

Title: Test for the existence of the residual spectrum with application to brain functional connectivity detection

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Abstract: Coherence is a similarity measure between two time series and takes the form of the time series extension of Pearson's correlation. However, only a linear relationship between two time series can be measured by coherence. In this talk, we first review the basics of spectra for those unfamiliar with the frequency domain approach to time series analysis. Then, we introduce a residual spectrum in order to measure non-linear relationships and show the existence and uniqueness of the residual spectrum by decomposing the regression model we consider into orthogonal processes. Moreover, we propose a test for the existence of the residual spectrum and show that our proposed test has asymptotically correct size and is consistent. Finally, we highlight the utility of the residual spectrum in brain functional connectivity detection.