# Edward De Brouwer

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33 years old

Machine Learning Researcher

## Education

2018–2023	PhD in Machine Learning for Healthcare, KU Leuven, Belgium, Summa Cum Laude.
	Title: Machine learning modeling of time-dependent patient trajectories (with Prof. Yves Moreau)
2020-2024	Bachelor in Philosophy, Institute of Philosophy, KU Leuven, Belgium.
	Specialization in Continental Philosophy and Phenomenology

- 2016–2017 Master Degree in Financial Mathematics and Actuarial Sciences, UCLouvain, Belgium,
   2013-2014 Magna Cum Laude.
- 2011–2014 **Double Master Degree in Electrical Engineering**, *KU Leuven and UCLouvain*, Belgium, *Magna Cum Laude*.

Specialization in Telecoms and Signal Processing.

2008–2011 **Bachelor in Engineering**, *UCLouvain*, Belgium, *Cum Laude*. Options in Electrical and Mechanical Engineering

# Experience

- 2023–Present Postdoctoral Associate, Yale University, New Haven, CT. Development of geometric machine learning techniques to model spatio-temporal cellular interactions. Developed new graph neural network methods for biological data. Supervisor: Pr. Dr. Smita Krishnaswamy.
   2018–2023 Ph D Student ESAT Katholieke Universiteit Leuven Leuven
  - 2018–2023 Ph.D Student, ESAT, Katholieke Universiteit Leuven, Leuven. Machine learning for healthcare. Thesis title : Machine learning modeling of time-dependent patient trajectories. Supervisor : Pr. Dr. Ir. Yves Moreau. Funded by a competitive personal FWO grant.
  - 2022-2023 **Visiting Researcher**, *Massachusetts Institute of Technology (MIT)*, Boston, USA. Researcher in the clinical ML group of Professor David Sontag. Working on modeling of clinical time series, survival analysis, and causal inference.
    - May- **Visiting Researcher**, University of Toronto + Vector Institute, Toronto, Canada.
  - Sep/2022 Research stay in the group of Professor Rahul Krishnan, working on orthogonal polynomial representations to improve neural differential equations architectures.
- May-Jul/2021 **Machine Learning Intern**, *Microsoft Research*, Cambridge, United Kingdom. Machine Learning Researcher supervised by Stephanie Hyland, co-supervised by Javier Gonzalez Hernandez and Melanie Pradier. Working on causal inference with uncertainty estimates for longitudinal observational data.
  - 2020-2021 **Visiting Researcher**, *ETH Zürich*, Basel, Switzerland. Machine Learning Researcher in the group of Prof. Karsten Borgwardt (MLCB). Working on topological data analysis and stochastic processes for medical time series data.

Sep-Nov/2020	<b>Digital Arts Resident</b> , <i>Cinema Jolia</i> , Brussels, Belgium. Worked on a digital artistic production, linking literature, photography and artificial intelligence. Production of "The Labyrinth", a poem generator through a journey in a labyrinth video game. Published in Backslash Lit, a magazine for digital literature. http://3.134.244.254/
Oct-Dec/2019	<b>Machine Learning Researcher Intern</b> , <i>Janssen pharmaceutica</i> , Beerse, Belgium. Machine learning for real world evidence in type-2 diabetes. Using CPRD data, I designed an algorithm to predict future occurrence of lower limb complication in type-2 diabetes.
Jun-Sep/2019	<b>Artificial Intelligence Resident</b> , <i>[Google] X, the moonshot factory</i> , Mountain View, California. Making the world a radically better place with machine learning empowered moonshots. Contributed to project Amber, aiming at addressing depression with EEG. Designed machine learning workflow to analyze the EEG data.
Jun-Aug/2017	<b>Data Scientist Intern</b> , <i>Data Innovation Lab, AXA</i> , Brussels. Worked on computer vision for car crash detection and estimation. Deep convolutional neural networks and visualization using class activation maps.
2016–2017	<b>Teaching Assistant</b> , <i>ISBA</i> , <i>Université Catholique de Louvain</i> , Louvain-la-Neuve. I was in charge of the practical sessions of courses given by the Institute of Statistics, Bio-Statistics and Actuarial Sciences. Courses given : Statistics I, Statistics II and Econometrics
2014–2015	<b>Software Design Engineer</b> , <i>Alcatel-Lucent</i> , Antwerp. I was member of the software development team for the G.Fast technology. Programming was done in C++.
2013–2013	<b>Research Student</b> , <i>IMEC Research Center</i> , Leuven. As an internship student, I worked on the Massive MIMO project MAMMOET (European Consortium). Part of my master thesis
2011–2011	<b>Tutor</b> , <i>UCL</i> , Louvain-la-Neuve. I was in charge of the practical sessions of the course "LFSAB1104 : Methodes Numerique"
	ences
Dec. 2023	<b>NeurIPS</b> , Huguet <sup>*</sup> , Tong <sup>*</sup> , De Brouwer <sup>*</sup> , et al., <i>A Heat Diffusion Perspective on Geodesic Preserving Dimensionality Reduction</i> .

