



# GCPR 2016

38th German Conference  
on Pattern Recognition  
Conference Digest  
September 12-15, 2016  
Hannover, Germany

organized by

**tnt**

**mpi**  
max-planck-institut  
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# 1 PREFACE

It is a pleasure to organize the 38th German Conference on Pattern Recognition (GCPR) in Hanover during September 11-14, 2016.

This year's call for papers resulted in 84 submissions from institutions of 21 countries. Each paper underwent a rigorous double-blind reviewing procedure by at least three Program Committee (PC) members, sometimes with support from additional experts. Afterwards, one of the involved PC members served as moderator for a discussion among the reviewers and prepared a consolidation report that was also forwarded to the authors in addition to the reviewers. The final decision was made during a PC meeting held in Hanover based on all reviews, discussions and, if necessary, additional reviewing. As a result of this rigorous reviewing procedure, 36 of the 84 submissions were accepted, which corresponds to an acceptance rate of 43%. Finally, from these accepted papers the organisers chose 20 for oral presentation in a single-track program and 16 for poster presentation. In accordance to the conference tradition, we organized a Young Researchers Forum to promote scientific interaction between outstanding young researchers and our community. The work of 5 selected students will be presented at the conference and included in these proceedings. Additionally 20 posters of the GCPR R3 Nectar Track will be presented. The accepted papers cover the entire spectrum of pattern recognition, machine learning, image processing, and computer vision. We thank all authors for their submissions to GCPR 2016 and all reviewers for their valuable assessment.

In addition to the presentations from the technical program we are also happy to welcome three internationally renowned researchers as our invited speakers to give a key-note lecture at GCPR 2016: Patrick Perez (Technicolor France), Thomas Wiegand (HHI Berlin, Germany) and David Fleet (University of Toronto, Canada). The technical program is complemented by a workshop on New Challenges in Neural Computation and by two tutorials: one on "Embeddings and Metric Learning" and the other on "CNNs".

The success of GCPR 2016 would not have been possible without the support of many institutions and people. We would like to thank MVTec Software GmbH, Viscom Vision Technology, Technicolor S.A., Robert Bosch GmbH, and DAGM (Deutsche Arbeitsgemeinschaft für Mustererkennung e.V.) for their sponsorship. Special thanks goes to the members of the Technical Support and the Local Organizing Committee. Finally, we are grateful to Springer for giving us the opportunity of continuing to publish GCPR proceedings in the LNCS series.

This year's conference city, Hanover, was founded in 1150 and was once the family seat of the Hanoverian Kings of Great Britain. Since then it has evolved into one of the 15 largest cities in Germany with 523 642 inhabitants. The Hanover fairground is the largest in the world, due to numerous extensions especially for the Expo 2000. The Hanover Fair and the CeBIT are counted among the most important fairs in Hanover. The city is of national importance because of its universities and medical school, its international airport and its large zoo. With its many parks and its large municipal woods, Hanover is the second most green city in Europe. It is an honor to host the GCPR this year and we are looking forward to witness animated scientific discussions.

July 2016

Bodo Rosenhahn  
Björn Andres

## 2.1 Organizers

**Conference Chair:** Prof. Dr.-Ing. Bodo Rosenhahn  
(Leibniz Universität Hannover, Germany)

**Program Chair:** Dr. Björn Andres  
(MPI for Informatics, Germany)



## 2.2 Program Committee

Andreas Maier	University of Erlangen-Nürnberg
Andres Bruhn	University of Stuttgart
Angela Yao	University of Bonn
Bastian Goldlücke	University of Konstanz
Bastian Leibe	RWTH Aachen University
Björn Menze	TU Munich
Carsten Rother	Tu Dresden
Carsten Steger	MVTec Software GmbH
Christian Bauckhage	Fraunhofer IAIS
Christian Heipke	LU Hannover
Christoph Lampert	IST Austria
Daniel Cremers	TU Munich
Fred Hamprecht	University of Heidelberg
Helmut Mayer	Bundeswehr University Munich
Horst Bischof	Graz University of Technology
Joachim Denzler	University of Jena
Josef Pauli	University of Duisburg-Essen
Jürgen Gall	University of Bonn
Laura Leal-Taixé	ETH Zürich
Mario Fritz	MPI for Informatics
Martin Welk	UMIT Hall
Olaf Hellwich	TU Berlin
Olaf Ronneberger	University of Freiburg
Peter Gehler	MPI Intelligent Systems
Reinhard Koch	Universität Kiel
Rudolf Mester	University of Frankfurt
Simone Frintrop	University of Hamburg
Thomas Pock	Graz University of Technology
Ullrich Köthe	University of Heidelberg
Volker Roth	University of Basel
Walter Kropatsch	Vienna University of Technology

## 3 LOCAL ARRANGEMENTS

### 3.1 Venue

The GCPR 2016 will be held at Hotel Dormero, Hanover, Hildesheimer Straße 34 - 38, 30169 Hanover - Germany  
<http://www.dormero.de/en/hotel-hannover/>



Workshops and tutorials will take place on Monday, September 12th. The main conference will be held from Tuesday, September 13th to Thursday, September 15th.

Floorplans of the Dormero hotel can be found can be found from page 11.

### 3.2 Location and Directions

#### How to get there by car

When on the A2 or A7 interstates, drive until you get to the interchange of “Hannover-Ost” and then on the A7 in the direction of Anderten until you get to the exit “Hannover-Anderten”, where you turn into the B65 federal highway in the direction of the city center. Drive beyond the intersection “Seelhorster Kreuz” and onto the B3 federal highway until you get to the intersection with the “Hildesheimer Strasse” road. Follow this road till you get to the center as far as “Geibelstrasse”. On your left, you will find the DORMERO Hotel Hannover.

The hotel's parking lot and underground garage has space for 160 cars. The parking ticket is 2,- € per hour or 18,- € per day for hotel guests. How to get there by public transport

From the Hanover Central Railway Station take subway (U-Bahn) lines 1 or 2 going to "Laatzen" or subway (U-Bahn) line 8 going to "Messe/Nord" and get off at the station "Hannover Schlägerstraße". The trip will take about 10 minutes.

#### How to get there by air

Hanover International Airport (HAJ) is 14 km away from the DORMERO Hotel Hannover. The cab ride will take about 27 minutes.

### 3.3 Registration

The registration and information desk will be located at the conference hotel Dormero , main entrance. The team of kcm (in orange shirts) will be glad to answer all your questions regarding the conference and Hannover (f.e. public transport, sightseeing, shopping, restaurant).

Opening times:

- Monday and Tuesday from 8:00 am
- Wednesday and Thursday from 8:30 am

### 3.4 Name Badge

Please wear your name badge all the time. Depending on your registration status, it may contain different colored marks that give you access to the workshops and tutorials only or the main conference.

