

# Elisa Oostwal

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## Positions

### PhD Student Computing Science

July 2021 – Present

*'Mechanistic Machine Learning: Combining the Explanatory Power of Dynamic Models with the Predictive Power of Machine Learning'*

Supervisors: Prof. Dr. Kerstin Bunte, Prof. Dr. Michael Biehl, Prof. Dr. Peter Tiño

Intelligent Systems Group, Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence, University of Groningen

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## Education

### MSc Computing Science

University of Groningen

*Specialization: Intelligent Systems and Visualization*

September 2018 – April 2021

- Thesis: 'Phase Transitions in Layered Neural Networks: The Role of the Activation Function'  
Supervisors: Prof. Dr. Michael Biehl, Prof. Dr. Kerstin Bunte, and Michiel Straat, MSc
- Research Internship: 'Learning of single-layer neural networks: ReLU vs. sigmoidal activation'  
Supervisors: Prof. Dr. Michael Biehl and Michiel Straat, MSc

### BSc Computing Science

University of Groningen

September 2015 – July 2018

- Joint Thesis: 'Efficiency of Organic Solar Cells: Improving a Model for the Fill Factor'  
Supervisors: Prof. Dr. Michael Biehl and Prof. Dr. Jan Anton Koster

### BSc Physics

University of Groningen

*Specialization: Nanophysics and Particle Physics*

September 2013 – July 2018

- Joint Thesis: 'Efficiency of Organic Solar Cells: Improving a Model for the Fill Factor'  
Supervisors: Prof. Dr. Michael Biehl and Prof. Dr. Jan Anton Koster

### Secondary school

Praedinius Gymnasium, Groningen

*Grammar school. Degree: Nature and Technology + Health*

September 2007 – July 2013

- Final Project: 'Plant Growth and Carbon Dioxide - A Study on the Influence of Carbon Dioxide on the Development of Plants'
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## Teaching

### Teaching Assistant

#### Neural Networks and Computational Intelligence

University of Groningen

*Level: MSc Computing Science, year 1*

November 2021 – January 2022

#### Modelling and Simulation

University of Groningen

*Level: MSc Computing Science, year 2*

September 2021 – November 2021

#### Computer Vision

University of Groningen

*Level: MSc Computing Science, year 1*

February 2021 – April 2021

#### Computer Graphics

University of Groningen

*Level: BSc Computing Science, year 3*

February 2021 – April 2021

#### Neural Networks and Computational Intelligence

University of Groningen

*Level: MSc Computing Science, year 1*

November 2020 – January 2021

**Modelling and Simulation**

Level: MSc Computing Science, year 2

**Languages and Machines**

Level: BSc Computing Science, year 2

**Pattern Recognition**

Level: MSc Computing Science, year 1

**Functional Programming**

Level: BSc Computing Science, year 2

**Languages and Machines**

Level: BSc Computing Science, year 2

**Computer Graphics**

Level: BSc Computing Science, year 3

**Signals and Systems**

Level: BSc Computing Science, year 2

**Functional Programming**

Level: BSc Computing Science, year 2

**Languages and Machines**

Level: BSc Computing Science, year 2

**Program Correctness**

Level: BSc Computing Science, year 1

**Signals and Systems**

Level: BSc Computing Science, year 2

**Discrete Structures**

Level: BSc Computing Science, year 1

**Imperative Programming**

Level: BSc Computing Science, year 1

**Program Correctness**

Level: BSc Computing Science, year 1

**Discrete Structures**

Level: BSc Computing Science, year 1

**Imperative Programming**

Level: BSc Computing Science, year 1

University of Groningen  
September 2020 – November 2020

University of Groningen  
April 2020 – June 2020

University of Groningen  
November 2019 – January 2020

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February 2017 – April 2017

University of Groningen  
November 2016 – January 2017

University of Groningen  
September 2016 – November 2016

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## Publications

**Elisa Oostwal, Michiel Straat, Michael Biehl.** 'Hidden Unit Specialization in Layered Neural Networks: ReLU vs. Sigmoidal Activation'. In: *Physica A: Statistical Mechanics and its Applications* 564, 125517 (Feb. 2021). ISSN: 0378-4371. DOI: <https://doi.org/10.1016/j.physa.2020.125517>. URL: <http://www.sciencedirect.com/science/article/pii/S0378437120308153>.

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## Talks

**Efficient Informed Posterior Construction for Partially Observed Dynamical Systems\***. NWO ICT.OPEN. Jaarbeurs Utrecht, The Netherlands. April 2023.

**Informed Posterior Construction for Partially Observed Dynamical Systems.** AMALEA - *Advances in Machine Learning*. Cetraro, Italy. September 2022.

**Informed Posterior Construction for Partially Observed Dynamical Systems.** *The 14th Mittweida Workshop on Computational Intelligence*. Hochschule Mittweida, Germany. August 2022.

**Using Information Geometric Principles For Theory-Guided Machine Learning.** *The 13th Mittweida Workshop on Computational Intelligence.* Hochschule Mittweida, Germany. September 2021.

**Phase Transitions in Layered Neural Networks: The Role of The Activation Function.** *The 12th Mittweida Workshop on Computational Intelligence.* Hochschule Mittweida, Germany. July 2020.

**Why ReLU Performs Better Than Sigmoidal Activation - Fundamental Differences Between ReLU and Sigmoidal Activation in Neural Networks.\*** *Alice & Eve, A Celebration of Women in Computing Science.* University of Twente, The Netherlands. January 2020.

\* poster presentation

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## Languages

**Natural Languages:** Dutch (native), English (full professional proficiency), German (limited working proficiency).

**Programming Languages:** MATLAB, Mathematica, Python, C/C++, Haskell, Java, R.