

MST Review Academic Year 2023/24



Alexander W. Koch

**Institute for Measurement Systems and Sensor Technology (MST)
Technical University of Munich (TUM)**

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Team

Koch, Alexander W., Prof. Dr.-Ing. habil. Dr. h.c.
(Professor emeritus since 01 October 2024)

Jakobi, Martin, Dr.-Ing., Academic Director (since Oct. 2024 at ESM)
Ott, Sabine, Dr.-Ing., Lecturer (until 30 September 2023)
Werthschulte, Kay, Prof. Dr.-Ing., Lecturer

Bierbaum, Rainer (since Oct. 2024 at ESM)
von Grafenstein, Rita (until 31 December 2024)
Josipovic, Hrvoje (from 01 July to 22 October 2023)
Poplawski, Zbigniew (since Oct. 2024 at ESM)

Baier, Valentin, Dr.-Ing. *) (until 30 June 2024)
Bian, Qiang, Dr.-Ing. (until 20 October 2023)
Brändle, Franziska, Dr.-Ing. (until 31 March 2024)
Buchfellner, Fabian, M.Sc. *)
Fink, Maximilian, Dr.-Ing. (until 30 September 2024)
Haas, Lukas, M. Eng. *)
Haider, Arsalan, M. Eng. *)
Hoffmann, Marcel, Dr.-Ing. (until 31 December 2024)
Kienitz, Sascha, Dr.-Ing. *) (until 28 January 2024)
Kurz, Wolfgang, M.Sc.
Stadler, Andrea, M.Sc. *)
Wang, Kun, Dr.-Ing. (until 31 August 2024)

*) External cooperation

ESM: Professorship of Environmental Sensing and Modeling, Prof. Jia Chen

Teaching and Research in Academic Year 2023/24

Teaching Courses

- Basic Laboratory Course Electrical Engineering
- Electrical Measurement of Environmental Quantities
- Electrical Measurement Technology for Computer Scientists
- Intellectual Property and Technopreneurship, Singapore
- Laboratory Course Measurement and Sensor Technology (teaching profession)
- Measurement Systems and Sensor Technology (MST)
- Measurement Systems and Sensor Technology, TUM Asia, Singapore
- Measurement Systems and Sensor Technology for Mathematicians
- Measurement Systems and Sensor Technology in Mechanical Engineering
- Measurement and Sensor Technology (teaching profession)
- Optomechatronical Measurement Systems, TUM Asia, Singapore
- Optomechatronical Measurement Systems (OMS)
- Photonic Measurement Systems (PM)
- Sensor Electronics, TUM Asia, Singapore

Bachelor Theses

- Adisoemarta, Antonius Edwin: Morphological Analysis of Real Neuronal Networks using Object Detection.
- Bektas, Furkan: Lipid Droplet Analysis in LN-18 Cell Lines using Hyperspectral Imaging Microscopy.
- Felix, Felix: Research on the Influence of Temperature in MeoM-PAS for Trace Gas Detection.
- Gündogdu, Dilara-Eda: Weiterentwicklung des Praktikumsversuchs Elektronenstrahlzilloskop.
- Lin, Yuhe: Construction of Deep Learning Networks Applied to Photoacoustic Imaging.
- Meier, Christoph: Detektion von Bewegungen eines Lastaufnahmemittels mithilfe eines MPU 6050 Beschleunigungssensors und Überprüfung der Eignung zur Anwendung in einem Lastwechselzähler.
- Winterer, Jakob: Identification of Dendritic Segments Located Between Dendro-Dendritic Intersections in Real Neural Networks.
- Zhu, Rongxin: Influence of the Photoacoustic Gas Cell Shapes on the Membrane-Less Optical Microphone–Photoacoustic Spectroscopy Gas-Sensing Systems.

Advanced Seminars

Stempler, Anselm: Überblick über die Methoden der Bodenfeuchtemessung.

Engineering Practice

- Abel, Lukas: Praktikumsbericht Stadtwerke Ingolstadt.
- Aichele, Roland: Entwicklung einer Temperatur-Schwellwertsteuerung für eine Scheibenheizung.
- Al Shouli Al Harari, Khalil: Qualitätsentwicklung bei der Firma Siltronic AG.
- An, Ruofei: Calibration System for Radar and Camera Based on the Perspective-Point Problem.
- Becker, Nico: Planung und Aufbau eines LED-Dauertestes.
- Berberoglu, Göktug: Ingenieurpraxis als Werkstudent im Bereich Produktionstechnologie.
- Cai, Yuanjin: Setup, calibration, and measurement of Liang Dao Rodaside Units.
- Caric, Marko: Unterstützung in der Produktion von Silver Atena.
- Dehvan, Amir: Sensorbasierte Reinraumüberwachung.
- De Oliveira e Silva: Praktikum als Feldapplikationsingenieur im Bereich Deutschland Massenmarkt.
- Dhieb, Chawki: Characterization of quantum components at room and cryogenic temperature.
- Dinaya, Alza Ahmad: Entwicklung und Aufbau eines Messgerätes zur Widerstandsmessung und Diodenmessung an Onboardchargern und DCDC-Wandlern.
- Faisst, Tim Niklas: Programmierung einer Umschaltmatrix zur automatischen Kalibrierung von Widerständen und Analyse von Echtzeitdaten.
- Friedl, Florian: Planare kapazitive Sensoren.
- Hammoud, Eva: Entwicklung und Fertigung von elektronischen Systemen - Testen und Implementieren von Komponenten auf Leiterplatten.
- Inal, Berfu: Einbrennstation und Mars-Projekt.
- Kleimeyer, Owen: Automatisierung einer Messvorrichtung zur 3D-Erfassung magnetischer Felder.
- Krish, Bangera: Automation Testing of LAN testing devices.

