Universitat Rovira i Virgili

Master in Artificial Intelligence

Complex Networks

A4. Dynamics on Complex Networks

Authors: Rafael Bianchi

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Contents

1 Introduction

For this assignment, the selected environment to work was Python and using specific libraries, as NetworkX[1] and Matplotlib[2] were used as well.
The chosen networks for this experiment were ER1000k8, SF_1000_g2.7 and PGP. For every of the mentioned networks, the parameters used where β ranging from 0 to 1 ($\Delta\beta = 0.02$) and the recovery probabilities 01, 05 and 0.9. For Monte Carlo, the parameter were also fixed for every network Nrep = 100, p(0) = 0.2, Tmax = 1000 and Ttrans = 900.

2 Network Plots

As showed in the plots below, and as the parameters were fixed to every network, it is easy to see when the fraction of the infected changed as the β was increased. The PGP(real), is the largest in this experiment and also the most computational costly. Diferently from the ER and the SF networks, the PGP network does not stay constant flat (infection fraction low) when β is low. The infection rate stays low and then grows rapidly.

2.1 PGP network

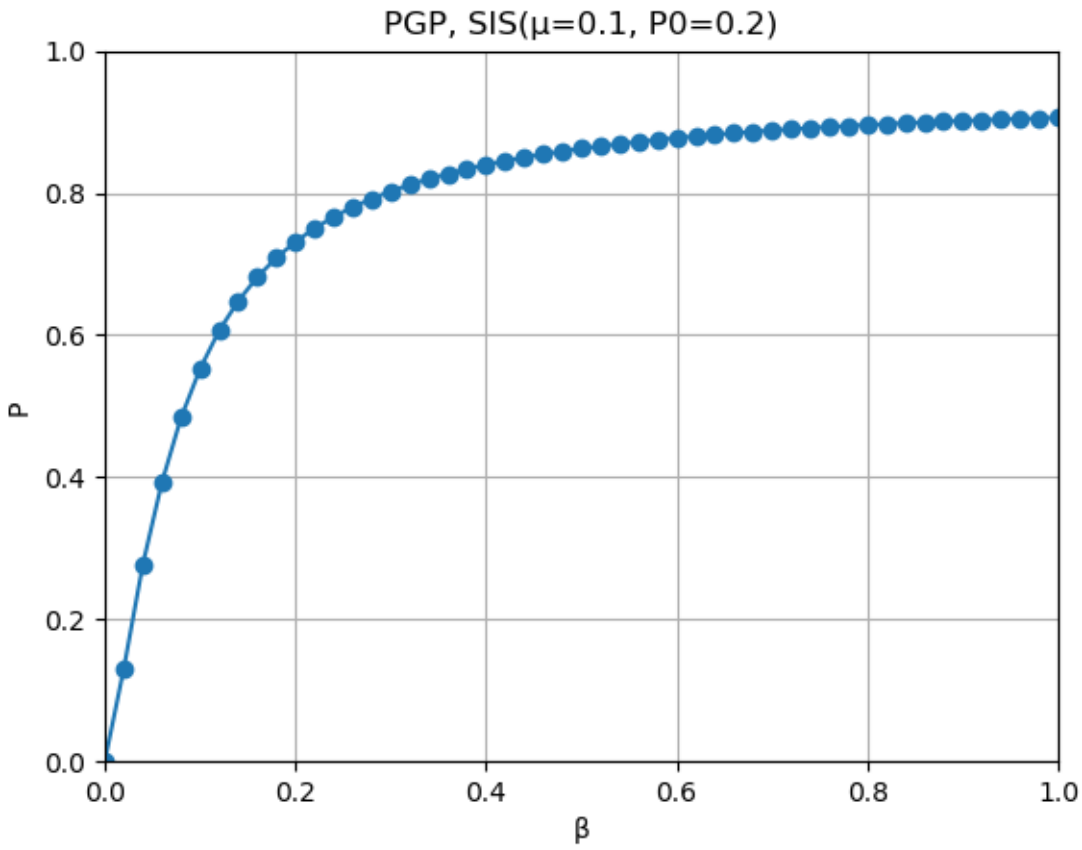

Figure 1: PGP Network

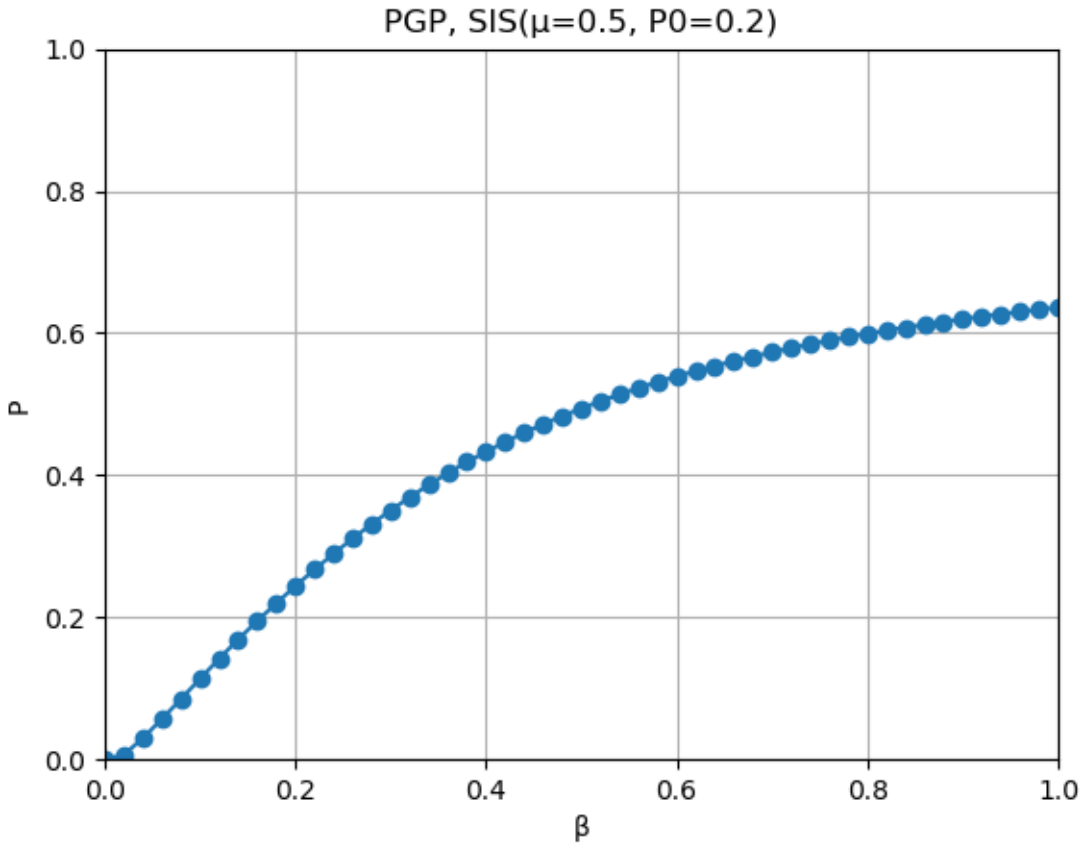

