

# ROLAND MOLONTAY

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## EMPLOYMENT HISTORY

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<b>Deputy Director</b> – Institute of Mathematics, BME	<i>July 2023 - Present</i>
<b>Associate Professor</b> – Department of Stochastics, BME	<i>Jan 2023 - Present</i>
<b>Research Fellow</b> – HUN-REN-BME Stochastics Research Group	<i>Aug 2021 - Present</i>
<b>Lab Director</b> – Human & Social Data Science Lab – BME	<i>July 2019 - Present</i>
<b>Visiting Researcher</b> – Indiana University Bloomington	<i>Feb 2022 - June 2022</i>
<b>Assistant Professor</b> – Dept. of Management and Business Economics, BME	<i>Aug 2021 - Dec 2022</i>
<b>Assistant Lecturer</b> – Dept. of Management and Business Economics, BME	<i>Aug 2020 - Jul 2021</i>
<b>Assistant Research Fellow</b> – MTA-BME Stochastics Research Group	<i>Aug 2018 - Jul 2021</i>

## EDUCATION

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<b>Budapest University of Technology and Economics (BME)</b> <b>Faculty of Natural Sciences</b> <b>Doctoral School of Mathematics and Computer Science</b> PhD in Applied Mathematics (2021)	<i>2015 - 2018</i>
<ul style="list-style-type: none"><li>• Research topic: network science, applied probability theory and data science</li><li>• PhD thesis: Structural Analysis of Networks</li><li>• Supervisor: Károly Simon</li><li>• Qualification: summa cum laude</li></ul>	
<b>Pallas Athéné Domus Educationis (PADE) Foundation</b> Supplementary PhD program in quantitative economics and finance in co-operation with the Central Bank of Hungary.	<i>2016 - 2019</i>
<b>Brown University, Providence, USA</b> Visiting PhD student at ICERM in the Dimension and Dynamics semester program	<i>Spring 2016</i>
<b>Budapest University of Technology and Economics (BME)</b> <b>Faculty of Natural Sciences</b> MSc in Applied Mathematics, Specialized in Stochastics	<i>2013 - 2015</i>
<ul style="list-style-type: none"><li>• Master's thesis: <i>Fractal Characterization of Complex Networks</i> Supervisor: Károly Simon</li><li>• Qualification of diploma: Excellent with highest honors</li></ul>	

**Budapest University of Technology and Economics (BME)**  
**Faculty of Natural Sciences**  
BSc in Mathematics

*2010 - 2013*

- Bachelor's thesis: *Networks and Fractals*  
Supervisors: Károly Simon, Júlia Komjáthy
- Qualification of diploma: Excellent

## **RESEARCH & DEVELOPMENT PROJECTS**

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

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

- 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 - Present*

Leading R&D projects in collaboration with Translational Medicine Center *2020 - Present*

## **TEACHING EXPERIENCE**

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**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 students)
- Project Laboratory (for mathematics MSc students)

**Instructor, BME** *Sep 2012 - Present*

- 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**
  - Consultant for the research of Marcell Nagy, topic: data-driven network science
  - Consultant for the research of József Pintér, topic: interpretable machine learning

- **15 BSc Theses**
- **10 MSc Theses**
- **10 Scientific Students Projects (TDK)**
- Individual research project of 25 Master students at BME *2016 - Present*  
Topic: Educational data science
- Summer internship of two Master students from ENSAE, Paris *Summer 2020, 2019*  
Topic: Data science and network science
- Summer internship of 5 Bachelor students from the UK *Summer 2018*  
Topic: Educational data science and network science

## CONFERENCES & SHORT VISITS

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- EduData Summit, San Francisco, 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, Providence, 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 Analysis and Mining, Vancouver, Canada *August 2019*  
 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 Practice of Computer Science, Novy Smokovec, Slovakia *January 2019*  
 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, *June 2018*  
 Las Palmas, Gran Canaria, Spain
- Mathematisches Forschungsinstitut Oberwolfach, Germany *December 2017*  
 Title of conference: *Network Models: Structure and Function*
- INES 2017, 21st IEEE Int. Conf. on Intelligent Engineering Systems, *October 2017*  
 Larnaca, Cyprus  
 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

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1. Nagy, M., & Molontay, R. (2023) *Interpretable Dropout Prediction: Towards XAI-Based Personalized Intervention*. Artificial Intelligence in Higher Education (online first)
2. Zakar-Polyák, E., Nagy, M., & Molontay, R. (2023). *Towards a Better Understanding of the Characteristics of Fractal Networks*. Applied Network Science, 8, 17
3. Csató, L., Molontay, R., & Pintér, J. (2023) *What is the optimal schedule for the UEFA Champions League groups?*. International Transactions in Operational Research (submitted)
4. 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.
5. 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
6. Berezvai, Z., Lukáts, G. D., & Molontay, R. (2022) *Assessing the Effects of a Reformed System of Student Evaluation of Teaching*. Periodica Polytechnica Social and Management Sciences (online first)
7. Alvarado-Uribe, J., Mejía-Almada, P., Masetto Herrera, A. L., Molontay, R., Hilliger, I., Hegde, V., ... & Ceballos, H. G. (2022). *Student Dataset from Tecnológico de Monterrey in Mexico to Predict Dropout in Higher Education*. Data, 7(9), 119.
8. Nagy, M., & Molontay, R. (2022) *Network Classification Based Structural Analysis of Real Networks and their Model-Generated Counterparts*. Network Science, 10 (2), 146-169
9. 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.
10. 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.
11. 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
12. 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
13. 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
14. Séllei, B., Stumphauer, 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.
15. Kovács, P., Nagy, M., Molontay, R. (2021) *Comparative Analysis of Box-Covering Algorithms for Fractal Networks*. Applied Network Science, 6(73)
16. 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)
17. Zeleny, K., Molontay, R., & Szabó, M. (2021). *A kollégiumi lét egyetemi teljesítményre gyakorolt hatásának vizsgálata*. Statisztikai Szemle, 99(1), 46-79.
18. 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).
19. 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.
20. 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
21. 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.
  22. 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.
  23. 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.
  24. 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.
  25. Berezvai Z., Lukáts G., & Molontay R. (2019). *A pénzügyi ösztönzők hatása az egyetemi oktatók osztályozási gyakorlatára*. Közgazdasági Szemle, 66, pp. 733-750.
  26. Molontay, R., & Varga, K. (2019). *On the Complexity of Color-Avoiding Site and Bond Percolation*. In Proceedings of the 45th International Conference on Current Trends in Theory and Practice of Computer Science, pp. 354-367, Springer
  27. 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.
  28. 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.
  29. 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.
  30. 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.
  31. 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.
  32. 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.
  33. 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.
  34. 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.
  35. 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.
  36. 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.
  37. 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.
38. 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.
  39. 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

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- 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: Interactive Learning Environments, Social Networks Analysis and Mining, Journal of Educational Measurement: Issues and Practice, Periodica Polytechnica, Information Fusion, Entropy, Sustainability, Education
- Member of the Young Academy of European Mathematical Society (EMYA)
- 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 (HUMATHS-IN)
- Coordinator of the data science specialization of the mathematics program at BME
- Outreach activities: Science Camp, Children's University, Researcher's Night
- Social media coordinator of the Institute of Mathematics, BME

## AWARDS

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- 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)
- 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

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**Programming languages** Python, R, Wolfram Language (Mathematica)

**Languages** Hungarian (native proficiency)  
English (full professional working proficiency)  
German (limited working proficiency)