

MITGLIEDERVERSAMMLUNG FREUNDE DES HHI

26. November 2019

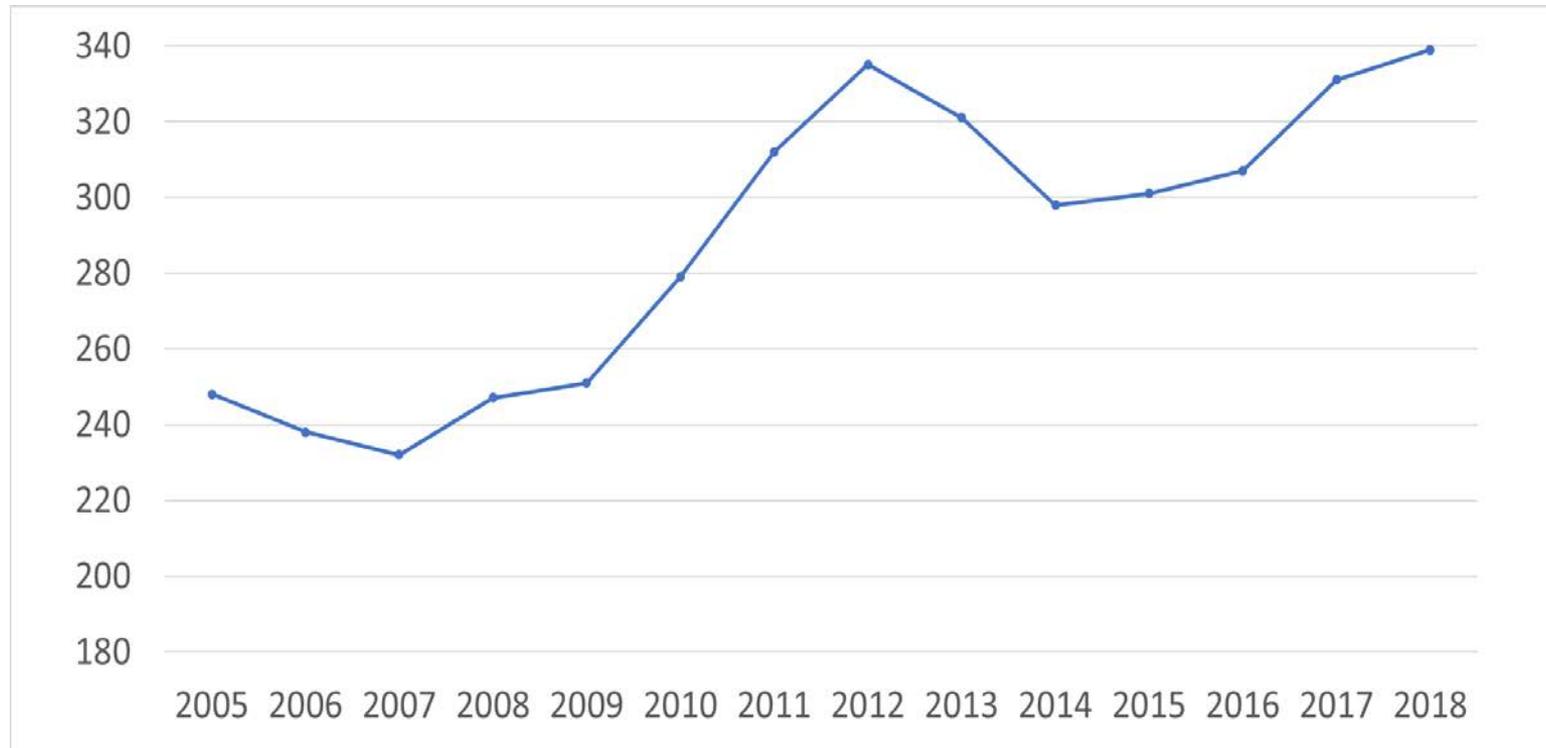


Departments

- Photonic Networks and Systems
- Photonic Components
- Fiber Optical Sensor Systems
- Wireless Communications and Networks
- Vision and Imaging Technologies
- Video Coding and Analytics

