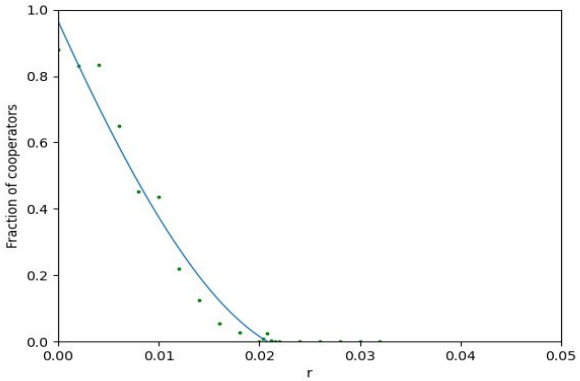
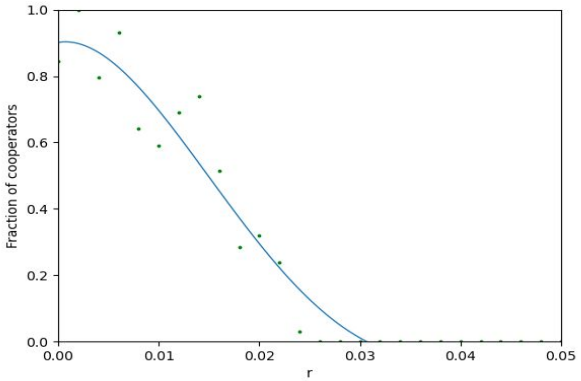
# Models

