Characterizing social information spreading by using event-synchronization and causality measures

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Understanding the diffusion of information is a fundamental challenge of complexity science. Here we analyze 28000 news articles published in Argentina in the period 26/05/2022 - 26/09/2022 in six main cities, and classify them in 20 non-orthogonal topics. Then, we obtain a time series for each topic and for each town by adding the number of articles published per day on the topic in the town.

Next, we use two causality measures, Granger causality, GC, and pseudo Transfer Entropy, pTE [2] to study how the information about a topic that appears in the local press in one city, spreads to news articles published in other cities. GC and pTE, however, have the drawback that assume stationarity. Therefore, we also use event synchronization measures, Q_s and Q_a, as proposed in [3]. To calculate Q_s and Q_a we count the number of events, c_{ij}, that occur in one time series, j, after an event occurred in a time series i, allowing for a lag of up to 3 days. The events are detected by using two thresholds, one to detect when media attention grows above a certain value, and another, to detect when media attention decays, and then, a different event may occur latter. These thresholds are defined in terms of the relative importance of a topic.

Finally, the process of information spreading is represented as a multiplex network, in which the different topics represent the layers, the six cities in Argentina represent the nodes, and the links are defined by thresholding the values of (GC and pTE) or (Q_s and Q_a). In this talk/poster, the results obtained with different event-detection criteria and with different synchronization/causality measures will be compared and discussed.

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