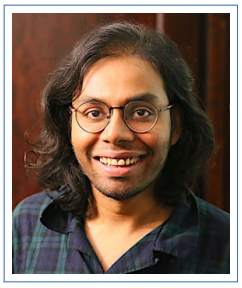

# Vikraman Choudhury

*Curriculum Vitae*

## Interests

I am a computer scientist studying *foundations of programming languages*, through an *algebraic lens*. I am also interested in *mathematical logic*, *constructive mathematics*, and *computer formalisation*. My previous work includes: (1) categorical and denotational semantics of reversible programming languages; (2) semantics of capability-safety and effects; (3) refinement types for program verification.

## Education & Academic Positions

| | |
|---|---|
| Aug, 2021–present | **Research Associate**, *University of Glasgow*, Glasgow, UK<br>School of Computing Science, advised by Prof. Simon Gay |
| Aug, 2020–2021 | **Paul Purdom fellow**, *Indiana University*, Bloomington, USA<br>IU Luddy School of Informatics, Computing, and Engineering |
| Oct, 2019–2021 | **Visiting researcher**, *University of Cambridge*, Cambridge, UK<br>Hosted by Prof. Marcelo P. Fiore |
| Feb–May, 2019 | **Visiting student**, *University of Cambridge*, Cambridge, UK<br>Hosted by Dr. Neel R. Krishnaswami |
| 2015–2022 | **Doctorate**, *Indiana University*, Bloomington, USA<br>MS & PhD in Computer Science, minor in Logic, advised by *Prof. Amr A. Sabry* |
| 2012–2015 | **Masters**, *Indian Institute of Technology*, Kanpur, India<br>Master of Technology in Computer Science, advised by *Prof. Piyush P. Kurur* |
| 2008–2012 | **Bachelors**, *Jadavpur University*, Kolkata, India<br>Bachelor of Computer Science and Engineering |

## Publications & Drafts

Authors are listed in alphabetical order rather than order of contributions, unless otherwise.


[1] **Choudhury, Vikraman**, J.Karwowski, A.Sabry. "Symmetries in Reversible Programming: From Symmetric Rig Groupoids to Reversible Programming Languages". *Proceedings of the ACM on Programming Languages* 6 (POPL Jan. 11, 2022), 6:1–6:32.

[2] **Choudhury, Vikraman**, M.Fiore. *Free Commutative Monoids in Homotopy Type Theory*. Comment: To appear in MFPS'22. Oct. 11, 2021. arXiv: 2110.05412 [cs, math]. URL: http://arxiv.org/abs/2110.05412 (visited on 06/20/2022).



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[3] C.-H.Chen, **Choudhury, Vikraman**, J.Carette, A.Sabry. "Fractional Types - Expressive and Safe Space Management for Ancilla Bits". *Reversible Computation - 12th International Conference, RC 2020, Oslo, Norway, July 9-10, 2020, Proceedings*. Ed. by Ivan Lanese and Mariusz Rawski. Vol. 12227. Lecture Notes in Computer Science. Springer International Publishing, 2020, pp. 169–186.

[4] **Choudhury, Vikraman**, N.Krishnaswami. "Recovering Purity with Comonads and Capabilities". *Proceedings of the ACM on Programming Languages* 4 (ICFP Aug. 2, 2020), pp. 1–28.

[5] J.Carette, C.-H.Chen, **Choudhury, Vikraman**, A.Sabry. "From Reversible Programs to Univalent Universes and Back". *Electronic Notes in Theoretical Computer Science* 336 (Apr. 2018), pp. 5–25.

[6] N.Vazou, A.Tondwalkar, **Choudhury, Vikraman**, R. G.Scott, R. R.Newton, P.Wadler, R.Jhala. "Refinement Reflection: Complete Verification with SMT". *Proceedings of the ACM on Programming Languages* 2 (POPL Jan. 2018), 53:1–53:31.

[7] C.-H.Chen, **Choudhury, Vikraman**, R. R.Newton. "Adaptive Lock-Free Data Structures in Haskell: A General Method for Concurrent Implementation Swapping". *Proceedings of the 10th ACM SIGPLAN International Symposium on Haskell, Oxford, United Kingdom, September 7-8, 2017*. Ed. by Iavor S. Diatchki. ACM, 2017, pp. 197–211.

[8] R.Scott, **Choudhury, Vikraman**, R.Newton, N.Vazou, R.Jhala. *Deriving Law-Abiding Instances*. Aug. 7, 2017. arXiv: 1708.02328 [cs]. URL: http://arxiv.org/abs/1708.02328 (visited on 06/20/2022).

