Thomas Langerak
Ph.D. Student
Andvanced Interactive Technologies
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Google Scholar | Personal Page | LinkedIn

RESEARCH INTEREST

I am interested in exploring the intersection of Human-Computer Interaction, Optimization, and Reinforcement Learning. My current research is focused on adaptive user interfaces from a multi-agent Reinforcement Learning perspective. In the past I built custom hardware for input and output devices, and developed novel control strategies for haptic interactions.

ACADEMIC EXPERIENCE

Ph.D. Student - Computer Science *2018 - Present*
Advanced Interactive Technologies, ETH Zürich, Switzerland.
Advisor: Prof. Otmar Hilliges

- 2020-Present: Focus on reinforcement learning, user modelling, and user interface optimization.
- 2018-2020: Focused on novel haptic systems, prototyping, hardware development.
- Teaching and student thesis supervision.
- Expected Graduation: December 2023

Graduate Intern *Spring 2018*
Advanced Interactive Technologies, ETH Zürich, Switzerland
Advisor: Prof. Otmar Hilliges

- Invited visiting student for my Master thesis.
- Focused on Model Predict Control strategies for haptics.
- Built a custom haptic system.
- Master Thesis outcomes: Paper [C.5] and Demo [A.2]

Summer Intern *Summer 2017*
User Interfaces, Aalto University, Finland
Advisor: Prof. Antti Oulasvirta

- Implemented different metrics for automatic interface aesthetics.
- Internship Outcome: The Aalto Interface Metric [A.3] is a direct result of my work.

PROFESSIONAL EXPERIENCE

Research Scientist Intern *Summer 2023*
Meta Reality Labs, Redmond, USA

- Human-Computer Interaction, Explainable AI
- Completed a full research project

Intern *Fall 2014*
Studio Sophisti, Amsterdam, the Netherlands

- Prototyping, Software, Electrical Engineering and Design.

- Hardware and Software development.
- First iteration on a red dot design award winner.
- Worked for Lego, Disney and Hasbro.

PRIOR EDUCATION

Double-degree M.Sc. Student *2016 - 2018*
Computer Science (Intelligent Systems), Aalto University & Twente University.
- Deep and Machine Learning, HCI, User Interfaces and Design.
- Minor: Entrepeneurship

Exchange Student *Spring 2015*
Industrial Design, Carnegie Mellon University, USA
- Semester Exchange to Carnegie Mellon University.
- Focus on product design and computational design.

B.Sc. Student *2012 - 2016*
Industrial Design, Eindhoven University of Technology, the Netherlands
- Specializing in tangible and embodied interaction
- Focus on software and electrical engineering.

PUBLICATIONS

Conference Papers

[C.1]: *MARLUI: Multi-Agent Reinforcement Learning for Goal-Agnostic Adaptive UIs.*
Thomas Langerak, Sammy Christen, Mert Albaba, Christoph Gebhardt and Otmar Hilliges. Under Review.

[C.2]: *Hedgehog: Handheld Spherical Pin Array based on a Central Electromagnetic Actuator.*
Aline Abler, Juan Zarate, **Thomas Langerak**, Velko Vechev and Otmar Hilliges. 2021. In World Haptics Conference.
Honorable Mention

[C.3]: *Omni: Volumetric Sensing and Actuation of Passive Magnetic Tools for Dynamic Haptic Feedback.*
Thomas Langerak*, Juan Zarate*, David Lindlbauer, Christian Holz, and Otmar Hilliges. 2020. In Proceedings of the 33rd Annual ACM Symposium on User Interface Software and Technology (UIST 20). Association for Computing Machinery, New York, NY, USA, 594606.

[C.4]: *Optimal Control for Electromagnetic Haptic Guidance Systems.*
Thomas Langerak, Juan Zarate, Velko Vechev, David Lindlbauer, Daniele Panozzo, and Otmar Hilliges. 2020. In Proceedings of the 33rd Annual ACM Symposium on User Interface Software and Technology (UIST 20). Association for Computing Machinery, New York, NY, USA, 951965.

