# Education

2013–2021 Doctor of Sciences, ETH Zürich, Zürich, Switzerland, Doctoral studies in Scalable Parallel Computing Laboratory (SPCL), Institute of Computer Systems, Department of Computer Science. Advisor: Torsten Hoefler Thesis: "Enabling High-Performance Large-Scale Irregular Computations" Graduation with honors: • ETH Medal for the outstanding doctoral thesis, • ACM SIGHPC Outstanding Doctoral Dissertation Award, • IEEE TCSC Outstanding Doctoral Dissertation Award, • SPEC Kaivalya Dixit Distinguished Doctoral Dissertation Honorable Mention, Nomination by ETH Zürich for ACM Doctoral Dissertation Award 2006–2012 Master of Science in Computer Science, AGH University of Science and Technology (AGH-UST), Krakow, Poland CERN (European Organization for Nuclear Research), Geneva, Switzerland, Individual studies at the Faculty of Electrical Engineering, Automatics, Computer Science and Electronics, combined with extensive stays at CERN. Advisor: Ryszard Tadeusiewicz (AGH-UST) Thesis: "Event Display System for the TOTEM Experiment in the Large Hadron Collider at CERN" Graduation with honors: • Summa cum laude. • Distinguished Dissertation Medal "AGH Diamonds" 2009–2010 Studies in Physics & Astronomy, Jagiellonian University, Krakow, Poland, Individual studies at the Faculty of Physics, Astronomy and Applied Computer Science Secondary School, Ruda Śląska, Poland, 2003-2006 Finished with greatest honors

# **Professional and Scientific Experience**

- 2021-present Scalable Parallel Computing Lab, ETH Zürich, Zürich, Switzerland, Senior Researcher, Scalable Parallel Computing Laboratory (SPCL), Institute of Computer Systems, Department of Computer Science. Leading research on generative AI & sparse graph computations at SPCL; see "Research Interests" & "Publications" Sections for more details
- 2021-present **ETH Future Computing Lab, ETH Zürich**, *Zürich, Switzerland*, Senior Researcher at the ETH Future Computing Lab (EFCL), leading interdisciplinary projects spanning SPCL/EFCL and industry partners
  - 2013–2021 **ETH Zürich**, *Zürich, Switzerland*, Research Assistant in Scalable Parallel Computing Laboratory (SPCL), Institute of Computer Systems, Department of Computer Science, Research in High-Performance Computing; see "Research Interests" & "Publications" Sections
    - 2013 **ETH Zürich**, *Zürich*, *Switzerland*, Intern in Scalable Parallel Computing Laboratory (SPCL), Institute of Computer Systems, Department of Computer Science, Research in High-Performance Computing; see "Research Interests" & "Publications" Sections
  - 2011–2012 **CERN (European Organization for Nuclear Research)**, *Geneva, Switzerland*, Software developer in the TOTEM Experiment, responsible for the development and maintenance of the TOTEM event display system for the online data preview, Selection of technologies involved: C++, Python, OpenGL, ROOT
  - 2011–2012 **Phi Fiduciaire**, *Geneva, Switzerland*, Consultant, responsible for: the analysis and development of a financial simulational system, management of software undertakings and projects, Selection of technologies involved: MATLAB, Java
  - 2011–2012 **EaglesWings**, *Geneva, Switzerland*, Creation and management (as a project leader) of EaglesWings: Polish Software Developers Platform for establishing interactions between Swiss corporations and Polish computer science specialists. Main focus: project management, analysis of user requirements

# 2010–2011 CERN (European Organization for Nuclear Research), Geneva, Switzerland,

Technical Student in the Engineering Department, responsible for: the development of the magnets information system for FLUKA (Monte Carlo Particle Physics package) for the simulational needs of the Large Hadron Collider (LHC), reconstruction of the LHC tunnel geometry description for FLUKA, construction of a system for project management at FLUKA,

Selection of technologies involved: Python, Bottle web framework, bash, awk, Flair

# 2009–2010 CERN (European Organization for Nuclear Research), Geneva, Switzerland,

Software developer in the TOTEM Experiment, responsible for the development of the TOTEM event display system for the offline data analysis,

Selection of technologies involved: C++, Python, requirements analysis, OO analysis & design, OpenGL, ROOT

# Selection of Awards and Honors (major ones underlined)

# 2024 HiPEAC Technology Transfer Award, Barcelona, Spain,

"The HiPEAC Technology Transfer Awards were launched (...) to recognize and encourage the transfer of leading-edge technologies from academia to industry."

#### 2024 IEEE TCHPC Award for Excellence in High-Performance Computing (Early Career), Atlanta, US,

"This award recognizes up to 3 individuals who have made outstanding, influential, and potentially long-lasting contributions in the field of high-performance computing within 5 years of receiving their PhD degree (...). It is sponsored by the IEEE Computer Society Technical Community on High-Performance Computing (TCHPC) and its member Technical Committees: Technical Committee on Parallel Process (TCPP), Technical Committee on Computer Communications (TCCC), Technical Committee on Distributed Processing (TCDP), Technical Committee on Cloud Computing (TCCLD), Task Force on Rebooting Computing (TFRC), Technical Committee on Computational Life Sciences (TCCLS)."

## 2024 OlympusMons Award,

A core member of the team awarded for the achievement "Network-Accelerated Distributed Storage Systems and Databases". "The OlympusMons awards (...) recognize and encourage foundational data storage research and nurture collaboration between industry, academia, and research"

# 2023 IEEE TCSC Award for Excellence in Scalable Computing "Young Achiever" (Early Career), <u>Melbourne, Australia</u>,

The IEEE TCSC (Technical Committee on Scalable Computing) Award (...) recognizes up to 5 individuals who have made outstanding, influential, and potentially long-lasting contributions in the field of scalable computing. "For contributions to graph machine learning and graph processing that enable simultaneous achievement of scalability, high performance, and high productivity."

2023 Best Paper Finalist at ACM/IEEE Supercomputing (SC23), Denver, USA

# 2022 Best Paper Award at ACM/IEEE Supercomputing (SC22), Dallas, USA,

for the paper "ProbGraph: High-Performance & High-Accuracy Graph Mining with Probabilistic Set Representations"

2022 Best Paper Finalist at ACM/IEEE Supercomputing (SC22), Dallas, USA, for the paper "Building Blocks for Network-Accelerated Distributed File Systems"

# 2022 Fellow of the Explorers Club, New York, US, Elected as a Fellow of the Explorers Club, an international multidisciplinary professional society focusing on scientific exploration, field research and Earth sciences, and resource conservation

2022 ACM SIGHPC Outstanding Doctoral Dissertation Award, Dallas, US, Selected by the ACM SIGHPC as the best doctoral dissertation in High-Performance Computing worldwide, "for his outstanding contributions that demonstrate how to simultaneously achieve high performance, large scale, and programmability in highly challenging and relevant irregular computations"

#### 2022 SPEC Kaivalya Dixit Distinguished Dissertation Award (Honorable Mention),

Selected by the Standard Performance Evaluation Corporation. "The SPEC Kaivalya Dixit Distinguished Dissertation Award aims to recognize outstanding doctoral dissertations in the field of computer benchmarking, performance evaluation, and experimental system analysis in general."

# 2021 IEEE TCSC Outstanding PhD Dissertation Award, Haikou, Hainan, China,

Selected by the IEEE Technical Committee on Scalable Computing (TCSC)

"The IEEE TCSC Outstanding PhD Dissertation Award is an annual award to recognize candidates that (...) have written an outstanding PhD dissertation in the field of the scalable computing with applications. This award is established to encourage doctoral research that combines theory and practice or makes in-depth technical contributions."

2021 ETH Medal, ETH Zürich, Zürich, Switzerland, "for an outstanding doctoral thesis"

- 2020 Invited Paper (to ACM Transactions on Reconfigurable Technology and Systems, Special Issue)
- 2019 Best Paper Finalist & Best Student Paper Finalist at ACM/IEEE Supercomputing, Denver, CO, USA, for the paper "Slim Graph: Practical Lossy Graph Compression for Approximate Graph Processing, Storage, and Analytics"
- 2019 Best Student Paper Award & Best Paper Finalist at ACM/IEEE Supercomputing, Denver, CO, USA, for the paper "Red-Blue Pebbling Revisited: Near Optimal Parallel Matrix Multiplication"
- 2019 ACM/SIGDA Student Travel Award at FPGA'19, Monterey, CA, US
- 2019 Best Paper Finalist at ACM/SIGDA FPGA'19, Monterey, CA, US
- 2018 ACM SIGARCH Student Travel Award at PACT'18, Limassol, Cyprus
- 2018 ACM Research Highlights, paper published in the Communications of the ACM Research Highlights
- 2018 HiPEAC Paper Award, Awarded by the HiPEAC Steering Committee for an ASPLOS'18 paper
- 2018 ACM SIGARCH Student Travel Award at ASPLOS'18, Williamsburg, VA, USA
- 2017 ACM Student Travel Award at HPDC'17, Washington, USA
- 2017 IEEE Student Travel Award at IPDPS'17, Orlando, FL, USA
- 2017 SIGHPC Student Scholarship, San Francisco, USA
- 2017 IPDPS'17 PhD Forum Participation Winner, Orlando, Florida, USA
- 2016 Best Paper Award at ACM HPDC'16
- 2016 ACM Student Travel Award at HPDC'16, Kyoto, Japan
- 2015 ACM/IEEE-CS George Micheal Memorial HPC Fellowship, Austin, Texas, USA, "The fellowship honors exceptional PhD students throughout the world whose research focus areas are in high-performance computing, networking, storage, and large-scale data analysis."
- 2015 Best Paper Award at ACM HPDC/FCRC'15
- 2014 Best Student Paper Award at ACM/IEEE Supercomputing 2014
- 2014 Best Paper Finalist at ACM HPDC'14
- 2014 ACM Student Travel Award at HPDC'14, Vancouver, Canada
- 2013 Best Paper Award & Best Student Paper Finalist at ACM/IEEE Supercomputing 2013
- 2013 **Google European Doctoral Fellowship**, Zürich, Switzerland, The first Google Fellowship in Parallel Computing. "Google Fellowship students are a select group recognized by Google researchers and their institutions as some of the most promising young academics in the world."
- 2013 Distinguished MSc Thesis Award ("AGH Diamonds"), AGH-UST, Krakow, Poland
- 2012 Honorary AGH Graduation "Summa cum laude", AGH-UST, Krakow, Poland
- 2012 <u>"Student Nobel Prize"</u>, Warsaw, Poland, Winner of the national competition for the <u>Best Student of Poland</u>
- 2010 **Polish Education Minister's Scholarship**, *Warsaw, Poland*, National-level scholarship, awarded for exceptional academic and scientific achievements (for 2010/2011)
- 2010 **"Sapere Auso" Academic Scholarship**, *Krakow, Poland*, Regional-level scholarship, awarded for exceptional academic and scientific achievements (for 2010/2011)
- 2009 **Polish Education Minister's Scholarship**, *Warsaw, Poland*, National-level scholarship, awarded for exceptional academic and scientific achievements (for 2009/2010)
- 2009 **"Sapere Auso" Academic Scholarship**, *Krakow, Poland*, Regional-level scholarship, awarded for exceptional academic and scientific achievements (for 2009/2010)
- 2007-2010 **University distinctions**, *Krakow, Poland*, Distinctions awarded for exceptional academic results
- 2007-2010 **University scholarships**, *Krakow, Poland*, Scholarships awarded for exceptional academic results
  - 2006 National Mathematical Competition Winner, Poznań, Poland
  - 2005 Polish Prime Minister's Scholarship, Warsaw, Poland, National-level scholarship for outstanding education results

# Summary of Research Profile

I lead research on generative AI and sparse graph computations; I also work on network topologies and occasionally other aspects of the high-performance computing landscape. Example workloads of interest are training and inference of large language models and graph neural networks, broad graph machine learning, prompting and agents, graph databases, graph streaming, and classical graph algorithms. I am interested in all major aspects of these computations, namely *processing*, *storage*, and *analytics*; "Processing" broadly indicates any transformations applied to the datasets, "storage" widely refers to any challenges related to how the datasets are represented or stored, and "analytics" names any form of activity targeted at extracting insights (scientific/business/industry) from the considered datasets.