- May. 2023 **ICLR**, Edward De Brouwer et al., Anamnesic Neural Differential Equations with Orthogonal Polynomial Projections.
- May. 2023 **ICLR**, Martijn Oldenhof, Adam Arany, Yves Moreau, Edward De Brouwer, *Weakly Supervised Knowledge Transfer with Probabilistic Logical Reasoning for Object Detection*.
- Dec. 2022 **NeurIPS**, Edward De Brouwer, *Deep Counterfactual Estimation with Categorical Background Variables*.
- April. 2022 **AISTATS**, Edward De Brouwer et al., *Predicting the impact of treatments over time with uncertainty aware neural differential equations.*
- April. 2022 International Conference on Learning Representations (ICLR), Max Horn, Edward De Brouwer et al., *Topological Graph Neural Networks*.
- Sep. 2021 **Neurology**, Steve Simpson-Yap & Edward De Brouwer et al., Associations of Disease-Modifying Therapies With COVID-19 Severity in Multiple Sclerosis.
- July 2021 Conference on Machine Learning, Optimization, and Data Science (LOD), Jaak Simm, Adam Arany, Edward De Brouwer and Yves Moreau, *Expressive Graph Informer Networks*. Grasmere, United Kingdom

- May 2021 International Conference on Learning Representations (ICLR), Poster, Edward De Brouwer et al., Latent Convergent Cross Mapping. Vienna, Austria
- April 2021 **Computer Methods and Programs in Biomedicine**, *Journal article*, Edward De Brouwer et al., *Longitudinal machine learning modeling of MS patient trajectories improves predictions of disability progression*.
- Dec. 2020 Conference on Neural Information Processing Systems (NeurIPS): Causality workshop, Spotlight, Edward De Brouwer et al., Latent Convergent Cross Mapping. Vancouver, Canada
- Nov. 2020 **Multiple Sclerosis and related disorders**, *Journal article*, Liesbet Peeters, ..., Edward De Brouwer et al., *Multiple Sclerosis Data Alliance–A global multi-stakeholder collaboration to scale-up real world data research*.
- June 2020 International Conference of Machine Learning (ICML): Artemis workshop, Poster, Edward De Brouwer et al., Inferring Causal Dependencies between Chaotic Dynamical Systems from Sporadic Time Series. Vienna, Austria
- June. 2020 Multiple Sclerosis Journal, Article, Liesbet Peeters, ..., Edward De Brouwer et al., COVID-19 in people with multiple sclerosis: A global data sharing initiative.
- Dec. 2019 **Conference on Neural Information Processing Systems (NeurIPS)**, *Poster*, Edward De Brouwer et al., *GRU-ODE-Bayes: Continuous modeling of sporadically-observed time series*. Vancouver, Canada
- Sep. 2019 European Committee for Treatment and Research in Multiple Sclerosis (ECTRIMS) Conference, Talk and Poster, Edward De Brouwer et al., Introducing Machine Learning for full MS patient trajectories improves predictions for disability score progression. Stockholm, Sweden
- Dec. 2018 **Conference on Neural Information Processing Systems (NeurIPS): ML4Health workshop**, *Poster*, Edward De Brouwer et al., *Deep ensemble tensor factorization for longitudinal patient trajectories classification*. Montreal, Canada

#### Talks

- September **Yale University**, Guided diffusion for cell trajectories prediction. 2023 New Haven, USA
- March 2023 **KU Leuven**, Machine Learning for Patient Trajectories. Leuven, Belgium
- September Yale University, Foundations of Data Science Institute, Predicting the impact of treatments 2023 over time with uncertainty aware neural differential equations. New Haven, USA
- September **Fields Institute**, Predicting the impact of treatments over time with uncertainty aware 2022 neural differential equations.

