UNIVERSITY OF
BIRMINGHAM

Noam Zeilberger, Birmingham Fellow
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4th February 2019

The Organisers
Adjoint School, ACT 2019

To whom it may concern,

It is my pleasure to write a letter of recommendation for Nicolas Blanco to participate in the Adjoint School at ACT 2019.

I first began interacting with Nicolas last June, when he was considering to apply for a PhD studentship at the University of Birmingham. With a Master's degree from the highly competitive LMFI ("Mathematical Logic and Foundations of Computer Science") program in Paris, as well as two years' experience in industry developing software for safety-critical systems using formal methods, Nicolas already demonstrated a strong and diverse background in mathematics, logic, and software engineering. Moreover, during our interactions I was impressed by his ability to quickly absorb concepts and to pose pointed questions. I therefore encouraged him to apply, and since October 2018 Nicolas has been enrolled as a PhD student at the School of Computer Science under my supervision, with a scholarship from the department.

The current focus of Nicolas' research is on developing categorical foundations for the verification of probabilistic and quantum programs, with a particular emphasis on a fibrational approach coming from the study of symmetric monoidal closed bifibrations. This topic combines aspects of my own research on type refinement systems with Nicolas' background in physics, as well as experience he gained during a Master's internship with Benoît Valiron. Although Nicolas is still in the early stages of his doctoral career, he shows a strong capacity for working independently, finding creative solutions to problems, and reflecting critically upon high-level goals. I am also delighted to see him adapting easily to working in a new environment in a foreign country, which is no doubt aided by his overall positive attitude and friendly demeanor (not to mention his leadership skills, for example in organizing a category theory reading group!).

I think that participating in the Adjoint School would be a wonderful opportunity for

Nicolas at this point of his PhD career. Several of the projects being proposed are relevant to his chosen thesis topic, and more broadly, he is highly interested and eager to learn about the effective application of category theory to different areas of science. Participating in the Adjoint School and at ACT 2019 would give him access to leading experts in applied category, as well as invaluable connections with other young researchers in this domain. I can therefore recommend Nicolas without hesitation, and will be happy to provide any further information in regards to his application.

Yours sincerely,

Noam Zeilberger

Applied Category Theory January 29, 2019

Dear members of the ACT,

I am really excited by the Applied Category Theory Summer School that you are organising.

I am a first year PhD student at the University of Birmingham.
My supervisor is Noam Zeilberger and I expect to complete my PhD on the 30th September 2021.
The temporary title of my PhD is "Fibrational aspects of probabilistic and quantum computing".
I plan on using the functor-as-type-refinement approach of Noam Zeilberger and Paul-André Melliès to better understand some categorical constructions in the study of non classical programming languages, from probabilistic and quantum Hoare logics to categorical semantics for causal structures.

More generally, my research interests lie in the application of Logic and Category Theory to Computer Science and Programming Languages, especially, how to shift classical methods to quantum settings.
These include but are not limited to: quantum λ-calculi, categorical quantum mechanics, linear logic, categories of vector spaces, and quantum formal methods.

Before my PhD, I did a Master at the University Paris Diderot in Mathematical Logic and Foundations of Computer Science.
There I learn about proof theory, type theory, linear logic and its categorical semantics, set theory, model theory, computability and complexity theory, amongst over subjects.

At the end of this master, I did an internship at LRI, University Paris-Sud, under the supervision of Benoit Valiron.
I designed a probabilistic linear $\lambda\mu$-calculus and its semantics in terms of (real) normed vector spaces and (completely) positive maps.

Being in Birmingham, UK, it would be easy for me to go to Oxford, even for a day if necessary.

Here is my order of project preference, going from the one I am the most interested in to the one that is the furthest from my research expertise.
1. Miriam Backens' "Simplyfing quantum circuits using the ZX-calculus
2. Mehrnoosh Sadrzadeh's "Formal and experimental methods to reason about dialogue and discourse using categorical models of vector spaces"
3. Tobias Fritz's "Partial evaluations, the bar construction, and second-order stochastic dominance"
4. Pieter Hofstra's "Complexity classes, computation, and Turing categories"
5. David Spivak's "Toward a mathematical foundation for autopoiesis"
6. Bartosz Milewski's "Traversal optics and profunctors"

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I see this Summer School as a great opportunity to join a vibrant community.
Collaboration is an important part of an academic career and this school offers a way to met people sharing similar interests.
I have been a reader of the n-café and I followed the work on categorical quantum mechanics for quite some time.
ACT will gather together a lot of researchers from those communities.

Careerwise, I planned on building an expertise in the application of category theory to probabilistic and quantum computing.
Most of the projects offered in this school have a connection to this topic.

Furthermore, I have not decided yet if I prefer staying in the academia or going back to the industry after my PhD.
These projects have the advantage of being more applied that what is common in category theory.
It would be a good additional research experience, especially if I choose to go in the industry.

All in all, I am looking forward to this summer school because I am really curious about all the topics that it will explore.

Best Regards,

Nicolas Blanco

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Professional experience

2018 **Formal Methods Software Engineer**, Clearsy Paris.
Using B-Method and Ada to develop new functionalities of an embedded safety critical software for a CBTC (driverless train)

2017 **Safety Engineer**, Clearsy Paris.
Safety analysis of a remote I/O platform
Creating a safety case for a SIL4 certification

Formation

2018 **PhD in Computer Science**, *University of Birmingham*, Birmingham, UK.
Categorical semantics of classical, probabilistic and quantum programming languages

2016 **MSc in Mathematics**, *Paris Diderot University*, Paris, France.
Mathematical Logic and Foundations of Computer Science

2014 **MSc in Mathematics**, *University of Nice Sophia Antipolis*, Nice, France.
Theoretical and Applied Mathematics

2012 **Grande École**, *ISIMA*, Clermont-Ferrand, France.
Graduate engineering school specialised in Computer Science and Computational Mathematics

Internship and thesis

2015 **Research internship/Master thesis**, *LRI*, Gif-sur-Yvette, France, duration : 5 months.
Denotational semantics of a linear probabilistic $\lambda\mu$-calculus based on topological vector spaces

2014 **Master thesis**, *University of Nice Sophia Antipolis*, Nice, France, duration : 3 months.
Theory of exterior algebras and Applications to quantum chemistry

2012 **Research internship**, *JHI*, Aberdeen, UK, duration : 5 months.
Modelisation in Obj-C of the influence of wild pollinators on crops

Languages

English Fluent
French Native

Programming Languages and technical skills

Industry B-Method, Event B, Ada, Bash and batch scripts, Microsoft Word, Microsoft Excel, Linux and Windows environment

Academic projects Obj-C, C, C++, OCaml, Coq, Java, LaTeX