

# Is spamming an efficient strategy in temporal networks ?

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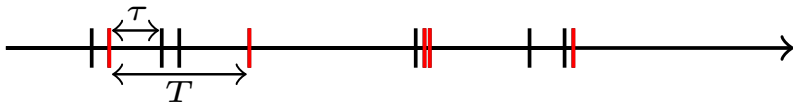
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- Someone wants to spread opinion/information to his neighborhood.
- Fixed allocated time to spend between diffusing and convincing.

# Framework

- SI diffusion model over an edge.
- power-law inter-contact probability distribution function (pdf)  $f$  (bursty behaviour).
- Probability  $p$  of success for each attempt  
→ underlying inter-success pdf.



$$T \sim \psi(T)$$

$$\tau \sim f(\tau)$$

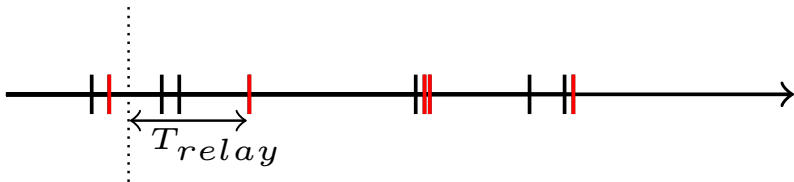
# Moments of the inter-success pdf

$$\langle T \rangle = \frac{\langle \tau^2 \rangle}{2 \langle \tau \rangle} + \frac{1-p}{p} \langle \tau \rangle$$

$$\langle T^2 \rangle = \frac{\langle \tau^3 \rangle}{3 \langle \tau \rangle} + \frac{1-p}{p} \left( 2 \langle \tau^2 \rangle + \frac{(1-p)}{p} \langle \tau \rangle^2 \right)$$

$\langle \tau^k \rangle = \int_0^{+\infty} \tau^k f(\tau) d\tau$  is the  $k^{\text{th}}$  moment of the inter-contact pdf  $f$ .

# Average Relay Time



$$T_{relay} = 1 + p \left( \frac{\langle \tau^2 \rangle}{2 \langle \tau \rangle^2} - 1 \right)$$

- Inter-meeting time pdf matters to determine whether process is bursty or not
- Probability of success  $p$  modulates the 'amplitude' of the burstiness

# Comparison of strategies

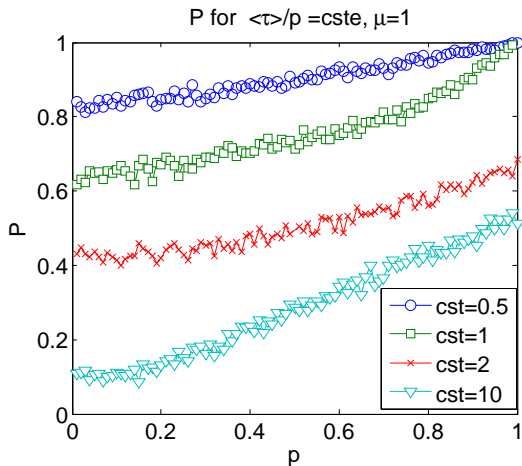
For a constant mean time between two successful transmissions  $\frac{\langle \tau \rangle}{p}$ ,  
which is the more efficient in term of diffusion :

increase the quantity (low  $\langle \tau \rangle$ )

or

increase the quality (high  $p$ ) of the successive attempts ?

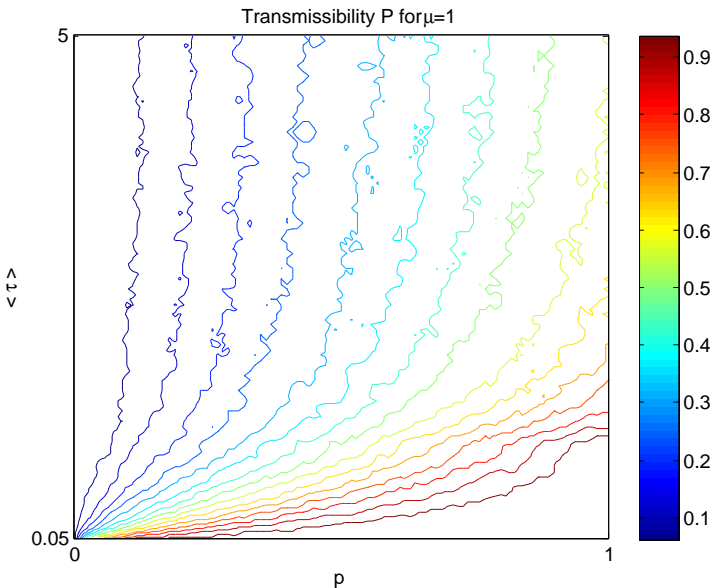
# Comparison of strategies : numerical results



At constant ratio,  
higher  $p$  is more efficient in  
terms of diffusion.

