



The University of Agder has more than 1400 employees and 13 000 students. This makes us one of the largest workplaces in Southern Norway. Our staff research, teach and disseminate knowledge from a variety of academic fields. Co-creation of knowledge is our common vision. We offer a broad range of study programmes in many fields. We are situated at two modern campuses in Kristiansand and Grimstad respectively.

We are an open and inclusive university marked by a culture of cooperation. The aim of the university is to further develop education and research at a high international level.

Two PhD Research Fellows - Signal Processing and Artificial Intelligence for wireless networks

The University of Agder (UiA), Faculty of Engineering and Science, [Department of Information and Communication Technology](#), invites applications for two three-year PhD positions. The position is located at Campus Grimstad, Norway. The starting date is as soon as possible or to be negotiated with the Faculty.

The PhD student will be supervised by researchers from the Intelligent Signal Processing and Wireless Networks (WISNET) Lab, Faculty of Engineering and Science, UiA.

Brief Information about the WISNET Lab

The herein announced position will be part of the recently established [Intelligent Signal Processing & Wireless Networks](#) (WISNET) Lab. The Lab activities span across the Department of Information and Communication Technology and the Department of Engineering. The researchers in the WISNET Lab have a strong expertise in a range of areas, among them, Data Science, Machine Learning, In-Network Processing and Distributed Artificial Intelligence for Wireless Communications, Networked Cyber-Physical Systems and Embedded Systems. The Lab has led a number of large research projects, funded by the Research Council of Norway, the EU research Programs FP7 and H2020, as well as national and international industries. WISNET Lab is in rapid expansion, having at present seven PhD students and three postdoctoral researchers working on multiple cutting-edge research projects, such as FRIPRO TOPPFORSK, SFI, PETROMAKS, IKTPLUSS and INFRASTRUCTURE projects. WISNET Lab is committed to achieving international research excellence; please see the notes about prospective PhD students at WISNET [here](#) before applying.

The open PhD positions are offered in the area of self-organized wireless networks enabled by direct device-to-device (D2D) simultaneous links employing novel dynamic spectrum access (DSA) features, aiming at progressing substantially over the state-of-the-art both in terms of theoretical aspects (fundamental performance analysis) and algorithm designs. The activities are mainly driven by a multi-disciplinary advanced research project on next generation wireless communications enabled by self-organized spectrum cartography (WISECART). WISECART is funded by the Research Council of Norway (RCN) under the research funding framework "[FRIPRO Toppforsk](#)", which is the most competitive and highly reputed funding program from the RCN for fundamental research across all disciplines.

[More about working at UiA.](#)

Research topics for the positions

The ever-increasing demand for ultra-high data rates and energy efficiency in radio access networks (RAN) together with the need for enabling different types of user-driven applications poses enormous challenges. In this context, D2D communication is being investigated in the wireless communication research community as a promising paradigm to boost both spectrum utilization and energy efficiency. To this end, D2D communication exploits the spatial proximity of devices, which enables direct exchanges of data and control information, i.e., bypassing the base station. As a consequence, higher spectrum reuse can be achieved by enabling multiple D2D communication links while meeting the communication needs for different types of services or applications involving nearby users.

In WISECART, the main goal is to scale up D2D communication to enable a self-organized networking among multiple and heterogeneous devices for purposes such as sharing contents of common interest, increasing connectivity, or intelligently performing certain cooperative tasks. These networks are expected to include not only human operated devices but also machine type communication devices and other objects, as motivated by the paradigms of Internet of Things (IoT) and Cyber-Physical Systems (CPS).

Your research may cover physical, MAC and network layers. In addition to theoretical advancements and algorithmic design, the PhD positions will involve simulation and experimental validation.

The main topics for the PhD positions will be:

- High-resolution localization methods to enable the construction of spectrum maps, by solely relying on the information-bearing signals. This dramatically reduces the overhead of control traffic, which needs to be kept minimal so that the complexity of localization and interference map construction scales well as a function of the number of nodes. The algorithms will be attuned to the specific user activity and traffic patterns. 5G and next-generation waveforms are of special interest to this task.
- Coordination protocols to build, maintain and adapt D2D-based topologies of spectrum sensors that are used to maintain the spectrum awareness, including: (i) neighbor and topology discovery protocols; (ii) sampling protocols capable of dealing with irregular and time-varying sampling caused e.g. by loss of connectivity, node mobility, and synchronization issues; (iii) efficient distributed in-network

computation, machine learning techniques and storage of interference maps, minimizing local storage requirements and maximizing the efficiency for accessing interference maps.

- Adaptive user-driven network protocols: (i) Control-plane network protocols to support the generation and maintenance of mesh-type formations for local communications with low control overhead, by considering the trade-off between the level of automatization of the local topologies among the nodes that find themselves co-located and engaged in a given application, and the control that should be guaranteed to the users over the activities of their devices; (ii) Data-plane network protocols to provide specific MAC and routing algorithms for communication within mesh-type formations, considering application requirements and traffic patterns, such as distribution of multimedia content and distributed computation. We will design protocols for scheduling and in-network caching in delay tolerant scenarios, making use of distributed dynamic storage at nodes and ensuring that transmission resources among the nodes are used according to the link qualities (e.g. channel gain maps), demand profiles, storage capacity and energy availability at nodes. We will also explore the use of mm-waves for communications to nearby nodes.

Each one of the two PhD positions will cover one or at most two of the topics described above. In addition, the work will involve also the development of some software architectures that will be used to implement the designed algorithms.

