**resilience\_gui**

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**15 January 2015**

# **Introduction**

This library provides a user interface for the python library ‘resilience’ along with added visual aspects to improve the user experience and range of analytics available to a user. Through the developed user interface the tool aims to provide the same level of flexibility as available natively through the resilience library thus allowing users to run a multitude of failure simulations. The functionality of the tool also extends from this to offer the ability to compute a range of common graph metrics, a selectin of those available in the NetworkX library. The library also provides the tool, and the user, with the ability to generate networks using some common graph generators. Finally, the tool utilises a range of drawing functions available in NetworkX to offer the user the ability to visualise a network during perturbations or not.

## **Dependencies**

The developed tool relies on a number of other libraries for which without the tool may not run or will suffer from reduced functionality.

* Python 2.7+
* NetworkX 1.7+
* PyQt4
* resilience 1+

# **Getting started**

## **User Interface**

The user interface has three main portions; (i) ) input network settings, (ii) failure analysis settings and (iii) the control buttons/menu’s. These are indicated in Figure 1 below.



Figure 1: Diagram of interface with main aspects highlighted.

## **Building a network**

There are number of options available to build a network:

* Graph generator
* CSV
* List
* Database

Before any analysis can be selected to be run the network build method should be selected and the parameters (file or values) entered to allow the network to be built. For the first option, using a graph generator algorithm, as available in the NetworkX library, help is available by hovering over the input boxes which are not shaded out for the network.

The CSV option requires the user to provide a CSV which contains a list of nodes and edges in the format of…..

The list option requires a list of nodes and a list of edges to be entered manually.

The database option allows users who have access to a database using the nx\_pgnet schema to build a network from this, which opens the option for visualising the network geographically as well. This requires the database connection parameters and the name of the network to be loaded.

## **Calculating metrics and simple visualisation**

To calculate a metric over a network options are available in the ‘Metric’ drop down menu. These allow the computation of a number of metrics using algorithms available in the NetworkX library. Results are returned in a window. There are options available for the computation of multiple metrics simultaneously, again with the results returned in a window.

Visualisations of networks can be quickly obtained through the ‘Draw’ button, which then gives options specific to the network build method (when built from the database this allows a geographic visualisation). The visualisation can be customised using the ‘Edit’ menu and the ‘View Options’ item, which allows the colouring and size of nodes/edges to be changed, including having the size based on a metric value, for which there a small number of options. The results of any visualisation can be saved in a range of formats using the toolbar available in the visualisation window.

## **Simple failure simulations**

Failure simulations

## **Complex failure simulations**

Further simulations