ROLAND MOLONTAY

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EMPLOYMENT HISTORY

Director – Institute of Biostatistics and Network Science, Semmelweis University *Sept. 2024 -*

Deputy Director – Institute of Mathematics, BME *July 2023 -*

Associate Professor – Department of Stochastics, BME *Jan 2023 -*

Lab Director – Human & Social Data Science Lab – BME *July 2019 -*

Research Fellow – HUN-REN-BME Stochastics Research Group *Aug 2021 -*

Visiting Researcher – Indiana University Bloomington *Feb 2022 - June 2022*

Assistant Professor – Dept. of Management and Business Economics, BME *Aug 2021 - Dec 2022*

Assistant Lecturer – Dept. of Management and Business Economics, BME *Aug 2020 - Jul 2021*

Assistant Research Fellow – MTA-BME Stochastics Research Group *Aug 2018 - Jul 2021*

EDUCATION

Budapest University of Technology and Economics (BME) *2015 - 2018*
PhD in Applied Mathematics (2021)
PhD thesis: Structural Analysis of Networks Supervisor: Károly Simon Qualification: summa cum laude

Pallas Athéné Domus Educationis (PADE) Foundation *2016 - 2019*
Supplementary PhD program in quantitative economics and finance
in co-operation with the Central Bank of Hungary.

Brown University, Providence, USA *Spring 2016*
Visiting PhD student at ICERM in the Dimension and Dynamics semester program

Budapest University of Technology and Economics (BME) *2013 - 2015*
MSc in Applied Mathematics, Specialized in Stochastics
Master's thesis: *Fractal Characterization of Complex Networks*
Supervisor: Károly Simon
Qualification of diploma: Excellent with highest honors

Budapest University of Technology and Economics (BME)
Faculty of Natural Sciences *2010 - 2013*
BSc in Mathematics Bachelor's thesis: *Networks and Fractals*
Supervisors: Károly Simon, Júlia Komjáthy
Qualification of diploma: Excellent

RESEARCH & DEVELOPMENT PROJECTS

Leading research projects in cooperation with Nokia Bell Labs *2014 -*
Research coordinator and lead researcher

- Domain-Specific Question Answering with LLMs and Knowledge Graphs *2024*
- Interpretable Log Anomaly Detection *2023*
- Cross-Domain Network State Modeling *2022*
- Big Data Algorithms for Anomaly Detection *2020 - 2021*

- Variable Dimensionality Input Handling for Machine Learning Algorithms *2019*
- Network State Transition Modeling and Prediction *2017 - 2018*
- Fingerprinting of computational resources of data processing *2016*
- User Segmentation Analysis *2014*

Leading R&D projects in collaboration with eKréta on educational data science *2020 -*

Founding the Statistics Consulting Group *June 2016 -*
We offer statistical consulting and provide data science research and development service to our corporate and academic partners.

TEACHING EXPERIENCE

Responsible lecturer, Aquincum Institute of Technology (AIT-Budapest) *2019 - Present*

- Data Science (for US computer science students)

Responsible lecturer, Budapest University of Technology and Economics (BME) *2017 - Present*

- Introduction to Data Science I. (for applied mathematics students)
- Data Analytics – BME (for business master students)
- Business Analytics (for MBA students)
- Mathematical Modeling Seminar (for mathematics BSc and MSc stuents)
- Project Laboratory (for mathematics MSc students)

Instructor, BME *2012 - 2018*

- Mathematics A3 (for civil engineers)
- Mathematics A2 (for civil and chemical engineers)
- Mathematics EP2 (for architect students)
- Mathematics EP1 (for architect students)
- Introduction to mathematics (for engineering and economics students)

Supervising students *Sep 2015 - Present*

- **PhD students**
  - Marcell Nagy, topic: data-driven network science (consultant), PhD defence: 2023
  - József Pintér, topic: interpretable machine learning
  - Csaba Kiss, topic: natural language processing
  - Donát Köllet, topicmachine learning models
- **15 BSc Theses**
- **12 MSc Theses**
- **12 Scientific Students Projects (TDK)**
- Individual research project of 25 Master students at BME *2016 - Present*
  Topic: Educational data science
- Summer internship of international Master students *2018 -*
  Topic: Data science and network science

CONFERENCES & SHORT VISITS

- Visiting the National Institute of Research and Development for Biological Science, Buchaerst, Romania *January 2025*
- NetSci International School and Conference on Network Science, Vienna, Austria *June 2023*
  Title of presentation: Network classification-based structural analysis of real networks and their model- generated counterparts

