Julia Ebert

PhD Candidate · Robotics Researcher · Boston, MA

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Education

Cambridge, MA Expected 2022	**Harvard University** PhD Candidate in Computer Science › Department of Energy Computation Science Graduate Fellow (DOE CSGF) · Siebel Scholar · 3.96 GPA › Thesis: *Distributed Decision-making for Inspection by Autonomous Robot Collectives*
London, UK 2016	**Imperial College London** Master of Research (MRes) in Bioengineering, with Distinction › Marshall Scholar › Thesis: *Assisting Balance Recovery with a Lower Limb Exoskeleton*
Boston, MA 2015	**Northeastern University** BS in Behavioral Neuroscience, Minor in Computer Science › Goldwater Scholar · summa cum laude · 3.98 GPA

Skills

Computer Science	Algorithm development · Python · C/C++ (including embedded programming and Arduino) · Robot Operating System (ROS) · Linux · Git/version control · MATLAB · JavaScript
Engineering & Fabrication	Computer-aided design (OnShape, Fusion 360) · Electronics design (Eagle) and production · 3D printing · CNC milling · Soldering · Laser cutting · Molding and casting

Research Experience

Cambridge, MA 2016 –	**Harvard University Self-Organizing Systems Research Group,** Prof. Radhika Nagpal Doctoral Researcher › Developing a framework for collective spatial decision-making in simulated and physical robot collectives. Includes developing bio-inspired and Bayesian decision and movement algorithms, and robust low-bandwidth communication. › Created Kilosim, an open-source multi-robot simulator (C++) capable of efficiently simulating hundreds of robots at up to 1000x real time. › Collaborating with MIT Media Lab to create heterogeneous robot swarm for inspection on space stations, including algorithm development and hardware testing in microgravity (Zero-G flights). › Designing and manufacturing LARVAbot: a collective of bioinspired robots to perform aggregate locomotion. Includes electronic, mechanical, and algorithm design.
Livermore, CA Summer 2018	**Lawrence Livermore National Laboratory,** Dr. Michael Schneider Computational Science Research Intern › Designed multi-agent algorithms for orbit tracking (space situational awareness, SSA) and maneuver detection with satellite constellations. › Programmed, refactored, and documented research codebase (Python) for SSA, now used extensively by SSA researchers at LLNL. › Developed a simulator and visualization tools (Python) for collective orbit observation by low earth orbit satellites.
London, UK 2015 – 2016	**Imperial College Human Robotics Group,** Prof. Etienne Burdet and Dr. Ildar Farkhatdinov Post-graduate research assistant › Developed algorithms for human-robot co-control of the LOPES exoskeleton in standing a walking balance recovery. Tested with human participants and modeled in Simulink.

Boston, MA	**Northeastern University Action Lab,** Prof. Dagmar Sternad
2011 – 2015	Undergraduate research assistant, including 6-month co-op
	› Programmed HapticMaster robot (C++) and conducted human-subject experiments control of objects with complex dynamics, resulting in two publications.
	› Designed and programmed (Matlab) experiments to assess ability of humans to learn and retain a motor task with rhythmic and discrete components. Conducted multi-month data collection (including with EEG) and analyzed results for Honors thesis.
Tübingen, DE	**Max Planck Institute for Intelligent Systems,** Prof. Stefan Schaal
July – Dec. 2013	Research co-op
	› Designed and programmed a learning task in which subjects learned to map high-dimensional hand joint movements to move a 2D cursor.
	› Conducted human subjects experiments and presented results at Neural Control of Movement conference.

Teaching & Mentoring Experience

Cambridge, MA	**Harvard University**
2021	› **Co-supervisor,** ETH masters thesis on swarm inspection algorithms
2018 – 2021	› **Teaching staff,** How To Make (Almost) Anything, Harvard section (3 semesters)
Summer 2019	› **REU mentor** for Kilobot research and outreach project
Spring 2018	› **Teaching fellow,** CS 189: Autonomous Robot Systems 🔗
Boston, MA	**Northeastern University**
2014 – 2015	› **Teaching assistant,** CS 2500: Fundamentals of Computer Science (2 semesters)
2012 – 2014	› **Tutor,** CS 2500: Fundamentals of Computer Science (3 semesters)
2011 – 2013	› **Undergraduate mentor,** Proactive Recruitment in Science and Mathematics (PRISM)

Interests & Activities

Outreach	NPR *Brains On* podcast guest · FIRST Lego League judge · Harvard *Science in the News* public lecture
Personal	Curling (Harvard club curling team) · Web design & development · Open source 3D print models

Publications

B Haghighat, **J Ebert**, J Boghaert, A Ekblaw, and R Nagpal. 2022. A Swarm Robotic Approach to Inspection of 2.5D Surfaces in Orbit. In *5th International Symposium on Swarm Behavior and Bio-Inspired Robotics (SWARM5)*. 🔗

J Ebert, M Gauci, F Mallmann-Trenn, and R Nagpal. 2020. Bayes Bots: Collective Bayesian Decision-Making in Decentralized Robot Swarms. In *2020 IEEE International Conference on Robotics and Automation (ICRA)*, 7186-7192. 🔗

I Farkhatdinov, **J Ebert**, G van Oort, M Vlutters, E van Asseldonk, and E Burdet. 2019. Assisting Human Balance in Standing with a Robotic Exoskeleton. *IEEE Robotics and Automation Letters*, 4, 2, 414–421. 🔗

J Ebert, M Gauci, and R Nagpal. 2018. Multi-feature collective decision making in robot swarms. In *Proceedings of the 17th International Conference on Autonomous Agents and MultiAgent Systems*, 1711–1719. Stockholm, Sweden. 🔗

S Bazzi, **J Ebert**, N Hogan, and D Sternad. 2018. Stability and Predictability in Dynamically Complex Physical Interactions. In *2018 IEEE International Conference on Robotics and Automation (ICRA)*, 5540–5545. 🔗

S Bazzi, **J Ebert**, N Hogan, and D Sternad. 2018. Stability and predictability in human control of complex objects. *Chaos*, 28, 10. 🔗