Requirements

To be regarded as an eligible applicant, the candidate must have:

- A solid academic background with a MSc. in Electrical Engineering, Electronics Engineering, Communications Engineering, Industrial Engineering, ICT or equivalent, is required. It is also possible to apply if the applicant is in the last year of the Master studies and in this case, if the applicant is selected, she or he will start the PhD position once the Master degree is finished.
- Substantial knowledge of all or most of the following:
 - optimization techniques
 - stochastic processes
 - wireless sensor networks
 - statistical signal processing
 - mathematical analysis and linear algebra
 - machine learning techniques
 - strong programming skills mainly in Matlab, LabView and C/C++

Moreover, it would be considered an advantage to have additional knowledge and experience in:

- D2D wireless communications
- Radio resource management, interference management
- Cognitive radios, DSA and spectrum sensing
- Localization and navigation techniques
- Distributed signal processing on graphs
- RF measurements and implementation in Software-Defined Radio Test-beds

Candidates should also have:

- Scientific ambition
- Motivation and strong interest in cutting-edge research
- Good analytical and problem solving skills
- Capacity for goal-oriented work and ability to concentrate
- Good communication and team-working skills, inventiveness and a proactive attitude
- Strong academic credentials, written and spoken English proficiency

The previous participation in national and European projects related to the areas of this position, will be also considered as a plus, as well as the publication of scientific papers on international conferences related to these topics.

In return, we offer the opportunity to contribute to the strategic capabilities of a world-class research organization, along with intensive supervision. You will collaborate with top scientists in your field and have excellent prospects for personal development in an innovative working environment for aspiring researchers. The candidate must be also admitted to the [PhD Program in Technology, with ICT as specialization](#), before or within the first three months of the second year.

The following admission requirements apply to the PhD Program:

- The average grade for courses included in the bachelor's degree (or equivalent) must be C (or equivalent) or higher
- The average grade for courses included in the master's degree (or equivalent) must be B (or equivalent) or higher
- The Master Thesis (or equivalent) must have a grade B (or equivalent) or higher when the candidate is admitted to the PhD program

Further provisions relating to the position as PhD Research Fellow can be found in the [Regulations Concerning Terms and Conditions of Employment for the Post of Post-Doctoral Research Fellow, Research Fellow, Research Assistant and Resident](#).

The successful applicant must have written and spoken English proficiency. Applicants from some countries must document their English proficiency through one of the following tests or certificates:

- TOEFL - Test of English as a Foreign Language with a minimum score of 600 on the Paper-based Test (PBT), or a minimum of 92 on the Internet based Test (iBT)
- IELTS - International English Language Testing System, with a result of at least 6.5, with no section lower than 5.5. (only Academic IELTS test accepted)
- CEFR (Common European Framework of Reference for Languages) certificate of at least Level B2

Please check this [website](#) to see if an English test is required. Please note that the English test requirement applies to applicants from most countries according to the list mentioned above. No other English tests or certificates will be approved, and certifications/statements cannot replace an English test.

Short-listed applicants will be invited for interviews. With the applicant's permission, UiA will also conduct a reference check before appointment.

Remuneration

The positions are remunerated according to the State salary scale, salary plan 17.515, code 1017, NOK 449 400 gross per year. A 2 % compulsory pension contribution to the Norwegian Public Service Pension Fund is deducted from the pay according to current statutory provisions.

The Norwegian public service is committed to reflecting the diversity of society, and the personnel policy of the University of Agder aims to achieve a balanced workforce. All qualified persons are therefore encouraged to apply for the position, irrespective of cultural background, gender, age or disability.

Women are especially encouraged to apply.

Appointment is made by the University of Agder's Appointments Committee for Teaching and Research Positions. The successful applicants will have rights and obligations in accordance with the current regulations for the public service.

Application

Submit your application and CV online. Please click on the link "**Apply for this job**". The following documentation should be submitted as attachments to the online application:

- Justification (maximum 5 pages) of the background of the candidate for each of the requirements of the position (see description above about the knowledge areas that a candidate should have), especially for optimization techniques, stochastic processes and statistical signal processing, wireless networks and programming in Matlab, LabView and C/C++
- Certificates and/or grades for all post-secondary education, up to and including the bachelor's level
- Master's degree/higher degree certificate, with a summary of the courses/subjects included in the degree
- Applicants with a foreign higher education must attach an official description of the grading system used at the issuing institution
- Summary (approximately 1-2 pages) of the Master Thesis
- Applicants who are required to document their English proficiency must submit their TOEFL or IELTS test results (these may be forwarded after the closing date) or their CEFR certificate
- Publication list or links to applicant's scientific publications (if any)
- A description of the candidate's research interests, motivation and background for the PhD position. Please, indicate clearly in your application your preferred topic/topics
- A list with the names and contact information of reference persons who would be willing to be contacted by telephone

Original documents must be presented for verification to the University of Agder. Successful candidates will be asked, normally during the interview, to ensure that the issuing university submits documents in a sealed envelope directly to UiA or provide access to their documents online, which allows UiA to verify the authenticity of these electronic documents via a secure website hosted at the issuing university (contact person at UiA will be provided later for certain candidates).

The applicants are fully responsible for submitting complete documentation. Without complete documentation we cannot, unfortunately, include you in the assessment process.

Closing date: 27.05.19

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In accordance with §25(2) of the Freedom of Information Act, applicants may request that they are not identified in the open list of applicants. The University, however, reserves the right to publish the name of applicants. Applicants will be advised of the University's intention to exercise this right.

Jobbnorge ID: 158067, Deadline: Monday, May 27, 2019