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Title	Covid-19 Infodemic In The Twittersverse: Characterization Of Misinformation Spread And Twitter Bot Activity By Critical Mass, Energy Decay, Entanglements, And Node Synchronization Using Multilayer And Spectral Graph Visualizations, Kuramoto Modeling, Sonification, And Wavefunction Simulation
Year	2022
Program	Doctor of Communication

ABSTRACT

No communication framework for “infodemiology” or investigate techniques within the discipline of communication have covered measurement of Twitter bots’ “virality and (massive) “misinformation spread” by energy and mass equivalence because these belong to quantum mechanics.

To posit infodemical measurements, this study of “COVID-19 infodemic” on Twitter characterized misinformation spread and Twitter bot activity by critical mass, energy decay, entanglements, and node synchronization using multilayer and spectral graph visualizations, Kuramoto modeling, sonification, and wavefunction simulation. The Python-based analytics pipeline was developed based on fundamental conceptualizations of 7 communication theories and quantum mechanics.

Simulation and (stochastic) modeling were implemented to investigate the intra- and interlayer relationships between bots, humans, and tweets. This study endeavored on (1) theorizing “virality” and bot activity, (2) data mining using Hoaxy® and bot detection set at $\geq .43$ using Botometer®, and (3) comprehensive data analysis using state-of-the-art techniques and statistics.

Misinformation spreads more frequently with user replies than with retweets and faster through interlayer edges. Super spreaders were detected using centrality- based metrics. Bots that had high betweenness and eigenvector centralities, random walk score, and PageRank score were false human accounts.

Bot cliques emerged inconsistently by edge entanglement with humans. False human accounts were central spreaders and were detectable by an increase in percolation centrality, random walk and PageRank scores. Spammers were peripheral spreaders with scores decreased or unchanged whenever connected indirectly to human hubs. False human accounts connect by power-law distribution. Many cross-links were shown between bots and humans. Overall, bots (re)produced the intrinsic “virality” of tweets with human users.

Bots synchronized (partially) around 400 seconds (6.67 minutes) at peak before reaching 200 seconds (3.33 minutes). Time to critical mass can be anticipated at .00025 seconds when bots have synchronized. Based on wavefunction simulation, a 13.55% tweet increase can generate a 29.45% network energy inflation at .70 (70%) bot “virality” within 9 months (peaked at 7th month).

Energy from critical mass due to bots can equal to 9.61×10^6 J, which can start to decay at .0015 seconds. Bots oscillated from <25 dB to 94.12 dB at 2090.91 Hz with 2 plateaus throughout the cycle. Bots maybe disbanded within .26 seconds at 50 J counter energy. On the other hand, a bot mass of 9.51×10^{-30} can equal to 1.58×10^{-13} J of kinetic energy per 2.14×10^{-18} J energy increment in the network or as much as .02 micro-Sievert/hour of ionizing radiation produced by a plain chest-x-ray.

A full-length Twitter data sonification is required to validate these findings while all logical and seed values have to be standardized. Model validation must be conducted in the future.

Keywords: COVID-19 infodemic; misinformation; Twitter bots; virality; critical mass; energy decay; entanglements; complex graph visualizations; spectral graph visualizations; node synchronization; wavefunction simulation; sonification