
Education

- 11/2019-07/2023 PhD (summa cum laude), **Karlsruhe Institute of Technology**, Germany
Computer Science (Dr. Ing.), “*Earables: Wearable Computing on the Ears*”.
Advisor: Prof. Dr. Michael Beigl. Secondary Advisor: Prof. Dr. Hans Gellersen.
- 10/2013-10/2019 B.Sc. & M.Sc. in Computer Science, **Karlsruhe Institute of Technology**, Germany
Specialization: Cognitive Systems (AI), Telematics. Minor: Finance and Economics.
Thesis: “*Wearability and Design of a Fully-Integrated Sleep Tracker*”.
- 2006-2013 Part-Time Student, **Hector Seminar**, Germany
Highly selective study program (by Dr. H.W. & J. Hector, co-founder SAP).

Professional Experience

- 10/2023-now Research Group Leader, **Karlsruhe Institute of Technology**, Germany
Wearable Systems within TECO at the Faculty of Computer Science.
- 03/2023-now Founder, **TOBI Technologies**, Germany
Spinoff dedicated to commercializing embedded wearable research (OpenEarable).
- 08/2022-11/2022 Visiting Researcher, **Massachusetts Institute of Technology**, Cambridge, USA
Space Exploration Initiative at Responsive Environments (Prof. Dr. Joseph Paradiso).
- 11/2019-09/2023 Research and Teaching Assistant, **Karlsruhe Institute of Technology**, Germany
TECO (Prof. Dr. Michael Beigl) at the Faculty of Computer Science.
- 04/2017-09/2017 Visiting Researcher, **Lancaster University**, Lancaster, United Kingdom
Interactive Systems (Prof. Dr. Hans Gellersen) in the Department of Computer Science.
- 10/2017-10/2020 Freelancer, **Various Projects**, Karlsruhe, Germany
Development of various websites e.g. coronazähler.de (> 5 million users).
- 10/2016-12/2016 Intern, **Microsoft**, Prague, Czech Republic
Identity and Authentication Team of Skype.
- 10/2014-10/2017 Founder, **enCourage Labs**, Karlsruhe, Germany
Development agency for different cross-platform smartphone apps.

Honors and Awards

- 2023 **Blanc & Fischer Dissertation Innovation Award**, across all university departments
- Special Recognition for Outstanding Review**, ACM Conference on Human Factors in Computing Systems (CHI)

- 2022 **Special Recognition for Outstanding Review**, Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies
- 2021 **Special Recognition for Outstanding Review**, Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies
- 2020 **Best Paper Award** ACM International Symposium on Wearable Computer
Best Master Thesis Award in Computer Science (sponsored by SICK)
Special Recognition for Outstanding Review, Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies
- 2019 **Best Paper Award**, Earcomp 2019
Audience Award, HackZurich (Europe's largest Hackathon, 360 participants)
- 2018 **1st Prize**, Deeptech:AI Hackathon (70 participants)
1st Prize, OpenCodes Hackathon (150 participants)
- 2017 **1st Prize**, InsurHack Hackathon (130 participants)
1st Prize + Audience Award, Coding Chemistry Hackathon (XXX participants)
- 2016 **1st Prize**, Accenture DigiHack Prague (400 participants in parallel in 8 countries)
1st Prize, code_n Hackathon (50 participants)
1st Prize, Xamarin Evolve Mini Hacks in Orlando (USA)
- 2015 **1st Prize**, Microsoft Imagine Cup Germany, world finalist in Redmond (USA)
1st Prize, XHack Karlsruhe
- 2009 **1st Prize**, Jugend forscht (Schüler experimentieren), Rhein-Neckar Area Germany

External Funding

— Total funding awarded **561,000€** (as sole lead on proposal development and execution).

