

Classification of Single-lead Electrocardiograms: TDA Informed Machine Learning

Paul Samuel P. Ignacio

Abstract

Atrial Fibrillation is a heart condition characterized by erratic heart rhythms caused by chaotic propagation of electrical impulses in the atria, leading to numerous health complications. State-of-the-art models employ complex algorithms that extract expert-informed features to improve diagnosis. In this note, we demonstrate how topological features can be used to help accurately classify single lead electrocardiograms. Via delay embeddings, we map electrocardiograms onto high-dimensional point-clouds that convert periodic signals to algebraically computable topological signatures. We derive features from persistent signatures, input them to a simple machine learning algorithm, and benchmark its performance against winning entries in the 2017 Physionet Computing in Cardiology Challenge.