### 3.5 Internet Access

Internet access will be provided by the Wifi network of the hotel:

SSID: "Dormero"

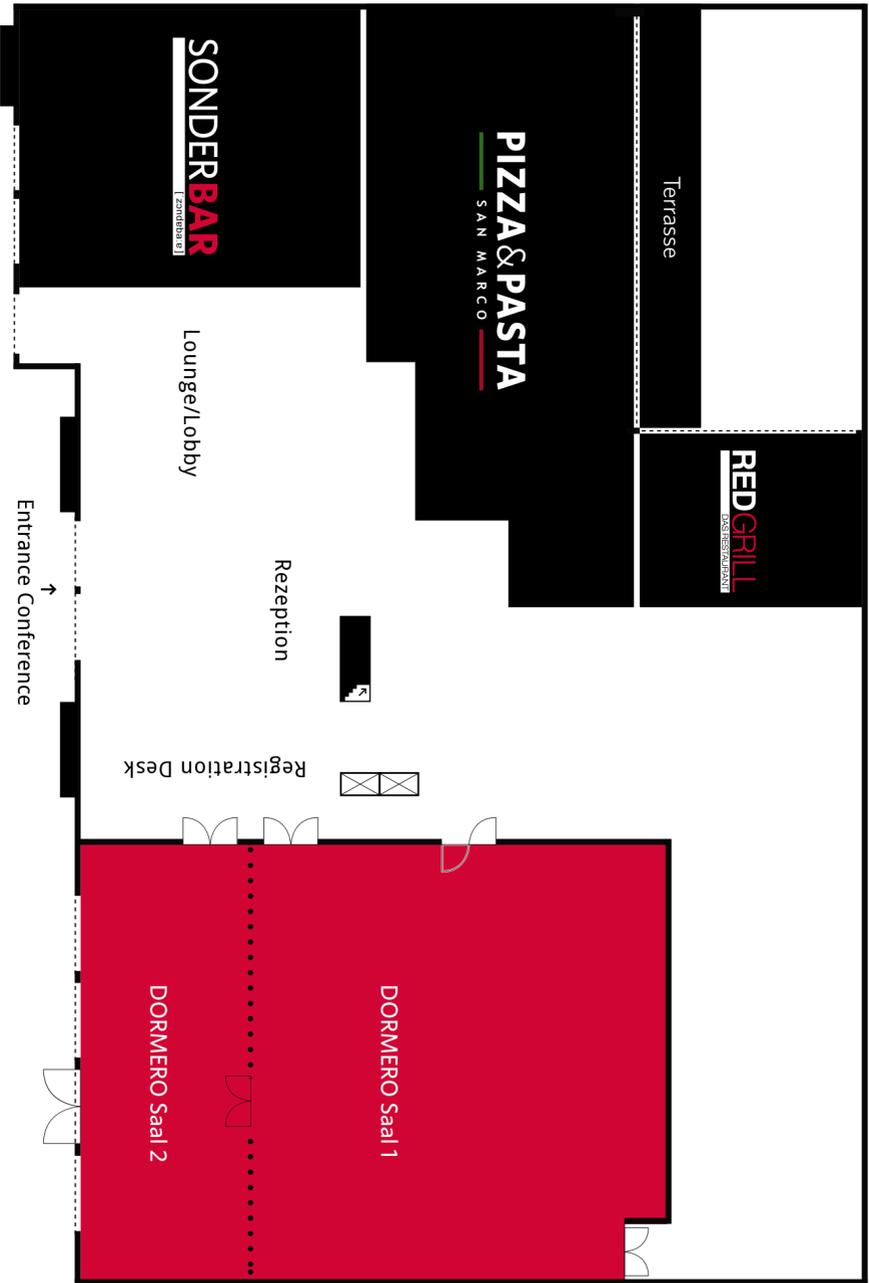
No password is required.

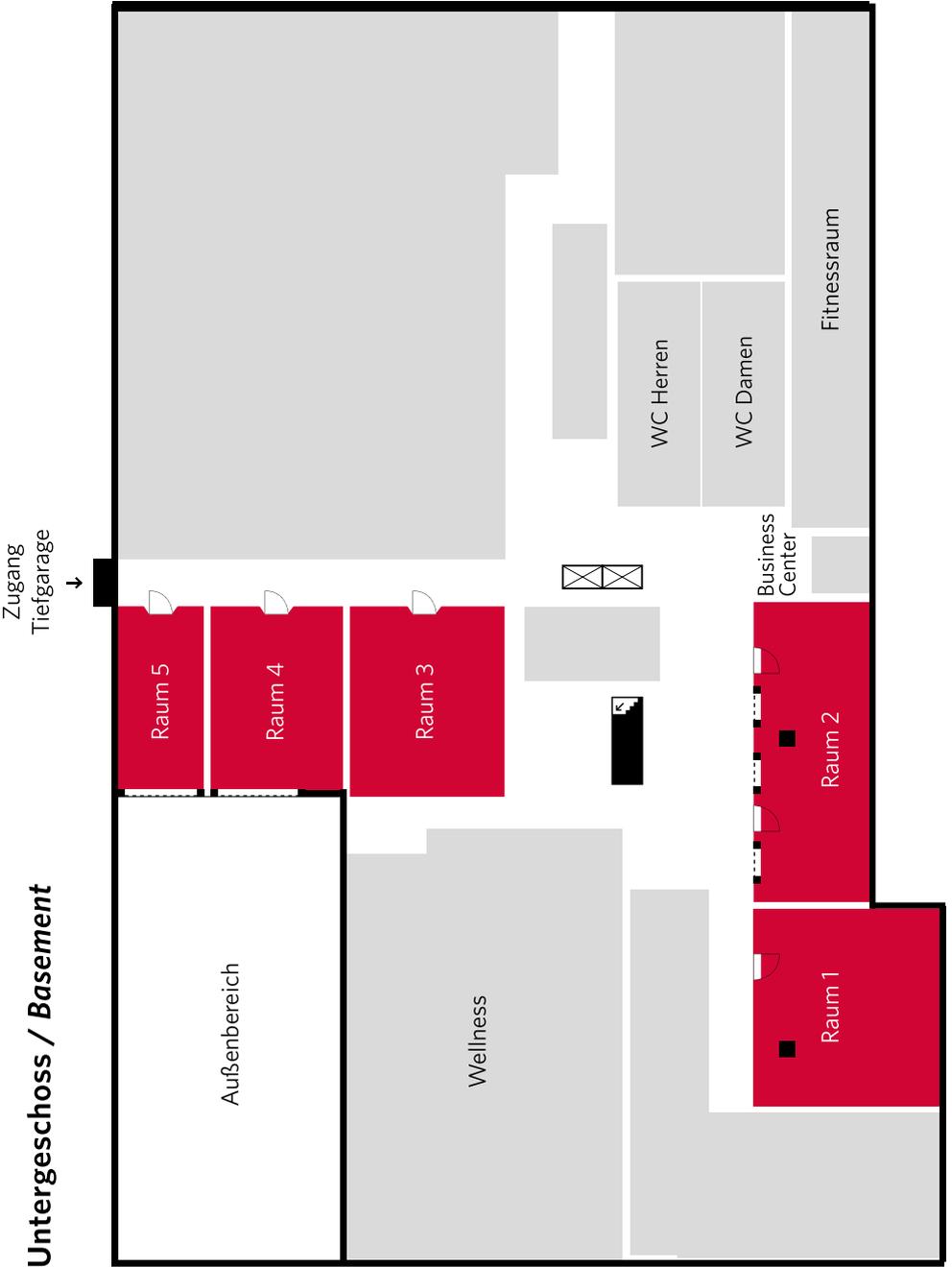
The QR-Code can be used by Android devices.