████████████████████ (undisclosed)
 embedded ML + wearables incl. large three months data campaign, 175,000€

████████████████████ (undisclosed)
 embedded machine learning with audio signals, 60,000€

████████████████████ (undisclosed)
 embedded machine learning tutorials, 21,000€

████████████████████ (undisclosed)
 custom wearable and embedded machine learning, 22,000€

SoftwareCampus, German Ministry of Education and Research
Fit2Ear: Personalized AI-generated Otoplastic, 97,000€

BMBF Project Grant, German Ministry of Education and Research, StartMTI
Aura: Diagnosing Sleep Apnea Using a Wearable Patch, 180,000€

Scholarships

- 03/2024 **CITRIS Health Innovation Intensive**, health innovation program at UC Berkeley, UC Santa Cruz, UC Merced, UC Davis Health Center, and UC Davis
- 09/2022-11/2022 **KIT Research Travel Grant**, research visit at MIT
DAAD IFI International Research Stays for CS, resigned (conflicting grants)

Invited Talks

- Invited talks
- Bosch Sensortec GmbH, Stuttgart, Germany. Host: Aibin Lazar. 01/2024.
 Karlsruhe Institute of Technology, Germany. Host: Dr. Jürgen Spitzer. 11/2023.
 Biosignals Connect, Karlsruhe, Germany. Host: Dr. Michael Knierim. 08/2023.
 MIT Media Lab, Cambridge, USA. Host: Prof. Dr. Joseph Paradiso. 11/2022.
 MIT Media Lab, Cambridge, USA. Host: Prof. Dr. Joseph Paradiso. 04/2022.
 Bosch Sensortec GmbH, Stuttgart, Germany. Host: PD Dr. Victor Pankratius. 07/2021.
 BASF SE, Ludwigshafen, Germany, Host: Dr. Martin Bruder Müller (CEO), 02/2018.

Teaching Experience

- Winter 2023/24 **Mobile Computing & Internet of Things Exercise** (2.5 ECTS), ≈ 60 students
- teaching quality index of “100%” (perfect score)
 - arranged guest talks by Bosch Sensortec and Amazon Web Services
- Summer 2023 **Software Engineering in Practice** (9 ECTS), 10 students
- Winter 2022/23 **Mobile Computing & Internet of Things Exercise** (in 5 ECTS lecture), ≈ 60 students
- Winter 2021/22 **Mobile Computing & Internet of Things Exercise** (in 5 ECTS lecture), ≈ 60 students
Mobile Computing Proseminar (3 ECTS), 1 student
- Summer 2021 **Designing and Conducting Experimental Studies** (4 ECTS), 4 students
Mobile Computing Proseminar (3 ECTS), 1 student
- Winter 2020/21 **Mobile Computing & Internet of Things Exercise** (in 5 ECTS lecture), ≈ 60 students
Software Engineering in Practice (9 ECTS), 10 students
Designing & Conducting Experimental Studies Seminar (4 ECTS), 3 students
Mobile Computing Proseminar (3 ECTS), 1 student
- Summer 2020 **Software Engineering in Practice** (9 ECTS), 10 students
Interactive Analytics Seminar (4 ECTS), 4 students
Ubiquitous Computing and Mobile Computing Seminar (3 ECTS), 1 student

Winter 2019/20 **Software Engineering in Practice** (9 ECTS), 20 students
Mobile Computing Proseminar (3 ECTS), 1 student

Research Group

PhDs	Tobias King	08/2023-now
	Jueun Lee	10/2023-now
	Sarah Makarem	10/2023-now
Student research assistants	Felix Schmitt	11/2023-now
	Lukas Probst	06/2023-now
	Dennis Moschina	01/2023-now
	Oliver Bagge	01/2023-now
	Nils Kerwer	01/2023-06/2023
	Mark Schenkel	07/2022-12/2023
	Vladimir Bashkuev	02/2022-04/2023
	Ömer Yägmurlu	01/2022-12/2023
	Anja Hansen	11/2021-05/2022
	Murat Kurnaz,	11/2021-12/2023
	Philipp Lepold,	02/2021-now
	Dylan Ray Roodt	01/2021-now
	Michael Küttner	11/2019-now
	Jennifer Münk	11/2019-11/2020
Daniel Wolfram	11/2019-09/2020	

Master and Bachelor Theses

I have supervised **6** master theses (30 ECTS) [M], **14** bachelor theses (15 ECTS) [B], and **2** research in practice projects (24 ECTS) [R].

