CoCo Seminar Series Spring 2026

Network Modeling and Analysis of Spatio-Temporal Correlations in Multivariate Time Series

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Wednesday March 4, 2026 12:15-1:15 pm EST

Fully online (Zoom; meeting link available on http://coco.binghamton.edu/)

This study develops a method of analyzing multivariate time series data that investigates lead-lag relationships among economic indicators during the COVID-19 era with a weighted directed network of lagged variables. Three complex networks are created with these variables and several lags of each as the network nodes. Network edges are weighted based on three relationship metrics: correlation, mutual information, and transfer entropy. In each network, the most influential and most influenced nodes over the time period are determined. This lead-lag network method is then applied to four target countries in CIRIGHTS, a large global human rights dataset, to determine the most influential and most influenced indicators of human rights, freedoms, and atrocities over time. A spatial network analysis investigates geographical correlations between each target country and its surrounding region to determine which variables best represent activity between the target country and the surrounding region with an undirected weighted network. The lead-lag and spatial network models are then combined to create a network model to investigate spatial lead-lag effects in the CIRIGHTS dataset.

Amanda Goodrick is an Associate Professor in Mathematics & Statistics at Slippery Rock University of PA. She earned a Master of Science in Mathematics from Youngstown State University. While teaching full-time, she earned a Master of Science in Data Analytics from Slippery Rock University and a PhD in Systems Science from Binghamton State University. Dr. Goodrick is the chair of the Mathematics, Statistics, & Physics department at Slippery Rock University and the graduate coordinator of the MS in Data Analytics program. Research interests are complex multivariate networks, data analytics, and mathematical, statistical, and simulation modeling.

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