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Structural Identifiability in Non-Gaussian Graphical Discrete Lyapunov Models

Graphical discrete Lyapunov models are statistical models derived from first-order vector autoregressive (VAR(1)) processes, with applications to causal discovery when only single-time-point equilibrium data, rather than the full time-series trajectories, are available. Motivated by the classic theorem of Marcinkiewicz, which establishes that non-Gaussian distributions with cumulants of all orders must have non-zero cumulants at infinitely many orders, we investigate the additional identifying information when the distributions in these models are non-Gaussian. In particular, we explore how polynomial equations associated with the higher-order cumulants of distributions in this model can be leveraged to identify the underlying graph, or causal structure.