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Information-Theoretic Causal Inference and Discovery

Guest Editor:

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Message from the Guest Editor

Causal inference is one of the main focus areas in AI and ML. Causality has received significant interest in ML in recent years in part due to its utility for generalization and robustness. Information-theoretic assumptions and techniques open new avenues for causality research ranging from discovery to inference. Some examples of the success of information theory in causal inference are the use of directed information, minimum entropy couplings and common entropy for bivariate causal discovery, the use of the information bottleneck principle with applications in the generalization of machine learning models, and analyzing causal structures of deep neural networks with information theory, among others.

This Issue focuses on bringing information theory and causality together to expand the scope of current causal reasoning algorithms. The expected contributions range from the introduction of new assumptions to pave the way for better analyses to addressing a causal question in a well-studied setting using a novel information-theoretic approach. Some applications include causal graph discovery and the identification of interventional or counterfactual distributions from data.

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Message from the Editor-in-Chief

The concept of entropy is traditionally a quantity in physics that has to do with temperature. However, it is now clear that entropy is deeply related to information theory and the process of inference. As such, entropic techniques have found broad application in the sciences.

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