

Measurement electronics solutions to characterize soft tissues

Summary

The overall goal of the Thesis project is to examine and develop the measurement techniques to characterize statically or dynamically soft tissues (eg heart muscle, lungs, overall body composition, skin etc) in clinical environment, in co-operation with Tartu University Hospital. Methods under interest could include using of the electrical bio-impedance (EBI) and electrical impedance tomography (EIT), but can consider also using of the magnetic induction and other sensors with related signal processing. Modelling and digital twinning could be considered as a promising option to go beyond the state of the art, while of course inventing and developing of the advanced instrumentation is a great challenge. Also, classical instrumentation challenges – in improved calibration, accuracy, resolution, frequency range – are in place. Also basic image processing and machine learning could complement the developed measurement techniques.

Research field:	Information and communication technology
Supervisor:	Olev Märtens
Availability:	This position is available.
Offered by:	School of Information Technologies Thomas Johann Seebeck Department of Electronics
Application deadline:	Applications are accepted between June 01, 2025 00:00 and June 30, 2025 23:59 (Europe/Zurich)

Description

Main supervisor: Dr Olev Märtens (TalTech)

Co-supervisor: Dr Arno Ruusalepp (University of Tartu)

The research

The research and development of innovative solutions includes first understanding of the state-of-art of the field. The research itself could be mostly R&D of the original real-time embedded measurement systems and interfaces with corresponding back-end solutions and validation of the proposed technical solutions and intellectual property in the relevant environments

Responsibilities and (foreseen) tasks

1. Compile a good state-of-art (*technology level* -TL) overview on the Thesis Topics, with clear indication of the:
 1. *Starting points for the technology development for the Thesis;*
 2. *Possible places to go beyond TL, by inventing significantly improved technical solutions;*
1. Develop and research of the meaningful original prototypes and demonstrators;
2. Significant participation of the customer-readiness-level (CRL) and Intellectual Property Readiness Level (IPRL) increase activities in the Thesis Topics;

Applicants should fulfil the following requirements:

- a clear interest in the topics of the position;
- a master's degree from the engineering field, eg of electronics engineering, mechatronics, hardware & software development;
- demonstrable skills in the development of the embedded systems;
- additionally basic understanding and skills in image processing and machine learning could be very beneficial;
- at least good-level (if not excellent) demonstrable reading, writing and analytical skills in English and some programming languages (eg C/C++, Python, R);
- Estonian language adds much value (if latest by 2-nd year);
- capacity to work both as an independent researcher and as part of the team(s);

The candidate should submit a research plan for the topic, including the overall research and data collection strategy.



We offer:

- 4-year PhD position at TalTech, in the Thomas Johann Seebeck department of electronics, research group of measurement electronics – worldwide recognized leader in e.g. bio-impedance R&D and related innovative (typically patented) solutions ;
- The chance to do high-level and really innovative and meaningful and applicable research by creating relevant intellectual property in the field;
- Opportunities for conference visits, research stays and networking with leading universities and research centers in the field.

About the department

Thomas Johann Seebeck department of electronics (including the research group of the measurement electronics) was established in 1962 and has been and is still the leading player in the field of electronics, including of measurement electronics – as well as nationwide, as well as internationally. The department has been characterized over decades by high-quality graduates of electronics engineering, co-operation with R&D units of the electronics and instrumentation industries and nowadays take part also in international R&D projects (Era-Net and similar, Horizon etc). Staff members are active (and are involving students) in the world's largest and most influential engineering organization IEEE (including the IEEE IMS – instrumentation and measurement society) and these activities have been noticed and highly recognized by IEEE.

(Additional information)

For further information, please contact sr researcher Dr Olev Märtens, olev.martens@taltech.ee



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