

# Causal Discovery in Biomedicine

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FORTH-ICS

Knowledge of causal relations is paramount in understanding the mechanisms of disease, designing novel drugs and treating patients. Which genes' expression is affecting another gene, what proteins affect the concentration levels of another biomarker, and what clinical factors affect treatment efficacy? When experimental data are not available one has to rely on observational or quasi-experimental data to generate the most plausible causal hypotheses to explore next.

Traditionally, biomarker identification in biomedicine has been using variable (a.k.a feature) selection techniques from statistics and machine learning, where the most predictive subset of variables is sought. Recent developments in causal modelling and induction from observational data however, allow us to soundly identify causal relations under certain broad conditions.

In this talk, I will review the general theory of causal discovery, pitfalls of traditional and ad-hoc approaches to causal discovery, present the algorithmic state-of-the-art in the field, as well as how it is applied in biomedical domains. I will also focus specifically on the expertise and contributions of our lab in the field, our future algorithmic directions extending the state-of-the-art, and our publicly available systems and algorithms for practitioners to use.