# Christopher Morris

## Address

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## Areas of Specialization

Graph embeddings (graph kernels, graph neural networks, invariant neural networks) from a theoretical as well as applied viewpoint, and their application in combinatorial optimization.

## Education

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| 2015–2019 | PhD in Computer Science, TU Dortmund University, Germany, final grade: 1.0 with highest distinction (best possible grade) |
| 01–04/2018 | Research stay at Stanford, Infolab (Jure Leskovec) |
| 2012–2015 | MSc in Computer Science, TU Dortmund University, Germany, final grade: 1.0 (best possible grade) |
| 2008–2012 | BSc in Computer Science, TU Dortmund University, Germany |
| 1997–2007 | University Entrance Qualification, Erzbischöfliches St.-Angela-Gymnasium, Wipperfürth |

## Employment

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| Since 03/2020 | Postdoctoral researcher in the group of Andrea Lodi, Polytechnique Montréal |
| 2015–2019 | PhD student and research associate, TU Dortmund University, within the Collaborative Research Center SFB 876, advised by Petra Mutzel (now University of Bonn) and Kristian Kersting (Technical University of Darmstadt) |
| 2007–2008 | Mandatory civil service (German Red Cross) |

## Publications

### Conference Papers

[1] Christopher Morris, Gaurav Rattan, Petra Mutzel. *Weisfeiler and Leman Go Sparse: Towards Scalable Higher-order Graph Neural Networks*, Neural Information Processing Systems (NeurIPS), pages TBD, 2020,

[2] Matthias Fey, Jan E. Lenssen, Christopher Morris, Jonathan Masci, Nils M. Kriege. *Deep Graph Matching Consensus*, International Conference on Learning Representations (ICLR) 2020.

[3] Lutz Oettershagen, Nils Kriege, Christopher Morris, Petra Mutzel. *Temporal Graph Kernels for Classifying Dissemination Processes*, SIAM International Conference on Data Mining (SDM), pages 496–504, 2020.

[4] Christopher Morris, Martin Ritzert, Matthias Fey, William L. Hamilton, Jan Eric Lenssen, Gaurav Rattan, Martin Grohe. *Weisfeiler and Leman Go Neural: Higher-order Graph Neural Networks*, AAAI Conference on Artificial Intelligence (AAAI), pages 4602–4609, 2019.

[5] Rex Ying, Jiaxuan You, Christopher Morris, Xiang Ren, William L. Hamilton, Jure Leskovec. *Hierarchical Graph Representation Learning with Differentiable Pooling*, Neural Information Processing Systems (NeurIPS), pages 4805–4815, 2018, spotlight presentation.

[6] Nils M. Kriege, Christopher Morris, Anja Rey, Christian Sohler. *A Property Testing Framework for the Theoretical Expressivity of Graph Kernels*, International Joint Conference on Artificial Intelligence (IJCAI), pages 2348–2354, 2018.

[7] Christopher Morris, Kristian Kersting, Petra Mutzel. *Glocalized Weisfeiler-Lehman Graph Kernels: Global-Local Feature Maps of Graphs*, IEEE International Conference on Data Mining (ICDM), pages 327–336, 2017, full paper.

[8] Christopher Morris, Nils M. Kriege. *Recent Advances in Kernel-Based Graph Classification*, European Conference on Machine Learning & Principles and Practice of Knowledge Discovery in Databases (ECML PKDD), pages 388–392, 2017.

[9] Christopher Morris, Nils M. Kriege, Kristian Kersting, Petra Mutzel. *Faster Kernels for Graphs with Continuous Attributes via Hashing*, IEEE International Conference on Data Mining (ICDM), pages 1095–1100, 2016.

### Journal Articles

[10] Lutz Oettershagen, Nils M. Kriege, Christopher Morris, and Petra Mutzel *Classifying Dissemination Processes in Temporal Graphs*, *Big Data* 8 (5), pages 363–378, 2020.

[11] Nils M. Kriege, Fredrik D. Johansson, Christopher Morris. *A Survey on Graph Kernels*, *Applied Network Science* 5 (1), pages 1-42, 2020.

[12] Nils M. Kriege, Marion Neumann, Christopher Morris, Kristian Kersting, Petra Mutzel. *A Unifying View of Explicit and Implicit Feature Maps for Structured Data: Systematic Studies of Graph Kernels*, *Data Mining and Knowledge Discovery* 33 (6), pages 1505-1547, 2019.

[13] Fritz Bökler, Mathias Ehrgott, Christopher Morris, Petra Mutzel. *Output-sensitive Complexity of Multiobjective Combinatorial Optimization*, Journal of Multicriteria Decision Analysis 24 (1-2), pages 25-36, 2017.

### Workshop Papers (Peer-reviewed)

[14] Christopher Morris, Gaurav Rattan, Petra Mutzel. *Weisfeiler and Leman go sparse: Towards scalable higher-order graph embeddings*, Graph Representation Learning and Beyond (GRL+, ICML 2020).