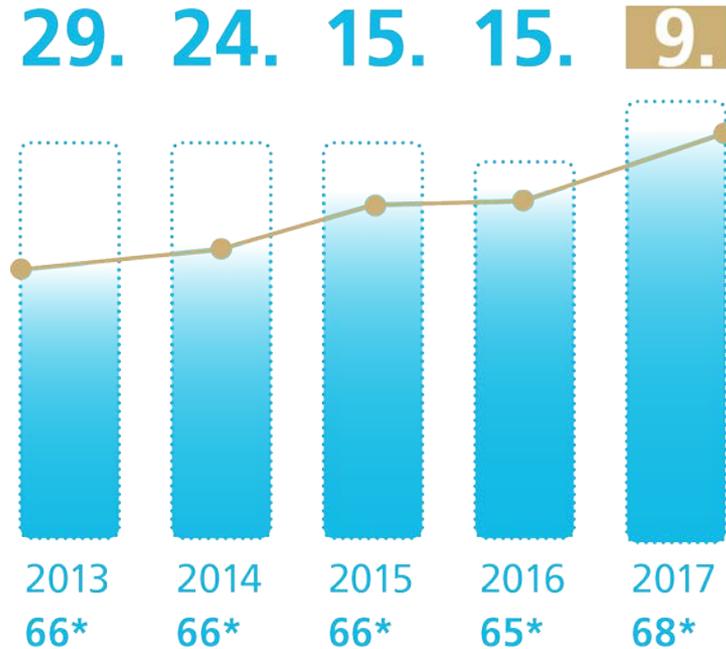


PERSONALENTWICKLUNG - KÖPFE GESAMT HHI



Wissenschaftliche Exzellenz:

HHI verbessert auf Platz 9 in der FhG



* Anzahl der Institute in der FhG

Photonic Networks and Systems

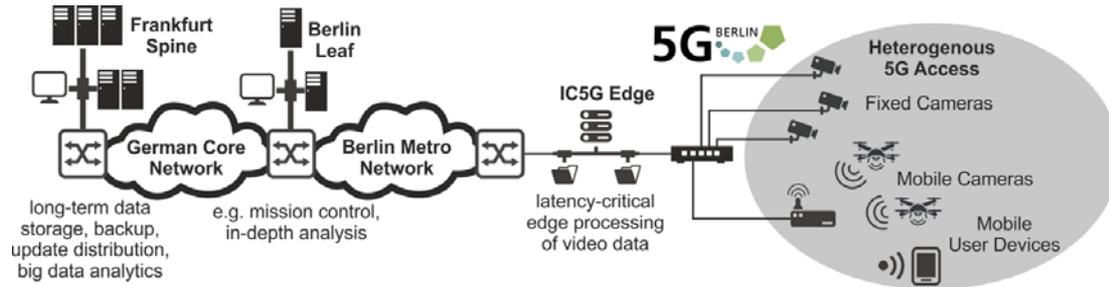
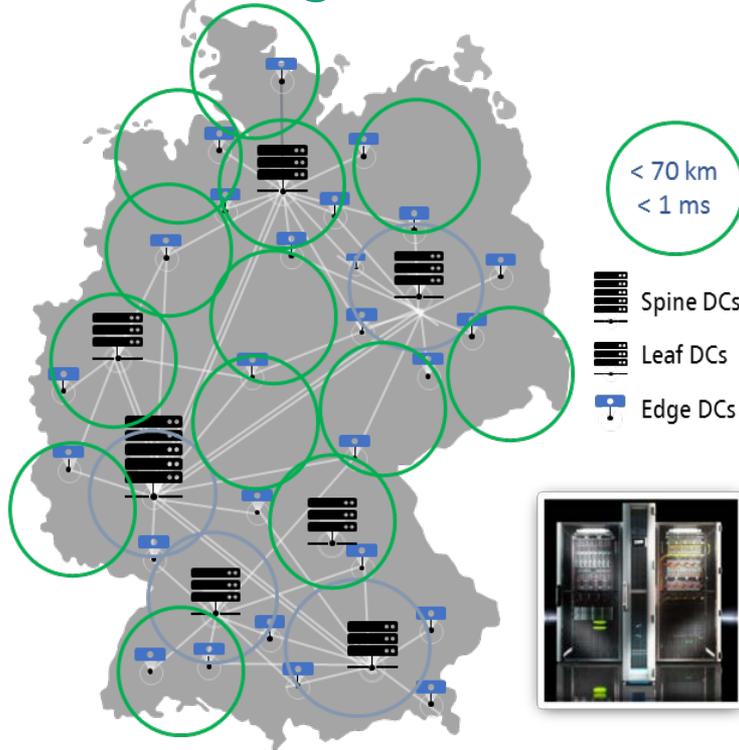