WiFi Dormero

Das Erdgeschoss / First floor





## 3.7 Restaurants

### Hannover for gourmets

Lovers of fine food will find a spectacular variety in Hannover. Whether you prefer haute cuisine, international specialities, unusual themed restaurants or traditional regional delicacies, there is something to suit every taste.

### From good plain fare to multiculti

The capital of Lower Saxony is home to foods and flavours from all over the globe and offers a huge selection of specialities from the Mediterranean, Asia and Latin America. Good plain German fare is served not only in many local pubs, but also in top class restaurants. Foodies can look forward to creative crossover cuisine with highly imaginative culinary combinations.

Nearly every district has its own Italian or Greek. Turkish cuisine is also a firm feature, ranging from simple kebab shops to sophisticated eateries. The choice of Far Eastern venues covers everything from fast food to first class. The magazine “Hannover geht aus!” provides comprehensive information (in German) about the culinary scene in and around Hannover.

### Queen of the vegetables and high-spirited dexterity

The traditional regional cuisine tends to be solid and substantial – as you would expect of the locals who, according to the regional anthem of Lower Saxony, “have their feet firmly on the ground and can weather any storm”. Most dishes are typically served with potatoes, sometimes in new-fangled variations, but first and foremost as good old boiled potatoes. In spring, asparagus is very popular: this finest of all veg tastes equally good with melted butter or hollandaise sauce and is normally accompanied with cured ham, a pork or veal escalope or salmon. When autumn comes around, it is the start of the curly kale season, which is traditionally enjoyed with a regional spicy sausage speciality.

Regional delicacies also include a platter of cold cuts and “wedding day soup”, a popular starter which contains tiny meat dumplings and egg garnish. Yeast cake topped with butter and almonds is traditionally served with afternoon coffee, while “Welfenspeise” a typical local desert consisting of blanc-mange and zabaglione, takes its royal name in reminiscence of Hannover’s

role as the capital of the Kingdom of Guelph in the 19th century.

“Lüttje Lage”, a drink that is exclusive to Hannover, originates from the annual Marksman’s Fair. The ritual has a strong alcoholic focus and requires two special glasses: one filled with Lüttje Lage beer, the other with clear schnapps. The trick is to hold the beer glass between thumb and index finger of one hand, and the schnapps glass between the middle and ring fingers of the same hand and then raise both glasses to your lips so that the schnapps and beer can be drunk in one go. The Lüttje Lage tradition dates back to the days of beer brewer Cord Broyhan in the 16th century. The Broyhan Haus – where the brewery pioneer lived – is now a gastropub in the city’s second-oldest half-timbered building.

Visitors who are interested in the history and technical aspects of brewing are advised to book a tour of Herrenhäuser brewery. In addition to the major traditional breweries Gilde and Herrenhäuser, Hannover also has a large number of microbreweries which serve their customers first-class home brew, such as Brauhaus Ernst August on the edge of the Old Town.

### Excellent and unexpected

Hannover’s only Michelin star restaurant is situated in the only street in the region which is under a preservation order: Ole Deelee in Heinrich-Wöhler-Strasse in Grossburgwedel, which has defended its star for four years. Other top class restaurants in and around Hannover which have earned a mention in the major restaurant guides include Titus, Die Insel, Le Monde and Tropeano Di Vino in Hanover, Gasthaus Lege in Burgwedel, Berggasthaus Niedersachsen in Gehrden and Gasthaus Müller in Barsinghausen.

However, discerning gourmets also appreciate creative culinary experiences outside the ranks of haute cuisine – especially when served in an original setting. For instance, who would expect to find top-of-the-range and outstandingly fresh cuisine at Theater am Küchengarten (tak), which is actually a cult cabaret venue? Or that “eat the world” offers culinary guided trips around the city? Hannover is also home to the World Of Kitchen (WOK), the only museum in Europe that is dedicated to this subject. Not to forget summer events such as Maschsee Lake Festival, outdoor venues including a large number of beautiful beer-gardens and rooftop terraces such as Schöne Aussichten 360°, Roof Garden or 6 Sinne Skybar Restaurant. Another tip for culinary aficionados is the solar-powered catamaran which cruises back and forth on Maschsee Lake from April to November and serves a fantastic Sunday brunch.

Source: <http://www.hannover.de/en/News/Hannover-for-gourmets>

■ **DORMERO Hotel Hannover**

Hildesheimer Straße 34 - 38, 30169 Hannover

<https://www.dormero.de/hotel-hannover/restaurant-bar/>

There are lunch specials at the conf. Hotel, as well as:

- RED GRILL – Das Restaurant (Mon-Sun 12:00-23:00)
- PIZZA & PASTA – San Marco (Mon-Sun 12:00-23:00)

■ **Mövenpick**

Georgstraße 35, 30159 Hannover

<http://www.moevenpick-restaurants.com/hannover-kroepcke>

1,200m distance to conf. Hotel and 15 min walk

kitchen: european

(Mon-Thu 08:00-22:00, Fri-Sat 08:00-23:00, Sun 09:00-22:00)

■ **L'Osteria**

Lavesstraße 1-2, 30159 Hannover

<http://losteria.de/hannover-lavesstrasse/>

1,300m distance to conf. Hotel and 16 min walk

kitchen: italien

(Tue-Sat 11:00-24:00 and Sun 12:00-21:30)

■ **IchiBan**

Friedrichswall 10, 30159 Hannover

<http://www.ichiban-hannover.de/>

600m distance to conf. Hotel and 8 min walk

kitchen: japanese (delicious Sushi)

(Mon-Sun 11:00-15:00 and 18:00-22:30)

■ **Al Dar**

Königstraße 3, 30175 Hannover

<http://www.aldar-hannover.de/index.php>

1,500m distance to conf. Hotel and 18 min walk

kitchen: syrian

(Mon-Sun 12:00-15:00 and 18:00-23:00)

**■ Schweinske**

Königsworther Straße, 30167 Hannover  
<http://schweinske.de/umgebung/hannover/>  
2,500 m distance to conf. Hotel and 6 min by car  
kitchen: german  
(Mon-Fri 11:00-23:00, Sat 09:00-00:00 and Sun 09:00-23:00)

**■ Rias Baixas II**

Plaza de Rosalia 2, 30449 Hannover  
[http://spanische-restaurants.com/riasbaixas2/index\\_riasbaixas2.html](http://spanische-restaurants.com/riasbaixas2/index_riasbaixas2.html)  
2,900m distance to conf. Hotel and 8 min by car  
kitchen: spanish (delicious Tappas)  
(Mon-Thu 09:30-24:00 and Sun 10:00-23:00)

**■ Brauhaus Ernst August**

Schmiedestraße 13, 30159 Hannover  
<http://www.brauhaus.net/>  
1,500m distance to conf. Hotel and 5 min by car  
kitchen: german  
(Mon-Thu 08:00-03:00, Fri-Sat 08:00-05:00 and Sun 09:00-03:00)

