

# Maja Rudolph

Senior Machine Learning Research Scientist  
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## EDUCATION

Ph.D. Computer Science, Columbia University <i>Advisor: David Blei</i> <i>Thesis: Exponential Family Embeddings</i>	2018
M.Sc. Electrical Engineering, Columbia University	2015
B.Sc. Mathematics, Massachusetts Institute of Technology	2013

## INDUSTRIAL RESEARCH

Senior Machine Learning Research Scientist <i>Bosch Center for AI, Pittsburgh, PA</i>	2021 - present
Machine Learning Research Scientist <i>Bosch Center for AI, Renningen, Germany</i>	2018 - 2021

## PUBLICATIONS

### *Preprints*

1. C. Qiu, M. Kloft, S. Mandt, and **M. Rudolph**. Self-supervised anomaly detection with neural transformations. *Under review*.
2. A. Li, C. Qiu, P. Smyth, M. Kloft, S. Mandt, and **M. Rudolph**. Deep active anomaly detection with diverse queries. *Under review*.
3. T. Schneider, C. Qiu, M. Kloft, D. Latif, S. Staab, S. Mandt, and **M. Rudolph**. Detecting anomalies in time series with local neural transformations. *Under review*.
4. D. Wagner, T. Michels, F. Schulz, **M. Rudolph**, M. Kloft. TimeSeAD: Benchmarking deep time-series anomaly detection. *Under review*.

### *Journal Articles*

5. S. Löwe, P. Lippe, **M. Rudolph**, and M. Welling. Complex-valued autoencoders for object discovery. In *TMLR*, 2022.
6. C. Qiu, S. Mandt, and **M. Rudolph**. History marginalization improves forecasting in variational RNNs. In *Entropy*, 2021.

7. J. L. McClelland, F. Hill, **M. Rudolph**, J. Baldridge, and H. Schütze. Placing language in an integrated understanding system: Next steps toward human-level performance in neural language models. In *Proceedings of the National Academy of Sciences*, 2020.

### Conference Articles

8. M. Schirmer, M. Eltayeb, S. Lessmann, and **M. Rudolph**. Modeling irregular time series with continuous recurrent units. In *ICML*, 2022.
9. C. Qiu, A. Li, M. Kloft, **M. Rudolph**, and S. Mandt. Latent outlier exposure for anomaly detection with contaminated data. In *ICML*, 2022.
10. C. Qiu, M. Kloft, S. Mandt, and **M. Rudolph**. Raising the bar in graph-level anomaly detection. *IJCAI*, 2022.
11. C. Qiu, T. Pfommer, M. Kloft, S. Mandt, and **M. Rudolph**. Neural transformation learning for deep anomaly detection beyond images. In *ICML*, 2021.
12. **M. Rudolph** and D. Blei. Dynamic embeddings for language evolution. In *The WebConf*, 2018.
13. **M. Rudolph**, F. Ruiz, S. Athey, and D. Blei. Structured embedding models for grouped data. In *NeurIPS*, 2017.
14. **M. Rudolph**, F. Ruiz, S. Mandt, and D. Blei. Exponential family embeddings. In *NeurIPS*, 2016.
15. **M. Rudolph**, J. Ellis, and D. Blei. Objective variables for probabilistic revenue maximization in second-price auctions with reserve. In *The WebConf*, 2016.

### Peer-reviewed Workshop Papers

16. M. Schirmer, M. Eltayeb, and **M. Rudolph**. Countinuous-discrete recurrent Kalman networks for irregular time-series. In *ML4ITS Workshop*, 2021.
17. T. Schneider, C. Qiu, M. Kloft, D. Latif, S. Staab, S. Mandt, and **M. Rudolph**. Detecting anomalies in time series with local neural transformations. In *ICML Workshop: Self-Supervised Learning for Reasoning and Perception*, 2021.
18. **M. Rudolph**. Multi-cause inference with sequential treatments. In *NeurIPS Workshop: CausalML*, 2019.
19. **M. Rudolph**, F. Ruiz, and D. Blei. Word2Net: Deep representations of language. In *NeurIPS Workshop: Bayesian Deep Learning*, 2018.
20. **M. Rudolph**, A. Hertzmann, M. Hoffman. A joint model for who-to-follow and what-to-view recommendations on Behance", In *Workshop on Modeling Social Media, WWW*, 2016.

21. **M. Rudolph**, D. Blei. The Dirichlet-gamma filter for discovery of neural ensembles and their temporal dynamics, In *Workshop on Statistical Analysis of Neural Data, NeurIPS*, 2015.