1. Imitation-based
2. Bayesian
3. Reputation
4. fc-Threshold



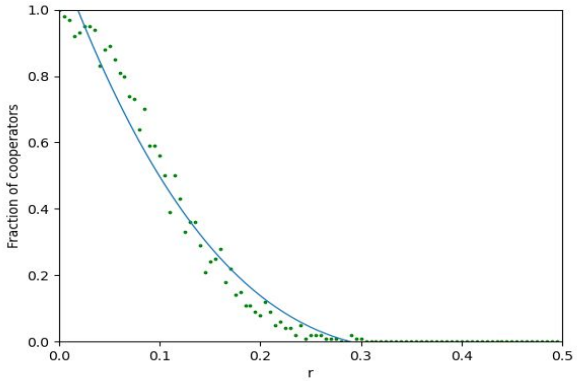

Lattice

0.02



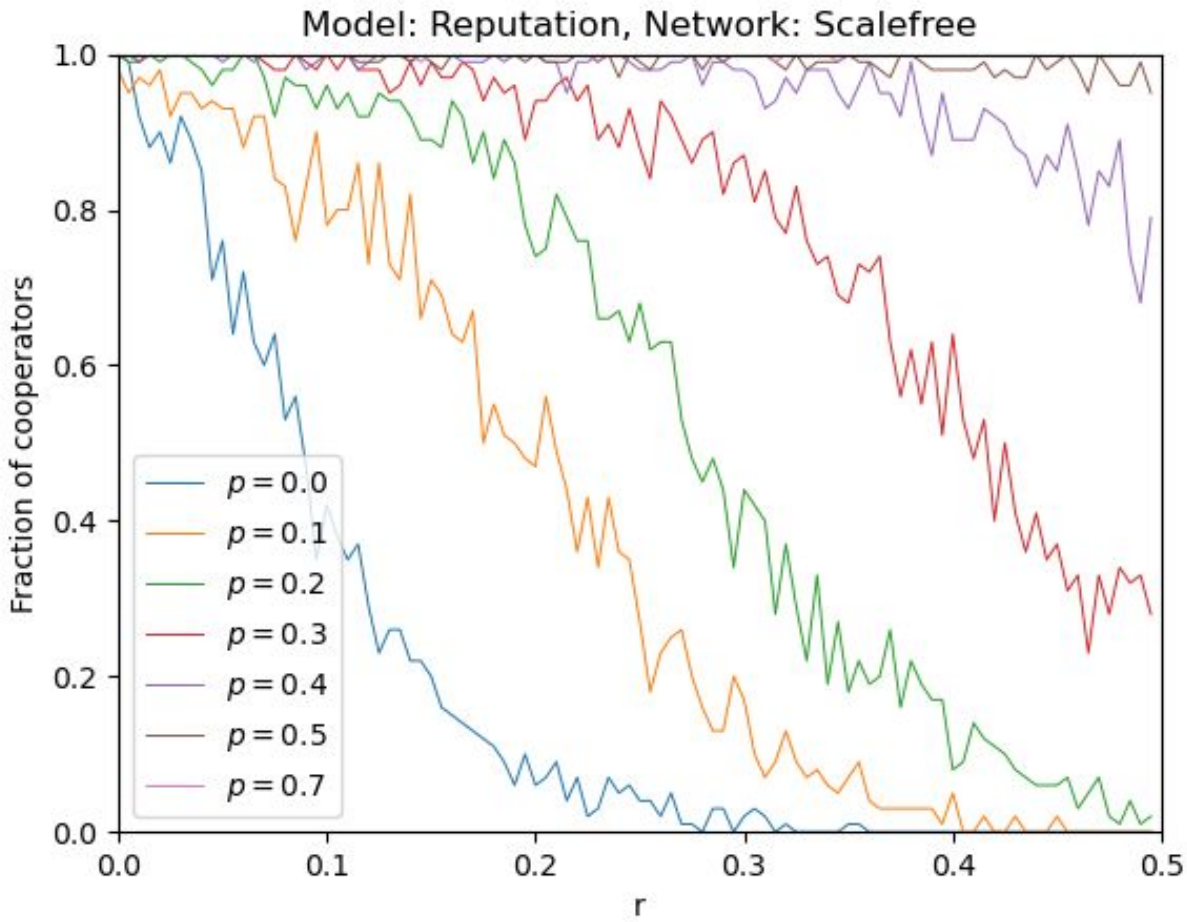

Smallworld

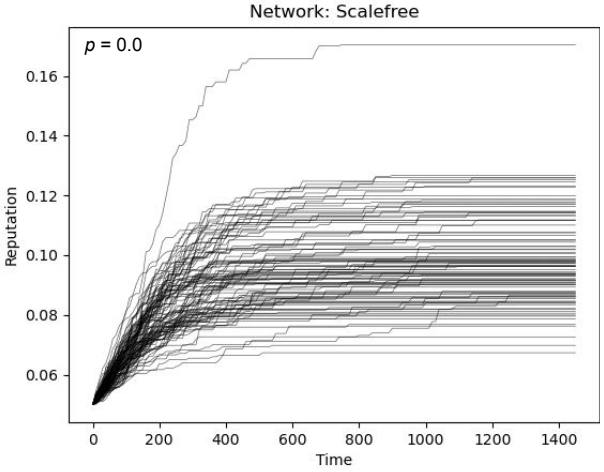
0.03

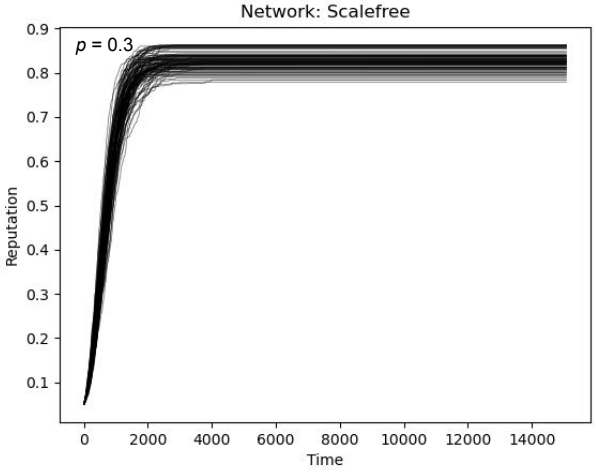


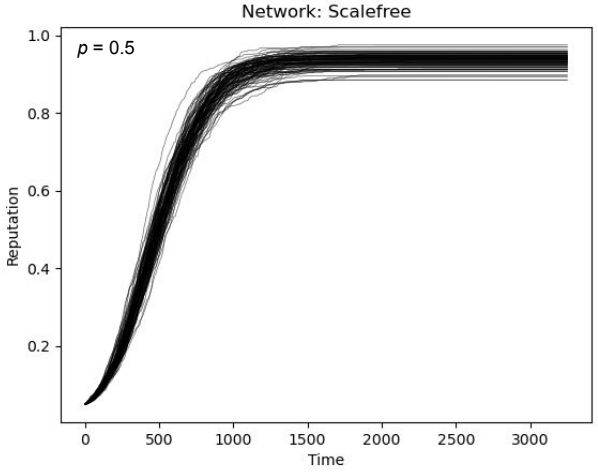

Scalefree

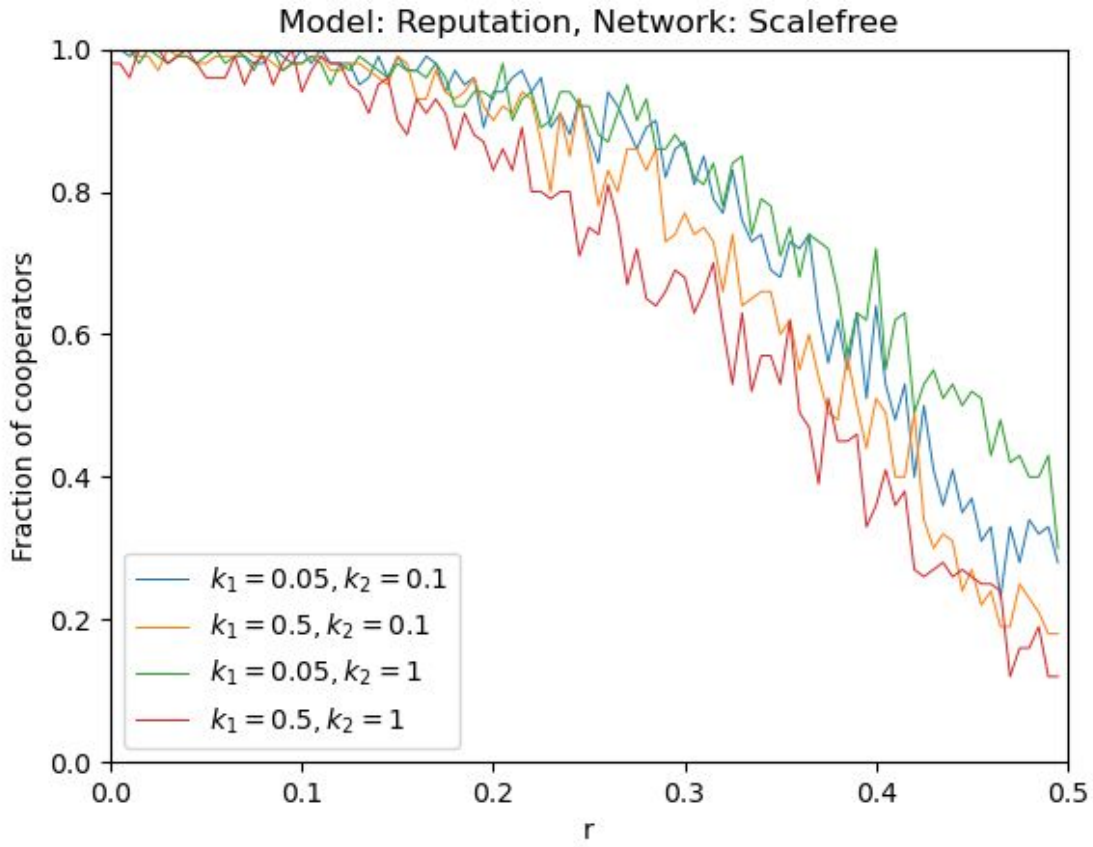
0.3


Model: Reputation, Network: Scalefree
Fraction of cooperators
r
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.1
0.2
0.3
0.4
0.5
$p = 0.0$
$p = 0.1$
$p = 0.2$
$p = 0.3$
$p = 0.4$
$p = 0.5$
$p = 0.7$

