Jakub Svoboda

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Personal Profile

I study the forces governing the spread of genetic variants in biology, opinions in social dynamics, charges in physics, or information in computer science. These forces are stochastic and act over a structured population. I analyze stochastic processes that describe these models from various fields. In my free time, I enjoy exercise and reading, especially history.

Education and Employment

15/3/2026 - now **Postdoc:** Dartmouth College, NH, USA
I work in the Math department with Santiago Schnell and international collaborators on various problems.

1/9/2025 - 15/3/2026 **Postdoc:** Institute of Science and Technology, Austria
I continued my work with Krishnendu Chatterjee and international collaborators on problems from game theory and evolutionary biology.

1/9/2019 - 31/8/2025 **PhD:** Institute of Science and Technology, Austria
I worked under the supervision of Krishnendu Chatterjee, and we worked on game theory, evolutionary theory, and stochastic processes on graphs.
Doctorate received: **14/8/2025.**

15/8/2014 - 31/8/2019 **Master's:** Charles University in Prague, Faculty of Mathematics and Physics
I studied Computer Science and received a bachelor's and master's degree with honors.

Publications

All the publications are peer-reviewed.
Orcid: 0000-0002-1419-3267
* authors ordered alphabetically

Journal publications

1. **The effect of the fitness gradient on fixation probability (Nature Communications)**
   J. Svoboda, H. Nemati, J. Tkadlec, K. Kaveh, K. Chatterjee
2. **Promoters of cooperation in evolutionary games (PNAS)**
   J. Svoboda, K. Chatterjee
3. **Density amplifiers of cooperation for spatial games (PNAS)**
   J. Svoboda, K. Chatterjee
4. **Amplifiers of selection for the Moran process with both Birth-death and death-Birth updating (PLOS CB)**
   J. Svoboda, S. Joshi, J. Tkadlec, K. Chatterjee
5. **Social balance on networks: Local minima and best-edge dynamics (Physical Review E)**
   K. Chatterjee, J. Svoboda, Đ. Žikelić, A. Pavlogiannis, J. Tkadlec*

6. **Infection dynamics of COVID-19 virus under lockdown and reopening (Scientific reports)**
   J. Svoboda, J. Tkadlec, A. Pavlogiannis, K. Chatterjee, M.A. Nowak
7. **Coexistence times in the Moran process with environmental heterogeneity (PRS A)**
   J. Svoboda, J. Tkadlec, K. Kaveh, K. Chatterjee
8. **Maintaining diversity in structured populations (PNAS Nexus)**
   D.A. Brewster, J. Svoboda, D. Roscow, K. Chatterjee, J. Tkadlec, M.A. Nowak
9. **Weighted packet selection for rechargeable links in cryptocurrency networks: Complexity and approximation (Theoretical Computer Science)**
   S. Schmid, J. Svoboda, M. Yeo*

Conference contributions

1. **Reinforcement Learning for Reachability: Guaranteeing Asymptotic Optimality (ICML 2026)**
   A. Palasamudram, J. Svoboda, S. Bansal, K. Chatterjee
2. **Linear Equations with Min and Max Operators: Computational Complexity (AAAI 2025, oral presentation)**
   K. Chatterjee, R. Luo, R. Saona, J. Svoboda*
3. **When is liquid democracy possible? On the manipulation of variance (PODC 2025)**
   K. Chatterjee, S. Gilbert, S. Schmid, J. Svoboda, M. Yeo*
4. **Boosting Payment Channel Network Liquidity with Topology Optimization and Transaction Selection (DISC 25)**
   K. Chatterjee, J. M. Křišťan, S. Schmid, J. Svoboda, M. Yeo*
5. **Reconfiguration Using Generalized Token Jumping (WALCOM 2025)**
   J.M. Křišťan, J. Svoboda*
6. **Value Iteration with Guessing for Markov Chains and Markov Decision Processes (TACAS 2025)**
   K. Chatterjee, M. Jafariraviz, R. Saona-Urmeneta, J. Svoboda*
7. **Reinforcement Learning: PAC Guarantees with Expected Conditional Distance (ICML 2024)**
   J. Svoboda, S. Bansal, K. Chatterjee
8. **Deterministic Sub-exponential Algorithm for Discounted-sum Games with Unary Weights (LICS 2024)**
   A. Asadi, K. Chatterjee, J. Svoboda, R. Saona Urmeneta*
9. **Congestion-Free Rerouting of Network Flows: Hardness and an FPT Algorithm (NOMS 2024)**
   E. Ceylan, K. Chatterjee, S. Schmid, J. Svoboda*
10. **Concurrent Stochastic Games with Stateful-Discounted and Parity Objectives: Complexity and Algorithms (FSTTCS 2024)**
    A. Asadi, K. Chatterjee, R. Saona, J. Svoboda*
11. **Route discovery in private payment channel networks (ESORICS 2024)**
    Z. Avarikioti, M. Bastankhah, M.A. Maddah-Ali, K. Pietrzak, J. Svoboda, M. Yeo*
12. **Faster Algorithm for Turn-based Stochastic Games with Bounded Treewidth (SODA 2023)**
    K. Chatterjee, T. Meggendorfer, R. Saona, J. Svoboda*
13. **R2: Boosting Liquidity in Payment Channel Networks with Online Admission Control (FC 2023)**
    M. Bastankhah, K. Chatterjee, M. Maddah-Ali, S. Schmid, J. Svoboda, M Yeo*
14. **Weighted Packet Selection for Rechargeable Links: Complexity and Approximation (SIROCCO 2023)** S. Schmid, J. Svoboda, M. Yeo*
15. **Shortest Dominating Set Reconfiguration Under Token Sliding (ISFCT 2023)**
    J.M. Křišťan, J. Svoboda*

