

PERSISTENT HOMOLOGY ON MALAYSIAN DATA SETS

FATIMAH ABDUL RAZAK

In this new age of data empowered race, many different methods claim to uncover hidden structures and information from data sets. Algebraic topology assigns algebraic invariants such as groups and vector spaces to topological space. In particular, homology theory is used to detect topological features such as components, holes and voids. Persistent homology is a method used on data sets to detect these topological features.

Persistent homology is applied on time series by first utilizing Taken's theorem in order to get higher dimensional sets of data. The aim is to develop an early warning systems for floods and haze (both occurring annually in Malaysia) as well as financial crashes by detecting extreme changes in the topological shapes of datasets. To this end, we apply persistent homology to time series of river streamflows, atmospheric content such as Particulate Matter less than 10 micrometers (PM_{10}) as well as some Asian Financial stock market indicators across a few decades.

(Author) SCHOOL OF MATHEMATICAL SCIENCES, FACULTY OF SCIENCE AND TECHNOLOGY, UNIVERSITI KEBANGSAAN MALAYSIA
Email address: fatima84@ukm.edu.my