Joshua Chen

🏛 joshua.chen@nottingham.ac.uk   ✉ josh@joshchen.io   🌐 joshchen.io   ⌨ jaycech3n

I'm interested in the big swath of mathematics encompassing category theory, logical foundations, and computer programs/proofs, with a particular bent towards homotopy type theory and univalent foundations.

Experience

Jan 2019–Aug 2020	**Alternative type systems and logical foundations in Isabelle**
University of Innsbruck	Investigated dependently-typed logics and related infrastructure and tools for the Isabelle proof assistant under the ERC SMART project at the Computational Logic group.
2017–2018	**Machine learning and NLP for Copernicus EMS**
Fraunhofer Institute for Intelligent Analysis and Information Systems	I worked in the Knowledge Discovery group of the Fraunhofer IAIS, applying probabilistic models to analyze and classify topics in tweet corpora. I implemented targeted topic models in Java and also used Python for natural language processing of Twitter and Facebook data. This work was part of the European Union's E2mC project—a pilot project using publicly-available social media data to support its Copernicus emergency management service.
2015	**Enumeration and visualization of planar trivalent graphs**
The Australian National University	I developed and implemented algorithms in Scala to enumerate and automatically draw certain classes of planar graphs. This was part of research in quantum algebra investigating subfactors and planar algebras.
2013–2014	**Temperley-Lieb categories and skein modules**
The Australian National University	Final year Honours research thesis in category theory, quantum algebra, and applications to low-dimensional topological invariants. Available online at `arXiv:1502.06845 [math.QA]`.
Nov 2012–Jan 2013	**Integer houses in cyclotomic fields**
The Australian National University	Selective international undergraduate research program. I investigated questions concerning the dimensions of objects in fusion categories with the aid of Wolfram Mathematica.

Education

Ph.D. Computer Science	University of Nottingham
Oct 2020–present	Advisor: Nicolai Kraus
Masters in Mathematics	University of Bonn
Oct 2015–Sep 2018	Advisor: Peter Koepke
	German GPA 1.9

B.Sc. (Honours)	The Australian National University
Mathematics	Advisor: Scott Morrison
Jun 2013–Jul 2014	First Class Honours (GPA 80%)

B.Sc. Mathematics	University of Canterbury
Feb 2010–Dec 2012	Dean's Congratulations (GPA 8.64/9)

Publications etc.

Semisimplicial Types in Internal Categories with Families
Extended abstract workshop contribution. 27th International Conference on Types for Proofs and Programs (TYPES 2021). Jun 2021.

Homotopy Type Theory in Isabelle
12th International Conference on Interactive Theorem Proving (ITP 2021). Jun 2021.
DOI: `10.4230/LIPIcs.ITP.2021.12`

An Implementation of Homotopy Type Theory in Isabelle/Pure
Masters thesis. Sep 2018.
arXiv: `arXiv:1911.00399 [cs.LO]`

The Temperley-Lieb categories and skein modules
Bachelors thesis. May 2014.
arXiv: `arXiv:1502.06845 [math.QA]`

Selected Talks

2021	*Semisimplicial Types in Internal CwFs*
	27th International Conference on Types for Proofs and Programs, Leiden (virtual)
2019	*Dependent Types in Isabelle*
	4th Prague Inter-Reasoning Workshop, Czech Technical University, Prague
2019	*Isabelle/HoTT*
	Seminar talk, Chair for Logic and Verification, Technische Universität München, Munich
2019	*Hybrid and alternative logics in Isabelle*
	Doctoral program, Conference on Intelligent Computer Mathematics, Prague
2014	*What is Mathematics?*
	Outreach talk, ANU Open Day 2014, Canberra
2014	*An Introduction to Topological Quantum Field Theory*
	Australian Mathematical Sciences Student Conference, Newcastle
2014	*The Temperley-Lieb categories and Turaev-Viro skein modules*
	ANU MSI Honours Conference, Canberra

Teaching Assistance

2021	Algorithms, Correctness and Efficiency — Introduction to Formal Reasoning (University of Nottingham)
2021	Programming Paradigms — Haskell (University of Nottingham)

2017–2018	Machine Learning (University of Bonn)
2017	Data Mining and Knowledge Discovery (University of Bonn)
2015	Engineering Mathematics 1B (University of Canterbury)
2014	Mathematics and Applications 1 (Australian National University)
2014	Mathematics and Applications 1 (University of Canterbury)
2013	Discrete Mathematics (University of Canterbury)

Awards

2013	ANU Mathematical Sciences Institute Honours Scholarship
2012	ANU Summer Research Scholarship
2011	University of Canterbury Peter Bryant Prize for Pure Mathematics
2010	University of Canterbury Dux Scholarship