



Machine Learning in Science

5th Annual Conference, 11 + 12 July 2023 in Tübingen

VENUE – Freistil (Wöhrdstraße 25, 72072 Tübingen)

TUESDAY, 11 July 2023

09:00	Opening Remarks Ulrike von Luxburg, Philipp Berens (Speakers of the Cluster of Excellence “Machine Learning”, University of Tübingen)
09:15	Computational Psychiatry: What Can We Learn from Large-Scale Brain Imaging Data? Tobias Kaufmann (University Hospital, Psychiatry and Psychotherapy, University of Tübingen)
10:00	Machine Learning to Predict Effects in Economics and Beyond Michael Knaus (School of Business and Economics, University of Tübingen)
10:45	Coffee Break
11:15	Lifelong Statistical Testing Claire Vernade (Department of Computer Science, University of Tübingen)
12:00	Machine Learning for Large-Scale Ecosystem Monitoring Christian Igel (Keynote) (Department of Computer Science, University of Copenhagen)
13:00	Lunch
14:00	Poster Session and Coffee – Individual Projects, AIMS Fellows and Research Groups
16:00	Machine Vision for Flexible and Robust Autonomous Robots Wieland Brendel (Max Planck Institute for Intelligent Systems, Tübingen)
16:45	ML as a Tool in Gravitational Wave Physics Daniela Doneva (Department of Physics, University of Tübingen)
17:30	Open Space (18:00 Guided Tour AI Makerspace)
19:00	Dinner

WEDNESDAY, 12 July 2023

09:00	Model-based Reinforcement Learning Georg Martius (Department of Computer Science, University of Tübingen)
09:45	Human-ML Assemblages in the Sciences: Approaches from Digital Anthropology & STS Christoph Bareither, Libuše Hannah Vepřek (Department of Historical and Cultural Anthropology (Ludwig Uhland Institute), University of Tübingen & LMU Munich)
10:30	Machine Learning for Sustainability - Bridging the Gap between Theory and Application Nicole Ludwig (Cluster of Excellence "Machine Learning", University of Tübingen)
11:00	Coffee Break
11:30	Health Natural Language Processing Carsten Eickhoff (University Hospital, Institute for Applied Medical Informatics, University of Tübingen)
12:15	Modeling Bacterial Communities' Dynamics with Graph Neural Networks Albane Ruaud (Cluster of Excellence "Machine Learning", University of Tübingen)
13:00	Lunch
14:00	Poster Session and Coffee - Cluster Network Projects <ul style="list-style-type: none">• Machine Learning in Education• Modeling and Understanding Spatiotemporal Environmental Interactions• Probabilistic Inference in Mechanistic Models• Compositionality in Minds and Machines• Uncovering the Inner Structure of Medical Images through Generative Modeling
16:45	Closing Remarks Ulrike von Luxburg, Philipp Berens (Speakers of the Cluster of Excellence "Machine Learning", University of Tübingen)



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Poster Sessions

TUESDAY, 11 July 2023 (14:00 - 16:00)

Individual Cluster Projects		
1.	Francesco Carnazza ¹ , Federico Carollo ¹ , Sabine Andergassen ¹ , Miriam Klopotek ² , Georg Martius ³ , Igor Lesanowsky ¹ <small>1 University of Tübingen, 2 University of Stuttgart, 3 MPI-IS Tübingen</small>	Machine Learning Stochastic Dynamics of Order Parameters
2.	Jonas Ditz , Bernhard Reuter, Nico Pfeifer	Convolutional Kernel Networks for Interpretable End-to-End Learning on (Multi-)Omics Data
3.	Jonathan Fuhr , Dominik Papies, Philipp Berens	Double Machine Learning Meets Panel Data - Promises, Pitfalls and Pending Problems
4.	Moritz Haas [*] , David Holzmüller [*] , Ulrike von Luxburg, Ingo Steinwart	Mind the Spikes: Benign Overfitting of Kernels and Neural Networks in Fixed Dimension
5.	Maria Heitmeier , Yu-Ying Chuang, Seth D. Axen and R. Harald Baayen	How to put frequency into a computational model of word comprehension (fast)
6.	Caroline Jachmann , Wolfgang Fuhl, Gizem Alsahan, Mathias Witte Paz, Kay Nieselt, Tjeerd Dijkstra	Metallica (Nothing else metals) - Using large language models to predict metal binding sites in proteins
7.	Kyra Liana Kadhim , Thomas Euler, Philipp Berens	A spatiotemporal model of neural activity in the outer plexiform layer of the mouse retina
8.	Matthias Karlbauer , Dale Durran, Nathaniel Cresswell-Clay, Thorsten Kurth, Mauro Bisson, Martin Butz	Advancing Deep Learning Weather Prediction on the HEALPix Mesh