I approach the associated problems holistically at different levels of the computing stack, working on (1) hardware architectures, and (2) interconnects, (3) middleware (frameworks, OS, runtimes), (4) algorithms, and (5) models, abstractions, & paradigms. The common aspect of these efforts is not only to solve a practical problem, but also to understand better the underlying fundamental properties of a given problem, system, phenomenon, or solution. This is done with performance modeling or any other formal way of describing a [given subspace] of reality.

I am also interested in the business perspective of the challenges behind graph computations, i.e., the "Five V's" of large-scale data processing: Volume (large sizes of stored and processed datasets), Velocity (high speeds of data generation, collection, or analysis), Variety (different types of processed datasets), Value (useful information in the gathered data), and Veracity (overall level of reliability of the gathered data).



figure 1: Authored publications together with their most relevant part of the computing & analytics stack.

# Full–Length Publications

**Total:** 53 papers (44 top conference papers, 9 top journal papers), 34 h-index, 49 i10-index, 6 best paper awards, 14 best paper finals in total, 3 other paper related research highlights.

# Legend:

 $\bigcirc$  – a conference paper,  $\bigcirc$  – a journal paper,  $\bigcirc$  – a report,

O – best paper award, best student paper award, or research highlights,

— best paper finalist, best student paper finalist, or another form of paper distinction,

A – an arXiv paper or an extension of a conference/journal paper,

**Note on proceedings vs. journals**: Many areas in computer science evolve **very** rapidly. Thus, conference proceedings are very often a principal publication method; they undergo the same rigorous peer review as journal publications

# Unless stated otherwise, first authorship indicates primary leading & technical contributions.

# 2025:

- arXiv'25 A. Besta, S. Chandran, J. Cudak, P. Iff, M. Copik, R. Gerstenberger, T. Szydlo, J. Müller, T. Hoefler.
   "Higher-Order Graph Databases", Link (arXiv): https://arxiv.org/pdf/2506.19661
- arXiv'25 A. Besta, P. Iff, M. Schneider, N. Blach, A. Maissen, S. Di Girolamo, J. Domke, J. Krattenmacher, A. Singla, K. Lakhotia, L. Monroe, F. Petrini, R. Gerstenberger, T. Hoefler. "EvalNet: A Practical Toolchain for Generation and Analysis of Extreme-Scale Interconnects", Link (arXiv): https://arxiv.org/pdf/2105.12663
- arXiv'25 A. M. Besta, L. Paleari, J. H. A. Jiang, R. Gerstenberger, Y. Wu, P. Iff, A. Kubicek, P. Nyczyk, D. Khimey, J. G. Hannesson, G. Kwaśniewski, M. Copik, H. Niewiadomski, T. Hoefler. "Affordable AI Assistants with Knowledge Graph of Thoughts", Link (arXiv): https://arxiv.org/pdf/2504.02670
- arXiv'25 (A. Besta, J. Barth, E. Schreiber, A. Kubicek, A. Catarino, R. Gerstenberger, P. Nyczyk, P. Iff, Y. Li, S. Houliston, T. Sternal, M. Copik, G. Kwaśniewski, J. Müller, Ł. Flis, H. Eberhard, H. Niewiadomski, T. Hoefler. "Reasoning Language Models: A Blueprint", Link (arXiv): https://arxiv.org/pdf/2501.11223
- arXiv'25 A P. Iff, <u>M. Besta</u>, T. Hoefler. "FoldedHexaTorus: An Inter-Chiplet Interconnect Topology for Chiplet-based Systems using Organic and Glass Substrates", *Link (arXiv):* https://arxiv.org/pdf/2504.19878
  - CF'25 @+A P. Iff, B. Bruggmann, <u>M. Besta</u>, L. Benini, T. Hoefler. "RapidChiplet: A Toolchain for Rapid Design Space Exploration of Chiplet Architectures", Proceedings of the 22nd ACM International Conference on Computing Frontiers (CF'25), Link (arXiv): https://arxiv.org/pdf/2311.06081.pdf,
- IPDPS'25 @+@ L. Gianinazzi, T. Ben-Nun, <u>M. Besta</u>, S. Ashkboos, Y. Baumann, P. Luczynski, T. Hoefler. "Energy-Optimal and Low-Depth Algorithmic Primitives for Spatial Dataflow Architectures", Proceedings of the 39th IEEE International Parallel and Distributed Processing Symposium (IPDPS'25),

#### 2024:

arXiv'24 (A M. Besta, R. Gerstenberger, P. Iff, P. Sonawane, J. Gómez Luna, R. Kanakagiri, R. Min, O. Mutlu, T. Hoefler, R. Appuswamy, A. O Mahony. "Hardware Acceleration for Knowledge Graph Processing: Challenges & Recent Developments",

Link (arXiv): https://arxiv.org/pdf/2408.12173

arXiv'24 (A. <u>M. Besta</u>, F. Scheidl, L. Gianinazzi, S. Klaiman, J. Müller, T. Hoefler. "Demystifying Higher-Order Graph Neural Networks", Link (arXiv): https://arxiv.org/adf/2406.12841

*Link (arXiv):* https://arxiv.org/pdf/2406.12841

arXiv'24 (A. <u>M. Besta</u>, A. Kubicek, R. Niggli, R. Gerstenberger, L. Weitzendorf, M. Chi, P. Iff, J. Gajda, P. Nyczyk, J. Müller, H. Niewiadomski, M. Chrapek, M. Podstawski, T. Hoefler. "Multi-Head RAG: Solving Multi-Aspect Problems with LLMs",

*Link (arXiv):* https://arxiv.org/pdf/2406.05085

- arXiv'24 A M. Besta, L. Paleari, A. Kubicek, P. Nyczyk, R. Gerstenberger, P. Iff, T. Lehmann, H. Niewiadomski, T. Hoefler. "CheckEmbed: Effective Verification of LLM Solutions to Open-Ended Tasks", Link (arXiv): https://arxiv.org/pdf/2406.02524
- arXiv'24 A. Besta, F. Memedi, Z. Zhang, R. Gerstenberger, N. Blach, P. Nyczyk, M. Copik, G. Kwaśniewski, J. Müller, L. Gianinazzi, A. Kubicek, H. Niewiadomski, O. Mutlu, T. Hoefler. "Demystifying Chains, Trees, and Graphs of Thoughts", *Link (arXiv): http://arxiv.org/ndf/2401.14205.ndf*

Link (arXiv): http://arxiv.org/pdf/2401.14295.pdf

- AAAI'24 @+@ M. Besta, N. Blach, A. Kubicek, R. Gerstenberger, J. Gajda, T. Lehmann, M. Podstawski, H. Niewiadomski, P. Nyczyk, T. Hoefler. "Graph of Thoughts: Solving Elaborate Problems with Large Language Models", Proceedings of the 38th Annual AAAI Conference on Artificial Intelligence, Link (arXiv): https://arxiv.org/pdf/2308.09687.pdf,
- NSDI'24 @+A N. Blach, <u>M. Besta</u>, D. De Sensi, J. Domke, H. Harake, S. Li, P. Iff, M. Konieczny, K. Lakhotia, A. Kubicek, M. Ferrari, F. Petrini, T. Hoefler. "A High-Performance Design, Implementation, Deployment, and Evaluation of The Slim Fly Network", Proceedings of the 21st USENIX Symposium on Networked Systems Design and Implementation (NSDI'24), Link (arXiv): https://arxiv.org/pdf/2310.03742.pdf,
  - SC'24 C+A P. Okanovic, G. Kwasniewski, P. S. Labini, <u>M. Besta</u>, F. Vella, T. Hoefler. "High Performance Unstructured SpMM Computation Using Tensor Cores", Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (Supercomputing'24), (acceptance rate: 22.7%),
- IPDPS'24 O+A Y. Baumann, T. Ben-Nun, <u>M. Besta</u>, L. Gianinazzi, T. Hoefler, P. Luczynski. "Low-Depth Spatial Tree Algorithms", Proceedings of the 38th IEEE International Parallel and Distributed Processing Symposium (IPDPS'24),

Link (arXiv): https://arxiv.org/pdf/2404.12953,

- SPAA'24 @+A K. Lakhotia, L. Monroe, K. Isham, <u>M. Besta</u>, N. Blach, T. Hoefler, F. Petrini. "PolarStar: Expanding the Scalability Horizon of Diameter-3 Networks", Proceedings of the 36th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA'24), Link (arXiv): https://arxiv.org/pdf/2302.07217.pdf,
- PPoPP'24 C. Gianinazzi, A. N. Ziogas, P. Luczynski, L. Huang, S. Ashkboosh, F. Scheidl, A. Carigiet, C. Ge, N. Abubaker, <u>M. Besta</u>, T. Ben-Nun, T. Hoefler. "Arrow Matrix Decomposition: A Novel Approach for Communication-Efficient Sparse Matrix Multiplication", Proceedings of the 29th ACM SIGPLAN symposium on Principles and Practice of Parallel Programming 2024 (PPoPP'24),

# 2023:

- LoG'23 O+A M. Besta, A. C. Catarino, L. Gianinazzi, N. Blach, P. Nyczyk, H. Niewiadomski, T. Hoefler. "HOT: Higher-Order Dynamic Graph Representation Learning with Efficient Transformers", Proceedings of the Learning on Graphs Conference (LoG'23), Link (arXiv): https://arxiv.org/pdf/2311.18526.pdf,
- **TPAMI U**+**(A)** <u>M. Besta</u>, T. Hoefler. "Parallel and Distributed Graph Neural Networks: An In-Depth Concurrency Analysis", *IEEE Transactions on Pattern Analysis and Machine Intelligence*, *Link (arXiv):* https://arxiv.org/pdf/2205.09702.pdf,
- CSUR ()+(A) M. Besta, R. Gerstenberger, E. Peter, M. Fischer, M. Podstawski, C. Barthels, G. Alonso, T. Hoefler. "Demystifying Graph Databases: Analysis and Taxonomy of Data Organization, System Designs, and Graph Queries", ACM Computing Surveys (CSUR), Link (arXiv): https://arxiv.org/pdf/1910.09017.pdf,
- SC'23a O+A M. Besta, R. Gerstenberger, M. Fischer, M. Podstawski, N. Blach, B. Egeli, G. Mitenkov, W. Chlapek, M. Michalewicz, H. Niewiadomski, J. Müller, T. Hoefler. "The Graph Database Interface: Scaling Online Transactional and Analytical Graph Workloads to Hundreds of Thousands of Cores", Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (Supercomputing'23), (acceptance rate: 23.9%), Best Paper Finalist A.

