PROJECT SUMMARY

Overview:

The Lorentz Center in Leiden has agreed to host and fund Applied Category Theory 2018 from April 23rd to May 4th, 2018. With funding from the NSF, grad students and postdocs in the US would be able to attend this event, which will bring together 30 senior researchers, 20 junior researchers, and 10 participants from industry to discuss progress in applied category theory, create community, and lay out a roadmap for future work. From January to April 2018, junior researchers will participate in an online reading seminar, culminating in a research school at the Lorentz Center April 23-26 where they will solve problems with help from expert mentors. The workshop proper will then feature lectures and discussion on four areas of applied category theory: networked dynamical systems, systems biology, cognitive science/AI, and causality. This event is organized by Bob Coecke (Oxford), Brendan Fong (MIT), Aleks Kissinger (Nijmegen), Martha Lewis (Amsterdam), and Joshua Tan (Oxford).

Intellectual Merit:

Category theory has long been a powerful tool for transferring
techniques between disciplines in pure mathematics. Recently it has become a useful tool in disciplines ranging from biochemistry, electrical engineering and control theory to the study of stochastic processes, the design of databases, and the design of networks of mobile agents. Operads, sheaves and other sophisticated concepts are not only giving rise to new methodologies for system design and analysis, but also triggering new developments in the underlying mathematics.

Broader Impacts:

Currently, category theory informs work at US companies including Metron Scientifc Solutions (the first PI is using operads in their project with DARPA to build a Complex Adaptive System Composition and Design Environment), Siemens (one student of the first PI is working in their project Next-Generation Engineering with Category Theory and Sheaves), and Categorical Informatics (the second PI is a cofounder of this company, which uses category theory to design databases). However, the potential of this subject in industry has just begun to be exploited. This workshop will address this problem. It will teach junior researchers in mathematics how to apply category theory, expose participants from industry to the uses of this subject, and forge new contacts between mathematicians and industry.