- EduData Summit, San Fransisco, USA *May 2023*
  Title of presentation: *Leveraging Data Science Techniques for Enhancing the Efficiency of Higher Education and Research Management*
- Digital Humanities Conference, Budapest *November 2022*
  Title of keynote presentation: *Introducing HSDSLab: How data and network science can help to answer research questions in human and social sciences?*
- Data Science and Statistics seminar, University of Illinois Chicago *October 2022*
  Title of presentation: *Copula-Based Anomaly Scoring of High-Dimensional Data with Application in Telecommunication Networks*
- Interdisciplinary Network Analysis Methods for Analyzing Social Systems, ICERM, Providense, USA *June 2022*
- Research visit at Purdue University, West Lafayette, USA *June 2022*
  Working with Joyce Main on educational data analysis
- EduData Summit, New York, USA, *June 2022*
  Title of presentation: *How can data science assist decision-making in higher education?*
- Indiana University's 4th Int. Learning Analytics Summit, Bloomington, USA *May 2022*
  Title of presentation: *How can data science assist decision-making in higher education?*
- 33rd International Conference of SITE, San Diego, USA *April 2022*
  Title of presentation: *Can professors buy better evaluation with lenient grading? A case study from Hungary*
- Research visit at Purdue University, West Lafayette, USA *March 2022*
  Title of presentation: *How can data science assist decision-making in higher education?*
- Research seminar of the Institute of the Future of Education *December 2021*
  Technologico de Monterrey, Mexico (virtual event)
  Title of presentation: *How can data science assist decision-making in higher education?*
- Networks 2021: A Joint Sunbelt and NetSci Conference (virtual) *June 2021*
  Title of presentation: Dank or Not? – Analyzing and Predicting the Popularity of Memes on Reddit
- NetSci-X 2020 Int. Conf. and School on Network Science, Tokyo, Japan *January 2020*
  Title of presentation: *Comparing Structural Feature-Based and Graph Embedding-Based Network Classification Methods*
- The 47th European Society of Engineering Education (SEFI) Annual Conf. *September 2019*
  Budapest, Hungary
  Title of presentation: *A Web Application for Predicting Academic Performance and Identifying the Contributing Factors*
- The 2019 IEEE/ACM International Conference on Advances in Social Networks *August 2019*
  Analysis and Mining, Vancouver, Canada
  Title of presentation: *Two Decades of Network Science – as seen through the co-authorship network of network scientists*
- 1st Conference on Transfer between Mathematics & Industry, *July 2019*
  Santiago de Compostela, Spain
  Title of poster: *Copula-Based Anomaly Scoring and Localization of High-Dimensional Data with Application in Telecommunication Networks*
- 45th International Conference on Current Trends in Theory and *January 2019*
  Practice of Computer Science, Novy Smokovec, Slovakia
  Title of presentation: *On the Complexity of Color-Avoiding Site and Bond Percolation*
- 7th International Conference on Complex Networks and their Applications, *December 2018*
  Cambridge, UK
  Title of presentation: *Modified Box-Dimension of Graphs and Hierarchical Scale-Free Graphs*
- 2nd Danube Conference for Higher Education Management, Budapest *November 2018*
  Title of presentation: *Who are the Best "Suppliers" for Universities*
- Building Bridges (Celebrating László Lovász), Budapest *July 2018*

Title of posters: *Illustrating the Co-authorship Network of László Lovász, The CPE Network: Scientific Impact of the Combinatorial Problems and Exercises*

- INES 2018, 22nd IEEE Int. Conf. on Intelligent Engineering Systems, Las Palmas, Gran Canaria, Spain — *June 2018*
- Mathematisches Forschungsinstitut Oberwolfach, Germany — *December 2017*
  Title of conference: Network Models: Structure and Function
- INES 2017, 21st IEEE Int. Conf. on Intelligent Engineering Systems, Larnaca, Cyprus — *October 2017*
  Title of presentation: *Cross-Correlation Based Clustering and Dimension Reduction of Multivariate Time Series*
- Alfréd Rényi Institute of Mathematics, Budapest — *August 2017*
  Title of conference: Graph limits, groups and stochastic processes
- University of Maryland, College Park, USA — *April 2016*
  Workshop on Dynamical Systems and Related Topics
- EURANDOM, Technical University of Eindhoven, Netherlands — *December 2015*
  WAW 2015 Conference and School
- Bar-Ilan University, Tel Aviv, Israel — *May 2015*
  Consultation with the Complex Networks research group
- EURANDOM, Technical University of Eindhoven, Netherlands — *January 2014*
  School on Probability Theory and Combinatorics
- ATHENS Programme, Instituto Superior Técnico, Lisbon, Portugal — *March 2013*
  School on Operations Research

