Florian **Berlinger**

PhD Candidate – Roboticist

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Education

Harvard University — Cambridge, USA
PhD and MS in Computer Science, Advisor: Prof. Radhika Nagpal — exp Nov 2020
Thesis: 3D Vision-Based Collective Behaviors in a Fish-Inspired Robot Swarm

ETH Zurich — Zurich, CHE
MS in Mechanical Engineering, Advisor: Prof. Bradley Nelson — 2016
Thesis: A Low-Cost, Highly Maneuverable, Miniature Underwater Robot Intended for Collective Behaviors

ETH Zurich — Zurich, CHE
BS in Mechanical Engineering, Advisor: Prof. Roland Siegwart — 2013
Thesis: Obstacle Climbing Control for an Inspection Robot with Magnetic Wheels

Fellowships & Awards

Financial Support, David B. Heller Innovation Fund — 2019
Certificate of Distinction in Teaching, Harvard University Bok Center — 2018
Best Paper Finalist, International Conference on Robotics and Automation — 2018
PhD Scholarship, Harvard University — 2017 – present
Fellowship, Janggen-Pöhn Foundation — 2017
Fellowship, Werner Siemens Foundation — 2016
Scholarship, Swiss Study Foundation — 2015
Best Innovator Award, Bühler Group — 2013
Fellowship, Swiss Study Foundation — 2011 – present
Graduation Award for First in Class, Wil High School — 2010
Sustainability Award for Best Matura Paper, Employer's Association Wil

Research

Harvard University, Self-Organizing Systems Research Group — Cambridge, USA
Prof. Radhika Nagpal — 2015 – present

- Designed and fabricated a miniature underwater robot with 3D fin-propelled locomotion and 3D visual perception suitable for collective behaviors
- Developed bio-inspired algorithms for 3D collective behaviors in simulation and with a physical robot swarm
- Contributed to the acquisition of a $225k Amazon grant

Harvard University, Microrobotics Laboratory — Cambridge, USA
Prof. Robert Wood — 2017 – 2020

- Applied custom-made dielectric elastomer actuators (DEAs) in soft robotics
- Demonstrated an autonomous DEA-driven underwater robot and a bending beam DEA for multi-modal locomotion (crawling, hopping, jumping, rolling)

Harvard University, Lauder Laboratory — Cambridge, USA
Prof. George Lauder — 2018 – 2020
- Designed a biomimetic fish-like underwater robot suitable as an experimental platform for addressing open questions in aquatic locomotion
- Replicated three key characteristics of fish swimming: linear speed-frequency relationship, U-shaped cost of transport, reverse Kármán wakes
- Used the robot to validate a thrust enhancement hypothesis for energy savings in fish schooling
- Developed a novel schooling-inspired propulsor for energy efficient underwater vehicles

ETH Zurich, Multi-Scale Robotics Lab — Zurich, CHE
Prof. Bradley Nelson — 2014
- Designed a miniscule force sensing catheter capable of measuring contact forces at its distal end during cardiac ablation
- Demonstrated tissue sampling (texture and flexibility) for diagnostic purposes

Bühler Group, Innovation Lab at R&D Food Processing — Bangalore, IND
Calvin Grieder, chairman and former CEO — 2013 – 2014
- Managed a $30k budget to conduct industrial research including the conception, design, and validation of food processing machines that are sold for profit
- Designed the framework and motor suspension for a novel and now commercially available single screw extruder
- Visited customers in Northern India to test prototypes for controlled and cost-effective oil spraying of pulses on site

ETH Zurich, Autonomous Systems Lab — Zurich, CHE
Prof. Roland Siegwart — 2012 – 2013
- Designed Ship Inspection Robot, a robust, cheap, and easy to operate inspection tool for the maritime transport sector intended to reduce costly inspection time in dry docks
- Contributed to an innovative overlapping wheel configuration (patented!) for overcoming a broad variety of obstacles encountered in cargo ships including I-shaped stiffeners
- Led the research team of ten interdisciplinary undergraduate students, oversaw the $15k budget, negotiated with manufacturers and suppliers, reported to investors and experts

Teaching & Mentoring

Harvard University — Cambridge, USA
Graduate student mentor for a visiting masters student from ETH Zurich — 2020
- Supervised a 6-month-long master's thesis on "Evasive Maneuvers in a Bioinspired Underwater Robot Collective"

Undergraduate student co-supervisor for CS91r: Supervised Reading and Research — 2020
- Supervised a semester-long research project on "Collective Mapping and Visual Odometry with Miniature Underwater Robots"

Guest lecturer and project advisor in CS289: Biologically-Inspired Multi-Agent Systems 2019
- Lectured in class and supervised two final projects

