1124-55-225 **Saba Emrani*** (semrani@ncsu.edu). *Topo-Geometric Frameworks for Physiological Signal Processing.*

We first present our framework for exploiting the intrinsic topology of signals to detect quasi-harmonic behaviors. Using delay embeddings, we transform the signal into a point cloud, whose topology reflects its periodic behavior. Persistent homology is employed to determine the underlying manifold, and the Euler characteristic provides a fast computation method. We apply this approach to breathing sounds for wheeze detection. We also use this method to identifying cell-cycle regulated genes. We then invoke one more dimension to the point cloud and utilize 3D delay embedding for spectral estimation of highly transient data in order to estimate the frequencies in wheezes. We next present a topological framework for extracting the characteristic points of pulse pressure waves (PPW). Using persistence diagram, we locate key characteristic points on PPW, and use them for calculating a measure of arterial stiffness. Finally, we present a geometric causal interaction measure based on multivariate delay embedding and exploit it in MEG data to construct effective connectivity maps of brain activity in order to decode visual stimuli. Moreover, we show that these maps as a response to structured images are more geometric, as disclosed by the evolution of their topological structures. (Received September 09, 2016)