Link (arXiv): https://arxiv.org/pdf/2305.11162.pdf,

- SC'23b C M. Besta, P. Renc, R. Gerstenberger, P. S. Labini, A. Ziogas, T. Chen, L. Gianinazzi, F. Scheidl, K. Szenes, A. Carigiet, P. Iff, G. Kwasniewski, R. Kanakagiri, C. Ge, S. Jaeger, J. Wąs, F. Vella, T. Hoefler. "High-Performance and Programmable Attentional Graph Neural Networks with Global Tensor Formulations", Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (Supercomputing'23), (acceptance rate: 23.9%),
- Report **R** <u>M. Besta</u>, R. Gerstenberger, N. Blach, M. Fischer, T. Hoefler. "GDI: A Graph Database Interface Standard", https://spcl.inf.ethz.ch/Research/Parallel\_Programming/GDI/gdi\_v0.1.pdf, *Research Report from ETH Zurich*
- SPAA'23 G K. Lakhotia, K. Isham, L. Monroe, <u>M. Besta</u>, T. Hoefler, F. Petrini. "In-network Allreduce with Multiple Spanning Trees on PolarFly", Proceedings of the 35th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA'23),
- arXiv'23b (A) J. Bazinska, A. Ivanov, T. Ben-Nun, N. Dryden, <u>M. Besta</u>, S. Shen, T. Hoefler. "Cached Operator Reordering: A Unified View for Fast GNN Training", *Link (arXiv):* https://arxiv.org/pdf/2308.12093.pdf,
- DAC'23a @+A P. Iff, <u>M. Besta</u>, M. Cavalcante, T. Fischer, L. Benini, T. Hoefler. "Sparse Hamming Graph: A Customizable Network-on-Chip Topology", *Proceedings of the Annual Design Automation Conference (DAC'23)*, *Link (arXiv):* https://arxiv.org/pdf/2211.13980.pdf,
- DAC'23b @+@ P. Iff, <u>M. Besta</u>, M. Cavalcante, T. Fischer, L. Benini, T. Hoefler. "HexaMesh: Scaling to Hundreds of Chiplets with an Optimized Chiplet Arrangement", *Proceedings of the Annual Design Automation Conference* (*DAC'23*),

Link (arXiv): https://arxiv.org/pdf/2211.13989.pdf,

TPDS'23 U+A M. Besta, M. Fischer, V. Kalavri, M. Kapralov, T. Hoefler. "Practice of Streaming Processing of Dynamic Graphs: Concepts, Models, and Systems", IEEE Transactions on Parallel and Distributed Systems (TPDS), (TPDS),

Link (arXiv): https://arxiv.org/pdf/1912.12740.pdf,

#### 2022:

- LoG'22 O+A M. Besta, P. Iff, F. Scheidl, K. Osawa, N. Dryden, M. Podstawski, T. Chen, T. Hoefler. "Neural Graph Databases", Proceedings of the Learning on Graphs Conference (LoG'22), Link (arXiv): https://arxiv.org/pdf/2209.09732.pdf,
- arXiv'22 A L. Gianinazzi, T. Ben-Nun, <u>M. Besta</u>, S. Ashkboos, Y. Baumann, P. Luczynski, T. Hoefler. "The spatial computer: A model for energy-efficient parallel computation", *Link (arXiv):* https://arxiv.org/pdf/2205.04934.pdf,
- SC'22a @+@ M. Besta, C. Miglioli, P. Sylos Labini, J. Tětek, P. Iff, R. Kanakagiri, S. Ashkboos, K. Janda, M. Podstawski, G. Kwasniewski, N. Gleinig, F. Vella, O. Mutlu, T. Hoefler. "ProbGraph: High-Performance and High-Accuracy Graph Mining with Probabilistic Set Representations", Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (Supercomputing'22), (acceptance rate: 23.4%),
  - Best Paper Award 🥥,

Link (arXiv): https://arxiv.org/pdf/2208.11469.pdf,

- SC'22b @+A K. Lakhotia, M. Besta, P. Iff, K. Isham, T. Hoefler, L. Monroe, F. Petrini. "PolarFly: A Cost-Effective and Flexible Low-Diameter Topology", Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (Supercomputing'22), (acceptance rate: 23.4%), Link (arXiv): https://arxiv.org/pdf/2208.01695.pdf,
- - Best Paper Finalist 🔘,

Link (arXiv): https://arxiv.org/pdf/2206.10007,

- KDD'22 @+@ M. Besta, R. Grob, C. Miglioli, N. Bernold, G. Kwasniewski, G. Gjini, R. Kanakagiri, S. Ashkboos, L. Gianinazzi, N. Dryden, T. Hoefler. "Motif Prediction with Graph Neural Networks", Proceedings of the 28th SIGKDD Conference on Knowledge Discovery and Data Mining (KDD'22), (acceptance rate: 14.9%), Link (arXiv): https://arxiv.org/pdf/2106.00761.pdf,
- IPDPS'22a @+A A. Strausz, F. Vella, S. Di Girolamo, <u>M. Besta</u>, T. Hoefler. "Asynchronous Distributed-Memory Triangle Counting and LCC with RMA Caching", Proceedings of the 36th IEEE International Parallel and Distributed Processing Symposium (IPDPS'22), Link (arXiv): https://arxiv.org/pdf/2202.13976.pdf,

IPDPS'22b C N. Gleinig, <u>M. Besta</u>, T. Hoefler. "I/O-Optimal Cache-Oblivious Sparse Matrix-Sparse Matrix Multiplication", Proceedings of the 36th IEEE International Parallel and Distributed Processing Symposium (IPDPS'22),

# 2021:

- TPDS'21a ①+④ M. Besta, J. Domke, M. Schneider, M. Konieczny, S. Di Girolamo, T. Schneider, A. Singla, T. Hoefler. "High-Performance Routing with Multipathing and Path Diversity in Ethernet and HPC Networks", IEEE Transactions on Parallel and Distributed Systems (TPDS), Link (arXiv): https://arxiv.org/pdf/2007.03776.pdf,
- **TPDS'21b** J. de Fine Licht, <u>M. Besta</u>, S. Meierhans, T. Hoefler. "Transformations of High-Level Synthesis Codes for High-Performance Computing", *IEEE Transactions on Parallel and Distributed Systems (TPDS)*, *Link (arXiv):* https://arxiv.org/pdf/1805.08288.pdf,
- MICRO'21 ()+(A) M. Besta, R. Kanakagiri, G. Kwasniewski, R. Ausavarungnirun, J. Beránek, K. Kanellopoulos, K. Janda, Z. Vonarburg-Shmaria, L. Gianinazzi, I. Stefan, J. Gómez-Luna, N. Blach, M. Copik, L. Kapp-Schwoerer, S. Di Girolamo, M. Konieczny, O. Mutlu, T. Hoefler. "SISA: Set-Centric Instruction Set Architecture for Graph Mining on Processing-in-Memory Systems", Proceedings of the 54th IEEE/ACM International Symposium on Microarchitecture (MICRO),

Link (arXiv): https://arxiv.org/pdf/2104.07582.pdf,

Link (arXiv): https://arxiv.org/pdf/2103.03653.pdf,

SPAA'21a O+A L. Gianinazzi, <u>M. Besta</u>, Y. Schaffner, T. Hoefler. "Parallel Algorithms for Finding Large Cliques in Sparse Graphs", Proceedings of the 33th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA'21),

Link (arXiv): https://arxiv.org/pdf/2109.09663.pdf,

SPAA'21b G. Kwasniewski, T. Ben-Nun, L. Gianinazzi, A. Calotoiu, T. Schneider, A. N. Ziogas, <u>M. Besta</u>, T. Hoefler. "Pebbles, Graphs, and a Pinch of Combinatorics: Towards Tight I/O Lower Bounds for Statically Analyzable Programs", Proceedings of the 33th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA'21),

Link (arXiv): https://arxiv.org/pdf/2105.07203.pdf,

- SC'21 G+A G. Kwasniewski, M. Kabic, T. Ben-Nun, A. N. Ziogas, J. E. Saethre, A. Gaillard, T. Schneider, <u>M. Besta</u>, A. Kozhevnikov, J. VandeVondele, T. Hoefler. "On the Parallel I/O Optimality of Linear Algebra Kernels: Near-Optimal Matrix Factorizations", Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (Supercomputing'21), (acceptance rate: 25.9%), Link (arXiv): https://arxiv.org/pdf/2108.09337.pdf,
- Middleware
   '21 Suite for Function-as-a-Service Computing'', Proceedings of the 22nd ACM/IFIP International Conference on Middleware,

Link (arXiv): https://arxiv.org/pdf/2012.14132.pdf,

- CACM'21 (J+(A) S. Sakr, A. Bonifati, H. Voigt, A. Iosup, ..., <u>M. Besta</u>, .... "The Future is Big Graphs! A Community View on Graph Processing Systems", *Communications of the ACM*, *Link (arXiv):* https://arxiv.org/pdf/2012.06171.pdf,
- arXiv'21b (R+(A) M. Besta, M.Schneider, S. Di Girolamo, A. Singla, T. Hoefler. "Towards Million-Server Network Simulations on Just a Laptop", Link (arXiv): https://arxiv.org/pdf/2105.12663.pdf,
- arXiv'21d R+A L. Gianinazzi, M. Fries, N. Dryden, T. Ben-Nun, <u>M. Besta</u>, T. Hoefler. "Learning Combinatorial Graph Labeling Algorithms",

Link (arXiv): https://arxiv.org/pdf/2106.03594.pdf,

# 2020:

SC'20a C+A M. Besta, A. Carigiet, Z. Vonarburg-Shmaria, K. Janda, L. Gianinazzi, T. Hoefler. "High-Performance Parallel Graph Coloring with Strong Guarantees on Work, Depth, and Quality", Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (Supercomputing'20), (acceptance rate: 25.1%),