2024	[M]	Philipp Lepold, “Open-Source Hardware for Biopotential Sensing with OpenEarable”
	[R]	Richard Sirius Hanser, “EarCapAuth: Capacitive Ear-Shape Sensing for Earable User Authentication”
	[B]	Dennis Moschina, “Coupling Heart Rate with Vibrotactile Cues to Induce Sleep”

- 2023 [M] David Laubenstein, “Ear-Based Temperature Probing: Sensor Placement and Fusion for Wearable Applications”
- [B] Tianchen Wang, “Gaze-Based Smooth Pursuit Gesture Interaction based on Hand Gestures”
- [M] Julian Westermann (co-supervised with Dr. Peter Zeile), “Low-Cost Lidar-Based Overtaking Detection for Bicycles”
- 2022 [M] Tobias King (co-supervised with Yexu Zhou), “Hardware-Aware Neural Architecture Search for Time Series Classification”
- [B] Kathrin Blum, “Eye Tracking with Around-the-Ear Electrodes”
- [B] Leonardo Weng, “Cardiopulmonary Resuscitation Support with a Earable Real Time Feedback System”
- [B] Jan Ettrich, “Benchmarking Tool for Embedded Feature Extraction”
- 2021 [R] Stefan Herrmann, “Cardiopulmonary Resuscitation Support: Comparison of Wrist-, Chest-, and Ear-Worn Devices and Estimation Algorithms”
- [B] Pierre Brosemer, “Real-Time Matching of Video-Extracted Skeleton Data with Motion Data from Wearable Devices”
- [B] Anja Hansen, “Matching Video-Extracted Motion Skeleton Data with Acceleration Data from Wearable Devices”
- [B] Erwin Müller, “Predicting the Relative Head Yaw Angle from Earable Audio Features”
- [B] Stefan Herrmann (co-supervised with Paula Breitling), “Using Wearables to Improve Quality of Cardiopulmonary Resuscitation”
- 2020 [B] Dennis Osipov, “Stress Prediction in Urban Traffic Using Wrist-Measured Bio Signals and Smartphone Sensors”
- [B] Julian Westermann (co-supervised with Dr. Peter Zeile), “The Influence of Traffic and Vibrations on the Stress Experienced by eScooter Drivers”
- [B] Victoria Karl, “Real-Time Stroke Sensing for Rowboats”
- [B] Michael Küttner, “Development and Evaluation of a Compression Algorithm for Periodic Medical Sensor Data”
- [B] David Laubenstein, “Classification of Respiratory Events with Earables and Machine Learning”
- [M] Jennifer Muenk (co-supervised with Paula Breitling), “Predictive Wound Documentation”

- [M] Christian Dinse, “Design and Validation of an Ear-Worn System for Detecting Apnea Events”

Voluntary Service

- Organizer Local Chair, **Mensch und Computer 2023**
Technology Chair, **Ubicomp 2021**
- External reviewer **Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT)**
11/2023, 08/2023, 02/2023, 11/2022, 05/2022, 02/2022, 11/2021, 08/2021, 05/2021, 02/2021, 11/2020, 08/2020, 05/2020
- ACM CHI Conference on Human Factors in Computing Systems (CHI)**
2023, 2022, 2020
- ACM International Symposium on Wearable Computers (ISWC)**
2023, 2022, 2021, 2020
- ACM Symposium on User Interface Software and Technology (UIST)**
2023
- IEEE Computer**
03/2023, 07/2022, 02/2022, 05/2020
- Taylor & Francis Ergonomics**
04/2021