- Solutions for high-performance optical transmission systems
- Usage in in-house, access, metropolitan, wide-area and satellite communication networks
- Researchers are focusing on: increase of the capacity, improvement of the security and energy efficiency

Photo: fotolia.com/Kobes

Low-Latency Core/Metro-Networks

German Edge Cloud / METRO-HAUL (EU)



- Latency-optimized connectivity between stationary and mobile cameras and their respective edge processing resources
- Low-latency video analytics e.g. for augmented reality applications
- Geo-distributed deployment and connectivity between cameras and edge compute nodes; private 5G

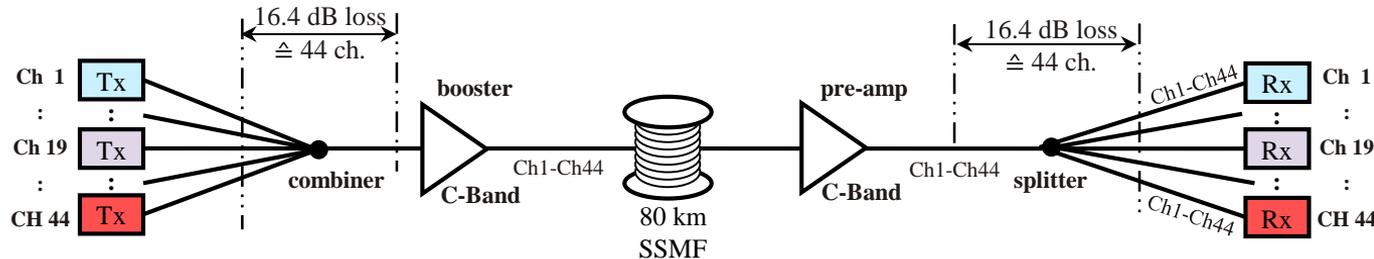
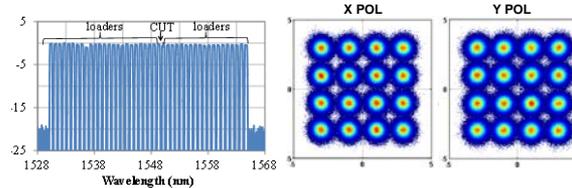
400G Datacenter Interconnects

Projects: SPEED and SENDATE

- Cost-efficient, high-capacity transmission with short/moderate reach (< 10/100 km)
- Si-based transceivers in small form factor
- Solution for inter-datacenter connection:
 - **Colorless** coherent WDM system
 - 44x 400Gb/s (56-GBd) PDM-16QAM using full C-band: 1.76 Tb/s experimentally evaluated by HHI



Google data centre in Finland



SPONSORED BY THE



Federal Ministry of Education and Research

Photonic Components

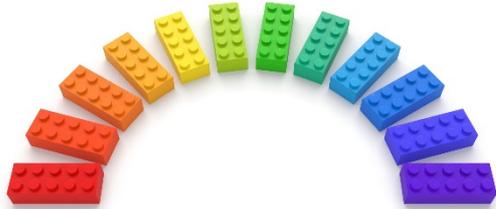


- The department researches optochips and Photonic Integrated Circuits (PICs)
- Development and prototyping services for German and international industry
- About every second bit in the internet comes into contact with technology from Fraunhofer HHI on the way to or from the recipient

Photo: istockphoto.com/nicolas_

Neue Gruppe: Photonic InP Foundry (PC-FOU)

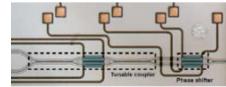
Photonische Integration nach dem Lego-Prinzip



Bends 	Tunable Gratings 	Photodiodes
Couplers 	Amplifiers, Phase Sections 	Balanced Diodes
Pol. Elements 	Lasers 	
TO MZIs 	EA Modulators 	RF tracks, crossings



Kunden: Photonische Integrierte Schaltkreise (PICs)



Mode Multiplexer
(Uni Milano)



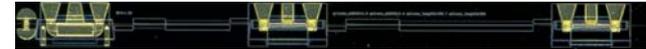
QE Source
(Quside)



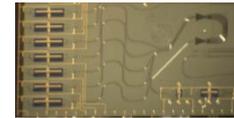
Stokes Vector Rx
(HHI)



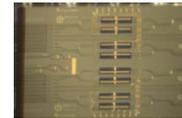
All-op. Neuron
(Princeton)



Dual-Pol EML
(HHI)



9ps MLL
(Chin. Acad. of Scien.)