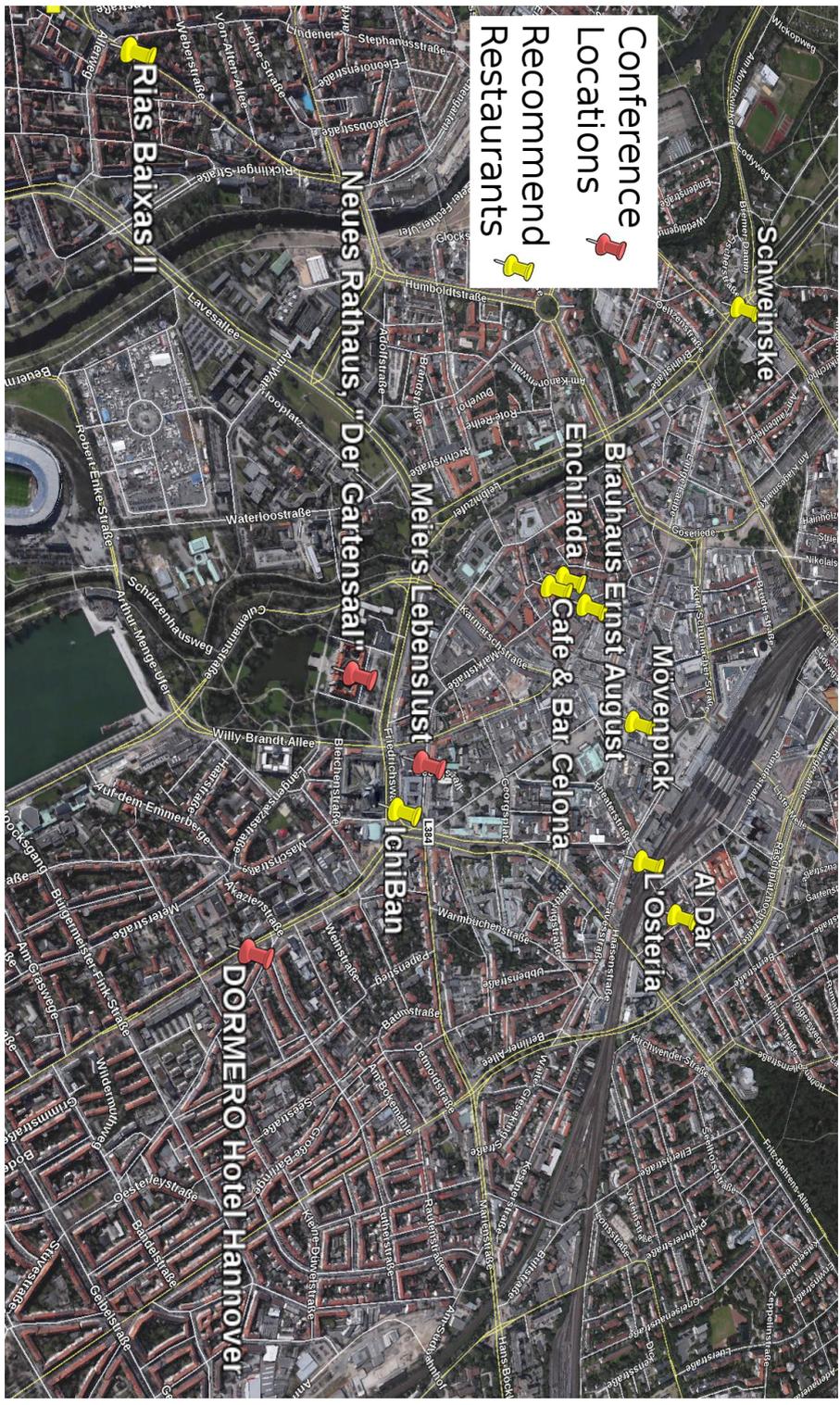
**■ Enchilada**

Knochenhauerstraße 36, 30159 Hannover  
<http://www.enchilada.de/hannover>  
1,500m distance to conf. Hotel and 5 min by car  
kitchen: mexican  
(Mon-Thu 17:00-24:00, Fri 17:00-02:00, Sat 12:00-02:00 and Sun 17:00-24:00)

**■ Cafe & Bar Celona**

Knochenhauerstraße 42, 30153 Hannover  
<http://www.celona.de/mein-celona/details/cafe-bar-celona-hannover-altstadt>  
1,400m distance to conf. Hotel and 5 min by car  
kitchen: spanish, international  
(Mon-Thu 09:00-01:00, Fri-Sat 02:00-02:00 and Sun 09:00-01:00)

Conference Locations  
Recommend Restaurants



Schweinske

Brauhaus Ernst August

Enchilada Cafe & Bar Celona

Mövenpick

Al Dar

L'Osteria

Meiers Lebenslust

Ichiban

Neues Rathaus, "Der Gartensaal"

DORMERO Hotel Hannover

Rias Baixas II

## 3.8 Sightseeing

### In the Heart of the Old Town



The historic half-timbered buildings in the Old Town are one of the most impressive sights in the city centre. The magnificent Market Church and the Old Town Hall are the southernmost examples of North German brick Gothic architecture. Stroll around picturesque lanes, explore upmarket boutiques, relax at attractive cafés and restaurants. Ballhofplatz, one of the most peaceful squares in the Old Town, is home to a theatre and is the venue for all manner of celebrations in summer. Just a few yards further along, you can relax on the banks of the River Leine and watch the world go by. This is where Germany's oldest flea market takes place on Saturdays.

### The New Town Hall



Built in 1913, it is the seat of the mayor of Hannover.

Many visitors are quite astonished to hear that the magnificent building they are standing in front of is, actually, the “new” town hall. Its size and grand architectural style make it look more “historical”, like a relict from more majestic times, when Hannover used to be a kingdom. The town hall itself was, however, ceremonially opened on 20 June 1913, after twelve years building time. The new townhall is the residence of the mayor, the head of the municipal administration. It is here, that the political bodies hold their sessions, receptions for official guests of the city and art exhibitions are held, the “Citizen’s Office” is also here. The doors of the town hall are always wide open to all visitors. Four scale models of Hannover are on permanent display under the nearly one hundred metre high dome of the town hall lobby, showing the city as it was in the Middle Ages, before World War II , the destruction of 1945 and the townscape of today. These models are always immensely popular amongst the visitors.

## Royal Gardens of Herrenhausen Baroque palace and garden world



The jewel in the crown. Hannover has an exceptional woman to thank for the greatest treasure that the city possesses: the Baroque garden in Herrenhausen was created by Electress Sophie (1630-1714).

Music, dance and theatre at Herrenhausen – this tradition thrives today with drama in the hedge theatre, concerts, festivals, world-class small-scale performing arts and international fireworks competitions to enliven Grosser Garten in Herrenhausen all year round.

## 4.1 Monday, September 12th



Dormero Saal 2



Dormero Raum 1

**Registration**

8:00-18:00

Registration Desk

**Workshop – New Challenges in Neural Computation (NC<sup>2</sup>)** 9:00-17:50

Dormero Saal 2

This year, again, we received a large number of very good contributions. All regular contributions will be presented by a talk of 15 min plus 5 min questions, short contributions will be presented by a talk of 10 min plus 5 min questions.

Besides regular talks of the participants, two invited speakers will present their work:

Prof. Jörg Lücke from University of Oldenburg will present research in deep learning

Prof. Marc Toussaint from University of Stuttgart will talk about his research in autonomous learning and robotics.