16. **Complexity of Spatial Games (FSTTCS 2022)**
K. Chatterjee, R. Ibsen-Jensen, I. Jecker, J. Svoboda*

17. **Simplified Game of Life: Algorithms and Complexity (MFCS 2020)**
K. Chatterjee, R. Ibsen-Jensen, I. Jecker, J. Svoboda*

Other Employment

15/9/2018 - 15/12/2018 Internship at ISTA
Three-month internship in the Chatterjee Group. Worked with Josef Tkadlec.

15/10/2016 - 1/9/2017 Adwind software
Programmer in a team developing Kite: analytical software for processing data from media research and monitoring advertising.

1/7/2017 - 15/8/2017 REU - Research Experience for Undergraduates in Computing
Solving CS problems during the summer at Rutgers University.

Recognition and Prizes

- Best paper award — SIROCCO 2023
- Competitive programming - ACM ICPC
  Central European Regional Contest - 11th place — 2016
  CTU Open (national round) - 1st place — 2015
- Mathematical Olympiad
  First in Moravian-Silesian region, silver medal in the Czech Republic — 2014

Teaching

- Formal Methods Course, ISTA, Teacher's Assistant — Spring 2021
- Algorithms and Data Structures Course, Charles University, Leading practicals — Spring 2018
- Discrete Mathematics Course, Charles University, Leading practicals — Spring 2018
- Combinatorics and Graph Theory Course, Charles University, Leading practicals — Fall 2017

Supervision

- Soham Joshi: Project about amplifiers for Bd and dB updating (PLOS CB).
- Esra Ceylan: Project about network flows (NOMS 2024).
- Sebastian Haslebacher: Project about stochastic games.
- Mahsa Bastankhah: Project about blockchain applications (FC 23).

Service

Program Committee: AAAI 2026
Reviewer/Subreviewer/External reviewer: Nature Communication, Nature Computational Science, Journal of Theoretical Biology, LICS, PLOS Computational Biology, MFCS, Information and Computation

Invited Talks and Presentations

- Visited Suguman Bansal at GATECH and talked about my work on the Moran process.
- STTI 2021, Czech conference, talked about the complexity of a simplified game of life.
- Evolutionary graph theory workshop at MPI Plön, talked about Amplifiers of selection for the Moran process with both Birth-death and death-Birth updating.
- Visited Se-Young Yun at KAIST and talked about reinforcement learning with expected conditional distance.
- Visited Seth Gilbert at NUS, talked about my work on the Moran process, and started a collaboration (resulted in a contribution to PODC 2025).
- Presented results related to density amplifiers at the annual meeting of the Society for Mathematical Biology (2025) in Edmonton.

Organization

- PraSe: Organizer of the Prague mathematical seminar for high school students.
- Kasiopea: Head organizer of a programming competition for high school students.

Software Engineering Skills

- **Programming Languages**

  C++, C#, Python

Interests

- **Floorball, Frisbee, Hiking**
- **Books**
- **History, Economics**
- **Learning**