Ma, Hao

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About Me

My research interests lie in the intersection of **machine learning** and **control theory**. I aim to develop a new framework to understand key properties such as stability, convergence, and robustness in machine learning algorithms. Moreover, I want to bridge the gap between theory and practice in machine learning. In addition, I have a strong interest in **diffusion models** and **large language models**, exploring their potential in advancing both theoretical understanding and practical applications in robotics and autonomous systems.

Education

- **Eidgenössische Technische Hochschule Zürich, Switzerland** *04.2022 – Now*
  Doctorate of Mechanical Engineering
- **Max Planck Institute for Intelligent Systems, Germany** *04.2022 – Now*
  Scientific Researcher
- **Technical University of Munich, Germany** *04.2019 – 11.2021*
  Master of Automotive Engineering GPA: 1.1/1.0
- **Karlsruhe Institute of Technology, Germany** *10.2018 – 04.2019*
  Master of Mechatronics and Information Technology
- **Jilin University, China** *09.2013 – 07.2017*
  Bachelor of Energy and Power Engineering (Automotive Engine) GPA: 3.13/4.0

Publications

- **Hao Ma**, Sabrina Bodmer, Andrea Carron, Melanie Zeilinger and Michael Muehlebach. Constraint-Aware Diffusion Guidance for Robotics: Real-Time Obstacle Avoidance for Autonomous Racing. *Conference on Robot Learning*, pages 1-19, 2025.

- **Hao Ma**, Melanie Zeilinger and Michael Muehlebach. Online Optimization of Closed-Loop Control Systems. *ICML Workshop*, pages 1-16, 2024.

- Simon Guist, Jan Schneider, **Hao Ma**, Le Chen, Vincent Berenz, Julian Martus, Heiko Ott, Felix Grüninger, Michael Muehlebach, Jonathan Fiene, Bernhard Schölkopf and Dieter Büchler. Safe & Accurate at Speed with Tendons: A Robot Arm for Exploring Dynamic Motion. In *Proceedings of Robotics: Science and Systems*, pages 1-12, 2024.

- **Hao Ma**, Melanie Zeilinger and Michael Muehlebach. Stochastic Online Optimization for Cyber-Physical and Robotic Systems. *ArXiv*, pages 1-46, 2024.

- **Hao Ma**, Dieter Büchler, Bernhard Schölkopf and Michael Muehlebach. Reinforcement learning with model-based feedforward inputs for robotic table tennis. *Autonomous Robots*, 47(8):1387-1403, 2023.

- Philip Tobuschat, **Hao Ma**, Dieter Büchler, Bernhard Schölkopf and Michael Muehlebach. Data-Efficient Online Learning of Ball Placement in Robot Table Tennis. In *Proceedings of International Conference on Intelligent Robots and Systems*, pages 567-573, 2023.

- Jan Achterhold, Philip Tobuschat, **Hao Ma**, Dieter Büchler, Michael Muehlebach and Joerg Stueckler. Black-Box vs. Grey-Box: A Case Study on Learning Table Tennis Ball Trajectory Prediction with Spin and Impacts. In *Proceedings of Learning for Dynamics and Control Conference*, pages 878-890, 2023.

•Simon Guist, Jan Schneider, **Hao Ma**, Vincent Berenz, Julian Martus, Felix Grüninger, Michael Muehlebach, Jonathan Fiene, Bernhard Schölkopf and Dieter Büchler. A Robust Open-source Tendon-driven Robot Arm for Learning Control of Dynamic Motions. In *Proceedings of RoboLetics: Workshop on Robot Learning in Athletics*, pages 1-3, 2023.

•**Hao Ma**, Dieter Büchler, Bernhard Schölkopf and Michael Muehlebach. A Learning-based Iterative Control Framework for Controlling a Robot Arm with Pneumatic Artificial Muscles. In *Proceedings of Robotics: Science and Systems*, pages 1-10, 2022.

Experience

•Eidgenössische Technische Hochschule Zürich *06.2024 (block course) and 02.2023 – 06.2023*

Teaching Assistant Switzerland

– I served twice as a teaching assistant for Dr. Michael Muehlebach at Eidgenössische Technische Hochschule Zürich for the course "Large-Scale Convex Optimization". I was mainly responsible for the colloquia and designing exercises and exams.

•Max Planck Institute for Intelligent Systems *11.2021 – 03.2022*

Scientific Researcher Germany

– I did an internship at the Learning and Dynamical Systems Group at the Max Planck Institute for Intelligent Systems under the supervision of Dr. Michael Muehlebach.

•Max Planck Institute for Intelligent Systems *05.2021 – 10.2021*

Scientific Researcher Germany

– I did an internship/Master's thesis at the Learning and Dynamical Systems Group at the Max Planck Institute for Intelligent Systems under the supervision of Dr. Michael Muehlebach.

Awards

•Max-ETH Center for Learning Systems Fellowship *05.2022 – 05.2024*

highly competitive fellowship funding Ph.D. studies (acceptance rate $\sim 3\% - 4\%$*)*

•Deutschlandstipendium *10.2020 – 09.2021*

awarded by the Bundesministerium für Bildung und Forschung

•Third-class Scholarship *09.2015 – 07.2016*

awarded by Jilin University

•Third-class Scholarship *09.2014 – 07.2015*

awarded by Jilin University

•Second-class Scholarship *09.2013 – 07.2014*

awarded by Jilin University

Public Communication

•Talk at the EWRL 2025 *2025*

European Workshop on Reinforcement Learning

– I presented a contributed talk at the EWRL 2025, entitled *Provably Efficient Online Learning in Real-World Cyber-Physical and Robotic Systems.*

•Wissen Was mit Doktor Whatson *2024*

Youtube video with science communicator Cedric Engels

– I supported the live demonstration of a ping-pong playing robot during my supervisor's media interview.

•Max Planck Research Magazine *2023*

Special issue on "Orientation"

– I supported the live demonstration and explanation of a ping-pong playing robot featured in my supervisor's magazine interview.

•Science and Innovation Days Tübingen *2023*

Live robotics presentation to the general public in Tübingen

– I delivered a live presentation on the working principles of a ping-pong playing robot, showcasing its functionality and enabling hands-on interaction for the public.

Technical Skills and Interests

Programming Languages: Matlab/Simulink, Python
Frameworks & Libraries: ROS, PyTorch, TensorFlow, MuJoCo, Isaac Gym, Brax, Hugging Face
Tools & Platforms: Git, Docker, VSCode, Jupyter, HPC Clusters
Operating Systems: Windows, Linux
Document Creation: Microsoft Office Suite, LaTeX, TikZ
Language Skills: Chinese(Native), English(C1), German(DSH-2)