

MICHAEL MOOR, MD PHD

CURRICULUM VITAE

PERSONAL INFORMATION

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EDUCATION AND EMPLOYMENT

- 2022-present Postdoctoral scholar; Prof. Dr. Jure Leskovec, Department of Computer Science, Stanford University.
- 2018-2021 Ph.D. in Machine Learning for Healthcare; Prof. Dr. K. Borgwardt, Machine Learning and Computational Biology Lab, Department of Biosystems Science and Engineering, ETH Zurich.
Ph.D. Thesis: Machine Learning on Clinical Time Series: Classification and Representation Learning.
- 2018-2021 Doctoral Studies: Lectures in Machine Learning, Deep Learning and Data Mining, ETH Zurich.
- 2018 M.D. Thesis: Fully-Automatic Tumor Segmentation and Analysis in Computed Tomography of Non-small-cell Lung Cancer; PD. Dr. T. Heye, Department of Radiology, University Hospital Basel
- 2017 Swiss medical licence exam ("Staatsexamen"), scored in the 9th decile.
- 2014-2015 Master Thesis: Pre- and Postoperative Quantification of Visceral and Subcutaneous Adipose Tissue in Morbidly Obese Patients applying Statistical Shape Models; Prof. Dr. O. Bieri, Division of Radiological Physics, Department of Radiology, University Hospital Basel
- 2011-2017 Medical studies (B.Sc. 2014, and M.Sc. 2017), admission score in the 98.9th percentile. Additional classes in Biology, Chemistry and Statistics (in total 421 ECTS), University of Basel.

AWARDS AND ACTIVITIES

- 2022 Stanford HAI Google Cloud Credit Grant (\$100,000) for the proposal "A Foundation Model for Medical Knowledge and Reasoning".
- 2022 Nomination for the ETH Silver Medal for best doctoral theses.
- 2020 Best paper award for the co-authored paper *Learning Individualized Treatment Rules with Estimated Translated Inverse Propensity Score* at the IEEE International Conference on Healthcare Informatics, 2020.
- 2011-2020 Fellowship of the Swiss Study Foundation, a swiss-wide program to promote excellence.
- 2013 TedX Zurich Talk about (charitable) impact through rationality.

PEER-REVIEWED PUBLICATIONS

The 'dagger' symbol, i.e. †, indicates equal contribution. The 'double dagger' symbol, i.e. ‡, is listed for co-supervising authors. Underlined authors indicate students that were mentored by me.

- 2023 1. **Michael Moor**[†], Oishi Banerjee[†], Zahra Shakeri Hossein Abad, Harlan M. Krumholz, Jure Leskovec, Eric J. Topol[‡], Pranav Rajpurkar[†]. *Foundation Models for Generalist Medical Artificial Intelligence*. *Nature*, Volume 616, 259–265 (2023).