$p$  = probability of success  
 $P$  = overall probability of  
success before recovery  
 $\frac{\langle \tau \rangle}{p}$  = naive mean time for  
success

# Comparison of strategies : numerical results

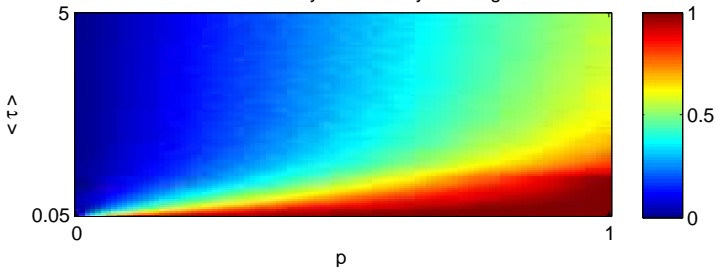


It is more efficient to be  $k$  times more convincing on one contact than the other way round.



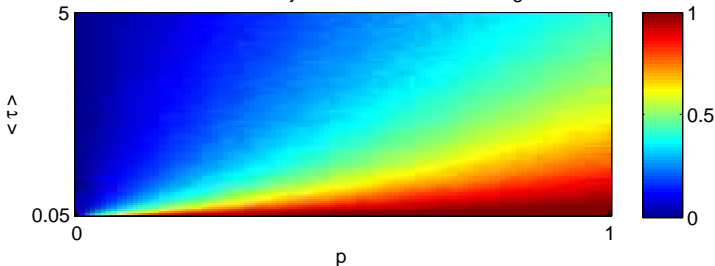
# Comparison with Poisson behaviour : numerical results

Transmissibility P for bursty meeting



If the meeting dynamic is bursty, transmissibility is more sensitive to the probability  $p$  of one attempt.

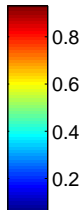
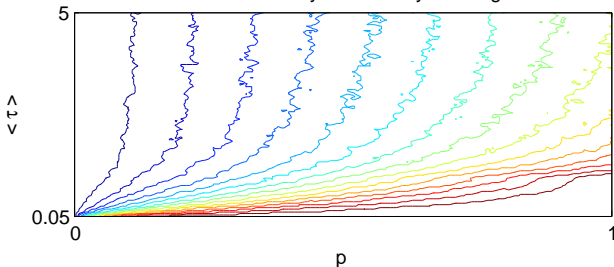
Transmissibility P for Poissonian meeting



If the meeting dynamic is Poissonian, only the ratio matters.

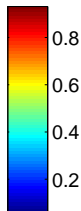
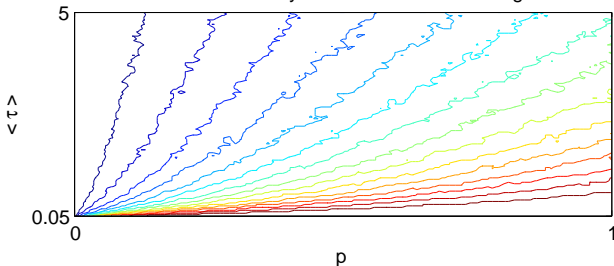
# Comparison with Poisson behaviour : numerical results

Transmissibility  $P$  for bursty meeting



If the meeting dynamic is bursty, transmissibility is more sensitive to the probability  $p$  of one attempt.

Transmissibility  $P$  for Poissonian meeting



If the meeting dynamic is Poissonian, only the ratio matters.

# Conclusion

- Distinction between inter-meeting and underlying diffusive processes
- Integration of social (burstiness) and 'biological' (probability of success) factors

Facing bursty meeting interactions, favor the quality of your message!