

Internship Subject (2025)
Title: **Causal Inference and Discovery**

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Context

Inferring causal relationships from observational data is common in scientific research, but it is a challenging problem especially if there are latent variables. We would address this by developing novel methods and algorithms for inferring complex causal models with or without latent variables. These methods will use advanced mathematical tools and techniques from information theory to reveal causal structures that existing methods may miss. **New algorithms will automate reasoning and provide clear evidence by generating human-verifiable proofs for causal models that are too complex for manual analysis.** This project will enhance our expertise in causal discovery, machine learning, and computer-assisted proofs. Suitable results can be submitted to a distinguished conference or journal or can be considered as a preliminary work for a potential PhD programme.

Keyword: Formal verification and reasoning of AIML, causal models, computer-assisted proofs

References

S. -W. Ho, L. Ling, C. W. Tan and R. W. Yeung, "Proving and Disproving Information Inequalities: Theory and Scalable Algorithms," IEEE Transactions on Information Theory, vol. 66, no. 9, pp. 5522-5536, Sept. 2020. <https://ieeexplore.ieee.org/abstract/document/9044774>
Software available (developed by Dr. Siu-Wai Ho)