Link (arXiv): https://arxiv.org/pdf/2008.11321.pdf,

- SC'20b O+A M. Besta, M. Schneider, K. Cynk, M. Konieczny, E. Henriksson, S. Di Girolamo, A. Singla, T. Hoefler. "FatPaths: Routing in Supercomputers and Datacenters when Shortest Paths Fall Short", Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (Supercomputing'20), (acceptance rate: 25.1%), Link (arXiv): https://arxiv.org/pdf/1906.10885.pdf,
- IPDPS'20 C+A M. Besta, R. Kanakagiri, H. Mustafa, M. Karasikov, G. Rätsch, T. Hoefler, E. Solomonik. "Communication-Efficient Jaccard Similarity for High-Performance Distributed Genome Comparisons", Proceedings of the 34th IEEE International Parallel and Distributed Processing Symposium (IPDPS'20), Link (arXiv): https://arxiv.org/pdf/1911.04200.pdf,
- **TRETS'20 M. Besta**, M. Fischer, T. Ben-Nun, J. De Fine Licht, T. Hoefler. "Substream-Centric Maximum Matchings on FPGA", Proceedings of the ACM Transactions on Reconfigurable Technology and Systems (TRETS), Special Issue, invited paper ,

Link (arXiv): https://arxiv.org/pdf/2010.14684.pdf,

# 2019:

SC'19a O+A M. Besta, S. Weber, L. Gianinazzi, R. Gerstenberger, A. Ivanov, Y. Oltchik, T. Hoefler. "Slim Graph: Practical Lossy Graph Compression for Approximate Graph Processing, Storage, and Analytics", Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (Supercomputing'19), (acceptance rate: 22.7%),
 Best Denser Singlist A. Best Student Person Finalist

Best Paper Finalist Link (arXiv): https://arxiv.org/pdf/1912.08950.pdf,

**SC'19b (G)**+**(A)** G. Kwasniewski, M. Kabic, **M. Besta**, R. Solca, J. VandeVondele, T. Hoefler: "Red-Blue Pebbling Revisited: Near Optimal Parallel Matrix Multiplication", Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (Supercomputing'19), (acceptance rate: 22.7%),

Best Paper Finalist Link (arXiv): https://arxiv.org/pdf/1908.09606.pdf,

- SC'19c O+A S. Di Girolamo, K. Taranov, A. Kurth, M. Schaffner, T. Schneider, J. Beranek, <u>M. Besta</u>, L. Benini, D. Roweth, T. Hoefler. "Network-Accelerated Non-Contiguous Memory Transfers", Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (Supercomputing'19), (acceptance rate: 22.7%), Link (arXiv): https://arxiv.org/pdf/1908.08590.pdf,
- IPDPS'19 C+A T. Ben-Nun, M. Besta, S. Huber, A. N. Ziogas, D. Peter, T. Hoefler. "A Modular Benchmarking Infrastructure for High-Performance and Reproducible Deep Learning", Proceedings of the 33rd IEEE International Parallel and Distributed Processing Symposium (IPDPS'19), Link (arXiv): https://arxiv.org/pdf/1901.10183.pdf,
- FPGA'19 @+@ M. Besta, M. Fischer, T. Ben-Nun, J. De Fine Licht, T. Hoefler. "Substream-Centric Maximum Matchings on FPGA", Proceedings of the 27th ACM/SIGDA International Symposium on Field-Programmable Gate Arrays, (acceptance rate: 23%), Best Paper Finalist (4/30) , Link (arXiv): https://arxiv.org/pdf/2010.14684.pdf,
- arXiv'19b A M. Besta, D. Stanojevic, J. De Fine Licht, T. Ben-Nun, T. Hoefler. "Graph Processing on FPGAs: Taxonomy, Survey, Challenges", Link (arXiv): https://arxiv.org/pdf/1903.06697.pdf,

# 2018:

**PACT'18** (D+A) M. Besta, D. Stanojevic, T. Zivic, J. Singh, M. Hörold, T. Hoefler. "Log(Graph): A Near-Optimal High-Performance Graph Representation", Proceedings of the 27th International Conference on Parallel Architectures and Compilation, (acceptance rate: 29%, 36/126), Link (arXiv): https://arxiv.org/pdf/2010.15879.pdf, ASPLOS'18 (G+(A) M. Besta, S. M. Hassan, S. Yalamanchili, R. Ausavarungnirun, O. Mutlu, T. Hoefler. "Slim NoC: A Low-Diameter On-Chip Network Topology for High Energy-Efficiency and Scalability", Proceedings of the 23rd ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS '18), (acceptance rate: 18.2%), HiPEAC Paper Award,

Link (arXiv): https://arxiv.org/pdf/2010.10683.pdf,

- PPoPP'18 C L. Gianinazzi, P. Kalvoda, A. De Palma, M. Besta, T. Hoefler. "Communication-Avoiding Minimum Cuts and Connected Components", Proceedings of the 23rd ACM SIGPLAN symposium on Principles and Practice of Parallel Programming 2018 (PPoPP'18), (acceptance rate: 20%),
- CACM'18 D. R. Gerstenberger, M. Besta, T. Hoefler. "Enabling Highly-Scalable Remote Memory Access Programming with MPI-3 One Sided", Communications of the ACM, October issue of 2018, Article in the "Research Highlights" Section (),
- arXiv'18 A M. Besta, T. Hoefler. "Survey and Taxonomy of Lossless Graph Compression and Space-Efficient Graph Representations",

Link (arXiv): https://arxiv.org/pdf/1806.01799.pdf,

# 2017:

- SC'17 C+A E. Solomonik, M. Besta, F. Vella, T. Hoefler. "Scaling Betweenness Centrality using Communication-Efficient Sparse Matrix Multiplication", Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (Supercomputing'17), (acceptance rate: 18.6%), Link (arXiv): https://arxiv.org/pdf/1609.07008.pdf,
- HPDC'17 (G+(A) M. Besta, M. Podstawski, L. Groner, E. Solomonik, T. Hoefler. "To Push or To Pull: On Reducing Communication and Synchronization in Graph Computations", Proceedings of the 26th ACM International Symposium on High-Performance Parallel and Distributed Computing (HPDC'17), (acceptance rate: 19%), Link (arXiv): https://arxiv.org/pdf/2010.16012.pdf,
- IPDPS'17 (C+A) M. Besta, F. Marending, E. Solomonik, T. Hoefler. "SlimSell: A Vectorizable Graph Representation for Breadth-First Search", Proceedings of the 31st IEEE International Parallel and Distributed Processing Symposium (IPDPS'17), (acceptance rate: 25%), Link (arXiv): https://arxiv.org/pdf/2010.09913.pdf,

# 2016:

arXiv'16 (A) E. Solomonik, M. Besta, F. Vella, T. Hoefler. "Betweenness Centrality is more Parallelizable than Dense Matrix Multiplication",

Link (arXiv): https://arxiv.org/pdf/1609.07008.pdf,

**HPDC'16** (G+A) [First two authors contributed equally to the work] P. Schmid, M. Besta, T. Hoefler. "High-Performance Distributed RMA Locks", Proceedings of the 25th ACM International Symposium on High-Performance Parallel and Distributed Computing (HPDC'16), (acceptance rate: 15.5%), Best Paper Award 🥥, Link (arXiv): https://arxiv.org/pdf/2010.09854.pdf,

2015:

- PACT'15 C+A [First two authors contributed equally to the work] H. Schweizer, M. Besta, T. Hoefler. "Evaluating the Cost of Atomic Operations on Modern Architectures", Proceedings of the 24th International Conference on Parallel Architectures and Compilation, (acceptance rate: 21%), Link (arXiv): https://arxiv.org/pdf/2010.09852.pdf,
- HPDC'15 (G+(A) M. Besta, T. Hoefler. "Accelerating Irregular Computations with Hardware Transactional Memory and Active Messages", Proceedings of the 24th ACM International Symposium on High-Performance Parallel and Distributed Computing (HPDC'15), (acceptance rate: 16%), Best Paper Award 🥥, Link (arXiv): https://arxiv.org/pdf/2010.09135.pdf,
  - ICS'15 @+A M. Besta, T. Hoefler. "Active Access: A Mechanism for High-Performance Distributed Data-Centric Computations", Proceedings of the 29th ACM International Conference on Supercomputing (ICS'15), (acceptance rate: 25%),

Link (arXiv): https://arxiv.org/pdf/1910.12897.pdf,

- Scientific'14 (J R. Gerstenberger, <u>M. Besta</u>, T. Hoefler. "Enabling Highly-Scalable Remote Memory Access Programming with MPI-3 One Sided", *Journal of Scientific Computing*, 2014,
  - SC'14 @+@ M. Besta, T. Hoefler. "Slim Fly: A Cost-Effective Low Diameter Network Topology", Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (Supercomputing'14), (acceptance rate: 20%), <u>Best Student Paper Award</u>, <u>Link (arXiv): https://arxiv.org/pdf/1912.08968.pdf</u>,
  - HPDC'14 OHO M. Besta, T. Hoefler. "Fault Tolerance for Remote Memory Access Programming Models", Proceedings of the 23rd ACM Intl. Symposium on High-Performance Parallel and Distributed Computing (HPDC'14), (acceptance rate: 16%), Best Paper Finalist , Link (arXiv): https://arxiv.org/pdf/2010.09025.pdf,
  - PADAL'14 (R A. Tate, ..., M. Besta, .... "Programming Abstractions for Data Locality", , Research Report from the PADAL Workshop 2014 at the Swiss National Supercomputing Center (CSCS)

# 2013:

SC'13 C+A R. Gerstenberger, <u>M. Besta</u>, T. Hoefler. "Enabling Highly-Scalable Remote Memory Access Programming with MPI-3 One Sided", Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (Supercomputing'13), (acceptance rate: 20%), <u>Best Paper Award</u> and <u>Best Student Paper Finalist</u>, Link (arXiv): https://arxiv.org/pdf/2001.07747.pdf,

# Earlier (undergrad):

- **EPL'11** (*Acknowledged for software development work*) The TOTEM Collaboration. "Proton-proton elastic scattering at the LHC energy of  $\sqrt{s} = 7TeV$ ", EPL (Europhysics Letters), volume 95, number 4, pages 41001, 2011,
- ICATPP'09 OV. Avati, M. Berretti, M. Besta, .... "Offline Software for the TOTEM Experiment at the LHC", In Proceedings of the 11th Conference on Astroparticle, Particle and Space Physics, Detectors and Medical Physics Applications, ICATPP'09, pages 658–665, Oct. 2010,
  - EDS'09 G. Antchev, P. Aspell, V. Avati, M. G. Bagliesi, V. Berardi, M. Berretti, <u>M. Besta</u>, .... "Diffraction at TOTEM", In Proc. of the 13th International Conference on Elastic and Diffractive Scattering: Moving Forward into the LHC Era, EDS'09, pages 249–256, Jun.–Jul. 2009

# Short Papers, Workshop Papers, Posters

- PDSW'21 © S. Di Girolamo, D. De Sensi, K. Taranov, M. Malesevic, <u>M. Besta</u>, T. Schneider, S. Kistler, T. Hoefler. "Network-Accelerated Distributed File Systems", Proceedings of the 6th International Parallel Data Systems Workshop (PDSW'21)
- PPoPP'21 G+A G. Kwasniewski, T. Ben-Nun, A. N. Ziogas, T. Schneider, <u>M. Besta</u>, T. Hoefler. "On the Parallel I/O Optimality of Linear Algebra Kernels: Near-Optimal LU Factorization", Proceedings of the 26th ACM SIGPLAN symposium on Principles and Practice of Parallel Programming 2021 (PPoPP'21), Link (arXiv): https://arxiv.org/pdf/2010.05975.pdf
  - Posters IPDPS'17, HPDC'17, ASPLOS'18, ETH Systems Group Industry Retreat 2016, ETH Systems Group Industry Retreat 2017

