Michiel Straat

Curriculum Vitae

Inspiration 1
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Current position

01/2023-current **Postdoctoral Researcher and group leader of the junior research group *Robust Lifelong Machine Learning for Physical Systems***, *Faculty of Technology, Bielefeld University*, Germany
Project: Robust Lifelong Machine Learning for Physical Systems (part of the SAIL research network)

Previous Positions and Experience

07/2022-12/2022 **Guest researcher**, *Faculty of Technology, Bielefeld University*, Germany
Lifelong machine learning

10/2018-06/2022 **PhD Researcher (aio)**, *Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence*, University of Groningen, The Netherlands
Thesis: Machine Learning: Statistical physics based theory and smart industry applications
Supervisors: Prof. Dr. Michael Biehl, Prof Dr. Kerstin Bunte, Prof. Dr. Nicolai Petkov
Grade: Doctorate obtained with *highest distinction*

12/2020-01/2022 **Research Partner**, *Philips Innovation Center*, Drachten, The Netherlands
Led the development of a real-time quality control method for fault prevention in a high-throughput production lines

06/2017-12/2017 **Intern**, *Philips Innovation Center*, Drachten, The Netherlands
Project: Predicting material properties from Eddy Current measurements
Supervisors: Nick Goet and Jan Siegersma
Grade: 9

07/2010-06/2014 **Software Consultant**, *Self-employed*, Leeuwarden, The Netherlands

Education

09/2016-09/2018 **Master's Degree in Computing Science (Specialization: Intelligent Systems and Visualization)**, *Faculty of Science and Engineering*, University of Groningen, Distinction: Cum Laude
Thesis: On-line Learning in Neural Networks with ReLU Activations
Supervisors: Prof. Dr. Michael Biehl and Dr. Kerstin Bunte
Grade: 9.5

09/2013-08/2016 **Bachelor's Degree (Dutch Dipl.- Inform.) in Computing Science**, *Faculty of Science and Engineering*, University of Groningen
Thesis: Time Series Classification in Complex Fourier Space
Supervisors: Prof. Dr. Michael Biehl and MSc. Friedrich Melchert
Grade: 9

08/2007-07/2013 **High School Degree**, *Stedelijk Gymnasium (Grammar school)*, Leeuwarden, The Netherlands, Degree: Nature and Technology + Health (Dutch: Natuur en Techniek + Gezondheid (NT/NG))
Additional courses: Computer Science and Economics

Selected Publications

2025 Markmann, Thorben, **Straat, Michiel**, and Hammer, Barbara. **Apr. 2025**. "Control of Rayleigh-Bénard Convection: Effectiveness of Reinforcement Learning in the Turbulent Regime". In: *In submission*. DOI: 10.48550/arXiv.2504.12000.

Straat, Michiel, Markmann, Thorben, and Hammer, Barbara. **Apr. 2025**. "Solving Turbulent Rayleigh-Bénard Convection using Fourier Neural Operators". In: *Proc. European Symposium on Artificial Neural Networks (ESANN) 2025, Bruges/Belgium*. Ed. by M. Verleysen. DOI: https://doi.org/10.14428/esann/2025.ES2025-131.

2024 Markmann, Thorben, **Straat, Michiel**, and Hammer, Barbara. **2024**. "Koopman-Based Surrogate Modelling of Turbulent Rayleigh-Bénard Convection". In: *2024 International Joint Conference on Neural Networks (IJCNN)*. IEEE, pp. 1–8. DOI: 10.1109/IJCNN60899.2024.10651496.

2023 Richert, Frederieke, **Straat, Michiel**, Oostwal, Elisa, and Biehl, Michael. **2023**. "Layered Neural Networks with GELU Activation, a Statistical Mechanics Analysis". In: *Proceedings ESANN 2023*. Ed. by Michel Verleysen. European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning : ESANN 2023 ; Conference date: 04-10-2023 Through 06-10-2023. i6doc.com publication, pp. 435–440. ISBN: 978-2-87587-088-9. URL: https://pure.rug.nl/ws/portalfiles/portal/874779144/ES2023-72.pdf.

2022 **Straat, Michiel**, Koster, Kevin, Goet, Nick, and Bunte, Kerstin. **2022**. "An Industry 4.0 example: real-time quality control for steel-based mass production using Machine Learning on non-invasive sensor data". In: *2022 International Joint Conference on Neural Networks (IJCNN)*. IEEE, pp. 01–08. DOI: 10.1109/IJCNN55064.2022.9892432.

2021 Münch, M., **Straat, M.**, Biehl, M., and Schleif, F-M. **Apr. 2021**. "Complex-valued embeddings of generic proximity data". In: *Structural, Syntactic, and Statistical Pattern Recognition*. Vol. 12644. Springer International Publishing, pp. 14–23. DOI: 10.1007/978-3-030-73973-7.

