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PhD student for developing autonomous capsule endoscopes combining radio and optical techniques
Aalto University

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Posted Sep. 9, 2021, set to expire Jan. 9, 2022

Job Title	PhD student for developing autonomous capsule endoscopes combining radio and optical techniques
Department	T411 Dept. Electronics and Nanoeng
Institution	Aalto University , , Finland
Date Posted	Sep. 9, 2021
Application Deadline	Open until filled
Position Start Date	Available immediately
Job Categories	Graduate Student
Academic Field(s)	Optics & Optical Engineering Electrical and/or Electronics
Job Website	https://aalto.wd3.myworkdayjobs.com/aalto/job/Otaniemi-Espoo-Finland/PhD-student-for-developing-autonomous-capsule-endoscopes-combining-radio-and-optical-techniques_R31925
Apply By Email	

Job Description

The Department of Electronics and Nanoengineering conducts research and arranges related courses in the field of electromagnetics, micro and nanotechnology, radio engineering, and space technology, featuring an international team of more than 150 Researchers and Research Assistants. The Department is part of the Aalto University School of Electrical Engineering (Aalto ELEC) with world-class research facilities and instruments.

The Millimetre Wave and THz Techniques group and the Antennas and Propagation group of Aalto University School of Electrical Engineering are together looking for a

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Job description
Capsule endoscopes are a popular diagnostic instrument for in-vivo inspection of the digestive tract. They are particularly advantageous in imaging the small intestine, which is difficult to reach with traditional, guided endoscope techniques. In addition, there is the constrained sensitivity and specificity in pathological tissue detections. These constraints are due to a limited capsule camera field-of-view, inadequate wireless image transfer speeds from the capsule to outside the body, and finally an insufficient battery capacity for supporting higher quality image acquisition throughout the complete digestive tract. The planned research at this position addresses these challenges by developing new radiofrequency and optical components that enable a significant improvement of image quality and hence diagnostic yield. The three main goals of this work are 1) designing and prototyping an optical system that achieves a full field-of-view from the capsule, 2) developing an antenna system that enables high-capacity in-body-to-out-of-body wireless data links, and 3) developing a new method to charge the capsule battery wirelessly.

As a PhD student you shall tackle those important research aspects by developing

* refractive optics at both ends of the capsule in conjunction with reflective optics on the side wall to achieve full field-of-view;
* antenna systems using e.g., multiple-input multiple-output radio technology, to enable high-data rates for transferring high-resolution images simultaneously from the multiple cameras inside the capsule;
* an antenna system including an impedance matching network to wirelessly receive energy from outside the body, topping up the capsule’s internal battery

The developed radiofrequency and optical components will be finally integrated with available power sources, transceivers, and detectors into a capsule to perform a real-time demonstration of improved wireless data/power transfer and acquisition of high-quality video images. During this project activity a physician will provide ongoing support from as a consultant on clinical operational conditions and diagnostics of the digestive tract using endoscopes.

The work will be embedded into several research projects, including one supported by the Academy of Finland. This project work also offers opportunities for international mobility to UCLA (USA), EPFL (Switzerland), QUT (Australia), and NICT (Japan). Due to its interdisciplinary nature, the research work offers good opportunities for cooperation and coordination of research work with research groups in different fields at Aalto University. The study will be performed in close collaboration with several doctoral students and post-doctoral researchers working on optics, radios and measurements. The candidate is expected to also communicate with other national and international academic research

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institutions.

Research environment
Both the [url=http://https://www.aalto.fi/en/department-of-electronics-and-nanoengineering/millimetre-wave-and-thz-techniques]Millimeter Wave and THz Techniques research group (lead by Assistant Professor Zachary Taylor) and the [url=http://https://www.aalto.fi/en/department-of-electronics-and-nanoengineering/antennas-and-propagation]Antennas and Propagation research group (lead by Associate Professor Katsuyuki Haneda) have been involved in various Academy of Finland, Business Finland, and EU FP7 and Horizon 2020 projects, and are hence known internationally among the relevant scientific and industrial research communities. Applying the accumulated scientific knowledge and our excellent experimental facilities to create novel industrial, scientific and medical applications is one of the key research missions of the groups.

Your background
You have the following qualifications:

* a Master' degree in Electrical Engineering, Applied Physics, or equivalent
* interest in doing translational research in a multidisciplinary field
* sufficient understanding and design skills of microwave components including antennas
* basic understanding of radio communication systems
* basic experience with laboratory equipment such as oscilloscope or network analyzer
* sufficient communication skills in both spoken and written English

In addition to the above qualifications, it is advantageous if you have the following knowledge and skills:

* experience in using and programming Labview and Matlab
* experience with relevant computer simulation tools such as AWR, CST or Comsol
* experience with ray tracing software packages, e.g. Zemax
* basic understanding of geometric-optics based design
* basic understanding of power transfer systems
* experience in manufacturing and measuring microwave components including antennas

We offer
This full-time position will be filled for four (4) years. The starting salary for a PhD student is approximately 2500€/month and salary will increase with responsibilities and performance over time. You are expected to complete doctoral research and studies within four years in the Doctoral Programme in Electrical Engineering of Aalto University. As an employer, Aalto University provides excellent learning and development opportunities as well as occupational health care services,

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commuter ticket benefit and versatile exercise services by Unisport. Finland has a comprehensive social security system. Preferable starting time is during the last quarter of year 2021.

Ready to apply?
Please submit your application through our recruiting system and include the following documents as one pdf package in English:

* Motivation letter
* Curriculum Vitae
* Course transcripts of master’s studies

If you are already working at Aalto University, please apply via our internal system Workday -> Find Jobs. Deadline for applications is September 30, 2021 but we will start reviewing candidates immediately upon receiving application documents.

More Information
For additional information, please contact Associate Professor Katsuyuki Haneda, katsuyuki.haneda(at)aalto.fi or Assistant Professor Zachary Taylor zachary.taylor(at)aalto.fi.

About Aalto University, Helsinki and Finnish society
At Aalto, high-quality research, art, education and entrepreneurship are promoted hand in hand. Disciplinary excellence is combined with multidisciplinary activities, engaging both students and the local innovation ecosystem. Our main campus is quickly transforming into an open collaboration hub that encourages encounters between students, researchers, industry, startups and other partners. Aalto University was founded in 2010 as three leading Finnish universities, Helsinki University of Technology, the Helsinki School of Economics and the University of Art and Design Helsinki, were merged to strengthen Finland’s innovative capability.

The greater Helsinki region is a world-class information technology complex, attracting leading scientists and researchers in various fields of electrical engineering. As a living and working environment, Finland consistently ranks high in quality of life, and Helsinki, the capital of Finland, is regularly ranked as one of the most livable cities in the world.

Finns are proud to say that we have one of the best education systems in the world. The Nordic values of equality and co-operation are deeply rooted in our society. We are one of the world’s top countries in happiness, clean air and nature, press freedom and consider the many voices in our society a strength.

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With high investments in R&D, a strong innovation culture, open data and advanced state of digitalization, we are a nation of innovation and entrepreneurship. Gender equality, flexibility and the low hierarchy are at the core of our Nordic working environment. Having four seasons, clean air and thousands of lakes, we are nature-loving people who take good care of our unique environment. For more information about living in Finland see Aalto´s pages for international staff: [url=https://www.aalto.fi/en/careers-at-aalto/for-international-staff]https://www.aalto.fi/en/careers-at-aalto/for-international-staff.

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Contact Information

Please reference Academickeys in your cover letter when applying for or inquiring about this job announcement.

Contact

Finland