REPPERGER RESEARCH INTERN PROGRAM
RESEARCH PROJECT #: AFRL-RHW-22-06

TASK AND MODEL DRIVEN NETWORK VISUALIZATION

PROJECT DESCRIPTION: Models of networks have applications in many areas of research – such as sociology and engineering – and in numerous operational settings of interest to the US military - such as intelligence and cyber defense. In applied operational settings, it is often necessary to characterize the networks when the underlying structure is unknown, and, subsequently monitor the network for changes once the structure is known.

Researchers at the Air Force Research Laboratory's Airman Systems Directorate have demonstrated that the network visualization method that provides the highest accuracy and response time in a basic network related task is dependent on the combination of the task being performed and the underlying network structure/model. AFRL researchers have also developed both semiparametric and Bayesian statistical methods to characterize and monitor changes within a given network. Recently, researchers have developed a workflow for extracting network structures given large volumes of communications. Research efforts are currently focused on leveraging these new methods for network understanding and insight generation. During this internship, the student will assist in utilizing these results to develop a network visualization framework that can provide the most descriptive visualization for a given network as well as alerting the user of significant and/or anomalous changes that occur as the network is monitored.

ACADEMIC LEVEL: Masters, PhD

DISCIPLINE NEEDED:
- Statistics
- Operations Research
- Mathematics

RESEARCH LOCATION: Wright-Patterson AFB Dayton, OH

RESEARCH ADVISER: Fairul Mohd-Zaid, PhD
Applied Mathematics, Air Force Institute of Technology, 2016

Dr. Fairul Mohd-Zaid is a Mathematical Statistician at the Air Force Research Laboratory's Mission Analytics Branch conducting research in network analysis, statistical visualization, and topological data analysis with other research interests in multi-sensor image fusion and multivariate analysis. Dr. Mohd-Zaid received the BS in Mathematics from Southern Polytechnic State University and the MS in Operations Research and PhD in Applied Mathematics from the Air Force Institute of Technology. He is a three time recipient of the DOD funded Science, Mathematics, and Research for Transformation (SMART) scholarship. Photo courtesy the U.S. Air Force Research Laboratory.