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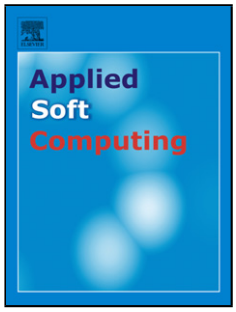

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Causality on Cross-Sectional Data: Stable Specification Search in Constrained Structural Equation Modeling

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Abstract

Causal modeling has long been an attractive topic for many researchers and in recent decades there has seen a surge in theoretical development and discovery algorithms. Generally discovery algorithms can be divided into two approaches: constraint-based and score-based. The constraint-based approach is able to detect common causes of the observed variables but the use of independence tests makes it less reliable. The score-based approach produces a result that is easier to interpret as it also measures the reliability of the inferred causal relationships, but it is unable to detect common confounders of the observed variables. A drawback of both score-based and constrained-based approaches is the inherent instability in structure estimation. With finite samples small changes in the data can lead to completely different optimal structures. The present work introduces a new hypothesis-free score-based causal discovery algorithm, called stable specification search, that is robust for finite samples based on recent advances in stability selection using subsampling and selection algorithms. Structure search is performed over Structural Equation Models. Our approach

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**The members of OPTIMISTIC consortium are described in [1].

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