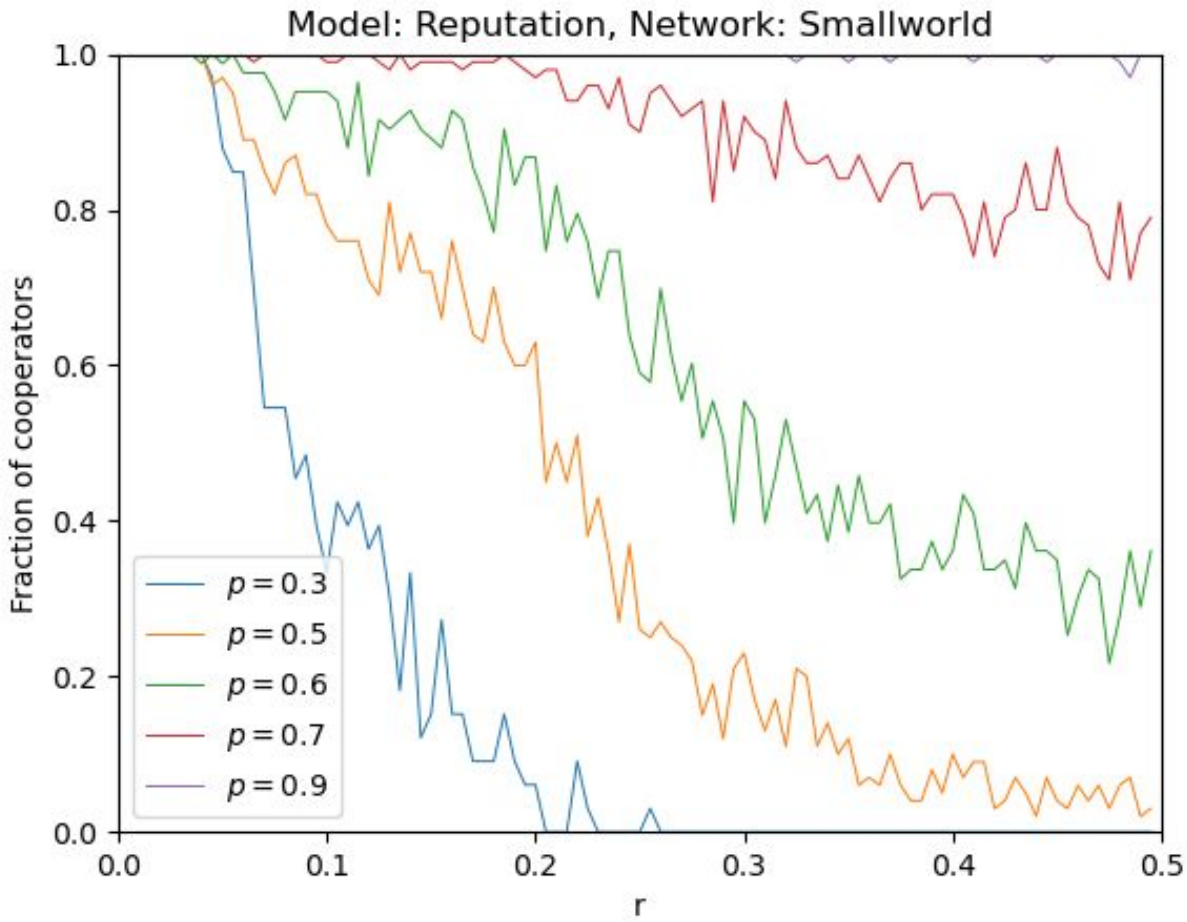

Network: Scalefree
p = 0.0
Reputation
Time
0.06
0.08
0.10
0.12
0.14
0.16
0
200
400
600
800
1000
1200
1400

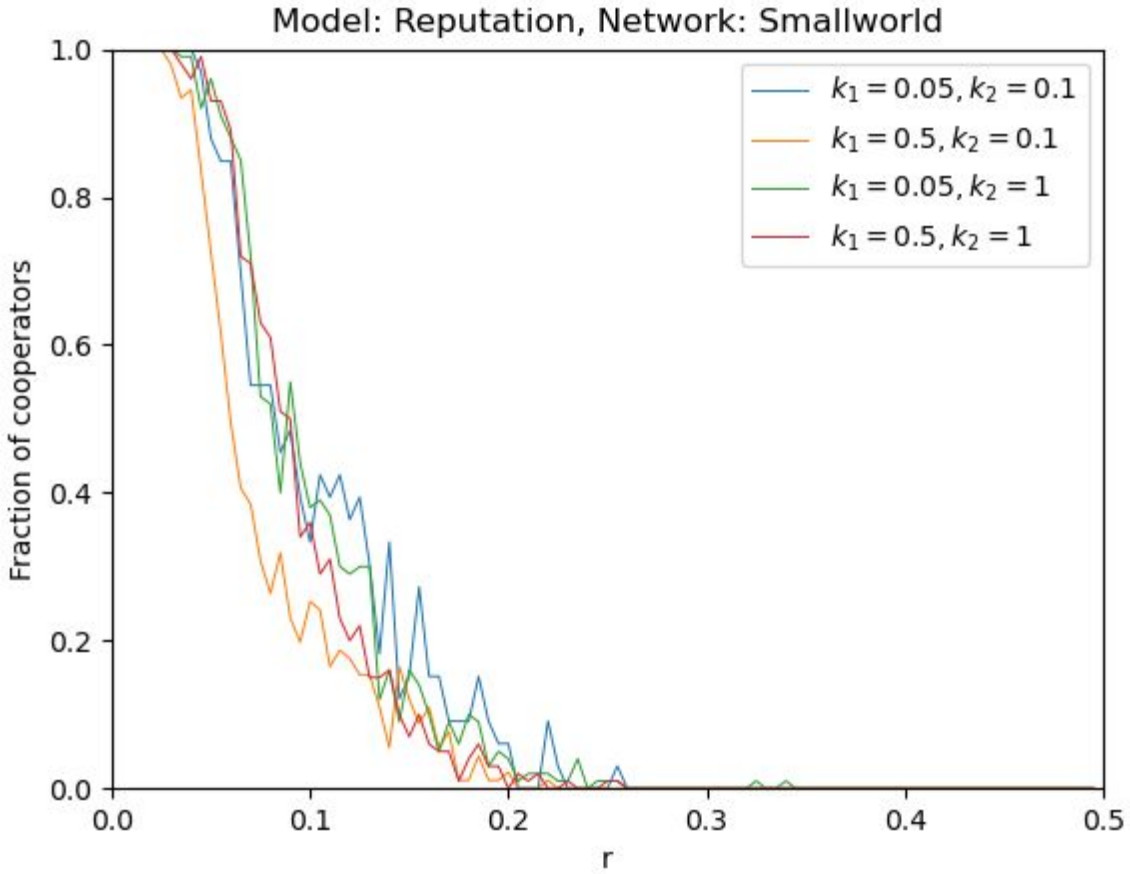

Network: Scalefree
p = 0.3
Reputation
Time
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
2000
4000
6000
8000
10000
12000
14000