Open Source and Other Projects

- [OpenEarable] openeearable.com, MIT License, 218★ (GitHub)
World’s first open-source ear-based sensing development platform.
- [edge-ml] edge-ml.org, MIT License, 34★ (GitHub)
End-to-end, browser-based machine learning framework for microcontrollers.
- [GazeHeatmap] github.com/TobiasRoeddiger/GazePointHeatMap, MIT License, 118★ (GitHub)
Command line tool to generate heatmap plots from gaze data.
- [coronazähler] coronazaehler.de, 5+ million unique visitors, 100+ million sessions
First website in Germany to scrape COVID cases automatically from public sources.
- [enCourage] encourage-now.com, 5k+ downloads
App to send distress calls in case of emergency. Idea integrated in all iPhones today.
- [AstroAnt] media.mit.edu/projects/astroant-1/overview/, miniature lunar swarm robot
Tiny robot with magnetic wheels that will measure the surface temperature of the MAPP-1 rover on the moon.

Summary of Academic Achievements

24 publications including:

- 8 peer-reviewed conference papers
- 2 peer-reviewed journal papers
- 4 peer-reviewed workshop papers
- 4 lightly reviewed demos and posters
- 2 technical reports
- 3 filed patents

Citations: **148**

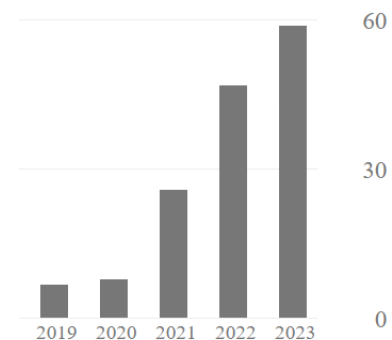
h-index: **6**

i10-index: **5**

based on

[Google Scholar](#)

(Jan 14th, 2024)



All citations and publications were achieved in **4 years**. My research has received **2 best paper awards, 1 dissertation award, and 1 Master thesis award**.

My publications have appeared at various top venues in different communities with competitive acceptance rates of **20-30%**. Out of all publications, **7 papers** were published in A or A* venues (according to [conferencerranks.com](#)). The research communities I publish in include:

- Ubiquitous Computing ACM IMWUT
- Wearable Computing ACM ISWC, ACM AHs
- Human-Computer Interaction ACM CHI

Five Selected Papers

T. Röddiger, C. Clarke, P. Breitling, T. Schneegans, H. Zhao, H. Gellersen, and M. Beigl. “[Sensing with Earables: A Systematic Literature Review and Taxonomy of Phenomena](#)”. Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, 6 (3):1–57, 2022.

T. Röddiger, C. Clarke, D. Wolffram, M. Budde, and M. Beigl. “[EarRumble: Discreet Hands-and Eyes-Free Input by Voluntary Tensor Tympani Muscle Contraction](#)” In Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems. Yokohama, Japan, May 2021.

T. Röddiger, T. King, D. R. Roodt, C. Clarke, and M. Beigl. “[OpenEarable: Open Hardware Earable Sensing Platform](#)”. In Adjunct Proceedings of the 2022 ACM International Joint Conference on Pervasive and Ubiquitous Computing and the 2022 ACM International Symposium on Wearable Computers). Online, Virtual, October 2022.

T. Röddiger, D. Wolffram, D. Laubenstein, M. Budde, and M. Beigl. “[Towards Respiration Rate Monitoring Using an In-Ear Headphone Inertial Measurement Unit](#)”. In Proceedings of the 1st International Workshop on Earable Computing, EarComp’19, page 48–53. Association for Computing Machinery, 2019. **Best Paper Award**.

