Beyond Epidemics

Insights from the RAMP project

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Department of Computer and Information Sciences

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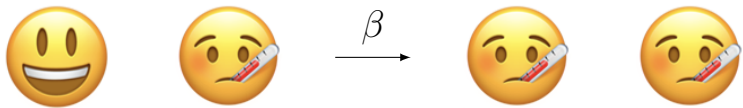
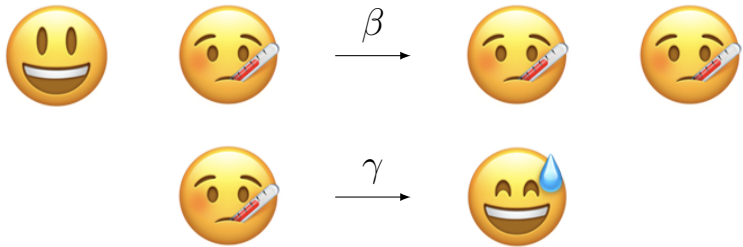
A ROTTEN RETIREMENT?
TAKE ACTION TODAY
NO to pension cuts
NO to worsening pay & conditions
WE'RE AT BREAKING POINT

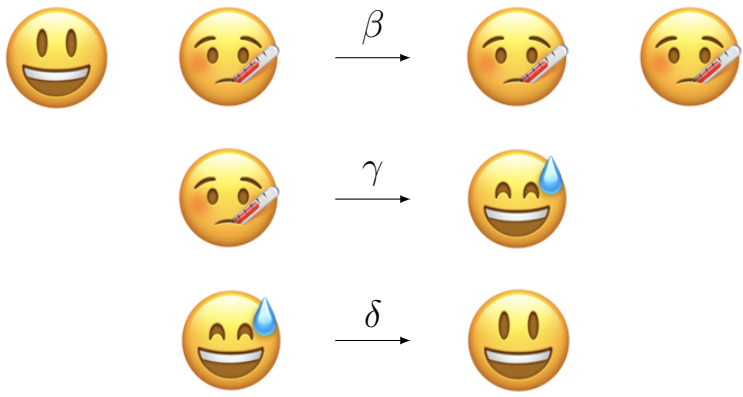