[15] Christopher Morris, Nils M. Kriege, Franka Bause Kristian Kersting, Petra Mutzel, Marion Neumann. *TUDataset: A collection of benchmark datasets for learning with graphs*, Graph Representation Learning and Beyond (GRL+, ICML 2020).

[16] Rex Ying, Jiaxuan You, Christopher Morris, Xiang Ren, William L. Hamilton, Jure Leskovec. *Hierarchical Graph Representation Learning with Differentiable Pooling*, KDD Deep Learning Day 2018.

### Thesis

[17] Christopher Morris. *Learning with Graphs: Kernel and Neural Approaches*, PhD thesis, TU Dortmund University, 2019.

[18] Christopher Morris. *Enumeration Complexity of Multicriteria Linear Optimization*, MSc thesis, TU Dortmund University, 2015.

## Academic Honors

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| 2020 | Nominated (by Computer Science department of TU Dortmund University) for dissertation award of TU Dortmund University (awarded for best Computer Science PhD thesis in 2020) |
| 2020 | Nominated (by TU Dortmund University) for the dissertation award of the German computer science association (GI Dissertationspreis) |

## Invited Talks

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| 11/2020 | INFORMS Annual Meeting, *Limits Of Graphs Neural Networks For Combinatorial Optimization* |
| 10/2019 | IBM Research, Zürich, *Graph Classification: Kernel and Neural Approaches* |
| 05/2019 | NEC Research, Heidelberg, *Graph Classification: Kernel and Neural Approaches* |
| 03/2018 | Stanford, SNAP, Infolab, *Learning Higher-order Graph Embeddings: Theory and Practice* |
| 07/2017 | RWTH Aachen, Chair of Logic and the Theory of Discrete Systems, *Graph Classification: Kernels and Beyond* |

## Teaching

Supervised eight bachelor and master thesis, one intern.

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| SS 2019 | Proseminar *Graph Algorithms* (supervised students and helped with organization) |
| SS 2018 | Seminar *Algorithm Engineering* (supervised students and helped with organization |
| SS 2017 | Seminar *Algorithm Engineering* (supervised students and helped with organization |
| WS 2016/17 | Student project group *Algorithm Engineering for Graph Data Mining* (co-organizer), Seminar *Algorithms Unplugged* (supervised students and helped with organization |
| SS 2016 | Seminar *Algorithm Engineering*, Seminar *Graph Mining* (supervised students and helped with organization |
| As a student | Programming tutorials for engineering students, teaching assistant for a course on theoretical computer science |

## Service to the Profession

Co-organizer of the Dagstuhl seminar *Graph Embeddings: Theory and Practice* (2021) (together with Martin Grohe (RWTH Aachen), Stephan Günnemann (TU Munich), Stefanie Jegelka (MIT))

Program committee member for IJCAI 2019, NeurIPS 2019, AAAI 2020, ICML 2020, IJCAI 2020, ECML-PKDD 2020, NeurIPS 2020, ICLR 2021, AAAI 2021

Program committee member for *Representation Learning on Graphs and Manifolds* (ICLR 2019 workshop), *Learning and Reasoning with Graph-Structured Data* (ICML 2019 workshop), *Graph Representation Learning* (NeurIPS 2019 workshop), *Graph Representation Learning and Beyond* (ICML 2020 workshop), *Graphs and more Complex Structures for Learning and Reasoning* (AAAI 2021 workshop)

(Sub-)Reviewer for WALCOM 2017, ISAAC 2018, ALENEX 2019, ESA 2018, ICALP 2020

Occasional reviews for IEEE Transactions on Pattern Analysis and Machine Intelligence (2× 2020), Journal of Machine Learning Research (2020), ACM Transactions on Knowledge Discovery from Data (2019), IEEE Transactions on Cybernetics (2020), IEEE Transactions on Mobile Computing (2020)

Initiator of `www.graphlearning.io`, a large collection of benchmark datasets for graph classification and regression

Member of the appeal commission for the professorship *Data Mining* (TU Dortmund University, 2017)

## Grants

Research associate and PhD student within the Collaborative Research Center SFB 876, assisted in preparing the grant proposal for project A6 *Resource-efficient Graph Mining*

## Other

***Computational Skills*** Python, C++, LaTeX, Scikit-learn, NumPy, PyTorch, PyTorch Geometric
***Languages*** German (native), English (fluent)
***Citizenship*** German and British

## Referees

Prof. Petra Mutzel
Computational Analytics,
Department of Computer Science,
University of Bonn
petra.mutzel@cs.uni-bonn.de

Prof. Kristian Kersting
Machine Learning Group,
Department of Computer Science,
TU Darmstadt
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Prof. Andrea Lodi
Canada Excellence Research Chair in Data Science for Real-Time Decision-Making,
Department of Mathematical and Industrial Engineering,
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