

Can we determine the shape of an impending disaster?

Abstract

Topology is an obscure field of mathematics dealing with shapes of objects focusing on qualitative features such as components, loops, voids and holes. Inspired by this, Topological data analysis (TDA) arise as an application of Topology for the analysis of data sets again emphasizing on qualitative features of these complex data sets. The basic premise of TDA is that data has shape and the role of TDA is to determine these shapes and make sense of these shapes. A particularly important tool of TDA is persistent homology (PH) and it is used to quantify and find structure in data that persist across different spatial resolutions. An important feature of PH is that it is robust with respect to small perturbations in input data and this aspect is particularly important for data in the presence of noise. This method has provided insights in the study of data in a variety of applications such as sensor networks, breast-cancer classification, diseases modelling, protein structure, materials science, neuroscience and many more. In this talk we shall provide a non-mathematical expose of PH especially in relation to our research on the Malaysian rainfall data. Our aim is to determine PH's efficacy in providing early warning signals for impending disasters such as floods.