Research student co-advisor for several graduate and undergraduate students 2018 – present

Teaching fellow in CS189: Autonomous Robot Systems 2018
- Held sections and office hours, advised and graded students, won teaching award

ETH Zurich Zurich, CHE
Teaching staff in Innovation Process 2013
- Coached three undergraduate engineering teams during their “Innovation Process” course
- Supported the students in conceptualizing and realizing a mechatronic system with several sensors and actuators to master a prespecified project challenge

Leadership & Service

reatch.ch, member of the reatch-team for artificial intelligence, wrote an article on AI and robotics 2017 – 2018

ETH Alumni New England Chapter, board member, organized talks with ETH professors 2016 – present

Wiler Forum for Sustainability Issues (WIFONA), board member and vice president, organized forums with Swiss Federal Councilors for several hundred participants 2010 – 2016

Publications

M. Duduta, **F. Berlinger**, R. Nagpal, D. Clarke, R. Wood, F.Z. Temel, Tunable Multi-Modal Locomotion in Soft Dielectric Elastomer Robots. *Accepted for publication in RoboSoft.*

M. Duduta, **F.C.J. Berlinger**, R. Nagpal, D.R. Clarke, R.J. Wood, F.Z. Temel, Electrically-latched compliant jumping mechanism based on a dielectric elastomer actuator. *Smart Materials and Structures*, 28(9), p.09LT01 (2019).

F. Berlinger, M. Duduta, H. Gloria, D. Clarke, R. Nagpal, R. Wood, A Modular Dielectric Elastomer Actuator to Drive Miniature Autonomous Underwater Vehicles. *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3429-3435 (2018). (Finalist for two Best Paper Awards.)

K. Soltan, J. O'Brien, **F. Berlinger**, R. Nagpal, J. Dusek, Biomimetic actuation method for a miniature, low-cost multi-jointed robotic fish. *MTS/IEEE OCEANS Charleston*, pp. 1-9 (2018).

F. Berlinger, J. Dusek, M. Gauci, R. Nagpal, Robust maneuverability of a miniature, low-cost underwater robot using multiple fin actuation. *IEEE Robotics and Automation Letters 3*, 140-147 (2017).

G. Chatzipirpiridis, S. Gervasoni, **F. Berlinger**, O. Ergeneman, S. Pané, B.J. Nelson, B.J., Miniaturized magnetic force sensor on a catheter tip. *IEEE International Conference on Solid-State Sensors, Actuators and Microsystems (TRANSDUCERS)*, pp. 1727-1730 (2015).

Patents

F.C.J. Berlinger, C.M. Clausen, Y. Detrekoey, J. Eichenberger, M.A. Eppenberger, M.S. Fisler, A. Mueller, S.M. Schmid, W. Fischer, Carriage cart with obstacle overcoming. *General Electric Technology GmbH*, U.S. Patent Application 15/041,652 (2016).

Presentations

A Bio-inspired Underwater Robot Collective for Distributed Search and Sampling
Invited talk, HUBweek, Boston, USA (Oct 2018)

A Modular Dielectric Elastomer Actuator to Drive Miniature Autonomous Underwater Vehicles
Award talk, IEEE ICRA, Brisbane, Australia (May 2018)

The Role of Robots
Invited talk, Swiss Study Foundation, Zurich, Switzerland (Jun 2017)

The Ship Inspection Robot - SIR
Invited talk, Marine Maintenance World Expo and Conference, Amsterdam, Netherlands (Jun 2016)

Skills

Areas of Expertise	Artificial intelligence, robotics, systems engineering, software design, product development, project management
Programming	Python, MATLAB, C/C++, HTML/CSS, Git, LaTeX
Fabrication	Computer-Aided Design, PCB design, 3D printing, laser cutting, milling, molding and casting, soldering
Languages	English (fluent), German (mother tongue), French (conversational), Spanish (basic)

Relevant Coursework

Computer Science	Data Structures and Algorithms, Probabilistic Analysis and Algorithms, Machine Learning, Computer Vision, Distributed Systems, Biologically-Inspired Multi-Agent Systems
Engineering	Mechanics, Technical Dynamics, Electrical Engineering, Control Systems, System Modelling, System Identification, Recursive Estimation, Dynamic Programming and Optimal Control, Autonomous Mobile Robots, Microrobotics
Mathematics	Multivariable Calculus, Linear Algebra, Numerical Analysis

Activities & Interests

Sport	Ski, mountain biking, tennis, soccer, golf
Music	Guitar, piano, enthusiastic listener of classical concerts and operas
Other	Hiking, cooking, art exhibitions