Jonas Umlauft

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Education

Dr.-Ing. Electrical Engineering, Technical University of Munich **05/2015 – 07/2020**
- Combined control engineering and machine learning to ensure safety of self-learning autonomous systems
- Title of dissertation: "Safe Learning Control for Gaussian Process Models", Grade: *"summa cum laude"*

M. Sc. Electrical Engineering, Technical University of Munich **10/2013 – 03/2015**
- Specialized in control theory, robotics and optimization
- Grade: 1.1 "with high distinction" (1.0 is best, 5.0 is worst, best 6 %)

Semester Abroad, National University of Singapore, Singapore **08/2014 – 12/2014**
- Specialized in machine learning and information theory

Semester Abroad, University of Cambridge, UK **02/2014 – 08/2014**
- Master's Thesis: "Probabilistic Models for Nonlinear System Identification and Control", Grade: 1.0
- Worked on model-based reinforcement learning algorithms supervised by Carl Rasmussen

B. Sc. Electrical Engineering, Technical University of Munich **04/2011 – 09/2013**
- Bachelor's Thesis: "Dynamic Movement Primitives for Cooperative Robotic Manipulation", Grade: 1.0
- Grade: 1.4 "with distinction" (1.0 is best, 5.0 is worst, best 5 %)

Studies Electrical Engineering, University of Hawaii, USA **08/2009 – 05/2011**
- Received scholarship as student athlete volleyball

Working Experience

Research Associate, Technical University of Munich **05/2015 – present**
- Contributed to research project "Control based on Human Models" at Chair for Information-oriented Control
- Took responsibility for lectures, lab courses, tutorials, exams and supervised over 20 student projects
- Coauthored grant proposal for an international project funded by the EU with over 7 million €

Working Student, BMW Group, Munich **10/2012 – 03/2013**
- Designed test specification, prepared experimental setups and analyzed test results for high voltage batteries

Working Student, Siemens AG, Munich **10/2011 – 09/2012**
- Implemented prototype and researched on HTML5 for the department System Architectures and Platforms

Commitments

Graduate Council Speaker, Technical University of Munich **10/2016 – 09/2017**
- Chaired the council consisting of approx. 50 doctoral representatives with a budget of over 20,000€
- Represented the university political interests of over 5000 doctoral candidates
- Joined the Board of the TUM Graduate School, the TUM Senate, and the TUM Board of Trustees

Doctoral Representative, Technical University of Munich **08/2015 – 07/2020**

- Joined the Graduate Council and led the working group *supervision* (3-4 people)
- Founded the "TUM Supervisory Award" which awards 5,000€ for outstanding supervision of PhD students
- Organized a network event for all doctoral candidates of TUM (approx. 800 participants)

Participant at Manage&More, UnternehmerTUM GmbH, Munich **10/2012 – 03/2014**

- Improved my project management skills and gained a product-driven mindset
- Led a team of 5 people in an innovation project with BMW

Athlete Volleyball **12/2004 – 04/2011**

- Played for the German national team and was selected to the NCAA All-American team (USA)
- Qualified as volleyball trainer and club manager C-level

Awards

Kurt-Fischer PhD Award **2020**

Awarded by the Department of Electrical and Computer Engineering for an exceptional thesis

IEEE Conference on Decision and Control Outstanding Student Paper Award **2018**

Selected from over 2000 submissions (with two others) by an expert committee

Scholar of the Max Weber-Programm **10/2013 – 03/2015**

Granted based on excellent grades (best 3% of cohort) and a personal interview

University of Hawaii College of Engineering Dean's List **08/2009 – 05/2011**

Awarded for excellent grades (best 20% of cohort)

Skills

Languages: German (native language), English (fluent), French (conversational)

IT: Matlab, Python (Tensorflow, PyTorch), C, C++, git, CUDA, Jenkins, Docker, ROS, Latex

Publications

Journal Articles

[1] **J. Umlauft**, L. Pöhler, and S. Hirche. "An Uncertainty-Based Control Lyapunov Approach for Control-Affine Systems Modeled by Gaussian Process". In: *IEEE Control Systems Letters* 2.3 (2018), pp. 483–488.

[2] **J. Umlauft** and S. Hirche. "Feedback Linearization based on Gaussian Processes with event-triggered Online Learning". In: *IEEE Transactions on Automatic Control (TAC)* (2020), pp. 1–16.

