Barbora Hudcová | Curriculum Vitae

✉ bara.hudcova@gmail.com

Research Positions

Postdoctoral researcher **Lausanne, Switzerland**
EPFL *2024–ongoing*

Main research interest: complex systems and artificial life. Working in the group of Clément Hongler.

Education

Ph.D. Student **Prague, Czechia**
Charles University, Faculty of Mathematics and Physics *2020–2024*

Supervisors: Tomáš Mikolov and Jiří Tůma. I study discrete dynamical systems as models of computation. My goal is to describe the notions from complex systems theory using abstract algebra and produce new results about the dynamics and computational capacity of such systems.

MSc. Student, graduated with honors **Prague, Czechia**
Charles University, Faculty of Mathematics and Physics *2018–2020*

Master thesis on "Complexity in Cellular Automata", supervisor: Tomáš Mikolov. I presented a novel classification of cellular automata dynamics, which identifies a phase-transition region and can further be used to automatically search for automata with complex behavior.

Academic Experience

Visiting Researcher **Lausanne, Switzerland**
EPFL *10/2022–12/2022*

Collaboration with the Statistical Physics of Computation Laboratory lead by Lenka Zdeborová. Together, we analyzed phase transitions of discrete dynamical systems using belief propagation methods.

Visiting Researcher **Oslo, Norway**
Oslo Metropolitan University *09/2021–12/2021 and 08/2022-09/2022*

Collaboration with the Living Technology Lab lead by Stefano Nichele. We analyzed the computational capacity of discrete dynamical systems via the notion of relative simulation.

Junior Researcher **Prague, Czechia**
Czech Institute of Informatics, Robotics and Cybernetics, CTU *2019–ongoing*

Member of a research team lead by Tomáš Mikolov which conducts research in the field of intelligent systems.

Teaching

Teaching assistant at Charles University, Faculty of Mathematics and Physics:

o Algebra *2022*
o Linear Algebra II *2021*
o Linear Algebra I *2019 and 2022*

- o Convex Optimization   *2018*
- o Number Theory Seminar   *2018*

Received the dean's award for best teaching in 2020/2021.

Organization Experience

- o Founding member of the CLAIRE Rising Researchers Network, https://claire-ai.org/r2network/. *2021–ongoing*
- o Organizer of ALIFE 2022 conference, Workshops and Tutorials chair. *2022*
- o Organizer of ALIFE 2021 conference, Tutorials chair. *2021*
- o Main organizer of the AI Seminar at the Czech Institute of Informatics, Robotics and Cybernetics for research groups in the field of AI. *2021–2022*
- o Vice chair of the Emerging Researchers in Artificial Life board. *2021–2022*
- o Main organizer of a four-day conference, the School of Algebra, for the Algebra Department students at the Charles University; taking place every semester. *2018–2019*

Languages

- o English (fluent), German (upper intermediate), Chinese (intermediate), Japanese (intermediate).
- o English language certificates: CAE (2014).
- o Chinese language certificates: HSKK, Primary Level (2014) and HSK 3 (2013) (level B1).

Grants

- o START Grant, Charles University   *04/2021–03/2023*

A competitive 2-year-long grant from Charles University. I was the principal investigator in a team of three Ph.D. students at the Algebra Department.

Publications

[1] **Simulation Limitations of Affine Cellular Automata.**
Barbora Hudcová, and Jakub Krásenský
accepted in Theoretical Computer Science, 2024, arXiv preprint arXiv:2311.14477

[2] **Dynamical Phase Transitions in Graph Cellular Automata.**
Freya Behrens, Barbora Hudcová, and Lenka Zdeborová
accepted in Phys. Rev. E, 2024, arXiv preprint arXiv:2310.15894

[3] **The Backtracking Dynamical Cavity Method.**
Freya Behrens, Barbora Hudcová, and Lenka Zdeborová
Phys. Rev. X, American Physical Society, 2023, 10.1103/PhysRevX.13.031021

[4] **Canonical Computations in Cellular Automata and Their Application for Reservoir Computing.**

Trym AE Lindell, Barbora Hudcová, and Stefano Nichele.
The 2023 Conference on Artificial Life Proceedings, MIT Press, 2023, 10.1162/isal_a_00594

[5] **Classification of Discrete Dynamical Systems Based on Transients.**
Barbora Hudcová, Tomáš Mikolov.
Artificial Life journal, 1–26, 2021, 10.1162/artl_a _00342, `https://arxiv.org/abs/2108.`
`01573`

[6] **Computational Hierarchy of Elementary Cellular Automata.**
Barbora Hudcová, Tomáš Mikolov.
The 2021 Conference on Artificial Life Proceedings, 2021, 10.1162/isal_a_00447

[7] **Classification of Complex Systems Based on Transients.**
Barbora Hudcová, Tomáš Mikolov.
The 2020 Conference on Artificial Life Proceedings, MIT Press, 367–375, 2020,
10.1162/isal_a_00260