

ESR8

Project title: Transfer learning for safe motion control of a heavy duty under-actuated crane in the presence of obstacles

Place of employment and planned mobility: Tampere University, Finland: 9 months – HIAB AB (Cargotec corporation), Sweden: 21 months – Volvo CE, Sweden: 6 months

Supervisory team: Reza Ghabcheloo, Joni Pajarinen, Marcus Rösth, Juho Vihonen, Torbjörn Martinsson

Project tasks and objectives: We consider a task where a large-scale robotic arm with an under-actuated end-effector moves an unknown load to a goal position while avoiding collisions with the environment. We assume access to a high fidelity simulator. Reinforcement learning is a potential solution to this task due to not requiring a perfect dynamics model or a complicated reward/cost model. However, for complex tasks reinforcement learning requires a large amount of training data generated during the training process. In principle, a simulator can be used to generate the data and the solution then transferred to the real robot.

The scientific objectives include: 1) While there is recent work on both reinforcement learning with sim-to-real and obstacle avoidance and also demonstrations of these on real robots, we are not aware of work that combines sim-to-real and obstacle avoidance on under-actuated large-scale machines; 2) To learn behaviour on the simulator of crane A, transfer to and fine tune the behaviour on real crane A, and then transfer the solution to real crane B, for which a simulator does not exist.

The ESR will acquire a broad range of knowledge of the state of the art in related fields, such as simulation, reinforcement learning, imitation learning.

The ESR will also be involved in dissemination through social media promotion of the network, such as Webropol surveys, and LinkedIn groups, YouTube video channels, Twitter and blogging.

Starting date: January 1st, 2020. Negotiable.

Duration of the work contract: 36 months/full-time contract

Trial period: 6 months

Target degree: PhD degree from Tampere University, Finland

Approximate gross salary: about 3600 EUR/month plus family allowance if applicable

Eligibility: ESR shall at the date of recruitment, be in the first four years (full-time equivalent research experience) of their research careers and have not been awarded a doctoral degree. The researcher must not have resided or carried out his/her main activity (work, studies, etc) in the country of his/her first employer (Tampere University, Finland) for more than 12 months in the 3 years immediately prior to his/her recruitment.

The applicant must be in possession of Master of Science (MSc) diploma in at the beginning of the employment.

English language requirements: Proficiency in written/spoken English is mandatory. In certain cases, we may ask for a language certificate.



Application

Closing date: 13.11.2019

The applicant must submit the following documents through [LAURA portal](#), only a clear copy of the documents will be considered

1. **Certified copies of the bachelor's and master's degree certificates with the Diploma Supplement (DS)** as approved by the EU Commission for degrees completed in European universities (when applicable) Official translations into English (if the original documents are in a language other than English)
2. **Curriculum Vitae/CV** (preferably in Europass format)
3. **List of publications (if any)**, your contributions in the publication
4. **References:** Contact details of 2 or more referees included in the CV
5. **Motivation letter: maximum 1 page** where you introduce yourself and present your qualifications; you may include also your previous research fields and main research results. Please emphasize your future goals career-wise
6. **Copy of the passport**
7. **Proof of residence:** statement and certificates/documents demonstrating your residence(s) in the last 4 years. [A template is available on the website under How to Apply.](#)

Additional information

Working and living conditions in Finland at Tampere University- Finland is among the most stable, free and safe countries in the world, based on prominent ratings by various agencies. It is also ranked as one of the top countries as far as social progress is concerned. Tampere is counted among the major academic hubs in the Nordic countries and offers a dynamic living environment. Tampere's region is one of the most rapidly growing urban areas in Finland and home to a vibrant knowledge-intensive entrepreneurial community. The city is an industrial powerhouse that enjoys a rich cultural scene and a reputation as a centre of Finland's information society.

The new Tampere University and higher education community began their operations on 1 January 2019. Tampere University of Technology, the University of Tampere and Tampere University of Applied Sciences are building a unique environment for multidisciplinary, inspirational and high-impact research and education, and a hub of expertise in technology, health and society. Read more [here](#).

Working and living conditions in Sweden at HIAB AB - Similarly to Finland Sweden is among the most stable, free and safe countries in the world, based on prominent ratings by various agencies. It is also ranked as one of the top countries as far as social progress is concerned. Sweden is considered the number one pioneer in gender equality. In Sweden almost everyone speaks English fluently and the standard of living is among the highest in the world. Sweden is among the top in PISA school rankings and university education is free of charge.

When working with **HIAB AB** you will be located in Hudiksvall, in Hälsingland on the east coast of Sweden relatively close to Stockholm. The city is located right next to the sea and is surrounded by fantastic nature and archipelago. In the middle of the city is the marina. There are beaches, all within walking distance. Hudiksvall is always close to both sea and forest. During the winter, there are ski stations different sizes - Hudiksvall, Järvsö and Hassela. They are all less than 1 hour away. There are several light trails for cross-country skiing and pimpling – climbing frozen waterfalls - and ice skating can be practiced in the city centre.

At HIAB, we offer you an opportunity to put your skills and experience into work and make an impact in our global organisation and the cargo handling industry in an eco-friendly way. You will work together with great



colleagues from various backgrounds inspired by share and ambitious goals. We value collaboration in our open and inclusive culture. With us, you will have the opportunity to develop yourself professionally. Join us to make a difference - and have fun while doing it. Please, check our [YouTube channel](#) and [home page](#) for more information.

Working and living conditions in Sweden at Volvo CE - At Volvo CE, we have higher ambitions than just providing the world with excellent construction equipment. We want to be a force for good in society and help find new ways to make the world a better place – environmentally, economically and socially sustainable. If you join us on our journey, you will be part of a passionate, ambitious and creative team where your work matters. Respect for people is at the core of our company values. That's why we've put much effort into creating a workplace where everybody feels welcome and where everybody's voice is heard. We cherish all kinds of diversity – from gender, age and nationality to ethnicity, faith and sexuality – not only because it's the right thing to do, but also because it's our firm belief that the more perspectives we can bring to the table, the stronger we become as a company.

