

NIHIL ALEX SHAH

Research Associate | nihil.io | nas54@cam.ac.uk

EDUCATION

- UNIVERSITY OF OXFORD (LINACRE COLLEGE) OCTOBER 2024
DPhil/PhD in Theoretical Computer Science
“Arboreal Covers over Relational Structures”
supervised by Prof. Samson Abramsky and Prof. Bartek Klin
- UNIVERSITY OF OXFORD (LADY MARGARET HALL) SEPTEMBER 2017
M.Sc. in Mathematics and Foundations of Computer Science
“Game Comonads in Finite Model Theory”
supervised by Prof. Samson Abramsky
- UNIVERSITY OF CALIFORNIA, BERKELEY DECEMBER 2015
B.A. in Pure Mathematics

ACADEMIC EXPERIENCE

UNIVERSITY OF CAMBRIDGE, COMPUTER SCIENCE AND TECHNOLOGY DEPARTMENT

Research Associate

May 2023 – Present

- Proved complexity bounds for the propositional satisfiability problem for various classes of partial Boolean algebras linking quantum information with algebraic logic and complexity.
- Supervising a research project with a PhD student on comonadic semantics for loosely-guarded logic and hypertree width.
- Supervised by Prof. Anuj Dawar as part of UKRI funded project on Symmetry in Computation

TEACHING EXPERIENCE

- University of Cambridge, Computer Science and Technology Department
 - Tutor for Topics in Logic and Complexity (Lent 2024)
- University of Oxford, Computer Science Department
 - Demonstrator for Functional Programming (Michaelmas 2020)
 - Tutor for Logic and Proof revision (Trinity 2021)
 - Tutor for Categories, Proofs, and Processes (Michaelmas 2021)
 - Tutor for Algorithms and Complexity, Merton College (Michaelmas 2023)
- University of California Berkeley, Philosophy Department
 - Marker for Philosophical Logic (Spring 2016)

JOURNAL PAPERS

- Tomáš Jakl, Dan Marsden & Nihil Shah (2025). A categorical account of composition methods in logic. In *Logic Methods in Computer Science*. 2025.
- Yoav Montacute & Nihil Shah (2024). The Pebble-Relation Comonad in Finite Model Theory. In *Logic Methods in Computer Science*. 2024
- Samson Abramsky & Nihil Shah (2021). Relating structure and power: Comonadic semantics for computational resources. *Journal of Logic and Computation*.

CONFERENCE PAPERS

- Samson Abramsky, Yoav Montacute & Nihil Shah (2024). Linear Arboreal Categories. In *40th Annual Conference on Mathematical Foundations of Programming Semantics, Oxford, UK*.
- Amin Karamlou & Nihil Shah (2024). No Go Theorems: Directed Containers That Do Not Distribute Over Distribution Monads. In *LICS '24: 39th Annual ACM/IEEE Symposium on Logic in Computer Science, Tallinn, Estonia*.
- Tomáš Jakl, Dan Marsden & Nihil Shah (2023). A categorical account of composition methods in

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- logic. In *LICS '23: 38th Annual ACM/IEEE Symposium on Logic in Computer Science, Boston, US*.
- Yoav Montacute & Nihil Shah (2022). The Pebble-Relation Comonad in Finite Model Theory. In *LICS '22: 37th Annual ACM/IEEE Symposium on Logic in Computer Science, Haifa, Israel*. **Winner of Kleene Best Student Paper Award.**
- Samson Abramsky & Nihil Shah (2018). Relating Structure and Power: Comonadic Semantics for Computational Resources. In *27th EACSL Annual Conference on Computer Science Logic, CSL 2018*.

PREPRINTS

- Anuj Dawar & Nihil Shah. Complexity of Satisfiability in Kochen-Specker Partial Boolean Algebras. *arxiv:2602.24164*
- Tomáš Jakl, Dan Marsden, & Nihil Shah. Generalizations of Bilinear Maps: Technical Report. *arxiv:2205.05382*

AWARDS AND HONOURS

- Kleene Best Student Paper Award in LICS 2022 awarded August 2022
- Oxford-DeepMind Graduate Scholarship awarded October 2019
- Distinction Honours in MSc. Mathematics and Foundations of Computer Science program
- NOAA-Hollings Scholarship awarded August 2013

INDUSTRY EXPERIENCE

HOLLAND AND HART/JURIS FUTURA

Software Engineer

Nov 2017 – Oct 2019

- Created a DPLL-style SAT solver for temporal logic to reason about regulations and workflows
- Document generation microservice automating structured data entry pulling from a myriad of sources
- Created a multithreaded WebSocket backend for an Outlook chat application
- Maintained several haskell microservices servicing four end-user applications
- Onboarded and mentored new backend engineers
- Use of Haskell's popular libraries: (mega)parsec, aeson, mtl, containers, servant, lens, recursion-schemes, freer, polysemy

NATIONAL OCEANOGRAPHIC DATA CENTER (NOAA)

Hollings Scholar Intern

May 2014 – Sept 2014

- Applied StanfordNLP to obtain structured oceanographic metadata (e.g. latitude/longitude, temperature, etc.) from unstructured text documents (e.g. PDFs)
- Applied Apache UIMA, Tikka, and Solr to create a Semantic Web enriched search software for archived data
- Used Java servlets, Bash scripting, and PostgreSQL

COMPUTATIONAL COGNITIVE NEUROSCIENCE LAB

Programmer

May 2009 – Aug 2010

- Used MATLAB, Bash scripting, Sun Grid Engine to benchmark vision models on a cluster's nodes
- Used Python and numpy to rotate, translate, and scale images in a large data set
- Created a data table comparing neural network simulation softwares on Semantic MediaWiki