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Ph.D. DISSERTATION DEFENSE

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Title:	Community Cohesion: Sentiment, Emotions, and Resilience
Chairperson:	Dr. Jose E. Ramirez-Marquez, Division of Enterprise Science and Engineering, School of Systems and Engineering
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ABSTRACT

For all practical purposes, community resilience is a complex phenomenon which defies consistent measurement due to the nature of any resilience metric: it can only be defined if there exists a state variable for the community of interest, as it measures the ability of such a state variable to stabilize after a disturbance. Any community is a system that cannot be fully characterized by a single variable, and different state variables follow different trajectories after disturbance. In addition, multiple state variables often interact with other variables, making the task of identifying the metric by which to measure community resilience a daunting one. The purpose of this thesis is not to define a universal community-resilience metric that works every time and for every community. Nor is it to define a community state metric that is ideal for measuring resilience. Rather, it is to explore the possibility of measuring community resilience by one possible community state metric - its cohesion, measured, in turn, based on data and metadata gleaned using modern text-mining tools from community members' social-media microblogs (tweets) and to understand the drivers (explanatory variables) of cohesion.

In his research, the author has formulated a statistically appropriate methodology for measuring community resilience, validating it on a set of simulations.

The author also derived a novel metric of community cohesion from the analysis of metadata and the lexicons in the tweets, as well as an innovative mathematically sound combination of machine learning techniques for measuring the significance of explanatory variables used in modeling community cohesion. The findings made by the author using these innovations included: (i) overall emotion intensity is the most significant driver of community cohesion; (ii) second-most significant drivers are metrics characterizing the adverse events analyzed in this dissertation – weather and air quality index; (iii) economy has no impact on cohesion, but it has a strong effect on prevailing emotions within the community; (iv) there is evidence that during high-perceived-risk events, community cohesion resilience is significantly lower than during low-perceived-risk events.