Straat, M., Abadi, F., Kan, Z., Göpfert, C., Hammer, B., and Biehl, M. **Apr. 2021**. "Supervised learning in the presence of concept drift: a modelling framework". In: *Neural Computing and Applications*, pp. 101–118. ISSN: 1433-3058. DOI: 10.1007/s00521-021-06035-1.

Oostwal, E., **Straat, M.**, and Biehl, M. **Feb. 2021**. "Hidden unit specialization in layered neural networks: ReLU vs. sigmoidal activation". In: *Physica A: Statistical Mechanics and its Applications* 564, p. 125517. ISSN: 0378-4371. DOI: 10.1016/j.physa.2020.125517.

2019 **Straat, M.** and Biehl, M. **Apr. 2019**. "On-line learning dynamics of ReLU neural networks using statistical physics techniques". In: *Proc. European Symposium on Artificial Neural Networks (ESANN) 2019, Bruges/Belgium*. Ed. by M. Verleysen.

Straat, M., Kaden, M., Gay, M., Villmann, T., Lampe, A., Seiffert, U., Biehl, M., and Melchert, F. **Mar. 2019**. "Learning vector quantization and relevances in complex coefficient space". In: *Neural Computing and Applications*. ISSN: 1433-3058. DOI: 10.1007/s00521-019-04080-5.

2018 **Straat, M.**, Abadi, F., Göpfert, C., Hammer, B., and Biehl, M. **Oct. 2018**. "Statistical Mechanics of On-Line Learning Under Concept Drift". In: *Entropy* 20.10. ISSN: 1099-4300. DOI: 10.3390/e20100775.

2017 **Straat, M.**, Kaden, M., Gay, M., Villmann, T., Lampe, A., Seiffert, U., Biehl, M., and Melchert, F. **July 2017**. "Prototypes and matrix relevance learning in complex fourier space". In: *2017 12th International Workshop on Self-Organizing Maps and Learning Vector Quantization, Clustering and Data Visualization (WSOM)*, pp. 1–6. DOI: 10.1109/WSOM.2017.8020019.

Awards

2022 **PhD with Highest Distinction**, *University of Groningen*, The Netherlands
Thesis: Machine learning: statistical physics based theory and smart industry applications
Grade: Highest distinction

2017 **Best Paper Award**, *Computer Science Student Colloquium*, University of Groningen
Paper: Segmentation of Blood Vessels in Retinal Fundus Images
Expert grade: 9.5

2016 **Best Presentation Award**, *BSc. Theses Symposium*, University of Groningen
Title: Time Series Classification in Complex Fourier Space
Experts grade: 9.0

Selection of Talks

25/04/2025 **Solving Turbulent Rayleigh-Bénard Convection using Fourier Neural Operators**, *European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning (ESANN) 2025*, Bruges, Belgium

18/02/2025 **Physics-Informed AI for Surrogate Models**, *Workshop Physics-Informed AI for Surrogate Models*, Dortmund, Germany

21/01/2025 **Solving Turbulent Rayleigh-Bénard Convection using Fourier Neural Operators**, *Applications of Intelligent Systems (APPIS) 2025*, Las Palmas de Gran Canaria, Spain

01/07/2024 **Koopman-based Modeling of Rayleigh-Bénard Convection**, *IEEE World Congress on Computational Intelligence (WCCI) 2024*, Yokohama, Japan

22/01/2024 **Koopman-based Modeling of Rayleigh-Bénard Convection**, *Applications of Intelligent Systems (APPIS)*, Las Palmas de Gran Canaria, Spain
Slides

24/03/2023 **Modelling adversarial training**, *Workshop on Intelligent Systems and Computational Intelligence (WISCI)*, Groningen, The Netherlands
Slides

23/08/2022 **An Industry 4.0 example: real-time quality control for steel-based mass production using Machine Learning on non-invasive sensor data**, *The 14th Mittweida Workshop on Computational Intelligence*, Mittweida, Germany
Slides

20/07/2022 **An Industry 4.0 example: real-time quality control for steel-based mass production using Machine Learning on non-invasive sensor data**, *World Congress on Computational Intelligence (WCCI), International Joint Conference on Neural Networks (IJCNN) 2022*, Padua, Italy
Slides

03/03/2021 **Feedback Alignment methods for training neural networks**, *Intelligent Systems March Seminar*, Groningen, The Netherlands
Slides

12/08/2020 **Dynamics of on-line learning in two-layer neural networks in the presence of concept drift**, *Summer Workshop on Statistical Physics and Machine Learning*, École de physique des Houches, Les Houches, France
Recording and Slides

02/07/2020 **Dynamics of on-line learning in two-layer neural networks in the presence of concept drift**, *The 12th Mittweida Workshop on Computational Intelligence*, Mittweida, Germany (online)
Abstract

12/09/2019 **Towards a statistical physics analysis of multilayer ReLU neural networks**, *The 11th Mittweida Workshop on Computational Intelligence*, Hochschule Mittweida, Germany
Slides, Abstract

