UNIVERSITY of WISCONSIN
UWMILWAUKEE

Department of
Mathematical Sciences

Dissertation Defense

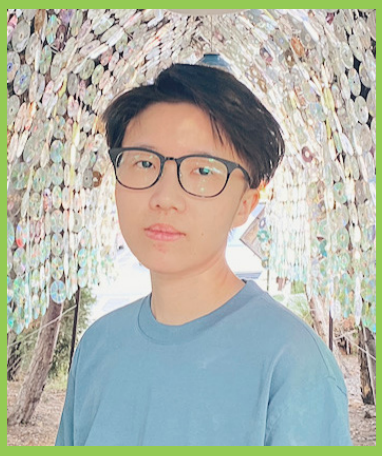
Liting Li

PhD Graduate Student

Under the Supervision of Daniel Gervini

Friday, April 22nd, 2022 @ 11:00am

Online via. Zoom



Ms. Liting Li

Functional Multidimensional Scaling

Multidimensional scaling is an important component in analyzing distances (similarities or dissimilarities) between objects and plays a key role in creating low-dimensional visualizations of objects. Regardless of the progress in this area, traditional solutions of multidimensional scaling problems are inapplicable to the distances which change with time. In this thesis, we focus on dissimilarities instead of similarities. Motivated by the studies of functional data analysis, we extend the current multidimensional scaling techniques and propose a functional method to obtain lower-dimensional smooth representations in terms of time-varying dissimilarities. This method incorporates the smoothness approach of functional data analysis by using cubic B-Spline basis functions. The model is also designed to arrive at optimal lower- dimensional representations such that dissimilarities evaluated by estimated representations is almost the same as the original dissimilarities of objects in a dimension which is easier for people to recognize. We verify the feasibility of the model by running simulations, as well as using the closing prices of the S&P 500 stocks as a real case to analyze their dissimilarities with this functional multidimensional scaling method. This case study provides us a good visualization on a 2D map for the 500 stocks so that we can see how their distances change in each month.

Committee Members:

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