Jobbnorge ID: 205482
Deadline: 5/23/2021
Website: https://www.usn.no/
Scope: Fulltime
Duration: Fixed Term

The Faculty of Technology, Natural Sciences and Maritime Sciences have a vacancy for a position as

PhD Research Fellow in Process, Energy and Automation Engineering

About the position

The Faculty of Technology, Natural Sciences and Maritime Sciences has a vacancy for a position as PhD Research Fellow in “Optimal control architecture applied to oil/gas production”. The position is at the Department of Electrical Engineering, Information Technology and Cybernetics, and reports to the Head of Department. The place of employment is Porsgrunn, Norway.

The appointment is for a period of three years. The position does not include teaching duties.

About the PhD-project

The PhD-project is a part of a larger project, “DigiWell”, which is funded by the Norwegian Research Council (project “308817 - Digital wells for optimal production and drainage”), Equinor ASA and University of South-Eastern Norway (“USN”). In addition, highly rated universities and companies are partners in the project.

Petroleum will dominate the global energy mix for years to come, and cost-effective and safe production from existing and near-future oil fields is central in a transition towards sustainable energy economies. Automatic production optimization implies finding a production policy for an oil/gas field with improved profit, and reduced energy consumption. Finding the optimal policy requires perfect system knowledge in the form of a dynamic model of the oil field and production equipment, future energy demand and oil/gas price, over the entire production lifetime of the reservoir.

For real oil/gas fields, this knowledge is uncertain, and properties change with time. The aim of the project is to develop a free modelling toolbox for combined long-term and short-term simulation. Almost all of the results in the project will have direct application in general process and energy industry. As part of the PhD study, it is recommended to spend some time at one of the partner universities.

PhD-project description

The PhD-project considers design of control architecture for new production fields. The concept of control architecture deals with choosing the best sensors/sensor locations and actuators/actuator locations for a system, and is based on a dynamic model of the system: essentially, if sensors and actuators are chosen such that the system has unstable zero dynamics, this may severely limit the bandwidth of robust estimators/observers and feedback controllers, and make it impossible to achieve good control. Examples of unstable zero dynamics include time delays and inverse response. In practice, cost of sensors and actuators will limit how many sensors/actuators are used, and the type that is used.

Some challenges in the project will be (i) to develop a measure of controller performance based on the control architecture, (ii) to develop a measure of sensor/actuator cost, (iii) to carry out a mixed integer multiobjective optimization for choosing equipment and location, (iv) to include model uncertainty in the decision, (v) to make algorithms general and efficient for large scale systems. The integer part is due to an integer number of sensors/actuators and their location, and the multiobjective part is due to balancing attainable performance based on control architecture against equipment cost.

Dynamic system models used in the control architecture study will be provided by other groups in the “DigiWell” project; models may be concentrated and linear or nonlinear, or distributed. Normal operation will be close to some equilibrium, and design based on linear models should be given first priority. The developed methods will be generic, and can be used for any system, also all types of land-based industry. Choice of control architecture is particularly important for systems where there is a high cost of modifying the architecture once production has started, such as for oil/gas production.

In summary, the developed methodology should be general, and should be implemented in a suitable language, preferably Julia (alternatively: MATLAB), and should be tested on models for oil/gas production.

Qualifications

- Applicants to the PhD position must have a Master's degree or equivalent higher education qualifications in Control Engineering /Engineering Cybernetics, or Applied Numerical Mathematics.
- Excellent candidates with background in Chemical Engineering, Process Technology, Electrical Power Engineering, or similar, may also be considered.
- The candidate should have some prior knowledge in dynamic models and control engineering, including basics of optimal control/MPC and Kalman filtering, as well as mathematical optimization.
- A good command of numerical mathematics, (large scale) linear algebra, and efficient programming in script languages such as MATLAB, Julia, or Python is an advantage.
- As part of the PhD work, publications are important, and efficient oral and written communication in English is therefore required.
- It is a requirement that the successful applicant is granted admission to the university's doctoral program in Process, Energy and Automation Engineering, thus a candidate must have an average grade B or better from the Master's degree. The applicant must have gained the degree within the start date of the position, so applicants in the last semester of their master degree are also encouraged to apply.
- This position is part of a larger project, so some co-operation with other researchers in the project is expected and Co-operation between staff members is an integrated part of the working atmosphere at the University of South-Eastern Norway.
- Diversity in background for the project team is also important.
- The candidate must be motivated and demonstrate a proven ability to work effectively within a team and in a collegiate manner to formulate and realize common objectives.