Mayr, Leonard: Elektronikprüfgerät zur Verbesserung der Robustheit einer neuen Displaytechnologie.

Meier, Christoph: Erstellung eines Konzepts für die mögliche Sensorintegration an Lastaufnahmemitteln.

Nassar, Hana: DC/DC Converter Testing and Validation.

Xiao, Yunye: Pflichtpraktikum bei DB Netz.

Zhang, Junxin: Bericht der Ingenieurpraxis.

Zhang, Xiaotina: Injector Flow Test.

Zhu, Rongxin: Construction and Simulation of Photoacoustic Gas Cells Using Comsol.

Research Practice

Chatzis, Dimitrios: Developing tactile sensing for anthropomorphic robotic hand.

Stemplinger, Anselm: Beurteilung der Eignung eines gefalteten Jamin-Interferometers zur Nutzung als membranloses optisches Mikrofon.

Wiegert, Lukas: Weiterentwicklung einer myoelektrischen Handgestenerkennung.

Xu, Jihan: Impact of Shape on the Sensitivity of Photoacoustic Gas Cell in the Michelson Interferometer-Based Membrane-Less Microphone-Photoacoustic Spectroscopy.

Xu, Wenbu: Investigation of Influencing Factors of the Balance Time in Photoacoustic Gas Cell and the Acoustic Pressure of the Photoacoustic Gas Cells with the Boundary Losses.

Master Theses

Bogenberger, Julian: Fortschrittliche optische Sensorik und Algorithmen für die präzise Lenkwinkelmessung im Automobilbau.

Chen, Jichu: Methodenentwicklung zur dynamischen Kalibrierung einer Stereokamera in einem optischen Erkennungssystem.

Cheng, Haoran: Applications of Deep Learning in Photoacoustic Imaging to Improve the Images' Resolution.

Gotsch, Maximilian: Measurement Site Identification in Multispectral Photoacoustic Spectroscopy Using a Scanning Modality.

Kariper, Emre: Hyperspectral Microscopy: A Novel Approach to Distinguish Vitality States of Single-Cells.

Steinberger, Andreas: Modellierung von interaktiven Fahrscenarien in einer Closed-Loop Simulationsumgebung für autonomes Fahren.

Su, Ye: Research on precision improvement algorithm in photoacoustic spectroscopy gas detection system.

Treutinger, Tim: Beamshaping Antenna for a CubeSat GNSS-Radio Reflectometer.

Yu, Jiale: Transfer Learning for vehicle NVH (Noise, Vibration, and Harshness) development.

Doctorates

Dr.-Ing. Bian, Qiang
Fiber Bragg Grating Sensors for High Temperature Metal Casting and Health Monitoring of Metal Structures
Exam on 13 October 2023
1. Examiner: Prof. Alexander W. Koch
2. Examiner: Prof. Johannes Roths, HAW München

Dr.-Ing. Wang, Kun
Fiber-Optic Multimode Interference Sensing and Imaging
Exam on 04 December 2023
1. Examiner: Prof. Alexander W. Koch
2. Examiner: Prof. Yosuke Mizuno, Yokohama National University

Dr.-Ing. Kienitz, Sascha
Investigations on a Fiber-Optic Pressure Measurement System for Aerodynamic Applications
Exam on 01 March 2024
1. Examiner: Prof. Alexander W. Koch
2. Examiner: Prof. Julien Weiss, TU Berlin

Dr.-Ing. Baier, Valentin
Measurement System for the Characterization of LiDAR-Scan Units for Autonomous Driving
Exam on 23 July 2024
1. Examiner: Prof. Alexander W. Koch
2. Examiner: Prof. Erwin Biebl

Dr.-Ing. Fink, Maximilian
Hochleistungsfähiges Short-Range LiDAR-System mit Multi-Laser-Technologie für Autonome Fahrzeuge
Exam on 30 September 2024
1. Examiner: Prof. Alexander W. Koch
2. Examiner: Prof. Gabriele Schrag

Special Events

- From 8 to 18 January 2024 Prof. Koch presented the lecture and the tutorial lecture “Sensor Electronics” for the TUM Asia Bachelor Program “Electronics and Data Engineering” at the Singapore Institute of Technology, Singapore.
- On 23 February 2024, the “Measurement Technology Through the Times - 25 Years of MST” event was carried out with almost 100 persons in attendance.
- From 1 to 8 July 2024, Prof. Koch presented the course “Intellectual Property and Technopreneurship” at the Singapore Institute of Technology, Singapore.
- From 20 November to 1 December 2023 Prof. Koch presented the lecture and the tutorial lecture “Optomechatronical Measurement Systems” in the framework of the master program “Green Electronics”, TUM campus in Singapore, German Institute of Science and Technology, in cooperation with Nanyang Technological University, Singapore.

