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Patrik Reizinger

Education

2021–2025 **Machine Learning Ph.D.**, *International Max Planck Research School for Intelligent Systems/University of Tübingen/ELLIS*, Tübingen, Germany
Thesis: Causal Representation Learning
Supervisors: Wieland Brendel, Ferenc Huszár, Matthias Bethge, Bernhard Schölkopf
ELLIS exchange at the University of Cambridge: 2022.10–2023.03.

2019–2021 **Electrical Engineering M.Sc.**, *Budapest University of Technology and Economics*, Budapest, Hungary, GPA 5.0/5.0 (valedictorian)
Thesis: Development of an Attitude Determination and Control System for CubeSats on LEO orbits
Supervisors: Ferenc Vajda, Márton Szemenyei
Extracurricular: iMSc program for talented students

2015–2019 **Electrical Engineering B.Sc.**, *Budapest University of Technology and Economics*, Budapest, Hungary, GPA 5.0/5.0 (valedictorian)
Thesis: Development of a 3D input device for virtual working environments
Supervisors: Ferenc Vajda, Márton Szemenyei
Extracurricular: German language program in cooperation with the Karlsruhe Institute of Technology
Exchange semester at the Karlsruhe Institute of Technology: 2018.10–2019.02.

Experience

2024.06–2024.09 **Summer Research Intern**, *Vector Institute*, Toronto, Canada
Hosted by Rahul G. Krishnan, working on causal representation learning and self-supervised methods

2020.02–2021.01 **Deep Learning Student Researcher**, *Budapest University of Technology and Economics*, Budapest, Hungary
Analyzed time series data with deep learning

2019.02–2021.02 **Control Engineering Intern**, *C3S Electronics Development LLC*, Budapest, Hungary
Developed and designed a CubeSat attitude determination and control system

2019.01–02. **FPGA Developer Intern**, *Karlsruhe Institute of Technology*, Karlsruhe, Germany
Implemented FPGA time synchronisation with a Python interface

2018.06–08. **Image Processing Intern**, *Fraunhofer Institute for Factory Operation and Automation IFF*, Magdeburg, Germany
Developed an automated visual inspection tool in C++, including a Python wrapper

2017.06–08. **Data Scientist Intern**, *Gravity R&D*, Budapest, Hungary
Analyzed customer data in Python with machine learning

2016.09–2019.01 **Virtual Reality Peripheral Device Developer**, *Budapest University of Technology and Economics*, Budapest, Hungary
Developed the hardware and software for a 3D input device for virtual working environments

Honors and Awards

2023,2024 **Qualcomm Innovation Fellowship Europe**, *Qualcomm*, Finalist

2023 **4th Place at German University Rowing Championship**, *German Rowing Association*, Coxed Men's Quad 500 m

2022 **NeurIPS Scholar Award**

2021 **Pro Scientia Gold Medal**, *National Scientific Students' Association Hungary*, top 0.03%

2021 **Hope Badge Special Award to The Most Promising Young Scientist**, *Pro Scientia Gold Medalists' Association*, top 0.003%

2019, 2021 **1st Prize at National Scientific Students' Association Conference**, *National Scientific Students' Association Hungary*, top 0.3%
- Attention-based curiosity in multi-agent reinforcement learning environments (2021)
- Stochastic weight matrix-based regularization methods for deep neural networks (2019)
- Development of a 3D input device for virtual working environments (2019)

2017–2019 **1st Prize at Scientific Students' Association Conference**, *Budapest University of Technology and Economics*, top 0.3%
- Attention-based curiosity in multi-agent reinforcement learning environments (2019)
- Development of an Attitude Determination and Control System for CubeSats on LEO orbits (2019)
- Stochastic weight matrix-based regularization methods for deep neural networks (2018)
- Development of a 3D input device for virtual working environments (2017)

2018 **Nokia Bell Labs Scholarship for Deep Learning Research**, *Nokia Bell Labs Hungary*

2016,2018 **New National Excellence Program Research Grant**, *Ministry of Innovation and Technology Hungary*, top 0.3%

2016–2018,2020 **National Higher Education Scholarship**, *Republic of Hungary*, top 0.8%

Publications

Patrik Reizinger*, Alice Bizeul*, Attila Juhos*, Julia E. Vogt, Randall Balestriero, Wieland Brendel, and David Klindt. Cross-Entropy Is All You Need To Invert the Data Generating Process, 2024.

Patrik Reizinger and Rahul G. Krishnan. Exploring A Bayesian View On Compositional and Counterfactual Generalization. In *NeurIPS 2024 Workshop on Compositional Learning: Perspectives, Methods, and Paths Forward*, 2024.