[9] J.Carette, C.-H.Chen, **Choudhury, Vikraman**, A.Sabry. "Fractional Types". Dec. 2016.

## Selected Talks

[1] **Vikraman Choudhury**. "Free Commutative Monoids in Homotopy Type Theory". 38th International Conference on Mathematical Foundations of Programming Semantics (MFPS 2022). July 2022.

[2] **Vikraman Choudhury**. "Symmetries in Reversible Programming". Logic and Semantics Seminar, Computer Laboratory, University of Cambridge. May 2022.

[3] **Vikraman Choudhury**. "Symmmetries in Reversible Programming". 49th ACM SIGPLAN Symposium on Principles of Programming Languages (POPL 2022). Jan. 2022.

[4] **Vikraman Choudhury**. "Weighted Sets and Modalities". Meeting on Graded Types, University of Kent. June 2022.

[5] **Vikraman Choudhury**. "Algebraic approaches to computation & programming". School of Computing Science, University of Glasgow. Apr. 2021.

[6] **Vikraman Choudhury**. "Recovering Purity with Comonads and Capabilities". Department of Computer Science and Engineering, Chalmers and Gothenburg University. Feb. 2021.

[7] **Vikraman Choudhury**. "Symmetries in Reversible Programming". PLUG Seminar, School of Computing Science, University of Glasgow. Dec. 2021.

[8] **Vikraman Choudhury**. "Weighted Sets and Modalities". SYCO 8, Tallinn University of Technology. Dec. 2021.

[9] **Vikraman Choudhury**. "A constructive model of differential linear logic". Department of Computer Science, University of Oxford. Dec. 2020.

[10] **Vikraman Choudhury**. "Algebraic approaches to computation & programming". Department of Informatics, King's College London. Nov. 2020.

[11] **Vikraman Choudhury**. "Free Commutative Monoids in Homotopy Type Theory". Logic and Semantics Seminar, Computer Laboratory, University of Cambridge. Nov. 2020.

[12] **Vikraman Choudhury**. "Recovering Purity with Comonads and Capabilities". 25th ACM SIGPLAN International Conference on Functional Programming (ICFP 2020). Aug. 2020.

[13] **Vikraman Choudhury**. "An introduction to Martin-Löf Type Theory". Logic and Semantics for Dummies, Computer Laboratory, University of Cambridge. Dec. 2019.

[14] **Vikraman Choudhury**. "Recovering Purity with Comonads and Capabilities". PURPL Fest & Midwest PL Summit 2019, Purdue University. Sept. 2019.

[15] **Vikraman Choudhury**. "Retrofitting Purity with Comonads and Capabilities". Logic and Semantics seminar, Computer Laboratory, University of Cambridge. May 2019.

[16] **Vikraman Choudhury**. "The finite-multiset construction in HoTT". Homotopy Type Theory 2019, Carnegie Mellon University. Aug. 2019.

[17] **Vikraman Choudhury**. "Automorphisms of $\mathbf{S}^1$". PL Wonks, Indiana University. Oct. 2018.

[18] **Vikraman Choudhury**. "Beth Semantics". Proof Theory and Constructive Mathematics seminar, Indiana University. May 2018.

[19] **Vikraman Choudhury**. "Homotopy theoretic aspects of Reversible Computing". PL Wonks, Indiana University. Sept. 2017.

## Theses

### PhD thesis

| | |
|---|---|
| title | Algebraic approaches to semantics of logic and programming |
| institution | Indiana University Bloomington, USA |
| supervisor | *Prof. Amr A. Sabry & Prof. Marcelo P. Fiore* |
| abstract | TBD |
| defense date | August, 2022 |
| url | TBD |

### Master thesis

| | |
|---|---|
| title | Distributed Issue Tracking using Patch Theory |
| institution | Indian Institute of Technology, Kanpur |
| supervisor | *Prof. Piyush P. Kurur* |
| abstract | In this thesis, we formalize a generalization of the `Darcs` theory of patches, and describe the design and implementation of a Distributed Issue Tracking system based on a variant of patch theory. We use dependent types in `Agda` to represent the various types of patches, model relationships between them, and prove properties about patch operations. |
| defense date | January 29, 2015 |
| url | https://hub.darcs.net/vikraman/thesis |