Network: Scalefree
p = 0.5
Reputation
Time
0.2
0.4
0.6
0.8
1.0
0
500
1000
1500
2000
2500
3000

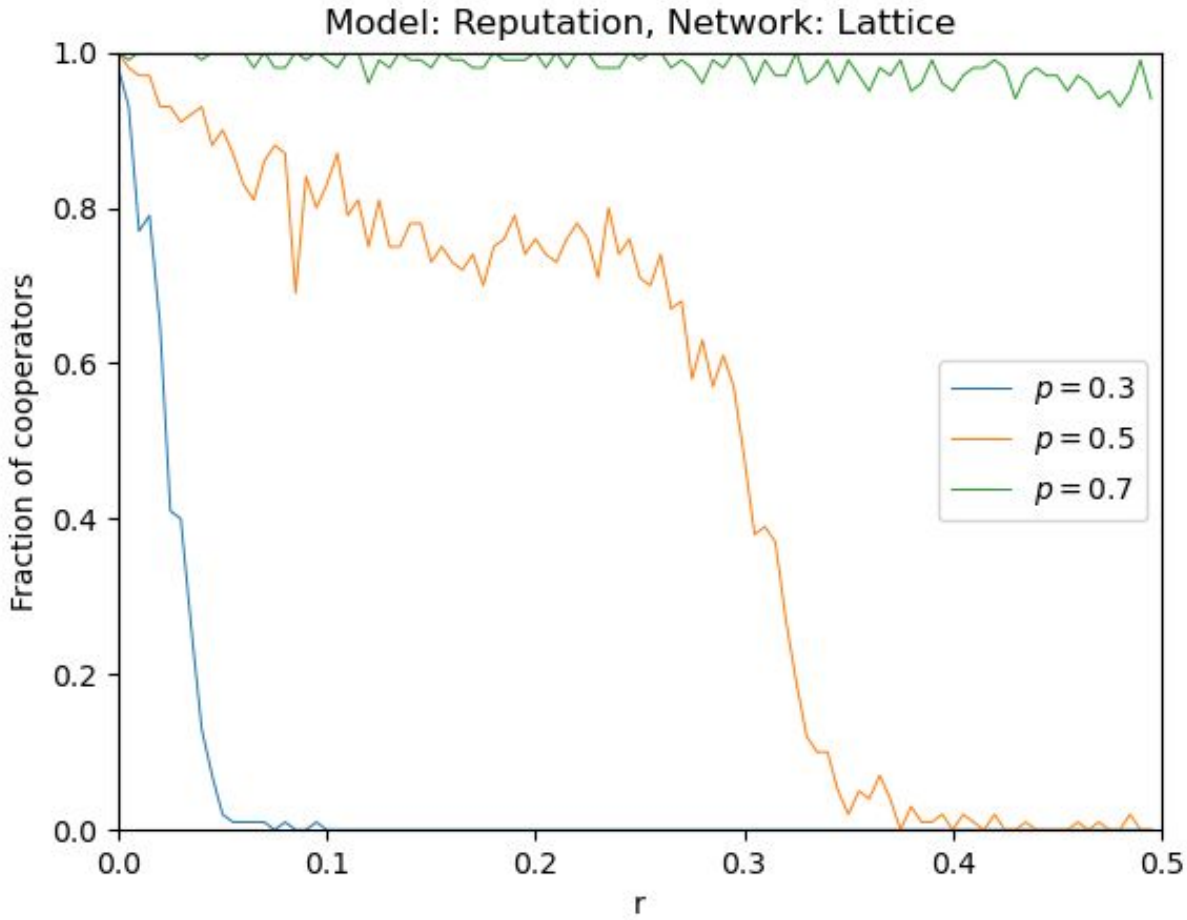



$k_1$ and $k_2$ are noise parameters for reputation-based and payoff-based imitation


Model: Reputation, Network: Smallworld
Fraction of cooperators
r
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.1
0.2
0.3
0.4
0.5
$p = 0.3$
$p = 0.5$
$p = 0.6$
$p = 0.7$
$p = 0.9$



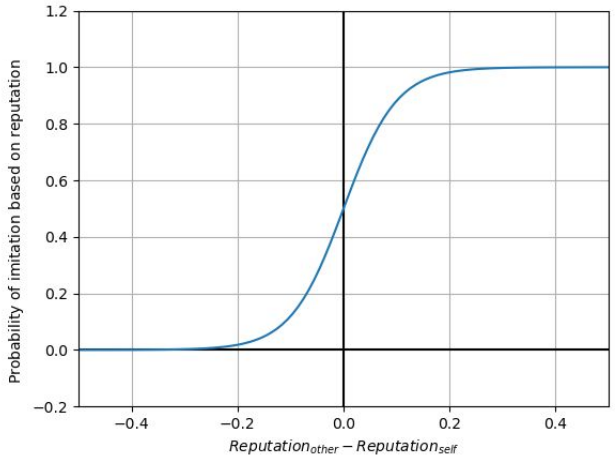

$k_1$ and $k_2$ are noise parameters for reputation-based and payoff-based imitation


Model: Reputation, Network: Lattice
Fraction of cooperators
r
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.1
0.2
0.3
0.4
0.5
$p = 0.3$
$p = 0.5$
$p = 0.7$

