CHRISTOPHER ILIFFE SPRAGUE

Researcher in structured artificial intelligence

sprague@kth.se | +46 073 080 7541 | American | British | Swedish Residency
cisprague | cisprague | cisprague | cisprague

EXPERIENCE

Researcher

KTH Royal Institute of Technology | Robotics, Perception, and Learning Department

Dec 2017 – June 2022 | Stockholm, SE

- Published research (100+ citations) in the intersections of control theory, machine learning, perception, and planning (adv. Petter Ögren and John Folkesson).
- Developed planning algorithms for multiple AUV scenarios and implemented them with ROS.
- Lead workshops and presented research at conferences and seminars.
- Presented robotic demonstrations to stakeholders on behalf of the Swedish Maritime Robotics Centre.
- Supervised multiple M.Sc. students to the completion of their theses.
- Developed and presented robotic planning assignments in a course of 200+ students for 4 semesters.
- Held help sessions in robotics and machine learning courses.
- Amplified research visibility with media outreach and social media.

AUV Assistant

University of Tasmania | Institute for Marine and Antarctic Studies

Dec 2019 – Feb 2020 | Amundsen Sea, West Antarctica

- Helped deploy the Nupiri Muka AUV near Thwaites glacier for under-ice data collection during the Korean Polar Research Institute's Winter 2019-2020 Antarctic expedition (adv. Peter King).
- Helped recover Gothenburg University's oceanographic moorings.

Researcher

European Space Agency | Advanced Concepts Team

Sep 2017 – Nov 2017 | Noordwijk aan Zee, NL

- Published research at the intersection of spacecraft trajectory optimisation and machine learning (adv. Dario Izzo).

Researcher

Japan Aerospace Exploration Agency | Institute of Space and Astronautical Science

Jun 2017 – Aug 2017 | Sagamihara, JP

- Researched machine learning for trajectory optimisation in the context of the lunar spacecraft mission EQUULEUS (adv. Yasuhiro Kawakatsu).

Learning Assistant

Rensselaer Polytechnic Institute

Aug 2016 – May 2017 | Troy, NY, USA

- Held consultation sessions and created a variety of workshops for study skills, time management, and stress management in order to promote academic excellence and encourage student involvement.

SKILLS

Software

JAX | PyTorch | GPyTorch | Python | ROS | Matlab | Mathematica

Theory

Machine learning | Optimal control | Hybrid dynamical systems | Order theory | Planning | Behavior trees | Physics-informed learning

EDUCATION

Ph.D. in Robotics

KTH Royal Institute of Technology

Dec 2017 – June 2022

M.S. in Aerospace Engineering

Magna Cum Laude

Rensselaer Polytechnic Institute

May 2016 – May 2017

B.S. in Aerospace Engineering

Cum Laude

Rensselaer Polytechnic Institute

Aug 2013 – May 2016

GRANTS

JSPS Summer Program

Japan Society for the promotion of Science

2017 | ¥692,500

East Asia and Pacific Summer Institute Fellowship

National Science Foundation

2017 | $5,400

NASA APL Fellowship

The Henry Foundation, Inc.

2015 | $4000

Software Engineer

The Johns Hopkins University Applied Physics Laboratory

Jun 2015 – Aug 2015 Laurel, MD, USA

- Produced targeted enhancements to the fault-protection systems of NASA's Solar Terrestrial Relations Observatory (adv. Dan Wilson and Kevin Balon).
- Updated the spacecrafts' testbeds to emulate their current operational modes.

PUBLICATIONS

Journal Articles

- Ögren, P., & **Sprague, Christopher I.** (2021). Behavior trees in robot control systems. *Annual Review of Control, Robotics, and Autonomous Systems*, *5*.
- **Sprague, Christopher I.**, & Ögren, P. (2021). Continuous-time behavior trees as discontinuous dynamical systems. *IEEE Control Systems Letters*.
- Torroba, I. *., **Sprague, Christopher I.***, Bore, N., & Folkesson, J. (2020). Pointnetkl: Deep inference for gicp covariance estimation in bathymetric slam. *IEEE Robotics and Automation Letters*, *5*(3), 4078–4085. ***Equal contribution**.
- Izzo, D., **Sprague, Christopher I.**, & Tailor, D. V. (2019). Machine learning and evolutionary techniques in interplanetary trajectory design, 191–210.

Proceedings

- **Sprague, Christopher I.**, & Ögren, P. (n.d.). Adding neural network controllers to behavior trees without destroying performance guarantees. In *Arxiv preprint arxiv:1809.10283*.
- Bhat, S., Torroba, I., Özkahraman, Ö., Bore, N., **Sprague, Christopher I.**, Xie, Y., … Folkesson, J., et al. (2020). A cyber-physical system for hydrobatic auvs: System integration and field demonstration. In *2020 ieee/oes autonomous underwater vehicles symposium (auv)(50043)* (pp. 1–8). IEEE.
- **Sprague, Christopher I.**, & Ögren, P. (2020). Learning how to learn bathymetry. In *2020 ieee/oes autonomous underwater vehicles symposium (auv)(50043)* (pp. 1–2). IEEE.
- **Sprague, Christopher I.**, Özkahraman, Ö., Munafo, A., Marlow, R., Phillips, A., & Ögren, P. (2018). Improving the modularity of auv control systems using behaviour trees. In *2018 ieee/oes autonomous underwater vehicle workshop (auv)* (pp. 1–6). IEEE.
- **Sprague, Christopher I.** (2016). Modelling and simulation of autonomous cubesats for orbital debris mitigation. In *6th international conference on astrodynamics tools and techniques*. European Space Agency.

LANGUAGES

English
Swedish
Spanish

REFEREES

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Prof. John Folkesson
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PRESS

- Researchers celebrate Antarctic under ice voyages of underwater vehicle (IMAS UTAS)
- A Shipwreck, 500 Years Old, Appears on the Baltic Seabed (New York Times)
- Using behavior trees to improve the modularity of AUV control systems (Tech Xplore)
- Rensselaer Graduate Students Successful in Garnering Summer Fellowships (RPI)