



Applied Category Theory <act2019school@gmail.com>

Application for ACT2019

1 message

Jack Hidary <hidary@google.com>

Wed, Jan 30, 2019 at 11:41 PM

To: act2019school@gmail.com

Hi,

I am very interested in participating in ACT2019. I am passionate about mathematics both in terms of pure mathematics as well as its potential to give us more insight into a wide range of other fields. Here is a [python notebook colab](#) I developed, for example, to share the details of the Riemann Hypothesis with my colleagues at Google and in the larger community.

I am not a traditional applicant for the program in that I lead two research groups at Google X (AI and Quantum Computing). Nevertheless, I hope to be included in the program as I would like to ramp up my knowledge of category theory as well as contribute to the group.

I have recently written a 300-page graduate-level textbook on quantum computing; the book was commissioned by Springer. They will publish it ~June of this year (detailed TOC attached; I can show the full draft if needed online over a video chat). I wrote the book not only for physicists, but for mathematicians and researchers in other fields who want to learn more about quantum computing.

I also develop mathematics courses and teach higher mathematics at our internal university at Google, engEDU. I enjoy writing these courses and teaching these subjects even though it is not part of the remit of my role, since it spreads the use of mathematics across the company.

Category theory is a very useful framework and I hope to be part of the program to contribute to this important field.

Sending this in at 11:40pm pacific time January 30th. Attached are the requested items.

Jack



Jack Hidary
AI@X & Quantum@X
Alphabet X Labs
[new colab](#) on Riemann

2 attachments

QuantumComputingBookTOC.pdf
94K

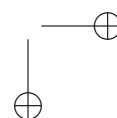
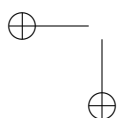
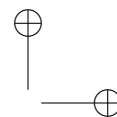
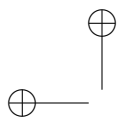


ACT2019 - Hidary1.pdf
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Quantum Computing: A Practical Approach

first edition
26 January 2019

Jack D. Hidary



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Hi,

Here is the requested info for the application to ACT 2019:

1. I serve as the lead of quantum computing research and programs and co-lead of AI research and programs at Alphabet (Google) X.
2. CV: <https://www.linkedin.com/in/jackhidary/>
3. Recent publications: [Google Scholar page](#)
4. I can commit to attending the Oxford program for both weeks (the school and the conference). I will not require any support to attend.

Statement on why the program and projects would match well with my research interests

The projects that I would look forward to working on are:

1. **Pieter Hofstra**

Title: *Complexity classes, computation, and Turing categories*

In my work on quantum computing, I have been focused on BQP and which algorithms can be assigned to this complexity class. As we build quantum computers over the next decade that go beyond the NISQ regime and approach the fault-tolerant-regime, this becomes more than just a theoretical question.

Chapter five of my forthcoming textbook on Quantum Computing focuses on complexity classes and how we think about them in this context. I would be very interested to work with Pieter and the group on these issues.

PS - my hobby is going through the [complexity zoo](#) website.

2. **Miriam Backens**

Title: *Simplifying quantum circuits using the ZX-calculus*

Also of great interest is [the work](#) that Miriam Backens has done on the ZX-calculus building on the work of Coecke and Duncan.

This framework can be a powerful tool to both analyze, construct and simplify quantum circuits. I am also interested in connecting this line of inquiry with our work on tensor networks. In my group we collaborate with a range of labs that develop quantum computing hardware; each hardware realization has different constraints and parameters that dictate the kinds of quantum circuits one can build and run; this project provide additional tools in the theoretical framework for quantum circuit design and understanding.

My comments on the two groups of interest delineate why I believe this program will be very beneficial for my research. I also hope that I can contribute a useful and different perspective in that my group and I have been immersed at the forefront of quantum algo design and development and the implications for complexity class analysis.

Note: could use some advice on what to do about the recommendation letter. The faculty I work with are visiting faculty in my group that I lead and thus would be inappropriate to ask for a letter of recommendation (Lenny Susskind, Patrick Hayden and others...). If needed, the school could contact the head of mathematics at Springer who knows my work, as a reference.

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In summary, I hope to join ACT2019 to both learn more about category theory, contribute to the group and attend the school and conference at Oxford.

Please email me at hidary@google.com with any questions.