NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Computer Science and Engineering
College of Engineering

Development of Feature Engineering Tools for Multivariate Time Series

Student: Poh Kang Yu   Supervisor: Assoc Prof A S Madhukumar

Project Objectives:

While causation and correlation can exist at the same time, correlation does not imply causation. Causation explicitly applies to cases where action A causes outcome B. On the other hand, correlation is simply a relationship. Event A relates to Event B—but one event doesn't necessarily cause the other event to happen.

This project differentiates between correlation and causation as we investigate on the analysis of causality for such multivariate time series datasets. These causality relationships between different time series are established using different tests such as Granger causality and Transfer Entropy.

Data Ready

- Is the multivariate time series data suitable to undergo the designated causality test?

Individual Stationary Test - Augmented Dickey Fuller test of all the multivariate time series.

Stationary Test as a System - Johansen test, is a procedure for testing cointegration of several, say k, I (1) time series.

Causality Tests

- What multivariate time causality test should be carried out?

Granger Causality Test - statistical hypothesis test for determining whether one time series is useful in forecasting another.

Transfer Entropy - a non-parametric statistic measuring the amount of directed (time-asymmetric) transfer of information between two random processes.
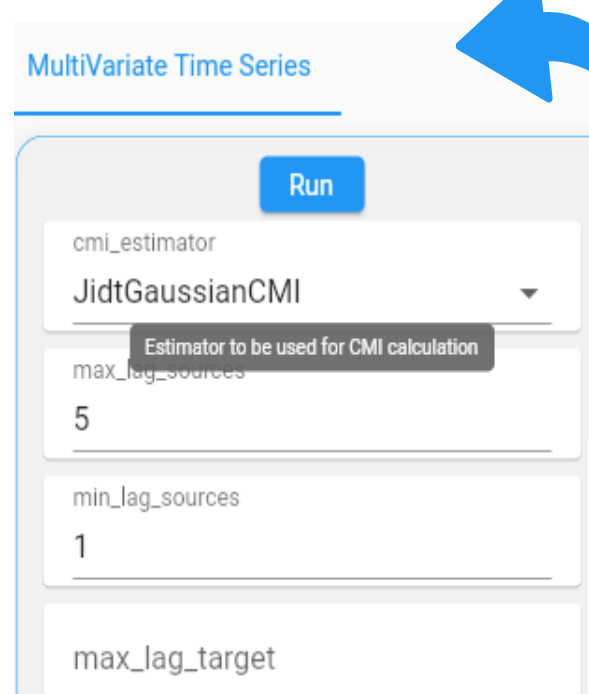
Toolkit Development
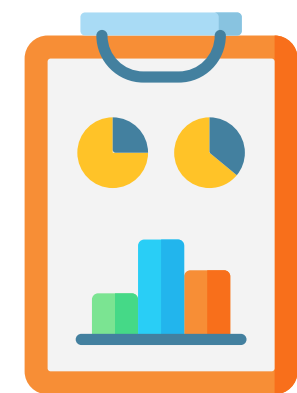
- Connecting all the pieces and developing a usable toolkit.

Flask – Used as a server to run all the required test in python. API calls are received executed.

Flutter - open-source UI software development kit created by Google. Used to develop applications for Android, iOS, Linux, Mac, Windows using a single code base

System Design

Upload Data – File is selected and uploaded into server

Tests and Parameters entered – Stationarity/ Causality are configured accordingly before it is run.

Test results – Results are returned through the flask server and shown accordingly
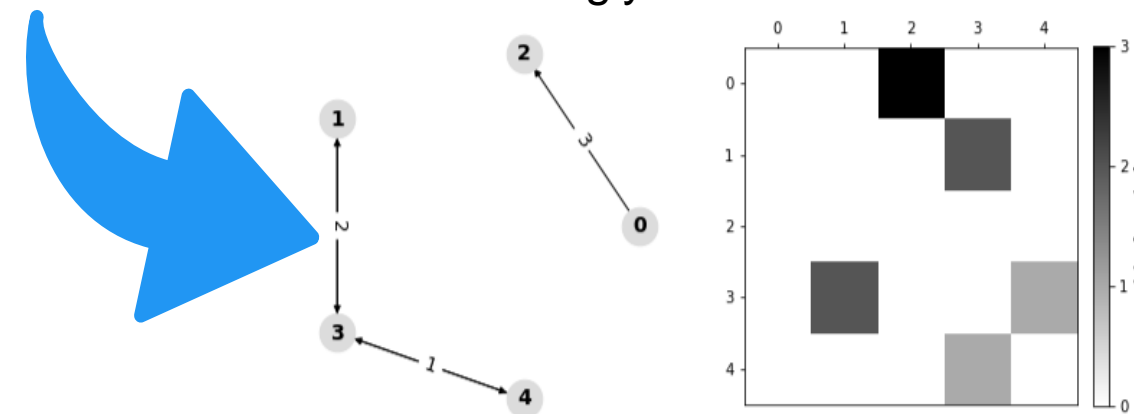
Future Works

Research on Transfer Entropy – And the different parameter tunings.

Research on other forms of causality – examples includes phase locking value, phase slope index and coherence.

Automated Settings Generator – An automated settings generator for the currently GUI can be implemented.

Enhancing GUI– Flutter's material is always updated which provides ample opportunity to update the GUI.