Chair of Circuit Design
TUM School of Computation, Information and Technology
Technical University of Munich

Master's Thesis / Research Internship

AI Signal Processing and Phantom Measurements for Wearable Ultrasound

About us

At the Chair of Circuit Design, we bridge the gap between the physical world and the digital frontier. As society faces global megatrends like climate change and demographic shifts, we believe the solution lies in smarter engineering. We specialize in the development of analog and mixed-mode integrated circuits, creating precise, low-power, and miniaturized sensing systems that power the Internet of Things (IoT).
In this thesis or research internship, you will contribute to our new research topic dealing with wearable ultrasound for continuous blood pressure monitoring.

Motivation

Current ultrasound devices are usually bulky cart-based devices that require a trained operator to perform an examination. By combining low-power integrated electronics with a wearable transducer assembly, one can enable continuous imaging without the need for a trained operator. A promising application is to use such a wearable ultrasound system for cardiovascular monitoring. Ultrasound is currently the only method that allows blood pressure measurements without the need for frequent calibration or variable pressure application. This makes it an attractive candidate for smart wearables and healthcare.

What are good prerequisites for this work?

- You like to build practical measurement setups; ideally, you already have some lab experience
- You are interested in AI image recognition and signal processing
- Basic knowledge/experience with AI, MATLAB, electronics, and PCB design, signal processing
- Nice to have: Understanding of the working principle of ultrasound
- Ideally, you are interested in combining a research internship and a master's thesis

Tasks

- Build an ultrasound phantom to mimic blood flow in an artery
- Use a commercial ultrasound device to acquire representative data for blood pressure estimation
- Implement AI models for detecting artery position and extracting relevant measurement data
- Implement and develop automatic blood pressure estimation algorithms from ultrasound images
- Explore the possibility of data reduction in the ultrasound images

Contact

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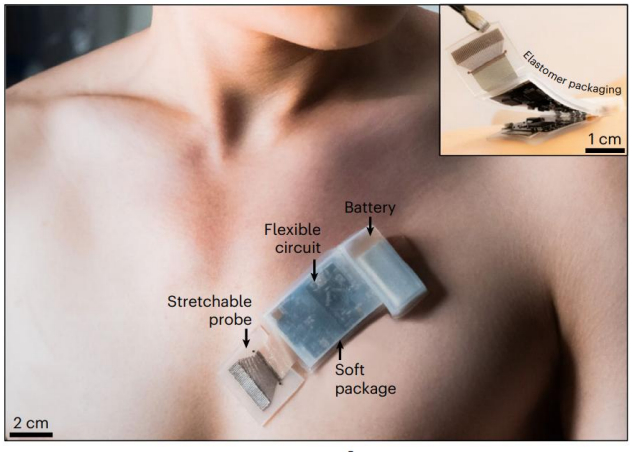
Example image:



M. Lin et al., "A fully integrated wearable ultrasound system to monitor deep tissues in moving subjects," Nature Biotechnol., vol. 42, no. 3, pp. 448–457, 2024, doi: 10.1038/s41587-023-01800-0