Julia Ebert

PhD candidate in computer science, seeking to create robust, autonomous multi-robot systems.

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Education

Cambridge, MA
2022 (expected)
2019

Harvard University
PhD Candidate in Computer Science
MS in Computer Science

- Department of Energy Computation Science Graduate Fellow (DOE CSGF) · Siebel Scholar · 3.96 GPA
- Thesis: *A Framework for Distributed Perception and Decision-making in 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
- Honors Thesis: *Asymmetric Learning in an Asymmetric Bimanual Task*

Skills

Computer Science
Algorithm development · Python (including NumPy, Pandas, Django) · C/C++ (including embedded programming,AVR, Arduino, OpenMP) · Robot Operating System (ROS) · Linux · Git/version control · MATLAB · JavaScript (including Vue.js) · Java

Engineering & Fabrication
Computer-aided design (OnShape, Fusion 360) · Electronics design (Eagle) and production · 3D printing · CNC milling · Soldering · Laser cutting · Molding and casting

Experience

Cambridge, MA
2016 –

Harvard University Self-Organizing Systems Research Group, Prof. Radhika Nagpal
PhD research assistant

- 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 researchers to create heterogeneous robot swarm for inspection on space stations.
- Designing and manufacturing LARVAbot: a collective of bioinspired robots to perform aggregate locomotion. Includes designing custom PCB, embedded programming, CAD and 3D printing of robot, and algorithm design for aggregate movement.

Livermore, CA
2018 –

Lawrence Livermore National Laboratory, Dr. Michael Schneider
Summer internship, ongoing collaboration

- Designing 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++) for human-subject experiments on prediction and stability in control of objects with complex dynamics; conducted pilot experiments.
- 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.
- Analyzed data (Matlab) to assess the effect of a prolonged motor experiment on cognitive fatigue in human subjects.

Nahant, MA — **Northeastern University Marine Science Center,** Prof. Joseph Ayers
May – Aug. 2015 — Summer research assistant

- Contributed to development of flex-sensing antennae for lobster-inspired robot.
- Developed neuron-based biomimetic control (LabView) for using antennae to adjust robot control in response to water currents (rheotaxis).

Watertown, MA — **Interactive Motion Technologies**
July – Sept. 2014 — Software development co-op

- Developed a backend and interface (Python + Django) for integrating clinical stroke assesment tools into a rehabilitation robot.

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, and conducted pilot experiments.

Teaching & Outreach

2021 — **Co-supervisor,** ETH masters student thesis
Summer 2019 — **REU mentor** for Kilobot research and outreach project
Fall 2018, Fall 2019 — **Teaching staff,** How To Make (Almost) Anything, Harvard section
Nov. 2018 — **Speaker,** Science in the News fall lecture series: "Brains and Bodies: How to Make Smart Robots"
Spring 2018 — **Teaching fellow,** Harvard CS 189: Autonomous Robot Systems
April 2018 — **Guest,** *Brains On!* science podcast live show
2014 – 2015 — **Teaching assistant,** Northeastern CS 2500: Fundamentals of Computer Science (2 semesters)

Publications

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.