APPLICATION TO THE ACT 2019 SCHOOL

HOANG KIM NGUYEN

1. Introduction

My name is Hoang Kim Nguyen and I am currently a Postdoc at the SFB 1085 *Higher invariants* at the University of Regensburg, working in the group of Prof. Denis-Charles Cisinski. I recently finished my PhD Thesis (October 2018) under the supervision of Prof. Ulrich Bunke and Dr. George Raptis. My thesis was mostly concerned with foundational aspects of higher category theory (see also below for a more detailed description).

I have conducted independent research in the field of higher category theory and also in homotopical algebra to study the homotopy theory of higher categories. In general, category theory continues to be one of my main research interests, higher or not (in case one wants to distinguish them). I have also always had a soft spot for the philosophy of language and my minor subject in my undergraduate studies was precisely this.

2. Motivation

As I have mentioned above, I have a background in higher category theory and abstract homotopy theory. My research has been mostly concerned with foundational aspects of higher category theory, but I very much enjoy the applications of abstract methods in other fields, as this is usually how I think and understand subjects and how I express myself.

Such applications can be inside mathematics, but the emergent field of applied category theory has really caught my interest recently. I find it exciting how one might apply categorical thinking in other sciences outside of mathematics. One of the appeals of category theory for me, apart from its clarity of expression, is its wide applicability, hence one always learns new subjects. Seeing this also in sciences outside of mathematics is a great opportunity to learn new things and also to see and understand them from a perspective which is close to my way of thinking.

Thus, I would like to participate and contribute in this exciting field of research. I believe that the ACT School 2019 is a perfect opportunity to get into the subject. It's a great way to learn from experts and to get to know the community. At the same time, working together with other motivated people to learn and conduct research has always been a positive experience for me.

I hope by participating in the ACT School 2019, I will have the opportunity to meet and get to know people working in applied category theory, to have interesting discussions on a topic which I enjoy a lot, and ultimately to be able to contribute to the field. I have just recently finished my PhD and would like to focus on category theory as a next research step and also get to know and become a part of the applied category theory community.

3. PhD Thesis

I have defended my thesis on October 26, 2018. My thesis consisted of four parts, which are mostly independent. The first part generalizes Cisinski's theory of model structures on presheaf categories with a functorial cylinder to locally presentable categories and also shows that one can drop one axiom to obtain model structures which behave in a 'covariant' or 'contravariant' way in a precise sense. The second part builds on this to construct a universal coCartesian fibration, which (strictly) classifies coCartesian fibrations of simplicial sets with small fibers. The third part, which is joint work with George Raptis and Christoph Schrade, generalizes Freyd's General Adjoint Functor Theorem to the setting of ∞-categories, and the fourth part identifies the infinite loop space structure of the cobordism category.

4. Project preference

(1) Formal and experimental methods to reason about dialogue and discourse using categorical models of vector spaces (Mehrnoosh Sadrzadeh)
(2) Complexity classes, computation, and Turing categories (Pieter Hofstra)
(3) Partial evaluations, the bar construction, and second-order stochastic dominance (Tobias Fritz)
(4) Traversal optics and profunctors (Bartosz Milewski)
(5) Toward a mathematical foundation for autopoiesis (David Spivak)
(6) Simplifying quantum circuits using the ZX-calculus (Miriam Backens)

5. Commitment and Funding situation

I am currently funded by the Deutsche Forschungsgemeinschaft in the SFB 1085 Higher Invariants at the University of Regensburg. There is travel funding available and I don't have any teaching obligation. Thus I can fully commit to coming to Oxford.

6. Reference

Prof. Denis-Charles Cisinski

Fakultät für Mathematik
Universität Regensburg
93040 Regensburg
Deutschland

Tel.: +49-941-943-5913
Email: denis-charles.cisinski@mathematik.uni-regensburg.de

Hoang Kim Nguyen

Curriculum Vitae

Faculty of Mathematics
Universität Regensburg
93040 Regensburg
Germany
✉ *hoang-kim.nguyen@mathematik.uni-regensburg.de*

Employment

Current **Universität Regensburg**.
Postdoc at the SFB 1085 Higher Invariants

Education

2014-2018 **Universität Regensburg**.
Ph.D. in Mathematics
Advisor: Prof. Dr. Ulrich Bunke and Dr. George Raptis

2011-2014 **Rheinische Friedrich-Wilhelms-Universität Bonn**.
Master of Science in Mathematics

2008-2011 **Technische Universität Berlin**.
Bachelor of Science in Mathematics

Scientific Interests

- Homotopy Theory
- Higher Category Theory

Publications and preprints

Adjoint functor theorems for ∞-categories, with George Raptis and Christoph Schrade, preprint arxiv:1803.01664, submitted.

On the infinite loop space structure of the cobordism category, Algebraic & Geometric Topology, Vol. 17, Issue 2.

Scientific Activities

Conferences and workshops attended

2017 Conference 'Invertibility and Duality in Derived Algebraic Geometry' at Universität Regensburg
2017 Workshop on '∞-operads and applications' at Universität Osnabrück
2016 Workshop 'Bordism, L-theory, and real algebraic K-theory at Universität Regensburg
2016 'Young Topologists Meeting' at University of Copenhagen
2016 Spring school 'Motives and derived algebraic geometry' at Universität Duisburg-Essen
2015 Workshop 'Derivators in Barcelona' at the University of Barcelona
2015 Summer school 'Algebraic K-theory and trace methods' at the Universität Regensburg
2015 'Young Topologists Meeting' at the EPFL Lausanne
2015 Spring school 'K-theory of topological algebras' at the Universität Regensburg

2015 Introductory school 'Homotopy theory, manifolds and field theories' at the Hausdorff Center for Mathematics Bonn

2015 The MIT Talbot Workshop 2015 'Little Disks Operads'

2013 Summer school 'Topology of high dimensional manifolds' at the Hausdorff Center for Mathematics Bonn

2013 Summer school 'Field theories, conformal nets and Kac-Moody groups' at the WWU Münster

Teaching experience

2015 Organizer Research Seminar 'The Grothendieck-Teichmüller group' at Universität Regensburg

2014 Teaching assistant Linear Algebra II at Universität Bonn

2013 Teaching assistant Mathematics for physicists I at Universität Bonn

2013 Teaching assistant Linear algebra II at Universität Bonn

2012 Teaching assistant Linear algebra I at Universität Bonn

2011 Teaching assistant Linear algebra for engineers at Technische Universität Berlin

Awards

2006 Abiturpreis der Deutschen Physikalischen Gesellschaft

Further activities

- Former member of the TU Berlin Big Band (Bass)
- Former member of the Freiburger Schüler Jazz Orchester (Bass, Guitar)
- Volunteer for the Lebenshilfe e.V.
- Volunteer at the Thi Nghe Orphanage in Ho-Chi-Minh-City, Vietnam

Languages

German	native
Vietnamese	native
English	fluent
French	fluent

Regensburg, January 29, 2019