Nick Hu

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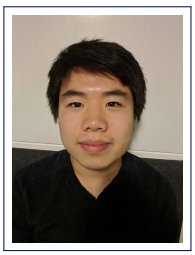

Education

Oct 2019–current **DPhil Computer Science**, *University of Oxford*, Quantum Group
Thesis — 'Coherent invertibility in associative n-categories'
Supervisors: Prof. Jamie Vicary & Prof. Sam Staton

Oct 2018–Sep 2019 **MSc Mathematics and Foundations of Computer Science**, *University of Oxford*, Distinction
Master's thesis — 'External traced monoidal categories'
Supervisor: Prof. Jamie Vicary

Oct 2015–Jul 2018 **BA Computer Science**, *University of Oxford*, Double First class
Practical work (Years 1–3): Distinction
Bachelor's thesis — 'Cartesian closed categories and the simply-typed λ-calculus'
Supervisor: Prof. Luke Ong

Research

Jun 2018–Sep 2018 **Research Internship**, *ERATO Hasuo Metamathematics for Systems Design Project*, National Institute of Informatics, Tokyo
Exploration of topics in coalgebra and automata theory focusing on an extension of '*Expressiveness of Probabilistic Modal Logics, Revisited*', for a game-theoretic characterisation of quantitative probabilistic bisimulation based on Kantorovich distance. Joint work with Dr. Ichiro Hasuo, Dr. Shin-ya Katsumata, and Dr. Bartek Klin. Funded by ERATO Hasuo Metamathematics for Systems Design Project.

Jul 2017–Sep 2017 **EPSRC Vacation Project**, *University of Oxford*
Supervision under Prof. Jeremy Gibbons on work related to implementing an embedding of Naperian functors (Haskell representable functors) into Haskell Accelerate, as an extension of '*APLicative Programming with Naperian Functors*'. Funded by EPSRC Vacation Bursary 2017.

Research Interests

Higher category theory, string diagrams, categorical semantics, coalgebra, programming languages, type theory, software tools, applied category theory

Experience

2018–current **College Lecturer & Departmental Tutor**, *University of Oxford*
For an up-to-date list, please see `cs.ox.ac.uk/people/nick.hu#teaching`.

Mar 2023–Dec 2023 **Research Intern**, *Huawei Technologies R&D UK*, Edinburgh, Programming Languages Research Group
Co-wrote the research software tool `sd-visualiser`. Full-time 3 months, part-time onwards.

May 2017 **World Finals' Coach**, *University of Oxford*, Rapid City, South Dakota, USA
Took a team to 41st Annual World Finals of the ACM International Collegiate Programming Contest.

Interests

Scuba diving, triathlon, 3D printing, open-source software, Japanese language

Publications

N. Corbyn, L. Heidemann, N. Hu, C. Sarti, C. Tataru and J. Vicary. 'homotopy.io: a proof assistant for finitely-presented globular n-categories'. In: *9th International Conference on Formal Structures for Computation and Deduction (FSCD 2024)*. 9th International Conference on Formal Structures for Computation and Deduction. Ed. by J. Rehof. Vol. 299. Leibniz International Proceedings in Informatics (LIPIcs). Tallinn, Estonia: Schloss Dagstuhl – Leibniz-Zentrum für Informatik, 2024, 30:1–30:26. ISBN: 978-3-95977-323-2. DOI: 10.4230/LIPIcs.FSCD.2024.30.

N. Hu and J. Vicary. 'Traced monoidal categories as algebraic structures in $\mathbf{Prof}$'. In: *Proceedings 37th Conference on Mathematical Foundations of Programming Semantics*. 37th Conference on Mathematical Foundations of Programming Semantics. Ed. by A. Sokolova. Vol. 351. EPTCS. Salzburg, Austria, 2021, pp. 84–97. DOI: 10.4204/EPTCS.351.6.

Y. Komorida, S.-y. Katsumata, N. Hu, B. Klin and I. Hasuo. 'Codensity Games for Bisimilarity'. In: *Proceedings of the 34th Annual ACM/IEEE Symposium on Logic in Computer Science*. 34th Annual ACM/IEEE Symposium on Logic in Computer Science. Vol. 34. Vancouver, Canada: IEEE, 2019, pp. 1–13. ISBN: 978-1-72813-608-0. DOI: 10.1109/LICS.2019.8785691.

Preprints

N. Hu, C. Tataru and J. Vicary. 'Coherent invertibility in associative n-categories'. 2024. In preparation.

Software

homotopy.io A graphical web-based proof assistant for finitely-presented globular n-categories, written in Rust, based on the theory of associative n-categories, which combinatorially encode n-dimensional string diagrams. Terms are manipulated as slices of string diagrams in spacial projection via a point-and-click interface, and can be viewed as 2D images, an interactive 3D WebGL rendering, or a 4D interactive animation.
`https://github.com/homotopy-io/homotopy-rs`

sd-visualiser An interactive tool for visualising string diagrams presented as hierarchical hypergraphs, written in Rust, which encode terms in a closed monoidal category and serve as a foundation for building programming languages. Terms are defined as programs, in either the implemented toy `sd` language or LLVM MLIR.
`https://github.com/sd-visualiser/sd-visualiser`

Awards

- EPSRC Doctoral Training Partnership Scholarship 2019
- Foundation College Scholarship 2018
- Catz Exchange Best Speaker 2018
- EPSRC Vacation Bursary 2017
- College Scholarship 2016

Academic activities

OOPSLA 2024 Artifact evaluation committee member for the 2024 ACM SIGPLAN International Conference on Object-Oriented Programming Systems, Languages, and Applications.

ACT 2021 Local organiser for the 4th Annual International Applied Category Theory Conference 2021 in Cambridge, United Kingdom.

For an extended list of my academic activities, please visit my website `https://nickx.hu`.