1128-55-291 **Emilie Purvine*** (emilie.purvine@pnnl.gov). *Applications and advances in topology of graphs.*

Graph and network data is ubiquitous in research domains from cyber security to transportation networks to biological interactions; network analysis typically focuses on standard properties like connectivity, clustering, and motif mining. However, these data sets can provide richer, more topological structure which may be ignored by network analysis. I will describe three areas of recent development in my work. First, the problem of evaluating system status in the domain of cyber security. Discrete topological spaces can be generated from the data and summarized using persistent homology or decomposed via combinatorial Hodge theory. These are compared to a baseline over time to discover abnormal behavior. Second, I will explore metric graphs, which arise in many application areas, and provide a complete characterization of the 1-dimensional intrinsic Čech persistence diagrams for metric graphs using persistent homology. This characterization can be used as a qualitative description to differentiate between metric graphs with significantly different topological structure. Finally, I will go beyond graphs to hypergraphs and their topological representations to motivate the use of higher order structure present in certain kinds of relational data, e.g., coauthorship networks. (Received February 28, 2017)