Final Exam 2 Ref

Prep Question: 2021-04-28

Explain the derivation of the probability used for the influence cascade + percolation models in Lab 6 to match SIR results...

(1) $P_{\text{recover in } \delta v} = \gamma \delta v$ (2) $\Rightarrow P_{\text{not recover in } \delta v} = 1 - \gamma \delta v$

(3) $P_{\text{not recover in } v} = [1-\gamma\delta v]_1 \cdots [1-\gamma\delta v]_{\frac{v}{\delta v}} = (1-\gamma\delta v)^{\frac{v}{\delta v}}$

$\lim_{\delta v \to 0} (1-\gamma\delta v)^{\frac{v}{\delta v}}$ (4) $= \boxed{e^{-\gamma v}} = P_{\text{not recover in } v}$

$P(v)dv = (\gamma \delta v) P_{\text{not recover in } v}$ (5) $= \boxed{\gamma e^{-\gamma v} dv} = P_{\text{recover in } (v, v+dv)}$

($P_{\text{recover in } [v, v+1]}$; recover in δv)

Avg $v = \langle v \rangle = \int_0^\infty P(v)dv = \int_0^\infty \gamma e^{-\gamma v} dv$ (6)

Oral Exam 2 Ref

2021-04-28

PreP Question cont.

(7) $P_{\text{Infect neighbor}} = 1 - e^{-\beta\langle\tau\rangle}$

1: If infected long enough, it will always affect it

β: infect neighbor Rate

$\langle\tau\rangle$: average time to recover

Intuitive: $\beta \uparrow = e^{-\beta\langle\tau\rangle} \downarrow$

$\tau \uparrow = e^{-\beta\langle\tau\rangle} \downarrow$

$\Big\} P_{\text{infect}} \downarrow$