

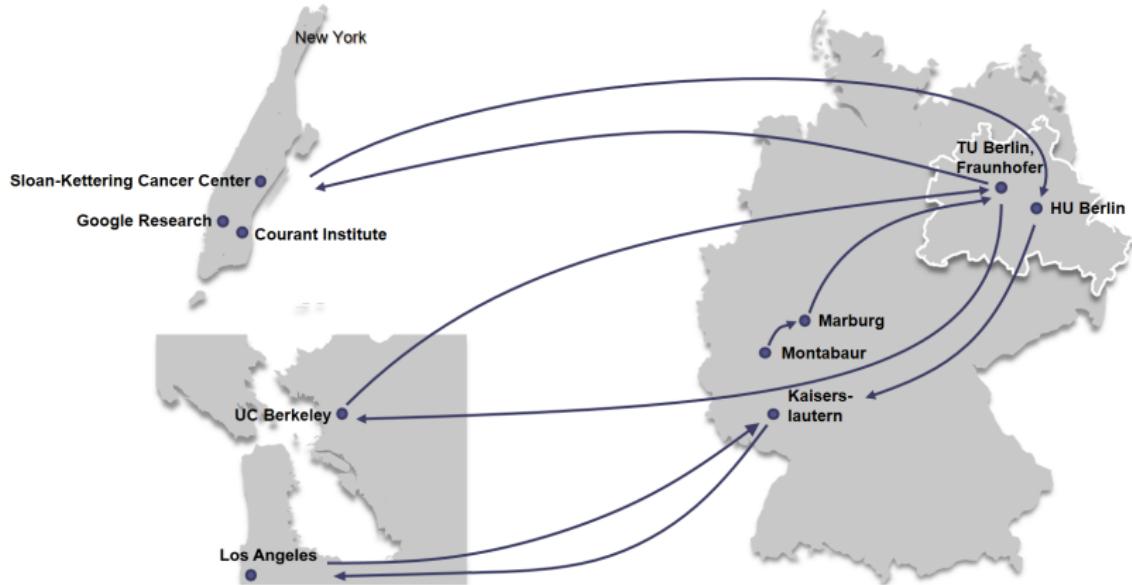
1.2 About Us

Machine Learning 1: Foundations

Marius Kloft (TUK)

21–28 Apr 2020

About::Me



Marius Kloft

About::Us—ML Group @ TU KL



Billy Joe Franks
PhD



Philipp Liznerski
PhD



PhD



PhD



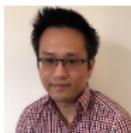
Waleed Mustafa
PhD



Matthias Kirchler
PhD



Rodrigo Alves
PhD



Quynh Nguyen
Postdoc



Antoine Ledent
Postdoc



Yunwen Lei
Visiting Prof



Marius Kloft
Prof

About::ML_Group

Our topics in **teaching**

- ▶ ML BSc project (WiSe)
- ▶ Machine Learning I (SoSe)
- ▶ Machine Learning II (WiSe)
- ▶ MSc Seminar (WiSe & SoSe; ML1 required)
- ▶ ML MSc project (for final-year students only)*
- ▶ MSc thesis
- ▶ PhD thesis

Our topics in **research**

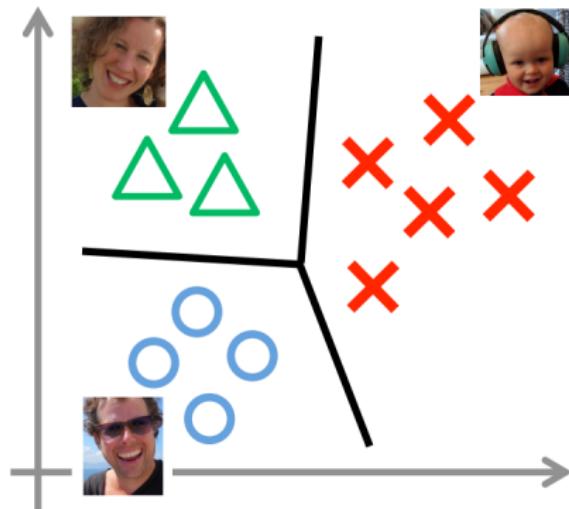
- ▶ Theory → Algorithms → Applications

* individual, guided research project preparing for MSc thesis in ML group

Our Topics in Research (1)