Optical Flip-Flop
(Uni Thessaloniki)



Interrogator
(Uni Warsaw)



100ch WDM Rx
(Bright Photonics)



W1-Professur „THz-Sensorik“ an der TU Berlin eingerichtet

Gruppenleiter Björn Globisch erhält Ruf

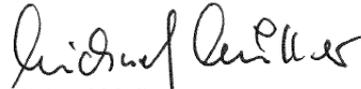


Der Regierende Bürgermeister von Berlin

Sehr geehrter Herr Dr. Globisch,

ich freue mich, Ihnen mitteilen zu können, dass die Technische Universität Berlin Sie zur Berufung vorgeschlagen hat.

Mit freundlichen Grüßen

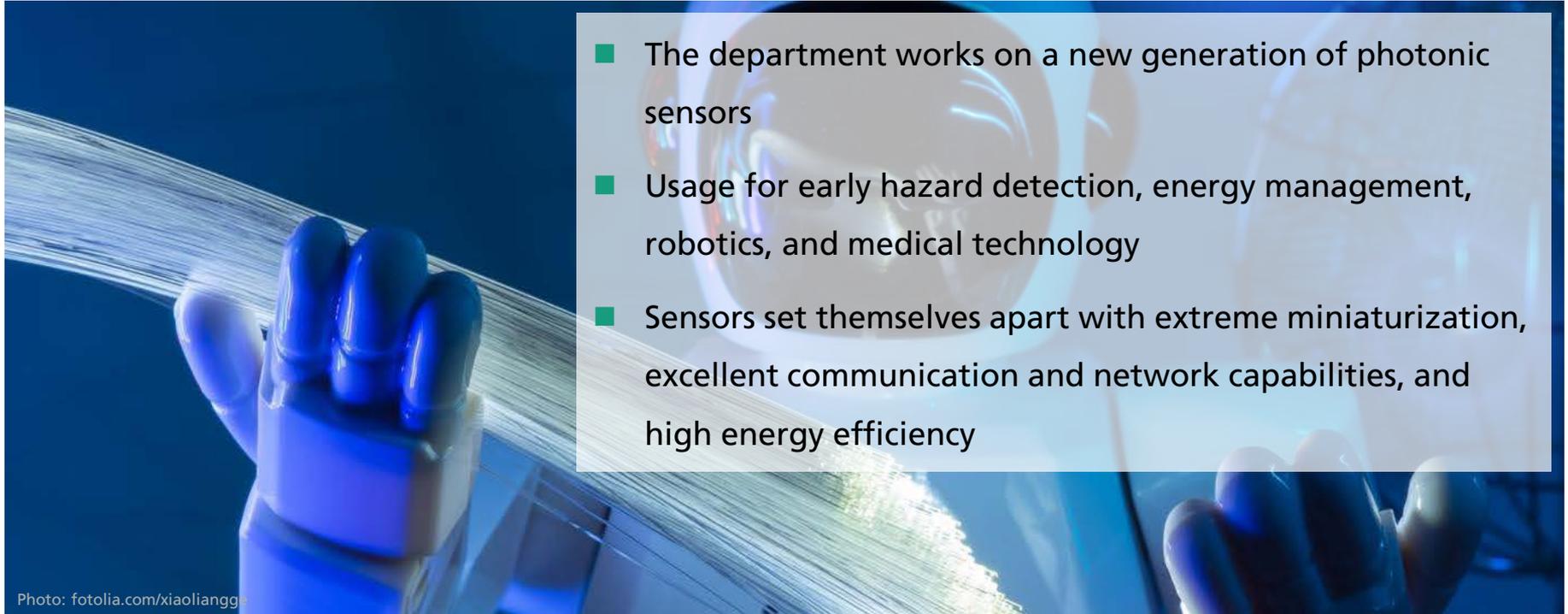


Michael Müller

- Gruppenleitung am HHI und Professur in Physik
- Große Bedeutung der THz-Sensorik für die Berliner Forschungslandschaft bestätigt

