Applied Category Theory 2018

Aim

Towards an integrative science: in ACT 2018, we want to instigate a multi-disciplinary research program in which concepts, structures, and methods from one scientific discipline can be reused in another. The aim of the workshop is to (1) explore the use of category theory within and across different disciplines, (2) create a more cohesive and collaborative ACT community, especially among early-stage researchers, and (3) to accelerate research by outlining common goals and open problems for the field.

Description

Category theory was developed in the 1940s to translate ideas from one field of mathematics to another. Topologists and geometers use category theory to describe the passage from one mathematical structure to another, while category theorists are also interested in categories for their own sake. In computer science and physics, many types of categories are used to give a formal semantics of domain-specific phenomena such as automata, regular languages, or quantum protocols. More recently, category theory has become an unexpectedly useful and economical tool for modeling a range of different disciplines, including programming language theory, quantum mechanics, systems biology, complex networks, database theory, and dynamical systems.

In the applied category theory community, a long-articulated vision understands categories as mathematical workspaces for the experimental sciences, similarly to their use in topology and geometry. This vision has proved true in certain fields, including computer science and mathematical physics, and we believe that these results can be extended in an exciting direction. We believe that category theory has the potential to bridge specific different fields, and moreover that theoretical developments in fields such as automata can be transferred successfully to application areas, for example systems biology, through category theory. Already, for example, the categorical modeling of quantum processes has helped solve an important open problem in natural language processing.

The workshop will host talks on a wide range of applications of category theory, including four special tracks on exciting new developments in the field:

* Dynamical systems and networks
* Systems biology
* Cognition and AI
* Causality

Accompanying the workshop will be a 4-day summer school for a limited number of early-career researchers, as well as a 16-week series of online seminars for up to 16 PhD students and postdocs called the Kan Extension Lab.

While attendance at the summer school is not required to attend the online seminar, or vice versa, our intention is for participants to attend both. Participants will have the opportunity to work with established mentors in the field, and will have the opportunity to present their research at the full workshop.