# Ksenia Bestuzheva

https://kbestuzheva.github.io Head of Research Group bestuzheva@zib.de

## Education

**Ph.D. in computer science**, *Australian National University* (Canberra, Australia) 2019
**Thesis title:** Global Optimisation for Energy Systems
**Supervisors:** Dr. Hassan Hijazi, Prof. Sylvie Thiebaux, Prof. Markus Hegland

**Diplom in applied mathematics and computer science**, *State Management University* (Moscow, Russia) 2014
With highest distinction

## Work Experience

**Head of research group**, *Zuse Institute Berlin* (Berlin, Germany) 2023-present

- coordination of the group's research in mixed-integer linear and nonlinear optimization
- PhD student supervision
- funding acquisition

**Head of development**, *SCIP Optimization Suite* 2023-present

- coordination of a developer team across multiple universities and research organisations
- communication with users and contributors

**Head of SynLab**, *Research Campus MODAL* 2023-present

- coordination of research activities in accordance with the goals of MODAL SynLab
- proposals and reporting

**Postdoctoral researcher**, *Zuse Institute Berlin* (Berlin, Germany) 2018-2023

- research in the area of mixed-integer nonlinear programming
- development of the solver SCIP
- MSc student and intern supervision

## Publications

**Journal publications**


- K. Bestuzheva, A. Gleixner, and T. Achterberg. Efficient separation of RLT cuts for implicit and explicit bilinear terms. *Mathematical Programming B*, 2024. doi: https://doi.org/10.1007/s10107-024-02104-0
- K. Bestuzheva, A. Chmiela, B. Müller, F. Serrano, S. Vigerske, and F. Wegscheider. Global optimization of mixed-integer nonlinear programs with SCIP 8. *Journal of Global Optimization*, 2023. doi: 10.1007/s10898-023-01345-1
- K. Bestuzheva, A. Gleixner, and S. Vigerske. A computational study of perspective cuts. *Mathematical Programming Computation*, 15(4):703–731, 2023. doi: 10.1007/s12532-023-00246-4
- K. Bestuzheva, M. Besançon, W.-K. Chen, A. Chmiela, T. Donkiewicz, J. van Doornmalen, L. Eifler, O. Gaul, G. Gamrath, A. Gleixner, et al. Enabling research through the SCIP Optimization Suite 8.0. *ACM Transactions on Mathematical Software*, 49(2):1–21, 2023. doi: 10.1145/3585516
- E. Ramin, K. Bestuzheva, C. L. Gargalo, D. Ramin, C. Schneider, P. Ramin, X. Flores-Alsina, M. M. Andersen, and K. V. Gernaey. Incremental design of water symbiosis networks with prior knowledge: The case of an industrial park in Kenya. *Science of The Total Environment*, 751:141706, 2021. doi: 10.1016/j.scitotenv.2020.141706
- K. Bestuzheva, H. Hijazi, and C. Coffrin. Convex relaxations for quadratic on/off constraints and applications to optimal transmission switching. *INFORMS Journal on Computing*, 32(3):682–696, 2020. doi: 10.1287/ijoc.2019.0900
- K. Bestuzheva and H. Hijazi. Invex optimization revisited. *Journal of Global Optimization*, 74(4):753–782, 2019. doi: 10.1007/s10898-018-0650-1

**Conference publications**

- K. Bestuzheva, A. Gleixner, and T. Achterberg. Efficient separation of RLT cuts for implicit and explicit bilinear products. In *Integer Programming and Combinatorial Optimization*, pages 14–28, Cham, 2023. Springer. doi: 10.1007/978-3-031-32726-1_2
- K. Bestuzheva, A. Gleixner, and H. Völker. Strengthening SONC relaxations with constraints derived from variable bounds. In *Proceedings of Proceedings of the Hungarian Global Optimization Workshop HUGO 2022*, pages 41–44, 2022

**Other publications**

- K. Bestuzheva, A. Gleixner, and H. Völker. Strengthening SONC relaxations with constraints derived from variable bounds. *arXiv preprint arXiv:2211.05518*, 2022
- K. Bestuzheva, M. Besançon, W.-K. Chen, A. Chmiela, T. Donkiewicz, J. van Doornmalen, L. Eifler, O. Gaul, G. Gamrath, A. Gleixner, et al. The SCIP Optimization Suite 8.0. *arXiv preprint arXiv:2112.08872*, 2021
- G. Gamrath, D. Anderson, K. Bestuzheva, W.-K. Chen, L. Eifler, M. Gasse, P. Gemander, A. Gleixner, L. Gottwald, K. Halbig, et al. The SCIP Optimization Suite 7.0. 2020

## Teaching Experience

**Theses completed under my supervision**

- H. Müller. Algorithms for constrained optimization using sums of nonnegative circuit polynomials certificates. Master's thesis, Humboldt University of Berlin, 2021

  Supervised jointly with Prof. Andrea Walther.

  The thesis introduced a new branch-and-bound framework for global polynomial optimisation that employs Sums of Nonnegative Circuit polynomials (SONC) nonnegativity certificates to obtain dual bounds at nodes of the branch-and-bound tree.

**Other experience**

- Supervising an ongoing PhD thesis on generalized convexity and mixed-integer nonlinear programming
- Co-supervising an ongoing PhD thesis on column generation approaches to production-maintenance scheduling
- Designing and presenting a lecture on mixed-integer nonlinear programming at the summer school Combinatorial Optimization at Work 2020 (the recording of the lecture is available online at `https://www.youtube.com/watch?v=BRe8855C4BA`)
- Supervision of international interns

## Awards

- COIN-OR Cup 2021: Hassan Hijazi, Guanglei Wang, Ksenia Bestuzheva, Smitha Gopinath, Mertcan Yetkin, and Carleton Coffrin (Gravity)
- Best Student Paper Award, 24th National Conference of the Australian Society for Operations Research, 2016

## Other Related Experience

**Technical editor**, *Mathematical Programming Computation* 2022-present

Performing technical reviews of submitted articles focusing on the software and/or data aspect of the submission

**Program committee member**, *Symposium on Experimental Algorithms* 2024

**Contributor**, *ASCEND - mathematical modelling software* 2012-2016

Worked on dynamic modelling, participated in two Google Summer of Code (GSOC) projects as a student (2012, 2013) and in two GSOC projects as a mentor (2015, 2016)

**Schools attended**

- NICTA Optimization Summer School. Kioloa, Australia (2016)
- Combinatorial Optimization at Work. Zuse Institute Berlin, Berlin, Germany (2015)

## Languages

- English: fluent
- Russian: mother tongue
- German: intermediate