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The Norwegian University of Science and Technology (NTNU) creates knowledge for a better world and solutions that can change everyday life.

Faculty of Information Technology, Mathematics and Electrical Engineering
Department of Engineering Cybernetics

Professor/Associate Professor in Big Data Cybernetics

NTNU is establishing the world's first professorship in Big Data Cybernetics in collaboration with KONGSBERG, combining the fields of automatic control and multivariate data modelling. For the successful applicant, this represents a unique opportunity to play a central role in the development of a new interdisciplinary field. The position will be affiliated with the Department of Engineering Cybernetics at NTNU's Faculty of Information Technology, Mathematics and Electrical Engineering.

Information about the department

The Department of Engineering Cybernetics (Institutt for teknisk kybernetikk, ITK) has 17 full-time professors, 11 adjunct professors, about 10 postdocs and researchers as well as 70 PhD candidates. Approximately 100 MSc candidates graduate annually from the three study programs in cybernetics, which comprise about 650 students in total.

The research and educational activities at ITK include fundamental and industrially-oriented activities in areas such as automatic control and systems theory, estimation and optimization, cyber-physical systems, autonomous unmanned vehicles, robotics, ships and marine systems, process control, smart grids, offshore renewable energy, automated drilling, fisheries and aquaculture, medical technology, safety-critical systems, embedded and real-time systems, systems engineering and instrumentation.

The department is involved in numerous research projects and centers, including the Centre of Excellence for Autonomous Marine Operations and Systems (NTNU AMOS). ITK's research activities are growing and we wish to strengthen our capability and capacity in strategically important fields.

Job description

In today's science and technology, the spatial, temporal and property-profile domains are often handled by different academic disciplines. However, real-world systems have spatial extent, temporal dynamics and a variety of physical properties. Modern measurement devices increasingly allow us to link these domains, which can provide us with deeper understanding, better control and new opportunities. However, the rapid increase in the amount of data currently poses a major challenge which requires a corresponding increase in our ability to interpret and make sense of this "big data". Many approaches to handling big data are based on black-box methods which may not be intuitive or transparent for human interpretation. Using such methods, humans are not included in the data modelling process and thus also risk being pushed out of the data analysis and decision-making processes.

To address this challenge, a new interdisciplinary field called "Big Data Cybernetics" is proposed, combining methods from automatic control and multivariate data modelling in order to discover systematic structures in the spatial, temporal and property-profile domains, and to convert these structures into quantitative, human-interpretable information. For example, the two fields of cybernetics and chemometrics have both developed successful, but quite different modelling tools. While the former focuses on modelling and control in the time domain, the latter focuses on multichannel spectroscopy and multivariate calibration, image analysis and soft modelling.

The main goal is to translate "big data" from a large number of sensor channels into "smart data" represented by a combination of theory-driven and data-driven models, by combining science's prior knowledge with nature's unexpected patterns to identify the relevant structures and develop interpretable and useful models. The overlap between cybernetic subspace identification and chemometric partial-least-squares regression could for instance be a fruitful common ground for the desired high-dimensional, spatio-temporal modelling. The outputs from such models shall be intuitively understandable by humans, who then can use their background knowledge and creativity for further refinement and development. This means that black-box modelling, such as e.g. artificial neural networks or support vector machines, are not the focus of Big Data Cybernetics.

The applicants' methodological basis should include theory and tools for describing scientific knowledge in terms of both first-principles mathematical models as well as unexpected cluster and subspace structures in large data sets. It is required to document solid competence in at least one of the two fields of automatic control and multivariate data modelling, and the applicant must demonstrate a strong interest in merging these two fields. Knowledge in system identification, nonlinear dynamics, feedback control and self-organization, signal processing, image analysis, visualization or machine learning is an advantage. Thus, several different scientific backgrounds are relevant for this new interdisciplinary field.

Research activities are expected to have a strong international profile and impact, with a long-term perspective and to be concentrated around basic challenges and enabling technologies with relevance and importance for applications and industry. The department has an international profile with a strong ambition to be a leading international research unit within its field. Specifically, the candidate will join a research community

at ITK which was rated "excellent from an international perspective" in the Norwegian Research Council's evaluation of 53 ICT communities in Norway in 2012, as only one out of three ICT communities to receive such a rating in the Norwegian university and college sector.

The department has strong relationships to Norwegian and international industry, with numerous joint research projects. The research activities of the department rely crucially on external funding, and the development of educational programs may also receive external funding. The successful applicant is expected to work actively to receive research grants and other external income from the Research Council of Norway, European research and educational agencies, relevant industry, and other available sources.