9.	Rosanna Krebs , Manfred Claassen	Learning conditional mechanistic models of immune cell dynamics using trajectory inference
10.	Kerstin Rau , Thomas Gläßle, Katharina Eggensperger, Frank Schneider, Philipp Hennig, Thomas Scholten	How can we quantify, explain, and apply the uncertainty of complex soil maps predicted with neural networks?
11.	Alessandro Simon , Martin Oettel, Georg Martius	An ML-based density functional for orientational correlations in inhomogeneous systems of patchy particles
12.	Hassan Shahmohammadi, Zohreh Gaderi , Adhiraj Ghosh, Harald Baayen, Hendrik Lensch	ViPE: Visualize Pretty-much Everything
13.	Jacqueline Wistuba-Hamprecht , Rolf Fendel, Jonas Ditz, Samuel Wörz, Benjamin Mordmüller, Nico Pfeifer	Predicting Malaria Vaccine Efficacy Based on Anti-Plasmodial Antibody Profiles in European and African study populations
AIMS Fellows		
14.	Albert Agisha Nt. , Moritz Haas, Bedartha Goswami and Ulrike Von Luxburg	Quantifying Variance in Networks from Spatio-Temporal Data
15.	Amel Abdelraheem , Stefano Woerner, Christian F. Baumgartner	Contrastive meta learning for medical image analysis
16.	Ifeoma Veronica Nwabuo , Jan Niklas Böhm, Dmitry Kobak, Philipp Berens	Unsupervised Visualization of Medical Images using t-SimCNE
Research Groups		
17.	Katharina Eggensperger	Exploring AutoML for Science
18.	Wolfgang Fuhl , Anne Herrmann-Werner, Kay Nieselt	The Tiny Eye Movement Transformer
19.	Nafiseh Kakhani , Moein Rangzan, Thomas Scholten	A Spatio-temporal Deep Learning Framework for Digital Soil Mapping
20.	Ndiye Michael Kebonye , Ruhollah Taghiyadeh-Mehrjardi, Kingsley John, Prince Chapman Agyeman, Nafiseh Kakhani, Zibanani Seletlo, Lesego Motlhetlhi, Boineelo Moyo, Thomas Scholten	Integrating ML and Multivariate Statistics to Uncover Pedodiversity-Elevational Patterns Across Multiple Spatial Scales

21.	Josua Stadelmaier , Gisela Gabernet, Markus Kowarik, Sven Nahnsen	Predicting B-Cell Receptors in the Cerebrospinal Fluid of Multiple Sclerosis Patients
22.	Polina Tsvilodub* , Fausto Carcassi*, Michael Franke (*joint first-authorship)	Explanatory models with Scaffolded LLMs
23.	Çağatay Yıldız , Sebastian Dziadzio, Beyza Ermis, Matthias Bethge	Lifelong machine learning

WEDNESDAY, July 12, 2023 (14:00 - 16:30)

Cluster Network Projects

	Compositionality in Minds and Machines	
1.	Shyamgopal Karthik, Karsten Roth , Massimiliano Mancini, Zeynep Akata	Faithful Text-to-Image Generation via Selection
2.	Tankred Saanum , Noemi Elteto, Peter Dayan, Marcel Binz, Eric Schulz	Reinforcement learning with simplicity priors
3.	Michael Kirchhof , Bálint Mucsányi, Seong Joon Oh, Enkelejda Kasneci	Transferable Uncertainty Estimation
4.	Turan Orujlu , Martin V. Butz, Charley M. Wu	VividDreamer: Tokenized world model with stochastic attention
	Modeling and Understanding Spatiotemporal Environmental Interactions (MUSTEIN)	
5.	Jannik Thümmel , Felix Strnad, Jakob Schlör, Martin Butz, Bedartha Goswami	Sub-seasonal to seasonal predictions through self-supervised learning
6.	Fedor Scholz , Manuel Traub, Thomas Scholten, Christiane Zarfl, Martin Butz	River Discharge Prediction with Neural Networks

7.	Manuel Traub , Fedor Scholz, Christiane Zarfl, Thomas Scholten, Martin V. Butz	Data-Analysis of Extreme Rainfall Events
8.	Florian Ebmeier , Nicole Ludwig, Volker Franz	Fault Detection for Solar Thermal Systems using Variational Autoencoders
Uncovering the inner structure of medical images through generative modeling		
9.	Jan Nikolas Morshuis , Matthias Hein, Christian Baumgartner	Diffusion models might show when we know enough
10.	Jaivardhan Kapoor , Jakob H. Macke, Christian F. Baumgartner	Longitudinal Brain MRI Modeling using Latent Diffusion
11.	Sarah Müller , Lisa M. Koch, Hendrik P. A. Lensch, Philipp Berens	Learning disentangled representations of retinal images with generative models
Probabilistic Inference in Mechanistic Models (PIMMs)		
12.	Jonathan Schmidt , Nicholas Krämer, Philipp Hennig	Joint Inference from Differential Equations and Data
13.	Guy Moss , Vjeran Višnjević, Cornelius Schröder, Reinhard Drews, Jakob H. Macke	Studying the History of Ice Shelves Using Simulation-Based Inference
14.	Jonas Beck , Nathanael Bosch, Philipp Hennig, Jakob H. Macke, Philipp Berens	Probabilistic ODE solvers for parameter inference in Hodgkin-Huxley models
15.	Sebastian Bischoff , Cornelius Schröder, Manfred Claassen, Jakob Macke	Gaussian linear model for reconstruction of gene expression dynamics without time series data
Machine Learning in Education		
16.	Hanqi Zhou , Robert Bamler, Charley M. Wu, Álvaro Tejero-Cantero	Hierarchical Deep State-Space Model for Enhanced Knowledge Tracing