[3] **J. Umlauft** and S. Hirche. "Learning Stochastically Stable Gaussian Process State-Space Models". In: *IFAC Journal of Systems and Control* 12 (2020), p. 100079.

[4] A. Capone, A. Lederer, **J. Umlauft**, and S. Hirche. "Data Selection for Multi-Task Learning Under Dynamic Constraints". In: *IEEE Control Systems Letters* 5.3 (2021), pp. 959–964.

[5] A. Lederer, A. Capone, **J. Umlauft**, and S. Hirche. "How Training Data Impacts Performance in Learning-Based Control". In: *IEEE Control Systems Letters* 5.3 (2021), pp. 905–910.

Conference Proceedings

[6] **J. Umlauft**, D. Sieber, and S. Hirche. "Dynamic Movement Primitives for cooperative manipulation and synchronized motions". In: *International Conference on Robotics and Automation (ICRA)*. IEEE. 2014, pp. 766–771.

[7] Y. Fanger, **J. Umlauft**, and S. Hirche. "Gaussian processes for dynamic movement primitives with application in knowledge-based cooperation". In: *International Conference on Intelligent Robots and Systems (IROS)*. IEEE. 2016, pp. 3913–3919.

[8] **J. Umlauft**, Y. Fanger, and S. Hirche. "Bayesian Uncertainty Modeling for Programming by Demonstration". In: *International Conference on Robotics and Automation (ICRA)*. 2017, pp. 6428–6434.

[9] **J. Umlauft**, T. Beckers, M. Kimmel, and S. Hirche. "Feedback linearization using Gaussian processes". In: *Conference on Decision and Control (CDC)*. IEEE. 2017, pp. 5249–5255.

[10] **J. Umlauft**, A. Lederer, and S. Hirche. "Learning Stable Gaussian Process State Space Models". In: *American Control Conference (ACC)*. IEEE. IEEE, 2017, pp. 1499–1504.

[11] **J. Umlauft** and S. Hirche. "Learning Stable Stochastic Nonlinear Dynamical Systems". In: *International Conference on Machine Learning (ICML)*. Ed. by D. Precup and Y. W. Teh. Vol. 70. Proceedings of Machine Learning Research. International Convention Centre, Sydney, Australia: PMLR, 2017, pp. 3502–3510.

[12] T. Beckers, **J. Umlauft**, D. Kulic, and S. Hirche. "Stable Gaussian process based tracking control of Lagrangian systems". In: *Conference on Decision and Control (CDC)*. IEEE. 2017, pp. 5180–5185.

[13] T. Beckers, **J. Umlauft**, and S. Hirche. "Stable Model-based Control with Gaussian Process Regression for Robot Manipulators". In: *World Congress of the International Federation of Automatic Control (IFAC)*. Vol. 50. 1. Toulouse, France: Elsevier, 2017, pp. 3877–3884.

[14] **J. Umlauft**, T. Beckers, and S. Hirche. "A Scenario-based Optimal Control Approach for Gaussian Process State Space Models". In: *European Control Conference (ECC)*. 2018, pp. 1386–1392.

[15] T. Beckers, **J. Umlauft**, and S. Hirche. "Mean Square Prediction Error of Misspecified Gaussian Process Models". In: *Conference on Decision and Control (CDC)*. 2018, pp. 1162–1167.

[16] L. Pöhler, **J. Umlauft**, and S. Hirche. "Uncertainty-based Human Trajectory Tracking with Stable Gaussian Process State Space Models". en. In: *IFAC Conference on Cyber-Physical & Human Systems (CPHS)*. IFAC. Miami, 2018.

[17] A. Lederer, **J. Umlauft**, and S. Hirche. "Uniform Error Bounds for Gaussian Process Regression with Application to Safe Control". In: *Advances in Neural Information Processing Systems (NeurIPS)*. 2019.

[18] A. Capone, G. Noske, **J. Umlauft**, T. Beckers, A. Lederer, and S. Hirche. "Efficient online closed loop exploration using receding horizon control". In: *Learning for Dynamics and Control (L4DC)*. Proceedings of Machine Learning Research, 2020.

[19] **J. Umlauft**, T. Beckers, A. Capone, A. Lederer, and S. Hirche. "Smart Forgetting for Safe Online Learning with Gaussian Processes". In: *Learning for Dynamics and Control (L4DC)*. Proceedings of Machine Learning Research, 2020.