# Selected Talks

- 2025 The Future of AI and High-Performance Computing: From Graph Intelligence to Ethical Digital Sovereignty, *Keynote talk* at the dissemination workshop "Digital Sovereignty in Evolving Times", Zurich, Switzerland
- 2025 Reasoning Language Models: Overview & Blueprint, Invited talk at CSCS HPC Advisory, Lugano, Switzerland
- 2024 Effective and Efficient LLM Ecosystems, Invited talk at AGH-UST, Krakow, Poland
- 2024 Graph-Enhanced Large Language Models, *Keynote talk* at Machine Learning with Graphs in High Performance Computing Environment at Supercomputing'24, Atlanta, US

- 2024 Effective and Efficient LLM Ecosystems, Invited talk at Weganingen University, Wageningen, Netherlands
- 2024 Effective and Efficient LLM Ecosystems with Graph of Thoughts and Beyond, *Invited talk* at *ZurichAl Meetup*, Zurich, Switzerland
- 2024 Robust Verification and Evaluation of LLM Computations, *Invited talk* at the Trillion Parameter Consortium, Argonne, IL, USA
- 2024 Effective and Efficient LLM Ecosystems, Invited talk at Google Zurich, Zurich, Switzerland
- 2024 Effective and Efficient LLM Ecosystems, Invited talk at AGH-UST, Krakow, Poland
- 2024 From Higher-Order Graph Structures to Dynamic Link Prediction and Beyond, *Invited talk* at the McGill University, online
- 2024 A High-Performance Design, Implementation, Deployment, and Evaluation of The Slim Fly Network, *Invited talk* at CSCS HPC Advisory, Locarno, Switzerland
- 2023 Towards Next-Generation Generative AI with Graphs and Graph Processing, Invited talk at NextSilicon, Israel
- 2023 Chains, Trees, and Graphs of Thoughts: Demystifying Structured-Enhanced Prompting, *Invited talk* at KUIS AI Center at Koç University, Turkey
- 2023 Graph of Thoughts: Solving Elaborate Problems with Large Language Models, *Invited talk* at the EFCL *Mini-Conference*, ETH Zürich, Zürich, Switzerland
- 2023 Chains, Trees, and Graphs of Thoughts: Demystifying Structured-Enhanced Prompting, *Invited talk* at the Dagstuhl Seminar "Scalable Graph Mining and Learning", Dagstuhl, Germany
- 2023 High-Performance and Programmable Attentional Graph Neural Networks with Global Tensor Formulations, *Conference talk at SC'23*, Denver, US
- 2023 The Graph Database Interface: Scaling Online Transactional and Analytical Graph Workloads to Hundreds of Thousands of Cores, *Conference talk* at *SC'23*, Denver, US
- 2023 Network Topologies for Networks-on-Chip and Inter-Chiplet Interconnects, *Invited talk* at the Strategy and *Technology Workshop (STW)*, online
- 2023 Graph of Thoughts: Solving Elaborate Problems with Large Language Models, *Invited talk at AGH-UST*, Krakow, Poland
- 2023 Neural Graph Databases with Graph Neural Networks, *Talk at the Linked Data Benchmark Council (LDBC) TUC workshop SIGMOD'23*, Seattle, US
- 2023 Next-Generation Graph Databases: Neural Reasoning, High Performance, Extreme Scales, *Invited talk* at the Snow Mountain Summit "European Innovation Stars", Brussels, Belgium
- 2023 Next-Generation Graph Databases: Neural Reasoning, High Performance, Extreme Scales, *Invited talk* at the *Innowave workshop*, online
- 2023 Parallel and Distributed Graph Neural Networks: An In-Depth Concurrency Analysis, *Invited talk* at the AGH-UST, Krakow, Poland
- 2023 Motif Prediction with Graph Neural Networks, Invited talk at AGH-UST, Krakow, Poland
- 2023 Enabling High-Performance Large-Scale Irregular Computations, ETH Zürich, Zürich, Switzerland
- 2022 Parallel and Distributed Graph Neural Networks: An In-Depth Concurrency Analysis, *Invited talk* at the Indian Institute of Technology Ropar, India
- 2022 ProbGraph: High-Performance and High-Accuracy Graph Mining with Probabilistic Set Representations, *Conference talk at SC'22*, Dallas, US
- 2022 Parallel and Distributed Graph Neural Networks: An In-Depth Concurrency Analysis, *Invited talk* at the Strategy and Technology Workshop, Dolder, Zürich, Switzerland
- 2022 Parallel and Distributed Graph Neural Networks: An In-Depth Concurrency Analysis, *Invited talk at AGH-UST*, Krakow, Poland
- 2022 Parallel and Distributed Graph Neural Networks: An In-Depth Concurrency Analysis, *Invited talk* at the University of Edinburgh, Edinburgh, UK
- 2022 Motif Prediction with Graph Neural Networks, *Invited talk* at the Zürich Research Center, ETH, Zürich, Switzerland
- 2022 Enabling High-Performance Large-Scale Irregular Computations, Invited talk at AGH-UST, Krakow
- 2021 Enabling High-Performance Large-Scale Irregular Computations, *Invited talk* at the Interdisciplinary Centre for Mathematical and Computational Modelling, Warsaw University, Warsaw
- 2021 Enabling High-Performance Large-Scale Irregular Computations, Invited talk at AGH-UST, Krakow

- 2021 GraphMineSuite: Enabling High-Performance and Programmable Graph Mining Algorithms with Set Algebra, *Conference talk at VLDB'21*, online
- 2021 Enabling High-Performance Large-Scale Irregular Computations, *Invited seminar talk* at University of Belfast, online
- 2021 Enabling High-Performance Large-Scale Irregular Computations , *Keynote talk* at International Conference on Computational Science, online
- 2021 Enabling High-Performance Cost-Effective InfiniBand Architectures with Slim Fly Topologies, *Invited talk* at *Swiss HPC Advisory Council Conference*, online
- 2020 High-Performance Parallel Graph Coloring with Strong Guarantees on Work, Depth, and Quality, *Conference talk* at ACM/IEEE Supercomputing'20, online
- 2020 Fat Paths: Routing in Supercomputers and Data Centers When Shortest Paths Fall Short, *Conference talk* at ACM/IEEE Supercomputing'20, online
- 2019 Slim Graph: Practical Lossy Graph Compression for Approximate Graph Processing, Storage, and Analytics, *Conference talk at ACM/IEEE Supercomputing'19*, Denver, US
- 2019 Towards High-Performance Processing, Storage, and Analytics of Extreme-Scale Graphs, *Invited talk* at the Department of Electronics, Informatics, and Telecommunications, AGH University of Science and Technology, Krakow, Poland
- 2019 Towards High-Performance Processing, Storage, and Analytics of Extreme-Scale Graphs, *Invited talk* at the Department of Electrotechnics, Automatics, Informatics, and Biomedical Engineering, AGH University of Science and Technology, Krakow, Poland
- 2019 Towards High-Performance Processing, Storage, and Analytics of Extreme-Scale Graphs, *Invited talk* at the *Interdisciplinary Centre for Mathematical and Computational Modelling*, Warsaw University, Warsaw
- 2019 Towards High-Performance Processing, Storage, and Analytics of Extreme-Scale Graphs, A talk during International Congress on Industrial and Applied Mathematics (ICIAM) 2019, Valencia, Spain
- 2019 Substream-Centric Maximum Matchings on FPGA, Conference talk during FPGA'19, Monterey, US
- 2019 Graph Processing, Deep Learning, High-Performance Computing, *Invited talk* at the IIS'19, London, United Kingdon
- 2018 Log(Graph): A Near-Optimal High-Performance Graph Representation, *Conference talk* during PACT'18, Limassol, Cyprus
- 2018 Lowering Diameter Enables Cost-Effective and High-Performance Networks, *Invited talk* at the Department of *Electronics, Informatics, and Telecommunications,* AGH University of Science and Technology, Krakow, Poland
- 2018 Lowering Diameter Enables Cost-Effective and High-Performance Networks, *Invited talk* at the Department of Electrotechnics, Automatics, Informatics, and Biomedical Engineering, AGH University of Science and Technology, Krakow, Poland
- 2018 To Push or To Pull: On Reducing Communication and Synchronization in Graph Computations, *An Invited talk* at the Dagstuhl Workshop of High-Performance Graph Algorithms, Dagstuhl, Germany
- 2018 To Push or To Pull: On Reducing Communication and Synchronization in Graph Computations, *A seminar talk* for the Systems Group, ETH Zürich, Zürich, Switzerland
- 2018 Lowering Diameter Enables Cost-Effective and High-Performance Networks, and How To Research It Better?, *Invited talk* at the CSCS Workshop at ETH Zürich, ETH Zürich, Zürich, Switzerland
- 2018 Slim NoC: A Low-Diameter On-Chip Network Topology for High Energy-Efficiency and Scalability, *Conference talk during ASPLOS'18*, Williamsburg, US
- 2018 Lowering Diameter Enables Cost-Effective and High-Performance Networks, *Invited talk* at WAMS (Workshop on Warehouse-scale Memory Systems), co-located with ASPLOS 2018, Williamsburg, US
- 2018 The Relevance of Graph Processing, *Invited talk* at the IIS'18, London, United Kingdon
- 2017 To Push or To Pull: On Reducing Communication and Synchronization in Graph Computations, *A seminar talk at the Department of Electrotechnics, Automatics, Informatics, and Biomedical Engineering*, AGH University of Science and Technology, Krakow, Poland
- 2017 To Push or To Pull: On Reducing Communication and Synchronization in Graph Computations, *Conference talk during HPDC'17*, Washington, US
- 2017 To Push or To Pull: On Reducing Communication and Synchronization in Graph Computations, *Invited talk at the University of Maryland*, Washington, US
- 2017 Active Access: A Mechanism for High-Performance Distributed Data-Centric Computations, *Invited talk* at the International Workshop on Runtime and Operating Systems for Supercomputers (ROSS) 2017, Washington, US