9:00            Opening

9:05-10:00    Advances in learning vector quantization

- T. Villmann, M. Kaden, A. Bohnsack: Classification Margin Dependent Exploration Horizons of Prototypes for Outlier Robust Classification in Learning Vector Quantization
- B. Paassen, A. Schulz, B. Hammer: Linear Supervised Transfer Learning for Generalized Matrix LVQ
- K. Bunte, E. S. Baranowski, W. Arlt, P. Tino: Relevance Learning Vector Quantization in Variable Dimensional Spaces

10:00-11:00   Processing time series data

- F. Melchert, U. Seiffert, M. Biehl: Functional approximation for the classification of smooth time series
- W. Aswolinskiy, J. Steil: Parameterized Pattern Generation via Regression in the Model Space of Echo State Networks
- F. Raue, M. Liwicki, A. Dengel: Symbolic Association Learning inspired by the Symbol Grounding Problem

11:00-11:30   Coffee break

11:30-12:30   Keynote talk

Marc Toussaint (University of Stuttgart): Representation Learning – I’ve heard that one before

12:30-14:00   Lunch break

14:00-15:00   Keynote talk

Jörg Lücke (University of Oldenburg): Neural Simpletrons – Minimalistic Deep Neural Networks for Probabilistic Learning with Few Labels

15:00-16:00 Sampling, modelling, and optimization

- O. Walter, R Hüb-Umbach: Unsupervised Word Discovery from Speech using Bayesian Hierarchical Models
- R. Rayyes, J. Steil: Goal Babbling with Direction Sampling for simultaneous exploration and learning of inverse kinematics of a humanoid robot
- J. Brinkrolf, T. Mittag, R. Joppen, A. Dröge, K.-H. Pietsch, B. Hammer: Virtual optimisation for improved production planning

16:00-16:30 Coffee break

16:30-17:40 Computer vision and deep learning

- H. Berntsen, W. Kuijper, T. Heskes: The Artificial Mind's Eye - Resisting Adversarials for Convolutional Neural Networks using Internal Projection
- M. Garbade, J. Gall: Handcrafting vs Deep Learning: An Evaluation of NTraj+ Features for Pose Based Action Recognition
- J. Kreger, L. Fischer, U. Bauer-Wersing, T. Weisswange: Quality Prediction for a Road Detection System
- P. P. Fouopi, G. Srinivas, S. Knake-Langhorst, F. Köster: Object Detection Based on Deep Learning and Context Information

17:40-17:50 Nomination of the best presentation award, closing

17:50-18:30 Meeting of the GI Fachgruppe Neural Networks

### Tutorial – Embeddings and Metric Learning

9:00-12:00

Dormero Raum 1

9:00-9:45

#### Embeddings

Talk by Zeynep Akata

9:45-10:00

Break

- 10:00-11:00    **Applications of Embeddings**  
 Talk by Zeynep Akata (Max Planck Institute for Informatics, Saarbrücken)  
 Practical Session by Yongqin Xian (Max Planck Institute for Informatics, Saarbrücken)
- 11:00-11:15    Coffee Break
- 11:15-12:00    **Metric Learning**

**Tutorial – NVIDIA**

14:00-18:00

Dormero Raum 1

- General Overview of natural Networks
- Deep Natural Networks
- Convolutional Neural Networks
- The benefit of GPUs for DNN
- Frameworks for deep learning on GPUs
- Introduction to Caffe
- Hands-on examples doing Digit Recognition

16:00-16:30    Coffee Break

**Icebreaker**

19:00-21:30

Meiers Lebenslust Restauration und Hausbrauerei

■ **Meiers Lebenslust Restauration und Hausbrauerei**

Osterstraße 64, 30159 Hannover

<http://www.meiers-lebenslust.de>

800m distance to conf. Hotel and 10 min walk

(Mon-Sun 11:30-00:00)

See Page 16 for the location on the map.

## GCPR Main Conference



Dormero Saal 1



Dormero Saal 2

## 4.2 Tuesday, September 13th

**Registration**

8:00-18:00

Registration Desk

**Opening**

9:00-9:20

Reinhard Koch

Dormero Saal 1

Welcome addresses by Volker Epping (President of LUH) and Bodo Rosenhahn.

**German Pattern Recognition Award**

9:20-10:00

Chair: Reinhard Koch

Dormero Saal 1

The German Pattern Recognition Award 2016 will be awarded to a young scientist for outstanding contributions in the field of computer vision and pattern recognition. It is sponsored by Daimler AG.

**Coffee Break**

10:00-10:30

Lounge/Lobby

**Oral Session: Image Processing**

10:30-12:30

Chair: Carsten Steger

Dormero Saal 1

■ **Precise and Robust Line Detection for Highly Distorted and Noisy Images**

*Dominik Wolters (Kiel University) and Reinhard Koch (Kiel University)*

■ **Pixel-level Encoding and Depth Layering for Instance-level Semantic Segmentation**

*Jonas Uhrig (Daimler AG, University of Freiburg), Marius Cordts (Daimler AG, TU Darmstadt), Uwe Franke (Daimler AG), Thomas Brox (University of Freiburg)*

■ **Artistic style transfer for videos**

*Manuel Ruder (University of Freiburg), Alexey Dosovitskiy (University of Freiburg), Thomas Brox (University of Freiburg)*

■ **Semantically Guided Depth Upsampling**

*Nick Schneider (Daimler AG, Karlsruhe Institute of Technology), Lukas Schneider (Daimler AG, ETH Zurich), Peter Pinggera (Daimler AG), Uwe Franke (Daimler AG), Marc Pollefeys (ETH Zurich), Christoph Stiller (Karlsruhe Institute of Technology)*

**Lunch Break**

12:30-14:00

See Page 12 for more information on restaurants.

**Invited Talk: David Fleet (University of Toronto)**

14:00-15:00

**Atomic-resolution multiview reconstruction using Cryo-EM**

Chair: Bodo Rosenhahn

Dormero Saal 1

Electron Cryomicroscopy (Cryo-EM) is an exciting vision-based technique for estimating the 3D atomic-resolution structure of molecules such as proteins and viruses. It addresses one of the foremost research problems in biology and medicine, i.e., macromolecular structure discovery. The problem, in a nutshell, is a form of multi-view 3D structure determination, inferring the 3D electron density of a particle from a large set of 2D transmission electron microscope images. We discuss recent advances, using Bayesian methods and branch-and-bound optimization, that provide the foundation for a new cryo-EM platform called CryoSPARC.