## PROFESSIONAL SERVICE

### Finance and Sponsorship Chair

*Women in Machine Learning Workshop*, 2017

- Organized the 2017 Women in Machine Learning workshop with a team of 5 volunteers
- Led fundraising: raised and managed \$260,000 for program costs and travel grants

**Program Committee:** NeurIPS, ICML, ICLR, AISTATS, ECML/PKDD

**Reviewer:** JMLR

## PATENT APPLICATIONS

1. M. Schiegg, C. Zimmer, S. Gerwinn, M. Zafar, **M. Rudolph**, Processing a classifier. European and US Pat. Appl. EP3848939A1; US2021209489A1, 2020
2. M. Schiegg, C. Zimmer, S. Gerwinn, M. Zafar, **M. Rudolph**, Processing a model based on a loss function. Chinese, European, Japanese, US Pat. Appl. CN113159325A; EP3848836A1; JP2021111399A; US2021209507A1, 2020
3. **M. Rudolph**, Estimating causal effects in a physical system. European Pat. Appl. EP3822882A1, 2019
4. T. Kirchner, **M. Rudolph**, System zur Bewertung des fahrdynamischen Zustands eines Fahrzeugs (Predictive driving assistance functions). German Pat. Appl. DE102019214430A1, 2019
5. T. Kirchner, **M. Rudolph**, Verfahren und Vorrichtung zur Positionsbestimmung eines magnetisch betriebenen Stellelements eines Stellgebersystems (Predicting piston position in magnetic valves). German Pat. Appl. DE102019219347A1, 2019
6. T. Kirchner, **M. Rudolph**, Verfahren und Vorrichtung zum Betreiben eines Ultraschallsensors sowie Ultraschallsensorsystem (Near-range detection for ultrasonic sensors). German Pat. Appl. DE102019213535A1, 2019
7. I. Laptev, **M. Rudolph**, Verfahren und Vorrichtung zum Kontrollieren eines Produktionsprozesses (Monitoring correlated production processes). German Pat. Appl. DE102019208922A1, 2019
8. **M. Rudolph**, M. Guenther, Monitoring mechanical production of workpieces. Chinese and German Pat. Appl. CN112123781A; DE102019208266A1, 2018

Additional patent applications have been filed but are not yet public.

## INVITED TALKS

- *Modeling Irregular Time Series with Continuous Recurrent Units*, Linderman Lab, December 2022, Stanford University, Stanford, CA.
- *Embeddings and Neural Transformations*, Workshop at EMNLP: Novel Ideas in Learning-to-Learn through Interaction, December 2022, virtual.
- *Modeling Irregular Time Series with Continuous Recurrent Units*, UC Irvine CML Seminar, February 2022, virtual.
- *Multimodal Dynamics Models for Industrial AI*, Keynote WiDS Zurich, March 2021, virtual.
- *Variational Dynamic Mixtures*, AABI Symposium, January 2021, virtual.
- *Density Estimation for Time Series Data*, Keynote DEBS Summer School, June 2019, Darmstadt, Germany.
- *Exponential Family Embeddings*, Vector Institute, April 2018, Toronto, Canada.
- *Structured Embedding Models for Language Variation*, NYU Text-as-Data Speaker Series, March 2018, New York, NY.
- *Edward - Probabilistic Modeling Made Easy*, Pygotham, October 2017, New York, NY.
- *Structured Embedding Models*, MIC3 Meaning in Context Workshop, September 2017, Stanford University, Stanford, CA.
- *Dynamic Bernoulli Embeddings for Language Evolution*, CSDP workshop on Real World Impacts of Political and Legal Texts, April 2017, Princeton University, Princeton, NJ.
- *Tutorial: Automating Machine Learning with Tensorflow and Edward*, March 2017, Riken Institute, Tokyo, Japan.
- *Exponential Family Embeddings*, March 2017, Riken Institute, Tokyo, Japan.
- *Exponential Family Embeddings*, Machine Learning Reading Group, October 2016, Princeton University, Princeton, NJ.
- *Tutorial: Applied Probabilistic Programming*, Janelia Machine Learning and Computer Vision Workshop, October 2016, Howard Hughes Medical Institute, Ashburn, VA.

## TEACHING EXPERIENCE

Instructor, Israeli Tech Challenge <i>Minicourse on Sequence Models</i>	Tel Aviv, Israel January 2019
Teaching Assistant, Columbia University <i>Machine Learning with Probabilistic Programming</i> <i>Foundations of Graphical Models</i> <i>Signals and Systems</i>	New York, NY Fall 2017 Fall 2015/16 Fall 2013

## MENTORING

### *Ph.D. Students*

Chen Qiu (with Marius Kloft and Stephan Mandt) 2019 - present

### *Master's Students*

Tim Schneider (Uni Stuttgart) 2021  
*Thesis: Outlier Region Detection in Time Series*

Mona Schirmer (Uni Berlin) 2021  
*Thesis: Continuous Discrete Recurrent Kalman Networks*

Giao Nguyen Quynh (Karlsruhe IT) 2021  
*Thesis: Kalman Mixture Networks*

Tianpeng Bu (TU Munich) 2020  
*Thesis: Normalizing Flows for Variable-length Time Series*

## REFERENCES

### **David Blei** (*Ph.D. Advisor*)

Title: Professor – Columbia University  
Department: Computer Science and Statistics  
Email: david.blei@columbia.edu

### **Stephan Mandt** (*Research Collaborator*)

Title: Associate Professor – UC Irvine  
Department: Computer Science  
Email: mandt@uci.edu

### **Marius Kloft** (*Research Collaborator*)

Title: Professor – TU Kaiserslautern  
Department: Computer Science  
Email: kloft@cs.uni-kl.de