We offer

- A stimulating and growing research environment, with good opportunities to develop your career and your academic skills
- A good social environment
- Attractive welfare benefits in the State Pension Plan
- Opportunity for physical activities within working hours

Salary

PhD Research Fellow (code 1017): NOK 482 200 a year. Further promotion will be based on time served in the position. A statutory contribution to the state pension plan will be deducted from the employee's salary.

Other information

The Academic Appointments Board for PhD Research Fellowships is responsible for the appointment. An expert assessment of applicants will be carried out. The candidates deemed best qualified will be invited to an interview.

The person appointed must comply with the laws, regulations and agreements that apply at any given time to the post. Please note that approved work permit is a prerequisite for the employment. A background check of relevant candidates will be performed.

According to its human resources policy, the University of South-Eastern Norway targets a balanced gender composition and aims to recruit persons with a background as an immigrant.The Department has few women appointed in scientific positions, and women are thereforenparticularly encouraged to apply.

The University contributes to the Inkluderingsdugnaden (a voluntary scheme to promote inclusion), and it is our aim that our employees, to the fullest extent possible, shall reflect the diversity of the general population. We therefore encourage qualified applicants with disabilities to apply for the post. The University will facilitate the workplace for employees with disabilities.

Pursuant to section 25, 2nd paragraph of the Freedom of Information Act, information on the applicant may be disclosed even if the applicant has requested not be included on the list of applicants. Applicants will be notified if such requests are not allowed.

Contact information

For more information about the position, please contact: Professor Bernt Lie, bernt.lie@usn.no or Associate Professor Roshan Sharma, Roshan.Sharma@usn.no.

For questions regarding the recruitment process, please contact: Ruth Helen Haugerud, ruth.haugerud@usn.no.

How to apply

The University of South-Eastern Norway makes use of online application management. Applicants to the post must register their application and CV with enclosures online via the Jobbnorge recruitment portal by clicking on the link on the right-hand side - "Søk stillingen" (Apply for the post).

The following documents shall be attached to the online application:

- Transcripts and diplomas of Bachelor's (180 ECTS) and Master's Degrees (120 ECTS)
- A 3-5 page project plan, consisting of: (i) a plan on how the applicant would structure the study on "Optimal control architecture applied to oil/gas production", and (ii) a ½ page description of the applicant's motivation for the study.
- Documentation of English proficiency
- Any scientific publications and a list of these
- Three references (contact information)

Please note that all documents must be in a Scandinavian language or in English. Any translations must be certified.

The application will be assessed on the basis of the attached documentation as requested above. Each applicant is responsible for ensuring that the required documentation has been uploaded with the application deadline.

The University has been awarded a Charter & Code certificate by the European Commission, and is entitled to use the HR Excellence in Research (HRS4R) logo. The University is also a member of the EURAXESS network, which contributes to good working conditions for mobile researchers.

Welcome to USN
Welcome to USN

Video: https://www.youtube.com/watch?v=DBbD2GVEIIY&list=PLpMvkOc4MPlYmz28LFGfdXsaQcq2yHsq9&index=4

About USN

The University of South-Eastern Norway, USN, is one of Norway's largest higher education institutions, with around 18,000 students and 1,900 employees across eight different campuses.

We offer studies, research and knowledge dissemination, all targeting various professions and working life and with a high level of quality internationally. Our goal as a University is to create value both for the individual student and for business and commerce, the public sector and society in general. We achieve this by utilising the best tools we have: education and research.

USN is a University with a strong social commitment where studies and working life are integrated. At USN, we focus on practice-relevant, profession-oriented and applied research and education.The students shall benefit from innovative educational methods and challenging studies closely associated with society's requirements and needs. They will learn how to adapt to a society and working life that is constantly changing. The University shall meet major social challenges with knowledge and expertise, helping to promote practical solutions, structural changes and new ways of thinking. USN's academic activities shall be embodied by a clear dedication to the UN's sustainable development goals. The University aims to realise this main profile in close cooperation with society and working life.

For more information on USN, please go to www.usn.no

Additional information

Place of service:
Campus Porsgrunn 3918 Porsgrunn (Porsgrunn Municipality)