**Oral Session: Learning I**

15:00-16:00

Chair: Bernt Schiele

Dormero Saal 1

■ **Chimpanzee Faces in the Wild: Log-Euclidean CNNs for Predicting Identities and Attributes of Primates**

*Alexander Freytag (Computer Vision Group Jena, Michael Stifel Center Jena), Erik Rodner (Computer Vision Group Jena, Michael Stifel Center Jena), Marcel Simon (Computer Vision Group Jena), Alexander Loos (Fraunhofer IDMT), Hjalmar Kuehl (MPI Evolutionary Anthropology, German Centre for Integrative Biodiversity Research), Joachim Denzler (Computer Vision Group Jena, Michael Stifel Center Jena, German Centre for Integrative Biodiversity Research)*

■ **Convolutional scale invariance for semantic segmentation**

*Ivan Krešo (University of Zagreb), Denis Čaušević (University of Zagreb), Josip Krapac (University of Zagreb), Siniša Šegvić (University of Zagreb)*

<b>Coffee Break</b>	16:00-16:30
	Lounge/Lobby

<b>Oral Session: Optimization</b>	16:30-17:30
Chair: Joachim Buhmann	
	Dormero Saal 1

■ **Convexification of Learning from Constraints**

*Iaroslav Shcherbatyi (Max Planck Institute for Informatics, Saarland University), Björn Andres (Max Planck Institute for Informatics)*

■ **FSI Schemes: Fast Semi-Iterative Solvers for PDEs and Optimisation Methods**

*David Hafner (Saarland University), Peter Ochs (Saarland University), Joachim Weickert (Saarland University), Martin Reißel (FH Aachen), Sven Grewenig (Saarland University)*

<b>DAGM Meeting</b>	17:30-20:00
	Dormero Saal 1

The German Association for Pattern Recognition (DAGM) invites every DAGM member to the annual gathering.

## 4.3 Wednesday, September 14th

<b>Registration</b>	8:30-18:00
	Registration Desk

<b>Invited Talk: Thomas Wiegand (HHI Berlin)</b>	9:00-10:00
<b>Image compression, processing, and machine learning</b>	
Chair: Jörn Ostermann	
	Dormero Saal 1

Most bits on the Internet are representing compressed video signals. Hence, video processing and compression algorithms are among the most important computation tasks. Another extremely popular topic is machine learning for classification, regression and pattern recognition. This talk will present various ideas how machine learning can be used together with video processing and compression. The inversion of deep neural networks for explaining classification results in video signals will be presented. As most video is available as coded data, pattern recognition in the compressed domain is of interest. We will show how a learning algorithm can improve real-time video encoding. Finally, we will present how machine learning and subjective video quality measurement using EEG leads to improved quality assessment and subjectively optimized video encoding methods.

<b>Poster Session I / Nectar Track I</b>	10:00-11:00
	Dormero Saal 2

<b>Poster Session I + Coffee Break</b>	11:00-11:30
	Dormero Saal 2 + Lounge/Lobby

- (P1) **Discrete Tomography by Continuous Multilabeling Subject to Projection Constraints**  
*Matthias Zisler (University of Heidelberg), Stefania Petra (University of Heidelberg), Claudius Schnörr (Hochschule München, CORSSNAV), Christoph Schnörr (University of Heidelberg)*

- (P2) **Reduction of Point Cloud Artifacts Using Shape Priors Estimated with the Gaussian Process Latent Variable Model**  
*Jens Krenzin (TU Berlin), Olaf Hellwich (TU Berlin)*
- (P3) **Camera-Agnostic Monocular SLAM and Semi-Dense 3D Reconstruction**  
*Martin Rünz (University of Koblenz-Landau), Frank Neuhaus (University of Koblenz-Landau), Christian Winkens (University of Koblenz-Landau), Dietrich Paulus (University of Koblenz-Landau)*
- (P4) **Efficient Single-view 3D Co-segmentation using Shape Similarity and Spatial Part Relations**  
*Nikita Araslanov (University of Bonn), Seongyong Koo (University of Bonn), Jürgen Gall (University of Bonn), Sven Behnke (University of Bonn)*
- (P5) **Fast and accurate micro lenses depth maps for multi-focus light field cameras**  
*Nuno Goncalves (University of Coimbra), Rodrigo Ferreira (University of Coimbra)*
- (P6) **Train Detection and Tracking in Optical Time Domain Reflectometry (OTDR) Signals**  
*Adam Papp (AIT), Christoph Wiesmeyr (AIT), Martin Litzenberger (AIT), Heinrich Garn (AIT), Walter Kropatsch (Vienna University of Technology)*
- (P7) **Parametric Dictionary-Based Velocimetry for Echo PIV**  
*Ecaterina Bodnariuc (University of Heidelberg), Stefania Petra (University of Heidelberg), Christian Poelma (Delft University of Technology), Christoph Schnörr (University of Heidelberg)*
- (P8) **Identifying individual facial expressions by deconstructing a neural network**  
*Farhad Arbabzadah (Technische Universität Berlin), Grégoire Montavon (Technische Universität Berlin), Klaus-Robert Müller (Technische Universität Berlin, Korea University), Wojciech Samek (Fraunhofer HHI)*

- (N1)  
(ICCV) **Neural Activation Constellations: Unsupervised Part Model Discovery with Convolutional Networks**  
*Marcel Simon (University of Jena) and Erik Rodner (University of Jena)*
- (N2)  
(CVPR) **Multicamera calibration from visible and mirrored epipoles**  
*Andrey Bushnevskiy (Technicolor R&I), Lorenzo Sorgi (Technicolor R&I) and Bodo Rosenhahn (Leibniz Universität Hannover)*
- (N3)  
(ICML (WS)) **Maximally Divergent Intervals for Anomaly Detection**  
*Erik Rodner (University of Jena et al.), Björn Barz (University of Jena), Yanira Guanache (University of Jena), Milan Flach (Max Planck Institute for Biogeochemistry Jena), Miguel Mahecha (Max Planck Institute for Biogeochemistry Jena et al.), Paul Bodesheim (Max Planck Institute for Biogeochemistry Jena), Markus Reichstein (Max Planck Institute for Biogeochemistry Jena et al.) and Joachim Denzler (University of Jena et al.)*
- (N4)  
(ECCV) **Multi-view 3D Models from Single Images with a Convolutional Network**  
*Maxim Tatarchenko (University of Freiburg), Alexey Dosovitskiy (University of Freiburg) and Thomas Brox (University of Freiburg)*
- (N5)  
(CVPR) **Temporal Action Detection using a Statistical Language Model**  
*Alexander Richard (University of Bonn) and Juergen Gall (University of Bonn)*
- (N6)  
(ISRPS) **Invariant descriptor learning using a Siamese convolutional neural network**  
*Lin Chen (Leibniz Universität Hannover), Franz Rottensteiner (Leibniz Universität Hannover), Christian Heipke (Leibniz Universität Hannover)*
- (N7)  
(IV) **Semantic Stixels: Depth is Not Enough**  
*Lukas Schneider (Daimler et al.), Marius Cordts (Daimler et al.), Timo Rehfeld (MBRDNA), David Pfeiffer (Daimler AG), MarkusENZweiler (Daimler AG), Uwe Franke (Daimler AG), Marc Pollefeys (ETH Zurich), Stefan Roth (TU Darmstadt)*

- (N8)  
(WACV) **A survey on moving object detection for wide area motion imagery**  
*Lars Wilko Sommer (KIT et al.), Michael Teutsch (Fraunhofer IOSB), Tobias Schuchert (Fraunhofer IOSB), Jürgen Beyerer (IOSB Fraunhofer et al.)*
- (N9)  
(TPAMI) **Human Pose estimation from Video and IMUs**  
*Timo von Marcard (Leibniz Universität Hannover), Gerard Pons-Moll (MPI Tuebingen), Bodo Rosenhahn (Leibniz Universität Hannover)*
- (N10)  
(Perception) **Limitations of the Oriented Difference of Gaussian Filter in Special Cases of Brightness Perception Illusions**  
*Ashish Bakshi (ISI Kolkata), Sourya Roy (Jadavpur University), Arijit Mallick (Jadavpur University), Kuntal Ghosh (ISI Kolkata)*

