Jobbnorge ID: 172310
Deadline: 7/4/2019
Website: http://www.ntnu.no
Scope: Fulltime
Duration: Project

The Department of Engineering Cybernetics has a vacancy for aPhD fellowship

PhD fellowship in sensor fusion and situational awareness for autonomous ships

This is NTNU

At NTNU, creating knowledge for a better world is the vision that unites our 7 000 employees and 40 000 students.

We are looking for dedicated employees to join us.

Video: https://www.youtube.com/watch?v=clgKd1SwGLI

About the position

The Department of Engineering Cybernetics (Institutt for teknisk kybernetikk, ITK) has 24 professors, 17 adjunct professors, about 15 postdocs and researchers as well as 70 PhD candidates. Approximately 160 candidates graduate annually from the three MSc programs in cybernetics, which comprise over 700 students in total. Also, about 35 candidates graduate annually from the BSc study in electrical engineering with specialization in automation.

The research and educational activities at ITK include both fundamental and applied 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; biomedical technology; safety-critical systems; embedded and real-time systems; systems engineering; and fisheries and aquaculture cybernetics.

We are looking for a PhD fellow within sensor fusion for autonomous ships at the Department of Engineering Cybernetics (ITK), Faculty of Information Technology and Electrical Engineering at the Norwegian University of Science and Technology (NTNU). The position is affiliated with the Centre for Autonomous Marine Operations and Systems (AMOS). It is part of a new research project “Autonomous ships, intentions and situational awareness” (Autosit), funded by the Research Council of Norway (RCN), DNV GL, Kongsberg Maritime and Maritime Robotics.

The goal of the Autosit project is to develop algorithms for automatic situational awareness to be used in collision avoidance systems for autonomous ships. The project builds on the Autosea project, which has developed and demonstrated autonomous collision avoidance systems, and on the Autoferry project which aims to develop an autonomous pedestrian ferry for crossing the Trondheim City Canal. The candidate will in particular collaborate with other PhD candidates in the Autosit project working on long-term vessel prediction and extended object tracking, and with PhD candidates in the Autoferry project working on sensor fusion and collision avoidance.

The position is supervised by Associate Professor Edmund Brekke.

Main duties and responsibilities

This PhD project aims to develop novel algorithms for sensor fusion, when data from exteroceptive sensors such as radars and cameras are to be combined with cooperative information exchange systems such as the Automatic Identification System (AIS). The information provided by AIS tends to be easier to process and interpret than radar images. Furthermore, AIS messages can contain additional information about course, vessel type and future destinations, which only can be inferred indirectly from exteroceptive sensors. However, not all vessels have AIS, and AIS information can be misleading due to negligence, deliberate sabotage or satellite errors. The autonomous ship must therefore be able to exercise judgement regarding which data source it prefers to rely on. The main goal is to enable autonomous ships to combine the information provided by AIS and by exteroceptive sensors in their collision avoidance systems. Perhaps surprisingly, fusion problems of this kind, which involve fusion of one data source that provides target identities with one data source that does not provide identities, are scarcely covered in the academic literature. The research will also be relevant to several other problems where transponder data are to be fused with conventional multi-target tracking, such as geofencing around airports. Tasks include:

- Development of probabilistic models for the cooperative-exteroceptive fusion problem.
- Development of algorithms for measurement level cooperative-exteroceptive fusion.
- Development of algorithms for track-to-track cooperative-exteroceptive fusion.
- Efficient implementation of the algorithms by means of mixture reduction techniques.

- Integration of long-term prediction techniques in the fusion algorithms.
- Validation of the methods in simulations and on real data recorded as part of the project.

The candidate is encouraged to spend part of the project period with a collaborating group abroad. It is possible to apply for funding for this from the RCN.

Qualification requirements

The PhD position's main objective is to qualify for work in research positions. The qualification requirement is:

- Completion of a master's degree or second degree (equivalent to 120 credits) with a strong academic background in cybernetics, statistics, signal processing, physics, mathematics or equivalent education with a grade of B or better in terms of NTNU's grading scale. Applicants with no letter grades from previous studies must have an equally good academic foundation. Applicants who are unable to meet these criteria may be considered only if they can document that they are particularly suitable candidates for education leading to a PhD degree.
- Proficiency in oral and written English.
    - The following tests can be used as documentation: TOEFL, IELTS, Cambridge Certificate in Advanced English (CAE) or Cambridge Certificate of Proficiency in English (CPE). Minimum scores are:
        - TOEFL: 600 (paper-based test), 92 (Internet-based test)
        - IELTS: 6.5, with no section lower than 5.5 (only Academic IELTS test accepted)
        - CAE/CPE: grade B or A.
- Strong skills in signal processing, pattern recognition, machine learning and/or related topics.
- Significant skills in computer programming, with proficiency in at least one of the following: Matlab, Python, C++.

