration of Optimization methods in the Lidl Supply Chain network.

Speaker: Ton de Kok (CWI)
Title: Lost-sales or backlogging? That is the question

In this presentation we discuss the similarities and differences between periodic review backlogging and lost-sales models in inventory management regarding optimal policies and optimal parameters for classes of policies. We present a new optimality condition for multi-item multi-echelon models under lost-sales that can be used for control parameter optimization. We discuss the performance of the lost-sales control policy that orders every period such that the non-stockout probability is equal to a fixed fractile: the P3-policy. We present an efficient procedure that accurately determines the order quantity every period under this control policy and a heuristic that performs very well in comparison to optimal policies for the lost-sales model. Finally, we discuss some managerial insights derived under the P3-policy and its implications for multi-item multi-echelon systems under lost-sales.

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Speaker: David Francas (Uni Heilbronn)
Title: Reducing product complexity in life sciences: A conic-integer programing approach and heuristic solution techniques

In pharmaceutical supply chains, most of the product complexity arises at the packaging level. Due to regulatory requirements and marketing considerations, a common practice is to rely on country-specific products that have market authorization in just one market. However, this practice comes at the expense of lower flexibility, higher inventory levels, and increased supply chain costs, which is a particular concern for high-value, low-volume drug brands. Motivated by the case of a major pharmaceutical company, we develop an optimization approach that identifies markets that should be served together via so-called multi-country packs. We model the decision problem as a mathematical program that considers inventory holding, setup, market compatibility, and complexity costs along with regulatory constraints. We show how to formulate this problem as a conic quadratic mixed-integer program that can be solved by standard optimization packages. Furthermore, we develop a simulated annealing algorithm that can solve large-size problems heuristically.

Speaker: Astrid Friedrich & Jasmin Krimm (Rentschler Biopharma SE)
Title: Using a simulation model to optimize scheduling of a highly purified water system

One of the most valuable and most important raw materials in the bio-pharmaceutical industry is water. It is used for both the production of active ingredients and the cleaning of production facilities. The continuous supply of water for the production processes is therefore vital and a top priority at Rentschler Biopharma SE.
As a rapidly growing company, production capacity has more than doubled in recent years. Despite extensive enlargements of the water system, bottlenecks in the supply of Highly Purified Water (HPW) continue to occur in manufacturing peak performance situations. These expansions resulted in a vastly complex HPW system and it soon became obvious that classic approaches to control the system would fail. A simulation model was developed to optimize this system in a goal-oriented manner. The aim was to determine the optimization potential of HPW scheduling by using the simulation model. This simulation showed great results and due to the new insights and optimized scheduling of the water system, a large investment could be postponed.

Speaker: Markus Frey (Hilti)
Title: Advanced Business Analytics at Hilti

Taking responsibility for the whole supply chain, from the production of products to the delivery to the end-customer is a challenging task. To ensures not only outstanding products but also a high customer service, Hilti takes up this challenge with this end-to-end view of the supply chain. One crucial aspect is thereby to leverage potentials by means of data and state-off-the-art methodologies and technologies.
Hilti Global Logistics further strengthened its digital and analytical competences by founding a team of experts in digitalization including also the sub-team Global Logistics Advanced Business Analytics. By applying advanced analytical method this team supports different functions in getting new insights into their data and process leading to improved decisions making. As data knows no functional boarder, Hilti Logistics seeks for holistic solutions which are applied and used cross-functional.
In this talk, we will give an overview about major topics Hilti Logistics initiated so far in the area of advanced analytics and digitalization. We thereby discuss targets, ambitions and

opportunities but also show organizational, operational and technological challenges by going the digital and analytical path.

Speaker: Torsten Gellert (Zalando SE)
Title: Large Scale Discount Optimization with Business Targets

Discount decisions play a central role in Zalando's financial lifecycle. They significantly contributed to the achieved GMV of 2.455 billion Euro in Q3 of 2020 and are central for supporting the ambitious YoY Zalando growth. Over 600.000 articles offered in 17 countries require constantly updated prices.They directly impact important aspects like customers perception, revenue growth and overstock at the end of a season.