- 2017 To Push or To Pull: On Reducing Communication and Synchronization in Graph Computations, *Invited talk at the Lawrence Berkeley National Laboratory*, Berkeley, US
- 2017 SlimSell: A Vectorizable Graph Representation for Breadth-First Search, *Conference talk* during IPDPS'17, Orlando, US
- 2017 High-Performance Distributed RMA Locks, *An industry workshop invited talk at the Systems Group*, ETH Zürich, Zürich, Switzerland
- 2017 Is It Possible to Blur the Boundaries Between Human Persons and 'Human-Like' Robots? An HPC Perspective, *Invited talk* at the IIS Conference, London, UK
- 2016 Accelerating Irregular Computations with Hardware Transactional Memory and Active Messages, *A seminar talk at the Department of Electrotechnics, Automatics, Informatics, and Biomedical Engineering*, AGH University of Science and Technology, Krakow, Poland
- 2016 Efficient Synchronization for Large-Scale Irregular Graph Computations, *Invited talk* at the Department of *Electronics, Informatics, and Telecommunications*, AGH University of Science and Technology, Krakow, Poland
- 2016 Efficient Synchronization for Large-Scale Irregular Graph Computations, *Invited talk* at the Computer Science Department, Warsaw University of Technology, Warsaw, Poland
- 2016 Evaluating the Cost of Atomic Operations on Modern Architectures, A seminar talk for the Software Group, ETH Zürich, Zürich, Switzerland
- 2016 High-Performance Distributed RMA Locks, *An industry workshop invited talk at the Systems Group*, ETH Zürich, Zürich, Switzerland
- 2016 Slim Fly: A Cost-Effective Low-Diameter Network Topology, *A seminar talk for the Software Group*, ETH Zürich, Zürich, Switzerland
- 2016 High-Performance Distributed RMA Locks, A seminar talk for the Systems Group, ETH Zürich, Zürich, Switzerland
- 2016 High-Performance Distributed RMA Locks, Conference talk during HPDC'16, Kyoto, Japan
- 2016 Accelerating Irregular Computations with Hardware Transactional Memory and Active Messages, *A seminar talk* for the Systems Group, ETH Zürich, Zürich, Switzerland
- 2016 Slim Fly: A Cost-Effective Low-Diameter Network Topology, An *invited talk* during an industry retreat, Engelberg, Switzerland
- 2015 Slim Fly: A Cost-Effective Low-Diameter Network Topology, A talk for external visitors during department evaluation, ETH Zürich, Zürich, Switzerland
- 2015 Accelerating Irregular Computations with Hardware Transactional Memory and Active Messages, *Conference talk during HPDC'15*, Portland, US
- 2015 Active Access: A Mechanism for High-Performance Distributed Data-Centric Computations, *Conference talk during ICS'15*, Newport Beach, US
- 2015 Active Access: A Mechanism for High-Performance Distributed Data-Centric Computations, A seminar talk for the Systems Group, ETH Zürich, Zürich, Switzerland
- 2014 Slim Fly: A Cost-Effective Low-Diameter Network Topology, An *invited talk* for Cray engineers during SC'14, New Orleans, US
- 2014 Slim Fly: A Cost-Effective Low-Diameter Network Topology, Conference talk at the SC'14, New Orleans, US
- 2014 Fault Tolerance for Remote Memory Access Programming Models, A talk during SC'14, New Orleans, US
- 2014 Fault Tolerance for Remote Memory Access Programming Models, *Conference talk* at the ACM HPDC'14, Vancouver, BC, Canada
- 2014 Fault Tolerance for Remote Memory Access Programming Models, *An institute seminar talk*, ETH Zürich, Zürich, Switzerland
- 2013 Enabling Highly-Scalable Remote Memory Access Programming with MPI-3 One Sided, *Conference talk* at the SC'13, Denver, US
- 2013 Enabling Highly-Scalable Remote Memory Access Programming with MPI-3 One Sided, *An institute seminar talk*, ETH Zürich, Zürich, Switzerland
- 2009–2012 Several talks on the Frog Event Display visualisation system for the TOTEM Experiment at CERN, Geneva, Switzerland
  - 2009 Thermodynamic of black holes, A student talk at the seminar of physics students' scientific association "Boson" at AGH-UST, Krakow, Poland

# **External Funding**

- 2024–2026 **Graph Computations and LLMs: A Synergy**, *ETH Zürich*, CHF 675,000 unrestricted industry gift
- 2023–2025 GLACIATION Green responsibLe privACy preserving dAta operaTIONs, ETH Zürich, CHF 404'980: Horizon 2021 EU Project
- 2022–2024 Next-Generation Heterogeneous Interconnects for High-Performance Irregular Workloads, ETH Zürich, CHF 975,000 unrestricted industry gift
  - 2021 Scalable Fabric for Future Data Centers, ETH Zürich, \$100,000 unrestricted industry gift
- 2013–2016 **Parallel Computing in Data Centers**, *ETH Zürich*, \$255,000 unrestricted gift; First European Fellowship for Parallel Computing

# Advising and Mentoring Students

In my mentoring activities, I focus on fostering research attitudes and activites. Each bachelor or master thesis project is founded on a small research idea that I would pursue myself, given time. Some theses were parts of the same, larger project, and some of them were also a part of a larger collaboration with other research groups.

# Co-advised PhD students and postdocs (chronologically):

- Lorenzo Paleari (research into large-scale deep learning models),
- Tiancheng Chen (research into large-scale deep learning models),
- Grzegorz Kwasniewski (research into training large-scale deep learning models),
- Patrick Iff (research into high-performance energy-efficient on-chip networks),
- Paolo Sylos Labini (research into high-performance communication-optimizing sparse computations),
- Paweł Renc (research into communication-optimal graph neural networks).

# Advised MSc students (chronologically):

- Jarno Himanen (research into Reasoning Language Models),
- Lara Nonino (research into Reasoning Language Models),
- Misha Orlow (research into Reasoning Language Models),
- Julia Barth (research into post-Transformer models),
- Afonso Catarino (research into LLM fine-tuning),
- Zixuan Chen (research into post-Transformer models),
- Jon Gunnar (research into LLM ecosystems),
- Afonso Catarino (research into Transformer architectures),
- Diana Khimey (research into LLM ecosystems),
- Eric Schreiber (research into LLM fine-tuning),
- Jakub Cudak (research into higher-order graph structures),
- Shriram Chandran (research into higher-order graph structures),
- Lorenzo Paleari (research into scalable generative AI ecosystems),
- Lucas Weitzendorf (research into high-efficiency retrieval augmented generation),
- Andrea Jiang (research into scalable generative AI ecosystems),
- Roman Niggli (research into scalable brain-inspired large language models),
- Zhenyu Zhang (research into scalable training of graph-enhanced large language models),
- Julien Schenkel (research into scalable agent interactions within large language models),
- Yifan Bao (research into scalable graph fine-tuning for large language models),
- Tobias Christ (research into scalable graph fine-tuning for large language models),
- Florim Memendi (research into graph prompting for large language models),
- Faveo Hoerold (research into scalable training of Transformers),
- Lukas Kapp-Schwoerer (research into scalable training of Graph Neural Networks),
- Yu Hong (research into quantum graph machine learning),
- Ales Kubicek (research into high-performance low-diameter network topologies & large language models),
- Armon Carigiet (research into communication-optimal Graph Neural Networks),
- Umberto Borso (Quantum Advantage in ML: Investigating Entanglement and Quantum Feature Maps in Neural Networks),
- Dan Lindholm (research into next-generation neural graph databases),
- Tiancheng Chen (Towards Distributed Sparse Tensor Computations in Graph Neural Networks),
- Francesco Andreuzzi (research into sampling strategies for Graph Neural Networks),
- George Mitenkov (Design and Implementation of Distributed Graph Analytics Algorithms for Graph Databases),
- Jan Kleine (research into extreme-scale graph databases),
- Nils Blach (research into large language models and into deployment of low-diameter network topologies),

- Florian Scheidl (research into higher-order Graph Neural Networks),
- Julia Bazinska (research into communication-optimal Graph Neural Networks),
- Patrick Iff, received the ETH Medal, (Towards Next-Generation Massively Parallel On-Chip Networks),
- Raphael Grob (research into motif prediction with Graph Neural Networks),
- Patrick Gruntz (Accelerating Graph Computations with In-Network Computing),
- Ioana Stefan (NUMA-awareness for Set-Based Graph Mining Problems),
- Roman Haag (One Sided-Enabled Indexes For Graph Databases),
- Yannick Schaffner (Community-Centric Clique Listing),
- Jakub Jałowiec (research into extreme-scale graph databases),
- Wojciech Chlapek (research into extreme-scale graph databases),
- Gabriel Gjini (Towards Probabilistic Graph Database Systems),
- Jacek Kusnierz (Serverless Graph Computations),
- Dominik Stanaszek (research into extreme-scale graph databases),
- Michał Grabowski (research into high-performance and scalable graph mining),
- Adam Latos (research into high-performance network topologies & routing),
- Aryaman Fasciati (Set-Centric Approximate Graph Processing for High-Performance Clique Mining),
- Karolina Cynk (Modeling and Evaluating Throughput of Layered Multipath Routing Schemes in Modern Data Center Networks),
- Jakub Golinowski (Understanding Performance Trade-Offs in BFS Design Space),
- Dimitri Stanojevic (Graph Processing on FPGAs),
- Florian Marending (Machine Learning for Graph Analytics),
- Marc Fischer, received the ETH Medal, (Graph Streaming Algorithms),
- Michał Podstawski (Extreme-Scale Graph Databases),
- Marcel Schneider (Adaptive Routing in Low-Diameter Networks),
- Pavel Kalvoda (Representation-Centric Graph Processing),
- Tijana Zivic (Effective Graph Compression),
- Erik Henriksson (Source-Based Non-Minimal Adaptive Routing in Low-Diameter Network Topologies).

# Advised BSc students (chronologically):

- Andreas Mohn (research into novel network topologies),
- Timo Wild (research into Reasoning Language Models),
- Raphael Larisch (research into quantum graph learning),
- Hannes Eberhard (research into LLM fine-tuning),
- Nicolas Dickenmann (research into interconnects and learning),
- Max Osterried (research into scalable agent interactions within large language models),
- Wendelin Wemhöner (research into fine tuning of foundation models),
- Afonso Catarino (research into Transformers for dynamic graph analytics),
- Jascha Krattenmacher (A Programmable Toolchain for Generation and Analysis of Network Topologies),
- Bernard Pranjic (research into set-centric graph processing on GPUs),
- Olivier Fischer (research into graph-based reinforcement learning approach for the topology mapping problem),
- Andrea Keusch (Accelerating Graph Neural Networks using a Vectorizable Graph Representation),
- Tiancheng Chen (Towards Learning-Enhanced Graph Databases),
- Loic Holbein (Congestion Benchmarking and Visualization of Large-Scale Interconnection Networks),
- Nicola Bernold (Towards Motif Mining for Graph Neural Networks),
- Maxime Benrubi (High-Performance Vectorizable Graph Representations),
- Maximilan Fries (A General Reinforcement Learning Solver for Combinatorial Optimization Problems on Graphs),
- Leonardo Schwarz (Towards Fast and Programmable Graph Mining),
- Anton Schäfer (Machine Learning for Graph Partitioning),
- Lukas Kapp-Schwoerer (Set-Centric Subgraph Isomorphism),
- Christoph Erdmann (Set Algebra for Work Reductions in Triangle Counting),
- Tomasz Świerczewski (research into large-scale RDMA graph databases),
- Marko Nikic (Towards Work Efficient Triangle Counting through Set Algebra),
- Cliff Hodel (Reducing Communication in Linear Algebra Computations),
- Nils Blach (Multipath Routing for Low-Diameter Network Topologies on InfiniBand Architecture),
- Armon Carigiet (Graph Coloring by Parallel Computation of Approximate Degeneracy Orderings),
- Adrian Balla (Analysis of Graph Mining Programming Models and Abstractions),
- Zur Shmaria (Towards High-Performance Clique Mining),
- Szymon Bernal (research into generic high-performance graph representations),
- Szymon Janikowski (research into generic high-performance graph representations),
- Kacper Janda (research into generic high-performance graph representations),
- Alessandro Maissen (Facilitating Design, Analysis, and Evaluation of Network Topologies),
- Jonas Bokstaller (Design and Implementation of Multipath Switching in InfiniBand Slimfly Networks),