PUBLICATIONS

1. Bidanta, S., Börner K., Herr, B.W., Nagy, M., ... & Molontay, R., Weber, G. (2024) *Functional Tissue Units in the Human Reference Atlas* (elfogadva, Nature Communications)
2. Murgás, L., Nagy, M., Barnes, K., & Molontay, R (2024) Decoding Memes: A Comparative Study of Machine Learning Models for Template Identification (benyújtva)
3. Soto-Camacho, M.D.C., Nagy, M., Molontay R., & Ramirez-Arellano, A. (2024) *Complex network classification using Deng entropy and bidirectional long short-term memory.* Fractals (online first)
4. Barnes, K., Juhász, P., Nagy, M., & Molontay R. (2024) *Topicality boosts popularity: a comparative analysis of NYT articles and Reddit memes.* Social Network Analysis and Mining, 14(1), 119
5. Fekete, P.T., Molontay, R., Ráth, B., & Varga, K. (2024) *Color-avoiding percolation and branching processes.* Journal of Applied Probability (online first)
6. Csató, L., Molontay, R., & Pintér, J. (2024) *Tournament schedules and incentives in a double round-robin tournament with four teams.* International Transactions in Operational Research, 31:3, 1486-1514
7. Nagy, M., & Molontay, R. (2024) *Interpretable Dropout Prediction: Towards XAI-Based Personalized Intervention.* International Journal of Artificial Intelligence in Higher Education, 34, 274–300
8. Zakar-Polyák, E., Nagy, M., & Molontay, R. (2023). *Towards a Better Understanding of the Characteristics of Fractal Networks.* Applied Network Science, 8, 17
9. Zakar-Polyák, E., Nagy, M., & Molontay, R. (2023). *Investigating the origins of fractality based on two novel fractal network models.* In Complex Networks XIII: Proceedings of the 13th Conference on Complex Networks, CompleNet 2022 (pp. 43-54). Cham: Springer International Publishing.
10. Molontay, R., & Nagy, M. (2023) *How to Improve the Predictive Validity of a Composite Admission Score? A Case Study from Hungary.* Assessment & Evaluation in Higher Education, 48:4, 419-437
11. Lukáts, G. D., Berezvai, Z., & Molontay, R. (2023) *Assessing the Effects of a Reformed System of Student Evaluation of Teaching.* Periodica Polytechnica Social and Management Sciences, 31(2), 164-177.
12. Nagy, M., Main, J., Molontay, R., & Griffith, A. (2023). Using Machine Learning Methods To Develop Person-Centered Models Predicting STEM Major Choice. European Society for Engineering Education (SEFI).