Fiber Optical Sensor Systems

10 years HHI-FS in Goslar



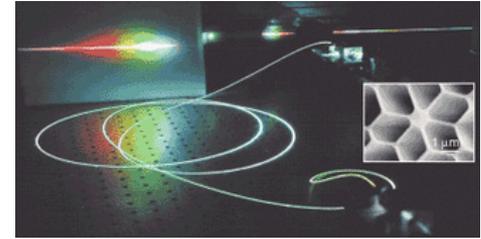
- The department works on a new generation of photonic sensors
- Usage for early hazard detection, energy management, robotics, and medical technology
- Sensors set themselves apart with extreme miniaturization, excellent communication and network capabilities, and high energy efficiency

Photo: fotolia.com/xiaoliangg

Research topics HHI-FS



FiberLab



SurfaceLab



BatterySafetyLab



Research topics

■ **FBG technology**

- HHI-FS – world best FBGs
- Fiber optical 3D shape sensing – from meters to kilometers
- Tactile and haptic sensing – light activated shape memory polymers and FBGs

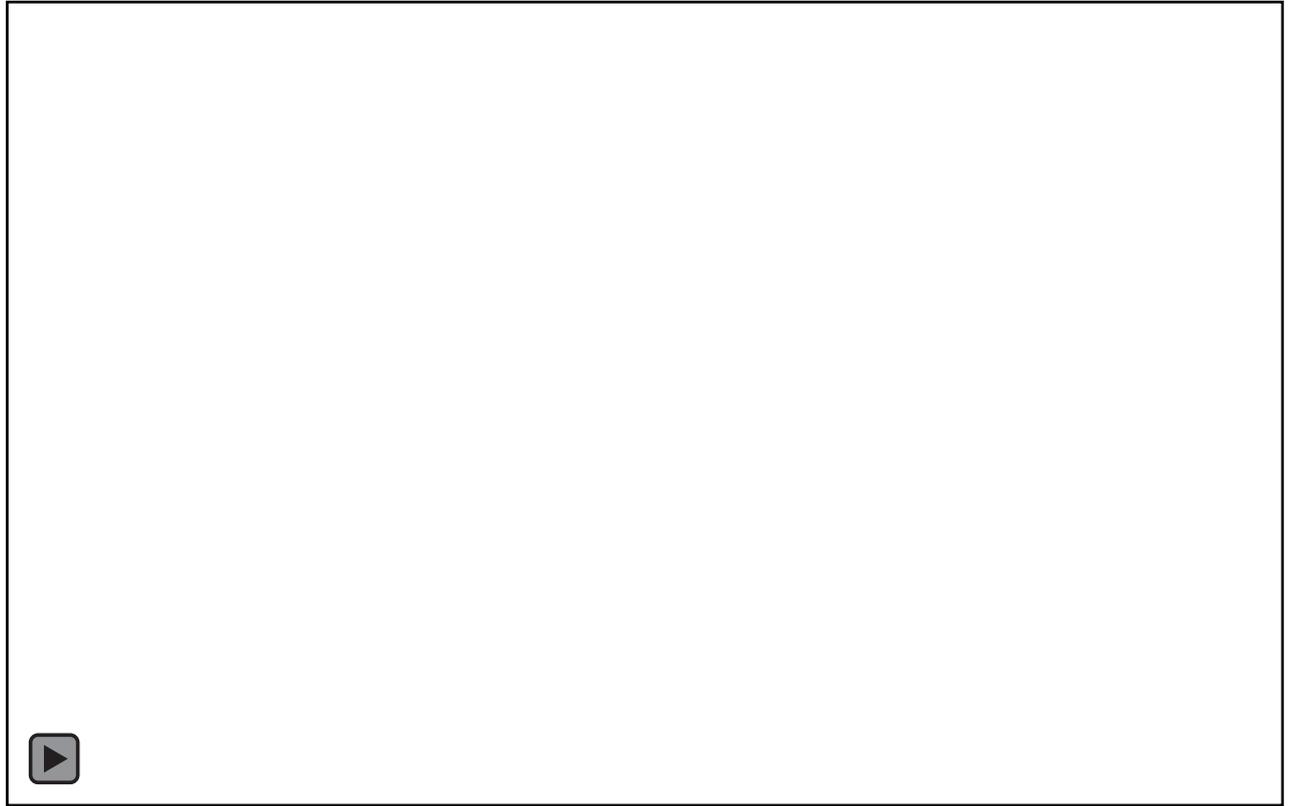
■ **Femtosecond laser surface processing**

- Large area electrodes for H₂ electrolysis – surface enlargement
- Catalytic activated surfaces (LOHC)

