Samuel Braunfeld

CONTACT INFORMATION

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RESEARCH INTERESTS

Model theory and combinatorics

POSITIONS

2018-2020: **President's Postdoctoral Fellow** University of Maryland, College Park
2020-2021: **Postdoctoral Fellow** University of Maryland, College Park
Mentor: Michael C Laskowski

2021-Present: **Postdoctoral Fellow** Charles University
Mentors: Jan Hubička and Jaroslav Nešetřil

2024-Present: **Researcher (tenure-track)** Czech Academy of Sciences, Computer Science Institute

EDUCATION

Rutgers University, New Brunswick

Ph.D. in Mathematics, 2018

- Advisor: Gregory Cherlin
- Thesis: *Infinite Limits of Finite-Dimensional Permutation Structures, and their Automorphism Groups: Between Model Theory and Combinatorics*, arXiv:1805.04219

University of California, Berkeley

B.A. in Mathematics, B.S. in Electrical Engineering and Computer Science, 2013

GRANTS

Principal investigator on Czech Science Foundation (GAČR) Junior Star Project *Model theory, structural combinatorics, and algorithms* (2024-2028) ($\approx$ 10% success rate in 2023)
Approximately $587,000$ euros

Awarded Czech Science Foundation (GAČR) Standard Project *Model theory, structural combinatorics, and algorithms* (2024-2026) ($\approx$ 15% success rate in 2023); independent panel from the Junior Star Project; declined in favor of Junior Star project
Approximately $190,000$ euros

Royal Society International Exchanges, *Crossroads of Model Theory and Graph Theory* (joint Principal Investigator with Viktor Zamaraev) (2024-2026)
$12,000$ pounds

AMS-Simons Travel Grant (2020-2022)
$5,000$ dollars

MENTORING

1. Postdocs: Rob Sullivan (2024 - Present)
2. PhD students (secondary advisor): Tomáš Hons and Aneta Pokorná (2024-Present)

3. Undergraduate students: Nathan Hayes, Matthew Kukla, Anthony Ostuni, and Davin Park (2020-2021)

PAPERS

The five most significant papers are starred.

1. Ertem Esiner, Adilet Kachkeev, Samuel Braunfeld, Alptekin Küpçü, Öznur Özkasap, *FlexDPDP: Flexlist-Based Optimized Dynamic Provable Data Possession*, ACM Transactions on Storage **12** (4) (2016) 23
2. Samuel Braunfeld, *The Lattice of Definable Equivalence Relations in Homogeneous n-Dimensional Permutation Structures*, Electronic Journal of Combinatorics **23** (2016), no. 4, Paper 44
3. Samuel Braunfeld, *Homogeneous 3-Dimensional Permutation Structures*, The Electronic Journal of Combinatorics **25** (2018), no. 2, Paper 52
4. Samuel Braunfeld, Λ*-ultrametric spaces and lattices of equivalence relations*, Algebra Universalis. **80** (2019), no. 3
5. Samuel Braunfeld, *The undecidability of joint embedding and joint homomorphism for hereditary graph classes*, Discrete Mathematics and Theoretical Computer Science. **21** (2019), no. 2

6*. Samuel Braunfeld, Pierre Simon, *The classification of homogeneous finite-dimensional permutation structures*, The Electronic Journal of Combinatorics, **27** (2020), no. 1, Paper 38

7. Samuel Braunfeld, *The undecidability of joint embedding for 3-dimensional permutation classes*, Discrete Mathematics and Theoretical Computer Science. **22** (2021), no. 2

8*. Samuel Braunfeld and Michael C Laskowski, *Characterizations of monadic NIP*, Transactions of the American Mathematical Society, Series B. **8** (2021)

9*. Samuel Braunfeld, *Monadic stability and growth rates of ω-categorical structures*, Proceedings of the London Mathematical Society, **124** (2022), no. 3

10. Samuel Braunfeld and Michael C Laskowski, *Theories with few non-algebraic types over models, and their decompositions*, Proceedings of the American Mathematical Society **150** (2022), no. 9
11. Samuel Braunfeld and Michael C Laskowski, *Mutual algebraicity and cellularity*, Archive for Mathematical Logic **61** (2022)
12. Samuel Braunfeld and Michael C Laskowski, *Worst case expansions of complete theories*, Model Theory **1** (2022), no. 1
13. Samuel Braunfeld and Michael C Laskowski, *Counting siblings in universal theories*, Journal of Symbolic Logic **87** (2022), no. 3
14. Samuel Braunfeld, *Ramsey Expansions of Λ-Ultrametric Spaces*, arXiv preprint, arXiv:1710:01193 (2017) (accepted, European Journal of Combinatorics, awaiting a special issue)
15. Samuel Braunfeld, Anuj Dawar, Ioannis Eleftheriadis, and Aris Papadopoulos, *Monadic NIP in monotone classes of relational structures*, 50th International Colloquium on Automata, Languages, and Programming (ICALP 2023). Leibniz International Proceedings in Informatics (LIPIcs), Volume 261
16. Samuel Braunfeld, David Chodounský, Noé de Rancourt, Jan Hubička, Jamal Kawach, and Matěj Konečný, *Big Ramsey degrees and infinite languages*, Advances in Combinatorics (2024)

