Intro:

A tool to specify testable causal models of software behaviour

**Background**:

Computational model are important tools for scientific research and decision making,

researcher use models to simulate experiment,

and decision makers use the results to make critical decision.

But according to a research in 2014, Out of the 62 studies, only 12 studies have applied at least one testing methods

This cause huge concern over the quality of the models

According to the same research There are two main reason:

1. Is testing problem due to the characteristics of computational model:

Some model are meant for experiment unknown area

which mean there’s often not much real-world data to compare the results to

1. Due to different trainings received by scientists and software engineer

This caused importance of software testing often being overlooked.

Some Advance methods are developed for testing models

but these advance methods require knowledge in software testing,

and are often too complicate to use,

**Problem analysis**

This project will mainly focus on a tool named Causcumber,

It uses Casual testing,

A testing method by change parts or input of the software and observe its execution path or output, therefore getting the behaviour of the software

And User can use these behaviour they observed to validate their software

To setup a test using Causcumber, user will need to define five files that is setup in a specific way with a specific format

This is very demanding for user since these files not only require user to have a decent understanding of their own model, but also the format and syntax required by Causcumber

So way to simplify the testing process is need, this tool will need to

1.Reduce the need for user to manually code.

2.Some parts of required file are not very straight forward, so a way to provide user assisting information is needed

3.Provide guides and hint on what data to input for user through the process.

**Design implementation**

the design of the tool transforming the structure of the file into the user interface.

Below is one of the edit functions for a file, left is the manual version of the file, and the right is the UI

User can setup the test data using the UI, and the input information will be turn into the format like left side

Another parts file require user to define the relation between the parameter

This tool will provide a graph of the parameter relation user defined

via graphviz

In the basic version of Causcumber, it require user to list every relation with their own understanding of the model, which is not realistic for user who isn’t trained in software development

With the visualization, it makes this process a lot easier

**Result**

The tool is used to carry out two test for two model, influenza1918 and covasim,

The tool reduce the need for user to manually code the test

Since tool auto generate file, User won’t require to learn the syntax and deal with format of the file

Some parts will still require user to manually code, but these is due to the different implementation method used by the developer of the tested model

**Conclusion**

Test computational model is an important step of development, but is often ignored.

Advance method such as Causcumber is useful, but are often too complicated for untrained user.

With An assist tool is implemented, provide guide during the editing process.

With the help of assisting tool, easier to encourage more user to use Causcumber for testing.