The scale of the problem imposes strict requirements on the efficiency of the optimization framework as it must be executed as a weekly or even daily routine. The implementation of this process in the past has been a hybrid of an automated optimization process and a manual selection of appropriate discount recommendations.
We built a fully automated system that will be able to provide discounts - reaching financial goals without human intervention. It aims to reach the business targets for all markets and guarantees close to optimal decisions.

The central piece of our solution is a Lagrangian Decomposition approach which was developed in collaboration with Prof. David Simchi-Levi and the Institute for Data, Systems, and Society (IDSS) of the MIT. We combine big data engineering approaches (massive parallelization with spark) and classical Operations Research tooling in order to cope with the high dimensional optimization problem. To this end, we rely on the sales forecast, based on a machine learning model.

Speaker: Josef Kallrath
Title: The Representation of Time in Modeling and Optimizing Supply and Value Chains

Supply chain and value chain optimization models are often based on mixed integer linear programming (MILP) or mixed integer nonlinear programming models (MINLP).
In this talk, we focus on the representation of time as an essential issue when modeling and optimizing supply or value chain problems as MILP or MINLP problems for two reasons: Accuracy and realistically mapping the real-world problem, and controlling the size of the problems.
For tactical and strategic planning, time-discrete (also called time-bucket) formulations often suffice. To keep the size limited, for time-bucket models an option is also to use different time discretization for production and sales aspects, or for near-future or further distance time periods.
Time-discrete models allow to incorporate transport times and shelf-life time as long as these are discrete multiples of the time buckets. For scheduling problems, time-continuous formulations based on event points are a very flexible alternative and can be used to cover many different situations outlined by examples from the process industry and a lock scheduling problem.
Somewhat in between time-discrete and time-continuous models are time-bucket models which allow for mass conversation across time-buckets.

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Speaker: Baris Cem Sal (Deutsche Post DHL)
Title: Data Analytics & Operations Research to support DHL Mission 2050: Zero Emissions

Speaker: Matthias Spreitzenbarth (Plannow)
Title: A practice approach for the successful implementation of Data Science in the manufacturing industry

The focus of attention on the implementation of Data Science in industry often comes from two different angles. One is the problems of how to control the individual processes that enable the overall manufacturing process. In most cases, the pain points can be broken down into drivers such as effort, quality, time and accuracy, thus providing the right information to the stakeholders involved. A lower contribution margin due to high resource and especially personnel costs can be identified. Secondly, new technological opportunities through the digital revolution such as AI, ML, IoT and optimization are driving manufacturers to implement new business models. Examples include computer-aided procedural design of manufacturing processes using solvers and ML solutions while adapting feedback, e.g., through IoT connectivity. Forecasting, planning and scheduling using parallel ML and optimization is also emerging. To implement Data Science successfully in manufacturing, it is essential to understand the artery between stakeholders, processes and the business. If you want to change things for the better, you need to know exactly what is happening today before you can build operational excellence. This presentation aims to share some approaches, experiences and lessons learned from practical projects in the manufacturing industry.

Speaker: Stephan Westphal (TU Clausthal)
Title: Digitalization in the bread supply chain

Harry-Brot produces roughly 1,000 varieties of baked goods that are distributed to 9,300 German stores. The baker runs 73 different production lines across nine sites; each production line is restricted to a specific set of products, speed of production, and capacity. In this talk, we present an integer programming based approach to determine an optimal assignment of baking products to different production lines. It aims at reducing costs at the production sites taking the specific requirements and capabilities into account. At the same time, the transportation costs which depend on the distance of the facility to the customers are minimized.
By applying this model and evaluating different scenarios, Harry-Brot could finally achieve significant cost reductions of 3.57 percent and 1.81 percent for production and transportation costs, respectively.

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