S. Hermann, P. Breitling, **T. Röddiger**, and M. Beigl. “[Cardiopulmonary Resuscitation Support: Comparison of Wrist-, Chest-, and Ear-Worn Devices and Estimation Algorithms](#)”. In 2021 International Symposium on Wearable Computers. Online, Virtual, September 2021.

Peer-Reviewed Conference Papers

- [C8] M. T. Knierim, D. Puhl, G. Ivucic, and **T. Röddiger**. “OpenBCI + 3D-Printed Headphones = Open ExG Headphones – An Open-Source Research Platform for Biopotential Earable Applications”. Late Breaking Work of the 2023 CHI Conference on Human Factors in Computing Systems. Hamburg, Germany, April 2023.
- [C7] **T. Röddiger**, C. Clarke, D. Wolffram, M. Budde, and M. Beigl. “EarRumble: Discreet Hands-and Eyes-Free Input by Voluntary Tensor Tympani Muscle Contraction” In Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems. Yokohama, Japan, May 2021.
- [C6] S. Hermann, P. Breitling, **T. Röddiger**, and M. Beigl. “Cardiopulmonary Resuscitation Support: Comparison of Wrist-, Chest-, and Ear-Worn Devices and Estimation Algorithms”. In 2021 International Symposium on Wearable Computers. Online, Virtual, September 2021.
- [C5] E. Pescara, A. Stubenbord, **T. Röddiger**, L. Fang, and M. Beigl. “Where Should I look? Comparing Reference Frames for Spatial Tactile Cues”. 2021 International Symposium on Wearable Computers. Online, Virtual, September 2021.
- [C4] **T. Röddiger**, M. Beigl, M. Hefenbrock, D. Wolffram, and E. Pescara. “Detecting Episodes of Increased Cough Using Kinetic Earables”. In Augmented Humans Conference 2021. Virtual, Online, February 2021.
- [C3] L. Fang, **T. Röddiger**, H. Sun, N. Willenbacher, and M. Beigl. “FLECTILE: 3D-Printable Soft Actuators for Wearable Computing”. In Proceedings of the 2020 ACM International Symposium on Wearable Computers. Online, Virtual, Sept. 2020. **Best Paper Award**.
- [C2] **T. Röddiger**, M. Beigl, and A. Exler. “Design Space and Usability of Earable Prototyping”. In Proceedings of the 2020 International Symposium on Wearable Computers, pages 73–78, 2020.
- [C1] **T. Röddiger**, M. Beigl, D. Wolffram, M. Budde, and H. Sun. “PDMSkin: On-Skin Gestures with Printable Ultra-Stretchable Soft Electronic Second Skin”. In Proceedings of the Augmented Humans International Conference, Online, Virtual, March 2020.

Peer-Reviewed Journal Papers

- [J2] **T. Röddiger**, C. Clarke, P. Breitling, T. Schneegans, H. Zhao, H. Gellersen, and M. Beigl. “Sensing with Earables: A Systematic Literature Review and Taxonomy of Phenomena”. Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, 6 (3):1–57, 2022.
- [J1] **T. Röddiger**, M. Beigl, D. Dörner, and M. Budde. “Responsible, Automated Data Gathering for Timely Citizen Dashboard Provision During a Global Pandemic (COVID-19)”. Digital Government: Research and Practice, 2(1):1–9, 2020.

Peer-Reviewed Workshop Papers

- [W4] D. Moschina, **T. Röddiger**, and M. Beigl. “Vertical Jump Test Using an Earable Accelerometer”. In Adjunct Proceedings of the 2023 ACM International Joint Conference on Pervasive and Ubiquitous Computing & the 2023 ACM International Symposium on Wearable Computing. Cancun, Mexico, October 2023.

