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**Michelle H Feng\***, mhfeng@math.ucla.edu, and **Mason A Porter**. *Cities, voting, and spider  
DUIs: Case studies in spatial applications of topological tools.*

Persistent Homology (PH) has been used to study the topological characteristics of data across a variety of scales. In this talk, we will focus on a variety of spatial applications, as the geometric and topological features of PH are well suited to exploring data sets which are embedded in space. We will introduce two novel constructions for transforming network-based data into simplicial complexes suitable for PH computations and compare these constructions to state of the art. Additionally, we will apply these constructions to a variety of geographic and spatial applications, including voting data, cities and urban networks, and biological networks (i.e. spiders under the influence). We will highlight the computational performance of our constructions and discuss the implications of the PH computations for identifying and classifying certain features in our various data sets. In particular, we discuss spatial patterns which emerge in each case, and how those patterns relate to existing scholarship in the relevant area. (Received September 17, 2019)