MSc and PhD candidates from the cybernetics study programs are expected to be competitive in an international job market. The professor/associate professor will play a leading role in developing an educational profile and ensuring an excellent learning environment, in collaboration with colleagues, students and external stakeholders. The professor/associate professor is expected to teach relevant courses at all levels and should supervise both MSc and PhD candidates.

In addition to research and education, the professor/associate professor is expected to be able to disseminate relevant parts of the research to a wider audience. The professor/associate professor is also expected to participate in the formal management of research, education and other relevant areas of activity in agreement with the head of department.

Qualifications

The applicant is required to have a doctoral degree or equivalent in a relevant area as described above, and document professional qualifications in essential areas of automatic control and/or multivariate data modelling. In addition, he or she is expected to have outstanding scientific expertise in one or more of these areas.

For a professorship, the applicant should be internationally recognized and able to lead and initiate research at a high international level. The applicant should demonstrate international experience and have a strong publication record in terms of papers in peer-reviewed journals and other relevant international publication channels. He or she should document the ability to obtain external funding from relevant sources.

For an associate professorship, the applicant should have a good publication record in terms of papers in peer-reviewed journals and other relevant international publication channels. Documented external funding and experience with research leadership will be rated positively. A person employed in the category of associate professor should have a research potential which makes it likely to qualify for a full professorship within five years of employment, even with normal teaching duties.

Regardless of position category, the applicant should demonstrate the ability to develop educational activities and the learning environment. He or she should have experience in the supervision of students or similar experience qualifying for such work. The applicant should demonstrate communicative skills that qualify for excellent teaching, supervision and dissemination, and have good collaboration skills necessary for joint projects with colleagues. Relevant collaboration with industry will also be considered positively.

Application requirements

The application should contain:

- CV including information relevant for the qualifications and a full list of publications with bibliographical references
- Diplomas and references
- The most important publications that are relevant for the evaluation of the applicant's qualifications (maximum 10 publications)
- A brief description of the scientific/technological relevance of the candidate's research
- Research proposal for the first five years of employment (maximum 10 pages)
- Information about educational experience, including development of study programs, curricula, teaching experience, and development of teaching methods and the learning environment. See "Documentation of an applicant's pedagogical qualifications": http://www.ntnu.edu/vacancies/pedagogical-qualifications
- Information about dissemination activities
- Other documents which the applicant would find relevant

Joint works will also be evaluated. If it is difficult to identify the contributions from individuals in a scientific collaboration, applicants are to enclose a short summary of his/her contribution.

Following the application deadline, a shortlist of applicants will be drawn up, and all applicants will be informed whether they are placed on the shortlist. Shortlisted applicants will be evaluated by an international expert committee. The top candidates from this evaluation will be invited for interviews and trial lectures. The evaluation will take into account not only the accumulated academic production but also the applicant's potential for scientific development and personal qualities.

Formal regulations

If the candidate does not have prior formal pedagogical qualifications in university-level teaching, the candidate must complete a recognized course which gives a pedagogical qualification within the first two years of employment. NTNU offers such courses.

Proficiency in the English language should be documented. New members of the academic staff who do not already master a Scandinavian language are expected to achieve proficiency in Norwegian or another Scandinavian language within three years of employment. This proficiency should correspond to level three in the "Norwegian for Foreigners" courses provided at NTNU.

Diversity is important to achieve a good, inclusive working environment. We encourage all qualified applicants to apply, regardless of gender, disability or cultural background.

The appointment is to be made in accordance with the regulations for State Employees and Civil Servants in Norway. The candidate must adhere to regulations that concern changes and developments within the discipline and/or the organizational changes concerning activities at NTNU.

Further details about the position can be obtained from Head of Department Morten Breivik, e-mail:morten.breivik@ntnu.no

The position as professor will normally be placed at salary level 69 - 101, at the time NOK 605 400 - 1 261 400 a year. The position as associate professor will normally be placed at salary level 57 - 77, at the time NOK 485 700 - 715 000 a year. These levels are currently

pending clarifications related to the new Basic Collective Agreements for Norwegian state employees. 2% of the salary will be deducted as an obligatory premium to the Norwegian Public Service Pension Fund.

Under Section 25 of the Freedom of Information Act, information about the applicant may be made public even if the applicant has requested not to have his or her name entered on the list of applicants.

Applications are to be submitted electronically through this page. Preferably, all attachments should be combined into a single file.

Reference no: IME 048-2016.

Application deadline: 2016-10-31.

Jobbnorge ID: 127389, Deadline: The application deadline has passed