

Review of: "Big Data, Granger Causality Analysis, and the Undecidability Property of Neuroimaging"

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This paper outlines the foundations for Granger causality and its neural correlate Granger-Geweke causality analysis by drawing on statistics and information theory. The article is fine structured, but with a couple of concerns listed as follows:

1. On page 5-6, the formula of spectral version of GC should be clearer. There are typos found in the bottom formula regarding delta symbols, it might corrected to be $\delta_{lm}=1$ ($l=m$), otherwise $\delta_{lm}=0$. In the first formula on page 6, the matrix of A should be the matrix of H, then it derives the matrix of H is the inverse of the matrix of A, as stated in the second formula. Similarly, the third main formula on page 6 (spectral G-causality), the equations should be clearer and more normal, the summation indices should be clearer written, e.g. what does Σ_{jj} mean, how the summation is performed with indices jj , and what is the value range for indices i and j .
2. On page 5-6, the authors cited Kaminski's references for spectral Granger causality, the reference is in 2001. However, there are relevant but more advanced frequency domain causality measures named Directed Transfer Functions (DTF) and Partial directed coherence (PDC), see below references [1-4]. These measures are similar to spectral GC, discussions of these relevant spectral measures may better enrich the content.
3. There are also many other derivations of GC, e.g. multivariate GC, nonlinear GC, and GC index, and also many other information-based causality measures such as transfer entropy, etc. These measures particular information-based measures should be addressed or mentioned, which better complement the discussions for neural data analysis.
4. In the reference list, more than half of the references last more than 10 years, citation of more recent studies may better improve the study.

[1]Takahashi DY, Baccala LA, Sameshima K, Frequency Domain Connectivity: an Information Theoretic Perspective, 32nd Annual International Conference of the IEEE EMBS Buenos Aires, Argentina, 2010.

[2]Baccala LA, Sameshima K, Partial directed coherence: a new concept in neural structure determination.Biol. Cybern, 84, 463-474, 2001.

[3]Baccala LA, Sameshima K, Comments on 'Is partial coherence a viable technique for identifying generators of neural oscillations?'. Biol Cybern. 95:135–141, 2006.

[4]Takahashi DY, Baccala LA, Sameshima K,Information theoretic interpretation of frequency domain connectivity measures. Biol Cybern. 103:463–469, 2010.