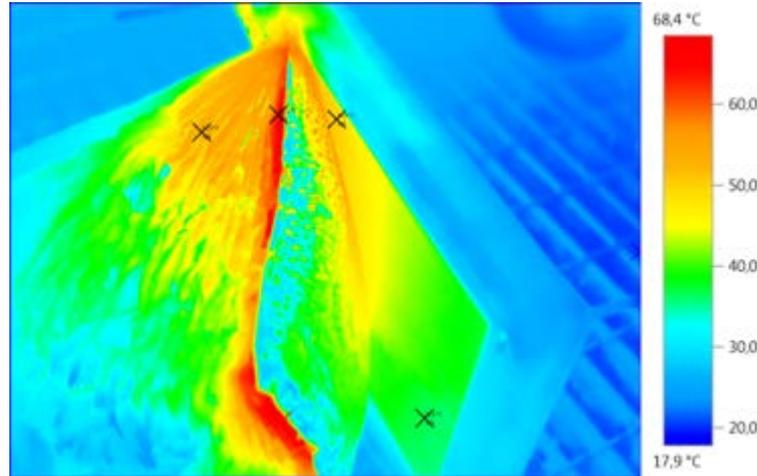
■ **Battery and sensor test center**

- Battery safety
- Authorized test lab for TÜV Rheinland
- 2nd life battery lab factory

FiberLab - Fiber optical dataglove and AR projection



Battery fire extinguishing systems test



■ Tests

- New fire extinguishers for Li batteries (F500)
- Passive protection systems (flame restraining textiles)

■ Customers

- Extinguishing system manufacturers
- Fire departments
- Battery system manufacturers

Wireless Communications and Networks

- Wireless solutions for future information networks
- Extensive contributions to the theory, concept development and technical feasibility of radio systems
- Development of 5G mobile networks

Photo: fotolia.com/scandinaviastock

The Next Generation: 5G Network



Mobile High Speed Internet

Car2Car & Car2X Communications

Industrial Wireless

Requirements

- 1000 x throughput
- 100 x devices
- 10 x battery life
- 1 ms latency

Technology

- DSL boxes and street lights become senders
- Optical fiber

5G Berlin



Tactile Internet for Production and Logistics

5G for Industry 4.0

- Reliable remote machine operation
- Augmented worker / workspace
- Predictive maintenance
- Machine and process monitoring
- High precision positioning
- Industrial edge cloud
- Truck-to-X Communication
- Secure remote access



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©Bosch

Vision and Imaging Technologies

- The department researches technologies and development solutions for the entire video processing chain
- Complex 2D/3D analysis and synthesis methods in media, medical and industrial fields of application and in computer vision
- Complex solutions for immersive and interactive systems with corresponding innovative camera, sensor, display and projection systems

Photo: istockphoto.com/Petrovich9

Vision & Imaging Technologies

Structure & Performance

Head of Department

Prof. Peter Eisert
Peter Kauff



Head of Group

Dr. Anna Hilsmann
Ingo Feldmann
Dr. Oliver Schreer
Christian Weissig



Kowikap	27
Researchers	32
Externals	4
Students	21
Budget	5.5 M€
External income	4.1 M€
FhG funding	1.5 M€
Industrial contracts	35 %

Computer Vision & Graphics



Immersive Media & Communication



Capture & Display Systems



Video Analysis for Security Applications

Detection of Face Morphing Attacks (BMBF)



Original



Morph



- Secure Authentication via detection of manipulated passport images
- Robust deep learning methods
- Explainability for optimized training of DNNs



Volumetric Video Capture Studio with Fraunhofer HHI Technology

1st commercial studio on European mainland opened in June 2018 located at the film studios Potsdam-Babelsberg operated by Volucap GmbH

ARRI[®]

