Noah Fleming
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Education and Employment

- **Assistant Professor** (biträdande universitetslektor) 2025 – Present
  Lund University, Lund, Sweden.
- **Assistant Professor** 2022 – 2025
  Memorial University of Newfoundland and Labrador, St. John's, Canada.
- **Postdoctoral Research Fellow** 2021 – 2022
  UC San Diego, USA.
  Hosted by Russell Impagliazzo and Samuel Buss
- **M.V. Raghunathan Research Fellow** 2021
  Simons Institute, UC Berkeley, California, USA.
  Satisfiability: Theory, Practice, and Beyond Program.
- **Ph.D. in Computer Science** 2017 – 2021
  University of Toronto, Toronto, Canada.
  Advisor: Toniann Pitassi
  Title: *The Proof Complexity of Integer Programming*.
- **M.Sc. in Computer Science** 2015 – 2017
  University of Toronto, Toronto, Canada.
  Advisor: Toniann Pitassi
  Project Title: *Linear Threshold Proof Systems*.
- **B.Sc. Double Major in Computer Science and Pure Mathematics** 2010 – 2015
  Memorial University of Newfoundland, St. John's, Canada.

Visiting Positions

- **Columbia University**, New York, U.S.A. 2025 – 2026
  Adjunct Associate Research Scientist.
- **Simons Institute, UC Berkeley**, California, U.S.A. Fall 2023
  Visiting Researcher.
  Satisfiability: Extended Reunion Program.
- **National Institute of Informatics**, Tokyo, Japan Summer 2019
  Research intern.
  Supervisor: Yuichi Yoshida.
- **Simons Institute, UC Berkeley**, California, U.S.A. Fall 2018
  Visiting Graduate Student.
  Lower Bounds in Computational Complexity Program.
- **Institute for Advanced Study**, Princeton, U.S.A. Fall 2017
  Visiting Graduate Student.

Research Funding

- NSERC Discovery Grant ($205,000 CAD) 2023 – 2028
  Principal Canadian research grant. 58% success rate with an average award of $173,000 for early career researchers (ECR) in my application year of 2023.
- NSERC Discovery Launch Supplement ($12,500 CAD) 2023
- Memorial University Startup grant ($40,000 CAD) 2022 – 2025

Awards and Honours

- UCSD CSE Postdoctoral Fellowship ($124,000 USD) 2021 – 2023

– Invited special issue journal article "On the Power and Limitations of Branch and Cut" at CCC 2021. 2021
Honour reserved for the top 5-10 papers in the conference.
– NSERC Postdoctoral Fellowship (PDF) ($90,000 CAD) 2021 – 2023
– Graduate Completion Award ($1,600 CAD) 2021
– Acres Productive Technologies Inc./Joseph Yonan Memorial Fellowship ($2,000 CAD) 2020
– Ontario Graduate Scholarship ($15,000 CAD) 2020
– Walter C. Sumner Memorial Fellowship ($8,000 CAD) 2020
– Walter C. Sumner Memorial Fellowship ($8,000 CAD) 2019
– Mitacs Globalink Research Award - Japan Society for the Promotion of Science (¥534,000 YEN) 2019
– NSERC Alexander Graham Bell Canada Graduate Scholarship - Doctoral (CGSD) ($105,000 CAD) 2017 – 2020
– NSERC Alexander Graham Bell Canada Graduate Scholarship - Master's (CGSM) ($17,500 CAD) 2015 – 2016

Publications

Author order in theoretical computer science is alphabetical. The exception to this rule, below, are the papers published in *Theory and Applications of Satisfiability Testing* (SAT), in which authors are listed according to contribution. Co-authors who are students of mine are underlined.

