



# Causal Network Inference via Group Sparse Regularization

[Andrew Bolstad](#), [Barry Van Veen](#), [Robert Nowak](#)

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This paper addresses the problem of inferring sparse causal networks modeled by multivariate auto-regressive (MAR) processes. Conditions are derived under which the Group Lasso (gLasso) procedure consistently estimates sparse network structure. The key condition involves a "false connection score." In particular, we show that consistent recovery is possible even when the number of observations of the network is far less than the number of parameters describing the network, provided that the false connection score is less than one. The false connection score is also demonstrated to be a useful metric of recovery in non-asymptotic regimes. The conditions suggest a modified gLasso procedure which tends to improve the false connection score and reduce the chances of reversing the direction of causal influence. Computational experiments and a real network based electrocorticogram (ECoG) simulation study demonstrate the effectiveness of the approach.

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