13. Alvarado-Uribe, J., Mejía-Almada, P., Masetto Herrera, A. L., Molontay, R., Hilliger, I., Hegde, V., ... & Ceballos, H. G. (2022). *Student Dataset from Tecnologico de Monterrey in Mexico to Predict Dropout in Higher Education.* Data, 7(9), 119.
14. Nagy, M., & Molontay, R. (2022) *Network Classification Based Structural Analysis of Real Networks and their Model-Generated Counterparts.* Network Science, 10 (2), 146-169
15. Kui, B., Pintér, J., Molontay, R., Nagy, M., Farkas, N., Gede, N., ... & Hungarian Pancreatic Study Group. (2022). EASY-APP: An artificial intelligence model and application for early and easy prediction of severity in acute pancreatitis. Clinical and Translational Medicine, 12(6), e842.
16. Kiss, S., Pintér, J., Molontay, R., Nagy, M., Farkas, N., Sipos, Z., ... & Szentesi, A. (2022). Early prediction of acute necrotizing pancreatitis by artificial intelligence: a prospective cohort-analysis of 2387 cases. Scientific Reports, 12(1), 1-11.
17. Nagy, M., & Molontay, R. (2021) *Comprehensive Analysis of the Predictive Validity of University Entrance Score in Hungary.* Assessment & Evaluation in Higher Education, 46:8, 1235-1253
18. Baranyi, M., & Molontay, R. (2021). *Comparing the effectiveness of two remedial mathematics courses using modern regression discontinuity techniques.* Interactive Learning Environments, 29:2, 247-269
19. Berezvai, Z., Lukáts, G. D., & Molontay, R. (2021). *Can professors buy better evaluation with lenient grading? The effect of grade inflation on student evaluation of teaching.* Assessment & Evaluation in Higher Education, 46:5, 793-808
20. Séllei, B., Stumphauser, N., & Molontay, R. (2021). *Traits versus Grades—The Incremental Predictive Power of Positive Psychological Factors over Pre-Enrollment Achievement Measures on Academic Performance.* Applied Sciences, 11(4), 1744.
21. Kovács, P., Nagy, M., Molontay, R. (2021) *Comparative Analysis of Box-Covering Algorithms for Fractal Networks.* Applied Network Science, 6(73)
22. Barnes, K., Riesenmy, T., Trinh, M. D., Lleshi, E., Balogh, N., & Molontay, R. (2021). *Dank or Not?–Analyzing and Predicting the Popularity of Memes on Reddit.* Applied Network Science, 6(21)
23. Zeleny, K., Molontay, R., & Szabó, M. (2021). *A kollégiumi lét egyetemi teljesítményre gyakorolt hatásának vizsgálata.* Statisztikai Szemle, 99(1), 46-79.
24. Baranyi, M., Nagy, M., & Molontay, R. (2020). *Interpretable Deep Learning for University Dropout Prediction.* In Proceedings of the 21st Annual Conference on Information Technology Education (pp. 13-19).
25. Horváth, G., Kovács, E., Molontay, R., & Nováczki, S. (2020). *Copula-Based Anomaly Scoring of High-Dimensional Data with Application in Telecommunication Networks.* ACM Transactions on Intelligent Systems and Technology (TIST), 11(3), 1-26.
26. Molontay, R., Horváth, N., Bergmann, J., Szekrényes, D., & Szabó, M. (2020). *Characterizing Curriculum Prerequisite Networks by a Student Flow Approach* . IEEE Transactions on Learning Technologies. 13(3), 491 - 501, IEEE
27. Molontay, R., & Nagy, M. (2020). *Twenty Years of Network Science: A Bibliographic and Co-authorship Network Analysis.* Big Data and Social Media Analytics, Lecture Notes in Social Networks, 1-24, Springer.
28. Bergmann J., Molontay R., Szekrényes D., & Szabó M. (2020). *Kreditrendszerű képzések mintatanterveinek és előtanulmányi hálóinak elemzése a hazai matematika alapszakok példáján.* Alkalmazott Matematikai Lapok, 37(1), pp. 9-45.
29. Komjáthy, J., Molontay, R., & Simon, K. (2019). *Transfinite fractal dimension of trees and hierarchical scale-free graphs.* Journal of Complex Networks, 7(5), pp. 764-791.
30. Barabás B., Fülöp O., & Molontay R. (2019). *The Co-Authorship Network and Scientific Impact of László Lovász.* Journal of Combinatorial Mathematics and Combinatorial Computing, 108, pp. 187-192.
31. Berezvai Z., Lukáts G., & Molontay R. (2019). *A pénzügyi ösztönzők hatása az egyetemi oktatók osztályozási gyakorlatára.* Közgazdasági Szemle, 66, pp. 733-750.
32. Molontay, R., & Varga, K. (2019). *On the Complexity of Color-Avoiding Site and Bond Perco-*

lation. In Proceedings of the 45th International Conference on Current Trends in Theory and Practice of Computer Science, pp. 354-367, Springer

