

# IBOSS-ECMath Workshop "Optimization Methods in Healthcare"

18.-19. October 2018  
Zuse Institute Berlin (ZIB)



## **IBOSS-ECMath Workshop** **"Optimization Methods in Healthcare"**

The first joint IBOSS-ECMath workshop on optimization methods in healthcare took place on 18.-19. October 2018 at the Zuse Institute Berlin (ZIB). It was organized and supported by ECMath and the MODAL AG.



### **Research Project IBOSS**

The research project

(IBOSS) aims at developing fast algorithms to optimize for more efficient resource utilization in daily operating room schedules at hospitals. IBOSS is carried out by three research institutions: ZIB, Freie Universität Berlin and the University of Paderborn each contribute with their individual expertise. The industry partners of IBOSS are the Charité Berlin, the German Association of OP-Managers (VOPM), and the French company DeepOR. IBOSS is funded by the Mathematics Research Program of the German Federal Ministry of Education and Research (BMBF) in the research cluster

IBOSS is also cooperating with its sister research project

which focuses on optimized patient care in rural areas. HealthFaCT also participated in this workshop.

### **ECMath**

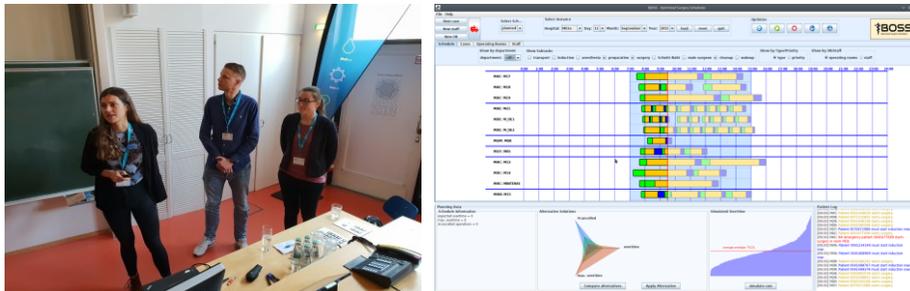
The Einstein Center for Mathematics Berlin (ECMath) aims at supporting mathematical research in selected innovation areas relevant for Berlin. It is funded by the Einstein Foundation Berlin and run by the three universities Freie Universität Berlin, Humboldt Universität Berlin, Technische Universität Berlin, and the two research institutes Weierstraß Institute for Applied Analysis and Stochastic and the Zuse Institute Berlin. ECMath provides a common platform for the Research Center , the Berlin Mathematical School (BMS), the German Center for Teachers' Education in Mathematics, the Research Campus MODAL, the DFG Research Centers 647, 114, and the Transregional Research Centers 109 and 154. A goal of ECMath is to transfer know-how from science to industry.



## Motivation and Aim of the Workshop

In contrast to industries like production and transport planning, mathematical optimization is not yet fully established in the healthcare sector. There are still many obstacles to overcome: the complexity of IT-systems, overconstrained requirements of each individual hospital, and, especially, human acceptance.

The intention of the workshop was to bring together partners from science, practice, and industry that work in the fields of healthcare planning and better process management. It served as a platform for people that work in different areas around planning in healthcare. The different perspectives on the common problems led to a fruitful exchange on how current processes are ran, what potential difficulties are, and how mathematical optimization can improve current processes in order to provide a better treatment of the patients, a better working environment for employees, and a healthy economical situation of the hospital.



## Institutions and Partners

12 institutions coming from [redacted] and the [redacted] participated in the workshop. German universities and research institutes included: Charité Berlin, ITWM Fraunhofer Kaiserslautern, FAU Erlangen, UNIKA-T Augsburg, and the Karlsruhe Institute of Technology (KIT). The workshop also welcomed two international



guests from Belgium (KU Leuven) and the Netherlands (TU Eindhoven) to reach out for international cooperation in the future. The IBOSS collaboration project HealthFaCT was represented by Johanna Schneider (ITWM Kaiserslautern) and Sebastian Tschuppik (FAU Erlangen).

Moreover, two partners from industry participated at the workshop: [redacted], a software developer of benchmarking solutions to analyze and compare (in-)efficiencies of workflows in hospitals, and [redacted], a developer of planning software for optimized planning at hospitals. The mixture of different expertise made the workshop a vibrant place for collaborative exchange on common planning problems in healthcare.

