Post-doctoral Research Fellow - Machine Learning and Autonomous Control for Cyber-physical systems

About the position

A fixed-term 100 % position is available at the University of Agder, Faculty of Engineering and Science, as a Post-doctoral Research Fellow in Information and Communication Technology, for a period of 2 years. The position is located, at the present, at the Campus Grimstad. The starting date is as soon as possible or to be negotiated with the Faculty.

The Postdoctoral researcher will be supervised by researchers from the Center Intelligent Signal Processing and Wireless Networks (WISENET), Faculty of Engineering and Science, UiA. Information about why UiA provides an excellent working environment can be found here.

The successful candidate will work in the area of Networked Cyber-Physical Systems, Data Analytics, Machine Learning and Distributed control for Autonomous Smart Water Networks.

The herein announced position will be part of the Center Intelligent Signal Processing & Wireless Networks (WISENET), whose activities span across both the Department of Information and Communication Technology and the Department of Engineering. The WISENET Center is recognized and funded by the national NFR TOPPFORSK Programme, Research Council of Norway. The WISENET Center has a strong expertise in a wide range of areas, among them, Data Analytics, Machine Learning, In-Network Processing and Distributed Intelligence, Wireless Networks, Networked Cyber-Physical Systems and Embedded Systems, having led a number of large research projects, funded by the Research Council of Norway, the EU research Programmes FP7 and H2020, as well as national and international industries. The WISENET Center is now in full expansion phase, having at the present ten PhD students, three postdoctoral researchers, working on different cutting-edge research projects, such as FRIPRO FRINATEK, SFI, PETROMAKS, INFRASTRUCTURE and IKTPLUSS Projects, among others. The WISENET Center is committed to achieving international research excellence; please see the notes about prospective Postdoctoral researchers at WISENET before applying.

A postdoctoral research position should function as an intermediate step in the research career following the completion of a PhD degree and preceding a faculty position in a university. For this reason, the WISENET Center is committed to offering the suitable environment and activities that allow the postdoctoral researcher to (i) consolidate her/his research maturity, (ii) develop her/his teaching and advising skills, and (iii) build up a solid resume that facilitates her/his incorporation to the academia as an assistant or associate professor.

Responsibilities

The open Postdoctoral researcher position is offered in the area of Networked Cyber-Physical Systems, Data Analytics and Machine Learning for Autonomous Smart Water Networks, advancing both theoretical aspects and algorithm designs, and considering also several application use cases in the domain of Smart Water Networks (SWN), which is of high importance in Norway, such as Aquaponics, pollution monitoring in the processing industry involving water and drinking water distribution networks (WDN).

Ever increasing pressures on natural and controlled water resources requires the need for effective management including legislative compliance in order to uphold water quality, is also growing. As water issues will continue to be a major challenge in the coming decades, especially in the light of climatic changes, the relevance of and need for SWN have never been more apparent. To this end, the concept of environmental diagnostics and autonomous control, which encompasses not just measurement of parameters (symptoms) but automated understanding (diagnosis) and appropriate automated actions (treatment), is emerging.

SWNs have emerged as a key engineering field that addresses the blend of networked data technologies with water infrastructures in order to solve many of the current challenges. By definition, SWNs have an inherited dependence on networked Cyber-Physical Systems, since the latter provides the technological suite to deliver responsible, scalable, and secure architectures in dynamic environments. These networked systems are composed of a large number of interconnected control units over large geographic areas or with high spatial densities. Unfortunately, currently existing scientific and engineering methods do not consider a really multidisciplinary approach involving smart sensing/control components, distributed intelligence and data analytics to offer timely warning, detection, and control, and are in general, very conservative and sub-optimal. The envisioned networked CPS will ensure: a) a highly reliable health protection with respect to both chemical and microbiological contamination, predicting and reacting through actuation (e.g. component dosages, smart valves and pumps), ensuring that the water quality and other ambient parameters are within corresponding limits adapting to the corresponding application demands; b) improved decision making and future planning for service operations and better condition monitoring of infrastructure.

The main topics for the Postdoctoral researcher position will be:

- Data-driven modelling of the space-time evolution of the physical phenomena and the dynamics of processes in relation to the application domains.
- Cooperative in-network signal/data processing, distributed control and statistical learning strategies. This includes data fusion and aggregation methods, as well as advanced machine learning tools, including Deep Learning. We will also take into account the heterogeneity of the devices, and evaluate the implications of the cooperation in this heterogeneous framework, considering the

constraints imposed by the communication medium, as well as the properly modelled spatio-temporal dynamics associated to the scenarios for each use case.
- High-level data analytics and multi-objective autonomous control algorithms. This includes methods capable of dealing with a large amount of heterogeneous multi-source data, including both sensor data and subjective data obtained from the quality assessment of end-users (e.g. water utilities, water and food consumers). The data analytics will directly support the control algorithms, but also the situation-aware operation and derivation of good operational patterns.