# Reputation

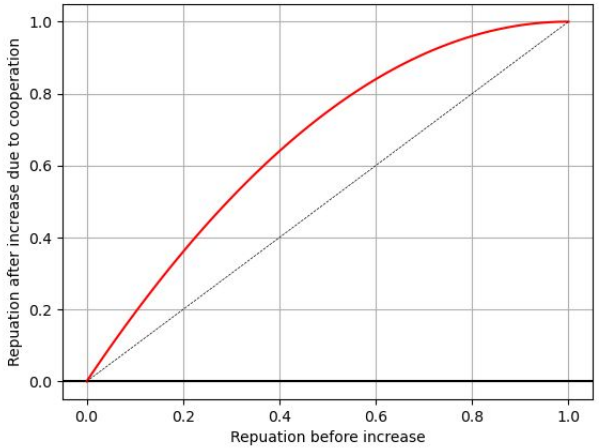
Every agent has a “reputation” which is represented by a number between 0 and 1. After every round of the game, a randomly chosen agent imitates one of it neighbours based on either the difference in their reputation or the difference in their payoffs from that round.

The probability with which an agent chooses a “reputation-based” imitation is the parameter *p.* The imitation itself occurs with a Fermi-like probability (shown below).



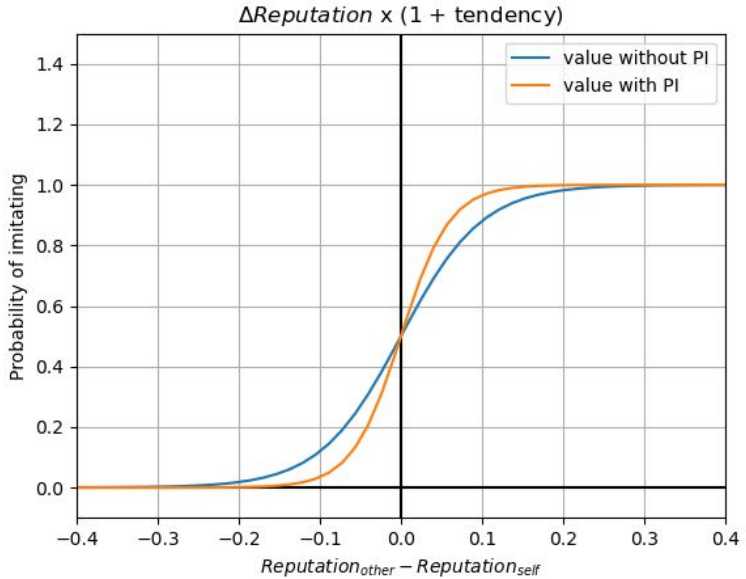
# Reputation

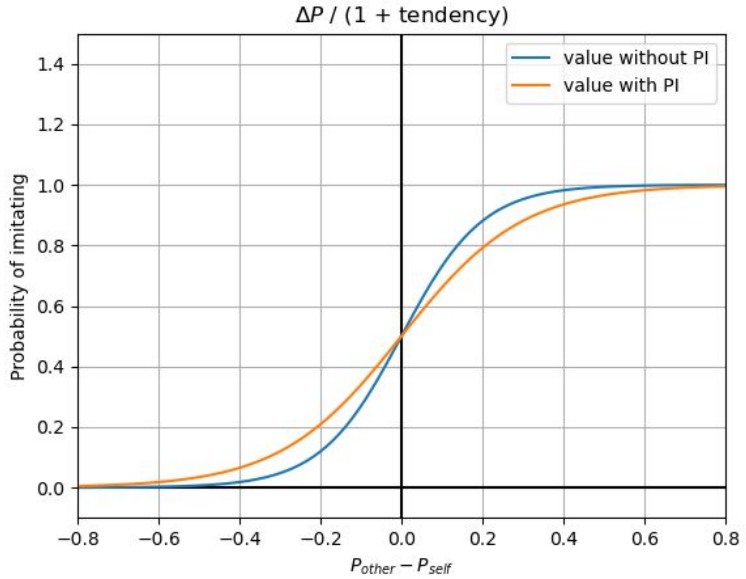
Every time an agent chooses to cooperate, its reputation increases. This increase is modeled as shown below. Therefore, the reputation of an agent is a loose indicator of its history of cooperation.