Funding and Cooperation

- Since 1999 cooperation with Prof. Félix Salazar Bloise, Universidad Politécnica de Madrid
- Since 1999 cooperation with the Max Planck Institute for Plasma Physics (IPP), Garching
- Since 2005 cooperation with Prof. Johannes Roths, Hochschule München University of Applied Sciences
- Since 2009 cooperation with Klüber Lubrication, Munich
- Since 2013 cooperation with Prof. Thomas Zeh, Kempten University of Applied Sciences
- Since 2017 cooperation with Blickfeld GmbH, Munich
- Funding of the scholarship of a person (08.01.2022-28.01.2024) in the field of Optical Metrology, by the Chinese Ministry of Education under its funding organization China Scholarship Council (CSC)

Publications, Patents, and Conferences

Bian, Q.; Zhu, H.; Yan, P.; Yang Yu, Y.; Buchfellner, F.; Stadler, A.; Roehrl, A.; Koch, A.W.; Roths, J.: Characterization of High-Temperature Performance of a Sapphire Fiber Bragg Grating With a Single-Mode Demodulation System. *IEEE Sensors Journal* 24, 2024.

Brändle, F.; Jakobi, M.; Koch, A.W.: Forschung auf dem Gebiet der Speckle-Messtechnik. *Annual Magazine Engineering Sciences Germany 2023/24 Measurement and Sensor Technology*, Institute for Scientific Publications, 2023.

Fink, M.; Schardt, M.; Baier, V.; Wang, K.; Jakobi, M.; Koch, A.W.: Simulation of coaxial time-of-flight measurements using SiPM as detector. *Sensors and Actuators A: Physical* 364 (114805), 2023.

Haas, L.; Haider, A.; Kastner, L.; Zeh, T.; Poguntke, T.; Kuba, M.; Schardt, M.; Jakobi, M.; Koch, A.W.: Velocity Estimation from LiDAR Sensors Motion Distortion Effect. *Sensors* 23, 2023.

Haider, A.; Haas, L.; Koyama, S.; Elster, L.; Köhler, M.H.; Schardt, M.; Zeh, T.; Inoue, H.; Jakobi, M.; Koch, A. W.: Modeling of Motion Distortion Effect of Scanning LiDAR Sensors for Simulation-Based Testing. *IEEE Access*, Vol. 12, 2024.

Haider, A.; Pigniczki, M.; Koyama, S.; Köhler, M.H.; Haas, L.; Fink, M.; Schardt, M.; Nagase, K.; Zeh, T.; Eryildirim, A.; Poguntke, T.; Inoue, H.; Jakobi, M.; A. W. Koch: A Methodology to Model the Rain and Fog Effect on the Performance of Automotive LiDAR Sensors. *Sensors* 23, 2023.

Roehrl, A.; Stadler, A.; Buchfellner, F.; Zehetmair, S.; Roths, J.: Ultra-high Temperature Sensor Utilizing an Intrinsic Sapphire Fabry-Pérot Interferometer. *Advanced Photonics Congress*, 2024.

Stadler, A.; Zeisberger, A.; Buchfellner, F.; Roehrl, A.; Koch, A.W.; Roths, J.: Accurate high-temperature profile sensing with dense multipoint arrays of regenerated fiber Bragg gratings. *Results in Physics* 65, 2024.

Wang, K.; Kishizawa, K.; Noda, K.; Dong, X.; Kurz, W.; Koch, A.W.; Lee, H.; Nakamura, K., and Mizuno, Y.: Suppression of temperature-dependent spectral power fluctuations in multimode FBG. *28th International Conference on Optical Fibre Sensors (OFS-28)*, 2023.

Wang, K.; Kishizawa, K.; Noda, K.; Kurz, W.; Dong, X.; Koch, A.W.; Lee, H.; Nakamura, K.; Mizuno, Y.: Spectral power stabilization against temperature variations in multimode fiber Bragg gratings. *Applied Physics Express* 17 (5), 2024.

Wang, K.; Mizuno, Y.; Dong, X.; Kurz, W.; Köhler, M.H.; Kienle, P.; Lee, H.; Jakobi, M.; Koch, A.W.: Multimode optical fiber sensors: from conventional to machine learning-assisted. *Measurement Science and Technology* 35, 2023.