Adam Seewald, Ph.D., Curriculum Vitae

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- I am currently a postdoc at ETH Zürich.
- My research focuses on robotics and computer science and involves autonomous robots in different environmental use cases.
- My fields of research interest are aerial robotics, energy and environment-aware automation, field robots, and motion and path planning, among others.

Education

2018-2022 **Ph.D., Engineering Science, University of Southern Denmark**

- Thesis: Energy-aware coverage planning and scheduling for autonomous aerial robots,
- Advisor: Prof. Ulrik Pagh Schultz

2016-2018 **Master, Computer Science and Engineering, University of Verona, Italy**

- Thesis: Evaluation of optimal trajectories for quadrotors with indirect methods in the presence of intermediate constraints
- Advisor: Prof. Paolo Fiorini

2013-2016 **Bachelor, Computer Science, University of Verona, Italy**

Experience

2024- **Postdoc, Environmental Robotics Lab, Dept. of Environmental Systems Science, ETH Zürich**

Project: Robot-assisted collection of eDNA for pest detection in precision agriculture, (PI: Stefano Mintchev)

Funding: World Food System Center and Fenaco's research program on smart sustainable farming

- Developing robotic techniques (motion and path planning, RGB-D perception, etc.) for the detection of pests in precision agriculture
- Coordinating research and dissemination across different organizations (World Food System Center, Agroscope, and AXA Climate)
- Integrating open-source aerial robots with manipulation capabilities for aerial-physical interaction on crops
- Serving as a teaching assistant for an introductory course on robotic techniques in precision agriculture

2022-2024 **Postdoc, GRAB Lab, Dept. of Mechanical Eng. and Materials Science, Yale University**

Project Mobile ground-based and aerial robots for biodiversity surveying, (PI: Aaron M. Dollar)

Funding Yale University's discretionary research fund

- Developed mobile robotic autonomy (navigation, control, and planning algorithms and communication methodologies) for nature conservation and surveying [c6]
- Managed undergraduate and graduate students at the GRAB and Intelligent Robot Autonomy Labs at Yale
- Assisted in writing an NSF grant proposal focused on certifiable control
- Researched and disseminated novel robot control strategies (ergodic control) [c7]
- Served as a teaching assistant for a survey course on sustainable technologies

2018-2022 **Ph.D. Researcher, Unmanned Aerial Systems Center, University of Southern Denmark**

Project TeamPlay – Time, Energy, and security Analysis for Multi/Many-core heterogeneous PLAtforms, (PI: Ulrik Pagh Schultz)

Funding European Union's Horizon2020 program under grant agreement number 779882

- Developed aerial robotics use case [c4] (fixed-wing aerial robot for precision agriculture)
- Developed an open-source motion planning/computing energy modeling library [j1] utilized by a network of collaborators (University of Amsterdam, University of Bristol, and INRIA)
- Managed European Union Horizon 2020 project TeamPlay and coordinated international industry collaboration (Thales Alenia Space, Sky-Watch, Irida Labs, and AbsInt)
- Served as a teaching assistant for graduate courses on numerical optimization for robots

Research

Peer-reviewed journal publication:

[j1] • Adam Seewald, Ulrik Pagh Schultz, Emad Ebeid, and Henrik Skov Midtiby, "**Coarse-grained computation-oriented energy modeling for heterogeneous parallel embedded systems**," in International Journal of Parallel Programming. 2021; vol. 49, no. 2, pp. 136–157. 10.1007/s10766-019-00645-y,

Peer-reviewed conference publications (7):

[c7] • Adam Seewald, Cameron J. Lerch, Marvin Chancán, Aaron M. Dollar, and Ian Abraham, "**Energy-aware ergodic search: Continuous exploration for multi-agent systems with battery constraints**," in IEEE International Conference on Robotics and Automation (ICRA'24), pp. 7048–7054.

[c6] • Adam Seewald, Marvin Chancán, Connor M. McCann, Seonghoon Noh, Omeed Fallahi, Hector Castillo, Ian Abraham, and Aaron M. Dollar, "**RB5 Low-cost explorer: Implementing autonomous long-term exploration on low-cost robotic hardware**," in IEEE International Conference on Robotics and Automation (ICRA'24), pp. 5977–5983.

[c5] • Benjamin Rouxel, Christopher Brown, Emad Ebeid, Heiko Falk, Clemens Grelck, Jesper Holst, Shashank Jadhav, Yoann Marquer, Marcos Martinez Alejandro, Kris Nikov, Ali Sahafi, Ulrik Pagh Schultz, Adam Seewald, Vangelis Vassalos, Simon Wegener, and Olivier Zendra, "**The TeamPlay project: Analysing and optimising time, energy, and security for cyber-physical systems**," in Design, Automation and Test in Europe Conference (DATE'23), pp. 1–6. 10.23919/DATE56975.2023.10137198,

[c4] • Adam Seewald, Héctor García de Marina, Henrik Skov Midtiby, and Ulrik Pagh Schultz, "**Energy-aware planning-scheduling for autonomous aerial robots**," in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS'22), pp. 2946–2953. 10.1109/IROS47612.2022.9981285,