## Professional Activities & Positions

| | |
|---|---|
| Jun–Jul, 2022 | ICFP'22 Artifact Evaluation Committee |
| Mar–Apr, 2022 | RC'22 Reviewer |
| Jan–Mar, 2021 | PLDI'21 Artifact Evaluation Committee |
| Aug 2020–present | SIGPLAN-M Long-term Mentor |
| Jul–Sep, 2020 | SPLASH'20 Artifact Evaluation Committee |
| Oct–Dec, 2019 | FOSSACS'20 External Reviewer |
| May–Jun, 2018 | ICFP'18 Artifact Evaluation Committee |
| Spring 2016 – 2017 | Research Assistant for *Prof. Ryan R. Newton*, with the IU Parfunc Group, working on various Haskell projects related to *deterministic parallelism* |
| 2015 | Research Assistant for *Prof. Manindra Agarwal (DOFA, IIT Kanpur)*, working on various projects for the *New York Office, IIT Kanpur* |

## Teaching & Supervisions

### University of Glasgow

Autumn 2021 — MSc Computer Science Supervisions
- Jingren Wang
- Zijian Chen
- Lingyuan Zhang

### University of Cambridge

| | |
|---|---|
| Michaelmas 2021 | Part II: Denotational Semantics |
| Michaelmas 2021 | Part II: Algebraic Topology |
| Michaelmas 2021 | Part II: Denotational Semantics |
| Michaelmas 2020 | Part II: Denotational Semantics |
| Michaelmas 2020 | Part II: Types |
| Lent 2020 | Part IB: Logic and Proof |
| Michaelmas 2019 | Part II: Denotational Semantics |
| Michaelmas 2019 | Part IB: Semantics of Programming Languages |
| Michaelmas 2019 | Part IA: Discrete Maths |

### Indiana University

| | |
|---|---|
| Spring 2020 | CSCI-B561: Advanced Database Concepts |
| Spring 2020 | CSCI-B401: Fundamentals of Computing Theory |
| Fall 2019 | CSCI-B505: Applied Algorithms |
| Spring 2019 | INFO-I590: Technical Foundations of Cybersecurity |
| Fall 2018 | CSCI-C 241 & H-241: Discrete Structures in Computer Science |
| Spring 2018 | CSCI-C 343: Data Structures |
| Fall 2017 | CSCI-C 241 & H-241: Discrete Structures in Computer Science |
| Fall 2015 | CSCI-C 211: Introduction to Computer Science |

## Industry Positions

Aug, 2022–present **Vaire Computing**, *London, UK*
- A reversible computing hardware startup
- Research advisor for designing a reversible programming language

Jun–Aug, 2020 **Galois Inc**, *Portland, OR, USA*
- Research Software Engineering Intern
- Contributed to a Symbolic Execution Engine in Haskell
- Built an Interactive Symbolic Debugger

2012–present **HackCave**, *New York, NY, USA*
- An online content curation platform based on streams
- Built the backend (rest api, datastore, search) and parts of the frontend
- Built and managed infrastructure for a distributed cluster of microservices

2012–2018 **Gentoo Linux**
- Wrote and maintained packages and ebuilds as a developer
- Maintainer for the Gentoo Haskell project
- Contributed to portage and various userland tools, and helped Gentoo infra
- Mentor for Google Summer of Code, 2012
- Representative for the Gentoo Foundation at the GSoC mentor summit, Google, Mountain View, Oct 2012

May–Sep, 2013 **Google Summer of Code**, *Google*
- Student developer for Gentoo Foundation
- Mentor: *Adrien Thebo, Puppet Labs*
- Built Puppet modules for Gentoo portage and userland tools
- Improved Gentoo support on upstream Puppet modules
- https://github.com/gentoo/puppet-portage

May–Sep, 2011 **Google Summer of Code**, *Google*
- Student developer for Gentoo Foundation
- Mentor: *Alec Warner, Google*
- Built a "Package statistics" client and server for Gentoo Linux
- https://gitweb.gentoo.org/proj/gentoostats.git

## Other Positions

2012–2015 **Lab assistant**, *Department of Computer Science, IIT Kanpur*
- Responsible for managing departmental and lab services
- Managed Debian servers providing mail, web, ldap, dns services, and automate them through Puppet

2012–2015 **navya**, *IIT Kanpur*
- Sysadmin for the navya and students servers
- Organized FOSS events on campus
- Provided FOSS computing services for the campus

2013–2014 **PG Mentor**, *Programming Club, IIT Kanpur*
- Mentored undergraduate students in various programming projects

## Other Academic Projects

Spring 2013 **Group Testing**, *IIT Kanpur*
- Supervisor: *Prof. Sumit Ganguly*
- Course project for CS719
- Studied Group Testing and its connections to Compressed Sensing, Coding Theory, and Expander Graphs

Fall 2012 **Forms of determinism for automata**, *IIT Kanpur*

- Supervisor: *Prof. Anil Seth*
- Term paper for CS644
- Explored various forms of determinism in automata, and connections to parity games