Anna Mészáros, Szilvia Ujváry, Wieland Brendel, **Patrik Reizinger**†, and Ferenc Huszár†. Rule Extrapolation in Language Models: A Study of Compositional Generalization on OOD Prompts, 2024.

Evgenia Rusak*, **Patrik Reizinger***, Attila Juhos*, Oliver Bringmann, Roland S. Zimmer-

mann, and Wieland Brendel. Infonce: Identifying the gap between theory and practice, 2024.

Patrik Reizinger*, Siyuan Guo*, Ferenc Huszár, Bernhard Schölkopf, and Wieland Brendel. Identifiable Exchangeable Mechanisms for Causal Structure and Representation Learning, 2024.

Patrik Reizinger*, Szilvia Ujváry*, Anna Mészáros*, Anna Kerekes*, Wieland Brendel, and Ferenc Huszár. Position: Understanding LLMs Requires More Than Statistical Generalization. In *Forty-first International Conference on Machine Learning*, 2024. Spotlight (top 3.5%).

Goutham Rajendran*, **Patrik Reizinger***, Wieland Brendel, and Pradeep Kumar Ravikumar. An Interventional Perspective on Identifiability in Gaussian LTI Systems with Independent Component Analysis. In *3rd Conference on Causal Learning and Reasoning (CLeaR)*, 2024. Accepted (oral).

Patrik Reizinger*, Han-Bo* Li, Aditya* Ravuri, Ferenc Huszár, and Neil D Lawrence. Independent Mechanism Analysis in GPLVMs. In *Fifth Symposium on Advances in Approximate Bayesian Inference*, 2023.

Patrik Reizinger and Ferenc Huszár. SAMBA: Regularized Autoencoders perform Sharpness-Aware Minimization. In *Fifth Symposium on Advances in Approximate Bayesian Inference*, 2023.

Hamza Keurti*, **Patrik Reizinger***, Bernhard Schölkopf, and Wieland Brendel. Desiderata for Representation Learning from Identifiability, Disentanglement, and Group-Structuredness. In *ICML 2023 Workshop 2nd Annual TAG in Machine Learning*, 2023.

Patrik Reizinger and Ferenc Vajda. CubeSat Attitude Determination with Decomposed Kalman Filters. *Journal of the Brazilian Society of Mechanical Sciences and Engineering*, 45(2):126, 2023.

Patrik Reizinger. The Falsificationist View of Machine Learning. *Information Society/Információs Társadalom (InfTars)*, 23(2), 2023.

Patrik Reizinger, Yash Sharma, Matthias Bethge, Bernhard Schölkopf, Ferenc Huszár, and Wieland Brendel. Jacobian-based Causal Discovery with Nonlinear ICA. *Transactions on Machine Learning Research*, 2023.

Evgenia Rusak*, **Patrik Reizinger***, Roland S. Zimmermann*, Oliver Bringmann, and Wieland Brendel. content suppresses style in dimensionality collapse in contrastive learning.

Patrik Reizinger*, Luigi Gresele*, Jack Brady*, Julius von Kügelgen, Dominik Zietlow, Bernhard Schölkopf, Georg Martius, Wieland Brendel, and Michel Besserve. Embrace the Gap: VAEs Perform Independent Mechanism Analysis. In *NeurIPS2022*, 2022.

Patrik Reizinger*, Yash Sharma, Matthias Bethge, Bernhard Schölkopf, Ferenc Huszár, and Wieland Brendel. Multivariable Causal Discovery with General Nonlinear Relationships. In *UAI 2022 Workshop on Causal Representation Learning*, 2022.

Márton Szemenyei and **Patrik Reizinger**. Handling Realistic Noise in Multi-Agent Systems with Self-Supervised Learning and Curiosity. *Journal of Artificial Intelligence and Soft Computing Research*, 12(2):135–148, 2021.

Patrik Reizinger, Péter Huszár, Dorottya Milánkovich, and Alexandra Széll. Kisműholdak fejlesztése a sokoldalúság és a könnyű reprodukálhatóság tükrében. *Repüléstudományi Közlemények*, 32(2):81–95, 2020.

Márton Szemenyei and **Patrik Reizinger**. Learning to Play Robot Soccer from Partial Observations. In *2020 23rd International Symposium on Measurement and Control in Robotics (ISMCR)*, pages 1–6. IEEE, 2020.

Patrik Reizinger and Márton Szemenyei. Attention-based curiosity-driven exploration in deep reinforcement learning. In *ICASSP 2020-2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pages 3542–3546. IEEE, 2020.

Marton Szemenyei and **Patrik Reizinger**. Attention-based curiosity in multi-agent reinforcement learning environments. In *2019 International Conference on Control, Artificial Intelligence, Robotics & Optimization (ICCAIRO)*, pages 176–181. IEEE, 2019.

