

Daniel Gratzer

PhD Student, Aarhus University

Curriculum Vitae and Publication List

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Education

- **Aarhus University** PhD (Fall 2018 – (Expected) Fall 2023)
(Masters GPA: 12.0) Advised by **Lars Birkedal**
- **Carnegie Mellon University** Bachelors of Science (Fall 2014 – Spring 2018)
(GPA: 3.73. Dean's List for 5 semesters. University Honors)
Honors Thesis (*supervised by Karl Craty*): **The Next 700 Failed Step-Index-Free Logical Relations**

Current Research

My research focuses on managing the complexity of modern programming languages and type theories. As programming languages and type theories introduce new features, it has become increasingly common to stratify the type system through *modalities*; thus preventing the uncontrolled mixing of features. The introduction of any modality, however, introduces serious challenges to the study of the behavior of a system. I am interested in applying modern algebraic and geometric techniques to the study of such modal type theories and programming languages.

Research Visits

- **Chalmers University** with Thierry Coquand March 2022–June 2022
- **University of Paris** with Adrien Guatto December 2021

Publications

In my field, conferences are the typical venue, not journals. A conference publication is full peer-reviewed research paper and, generally, they are as or more important than journal publications. Four of the conferences below are rated at A* by **the Australian CORE rankings**. This signifies that they are in the top 4% of computer science conferences.

Peer-reviewed publications

- **Under lock and key** 2023
G.A. Kavvos, Daniel Gratzer
To appear in the Bulletin of Symbolic Logic
- **A stratified approach to Löb induction** 2022
Daniel Gratzer, Lars Birkedal
Formal Structures in Computation and Deduction (FSCD)
- **Normalization for Multimodal Type Theory** 2022
Daniel Gratzer
Logic in Computer Science (LICS)
A* flagship conference
Selected for extended version
- **A Cubical Language for Bishop Sets** 2022
Jonathan Sterling, Carlo Angiuli, Daniel Gratzer
Logical Methods in Computer Science (LMCS)
- **Modalities and Parametric Adjoints** 2022
Daniel Gratzer, Evan Cavallo, G.A. Kavvos, Adrien Guatto, Lars Birkedal
Transactions on Computational Logic (ToCL)
- **Multimodal Dependent Type Theory** 2021
Daniel Gratzer, G.A. Kavvos, Andreas Nuyts, Lars Birkedal.
Logical Methods in Computer Science (LMCS)
- **Transfinite Iris: Resolving an Existential Dilemma of Step-Indexed Separation Logic** 2021
Simon Spies, Leonard Gäher, Daniel Gratzer, Joseph Tassarotti
Robbert Krebbers, Derek Dreyer, Lars Birkedal
Programming Language Design and Implementation (PLDI)
A* flagship conference
- **Multimodal Dependent Type Theory** 2020
Daniel Gratzer, G.A. Kavvos, Andreas Nuyts, Lars Birkedal.
Logic in Computer Science (LICS)

A* flagship conference

Selected for extended version (174 submitted, 69 accepted, ~10 extended versions)

- **Implementing a Modal Dependent Type Theory** 2019
Daniel Gratzer, Jonathan Sterling, Lars Birkedal.
International Conference on Functional Programming (ICFP)
A* flagship conference
Distinguished paper (119 submissions, 39 accepted and 4 distinguished papers).
- **Cubical Syntax for Reflection-Free Extensional Equality** 2019
Jonathan Sterling, Carlo Angiuli, Daniel Gratzer.
Formal Structures in Computation and Deduction (FSCD)
Best Junior Researcher Paper
- **Managing Obligations in Higher-Order Concurrent Separation Logic** 2019
Aleš Bizjak, Daniel Gratzer, Robbert Krebbers, Lars Birkedal.
Principles of Programming Languages (POPL)
A* flagship conference