- Philipp Bomatter (Towards Extreme-Scale Cache Coherence Protocols and Simulations),
- Christoph Amevor (Partitioned: A Method for Block-Sparsification of Fully Connected Layers in Neural Networks),
- Patrick Iff (Probabilistic Set Representations for Approximate Graph Algorithms),
- Lukas Fluri (Towards Quantum Graph Processing and Analytics),
- Joris Diem (Substream-Centric Maximum Matchings),
- Dawid Suder (research into low-diameter network topologies),
- Sebastian Leisinger (Bloom Filters and MinHash Representations for Approximate Graph Processing),
- Pascal Störzbach (Specialized Hardware Architectures for Dense Linear Algebra),
- Michal Sudwoj (research into spectral graph analysis),
- Yannick Schaffner (Towards High Performance Clique Listing),
- Daniel Peter (The Reference Framework of Deep500),
- Emanuel Peter (Towards a High-Performance Distributed In-Memory RMA Graph Database),
- Fabian Gessler (research into approximate graph processing),
- Philippe Mösch (Towards High-Performance Vectorizable Graph Representations),
- Simon Weber (Accelerating Graph Processing Using Lossy Compression),
- Thomas Leu (Understanding and Accelerating Graph Algorithms Expressed with Linear Algebra),
- Severin Kistler (Towards In-Network Graph Processing),
- Elias Stalder (Simulations for In-Network Graph Processing),
- Jonas Gude (Towards Storage-Efficient Graph Representations),
- Pascal Blöchlinger (Accelerating Graph Computations with Memory-Efficient Sparse Matrix Decompositions),
- Dimitri Stanojevic (Storage Efficient Graph Representations),
- Linus Groner (Communication-Optimizing Graph Processing),
- Florian Marending (High-Performance BFS Graph Traversals with SIMD-aware Representations),
- David Schmidig (Accelerating Graph Computations with Approximation Techniques based on Linear Algebra),
- Maurice Hörold (Accelerating Breadth-First Search with Spatial Locality and Prefetching),
- Michał Podstawski (To Push or To Pull for Graph Coloring),
- Patrick Schmid (High-Performance RMA Reader-Writer Lock),
- Hermann Schweizer (Modelling and Evaluating Performance of Atomic Operations).

## Group semester project mentorship:

- Simon Huber, Marc Meiners, Severin Richner, Gilles Vogt and Lukas Zink
- (Research into novel network topologies),
- Chi ZHANG, Haiqiang ZHANG, Muyang DU, Peiran MA, Tao ZHANG
- (Research into scalable LLM agent infrastructures),
- Cavalli Francesco, Lo Russo Nicola, Ferrari Marcel, Wu You, Lompa Christopher
- (Optimized All-to-all Algorithm for Low-Diameter Network Topologies),
- Lindenberger Philipp, Unagar Ajay, Kenza Amara, Chia-I Hu
- (VF2 and Glasgow: Parallel Induced Subgraph Isomorphism Solvers)
- Kistler Severin, Peter Emanuel, Baumgartner Roger, Senn Alain
- (Experimental Analysis of Various  $(\Delta+1)$ -Graph Coloring Algorithms),
- Hamilton Carrillo-Nunez, Paulina Aguirre
- (MPI-Based Study of Dijkstra and Bellman-Ford Algorithms for the Shortest Path Problem),
- Tatkowski Peter, Özdemir Esref, Leisinger Sebastian, Holenstein Tobias
- (Parallel Algorithms for Subgraph Isomorphism),
- Sotiropoulou Athina, Triantafyllos Andreas, Lekkas Dimitrios, Foteini Strati
- (Parallel Community Detection in Massive Networks using OpenMP),

# Teaching

- May 2025 [Invited lecture] Effective and Efficient LLM Ecosystems, ETH Zürich, Zürich, Switzerland, An invited lecture at the FinsureTech Hub
- November 2022 [Invited lecture] Parallel and Distributed Graph Neural Networks: An In-Depth Concurrency Analysis, ETH Zürich, Zürich, Switzerland, An invited lecture at the "Design of Parallel and High-Performance Systems" course
- December 2022 [Tutorial] Parallel and Distributed Graph Neural Networks: An In-Depth Concurrency Analysis, Learning on Graphs Conference (LoG'22)
  - Fall 2022 [Lecture] Design of Parallel and High-Performance Systems, ETH Zürich, Zürich, Switzerland, Mentoring groups of students

- Fall 2020 **[Lecture] Design of Parallel and High-Performance Systems**, ETH Zürich, Zürich, Switzerland, Mentoring groups of students
- Fall 2019 **[Lecture] Design of Parallel and High-Performance Systems**, ETH Zürich, Zürich, Switzerland, Mentoring groups of students
- Fall 2015 **[Seminar] Research Topics in Software Engineering**, *ETH Zürich, Zürich, Switzerland*, Advising master students
- Fall 2013 **[Seminar] Research Topics in Software Engineering**, *ETH Zürich, Zürich, Switzerland*, Advising bachelor students
- Spring 2013 **[Lecture] Parallel Programming**, *ETH Zürich, Zürich, Switzerland*, Exercise sessions with  $\approx 12$  students

# Service

Reviewing 2013–now	Reviewer for various conferences and journals, including SPAA, PPoPP, ICS, CF, HPDC, TOPC, TACO, IPDPS, JSFI, PACT, PPoPP, EuroSys, TPDS, JLT, HPGP, Parallel Computing, JONS
HPGP'16	A PC member in the 1st High Performance Graph Processing workshop, <i>Kyoto, Japan</i> , Co-located with the ACM HPDC 2016
SC14	A panelist in the discussion "HPC For Undergraduates: Grad Student Perspective" during SC14, New Orleans, $LA$ , $US$
PASC'14 PADAL'14	Conference staff member at PASC'14 Help with organization

Grants Helped with writing an application for a successful ERC Starting Grant

# Associations

2019–present	HiPEAC affiliated member
2018–present	SIGARCH member (student, professional)

- 2016-present SIGHPC member (student, professional)
- 2014-present ACM member (student, professional)
- 2018-present IEEE TCCA member (student, professional)
- 2014-present IEEE member (student, professional)
- 2009-2011 Computer Science students' scientific association "BIT" at AGH-UST
- 2009-2011 Physics students' scientific association "Boson" at AGH-UST
- 2009-2011 Mountaineering students' association "SAKWA" at AGH-UST
- 2009–2011 Kyokushin Karate students' association "Sokół" at AGH-UST

# Languages, Soft Skills, Additional Skills & Activities

Languages	English – work proficiency, Certificate in Advanced English (CAE), <b>grade A</b> Russian – communicative	
	German – beginner	
	Polish – mother tongue	
Driving	Clean driving license, category B	
Selection of personality features	A more comprehensive overview of how I train my mental features can be found in the "General Statement of Reason" part of the "Exploration & Expeditions" section of my personal website • Extremely high level of determination, drive, and commitment towards set goals.	
	<ul> <li>Strong personality with high level of resistance to stress.</li> <li>Striving for perfection with simultaneous understanding of the 80/20 principle.</li> <li>Ability to both lead and mentor as well as learn highly effectively from others.</li> <li>Ability to learn and adapt quickly whenever required to accomplish set goals.</li> <li>Very high focus on effectiveness and efficiency.</li> </ul>	
nterviewing	Lam responsible for interviewing condidates for research positions in Scalable Parallel Computing Lab. This task	

# Interviewing I am responsible for interviewing candidates for research positions in Scalable Parallel Computing Lab. This task gave me abroad perspective of other people's attitudes, motivations, and prepared me to select good candidates for my future research groups

# **Exploration & Expeditions** *High-Performance Expeditions for High-Performance Research*

I have organized and conducted 35 expeditions (vast majority solo) into some of the most remote, isolated, and logistically demanding mountain ranges and plateaus, focusing on North & East Siberia and Siberian Arctic, both in summer and in winter.

# **General Statement of Reason**

I conduct expeditions because I like to solve challenging multifaceted problems in exploratory mountaineering and in polar exploration in very remote and hard-to-reach mountain ranges and plateaus. Moreover, I use expeditions as a propeller for more effective and more efficient research activities. Specifically, my expeditions develop personality strength, mental resilience, perseverance and tenacity, resourcefulness, resistance to stress, and leadership skills. They have greatly enhanced my research activities: all the mental and psychological resources developed and trained in very hostile environments can be directly reused when tackling demanding deadlines and any other research challenges. The expeditions are also a great lesson in efficient risk management and decision making: one must learn how to quickly and efficiently make many decisions that may have important consequences: a bad decision may lead to death, a good decision may save one's life. Here, *solo* expeditions are of particular value: one learns how to fully rely on oneself, not take anything and anyone for granted, and take full responsibility for one's actions.

<u>General goals</u> I am most interested in: (a) climbing remote peaks in deep winter conditions in January–February (usually previously unclimbed in winter) in the coldest parts of Siberia, and (b) traversing and exploring the most isolated mountain ranges and plateaus. Selected target regions: Yakutia, Kolyma, Chukotka, Taimyr Peninsula, Central Siberian Plateau, Evenkia.

**Targeted destinations** As my targets, I select mountains and plateaus that are as remote and isolated from nearest civilization outposts as possible, hard to get to, challenging logistically and topographically, and mostly unexplored (having seen little to no exploratory attention). An example is Byrranga Mountains, an absolutely pristine and equally harsh mountain range in the Siberian Arctic located more than 500km from the nearest reachable village, where I organized solo expeditions. **Byrranga is the northernmost continental (mainland) mountain range on Earth**. Other examples are various Yakutian mountain ranges in winter, such as Verkhoyansk Mountains, Suntar-Khayata Mountains, or Chersky Mountains: very far away from civilization, and unique due to their extremely low winter temperatures, **reaching levels around -70 Celsius**.

Why the mountains of North Siberia and Siberian Arctic specifically? Because this is a hostile and unyielding environment, very challenging, virtually unexplored, and completely pristine in most parts. Both summers and winters come with numerous mental and physical challenges related to weather, climate, terrain, for example: deep valleys full of swampy and impassable taiga forests, vast, gloomy, and severe plateaus with ferocious winds, unexplored crevassed glaciers, violent and wide rivers, grey and bleak polar deserts, endless marshy tundra, sheer cliffs and deep canyons (sometimes deeper than 1000 meters), technically demanding mountain ridges and faces, temperatures as low as -70 C (without the windchill factor) and as high as +40 C, deep, soft, and unstable snow, vast fields of sharp stones, wild animals, ultimate isolation and solitude, and many others.

