

PhD candidate positions: **Activity Recognition and Ubiquitous Computing** **at TU Eindhoven, NL**

The Activity and Context Recognition group within the Signal Processing Systems section of TU Eindhoven is looking for talented candidates interested in pursuing a 3 to 4-year PhD program. Research topics in recognition of human activities and ubiquitous computing address novel personal and clinical healthcare technology, energy efficient buildings, and smart environments that respond to occupant behaviour. Please find the appointment details and contact information below.

PhD candidate position: Activity and context inference in ambient intelligent environments.

Background: Coaching healthy eating habits is a major challenge and essential to minimise disease risks, as evidenced by the pandemic of overweight and obesity. Novel lighting systems (based on LED and OLED) offer various options to stimulate mental state and provide information. Thus, light can provide dietary activity and behaviour cueing and feedback.

Focus: The goal of this project is to develop frameworks and practical demonstrations of activity and mental context recognition related to food preparation and consumption. In particular, the candidate's work will focus on developing novel dynamically adaptive activity recognition techniques that can be used to cue food preparation and dietary activity using ambient light. Information on activity and context will be derived from ambient and on-body multi-modal sensors. The candidate's work will span electronic systems, pilot studies, signal processing, and pattern recognition fields, with a focus on the latter.

Keywords: Activity recognition, ubiquitous sensors, wearable systems, control theory.

PhD candidate position: Physiological health and stress monitoring in newborns and babies.

Background: Newborn infants and babies need care and assistance to prevent health risks. In particular, preterm infants require 24h medical attendance, to detect early signs of potentially detrimental health developments. However, sensors and electrodes attached to the body generate pain and stress in newborns, which can lead to permanent diseases later in life. Thus, sensing must be performed without sticky body contacts, while maintaining quality of derived vital signs.

Focus: In this project decision support algorithms will be developed to interpret physiological information sources from multiple weak sensors that are embedded in the infant/baby environment. Unobtrusive sensors will be integrated into wearable garments, mattress, and other ambient smart objects. The algorithms will target (1) interpretation of vital signs from multi-modal physiological sensors, (2) sensor design and evaluation to interpret pain-related mental strain, and (3) analysis of gastric tract function from sensor arrays. In all considered situations, the work will focus on distributed signal processing and pattern analysis from multiple weak sources. Validations of the algorithms will be performed in clinical trials with perterm infants and in simulations.

Keywords: Biomedical sensors, sensor fusion, pattern analysis, clinical decision support.

PhD candidate position: Behaviour estimation to optimise energy consumption in public buildings.

Background: Many energy-consuming building installations are currently manually operated according to static assumptions of how occupants utilise buildings. In particular, public buildings (including offices, hotels, hospitals, etc.) have a very dynamic utilisation depending on the activity and behaviour of their occupants. Dynamically adapting building installations and appliances to occupant activities and behaviour can profoundly save energy.

Focus: This project will investigate ambient activity and behaviour recognition concepts to optimise energy consumption using various ambient sensor modalities. Sensor systems and algorithms are developed to derive activity information, which is subsequently used to control lighting, ventilation and temperature, and different appliances. In addition this project will incorporate building context information derived from different sources (e.g. weather condition) into the analysis.

Keywords: Activity recognition, distributed systems, sensor fusion, pattern analysis, control theory.

PhD candidate position: Ubiquitous on-body and ambient sensor network design and evaluation.

Background: Miniaturised sensing and signal processing systems are essential for intelligent ambient and on-body assistants. Such assistants are intended to help the user in accomplishing daily activities and tasks by providing information, e.g. on health state for chronic patients, physical performance in sports, and energy saving in buildings. In all situations, available resources in such networks are limited urging effective algorithm implementations.

Focus: This project will investigate distributed sensor network systems for rapid prototyping in ubiquitous environments with the aim to extract activity information. In particular, the project will consider the tradeoff between system performance and resource usage and ultra low-power algorithm operation. Different prototyping network installations will be implemented and deployed to evaluate solutions in buildings and on-body.

Keywords: Ubiquitous sensors, distributed systems, control theory, resource awareness.

It is possible to apply for multiple positions. Successful candidates will have a strong background in one or more of the following fields, through their study curricula and previous project experience, ideally evidenced by first publications: biomedical engineering, pattern recognition, artificial intelligence, control theory. In addition, experience in analysis (e.g. Matlab) and programming tools (e.g. Python, C++) are mandatory, electronic design expertise is beneficial.

The appointment is for four years. The daily communication language of the group is English. As an employee of the university you will receive a competitive salary as well as excellent employment conditions (including excellent sport facilities and child care). The research must be concluded by writing a PhD thesis. A salary is offered starting at EUR 2042 per month (gross) in the first year and increasing up to EUR 2612 per month (gross) in the last year. Moreover 8% bonus share (holiday supplement) is provided annually. Assistance for finding accommodation can be given. TU/e offers you also the opportunity for personal development by developing your social and communication skills. We do this by offering every PhD student a series of courses that are part of the Proof program as an excellent addition to your scientific education.

For further information please contact Oliver Amft, amft@tue.nl. Applications should be submitted to Oliver Amft, amft@tue.nl and include: a full CV, a brief letter of interest, Bachelor and Master/graduate curriculum course list and evaluation results, and results of a recent English language test. In addition please indicate when you would be available to assume a position. The positions will be filled as soon as possible. Additional information can be found at:

<http://www.sps.ele.tue.nl/members/O.Amft>

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