Peer Reviewed Conference Publications

1. Noah Fleming, Yuichi Yoshida. Sensitivity Lower Bounds for Approximation Algorithms.
To appear at the 2026 ACM-SIAM Symposium on Discrete Algorithms (SODA 2026).
2. Noah Fleming, Deniz Imrek, Christophe Marciot. Provably Total Functions in the Polynomial Hierarchy.
Proceedings of the 40th *Computational Complexity Conference* (CCC 2025).
doi: 10.4230/LIPIcs.CCC.2025.28
3. Susanna de Rezende, Noah Fleming, Duri Andrea Janett, Jakob Nordström, Shuo Pang. Truly Supercritical Tradeoffs for Resolution, Cutting Planes, Monotone Circuits, and Weisfeiler-Leman.
Proceedings of the 57th Annual Symposium on Theory of Computing (STOC 2025).
doi: 10.1145/3717823.3718271.
4. Noah Fleming, Stefan Grosser, Toniann Pitassi, Robert Robere. Black-Box PPP is not Turing Closed.
Proceedings of the 56th Annual ACM Symposium on Theory of Computing (STOC 2024).
doi: 10.1145/3618260.3649769
5. Vipul Arora, Arnab Bhattacharyya, Noah Fleming, Esty Kelman, Yuichi Yoshida. Low Degree Testing over the Reals.
Proceedings of the 2023 Symposium on Discrete Algorithms (SODA 2023).
doi: 10.1137/1.9781611977554.ch31
6. Marc Vinyals, Chunxiao Li, Noah Fleming, Antonina Kolokolova, Vijay Ganesh. Limits of CDCL Learning via Merge Resolution.
Proceedings of the 26th International Conference on the Theory and Applications of Satisfiability Testing (SAT 2023).
doi: 10.4230/LIPIcs.SAT.2023.27
7. Sam Buss, Noah Fleming, Russell Impagliazzo. TFNP Characterizations of Proof Systems and Monotone Circuits.
Proceedings of the 14th Innovations in Theoretical Computer Science (ITCS 2023).
doi: 10.4230/LIPIcs.ITCS.2023.30
8. Noah Fleming, Toniann Pitassi, Robert Robere. Extremely Deep Proofs.
Proceedings of the 13th Innovations in Theoretical Computer Science (ITCS 2022).
doi: 10.4230/LIPIcs.ITCS.2022.70
9. Noah Fleming, Mika Göös, Stefan Grosser, Robert Robere. On Semi-Algebraic Proofs and Algorithms.
Proceedings of the 13th Innovations in Theoretical Computer Science (ITCS 2022).
doi: 10.4230/LIPIcs.ITCS.2022.69
10. Noah Fleming, Mika Göös, Russell Impagliazzo, Toniann Pitassi, Li-Yang Tan, Robert Robere, Avi Wigderson. On the Power and Limitations of Branch and Cut.
Proceedings of the 36th Computational Complexity Conference (CCC 2021).
doi: 10.4230/LIPIcs.CCC.2021.6
Invited to the special journal issue for CCC 2021.
11. Chunxiao Li, Jonathan Chung, Soham Mukherjee, Marc Vinyals, Noah Fleming, Antonina Kolokolova, Alice Mu, Vijay Ganesh. On the Hierarchical Community Structure of Practical SAT Formulas.

Proceedings of the 24th International Conference on the Theory and Applications of Satisfiability Testing (SAT 2021).
doi: 10.1007/978-3-030-80223-3_25

12. Chunxiao Li, Noah Fleming, Marc Vinyals, Toniann Pitassi, Vijay Ganesh. Towards a Complexity-Theoretic Understanding of Restarts in SAT Solvers. *Proceedings of the 23rd International Conference on the Theory and Applications of Satisfiability Testing* (SAT 2020).
doi: 10.1007/978-3-030-51825-7_17
13. Noah Fleming, Yuichi Yoshida. Distribution-Free Testing of Linear Functions on $\mathbb{R}^n$.
Proceedings of the 11th Innovations in Theoretical Computer Science Conference (ITCS 2020).
doi: 10.4230/LIPIcs.ITCS.2020.22
14. Paul Beame, Noah Fleming, Russell Impagliazzo, Antonina Kolokolova, Denis Pankratov, Toniann Pitassi, Robert Robere. Stabbing Planes.
Proceedings of the 9th Innovations in Theoretical Computer Science Conference (ITCS 2018).
doi: 10.4230/LIPIcs.ITCS.2018.10
15. Noah Fleming, Denis Pankratov, Toniann Pitassi, Robert Robere. Random $\Theta(\log n)$-CNFs are Hard for Cutting Planes.
Proceedings of the 58th annual IEEE Symposium on Foundations of Computer Science (FOCS 2017).
doi: 10.1109/FOCS.2017.19

In Submission

1. Noah Fleming, Stefan Grosser, Hanlin Ren, Siddhartha Jain, Jiawei Li, Morgan Shirley, Weiqiang Yuan. Total Search Problems in ZPP.