[c3] • Georgios Zamanakos, Adam Seewald, Henrik Skov Midtiby, and Ulrik Pagh Schultz, "**Energy-aware design of vision-based autonomous tracking and landing of a UAV**," in IEEE International Conference on Robotic Computing (IRC'20), pp. 294–297. 10.1109/IRC.2020.00054,

[c2] • Adam Seewald, Héctor García de Marina, Henrik Skov Midtiby, and Ulrik Pagh Schultz, "**Mechanical and computational energy estimation of a fixed-wing drone**," in IEEE International Conference on Robotic Computing (IRC'20), pp. 135–142. 10.1109/IRC.2020.00028,

[c1] • Adam Seewald, Ulrik Pagh Schultz, Julius Roeder, Benjamin Rouxel, and Clemens Grelck, "**Component-based computation-energy modeling for embedded systems**," in ACM SIGPLAN International Conference on Systems, Programming, Languages, and Applications: Software for Humanity (SPLASH'19), pp. 5–6. 10.1145/3359061.3362775,

Peer-reviewed workshop publications (2):

[w2] • Adam Seewald, "**Beyond traditional energy planning: The weight of computations in planetary exploration**," in IROS Workshop on Planetary Exploration Robots: Challenges and Opportunities (PlanRobo'20), p. 3. ETH Zürich. 10.3929/ethz-b-000450120,

[w1] • Adam Seewald, Emad Ebeid, and Ulrik Pagh Schultz, "**Dynamic energy modelling for SoC boards: Initial experiments**," in Workshop on High-Level Programming for Heterogeneous and Hierarchical Parallel Systems (HLP-GPU'19), p. 4.

Others (2):

[o2] • Adam Seewald, "**Energy-aware coverage planning and scheduling for autonomous aerial robots**," Ph.D. thesis, p. 184. Syddansk Universitet. Det Tekniske Fakultet, 2021. 10.21996/7ka6-r457,

[o1] • Adam Seewald, Ulrik Pagh Schultz, Emad Ebeid, and Henrik Skov Midtiby, "`powprofiler` **computations energy modeling tool**," v. 1.0.2, 2021. 10.5281/zenodo.5562457,

Invited lectures

- **Innovations in robotics for sustainable crop production**. Invited Talk at the Innovations for Sustainable Local Food Systems day at ETH Zürich World Food System Center. June 14, 2024.
- **Ergodic control applications: Energy optimal control**. Invited Speaker at the ICRA Tutorial on Ergodic Control, IEEE International Conference on Robotics and Automation. May 13, 2024.
- **Energy-aware dynamic planning: Merging path planning and computations scheduling for the drone use-case**. Invited Talk at the TeamPlay Final Workshop, (Virtual Event). May 27, 2021.
- **Energy estimation and modeling for the drone use-case**. Invited Talk at the TeamPlay Workshop, European Network on High-Performance Embedded Architecture and Compilation Conference. January 22, 2020.

Teaching and advising

Teaching at graduate and undergraduate levels (3):

Fall 2024 **Introduction to Agricultural Robotics**, ETH Zürich

Role Teaching assistant (PI: Stefano Mintchev)

- Elective introductory course on robotics techniques in precision agriculture for master's students from different backgrounds

Fall 2022 **You, Your Planet, and a Sustainable Future**, Yale University

Role Teaching assistant (PI: Aaron M. Dollar)

- Survey course on sustainable technologies for undergraduate students in engineering and environmental science

Spring 2019, '20 **Optimization and Control**, University of Southern Denmark

Role Teaching assistant (PI: Agus Hasan)

- Elective course on numerical optimization, methods and solvers, for master's students in robot systems

Advising of graduate and undergraduate students (2):

- **Omeed Fallahi**, undergraduate student in computer science, Yale University, 2022–2023
- **Magnus O. C. Liisberg**, master's student in robot systems, University of Southern Denmark, 2018–2019

Professional and outreach activities

- **Member**, Institute of Electrical and Electronics Engineers (IEEE), 2019–
- **Member**, Association for Computing Machinery (ACM), 2019–
- **Organizer** of the Time, Energy, and Security Analysis for Multi/Many-core Heterogeneous Platforms Final Workshop (TeamPlay'21)
- **Program Committee member**, IEEE International Conference on Robotic Computing (IRC'23, '22, '21),
- **Reviewer**, IEEE Robotics and Automation Letters (RA-L),
- **Reviewer**, International Symposium on Distributed Autonomous Robotic Systems (DARS'24),
- **Reviewer**, IEEE International Conference on Soft Robotics (RoboSoft'24),
- **Reviewer**, IEEE International Conference on Robotics and Automation (ICRA'24),
- **Reviewer**, IEEE International Conference on Automation Science and Engineering (CASE'23),
- **Reviewer**, IEEE International Conference on Robot and Human Interactive Communication (Ro-man'22)
- **Reviewer**, IEEE International Conference on Unmanned Aircraft Systems (ICUAS'22),
- **Reviewer**, International Workshop on Robotics Software Engineering (RoSE'22),
- **Reviewer**, IEEE International Conference on Unmanned Aircraft Systems (ICUAS'21)
- **Reviewer**, IEEE International Conference on Control, Automation, Robotics and Vision (ICARCV'20)

References

Prof. Aaron M. Dollar,
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