26/04/2019 **On-line learning dynamics of ReLU neural networks using statistical physics techniques**, *European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning - ESANN 2019*, Bruges, Belgium
Slides

29/06/2017 **Prototypes and matrix relevance learning in complex Fourier space**, *12th International Workshop on Self-Organizing Maps and Learning Vector Quantization, Clustering and Data Visualization*, Laboratoire Lorrain de Recherche en Informatique et ses Applications (Loria), Nancy, France
Slides

04/2017 **Segmentation of blood vessels in retinal fundus images**, *SC@RUG2017*, University of Groningen, The Netherlands
Slides

Organization and Leadership

19/09/2025 **International Workshop on Learning from Small Data**, *ECML-PKDD 2025*, Alfândega Porto Congress Centre

26/03/2025 **Poster session on the Innovation of AI Evaluation Beyond Accuracy and Precision**, *SAIL Spring School 2025*, Center for Cognitive Interaction Technology, Bielefeld University

18/02/2025 **Organization and presentation of workshop Physics-Informed AI for Surrogate Models**, *Lamarr Institute*, TU Dortmund University

23/11/2023 **Organization of workshop Limitations of Large Language Models**, *Center for Cognitive Interaction Technology*, Bielefeld University, https://sites.google.com/view/sail-ws-llms/home

01/2023- **Head of junior research group *Robust Lifelong Machine Learning for Physical Systems*, research network SAIL**, *Center for Cognitive Interaction Technology*, Bielefeld University

01/2021-05/2022 **Organization of the Intelligent Systems seminars**, *Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence*, University of Groningen

11/2019-03/2020 **Head of Teaching Assistants of the Advanced Algorithms and Data Structures course**, *Faculty of Science and Engineering*, University of Groningen, 5 TAs, 120 students

01/2017-04/2017 **Head of the organization of the 14th Student Colloquium**, *Faculty of Science and Engineering*, University of Groningen

Reviewing and committees

I have been a reviewer or committee member for several conferences, journals, workshops and other events, including:

- Organizing committee for the *International Workshop on Learning from Small Data*, 2025, Alfândega Porto Congress Centre
- Organizing committee SAIL Spring School 2025: Innovation of AI Evaluation Beyond Accuracy and Precision, Center for Cognitive Interaction Technology, Bielefeld University
- Technical Program Committee International Joint Conference on Artificial Neural Networks (IJCNN) 2024
- European Symposium on Artificial Neural Networks (ESANN)

- International Joint Conference on Artificial Neural Networks (IJCNN)
- Neurocomputing
- Neural Processing Letters
- Committee member PhD defense Bielefeld University, 2023

Teaching

Teaching Assistant

11/2020-02/2021 **Neural Networks and Computational Intelligence**, *Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence*, University of Groningen

09/2020-11/2020 **Modelling and Simulation**, *Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence*, University of Groningen

11/2019-01/2020 **Head Teaching Assistant for Advanced Algorithms and Data Structures**, *Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence*, University of Groningen

09/2019-11/2019 **Modelling and Simulation**, *Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence*, University of Groningen

09/2017-11/2017 **Information Security (double position)**, *Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence*, University of Groningen

09/2016-11/2016 **Information Security (double position)**, *Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence*, University of Groningen

Supervision

2023- **Group Leader (2 PhD students)**, *Robust Lifelong Machine Learning for Physical Systems* , Bielefeld University

2025 **MSc. Thesis**, *J. Freiherr Bock von Wülfingen*, Bielefeld University

2021 **MSc. Thesis**, *P. Eilers*, University of Groningen

2020 **MSc. Internship**, *P. Eilers*, University of Groningen

2020 **MSc. Internship**, *N. Tamboli*, University of Groningen

2020 **MSc. Thesis**, *E. Oostwal*, University of Groningen

2019 **MSc. Internship**, *E. Oostwal*, University of Groningen

2019 **MSc. Thesis**, *Z. Kan*, University of Groningen

Programming languages

- Python
- Mathematica
- Matlab
- C/C++

Schools attended

14/2024-15/2024 **TorchPhysics: Deep Learning for partial differential equations**, Werner-von-Siemens Centre, Berlin

09/2021-09/2021 **Gaussian Process and Uncertainty Quantification Summer School 2021**, University of Sheffield

08/2020-08/2020 **Summer Workshop on Statistical Physics and Machine Learning**, *École de physique des Houches*, Les Houches, France

09/2014-04/2015 **C/C++**, *Institute for Mathematics and Informatics*, University of Groningen
Lecturer: Prof. Dr. F.B. Brokken (Course website)

Languages

Dutch	Mother tongue
English	Fluent
German	Fluent
Russian	B1

References

- Prof. Dr. Barbara Hammer (Website, e-mail: bhammer@techfak.uni-bielefeld.de)
- Prof. Dr. Michael Biehl (Website, e-mail: m.biehl@rug.nl)
- Prof. Dr. Kerstin Bunte (Website, e-mail: k.bunte@rug.nl)