Abstracts

- **Controlling unfolding in type theory** 2023
Daniel Gratzer, Jonathan Sterling, Carlo Angiuli, Thierry Coquand, Lars Birkedal
HoTT
- **Unifying cubical and multimodal type theory** 2022
Frederik Lerbjerg Aagaard, Magnus Baunsgaard Kristensen, Daniel Gratzer, Lars Birkedal
TYPES
- **A flexible multimodal proof assistant** 2022
Philipp Stassen, Daniel Gratzer, Lars Birkedal
TYPES
- **Normalization for multimodal type theory** 2021
Daniel Gratzer
TYPES
- **Modalities and Parametric Adjoints** 2021
Daniel Gratzer, Evan Cavallo, G.A. Kavvos, Adrien Guatto, Lars Birkedal
TYPES
- **Multimodal Dependent Type Theory** 2020
Daniel Gratzer, G.A. Kavvos, Andreas Nuyts, Lars Birkedal.
International Congress on Mathematical Software (ICMS)
- **Multimodal Dependent Type Theory** 2020
Daniel Gratzer, G.A. Kavvos, Andreas Nuyts, Lars Birkedal.
TYPES
- **XTT: Cubical Exact Equality and Categorical Gluing** 2019
Jonathan Sterling, Carlo Angiuli, Daniel Gratzer.
HoTT
- **Cubical Syntax for Reflection-Free Extensional Equality** 2019
Jonathan Sterling, Carlo Angiuli, Daniel Gratzer.
TYPES

Talks

Conference and workshop talks

- **A stratified approach to Löb induction** 2022
Conference talk at *FSCD*
- **Normalization for multimodal type theory** 2022
Conference talk at *LICS*
- **Normalization for multimodal type theory** 2021
Conference talk at *TYPES*
- **Modalities and Parametric Adjoints** 2021
Conference talk at *TYPES*
- **Multimodal Dependent Type Theory** 2020

Workshop talk at *International Congress on Mathematical Software*

- **Multimodal Dependent Type Theory** 2020
Conference talk at *TYPES*
- **Multimodal Dependent Type Theory** 2020
Conference talk at *Logic in Computer Science*
- **Implementing a Modal Dependent Type Theory** 2019
Conference talk at *International Conference on Functional Programming*
- **Managing Obligations in Higher-Order Concurrent Separation Logic** 2019
Conference talk at *Principles of Programming Languages*

Invited talks

- **Controlling unfolding in type theory** 2023
Second WG6 meeting
- **Modalities and (weak) dependent right adjoints** 2023
Homotopy Type Theory Electronic Seminar Talks (HoTTEST)
- **Modalities from the start** 2023
Bergen University, Type Theory Seminar
- **Normalization for multimodal type theory** 2022
Chalmers University, ProgLog Seminar
- **Sketching type theories** 2021
University of Lyon, Chocla Seminar
- **Multimodal Dependent Type Theory** 2020
Stockholm University, Logic Seminar
- **Multimodal Dependent Type Theory** 2020
IT University of Copenhagen, PLZ Seminar
- **Modalities in Type Theory** 2019
University of Paris
- **Implementing Type Theory** 2019
Computer Science Day in Aarhus University

Preprints

- **Normalization for Multimodal Type Theory** 2023
Daniel Gratzer
Under review, extended version of the LICS publication by the same name.
- **Controlling unfolding in type theory through extension types** 2023
Daniel Gratzer, Jonathan Sterling, Carlo Angiuli, Thierry Coquand, Lars Birkedal
Under review
- **Denotational semantics of general store and polymorphism** 2022
Jonathan Sterling, Daniel Gratzer, Lars Birkedal
Under review
- **Unifying cubical and multimodal type theory** 2022
Frederik Lerbjerg Aagaard, Magnus Baunsgaard Kristensen, Daniel Gratzer, Lars Birkedal
Under review
- **Strict universes for Grothendieck topoi** 2022
Daniel Gratzer, Michael Shulman, Jonathan Sterling
Under review
- **A Case Study in Iris: Concurrent Stacks with Helping** 2017
Daniel Gratzer, Mathias Høier, Aleš Bizjak, Lars Birkedal.
- **Positive Function Spaces in Focalized Propositional Logic** 2015
Daniel Gratzer, Karl Craty

Teaching and Service

- **Program committee member** for MFPS (2022)
- **Layout Editor** for LMCS (Spring 2019 – Spring 2021)
- **External reviewer** for CSL, ESOP, POPL, ITP, ICFP, JFP, LICS, and MSCS.

— ***Teaching at Aarhus University***

- Teaching assistant for Compilers (Fall 2022)
- Co-organizer for Categorical Type Theory Seminar (Spring 2021)
- Co-organizer for Category Theory (Fall 2019, Fall 2020)
- Teaching assistant for Program Analysis and Verification (Fall 2018)

In addition to the above, I have helped with Lars Birkedal to advise masters theses.

— ***Teaching at Carnegie Mellon University***

- Teaching assistant for Constructive Logic (Fall 2017)
- Teaching assistant for Practical Foundations of Programming Languages (Spring 2016)
- Teaching assistant for Introduction to Functional Programming (Spring 2015 – Fall 2015)