EXtreme Classification (XC)

Classification using an eXtremely large amount of Classes



Example: face recognition

Y. Lei, Ü. Dogan, D. Zhou, and M. Kloft, Data-dependent generalization bounds for multi-class classification, *IEEE Trans. Inf. Theory*, vol. 65, no. 5, pp. 2995–3021, 2019

Our Topics in Research (2)

Deep Anomaly Detection

Detecting **rare, novel, or anomalous** data instances in large data collections using deep learning.



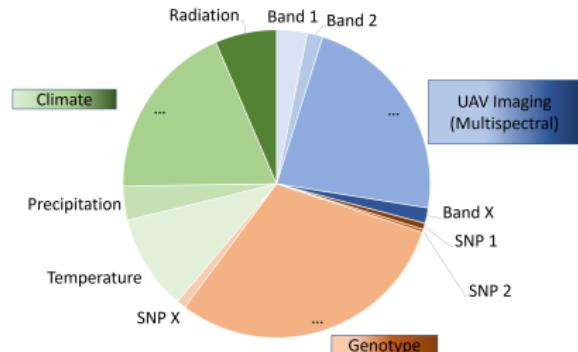
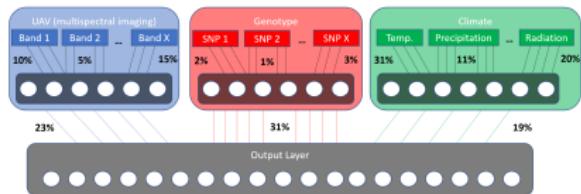
Ex.: detection of anomalous images (here: weird bedrooms)

L. Ruff, N. Görnitz, L. Deecke, S. A. Siddiqui, R. A. Vandermeulen, A. Binder, E. Müller, and M. Kloft, Deep one-class classification, in *Proceedings of the 35th International Conference on Machine Learning (ICML)*, ser. Proceedings of Machine Learning Research, vol. 80, PMLR, 2018, pp. 4390–4399

Our Topics in Research (3)

Interpretable Multiple Neural Learning

Integrating multiple data representations into deep learning,
in an interpretable way



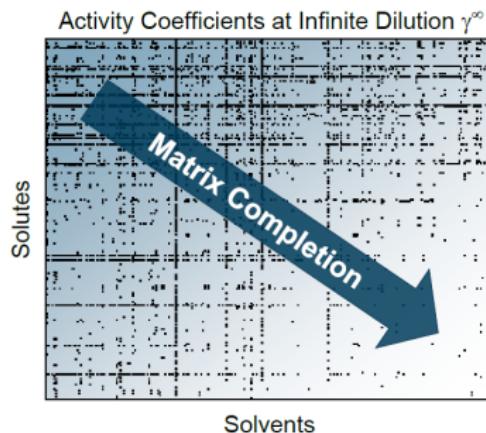
Example: predict plant breeding value from environmental, hyperspectral, and genetic data

M. Kloft, U. Brefeld, S. Sonnenburg, and A. Zien, ℓ_p -norm multiple kernel learning, *J. Mach. Learn. Res.*, vol. 12, pp. 953–997, 2011

Our Topics in Research (4)

Applications of ML in Chemical Engineering

Helping chemical engineers to develop more economic ways of using materials and energy



Example: prediction of thermodynamical interactions of substances using matrix completion

F. Jirasek, R. A. S. Alves, J. Damay, R. A. Vandermeulen, R. Bamler, M. Bortz, S. Mandt, M. Kloft, and H. Hasse, Machine learning in thermodynamics: Prediction of activity coefficients by matrix completion, *The Journal of Physical Chemistry Letters*, vol. 11, no. 3, pp. 981–985, 2020. DOI: 10.1021/acs.jpcllett.9b03657