Figure 2: PGP Network

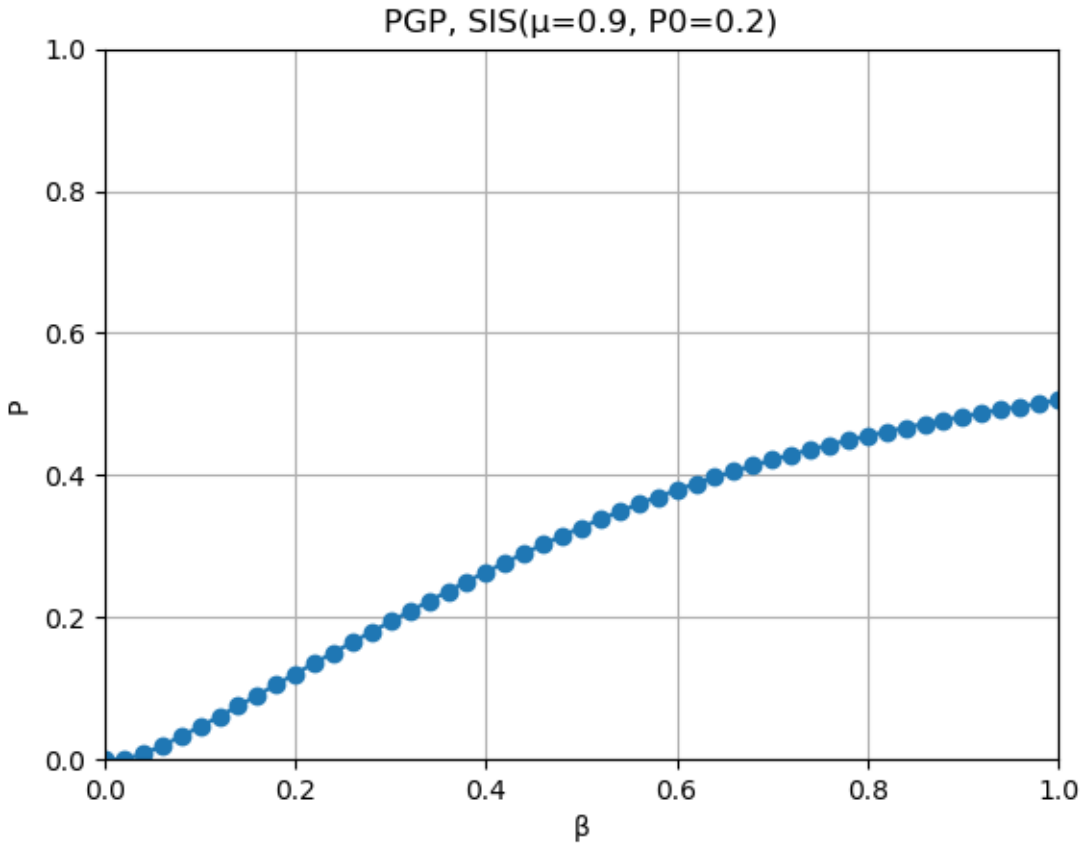

Figure 3: PGP Network

2.2 SF_1000_g2.7 network

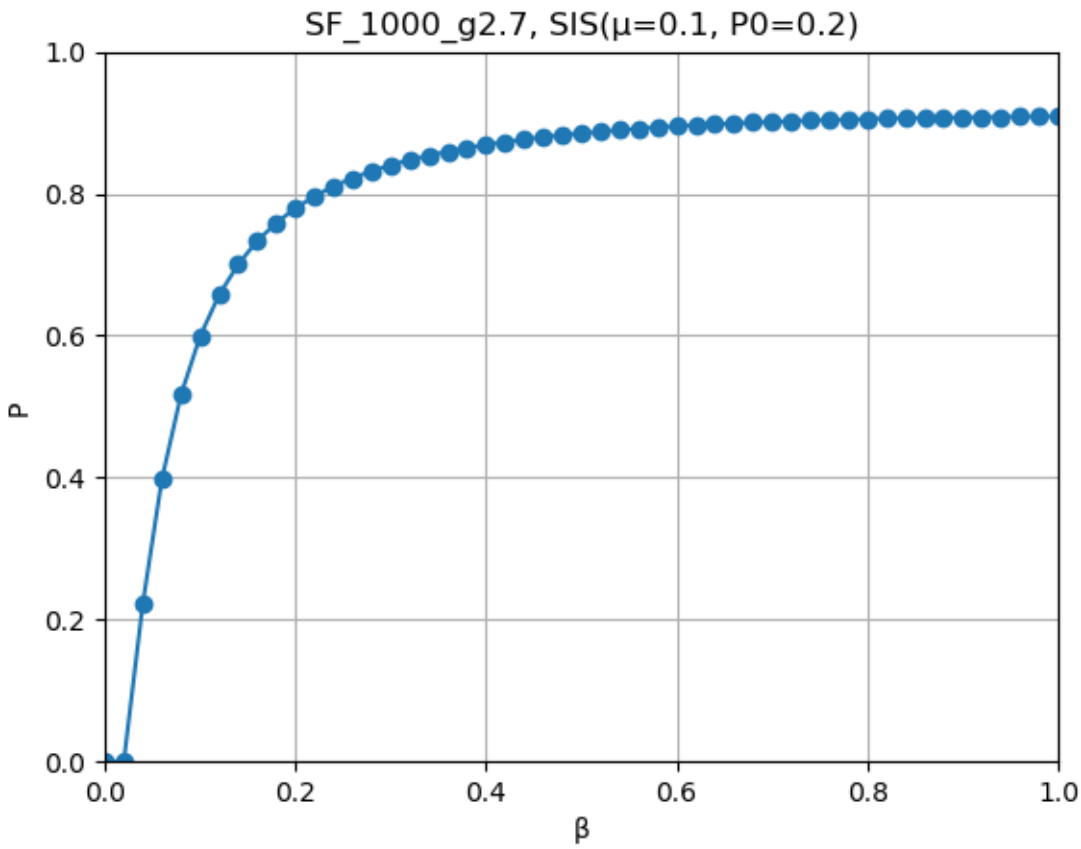

Figure 4: SF_1000_g2.7 network

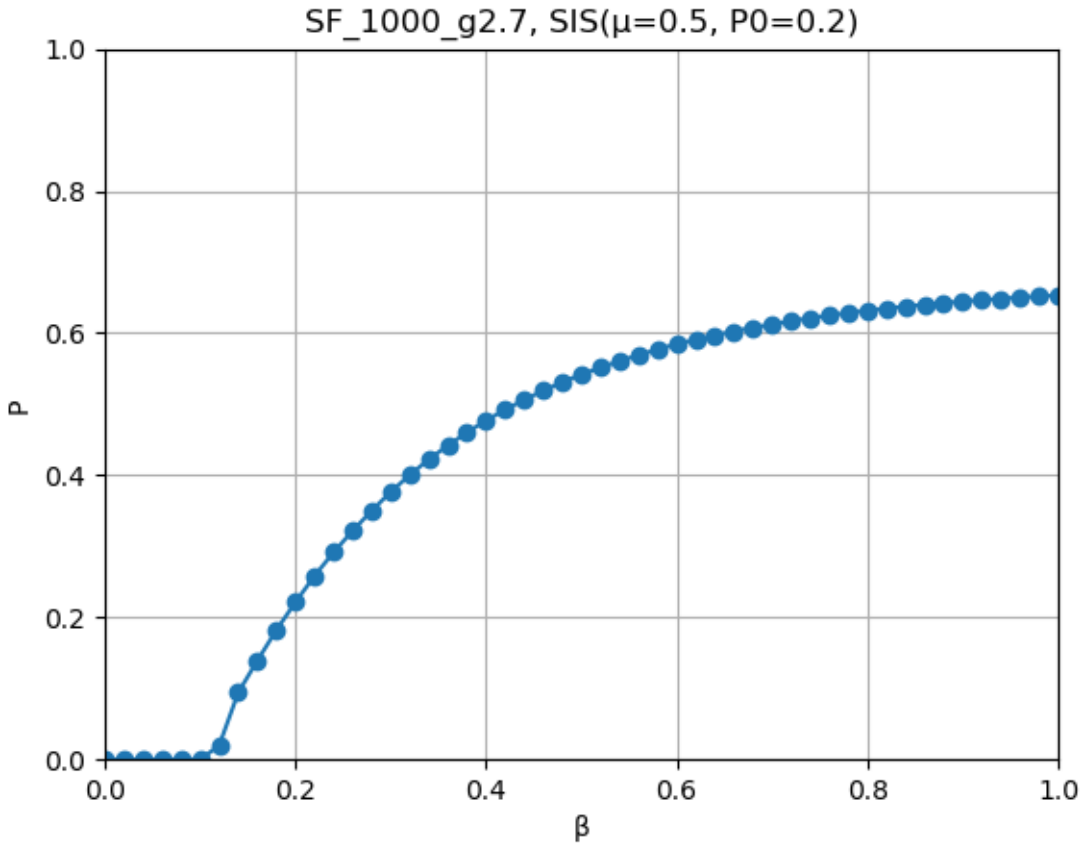

Figure 5: SF_1000_g2.7 network

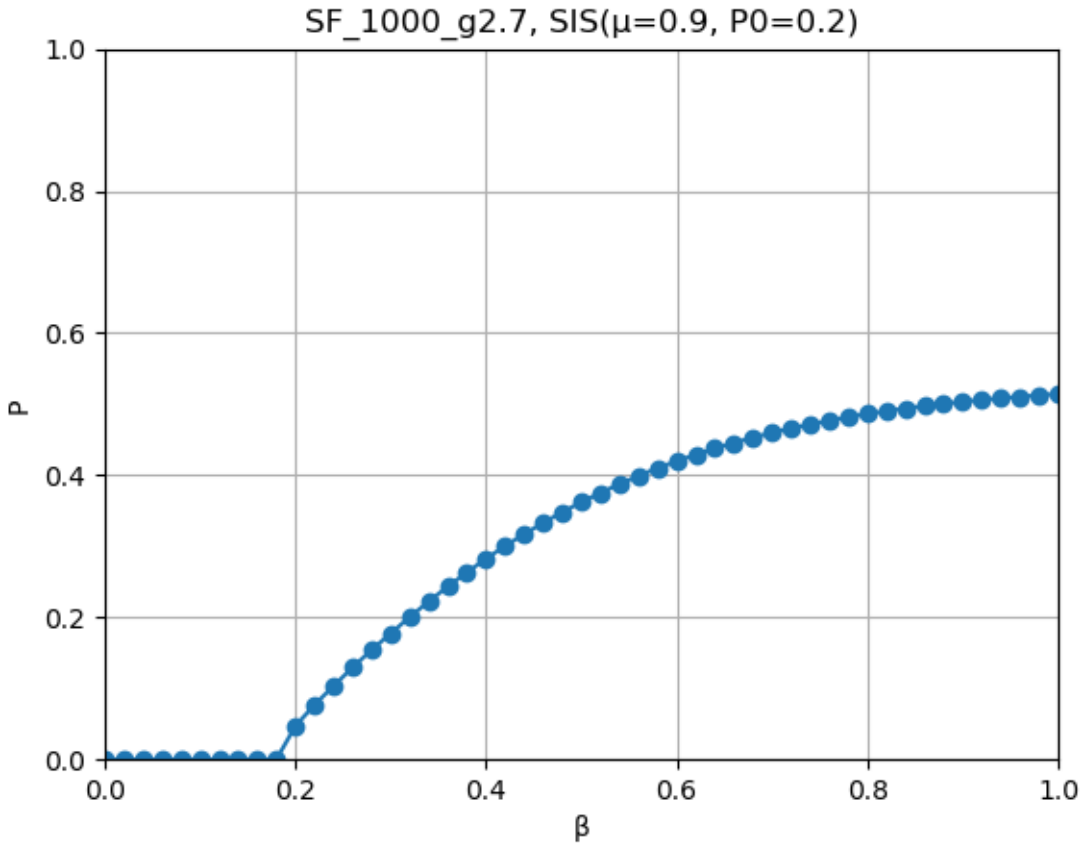

Figure 6: SF_1000_g2.7 network