- 2022
2. Max Horn[†], Edward De Brouwer[†], **Michael Moor**, Yves Moreau, Bastian Rieck[‡], and Karsten Borgwardt[‡]. *Topological Graph Neural Networks. Proceedings of the International Conference on Learning Representations (ICLR), 2022*
 3. Bowen Fan, Juliane Klatt, **Michael Moor**, Latasha Daniels, Swiss Pediatric Sepsis Study, Lazaro Sanchez-Pinto, Philipp Agyeman, Luregn Schlapbach, Karsten Borgwardt. *Prediction of recovery from multiple organ dysfunction syndrome in pediatric sepsis patients. Bioinformatics*, Volume 38, Issue Supplement_1, i101-i108, 2022.
- 2021
4. **Michael Moor**[†], Bastian Rieck[†], Max Horn, Catherine R Jutzeler[‡], and Karsten Borgwardt[‡]. *Early Prediction of Sepsis in the ICU using Machine Learning: A Systematic Review. Frontiers in Medicine*, Volume 8, 2021.
 5. Felix Hensel, **Michael Moor**, and Bastian Rieck. A Survey of Topological Machine Learning Methods. *Frontiers in Artificial Intelligence*, Volume 4, 2021.
 6. Jannis Born[†], Nina Wiedemann[†], Manuel Cossio, Charlotte Buhre, Gabriel Brändle, Konstantin Leidermann, Avinash Aujayeb, **Michael Moor**, Bastian Rieck, and Karsten Borgwardt. *Accelerating Detection of Lung Pathologies with Explainable Ultrasound Image Analysis. Applied Sciences*, Volume 11, No. 2, 2021.
- 2020
7. Christian Bock[†], **Michael Moor**[†], Catherine R Jutzeler, and Karsten Borgwardt. *Machine Learning for Biomedical Time Series Classification: From Shapelets to Deep Learning. Artificial Neural Networks*, pp. 33-71. Humana, New York, NY.
 8. Thomas Gumbsch, Christian Bock, **Michael Moor**, Bastian Rieck, Karsten Borgwardt. *Enhancing Statistical Power in Temporal Biomarker Discovery through Representative Shapelet Mining. Bioinformatics*, Volume 36, Issue Supplement_2, pp. i840-i848, December 2020.
 9. Zhiliang Wu, Yinchong Yang, Yunpu Ma, Yushan Liu, Rui Zhao, **Michael Moor**, and Volker Tresp. *Learning Individualized Treatment Rules with Estimated Translated Inverse Propensity Score. Proceedings of the IEEE International Conference on Healthcare Informatics (ICHI)*, pp. 1-11, 2020.
 10. **Michael Moor**[†], Max Horn[†], Bastian Rieck[‡], Karsten Borgwardt[‡]. *Topological Autoencoders. Proceedings of the International Conference on Machine Learning (ICML)*, PMLR 119:7045-7054, 2020.
 11. Max Horn, **Michael Moor**, Christian Bock, Bastian Rieck, and Karsten Borgwardt. *Set Functions for Time Series. Proceedings of the International Conference on Machine Learning (ICML)*, PMLR 119:4353-4363, 2020.
 12. Stephanie L. Hyland[†], Martin Faltys[†], Matthias Hüser[†], Xinrui Lyu[†], Thomas Gumbsch[†], Cristóbal Esteban, Christian Bock, Max Horn, **Michael Moor**, Bastian Rieck, Marc Zimmermann, Dean Bodenham, Karsten Borgwardt[‡], Gunnar Rättsch[‡], and Tobias M. Merz[‡]. *Early prediction of circulatory failure in the intensive care unit using machine learning. Nature Medicine*, Volume 26, Issue 3, pp. 364-373, March 2020.
- 2019
13. **Michael Moor**, Max Horn, Bastian Rieck, Damian Roqueiro, Karsten Borgwardt. *Early Recognition of Sepsis with Gaussian Process Temporal Convolutional Networks and Dynamic Time Warping. Proceedings of the 4th Machine Learning for Healthcare Conference (MLHC)*, Volume 106 of Proceedings of Machine Learning Research, pp. 2-26, August 2019.

14. Bastian Rieck[†], Christian Bock[†], Matteo Togni[†], **Michael Moor**, Max Horn, Thomas Gumbsch, Karsten Borgwardt. *Neural Persistence: A Complexity Measure for Deep Neural Networks Using Algebraic Topology*. *Proceedings of the International Conference on Learning Representations (ICLR)*, 2019.
15. Anne Christin Meyer-Gerspach, Ralph Peterli, **Michael Moor**, Philipp Madörin, Andreas Schötzau, Diana Nabers, Stefan Borgwardt, Christoph Beglinger, Oliver Bieri, Bettina Wölnerhanssen. *Quantification of Liver, Subcutaneous, and Visceral Adipose Tissues by MRI Before and After Bariatric Surgery*. *Obesity surgery*, Volume 29, Issue 9, pp. 2795-2805. Mai 2019.
- 2018 16. Christian Bock, Thomas Gumbsch, **Michael Moor**, Bastian Rieck, Damian Roqueiro, Karsten Borgwardt. *Association Mapping in Biomedical Time Series via Statistically Significant Shapelet Mining*. *Bioinformatics*, Volume 34, Issue 13, pp. 1438-1446, July 2018