Toronto, Canada

- July 2022 Harvard University, Data to Actionable Knowledge Lab, Neural Differential Equations for Modeling Patient Trajectories. Boston, USA
- Oct. 2021 UC San Diego Health Department of Biomedical Informatics Seminar, Machine Learning for Patients Trajectories. San Diego, USA

- Oct. 2021 Fall Workshop on Computational Geometry, Topological Graph Neural Networks. Montana State University, USA
- Sep. 2021 **University of Torino**, Neural Differential Equations: Handling irregularly sampled time series with a focus on healthcare.. Torino. Italy
- Jul. 2021 Microsoft Research Cambridge, Counterfactual ODEs : predicting the impact of treatments over time with uncertainty aware neural differential equations. Cambridge, United Kingdom
- Nov. 2020 Imperial College London, Invited speaker at the DataLearning seminar, ODE-Based RNNs for sporadic time series.. London, United Kingdom
- Nov. 2020 **BeneLearn**, *Contributed Talk*, GRU-ODE-Bayes: Continuous modeling of sporadicallyobserved time series. Leiden, Netherlands
- Nov. 2019 **Bienal Internacional Covalente**, *Keynote*, *Machine learning for patient trajectories*. Cucuta, Colombia
- Nov. 2019 **IEEE EMBS Benelux Chapter symposium**, Contributed Talk, Dealing with sporadic observations for critical care patient trajectories. Leuven, Belgium
- Dec. 2017 **BigData.be**, *Meetup*, *Deep convolutional networks for car damages automatic detection*. Brussels, Belgium

#### Awards

- 2023 PhD Thesis award, Received the highest honours for my PhD thesis (top 95%).
- 2022 **FWO PhD Travel Grant**, Competitive travel grant for an internship at University of Toronto.
- 2019-2023 **FWO-SB PhD grant**, Competitive research grant (17% success rate) for a fully funded 4 years PhD program.
  - 2022 NeurIPS travel grant.
  - 2019 NeurIPS travel grant.

#### Teaching

- 2023 **Research Mentor**, *SUMRY Yale University*, Research mentor for a 8 weeks undergrature summer research program : Summer of Undergradute Research at Yale. Topic: graph neural networks and differential geometry.
- 2021-2023 Master Thesis Supervisor, KU Leuven, Supervised two master thesis in the Artifical Intelligence Master program.
- 2016-2017 **Teaching Assistant**, *UCLouvain*, Teaching assistant for undergraduate courses in Statistics I, II and Econometrics.
  - 2011 **Undergraduate Teaching Assistant**, *UCLouvain*, Junior teaching assistant for the course FSAB1104: Numerical Methods.

Languages

French Mother Tongue

- English Fluent
- Spanish Fluent

Dutch Fluent Italian Intermediate

#### Computer skills

Programming Python, C++ Statistics R, SAS

Misc. Matlab, Git Specific. Pytorch, Tensorflow, Keras

## Reviewer

- Since 2024 Journal of Biomedical and Health Informatics, IEEE.
- Since 2022 TMLR.

- Since 2021 NeurIPS, ICLR, ICML, AISTATS.
- Since 2021 International Conference on Machine Learning, Optimization, and Data Science, LOD.
- Since 2020 Transactions on Neural Networks and Learning Systems, IEEE.
- Since 2020 Artificial Intelligence Review, Springer-Nature.
- Since 2019 Machine Learning for Healthcare (ML4H), NeurIPS workshop.
- Since 2018 Bioinformatics, Oxford Academic.

# Gap Year 2015-2016

2015-2016 I traveled for 13 months backpacking around South America. I spent most of my time volunteering in NGO's, toured with a circus as a performer and discovered the continent and its culture. I also took the advantage of the opportunity to learn Spanish.

### Interests

- Arts and I spend most of my free time working on projects linking arts, technology and architecture. Technology This includes digital poems generators, making a piano that serves cocktails based on the mood of what you played or the design of virtual reality experiences.
  - Music l'm a huge fan of music. I play jazz guitar and love tweaking with synthetisers. Check out my latest project on electronic music for fridges : *Wagner & Faust* on Spotify.
  - Oldtimer I am the happy owner of a 1977 VW T2 bay window that I use to tour around Europe. In the process of converting it into an electric powered vehicle.
  - Festivals I helped organizing several festivals. Among them, a two weeks jazz festival: openjazz.be.Scouts I was a scout leader for 3 years, taking care of teenagers from 12 to 16 years old.