



“MATH for Machine Learning” Seminar

Information Flow Axioms in Categorical Probability

Ms. Zilin Su
HKU

Abstract

This talk introduces Fritz, Tobias, et al. "Dilations and information flow axioms in categorical probability." *Mathematical Structures in Computer Science* 33.10 (2023): 913-957.

The probability of an event reflects the information available about it, while a probability function or a stochastic kernel reflects a channel that transports information flow. In ordinary probability, for example, Bayes' theorem inverts the generative direction $\Theta \rightsquigarrow X$ into the inferential direction $X \rightsquigarrow \Theta$ by disintegrating a joint law into marginal and conditional.

The assumption that no information is lost when hidden structures are added to apply these tools, holds on finite and standard Borel spaces, but can fail in general domains, such as higher order systems and semiring-valued kernels.

This talk makes the assumptions explicit as information-flow axioms. Starting from an abstract information flow structure, the report will clarify which hidden assumptions underlie familiar statistical principles, including nonnegative probability, the existence of conditional and marginals, and stability of (almost sure) equality. The report will establish a mathematical hierarchy among these assumptions axioms and give examples illustrating the information loss that can result when they are removed.

Members of the Department of Mathematics are welcome to attend. Any content designated as confidential by the presenter should be kept confidential.

Date:	October 8, 2026 (Thursday)
Time:	3:00 pm – 4:00 pm
Venue:	Room 210, Run Run Shaw Building HKU