

# SIRD Model over Small World, Scale Free Graphs

Thomas Draycott

12/11/2022

# 1 Introduction

TOBEADDED

## 2 Literature Review

### 2.1 Graph Theory

Graph Theory is the study of networks (graphs will be referred to as networks from now on) where vertices (we will also from this point forwards we will be referring to vertices as nodes) are connected by edges, see APPENDIX for a further explanation.

### 2.2 Small World Graphs

In May 1967 Professor of Psychology at the Graduate School and University Center of the City University of New York, Stanley Milgram ran an experiment to see if a person living in Omaha, Nebraska could get a parcel to a stockbroker in Boston, Massachusetts (Milgram 1967). In his experiment he found the average path length to reach the stockbroker was 5.5, which created the term six degrees of separation (however Milgram's experiment had flaws which puts the exact number into doubt). This idea of having such a small average path length for such numerous nodes is a hallmark of a small world graph.

A Small world graph is defined by the following property:  $L \propto \log N$  where  $L$  is the average shortest path length of the network and  $N$  is the total number of nodes (Watts and Strogatz 1998).

## References

- Milgram, Stanley (1967). "The small world problem". In: *Psychology today* 2.1, pp. 60–67.
- Watts, Duncan J. and Steven H. Strogatz (June 1998). "Collective dynamics of 'small-world' networks". In: *Nature* 393.6684, pp. 440–442. ISSN: 1476-4687. DOI: 10.1038/30918. URL: <https://doi.org/10.1038/30918>.