

# Thesis Proposal

Institute for Software Research  
Societal Computing



## Cyber-FIT: An Agent-Based Modeling Approach to Simulating Cyber Team Performance

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Wednesday, December 2nd, 2020  
9:00 AM - 11:00 AM  
Zoom

Over the past decade organized cyber teams have become more ubiquitous across the globe. Militaries and governments employ cyber teams to protect computer networks of national interest. Large banks have cyber response teams monitoring their networks 24/7. Most corporate Information Technology groups have some semblance of cyber security teams within them. The overarching research question of this thesis is: How well are the cyber teams performing? Cyber team performance is still not well understood due to how difficult it is to both define the performance measures and collect meaningful data.

My approach to this problem begins with a computational agent-based modeling framework for simulating cyber team operations called Cyber-Forces, Interactions, Terrain (FIT). This approach then allows for definitions of performance measures based on outcomes prescribed by military doctrine and industry best practices in protecting cyberspace from potential and active threats and attacks. This work is cross-disciplinary in nature and will incorporate elements of agent-based modeling, network science, and theory of performance.

My dissertation work will provide a software framework that can be applied to different cyber simulation efforts, and is easily extendable to a multitude of research questions. Primarily, this work creates novel metrics and computational methodology to define cyber mission success, not currently being tracked. Several realistically scaled simulations of cyber conflict will be conducted in order to analyze the synthetic data generated and formally define the metrics of interest. This data will be validated against empirical data from large cyber war exercises and competitions. The output of this work can be applied to several existing efforts in the form of data definitions for modeling and simulation software, what-if analysis for cyber policy decision makers, and wargaming for military planners.

**Committee: Dr. Kathleen Carley, Dr. Christian Lebriere,  
Dr. Greg Shannon, Dr. Leslie Blaha (Air Force Research Laboratory)**