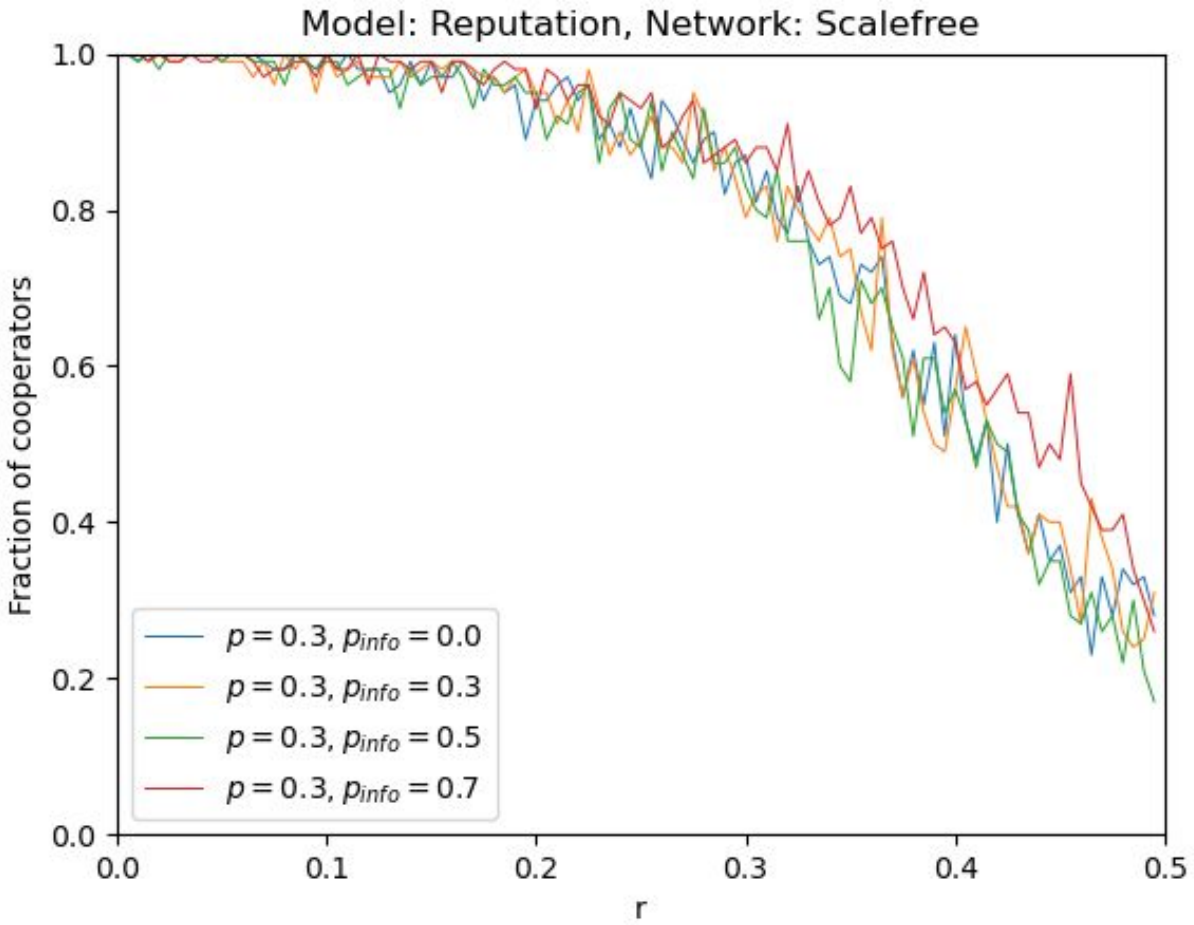


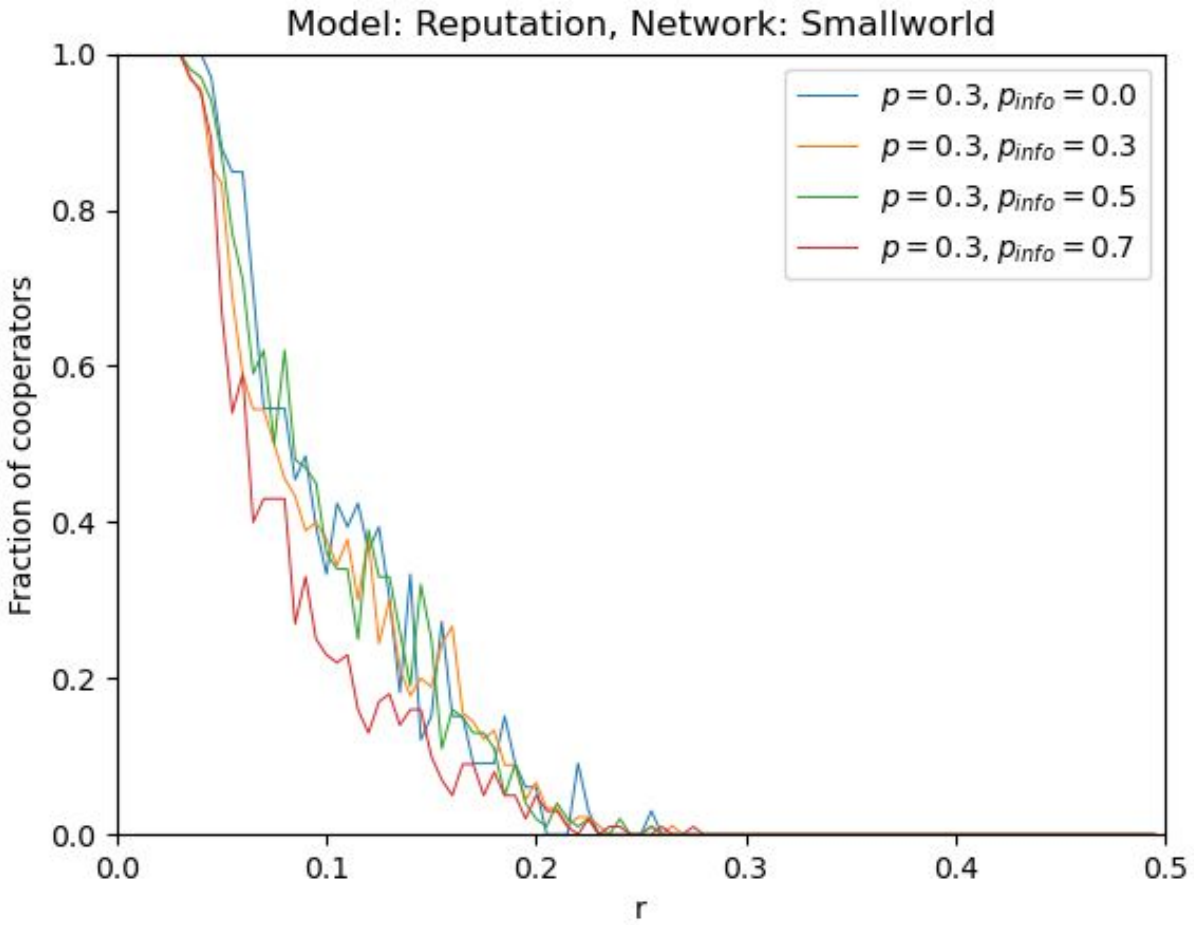
# Reputation

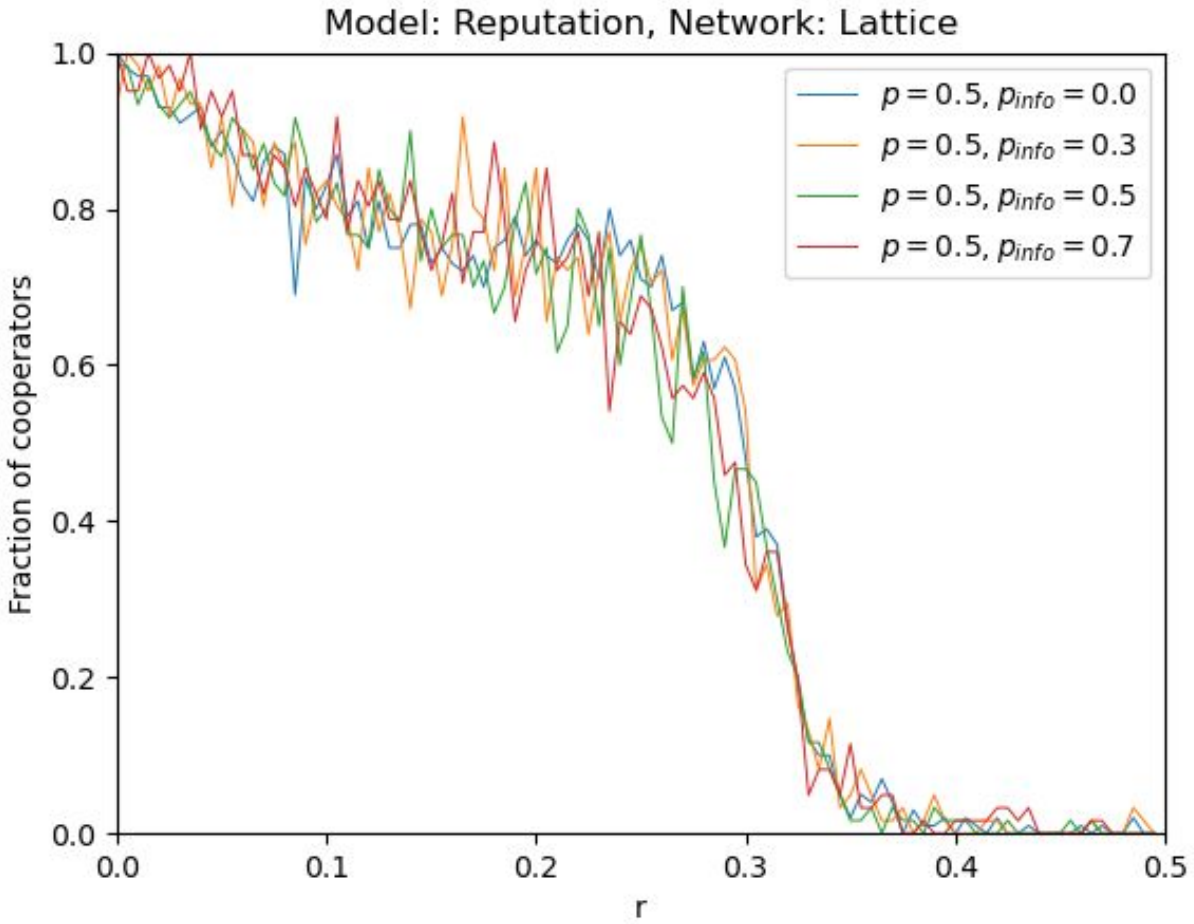
Two new parameters called $p_{info}$ (representing the degree of dissemination of 1 unit of public information) and *tendency* (the tendency of an individual to use this information) is introduced. Assumption - knowledge of public information collectively benefits the agents i.e. promotes cooperation.



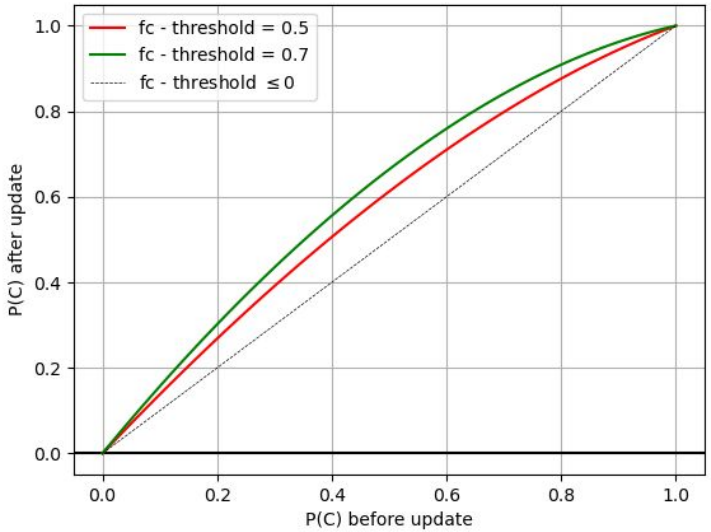

Model: Reputation, Network: Scalefree
Fraction of cooperators
r
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.1
0.2
0.3
0.4
0.5
$p = 0.3, p_{info} = 0.0$
$p = 0.3, p_{info} = 0.3$
$p = 0.3, p_{info} = 0.5$
$p = 0.3, p_{info} = 0.7$


Model: Reputation, Network: Smallworld
Fraction of cooperators
r
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.1
0.2
0.3
0.4
0.5
$p = 0.3, p_{info} = 0.0$
$p = 0.3, p_{info} = 0.3$
$p = 0.3, p_{info} = 0.5$
$p = 0.3, p_{info} = 0.7$


Model: Reputation, Network: Lattice
Fraction of cooperators
r
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.1
0.2
0.3
0.4
0.5
$p = 0.5, p_{info} = 0.0$
$p = 0.5, p_{info} = 0.3$
$p = 0.5, p_{info} = 0.5$
$p = 0.5, p_{info} = 0.7$

