

# 5th International Workshop on Planning of Emergency Services

Interdisciplinary approaches for recent  
challenges





# Welcome

We are pleased to welcome you at the “5<sup>th</sup> International Workshop on Planning of Emergency Services” at the Karlsruhe Institute of Technology.

In the last decade research on emergency medical logistics has gained momentum and a number of sophisticated approaches for locating, relocating and dispatching ambulances have been proposed. Nevertheless, in countries like Germany, hardly any Operations Research is used, neither for strategical nor operational EMS planning. Uncertainty about its applicability and the necessity of for tools which are easily usable and intuitive might be two reasons for that.

The ‘5th International Workshop on Planning of Emergency Services’ brings together practitioners and scientists from different research areas and creates an informal setting. The aim of this workshop is to openly discuss current and future opportunities and challenges for emergency medical services systems worldwide. This is an ideal setting, particularly for early career researchers, to present and discuss their current research.

Wednesday September 19 will show the (scientific) progress in the field. On Thursday September 20 we will discuss open challenges, potential approaches and ideas for future collaborations.

The workshop will be held in Karlsruhe, Germany, which is an hour south of Frankfurt. Karlsruhe is home to the Federal Constitutional Court and the Federal Court of Justice. It is conveniently located for daytrips to Strasbourg or the Black Forest.

We hope you enjoy the workshop and have a pleasant stay in Karlsruhe.



# **General information**

## **Venue**

On Wednesday, the workshop takes place in the Karlsruhe palace, an iconic location in the city. Lunch will be served in the workshop room. If the weather permits, we can eat outside and enjoy the Palace gardens. Coffee can be ordered on-demand. In the evening, a barbecue will be organised at the Palace.

On Thursday, we move the venue to a university building very close to the Palace. The workshop will take place in building 20.30, room 3 in the basement. The address is Englerstr. 2. Coffee breaks and lunch will take place in the main hall of the building.

## **Public transport**

The public transport network of Karlsruhe consists of buses and trams and the city is easily reachable by train. Please be aware of the construction sites in Karlsruhe. We recommend to take tram 4 to take to the Palace (stop "Marktplatz") or the university (stop "Kronenplatz"). It departs in front of the train station. Also bus 10 takes you directly to "Marktplatz" leaving from the train station. To plan your journey, visit [www.bahn.de](http://www.bahn.de) for trains and [www.kvv.de](http://www.kvv.de) for public transport in Karlsruhe.

## **Car**

If you travel by car, there are several possibilities to park your car in the city center. For example, at Schloßplatz 16 or at Zirkel 2. Unfortunately, there is no free parking close by.

## **Internet access**

On Wednesday we will have Wi-Fi in the Palace, the login information will be displayed in the workshop room. The eduroam network is available at the workshop venue on Thursday. Around the city you can use KA-WLAN for free.

## **Contact information**

Melanie's phone number: +49 (0)174 6641826



# Programme

**Wednesday, September 19**

<b>Registration</b>	<b>9:00 – 10:00</b>
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<b>Welcome</b>	<b>10:00 – 10:30</b>
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*Melanie Reuter-Oppermann and Sebastian Rachuba*

<b>Workshop</b>	<b>10:30 – 12:00</b>
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## **Optima Predict**

*Tef Jansma, Business Analyst Optima at Intermedix*

Our workshop will focus on a location problem, specifically base/standby post positions related to variables such as hospitals and large bases in a high-utilisation situation. The results we obtained for a large client in the UK are better than what traditional MEXCLP-based approaches achieve. During the workshop, we will use Optima Predict to illustrate this case and provide background regarding the used methodology. Finally, we discuss why, at least on the local level, this approach delivers the results it does. We anticipate an interactive session with space for discussion.

<b>Lunch</b>	<b>12:00 – 13:00</b>
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<b>Talk 1</b>	<b>13:00 – 13:45</b>
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## **Shift schedule optimization for basic life support ambulances using Stochastic Programming**

*Pieter van den Berg*

Many ambulance services have a fixed schedule of shifts for their vehicles. This defines the available capacity for each time of the day, which does not always match the demand for ambulances. We present

a Stochastic Programming model to optimize the shift schedules of Basic Life Support ambulances that are used for non-urgent patient transportation. Even though these BLS ambulances cannot be assigned to emergency calls, we have shown in earlier work that the scheduling of non-urgent patient transportation requests affects the coverage for emergency calls. This is due to the fact that transportation requests that cannot be assigned to a BLS ambulance are assigned to an ALS ambulance that is normally providing coverage to emergency calls. In the shift schedule optimization, we use the impact on the coverage for emergency calls as our objective. By optimizing the schedule based on a large set of simulated scenarios, we find schedules that can improve the service provided to non-urgent patients and improve the remaining coverage provided by ALS ambulances. Scenarios are generated from a set of over 10,000 patient transportations. The resulting shift schedule is evaluated on a different set of scenarios. In addition, we apply the new schedule to an online optimization model for the real-time scheduling of patient transportations in which we use the data from the first nine months of 2014.