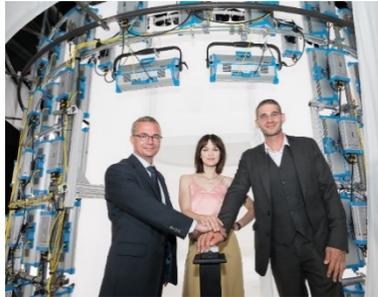
Interlake
Your IT Crew

VOLUCAP

Fraunhofer
HHI

STUDIO BABELSBERG

UFA

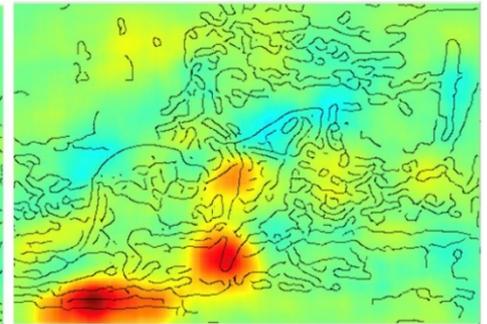
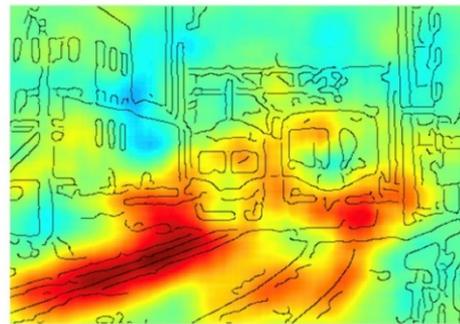
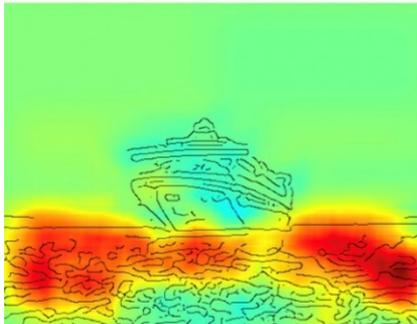


Explainable AI

Winning method of the PASCAL Challenge was a **Clever Hans predictor**.

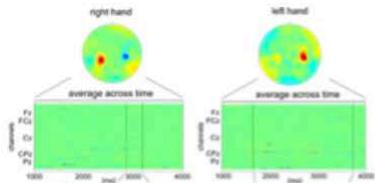
Nobody realized it for years, because the model was a black box.

PASCAL Visual Object Classes Challenge (2005 – 2012)

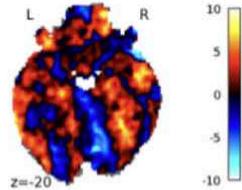


Applications of AI in Health

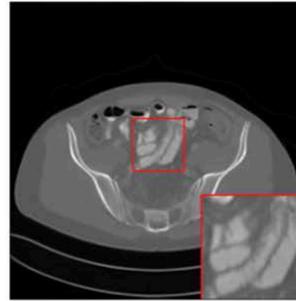
EEG (Sturm'16)



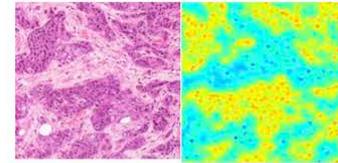
fMRI (Thomas'18)



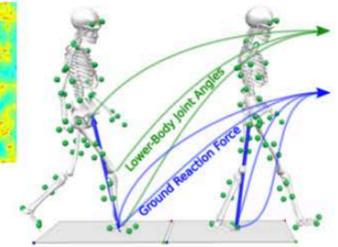
Limited Angle Tomography (März'19)



Histopathology (Hägele'19)



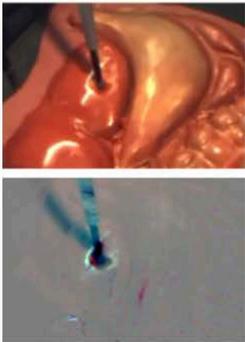
Gait Analysis (Horst'19)



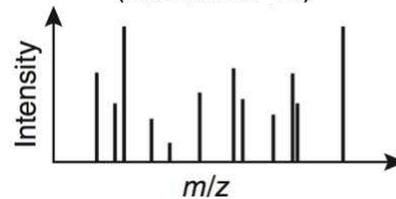
ECG (Strodthoff'18)



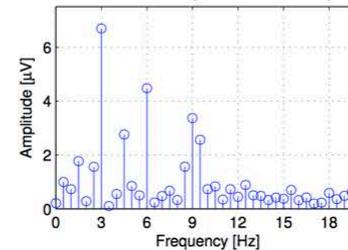
Robotic Surgery (Marban'17)



Proteomics (Strodthoff'19)



SSVEP (Bosse'17)



Neutrophil Analysis (Wagner'19)



Fraunhofer-Institut für Nachrichtentechnik, Heinrich-Hertz-Institut, HHI

**WE PUT SCIENCE
INTO ACTION.**

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