PREPRINTS

- 2023 1. Hamed Nilforoshan[†], **Michael Moor[†]**, Yusuf Roohani, Yining Chen, Anja Šurina, Michihiro Yasunaga, Sara Oblak, Jure Leskovec. *Zero-shot Causal Learning*. Preprint, arXiv:2301.12292, 2023.
- 2021 2. **Michael Moor[†]**, Nicolas Bennett[†], Drago Plečko[†], Max Horn[†], Bastian Rieck, Nicolai Meinshausen, Peter Bühlmann, and Karsten Borgwardt. *Predicting Sepsis in Multi-Site, Multi-National Intensive Care Cohorts Using Deep Learning*. Preprint, arXiv:2107.05230, 2021.
- 2020 3. **Michael Moor**, Max Horn, Christian Bock, Karsten Borgwardt, and Bastian Rieck. *Path Imputation Strategies for Signature Models of Irregular Time Series*. Preprint, arXiv:2005.12359, 2020.

WORKSHOP CONTRIBUTIONS

- 2020 1. **Michael Moor**, Max Horn, Karsten Borgwardt, and Bastian Rieck. *Challenging Euclidean Topological Autoencoders*. Accepted for presentation at the NeurIPS 2020 TDA and Beyond Workshop.
2. **Michael Moor**, Max Horn, Christian Bock, Karsten Borgwardt, and Bastian Rieck. *Path Imputation Strategies for Signature Models*. Accepted for presentation at the ICML 2020 Workshop on the Art of Learning with Missing Values (Artemiss).

INVITED TALKS (SELECTED LONG TALKS)

- 2022/11 *Machine Learning on Clinical Time Series: Classification and Representation Learning*. ETH Silver Medal Presentations 2022, D-BSSE, ETH Zurich, Switzerland.
- 2022/10 *The Hitchhiker's Guide to Medical Artificial Intelligence*. MD-PhD Retreat 2022, Vitznau, Switzerland.
- 2022/08 *Generalizable Medical AI*. Seminar, Stanford Center for Biomedical Informatics Research, Stanford, USA.
- 2021/04 *Early Prediction of Sepsis in the ICU using Machine Learning*. Consortium Call, Personalized Swiss Sepsis Study, Basel, Switzerland.
- 2020/11 *Machine learning for personalized medicine*. Young Scientists Lunch Webinar, Swiss Society for Biomaterials and Regenerative Medicine, Zurich, Switzerland.

2020/09 *Topological representation learning* (45'). DataSig Seminar, Mathematical Institute, University of Oxford, UK.

MENTORSHIP AND TEACHING

2019 *Data Mining II*, ETH Zurich (Teaching assistant).

2021 *Data Mining II*, ETH Zurich (Teaching assistant).

SERVICE TO THE COMMUNITY

2021 Program Committee for the ICLR 2021 Geometrical and Topological Representation Learning Workshop.

2020 Program Committee for the NeurIPS 2020 TDA and Beyond Workshop.

2020 Program Committee for the ICML 2020 Workshop on the art of learning with missing values (Artemiss).

2019-Present Peer-reviewing for the journals Machine Learning (Springer Nature), Nature Communications, and Bioinformatics, as well as the conferences ISMB, ECML PKDD, MLHC Neurips, and ICLR.

OTHER INFORMATION

Languages

GERMAN · Native speaker
 ENGLISH · Fluent
 FRENCH · Intermediate
 MANDARIN · Beginner

Technical

Python (PyTorch/Lightning, Tensorflow) · R · MATLAB · SQL · \LaTeX · Google Cloud · Vim/Neovim · Git

Current Interests

Machine Learning for Healthcare · Time Series Analysis · Topological Machine Learning · Foundation models