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**Talk 2**

**13:45 – 14:30**

## **Forecasting medical emergency events: A zero-inflated Poisson approach**

*Niki Matinrad*

In order for efficient resource management to be possible, it is necessary to have information about the expected demand for service. In collaboration with SOS Alarm, who operationally manages the major part of the ambulance resources in Sweden, this study is aimed at developing a forecasting model for daily medical emergencies, and investigating which factors that are relevant to be included in the model. Data from ambulance call records in three counties in Sweden from the years 2013 and 2014 were used for modelling and analysis. After initial data cleaning, the call data was aggregated into grid zones, and complemented with additional population and grid zone characteristics. In addition to the spatial division, the call data was also partitioned into time slots, one for each hour of the week (168 slots), and a forecast was produced for each zone and time slot. Due to the spatial and temporal



division, there was a large number of zeros in the call data. Therefore, zero-inflated Poisson regression (ZIP) was used to develop the forecasting model and to select significant factors. The model was compared to the forecasting model that is currently incorporated in the information system used by the ambulance dispatchers. The results show that the new model performs better than the existing one.

### **Talk 3**

**14:30 – 15:15**

#### **sim911: A discrete event simulation tool for emergency medical services and its application to the canton of St. Gallen**

*Michael Schmid*

In the 21st century, emergency medical services face several challenges: an increasing number of emergency calls due to growing and ageing population, shorter response time thresholds demanded by society and/or law, and severe cost pressure.

How to take good decisions in such a complex system where life is at risk? Here, simulations can be of great help. They allow for evaluating detailed what-if scenarios in a safe virtual environment and offer great opportunities for involving healthcare professionals and management in model-development. We present sim911, a rule based discrete event simulation for emergency medical services. This tool allows for a wide range of applications and has been used by EMS and air rescue in 13 cantons in Switzerland for over 10 years. We use a generic 3-Tier architecture with independent data-, simulation- and analysis layer which enables us to tackle various operational, tactic and strategic questions.

In the first part of our talk, we provide a short overview of sim911. In the second part, we present a joint project with "Rettung St. Gallen" which resulted in a relocation of 11 bases.

**Towards a decision support tool for EMS management in Germany***Melanie Reuter-Oppermann and Sebastian Rachuba*

This research project aims at studying necessary aspects for designing a decision support tool for Emergency Medical Services (EMS) management in Germany. It combines knowledge from different disciplines like (Behavioural) Operations Research (BOR/OR), Information Systems (IS) and Service Science. The aim is to support dispatchers and EMS managers with various backgrounds to make decisions on various planning problems on different levels for varying time horizons. The research also intends to bridge the gap between academic OR and the use of OR in practice.

As a first step, we contacted decision makers in an empirical study by means of web-based questionnaires. The results of the questionnaires show that decision makers have indeed different and often multiple objectives that need to be included in a decision support tool.

**Coffee break****16:00 – 16:30****Poster Session****16:30 – 17:30****Wrap-up****17:30 – 17:45****Dinner****18:00 – end**

A BBQ will be served in the Palace Garden.

## **Thursday, September 20**

<b>Discussions Part 1</b>	<b>9:30 – 10:15</b>
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<b>Coffee break</b>	<b>10:15 – 10:30</b>
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<b>Discussions Part 2</b>	<b>10:30 – 12:30</b>
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<b>Lunch</b>	<b>12:30 – 13:30</b>
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<b>Discussions Part 3</b>	<b>13:30 – 15:00</b>
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<b>Coffee break</b>	<b>15:00 – 15:15</b>
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<b>Closing</b>	<b>15:15 – 16:00</b>
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*Melanie Reuter-Oppermann*

Summary of the workshop, the discussions and the ideas for future collaborations.

If participants are interested, we can stay in the workshop room after the wrap-up for deeper discussions, first paper drafts etc.



## Programme at a glance

	<b>Wednesday, Sept 19<sup>th</sup></b>	<b>Thursday, Sept 20<sup>th</sup></b>
09:00 - 09:30	Registration	
09:30 - 10:00		Discussion
10:00 - 10:30	Welcome	Coffee break
10:30 - 11:00	Workshop	Discussion
11:00 - 11:30		
11:30 - 12:00		
12:00 - 12:30	Lunch	
12:30 - 13:00		Lunch
13:00 - 13:30	Talks	Discussion
13:30 - 14:00		
14:00 - 14:30		
14:30 - 15:00		
15:00 - 15:30		Coffee break
15:30 - 16:00		Closing
16:00 - 16:30	Coffee break	
16:30 - 17:00	Poster session	
17:00 - 17:30		
17:30 - 18:00	Wrap-up	
18:00 - end	Conference Dinner (BBQ)	



# Notes

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