2011–2012 **Fault tolerant distributed GUI server**, *Jadavpur University*

- Supervisors: *Prof. Chandan Mazumdar & Prof. Mridul S. Barik*
- Bachelor's project at *Jadavpur University*
- Built a fault tolerant distributed GUI server using Qt embedded
- Deployed by DRDO for missile launching systems
- https://github.com/vikraman/amestris

Fall 2011 **Computational Geometry**, *Jadavpur University*

- Supervisor: *Prof. Chandan Mazumdar*
- Built a GUI that demonstrates various computational geometry algorithms using CGAL and Qt4
- https://github.com/vikraman/cgal-qt-demos

## Relevant Coursework

Fall 2018 Programming Languages Implementation (CSCI-P 523)
Fall 2018 Proof Theory and Constructive Mathematics (CSCI-B 619)
Spring 2017 Recursion Theory (MATH-M 584)
Spring 2017 Elementary Artificial Intelligence (CSCI-B 551)
Fall 2016 Model Theory (MATH-M 682)
Fall 2016 Distributed Systems (CSCI-B 534)
Spring 2016 Homotopy Type Theory (CSCI-B 629)
Spring 2016 Programming Language Foundations (CSCI-B 522)
Fall 2015 Programming Language Principles (CSCI-B 521)
Fall 2015 Logical Theory I (PHIL-P 505)
Spring 2015 Type Theory (special interest group)
Spring 2015 Category Theory (CS680) (audited)
Fall 2013 Functional Programming (CS653)
Fall 2013 Quantum Computing (CS682) (audited)
Spring 2013 Data Streaming Algorithms and Systems (CS719)
Spring 2013 Circuit Complexity Theory (CS642)
Fall 2012 Finite Automata on Infinite inputs (CS644)
Fall 2012 Computational Algebra and Number Theory (CS681)

## Awards & Achievements

- SIGPLAN PAC award for attending and presenting at *POPL 2022*, organised by *ACM SIGPLAN, 2022*
- Recipient of the *Paul Purdom Fellowship* for the 2020 – 2021 academic year, at the Luddy School of Informatics, Computing, and Engineering, Indiana University
- Awarded *Student Academic Appointment (SAA)* as an *Associate Instructor (SAA)* at *Indiana University, 2015, 2018, 2019*

- Recipient of scholarship award for attending *Logic Mentoring Workshop (LMW)*, colocated with *LICS, 2019*
- SIGPLAN PAC award for attending and presenting at *POPL 2018*, organised by *ACM SIGPLAN, 2018*
- Scholarship award for attending *Joint Mathematics Meetings (JMM)*, organised by the *American Mathematical Society (AMS), 2018*
- Selected for participation in the *Mathematics Research Community (MRC)*, organised by the *American Mathematical Society (AMS), 2017*
- Awarded *Student Academic Appointment (SAA)* as a *Research Assistant (RA)* at *Indiana University, 2016, 2017*
- Qualified admission test to join Computer Science PhD program at *IIT Kanpur, 2015*
- Recipient of scholarship award for attending *Programming Languages Mentoring Workshop (PLMW)*, colocated with *POPL, 2015*
- Ranked 131 in the *Graduate Aptitude Test in Engineering (GATE), 2012*
- Honorable mention at *ACM-ICPC Regionals, Asia Region, Kanpur site, 2010, 2011*
- Finalist for *Jagadish Bose National Science Talent Search (JBNSTS) Senior scholarship, 2008*
- Awarded *Centum in Mathematics award for scoring 100% in Mathematics in ISC, 2008*
- Ranked 136 in *West Bengal Joint Entrance Examination (WBJEE), 2008*
- Ranked 3 in state level in *All India Engineering Entrance Examination (AIEEE), 2008*
- Qualified for and participated in *Indian National Mathematical Olympiad, 2006, 2007, 2008*
- Winner of *State level Maths Olympiad (MO), Chemistry Aptitude Test (CAT), and quizzes, 2005, 2006, 2007, 2008*
- Ranked in top 1% in *National Standard Examination in Physics (NSEP) and Chemistry (NSEC), 2007*
- Finalist for *National Talent Search (NTSE) Examination, 2007*
- Recipient of *Jagadish Bose National Science Talent Search (JBNSTS) Junior scholarship, 2006*
- Ranked 212, 200, 84, 148 in *National Level Science Talent Search Examination (NSTSE), 2003, 2004, 2005, 2006*
- Ranked 64 in *National Cyber Olympiad, 2005*

## References


Prof. Amr A. Sabry
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