33. Baranyi, M., & Molontay, R. (2019). *Effect of Mathematics Remediation on Academic Achievements – a regression discontinuity approach*. In Proceedings of the International Symposium on Educational Technology, pp. 29-33, IEEE.
34. Horváth, N, Molontay, R., & Szabó, M. (2019). *Who are the Most Important "Suppliers" for Universities? – Ranking secondary schools based on their students' university performance*. In Proceedings of the 2nd Danube Conference: In search of excellence in higher education, pp. 133-143.
35. Baranyi, M., Gál, K., Molontay, R., & Csabay, B. (2019). *Modeling Students' Academic Performance Using Bayesian Networks*. In Proceedings of the 17th International Conference on Emerging eLearning Technologies and Applications, pp. 42-49, IEEE.
36. Kiss, B., Nagy, M., Molontay, R., & Csabay, B. (2019). *Predicting Dropout Using High School and First-semester Academic Achievement Measures*. In Proceedings of the 17th International Conference on Emerging eLearning Technologies and Applications, pp. 383-389, IEEE.
37. Nagy, M., Molontay, R., & Szabó, M. (2019). *A Web Application for Predicting Academic Performance and Identifying the Contributing Factors*. In Proceedings of the 47th SEFI Annual Conference pp. 1794-1806.
38. Molontay, R., & Nagy, M. (2019). *Two Decades of Network Science: as seen through the co-authorship network of network scientists*. In Proceedings of the 2019 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining pp. 584-588.
39. Nagy, M., & Molontay, R. (2019). *On the Structural Properties of Social Networks and their Measurement-Calibrated Synthetic Counterparts*. In Proceedings of the 2019 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining pp. 584-588.
40. Nagy, M., & Molontay, R. (2018). *Predicting Dropout in Higher Education based on Secondary School Performance*. In Proceedings of the 22nd International Conference on Intelligent Engineering Systems pp. 389-394, IEEE.
41. Horváth, M. D., Molontay, R., & Szabó, M. (2018). *Visualizing Student Flows to Track Retention and Graduation Rates*. In Proceedings of the 22nd International Conference on Information Visualisation pp. 338-343, IEEE.
42. Barabás, B., Fülöp, O., Molontay, R., & Pályi, G. (2017). *Impact of the Discovery of Fluorous Biphasic Systems on Chemistry: A Statistical and Network Analysis*. ACS Sustainable Chemistry & Engineering, 5(9), pp. 8108-8118, ACM.
43. Horváth, I., Finta, I., Kovács, F., Mészáros, A., Molontay, R., & Varga, K. (2017). *Markovian Queue with Garbage Collection*. In Proceedings of the 24th International Conference on Analytical and Stochastic Modelling Techniques and Applications, Lecture Notes in Computer Science, 10378, pp. 109-144, Springer.
44. Egri, A., Horváth, I., Kovács, F., Molontay, R., & Varga, K. (2017). *Cross-Correlation Based Clustering and Dimension Reduction of Multivariate Time Series*. In Proceedings of the 21st International Conference on Intelligent Engineering Systems pp. 242-246, IEEE.
45. Egri, A., Horváth, I., Kovács, F., & Molontay, R. (2016). *Fingerprinting and Reconstruction of Functionals of Discrete Time Markov Chains*. In the proceedings 23rd International Conference on Analytical and Stochastic Modelling Techniques and Applications, Lecture Notes in Computer Science, 9845, pp. 140-154, Springer.

SERVICE AND ACTIVITIES

- Member of the Young Acedemy of European Mathematical Society (EMYA) (2023-)
- Secretary of the Institute of Scientific Computing, Society (2023-)
- Member of the local organizing committee: Geometry of Deterministic and Random Fractals: Honouring the 60+1st birthday of Professor Károly Simon (June 2022)
- Organizing workshop on educational data science at BME (November 2021)

- Program Committee Member: Complex Networks 2019, 2020, 2021, 2022, 2023, Advances in Social Network Analysis and Mining (ASONAM 2020)
- Reviewer: nteractive Learning Environments, Social Networks Analysis and Mining, Journal of Edu- cational Measurement: Issues and Practice, Periodica Polytechnica, Information Fusion, Entropy, Sustainability, Education, Frontiers in Education, IEEE Transactions on Learning Technologies, Socio-Economic Planning Sciences, Journal of Diabetes Research, Expert Systems with Applica- tions, Data in Brief, Applied Computational Intelligence and Soft Computing
- Member of the János Bolyai Mathematical Society
- Member of the Hungarian Artificial Intelligence Coalition (Education and Public Awareness Working Group)
- Member of the Artificial Intelligence National Laboratory
- Member of the Hungarian Service Network for Mathematics in Industry and Innovation (HU-MATHS-IN)
- Coordinator of the data science specialization of the mathematics BSc and MSc programs at BME
- Outreach activities: Science Camp, Children's University, Researchers' Night
- Social media coordinator of the Institute of Mathematics, BME

AWARDS

- Károly Conlegner Lecturer Award (2024)
- Receipent of the University Research Scholarship Programme (EKÖP) (2024)
- MTA Publication Award of Excellence (2023)
- PD OTKA Scholarship (awarded by the National Research, Development and Innovation Office) (2022-2025)
- Róbert Bárány Award (awarded by the Eötvös Loránd Research Network) (2022)
- Gyula Farkas Memorial Award (awarded by János Bolyai Mathematical Society) (2020)
- BME Innovation Award of the Pro Progressio Foundation (2020)
- Research scholarship of the New National Excellence Program (ÚNKP) (2019, 2022)
- Pro Progressio Foundation's Award for Outstanding Supervisors of Scientific Student Projects (TDK) (2019)
- Outstanding Lecturer Award of the Faculty of Natural Sciences at BME (2019)
- Innovation Award of the Department of Stochastics (2018)
- Scientific Scholarship of the Faculty of Natural Sciences (2014)
- Medal of Study of Városmajori Secondary School (2010)

RELATED SKILLS

Programming languages	Python, R, Wolfram Language (Mathematica)
Languages	Hungarian (native proficiency) English (full professional working proficiency) German (limited working proficiency)