1107-92-333 **Carina Curto*** (ccurto@psu.edu), Dept of Mathematics, McAllister Bldg, The Pennsylvania State University, State College, PA 16802. *Clique topology reveals intrinsic geometric structure in neural correlations.*

Detecting meaningful structure in neural activity and connectivity data is challenging in the presence of hidden nonlinearities, where traditional eigenvalue-based methods may be misleading. We introduce a novel, topological approach to matrix analysis that uncovers features of the data that are invariant under arbitrary monotone transformations. These features are encoded in the *order complex*, a combinatorial object that keeps track of the ordering of matrix entries. We found that topological invariants of the order complex, called *Betti curves*, can be used to distinguish random from non-random structure, and provide reliable signatures of geometric organization.

We then analyzed the pattern of correlations among pyramidal neurons in rat hippocampus, where geometric structure is an expected correlate of position coding. Remarkably, we found that hippocampal activity exhibits geometric signatures not only during spatial navigation, but also during non-spatial behaviors such as wheel running and sleep. (Received January 18, 2015)