The appointment is to be made in accordance with the regulations in force concerning State Employees and Civil Servants and national guidelines for appointment as PhD, post doctor and research assistant.

Other qualifications

The following are highly desirable qualifications, and the candidate should have some of these fulfilled:

- Knowledge and skills in sensor fusion and estimation.
- Knowledge and skills in probabilistic machine learning, e.g., variational inference and graphical models.
- Knowledge about point process theory, measure theory and functional analysis.
- Experience with autonomous vehicle technology, from previous work experience, internships or voluntary activities.
- Experience with maritime radar systems and/or machine vision systems, including feature detection and camera calibration.
- Excellent communication skills, both oral and written.

Applicants that expect to complete their master's degree by January 2020 can apply.

Personal characteristics

Applicants are required to justify their candidacy by explicitly explaining their personal motivation and academic aptitude for pursuing a doctoral degree within this research field.

The work is expected to range from mathematical analysis to experiments with ASVs at sea - the candidate as a result must be able to articulate her/his ideas and be open to those well outside her/his comfort zone.

Academic results, publications, relevant specialization, work or research experience, personal qualifications, and motivation will be considered when evaluating the applicants.

In the evaluation of which candidate is best qualified, emphasis will be placed on education, experience and personal suitability, in terms of the qualification requirements specified in the advertisement.

We offer

- exciting and stimulating tasks in a strong international academic environment
- an open and inclusive work environment with dedicated colleagues
- favourable terms in the Norwegian Public Service Pension Fund
- employee benefits

Salary and conditions

PhD candidates are remunerated in code 1017, and are normally remunerated at gross from NOK 479 600 per annum before tax. From the salary, 2% is deducted as a contribution to the Norwegian Public Service Pension Fund.

The appointment is for a term of 3 years without teaching assistance, or up to 4 years including 25% of teaching assistance. Appointment to a PhD position requires admission to the PhD programme in Engineering Cybernetics.

As a PhD candidate, you undertake to participate in an organized PhD programme during the employment period. A condition of appointment is that you are in fact qualified for admission to the PhD programme within three months.

See https://innsida.ntnu.no/wiki/-/wiki/English/PhD+forms+%E2%80%93+IE and https://www.ntnu.edu/studies/phtk for more information about the programme.

The engagement is to be made in accordance with the regulations in force concerning State Employees and Civil Servants, and the acts relating to Control of the Export of Strategic Goods, Services and Technology. Candidates who by assessment of the application and attachment are seen to conflict with the criterias in the latter law will be prohibited from recruitment to NTNU. After the appointment you must assume that there may be changes in the area of work.

General information

Working at NTNU

A good work environment is characterized by diversity. We encourage qualified candidates to apply, regardless of their gender, functional capacity or cultural background. Under the Freedom of Information Act (Offentleglova), information about the applicant may be made public even if the applicant has requested not to have their name entered on the list of applicants.

Questions about the position can be directed to Associate Professor Edmund Brekke, email: Edmund.Brekke@ntnu.no .

About the application:

Applications are to be submitted electronically through this page (www.jobbnorge.no). Preferably, all attachments should be combined into a single file.

The application must contain:

- CV including information relevant for the qualifications and contact information for at least 2 reference persons
- Certified copies of academic diplomas and transcripts.
- Applicants from universities outside of Norway are requested to send a diploma supplement (or a similar document) which describes in detail the study and grading system, and the rights for further studies associated with the obtained degree.
- A short research statement (max. 3 pages) including:
    - A short presentation of the motivation for a PhD study.
    - Why the applicant is suited for the position.
    - The applicant's view of research challenges for the PhD position.

Publications and any other work that the applicant wishes to be considered must also be enclosed. Joint works will be considered if a short summary outlining the applicant's contributions is attached.

Incomplete applications will not be considered.

Mark the application with the reference number: 2019/17711.

Application deadline: 04.07.2019.

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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.

Department of Engineering Cybernetics (ITK)

Engineering cybernetics is the study of automatic control and monitoring of dynamic systems. We develop the technologies of tomorrow through close cooperation with industry and academia, both in Norway and internationally. The Department contributes to the digitalization, automation and robotization of society. The Department of Engineering Cybernetics is one of seven departments in the Faculty of Information Technology and Electrical Engineering.

Additional information

Place of service:

Trondheim 7491 Trondheim (Trondheim Municipality)