Dr.-Ing. Tobias Röddiger

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last update: October 30th 2023

Experience

Karlsruhe Institute of Technology, Postdoc — *Karlsruhe, GER*
- scaling OpenEarable to be the global leading research platform for wearable ear sensing research — *Aug. '23 - now*

Karlsruhe Institute of Technology, Ph.D. Student — *Karlsruhe, GER*
- thesis topic "Earables: Wearable Computing on the Ears", supervised by Prof. Dr. Michael Beigl — *Nov. '19 - Jul. '23*
- hands on development of projects in machine learning, embedded systems, and hearables (see "Selected Projects")
- published 14 papers at world-class venues incl. Ubicomp and CHI (two best paper awards, see "Selected Papers")
- filed three patents in different fields
- working on research projects together with two industry-leading companies, overseeing budget as well as deadlines
- participated "Software Campus" which trains doctoral candidates management and leadership skills
- giving yearly practice lecture to 100+ students on mobile development and supervised 13 final thesis projects

Massachusetts Institute of Technology, Visiting Ph.D. Student — *Boston, USA*
- developing "OpenEarable", a multi-sensory in-ear platform for human-in-the-loop studies — *Sep. '22 - Nov. '22*
- contributing to AstroAnt, a miniature robot flying to the moon in 2023, working on the firmware and bootloader

Microsoft, Software Engineer Intern — *Prague, CZ*
- gathered cross-team requirements and built a telemetry library used by services across Skype — *Oct. - Dec. '16*
- contributed to a new auth-token service and took responsibility for getting the service into production

encourage-now.com, Co-Founder — *Karlsruhe, GER*
- took responsibility for developing the enCourage cross-platform emergency app (5.000+ downloads) — *Oct. '14 - Oct. '17*
- app was covered in major German news outlets (Die Welt, WiWo, Süddeutsche, Pro7, RTL II, SWR3, etc.)

Education

Karlsruhe Institute of Technology, M.Sc. Informatics — *Karlsruhe, GER*
- special interest in machine learning, medical informatics and design thinking — *Oct. '17 - Oct. '19*
- best master thesis award 2020 "Exploring the Wearability and Design of a Fully-Integrated Sleep Tracker"

SUGAR-network.org — *Multiple Locations*
Design thinking project with BASF and workshops at Stanford University. — *Sep. '17 - Jun. '18*
- developed augmented reality app for smartphones which resulted in a meeting with the BASF CEO
- HPC cluster application with 200 nodes which reduced concept video rendering from 30 days to 30 minutes

Lancaster University, Interactive Systems, Visiting Bachelor Thesis Student — *Lancaster, UK*
- developed novel notification user interaction technique based on gaze (optokinetic response) — *Apr. - Sep. '17*

Karlsruhe Institute of Technology, B.Sc. Informatics — *Karlsruhe, GER*
- special interest in ubiquitous and mobile computing, software design, and finance — *Oct. '13 - Oct. '17*

Hector Seminar, part-time student — *Mannheim, GER*
By Hans-Werner Hector (Co-Founder SAP) to offer selected students weekly advanced lessons. — *'06 - ' 13*
- project at age 16 with University of Mannheim "Artificial intelligence for the board game Cluedo"

Selected Projects

edge-ml.org, Project Lead and Software Developer
- low-code web framework that supports the complete life cycle of tinyML models (data collection to deployment)
- implemented first version, now responsible for the vision of the open-source tool and for prioritizing new features

open-earable.teco.edu, Project Lead and Hardware Developer
- world's first open-source hardware platform for hearable research, integrates various sensors for novel applications
- designed custom PCBs of the fully-integrated hearable platform which fits behind the ear of the wearer

coronazaehler.de, Project Lead and Software Developer
- first German website to scrape COVID-19 cases from public sources, 5+ million unique visitors, 100+ million sessions
- lead programmer, ramped up and rolled out the website within one week, supports thousands of concurrent users

Skills

Soft Skills: work in fast-paced environments and quickly grasp new concepts (participated 30+ hackathons); excellent team player with the ability to lead a group to joint success; ability to prioritize tasks in complex environments while keeping the right amount of attention to critical details;
Programming: hands-on project experience in C#, Python, Java, JavaScript, C, C++, HTML, CSS
Open-Source: OpenEarable open-source ear sensing platform (103 ★ on GitHub), edge-ml.org end-to-end tinyML (project lead, 25 ★ on GitHub); GazePointHeatMap (84 ★ on GitHub)
Hardware: hearables, PCB design, embedded systems, edge machine learning / tinyML
Languages: English (fluent), German (native), French (basic)

Awards

- SICK best master thesis at KIT 2020 ("Exploring the Wearability and Design of a Fully-Integrated Sleep Tracker")
- participated in over 30 hackathons around the globe and won 16 awards at different events
- Microsoft Imagine Cup overall winner Germany '15 and world finalist at the Microsoft HQ with Satya Nadella (CEO)
- invited student at Xamarin Evolve '16 with Nat Friedman, Xamarin Student Partner from '16 to '17
- two awards for outstanding review ACM Interactive, Mobile, Wearable and Ubiquitous Technologies Journal (IMWUT)

Scholarships

- "KIT Research Travel Grant", awarded for research activities at Massachusetts Institute of Technology
- "DAAD IFI - International research stays for computer scientists", resigned after acceptance

Patents

Hearables / Embedded Machine Learning *(confidential)* 2021 (pending)
Tobias Röddiger, Michael Beigl, Victor Pankratius

Discreet Hands- and Eyes-Free Input by Voluntary Tensor Tympani Muscle Contraction 2021 (pending)
Tobias Röddiger, Christopher Clarke, Michael Beigl

Sensor system, evaluation device, method and computer program product for recording a subject's sleeping behavior 2018 (pending)
Tobias Röddiger, Matthias Budde, Marcel Köpke, Michael Beigl

Publications (all publications have been peer-reviewed!)

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, pages 226–227, 2018

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, pages 440–443, 2018

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)**

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, pages 1–9, 2020

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

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, pages 32–36, 2020 **(best paper award)**

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

T. Röddiger, M. Beigl, M. Hefenbrock, D. Wolffram, and E. Pescara. Detecting Episodes of Increased Cough Using Kinetic Earables. In Augmented Humans Conference 2021, pages 111–115, 2021

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, pages 1–14, 2021

T. Röddiger, C. Dinse, and M. Beigl. Wearability and Comfort of Earables During Sleep. In 2021 International Symposium on Wearable Computers, pages 150–152, 2021

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, pages 28–32, 2021

E. Pescara, A. Stubenbord, **T. Röddiger,** L. Fang, and M. Beigl. Where Should I look? Comparing Reference Frames for Spatial Tactile Cues. In 2021 International Symposium on Wearable Computers, pages 68–72, 2021

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 and Proceedings of the 2021 ACM International Symposium on Wearable Computers, pages 180–184, 2021

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

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, T. King, D. R. Roodt, C. Clarke, and M. Beigl. OpenEarable: Open Hardware Earable Sensing Platform. In Proceedings of the 1st International Workshop on Earable Computing, EarComp, volume 22, pages 29–34, 2022

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, pages 103–105, 2022

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. In Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems, pages 1–7, 2023