## Workshop in Numbers

Number of participants	19
Number of Speakers	15
Number of Speakers IBOSS	4
Speakers from Science	6
Speakers from Industry/Practice	5
Speakers by Countries	13x Germany 1x Netherlands 1x Belgium



of Day 1 was closed by an exciting discussion on obstacles for integrating (computational) innovations into the healthcare sector.

Day 2 focused on the mathematical and computational challenges with special regard to modeling uncertainty. Guanlian Xiao (TU Eindhoven) presented an efficient approach to scheduling operating rooms in an adaptive manner. Roel Leus (KU Leuven) gave a comprehensive overview on the current state-of-the-art in stochastic scheduling. The last talk was given by Guillaume Sagnol (IBOSS, TU Berlin) who studied the theoretical cost of fixed OP schedules compared to allowing adaptive rescheduling.

### Scientific Program and Research

The scientific program covered two days: Day 1 focused on practical challenges of optimization approaches in healthcare. Day 2 addressed the mathematical challenges, in particular the omnipresence of uncertainty that plays a key role in efficient healthcare planning.

The workshop was introduced by Matthias Diemer, head of the OP-Management at Charité Berlin and chair of the German Association for OP-Managers (VOPM). He was followed by a presentation of Joachim Gerst, executive OP-manager at Charité Berlin, who gave an exciting overview on the current OP-planning situation at Charité Berlin.

The workshop continued with presentations of the two BMBF research projects IBOSS and HealthFaCT, which reported about the results that they achieved. Next, there were two industry talks of the companies digmed and Imilia, which presented their software solutions. Day 1 was followed by an in-depth simulation study of Jan Schoenfelder of planning policies at the university hospital in Augsburg. The official part



## Schedule

18.10.18	Speaker	Title
10:00 – 10:10	<b>Matthias Diemer</b> (Charité, VOPM)	Welcome
10:10 – 10:30	<b>Joachim Gerst</b> (Charité)	Requirements for Practical Use Cases
10:30 – 11:00	<b>Katharina Bieker</b> (Uni Paderborn) <b>Mona Rams</b> (FU Berlin) <b>Alexander Tesch</b> (ZIB)	IBOSS: Information-Based Optimization of Surgery Schedules
11:00 – 11:30	<b>Katharina Bieker</b> (Uni Paderborn) <b>Mona Rams</b> (FU Berlin) <b>Alexander Tesch</b> (ZIB)	Current Developments in the IBOSS Optimization Tool
11:30 – 11:45	Break	
11:45 – 12:15	<b>Johanna Schneider</b> (ITWM Kaiserlautern)	HealthFaCT – Optimization of medical case in rural environments
12:45 – 13:45	Lunch	
13:45 – 14:15	<b>Enno Bialas</b> (digmed)	OP-Benchmarking in Digmed
14:15 – 14:45	<b>Marcus Ehrenburg</b> (Imilia) <b>Eddie McGreal</b> (Imilia)	Operating Room Planning in Timerbee
14:45 – 15:15	<b>Sebastian Velten</b> (ITWM Kaiserslautern)	Interactive operating theater scheduling with planning horizons
15:15 – 15:30	Break	
15:30 – 16:00	<b>Jan Schoenfelder</b> (UNIKA-T Augsburg)	Simulation-based evaluation of operating room management policies
16:00 – 17:00	Open Discussion on Selected Topics in Practical Challenges in Healthcare	
18:00	Dinner (Luise)	

19.10.18	Speaker	Title
10:00 – 10:30	<b>Invited: Guanlian Xiao</b> (University of Eindhoven)	Models, algorithms and performance analysis for adaptive operating room scheduling
10:30 – 11:00	<b>Invited: Roel Leus</b> (KU Leuven)	Scheduling under Uncertainty – an overview of recent developments
11:00 – 11:30	<b>Guillaume Sagnol</b> (TU Berlin)	Stochastic Extensible Bin Packing
11:30 – 11:45	Break	
11:45 – 12:30	Open Discussion on Selected Topics in Mathematical Optimization in Healthcare	
12:30 – 13:30	Lunch + Farewell	

## Results and Perspectives

The workshop opened many new perspectives for possible collaboration. Out of this workshop, it was decided to add as an official cooperation partner of IBOSS since many topics of common interest could be identified. A further research visit to the UNIKA-T in Augsburg is already arranged. Moreover, the agenda on how to link the research projects IBOSS and HealthFaCT became more concrete.

For more information around IBOSS stay tuned to the official IBOSS website:

<http://www.zib.de/projects/information-based-optimization-surgery-schedules>