**Oral Session: Segmentation**

11:30-12:30

Chair: Helmut Mayer

Dormero Saal 1

- **Automated Segmentation of Immunostained Cell Nuclei in 3D Ultra-microscopy Images**  
*Aaron Scherzinger (University of Münster), Florian Kleene (University of Münster), Cathrin Dierkes (Max Planck Institute for Molecular Biomedicine), Friedemann Kiefer (Max Planck Institute for Molecular Biomedicine), Klaus Hinrichs (University of Münster), Xiaoyi Jiang (University of Münster)*
- **Robust Interactive Multi-label Segmentation with an Advanced Edge Detector**  
*Sabine Müller (Saarland University, Saarland University Hospital), Peter Ochs (Saarland University), Joachim Weickert (Saarland University), Norbert Graf (Saarland University Hospital)*

**Lunch Break**

12:30-14:00

**Oral Session: Applications**

14:00-16:00

Chair: Juergen Gall

Dormero Saal 1

■ **Contiguous Patch Segmentation in Pointclouds***William Nguatem (Bundeswehr University Munich), Helmut Mayer (Bundeswehr University Munich)*■ **Randomly Sparsified Synthesis for Model-based Deformation Analysis***Stefan Reinhold (University of Kiel), Andreas Jordt (University of Kiel), Reinhard Koch (University of Kiel)*■ **Depth Map based Facade Abstraction from Noisy Multi-View Stereo Point Clouds***Andreas Ley (TU Berlin), Olaf Hellwich (TU Berlin)*■ **Stereo Visual Odometry without Temporal Filtering***Joerg Deigmoeller (Honda Research Institute EU), Julian Eggert (Honda Research Institute Europe)***Poster Session II + Coffee Break**

16:00-16:30

Dormero Saal 2 + Lounge/Lobby

**Poster Session II / Nectar Track II**

16:30-17:30

Dormero Saal 2

(P9) **Boundary preserving variational image differentiation***Yosra Mathlouthi (INRS-EMT), Amar Mitiche (INRS-EMT), Ismail Ben Ayed (ETS)*(P10) **A Prediction-Correction Approach for Real-Time Optical Flow Computation Using Stereo***Maxime Derome (ONERA), Aurélien Plyer (ONERA), Martial Sanfourche (ONERA), Guy Le Besnerais (ONERA)*(P11) **Weakly-supervised semantic segmentation by redistributing region scores to pixels***Josip Krapac (University of Zagreb), Siniša Šegvić (University of Zagreb)*

- (P12) **Learning a Confidence Measure for Real-time Egomotion Estimation**  
*Stephanie Lessmann (Delphi Electronics & Safety), Jens Westerhoff (University of Wuppertal), Mirko Meuter (Delphi Electronics & Safety), Josef Pauli (University of Duisburg-Essen)*
- (P13) **Learning to Select Long Track Features for Structure-From-Motion & Visual SLAM**  
*Jonas Scheer (Intel Visual Computing Institute), Mario Fritz (MPI for Informatics), Oliver Grau (Intel Visual Computing Institute)*
- (P14) **Source Localization of Reaction-Diffusion Models for Brain Tumors**  
*Rym Jaroudi (University of Linköping), George Baravdish (University of Linköping), Freddie Astrom (University of Heidelberg), Tomas B. Johansson (University of Linköping, University of Aston)*
- (P15) **Depth Estimation Through a Generative Model of Light Field Synthesis**  
*Mehdi S. M. Sajjadi (Max Planck Institute for Intelligent Systems), Rolf Köhler (Max Planck Institute for Intelligent Systems), Bernhard Schölkopf (Max Planck Institute for Intelligent Systems), Michael Hirsch (Max Planck Institute for Intelligent Systems)*
- (P16) **Coupling Convolutional Neural Networks and Hough Voting for Robust Segmentation of Ultrasound Volumes**  
*Christine Kroll (Technische Universität München), Fausto Milletari (Technische Universität München), Nassir Navab (Technische Universität München), John Hopkins University Baltimore), Seyed-Ahmad Ahmadi (Ludwig-Maximilians-Universität München)*
- (N11) **3D Reconstruction of Human Motion from Monocular Image Sequences**  
 (TPAMI) *Bastian Wandt (Leibniz Universität Hannover), Hanno Ackermann (Leibniz Universität Hannover), Bodo Rosenhahn (Leibniz Universität Hannover)*
- (N12) **PSyCo: Manifold Span Reduction for Super Resolution**  
 (CVPR) *Eduardo Pérez-Pellitero (Leibniz Universität Hannover et al.), Jordi Salvador (Technicolor R&I), Javier Ruiz-Hidalgo (Universitat Politècnica de Catalunya), Bodo Rosenhahn (Leibniz Universität Hannover)*

- (N13)  
(CVPR) **Efficient Decomposition of Image and Mesh Graphs by Lifted Multicuts**  
*Margret Keuper (University of Freiburg), Evgeny Levinkov (MPI Saarbrücken), Nicolas Bonneel (CNRS Lyon), Guillaume Lavoue (CNRS Lyon), Thomas Brox (University of Freiburg), and Bjoern Andres (MPI Saarbrücken)*
- (N14)  
(EMMCVPR) **Randomly Walking Can Get You Lost: Graph Segmentation with Unknown Edge Weights**  
*Hanno Ackermann (Leibniz Universität Hannover), Björn Scheuermann (Leibniz Universität Hannover), Tat-Jun Chin (University of Adelaide), Bodo Rosenhahn (Leibniz Universität Hannover)*
- (N15)  
(TASLP) **Turbo Automatic Speech Recognition**  
*Simon Recheur (TU Braunschweig), Robin Weiß (TU Braunschweig) and Tim Fingscheidt (TU Braunschweig)*
- (N16)  
(EGSR) **Adaptive Image-Space Sampling for Gaze-Contingent Real-time Rendering**  
*Michael Stengel (TU Braunschweig), Steve Grogorick (TU Braunschweig), Martin Eisemann (TH Köln), Marcus Magnor (TU Braunschweig)*
- (N17)  
(CVPR) **The Cityscapes Dataset for Semantic Urban Scene Understanding**  
*Marius Cordts (Daimler AG et al.), Mohamed Omran (MPI Informatics), Sebastian Ramos (Daimler AG et al.), Timo Rehfeld (Daimler AG et al.), Markus Enzweiler (Daimler AG), Rodrigo Benenson (MPI Informatics), Uwe Franke (Daimler AG), Stefan Roth (TU Darmstadt), and Bernt Schiele (MPI Informatics)*
- (N18)  
(WACV) **A global-to-local framework for infrared and visible image sequence registration.**  
*Michael Ying Yang (Leibniz Universität Hannover), Yu Qiang (Leibniz Universität Hannover) and Bodo Rosenhahn (Leibniz Universität Hannover)*
- (N19)  
(ICA) **Lightweight, Non-invasive Collection of Steering Wheel Angles and Pedal Positions**  
*Miriam Ruf (Fraunhofer IOSB), Jens Ziehn (Fraunhofer IOSB et al.), Leonid German (Leibniz Universität Hannover), Bodo Rosenhahn (Leibniz Universität Hannover), Dieter Willersinn (Fraunhofer IOSB), Jürgen Beyerer (Fraunhofer IOSB et al.), Heinrich Gotzig (Valeo Schalter und Sensoren GmbH)*

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**GCPR-Dinner**

19:00-22:30

"Der Gartensaal"

**■ Neues Rathaus, "Der Gartensaal"**

Trammplatz 2, 30159 Hannover

1000m distance to conf. Hotel and 13 min walk

See Page 16 for the location on the map.