2.3 ER1000k8 network

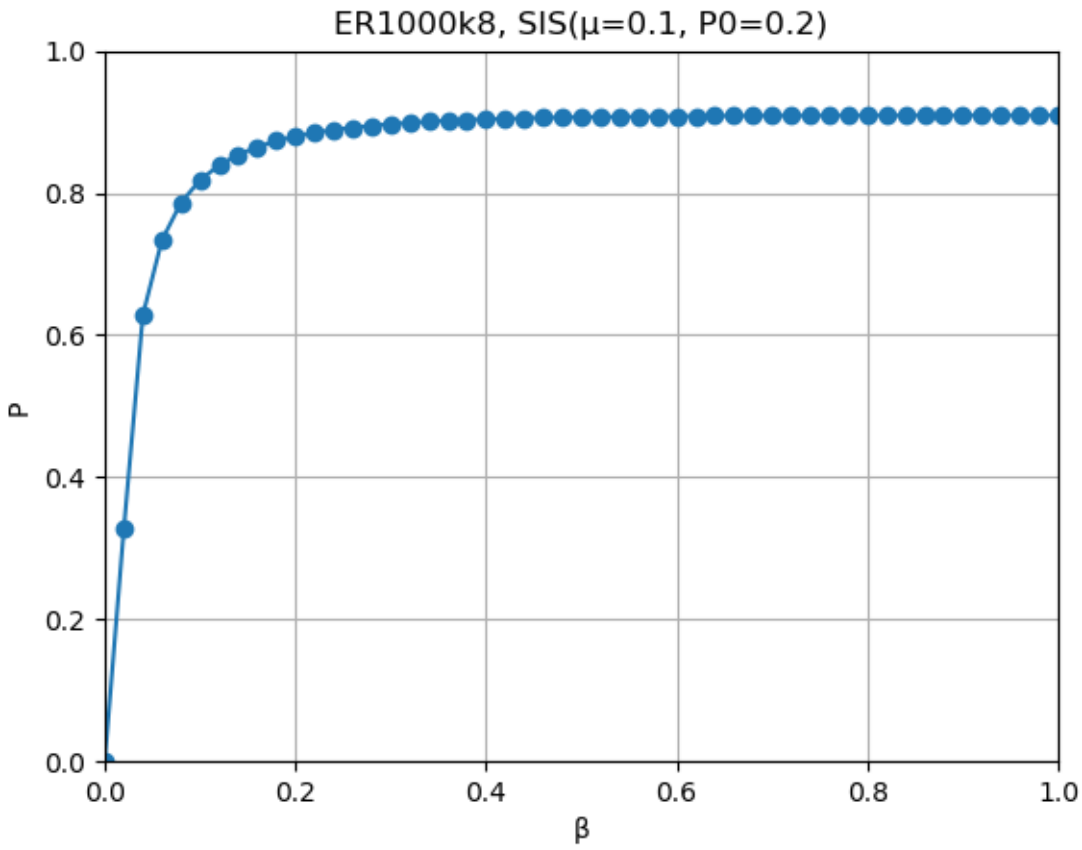

Figure 7: ER1000k8 network

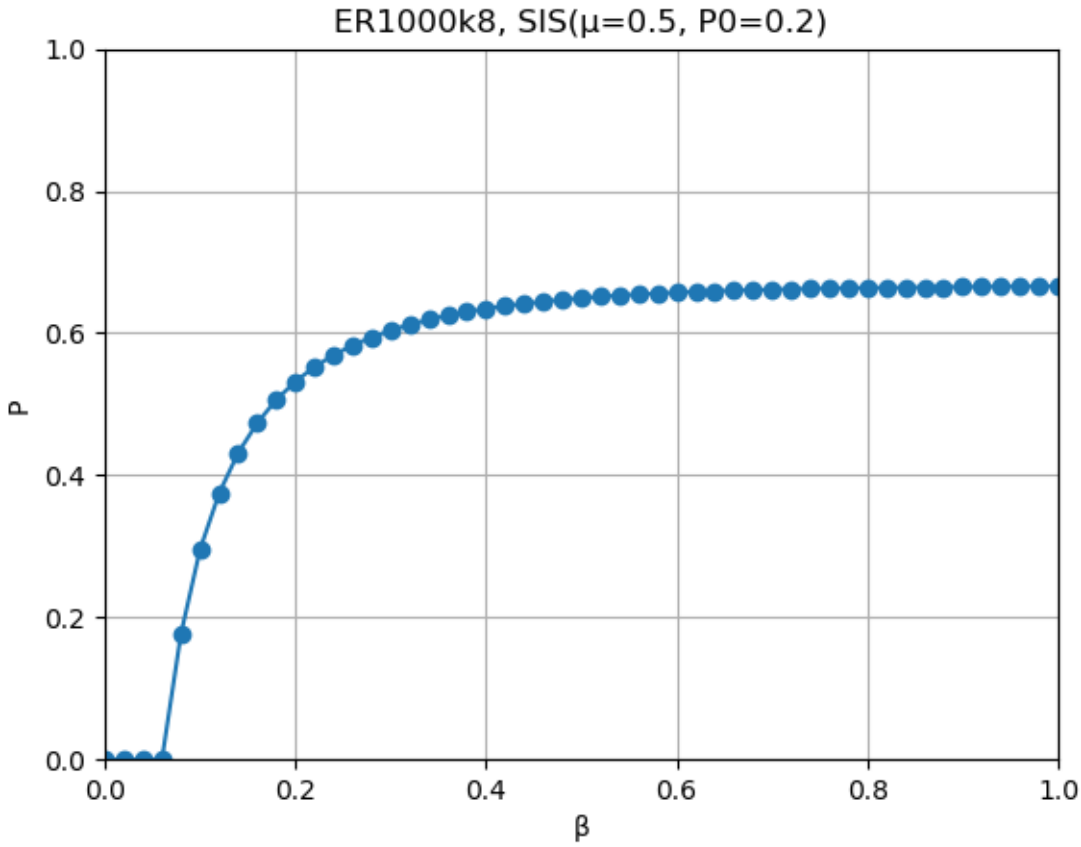

Figure 8: ER1000k8 network

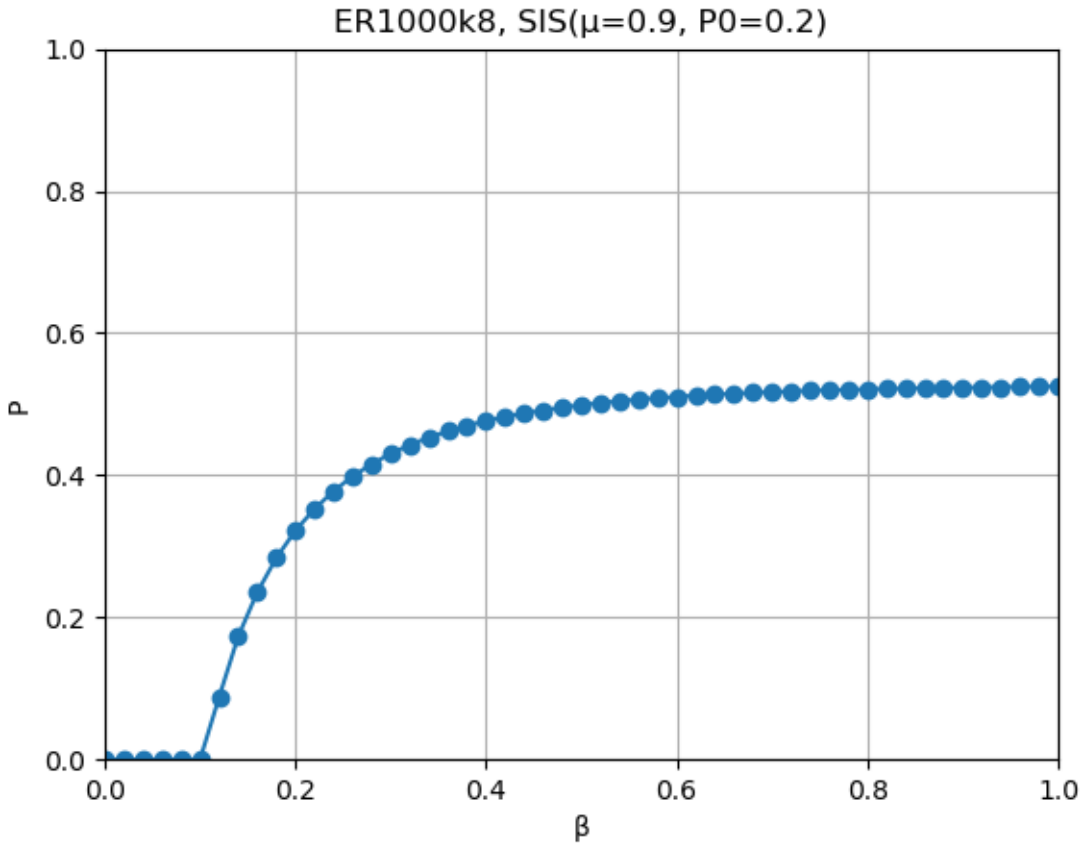

Figure 9: ER1000k8 network

References

[1] Aric A. Hagberg, Daniel A. Schult, and Pieter J. Swart. Exploring network structure, dynamics, and function using networkx. In Gaël Varoquaux, Travis Vaught, and Jarrod Millman, editors, *Proceedings of the 7th Python in Science Conference*, pages 11 – 15, Pasadena, CA USA, 2008.

[2] J. D. Hunter. Matplotlib: A 2d graphics environment. *Computing In Science & Engineering*, 9(3):90–95, 2007.