Some expeditions are stationary and combined with intense readings of research papers in the isolation of inspiring views.

# Selected Mountaineering & Polar Expeditions (Major Ones Underlined)

A total of more than 35 expeditions organized from 2008. Unlisted expeditions are either failed ones not worth mentioning, or training/reconnaissance undertakings.

 $\bigcirc$  – a winter expedition,  $\bigcirc$  – an autumn expedition,  $\bigcirc$  – a summer expedition  $\bigcirc$  – a solo expedition,  $\bigcirc$  – mostly trekking,  $\bigcirc$  – mostly climbing,  $\bigotimes$  – mostly skiing  $\bigcirc$  – a featured important expedition

February 2025

# 🕕 W S 🕒 A fully winter traverse of the Anabar Plateau, solo,

The first fully winter traverse of the highest part of the Anabar Plateau, one of the great plateaus of the Arctic of Asia. The traverse included the first winter climbs of the highest point of the plateau and of another (probably completely virgin) peak in the central part of the plateau. The traverse was probably the first ever expedition to the plateau in modern times that was conducted in deep winter – for example, there were two other expeditions to the Anabar Plateau before, but both starting in mid or late March. Moreveor, this expedition was probably the first ever exploration of the extremely remote and unspoilt south-west parts of the plateau. Example highlights of the expeditions: absolute temperatures constantly between -40 C and -50 C, combined with very strong winds on top of that. During the second week, there was also the famous Siberian wind of intensely cold air (called Buran or Purga). At several occasions, due to intense cold, my eyelashes froze to my lids. A very northern location also meant very low amounts of sunlight.

August-

## S S Expedition to Central Kunlun & Northern Chang-Tang, solo,

September 2024 Solo trekking and packrafting in a very remote part of Northern Tibet (Chang-Tang) and central parts of the Kunlun Mountains. Crossing parts of the region, climbing virgin mountain passes, and fighting wild yaks.

#### S S Expedition to Anabar & Putorana Plateau, solo, September 2023

Solo trekking and packrafting in a very remote part of Central Siberian Plateau, a region between the Anabar and the Putorana Plateau. Crossing the region from East to West, which included around 250 km of trekking across dense taiga forests and tundra plateaus, and packrafting on the unexplored River Kyndyn

#### () S S T First summer solo crossing of the Anabar Plateau, July 2022

Solo trekking and packrafting in one of the most remote and isolated parts of Central Siberian Plateau, its northermost part called the Anabar Plateau. Crossing the plateau from East to West, which included around 100 km of trekking across dense taiga forests and tundra plateaus, and 350 km of packrafting on River Kotuykan

#### **(S) (I)** Expedition to North and Central Putorana Plateau, solo, July 2021

Solo trekking and packrafting in one of the most remote and isolated parts of Putorana Plateau (the northern and the central part). An ascent of the highest point of the plateau. It is simultaneously the highest point of the whole Central Siberian Plateau. It may have been the first non-Russian ascent of the highest plateau point.

# 

The first winter ascent (January) of the highest peak "Two Cirques" in Anadyr Highlands (Western Chukotka). The peak is located in a very cold region of Western Chukotka, where temperatures around -60 C are recorded. Ascent on skis and crampons. Mid January and northern location also meant very low amounts of sunlight (around 4-5 hours per day) and strong winds. This expedition was a part of the project that won the "Feat of the Year" award at Kolosy Festival 2021

#### February 2020

The first winter ascent (February) of the highest peak in Verkhoyansk Mountains (Yakutia). The peak is unnamed, its altitude is  $\approx$ 2410 meters. The peak is located in the district where Verkhoyansk, one of the coldest regions of Yakutia, also referred to as the northern "Pole of Cold", is located (similarly to Oymyakon, the region where the lowest temperatures in the whole northern hemisphere of around -70 C were officially measured). Thus, the climbed peak can effectively be called one of the coldest mountains in the whole northern part of the world. It was a solo expedition. It was also probably the first winter exploration of the massif. The climb was in unfavourable conditions (very strong winds, the famous "Purga" (also called "Buran"), the Siberian wind of cold air). This expedition was a part of the project that won the "Feat of the Year" award at Kolosy Festival 2021

(1) (W) (S) (G) First winter ascent of the highest peak in Suntar-Khayata Mountains, solo, January 2020

> The first winter ascent (early January) of the highest peak in Suntar-Khayata Mountains (Yakutia). The peak is called Mus-Khaya, its altitude is 2960 meters. The peak is located in the Oymyakon District, which is the coldest region of Yakutia. Thus, as Oymyakon is known as the northern "Pole of Cold" (the region where the lowest temperatures in the whole northern hemisphere of around -70 C were officially measured), the climbed peak can effectively be called one of the coldest mountains in the whole northern part of the world. It was a solo expedition. It was also probably the first winter exploration of the glaciers in the massif. The distance from the peak to the nearest village: over a 130km (it took 3 days one-way to approach the massif on snow mobiles across virgin deep taiga forests and high mountain plateaus). Amount of daylight: 5-6 hours. No sunlight in valleys at all. Temperatures in valleys: down to -55 C. Temperatures while climbing: down to -45 C. This expedition was a part of the project that won the "Feat of the Year" award at Kolosy Festival 2021

#### 🔼 🚯 🗊 Putorana Plateau, solo, September 2019

A solo trekking and a climb of the highest point in the western part of the Putorana Plateau.

August 2019

### (A) (S) (C) Pamir Mountains in Kyrgyzstan,

An attempt to climb a 7000-meter peak in 4 days without prior acclimatization. I reached 6400 meters on day 4 after arriving at the airport in Osh, Kyrgyzstan

January 2019

#### 

The first winter ascent (January) of the highest (unnamed) peak in Momsky Mountains (Yakutia); the altitude of the peak is 2480m. The peak has no name and there is no photo available on the Internet, even the mountaineers from Yakutsk that I know, who trek there, do not have one because of the remoteness of the area. It was a solo expedition. It was also probably the first winter exploration of the only glaciated part of the Momsky Mountains. The distance from the peak to the nearest village: over a 100km (it took 3 days one-way to approach the massif on snow mobiles). Amount of daylight: 6-8 hours. No sunlight in valleys at all. Temperatures in valleys: down to -55 C. Temperatures while climbing: down to -40 C. I climbed the peak through its north face; the climb was somehow technical (slopes up to ≈60 degrees). This expedition was shortlisted for the Feat of the Year Award at the Kolosy Festival in 2020

# End of December 🌗 🖤 🕲 🕒 Solo Winter Climb of Mt. Elbrus,

2017 Solo winter climb of the highest European peak, in 2.5 days (total time from and back to the airport). I had virtually no prior acclimatization, and very little amount of sleep in the week and the night before the climb.

August 2017

### 🔒 🖪 🕥 🕕 The first traverse of Eastern Byrranga Mountains,

Solo, unsupported traverse of the highest, most remote, and least known and researched part of Byrranga Mountains, described in scarce research papers (e.g., "Biogeography of the Byrranga Mountains, Taymyr Peninsula") as one of the least known areas of the Arctic; a region with extremely difficult access. In very short: I covered around 320 kilometers in 9.5 days, on foot, solo, fully unsupported. It was usually 35–40 kilometers per day, the maximum distance of  $\approx$ 67 kilometers in non-stop 21 hours of march in difficult terrain, with damaged feet. The terrain was almost always swamps, fields of sharp stones, glaciers, deep snow, or large and violent rivers. I climbed all the three highest peaks above 1100 meters, traversed glaciers, all in the complete isolation with the nearest village around 500 kilometers away in a straight line. To maximize the chances of success, I organized the expedition on purpose to make it a "one-way" traverse (= "finish or perish"). I was left by a helicopter at the southern border of the mountains and I organized a pick-up far in the North, beyond the northern border of the mountains, 300 kilometers away. There were very little chances of helicopter arriving to any other point except for the pick-up location. Effectively, I had to finish the expedition successfully, or die. This was the forcing and the motivating aspect for finishing the whole march, and it ultimately ensured expedition success. It was simultaneously a very fruitful lesson in risk management. This expedition received a distinction in the "Travel" track during the symposium "Kolosy Festival" on exploration.

September 2015

## 15 🚯 🚺 Byrranga Mountains in Taimyr Peninsula, solo,

A solo trekking in the most remote and hardest-to-reach mountain range in the Arctic of Asia. Solo climbs of virgin mountains.

September 2012 (A) (S) (T) East Sayan Mountains, solo, My first solo expedition to taiga and Siberian mountains. Ascents of 3000+ meter peaks.

#### February - March 2011 W ① A winter ascent of the highest Ural peak, Winter polar expedition with temperatures down to -40 C. A winter ascent of Mt. Narodnaya (the highest Ural peak). Covered ≈250 km on foot and skis. This expedition was featured in several Polish magazines and newspapers dedicated to outdoor

# Selection of Awards and Honors (Expeditions)

 2023 Distinction Award at "Kolosy Festival", Gdynia, Poland, The exploration of the Anabar Plateau received a distinction in the "Travel" category
 2022 - now OutdoorTeam Member,

Ambassador of products such as Bergans of Norway, Y by Nordisk, or Bestard

2022 O Fellow of The Explorers Club,

Elected as a Fellow of The Explorers Club, an international multidisciplinary professional society focusing on scientific exploration, field research and Earth sciences, and resource conservation

2021 "Feat of the Year" exploratory award, Gdynia, Poland, Winner of the main award at the "Kolosy Festival", a symposium of explorers and travelers, for identifying and solo climbing (first winter ascents) three coldest mountains of Siberia. Kolosy is one of the largest such events in Europe, with pre-pandemic audience of up to 6,000 people

## 2021 () "Andrzej Zawada Prize", Gdynia, Poland,

Winner of the "Andrzej Zawada Prize" for the winter exploration of Siberian mountains. "Andrzej Zawada Prize" is a mountaineering prize, named after Andrzej Zawada, the central organizer and leader of the Polish Winter Himalayan taskforce in 70s/80s, and the member of The Explorers Club

#### 2021 *O Journalists' Prize*, *Gdynia*, *Poland*,

Winner the "Journalists Award" at the Kolosy Festival, for the exploration of Siberian mountains, "For consistency in realizing goals, for combining mathematical precision with a visionary approach in eliminating white spots on maps, and for timelessness of concept and frugality of message."

2021 O Posipix Photo Competition Winner,

À photo from my expedition to the Suntar-Khayata Mountains in Yakutia in February/March won the August 2021 Posipix photo competition, with a theme "On the move" (the "Student" category)

# 2019 – 2021 La Sportiva Ambassador/Athlete,

La Sportiva is one of the most renowned and biggest manufacturers of mountaineering boots

# 2018 Distinction Award at "Kolosy Festival", Gdynia, Poland,

The solo traverse of the Byrranga Mountains received a distinction in the "Travel" category

# Explored Mountain Ranges & Plateaus (Selected)

