SBP-BRiMS Tutorial Overview

<u>Instructor</u>: Geoff Dobson, CASOS, Carnegie Mellon University
<u>Time</u>: 2 hours
<u>Subject</u>: Agent-Based Modeling for virtual experimentation

<u>Overview</u>
In this tutorial, students will hear a short lecture (30 minutes) on agent-based modeling principles, practices, and applications. Then each student will download an agent-based model from a provided repository and get the code running. A few changes will be introduced into the model to demonstrate how agent rulesets work in conjunction with policy/theory modeling. The students will create their own virtual experiment modifying several variables and collecting outcome data from the model. Finally, the students will discuss how to validate the data with a combination of stylized facts and empirical data.

<u>Cyber-FIT</u>
The Cyber-Forces, Interactions, Terrain agent-based simulation framework is a CASOS developed tool that simulates cyber conflict engagements between opposing forces. The model can be configured with input files defining the defending cyber teams, kinetic forces supported, contested computer network details (cyber terrain), and adversarial forces. The software exports simulated results (computers damaged, adversarial effects, vulnerability levels, performance statistics, etc.) into files that can be analyzed using typical tools such as Python and R.

<u>Virtual Experiments</u>
Virtual experiments are useful for modeling natural phenomenon that is difficult to experiment with in real life. For example, it would be extremely costly and disruptive to run an experiment where a bridge collapses. So, there are physics simulation software that allows civil engineers to test things like material fault tolerance levels or weather degradation. Virtual experiments can be very effective in testing out new theories and changes to existing models. Like real experiments, virtual experiments should be done in a controlled manner. This means that design of experiments concepts should be followed describing exactly which variables will be controlled for and altered. Also, the method in which the outcome variables will be defined and collected should be clearly defined. In this tutorial students will learn about all of these concepts and run their own virtual experiment using the Cyber-FIT software.