In addition to the theoretical and algorithm design work, the research work will involve also the demonstration and validation of a real system solution for spatio-temporal dense monitoring and control in one or several of the application domains, showing several gains: (a) the early detection and warning when different types of pollutants are present in WDNs or industrial effluents, (b) improved management of the WDN by correlating pollution distribution with other events, such as leakages or degradation in the WDN, or production parameters for the industrial case (c) optimal balance between fish and plant ecosystems in Aquaponics, so that the water parameters are tuned to maximize the production while guaranteeing quality and minimizing resources, (d) increase of end-user satisfaction and increased benefits of the exploitation of WDN and Aquaponics industrial plants. Pilot-scale facilities for demonstration will be provided directly by existing and planned projects/infrastructure in the portfolio of other institutions collaborating with the WISENET Center, namely, the Norwegian Institute for Water Research (NIVA), the Norwegian Institute of Bio-economy Research (NIBIO) and the Kristiansand Municipality Water Infrastructure.

Required qualifications

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

- A PhD in Electrical Engineering, Computer Engineering, Computer Science, Telecommunication Engineering, or similar. Having a PhD Thesis on a related topic is an advantage. It is desirable that the applicant has defended his/her doctoral thesis within the last four years. PhD students are also welcome to apply if their defence is scheduled for the next few months. The PhD Thesis must be approved within the deadline for applying for this position.
- Solid understanding and experience in (some of) the following areas:
  - advanced optimization techniques, including multi-period and networked optimization
  - statistical signal processing and stochastic processes
  - data science and machine learning techniques
  - distributed computation for cyber-physical systems
  - graph signal processing
  - programming in Matlab, C/C++, Python or Java

Experience in Testbed implementation is also welcome.

The publication of scientific papers on high impact journals and first-class international conferences related to these topics will be taken into account positively, as well as the previous participation in national or European projects related to the topics above.

Further provisions relating to the positions as Post-doctoral Research Fellows 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](#).

Personal qualities

- 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.
- Capacity also to perform independent research.
- Strong academic credentials, written and spoken English proficiency.

Personal qualities and suitability for the position will be emphasised.

We offer

- the opportunity to work in a world-class research organisation with an excellent research environment. 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 environment will also provide opportunities for personal development in a diverse environment, modern facilities and a comprehensive set of welfare offers.
- professional development in a large, exciting and socially influential organisation
- a positive, inclusive and diverse working environment
- modern facilities and a comprehensive set of welfare offers
- membership of the [Norwegian Public Service Pension Fund](#)

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

The University of Agder is an open, friendly and professional employer, with a Scandinavian view on life/work balance, and with a clear vision to do research to enlighten human understanding.

[More about working at UiA](#).

The position is remunerated according to the State salary scale, salary plan 17.510, code 1352 Post-Doctoral Research Fellow, salary NOK 544 400-658 300 gross per year. A compulsory pension contribution to the Norwegian Public Service Pension Fund is deducted from the pay according to current statutory provisions.

General information

A good working environment is characterised by its diversity. We therefore encourage all qualified candidates to apply for the position, irrespective of gender, age, disability or cultural background. The University of Agder is an IW (Inclusive Workplace).

Women are strongly encouraged to apply for the position.

The successful applicant will have rights and obligations in accordance with the current regulations for the position, and organisational changes and changes in the duties and responsibilities of the position must be expected. Appointment is made by the University of Agder's Appointments Committee for Teaching and Research Positions.

[Read more about the employment process](#).

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

Application

The application and any necessary information about education and experience (including diplomas and certificates) are to be sent electronically. Use the link "**Apply for this job**".

The following documentation must be uploaded electronically:

- Certificates with grades (Bachelor, Master and PhD).
- Up to 10 scientific publications and/or R&D projects which the candidate wishes to particularly emphasise for the assessment process. For the scientific applications, include summary and links to them.
- An electronic copy of your PhD thesis and Master's thesis (if applicable).
- Justification (maximum five 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).
- Project plan (maximum two pages) proposed by the candidate in relation to this postdoctoral position.
- Any other relevant documentation.

The applicant is fully responsible for submitting complete digital documentation before the closing date. We draw your attention to the fact that we cannot, unfortunately, include you in the assessment process if attachments are missing. All documentation must be available in a Scandinavian language or English.

Application deadline: 27.05.19

Contact

For questions about the position:

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For questions about the application process:

- HR Advisor Nina Rønningen, tel. +47 38 14 20 16, e-mail nina.ronningen@uia.no

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