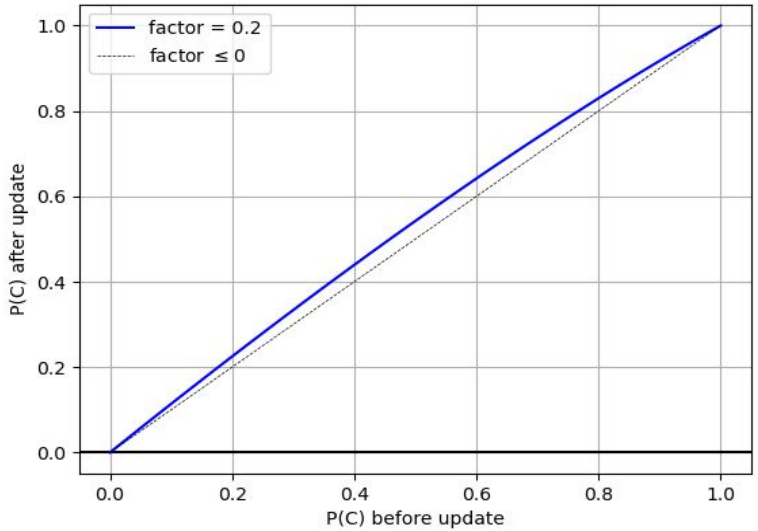
# fc-Threshold

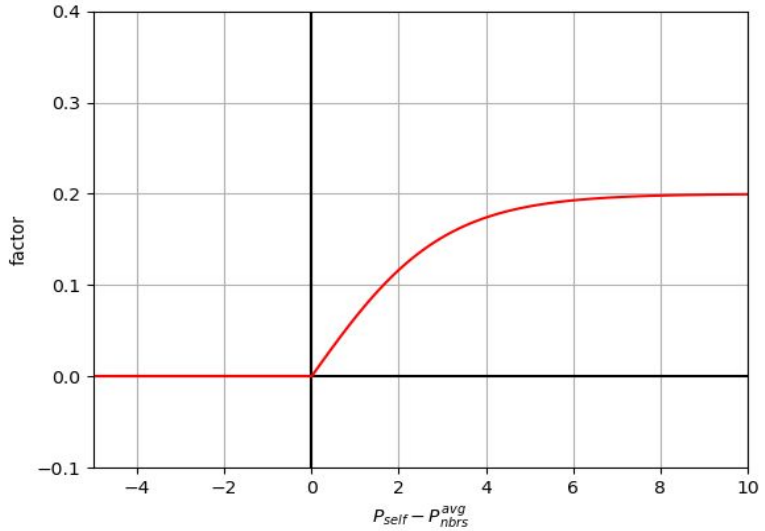
Each strategy is assigned a fixed probability (specific to an individual agent) and this is probability distribution is updated after every time step. All agents have access (with probability $p_{fc}$) to the fraction of cooperators (fc) in the system at any given time step. Each agent has an fc-threshold ($\in [0,1]$). The difference between fc and the threshold determines the increase in probability of cooperation.

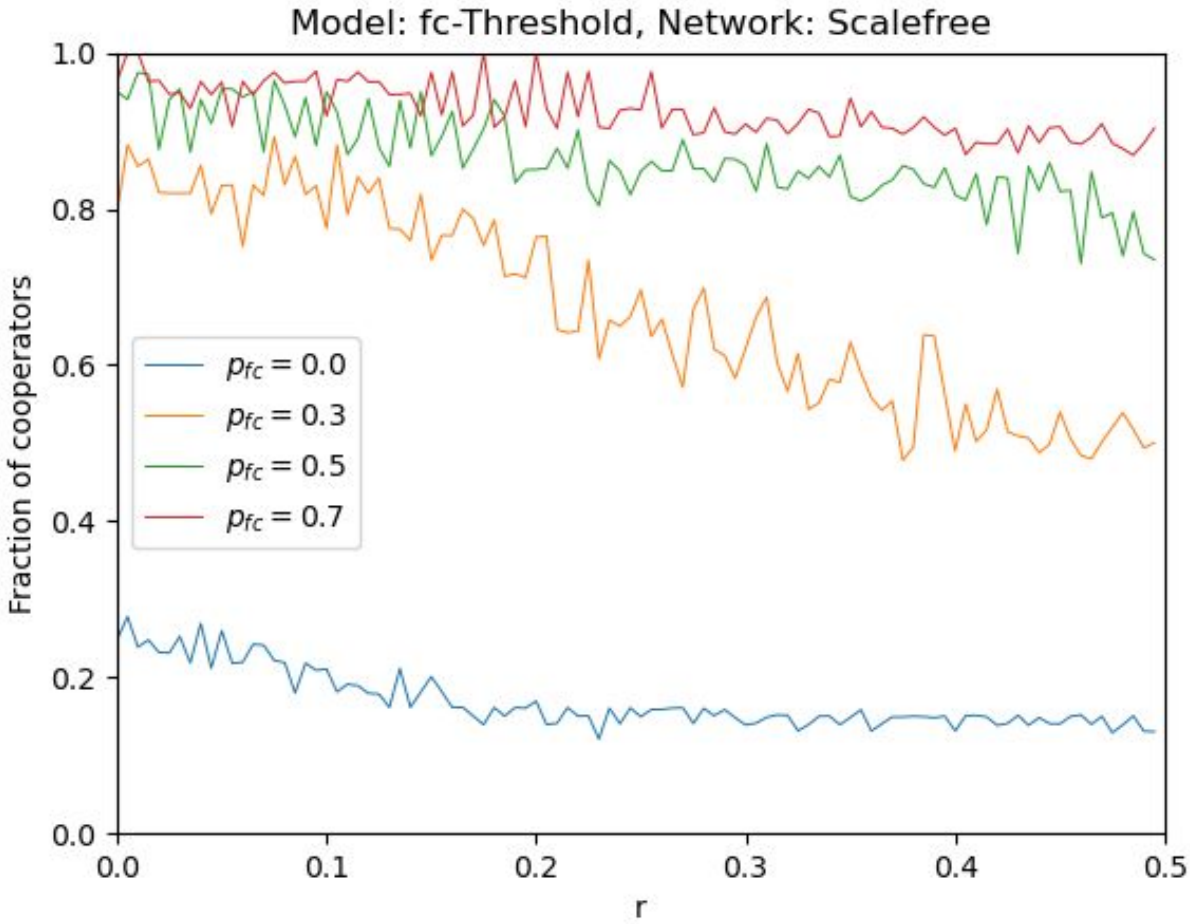


# fc-Threshold

If the agent does not have access to the the public information (fc), then it will depend on the difference in payoff between the agent and its neighbours.




Model: fc-Threshold, Network: Scalefree
Fraction of cooperators
r
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.1
0.2
0.3
0.4
0.5
$p_{fc} = 0.0$
$p_{fc} = 0.3$
$p_{fc} = 0.5$
$p_{fc} = 0.7$