[C.5]: *Contact-free Nonplanar Haptics with a Spherical Electromagnet.*
Juan Zarate*, **Thomas Langerak***, Bernhard Thomaszewski and Otmar Hilliges. 2020 IEEE Haptics Symposium (HAPTICS), Crystal City, VA, USA, 2020, pp. 698-704.

Auxiliary: Demos, Posters, and Workshops

[A.1]: *Robust Real-Time Tracking of Axis-Symmetric Magnets via Neural Networks.*
Mengfan Wu, **Thomas Langerak**, Juan Zarate and Otmar Hilliges. Arxiv.

[A.2]: *Generalizing User Models through Hybrid Hierarchical Control.*
Thomas Langerak, Sammy Christen, Anna Feit and Otmar Hilliges. 2021. In Reinforcement Learning for Humans, Computer, and Interaction (CHI 2021 Workshop).

[A.3]: *A Demonstration on Dynamic Drawing Guidance via Electromagnetic Haptic Feedback.*
Thomas Langerak, Juan Zarate, Velko Vechev, Daniele Panozzo, and Otmar Hilliges. 2019. In The Adjunct Publication of the 32nd Annual ACM Symposium on User Interface Software and Technology (UIST 19). Association for Computing Machinery, New York, NY, USA, 110112.

[A.4]: *Aalto Interface Metrics (AIM): A Service and Codebase for Computational GUI Evaluation.*
Antti Oulasvirta, Samuli De Pascale, Janin Koch, **Thomas Langerak**, et al. 2018. In The 31st Annual ACM Symposium on User Interface Software and Technology Adjunct Proceedings (UIST 18 Adjunct). Association for Computing Machinery, New York, NY, USA, 1619.

TEACHING

Organized Course

Seminar on Computational Haptics — *Spring 2020, 2021*

Individual Lectures

Human-Computer Interaction: (Computational) Haptics — *Fall 2021, 2022*
Human-Computer Interaction: Combinatorial Optimization — *Fall 2021, 2022*
Human-Computer Interaction (Industry): Combinatorial Optimization — *Fall 2020*

Teaching Assistant

Computer Science I — *Spring 2022*
Ubiquitous Computing — *Spring 2020, 2021*
Seminar on Advanced topics in Technical HCI — *Spring 2020, 2021*
Human-Computer Interaction — *Fall 2020, 2021, 2022*
Seminar in Computational Interaction — *Spring 2019*
Fairness, Equality and Accountability in Machine Learning — *Spring 2019*

COMMUNITY SERVICE & ORGANIZING COMMITTEES

Co-Chair, Data — *2021, 2022*
Symposium on User Interfaces, Systems and Technologies (UIST)

- Combine the different systems a conference uses and manage all data streams.
- Collaborate with different chairs.

Co-Chair, Virtual Experiences and Operations — *2020*
Symposium on User Interfaces, Systems and Technologies (UIST)

- Transitioning a physical conference into virtual-only.
- Investigate the needs and solutions for virtual conferences.
- Manage all data streams.
- Do presenter and attendee on boarding.

REVIEWING

2022 CHI, UIST, IEEE Sensors, NordiCHI
2021 IEEE Sensors, UIST, CHI
2020 CHI, UIST
2019 UIST

STUDENT SUPERVISION

Master Thesis

Caroline Sauget. 2022. *Deep Reinforcement Learning for Sustainability.*

Mengfan Wu. 2021. *Electromagnetic Tracking via Deep Learning.*
Under review.

Aline Abler. 2021. *Building A Hedgehog Pin Array Haptic Interface.*
Accepted for World Haptic Conference 2021 & Honorable Mention for Best Paper.

AWARDS

NASA Europa Challenge Finalist *2019*
EIT Digital Excellence Scholarship *2019*

INVITED TALKS

11/2022 CMU, Augmented Perception Lab

SKILLS

Software & Programming

- **Languages:** Python, Unity, Arduino
- **Methods:** AI, Optimization, Supervised Learning, Reinforcement Learning
- **Others:** Quick prototyping, proof-of-concepts

Hardware

- **Electronic:** Sensors, Actuators, Arduino, Raspberry Pi, Quick Prototyping.
- **Mechanical:** Laser Cutting, 3D printing, CAD Design