Patrik Reizinger and Bálint Gyires-Tóth. Stochastic weight matrix-based regularization methods for deep neural networks. In *International Conference on Machine Learning, Optimization, and Data Science*, pages 45–57. Springer, Cham, 2019.

Patrik Reizinger and Ferenc Vajda. Concept of a mobile, cameraless VR-controller framework for working environments. 2018.

Talks

2024.07. **Embrace the Gap: VAEs Perform Independent Mechanism Analysis**, *Critical ML Lab, University of Waterloo*, Waterloo, Canada

2023.12. **Embrace the Gap: VAEs Perform Independent Mechanism Analysis**, *Central European University Representation Learning Reading Group*, Budapest, Hungary

2023.02. **Popper meets machine learning - How falsificationism can guide the design of AI solutions**, *Darwin College*, Cambridge, UK

2023.01. **Multivariable Causal Discovery for General Nonlinear Functions**, *AstraZeneca Seminar*, online

2022.12. **Multivariable Causal Discovery for General Nonlinear Functions**, *Learning on Graphs Cambridge Meetup*, Cambridge, UK

2022.10. **Embrace the Gap: VAEs Perform Independent Mechanism Analysis**, *University of Warsaw Machine Learning Seminar*, online

2022.08. **Multivariable Causal Discovery for General Nonlinear Functions**, *UAI 2022 Workshop on Causal Representation Learning*, Eindhoven, Netherlands

Teaching

Fall 2020/21 **Teaching Assistant**, *Budapest University of Technology and Economics*, Budapest, Hungary
Image Processing Laboratory I., Computer Vision Systems, Deep Learning in Visual Computing

Fall 2017/18 **Teaching Assistant**, *Budapest University of Technology and Economics*, Budapest, Hungary
Digital Design I. laboratory

Extracurriculars & Coursework

2023.12. **CI/CD for Machine Learning cerfification**, *Weights and Biases*, online

2022.07. **ELLIS Cambridge Unit Machine Learning Summer School**, *ELLIS Cambridge Unit*, Cambridge, UK

2022.07. **Machine Learning Summer School**, *ML in PL*, Krakow, Poland

2021.04. **A Young Leader's Guide to Risk**, *McChrystal Group*, Budapest, Hungary

2020.09. **Ladybird Guide to Spacecraft Operations Workshop**, *European Space Agency*, online

2020.07. **Eastern European Machine Learning Summer School**, *ML in PL*, online

2019.07. **International Summer School on Deep Learning**, *IRDTA*, Warsaw, Poland

2019.01. **Concurrent Design Workshop**, *European Space Agency*, ESEC-Galaxia, Redu, Belgium

2018–2020 **Leadership Academy**, *Mathias Corvinus Collegium*, Budapest, Hungary

2018.11. **Traction Europe Case Studies for Outstanding Engineering Students**, *Boston Consulting Group*, Paris, France

2016–2018 **Business and Economics Specialization**, *Mathias Corvinus Collegium*, Budapest, Hungary

2015–2016 **University Junior Program**, *Mathias Corvinus Collegium*, Budapest, Hungary

Outreach & Community Service

2024 **Organizer**, *CALM: First Workshop on Causality and Large Models*, NeurIPS 2024

2021–ongoing **Thesis committee member**, *Budapest University of Technology and Economics*

2020–2022 **Coordinator**, *Machine Learning Journal Club for Hungarian Students*

2020 **Program Committee Member**, *6th International Conference on Machine Learning, Optimization, and Data Science*

2016 **E-learning Developer**, *EduBase*
Video series for the Digital Design I. university course

Mentoring

2023–ongoing **Bálint Mucsányi**, *M.Sc. at the University of Tübingen→ Ph.D. at MPI-IS*

2023–ongoing **Szilvia Ujváry**, *M.Sc.→ Ph.D. at the University of Cambridge*

2023–ongoing **Anna Mészáros**, *M.Sc.→ Ph.D. at the University of Cambridge*

2022–ongoing **Boglárka Ecsedi**, *B.Sc. at GeorgiaTech*

Reviewing

Competencies

Machine Learning	■■■■■ PyTorch ■■■■■ PyTorch Lightning ■■■■■ Weights and Biases
Software Engineering	■■■■■ Git ■■■■□ CI/CD ■■■□□ Singularity
Programming Languages	■■■■■ Python ■■■■□ C++ ■■■□□ C
Research	■■■■■ Zotero ■■■■□ LaTeX

Languages

English	Proficient
German	Proficient
Italian	Elementary
Hungarian	Native

Tübingen, 2nd November, 2024