Peer Reviewed Journal Publications

1. Noah Fleming, Mika Göös, Russell Impgaliazzo, Toniann Pitassi, Li-Yang Tan, Robert Robere, Avi Wigderson. On the Power and Limitations of Branch and Cut.
Theory of Computing (ToC), CCC Special Issue, to Appear.
2. Noah Fleming, Denis Pankratov, Toniann Pitassi, Robert Robere. Random $\Theta(\log n)$-CNFs are Hard for Cutting Planes.
Journal of the ACM (JACM 2022).
doi: 10.1145/3486680
3. Noah Fleming, Pravesh Kothari, Toniann Pitassi. Semialgebraic Proofs and Efficient Algorithm Design.
Foundations and Trends® in Theoretical Computer Science, 14 (1-2): 1-229 (2019).
doi: 10.1561/0400000086
4. Noah Fleming, Antonina Kolokolova, Renesa Nizamee. Complexity of Alignment and Decoding Problems: Restrictions and Approximations.
Machine Translation, 29 (3-4): 163-187 (2015).
doi: 10.1007/s10590-015-9172-5

Book Chapters

1. Noah Fleming, Toniann Pitassi. Reflections on Proof Complexity and Counting Principles.
In Ivo Düntsch and Edwin Mares, editors, *Alasdair Urquhart on Nonclassical and Algebraic Logic and Complexity of Proofs*, Outstanding Contributions to Logic. Springer International Publishing (2022).
doi: 10.1007/978-3-030-71430-7

Supervision

Graduate Students

– Christophe Marciot (Lund University, Ph.D.) 2023 – Present
– Deniz Imrek (University of Austin, Ph.D., co-supervised with Anna Gal) 2023 – Present
– Jordan Kilfoy (Memorial University, MSc., co-supervised with Antonina Kolokolova) 2024 – Present

Postdocs and Researcher Scientists

– Marc Vinyals. Researcher Scientist, Memorial University, co-hosted with Antonina Kolokolova. 2022

Undergraduate Students

- Michael Gregory. Honours Thesis, Memorial University. Now a MSc student at University of Waterloo. 2024 – 2025
- Grey Seaward. Honours Thesis, Memorial University. 2023 – 2025
- Parsa Esmkhani. Research Assistant, Memorial University, co-supervised with Antonina Kolokolova. 2023 – 2025
- Gavin Hull. Research Assistant, Memorial University. Winter 2023
- Felipe Heap. Research Assistant, University of Toronto, co-supervised with Toniann Pitassi. 2019

I have also hosted a number of visiting researchers (between one week and one month) from Waterloo University, University of Warwick, UT Austin, University of Toronto, and McGill University.

Professional Service

- *Program Committee Member*
  - 17th Innovations in Theoretical Computer Science (ITCS 2026).
  - 28th International Conference on Theory and Applications of Satisfiability Testing (SAT 2025).
- *External Reviewer*
  - Conferences: FOCS, STOC, CCC, ITCS, SODA, SAT, ISAAC, ICALP, LICS, ESA, STACS, Random.
  - Journals: Journal of the ACM, Theory of Computing, Information Processing Letters, TheoretiCS, Computational Complexity, Logical Methods in Computer Science, Journal of Artificial Intelligence.
  - Grants: German Research Foundation (DFG).

Teaching

- Comp 3602: *Introduction to the Theory of Computing*. Memorial University. Fall 2023, Fall 2024.
- Comp 6901: *Applied Algorithms*. Memorial University. Fall 2023, Fall 2023, Fall 2024.
- Comp 6902/COMP 4742: *Theory of Computation*. Memorial University. Winter 2023, Winter 2025.
- CSC165: *Mathematical Expression and Reasoning*. University of Toronto. Winter 2017. Co-taught with Toniann Pitassi.