## 4.4 Thursday, September 15th

**Registration**

8:30-18:00

Registration Desk

**Invited Talk: Patrick Perez (Technicolor France)**

9:00-10:00

**On visual comparison.**

Chair: Björn Andres

Dormero Saal 1

Deciding if two pieces of visual content are somehow related, or to which degree they are related, is an ubiquitous problem when searching, processing and analyzing images. Such visual comparisons can be conducted among small fragments (e.g., point matching for tracking or 3D reconstruction, patch-based image processing, mid-level feature mining), object-level fragments (e.g., face verification or face clustering) or whole images (copy detection, image retrieval, picture linking). To this end, visual content is usually turned into a fixed size, high-dimensional vector representation and a suitable similarity measure is defined between such vectors. Focusing on large scale example-based search and on face verification, we shall discuss how parts of this “description-comparison” pipeline can be learned, with or without supervision, in order to speed up comparisons or to make them more meaningful.

**Oral Session: Learning II**

10:00-11:00

Chair: Thomas Brox

Dormero Saal 1

■ **Large-scale Active Learning with Approximated Expected Model Output Changes**

*Christoph Kaeding (Computer Vision Group Jena, Michael Stifel Center Jena), Alexander Freytag (Computer Vision Group Jena, Michael Stifel Center Jena), Erik Rodner (Computer Vision Group Jena, Michael Stifel Center Jena), Andrea Perino (German Centre for Integrative Biodiversity Research, Univer-*

sität Halle (Saale)), Joachim Denzler (Computer Vision Group Jena, Michael Stifel Center Jena, German Centre for Integrative Biodiversity Research)

■ **A Convnet for Non-Maximum Suppression**

Jan Hosang (MPI-Inf), Rodrigo Benenson (MPI-Inf), Bernt Schiele (MPI-Inf)

**Coffee Break**

11:00-11:30

Lounge/Lobby

**Oral Session: Image Analysis**

11:30-12:30

Chair: Joachim Denzler

Dormero Saal 1

■ **Occlusion-aware depth estimation using sparse light field coding**

Ole Johannsen (University of Konstanz), Antonin Sulc (University of Konstanz), Bastian Goldlücke (University of Konstanz)

■ **Joint Object Pose Estimation and Shape Reconstruction in Urban Street Scenes Using 3D Shape Priors**

Francis Engelmann (RWTH Aachen University), Jörg Stückler (RWTH Aachen University), Bastian Leibe (RWTH Aachen University)

**Lunch Break**

12:30-14:00

**Oral Session: Motion and Tracking**

14:00-15:00

Chair: Christian Heipke

Dormero Saal 1

■ **Joint Recursive Monocular Filtering of Camera Motion and Disparity Map**

Johannes Berger (University of Heidelberg), Christoph Schnörr (University of Heidelberg)

■ **From Traditional to Modern : Domain Adaptation for Action Classification in Short Social Video Clips**

*Aditya Singh (IIIT Hyderabad), Saurabh Saini (IIIT Hyderabad), Rajvi Shah (IIIT Hyderabad), P. J. Narayanan (IIIT Hyderabad)*

**Coffee Break**

15:00-15:30

Lounge/Lobby

During the extended coffee break the program committee members will determine the winners of the DAGM awards.

**GCPR-Awards, Closing and Farewell**

15:30

Dormero Saal 1

The German Association for Pattern Recognition (DAGM) awards prizes for the best scientific contributions to GCPR 2016. The criteria include both the originality and scientific quality of the presentation (talk or poster) during the conference. The prize-winning contribution will be awarded a certificate, a cash prize, and will be mentioned in the proceedings of GCPR 2016 as well as on the web site of the DAGM.

5 GCPR 2017



University  
of Basel



# GCPR 2017

39<sup>th</sup> German Conference on Pattern Recognition  
September 13-15, Basel, Switzerland

Authors are invited to submit high-quality papers presenting original research. Submitted papers will be reviewed based on originality, soundness, empirical evaluation, and presentation. The proceedings will be published in the Springer LNCS series.

The scope of GCPR 2017 includes, but is not limited to, the following topics:

- Image/video processing, analysis, and computer vision
- Machine learning and pattern recognition
- Mathematical foundations, statistical data analysis and models
- Computational photography and confluence of vision and graphics
- Biomedical image processing and analysis
- Document analysis
- Biometrics
- Speech and signal processing
- Applications

**Submission deadline**  
April 8, 2017

**Notification**  
May 30, 2017

**Main conference**  
Sep 13-15, 2017

**Tutorials**  
Sep 12, 2017

**Chairs**  
Volker Roth  
Thomas Vetter

[gcpr2017.dmi.unibas.ch](http://gcpr2017.dmi.unibas.ch)





# MAIN CONFERENCE AT A GLANCE

## Tuesday, September 13<sup>th</sup>

- 8:00-18:00 Registration
- 9:00-9:20 Opening
- 9:20-10:00 German Pattern Recognition Award
- 10:00-10:30 Coffee Break
- 10:30-12:00 **Oral Session: Image Processing**
- 12:30-14:00 Lunch Break
- 14:00-15:00 **Invited Talk: David Fleet**
- 15:00-16:00 **Oral Session: Learning I**
- 16:00-16:30 Coffee Break
- 16:30-17:30 **Oral Session: Optimization**
- 17:30-20:00 DAGM Meeting

## Wednesday, September 14<sup>th</sup>

- 8:30-18:00 Registration
- 9:00-10:00 **Invited Talk: Thomas Wiegand**
- 10:00-11:00 **Poster Session I / Nectar Track I**
- 11:00-11:30 **Poster Session I + Coffee Break**
- 11:30-12:30 **Oral Session: Segmentation**
- 12:30-14:00 Lunch Break
- 14:00-16:00 **Oral Session: Applications**
- 16:00-16:30 **Poster Session II + Coffee Break**
- 16:30-17:30 **Poster Session II / Nectar Track II**
- 19:00-22:30 GCPR-Dinner

## Thursday, September 15<sup>th</sup>

- 8:30-18:00 Registration
- 9:00-10:00 **Invited Talk: Patrick Perez**
- 10:00-11:00 **Oral Session: Learning II**
- 11:00-11:30 Coffee Break
- 11:30-12:30 **Oral Session: Image Analysis**
- 12:30-14:00 Lunch Break
- 14:00-15:00 **Oral Session: Motion and Tracking**
- 15:00-15:30 Coffee Break
- 15:30 GCPR-Awards, Closing and Farewell