- [W3] **T. Röddiger**, T. King, D. R. Roodt, C. Clarke, and M. Beigl. “[OpenEarable: Open Hardware Earable Sensing Platform](#)”. In Adjunct Proceedings of the 2022 ACM International Joint Conference on Pervasive and Ubiquitous Computing and the 2022 ACM International Symposium on Wearable Computers). Online, Virtual, October 2022.
- [W2] H. Zhao, **T. Röddiger**, and M. Beigl. “[AirCase: Earable Charging Case with Air Quality Monitoring and Soundscape Sonification](#)”. In Adjunct Proceedings of the 2021 ACM International Joint Conference on Pervasive and Ubiquitous Computing. Online, Virtual, October 2021.
- [W1] **T. Röddiger**, D. Wolfram, D. Laubenstein, M. Budde, and M. Beigl. “[Towards Respiration Rate Monitoring Using an In-Ear Headphone Inertial Measurement Unit](#)”. In Proceedings of the 1st International Workshop on Earable Computing, EarComp’19, page 48–53. Association for Computing Machinery, 2019. **Best Paper Award**.

Theses

- [T2] **T. Röddiger**, “[Earables: Wearable Computing on the Ears](#)”. Karlsruhe Institute of Technology, Karlsruhe, Germany, July 2023. **Blanc & Fischer Innovation Award 2023**.
- [T1] **T. Röddiger**, “[Exploring the Wearability and Design of a Full-Integrated Sleep Tracker](#)”. Karlsruhe Institute of Technology, Karlsruhe, Germany, October 2019. **SICK Best Master Thesis in CS 2019 Award**.

Lightly Reviewed Posters and Demos

- [D4] S. Hermann, **T. Röddiger**, and M. Beigl. “[Towards Detecting Complete Chest Recoil from Smartphone Vibration Strength during Cardiopulmonary Resuscitation](#)”. In Proceedings of the 2022 ACM International Symposium on Wearable Computers. Online, Virtual, 2022.
- [D3] **T. Röddiger**, C. Dinse, and M. Beigl. “[Wearability and Comfort of Earables During Sleep](#)”. In 2021 International Symposium on Wearable Computers. Online, Virtual, 2021.
- [D2] **T. Röddiger**, D. Doerner, and M. Beigl. “[ARMart: AR-based Shopping Assistant to Choose and Find Store Items](#)”. In Proceedings of the 2018 ACM International Joint Conference and 2018 International Symposium on Pervasive and Ubiquitous Computing and Wearable Computers. Singapore, Singapore, October 2018.
- [D1] **T. Röddiger**, M. Beigl, M. Köpke, and M. Budde. “[VOCNEA: Sleep Apnea and Hypopnea Detection Using a Novel Tiny Gas Sensor](#)” In Proceedings of the 2018 ACM International Symposium on Wearable Computers. Singapore, Singapore, October 2018.

Technical Reports

- [R2] T. King, Y. Zhou, **T. Röddiger**, and M. Beigl. “[MicroNAS: Memory and Latency Constrained Hardware-Aware Neural Architecture Search for Time Series Classification on Microcontrollers](#)”. arXiv preprint arXiv:2310.1838. 2023.
- [R1] N. Schwabe, Y. Zhou, L. Hielscher, **T. Röddiger**, T. Riedel, and S. Reiter. “[Tools and Methods for Edge-AI-Systems](#)”. at-Automatisierungstechnik, 70(9):767–776, 2022.

Patents

- [P3] **Sensor System and Methodology for Determining a User's Chewing Behavior,** (pending), [DE102021210223A1](#).
Tobias Röddiger, Michael Beigl, Victor Pankratius

- [P2] **Discreet Hands- and Eyes-Free Input by Voluntary Tensor Tympani Muscle Contraction,** (withdrawn), [EP4085835A](#).
Tobias Röddiger, Christopher Clarke, Michael Beigl

- [P1] **Sensor System, Evaluation Device, Method and Computer Program Product for Recording a Subject's Sleeping Behavior,** (pending), [WO2020070126A1](#).
Tobias Röddiger, Matthias Budde, Marcel Köpke, Michael Beigl