17. Andrés Aranda, Samuel Braunfeld, David Chodounský, Jan Hubička, Matěj Konečný, Jaroslav Nešetřil, Andy Zucker *Type-respecting amalgamation and big Ramsey degrees*, arXiv preprint, arXiv:2303.12679 (2023) (accepted, Eurocomb 2023)
18. Samuel Braunfeld, *Decidability in geometric grid classes of permutations*, arXiv preprint, arXiv:2308.04201 (2023) (accepted, Proceedings of the American Mathematical Society)
19. Samuel Braunfeld, Jaroslav Nešetřil, Patrice Ossona de Mendez, and Sebastian Siebertz, *On the first-order transduction quasiorder of hereditary classes of graphs*, arXiv preprint, arXiv:2208.14412 (2022) (submitted)
20*. Samuel Braunfeld and Michael C Laskowski, *Existential characterizations of monadic NIP*, arXiv preprint, arXiv:2209.05120 (2022) (submitted)
21. Samuel Braunfeld, Jaroslav Nešetřil, Patrice Ossona de Mendez, and Sebastian Siebertz, *Decomposition horizons and a characterization of stable hereditary classes of graphs*, arXiv preprint, arXiv:2209.11229 (2022) (submitted)
22*. Samuel Braunfeld, Colin Jahel, and Paolo Marimon, *When invariance implies exchangeability (and applications to invariant Keisler measures)*, arXiv preprint, arXiv:2408.08370 (2024) (submitted)
23. Samuel Braunfeld and Michael C Laskowski, *Indiscernibles in monadically NIP theories*, arXiv preprint, arXiv:2409.05223 (2024) (submitted)
24. Asma Ibrahim Almazaydeh, Samuel Braunfeld, and Dugald Macpherson, *Omega-categorical limits of betweenness relations and D-sets*, arXiv preprint, arXiv:2410.05832 (2024) (submitted)

Papers with undergraduate co-authors

25. Samuel Braunfeld and Matthew Kukla, *Logical limit laws for layered permutations and related structures*, Enumerative Combinatorics and Applications. **2** (2022), no. 4

Invited Conference Talks

Interactions of model theory and structural graph theory, Combinatorial Problems in Model Theory and Computer Science, University of Leeds (November 2023)

Monadic dividing lines and hereditary classes, European Logic Colloquium (Model theory session), Reykjavik University (June 2022)

Structure and non-structure in hereditary classes, Combinatorics Meets Model Theory, University of Cambridge (June 2022)

Monadic Dividing Lines and Hereditary Classes, Structural Limits Workshop, Erdös Center (April 2022)

Monadic dividing lines and tame hereditary classes, Workshop on Model Theory and Combinatorics, Fields Institute (December 2021)

Cellularity and beyond, Homogeneous Structures: Model Theory meets Universal Algebra, Oberwolfach (January 2021)

Homogeneous finite-dimensional permutations, Unifying Themes in Ramsey Theory, Banff International Research Station (November 2018)

Invited Seminar Talks

TBD, Logic Seminar, Hebrew University of Jerusalem (December 2024)

Some interactions between model theory and structural graph theory, Seminar on Foundations of Computing, Masaryk University (April 2024)

Some interactions between model theory and structural graph theory, Computer Science Colloquium, University of Liverpool (April 2024)

Some interactions between model theory and structural graph theory, Algorithms, Graphs, and Combinatorics Seminar, University of Montpellier (February 2024)

Model theory reflected in finite structures, Mathematics Colloquium, University of Denver (January 2023)

Model theory reflected in finite structures, Oliver Club, Cornell University (November 2022)

A tour of monadic dividing lines, Logic Seminar, University of Wisconsin-Madison (September 2022)

Monadic Dividing Lines and Hereditary Classes, Logic Seminar, Institute for Research in Fundamental Sciences (Iran), (March 2022)

Cellularity and beyond, Séminaire Général de Logique, Paris-Lyon (March 2021)

Monadic stability and growth rates of ω-categorical structures, Logic and Computation Seminar, University of Pennsylvania (January 2020)

Monadic stability and growth rates of ω-categorical structures, Model Theory Seminar, CUNY (September 2019)

The undecidability of the joint embedding property for hereditary graph classes, and related problems, Algebra Institute International Seminar, TU Dresden (January 2018)

The undecidability of the joint embedding property for hereditary graph classes, and related problems, Logic Seminar, University of Maryland (December 2017)

The Lattice of Definable Equivalence Relations in Homogeneous n-Dimensional Permutation Structures, Model Theory Seminar, CUNY (April 2016)

Teaching Experience (as Lecturer)

Summer	2016	Linear Algebra
Summer	2017	Linear Algebra
Fall	2018	Applications of Linear Algebra
Spring	2019	Complex Variables
Fall	2019	Elementary Mathematical Logic
Spring	2020	Introduction to Linear Algebra
Fall	2020	(Graduate) Mathematical Logic, Calculus I
Spring	2021	Combinatorics and Graph Theory, Calculus I
Fall	2022	Interactions of Model Theory and Combinatorics
Spring	2025	Interactions of Model Theory and Combinatorics

Service

External committee member for a Master's thesis at Universidad de los Andes (2022)

Supervised undergraduate research, leading to a published paper (2020-2021)

Girls Talk Math UMD group leader (2019)

University of Maryland logic seminar organizer (2019-2021)

Model Theory and Mathematical Logic conference co-organizer (2019)

Rutgers/DIMACS REU talks *Homogeneity, amalgamation, and Ramsey theory* (2018,2019)
(One of a series of talks meant to prepare students to attend a conference at the end of the REU. The students singled out my talk as particularly helpful, so I was asked to repeat it the next year.)

MATLAB curriculum editing for Linear Algebra at Rutgers (2016)