Invited Talks

These *do not* include presentations for accepted papers at conferences.

1. Computer Science Colloquium, Southern Denmark University (SDU). *Connecting Proofs and Algorithms.* 2025
2. Computer Science Colloquium, University of Montreal, *Connecting Proofs and Algorithms.* 2025
3. Theory Seminar, Columbia University, *Supercritical Trade-offs.* 2025
4. Theory Seminar, University of Chicago, *Proofs, Circuits, and Total Functions.* 2025
5. Theory Seminar, University of Toronto, *Supercritical Trade-offs.* 2024
6. MIAO Seminar, University of Copenhagen, *PPP is not Turing Closed in the Black-Box Setting.* 2024
7. Proof Complexity and Beyond Workshop, MFO Oberwolfach, *PPP is not Closed for Turing Reductions.* 2024
8. Theory Seminar, National Institute of Informatics, Seminar Title: *Black-Box PPP is not Turing Closed.* 2024
9. Math Colloquium, Memorial University, *A Logical Approach to P vs. NP.* 2023
10. Theory Seminar, University of Toronto, *Proofs, Circuits, and Total Functions*. 2023
11. Extended Reunion: Satisfiability Program, Simons Institute, Berkeley, *The Proof Complexity of Integer Programming*. 2023
12. Meta-Complexity Program Simons Institute, Berkeley, *TFNP, Proof Complexity and Monotone Circuit Complexity*. 2023
13. North American Annual Meeting of the Association for Symbolic Logic, *The Proof Complexity of Integer Programming*. 2023
14. Satisfiability: Theory, Practice, and Beyond Reunion Program, Simons Institute, Berkeley, *Extremely Deep Proofs*. 2023
15. Online SAT Seminar, virtual, *Extremely Deep Proofs*. 2022

16. Theory Seminary, University of California, San Diego, *Semi-Algebraic Proofs and Algorithms*. 2022
17. Oxford-Warwick Complexity Meeting, virtual, *Extremely Deep Proofs*. 2021
18. MIAO Seminar, University of Copenhagen, *On the Complexity of Branch-and-Cut*. 2021
19. Simons Institute, Berkeley, California, *The Proof Complexity of Integer Programming Solvers*. 2021
20. Simons Institute, Berkeley, California, *The Proof Complexity of Practical Integer Programming*. 2021
21. Mathematics Seminar, Institute for Advanced Study, *Recent Progress on Cutting Planes Proofs*. 2020
22. BIRS Proof Complexity Workshop 20w5144, Banff Center, *Semialgebraic Proofs and Efficient Algorithm Design*. 2020
23. Theory Seminar, Simon Fraser University, *Stabbing Planes*. 2019
24. Computer Science Seminar, Memorial University, *Random CNF formulas are hard to refute in Cutting Planes*. 2018
25. Proof Complexity Workshop, Dagstuhl, Seminar Title: *Stabbing Planes*. 2018
26. Proof Complexity and Beyond Workshop, MFO Oberwolfach, *Random $\Theta(\log n)$-CNF formulas Are Hard for Cutting Planes*. 2017

Invited Workshops

These are highly selective, invitation-only research meetings, typically involving ≈ 40 leading researchers in the area.

1. Theory and Practice of SAT and Combinatorial Solving (26w5626), Banff International Research Station, Canada. 2026
2. Proof Complexity and Beyond, MFO Oberwolfach, Germany 2024
3. Extended Reunion: Satisfiability Program, Simons Institute, Berkeley, USA. 2023
4. Communication Complexity and Applications III (22w5124), Banff International Research Station, Canada. 2022
5. Mathematical Approaches to Lower Bounds, ICMS, Edinburgh. 2022
6. Proof Complexity (20w5144), Banff International Research Station, Canada. 2020
7. Proof Complexity, Dagstuhl, Germany 2018
8. Proof Complexity and Beyond, MFO Oberwolfach, Germany 2017
9. Computational Complexity (16w504), Banff International Research Station, Canada. 2016