Epidemics of human-human disease



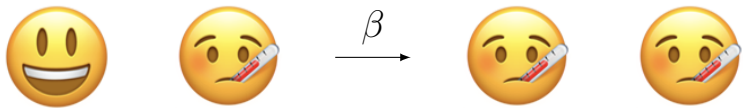
Epidemics of human-human disease



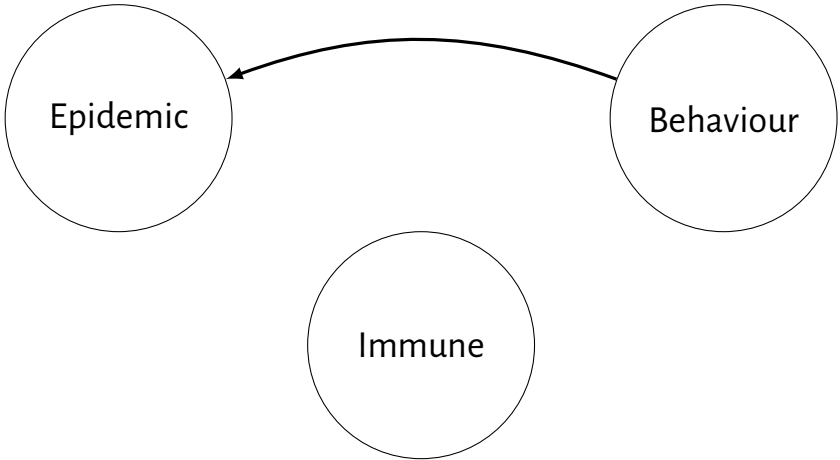
Epidemics of human-human disease



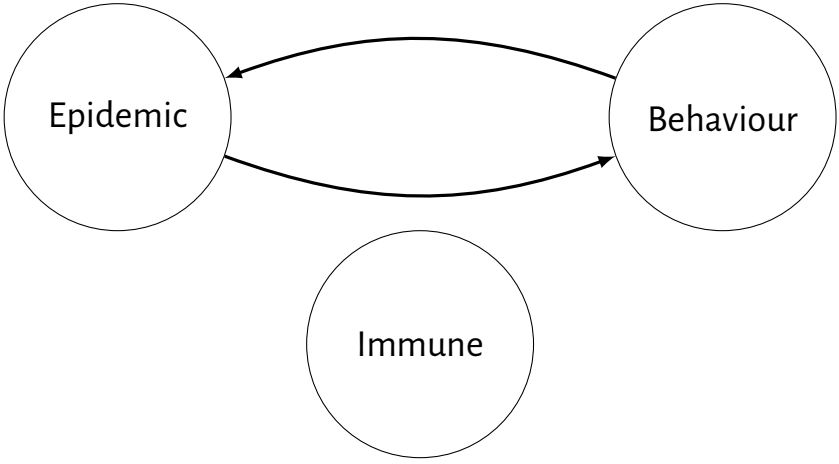
Epidemics of human-human disease



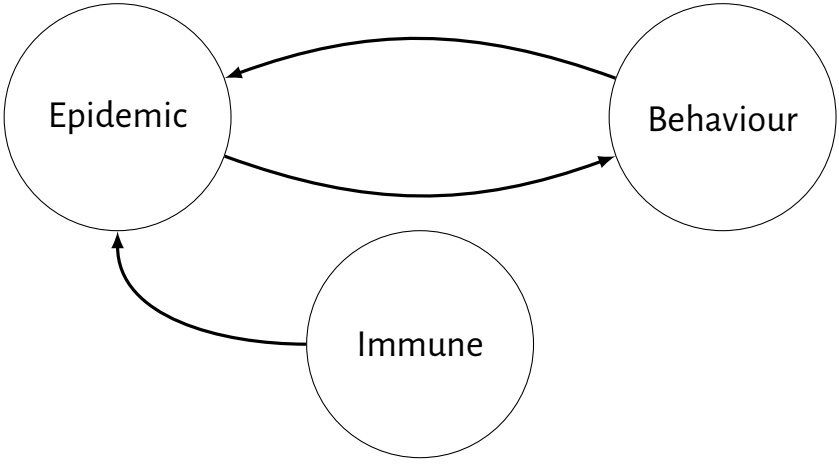
Coupled models



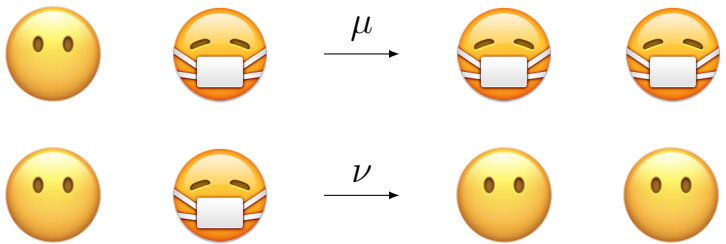
Coupled models



Coupled models



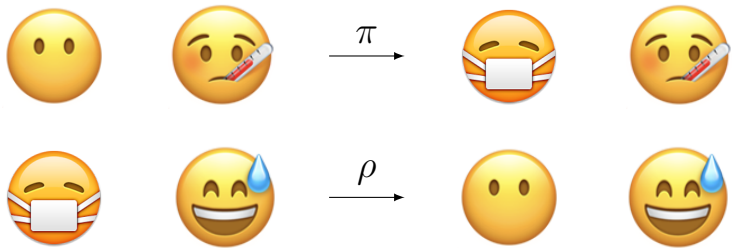
An epidemic of masks



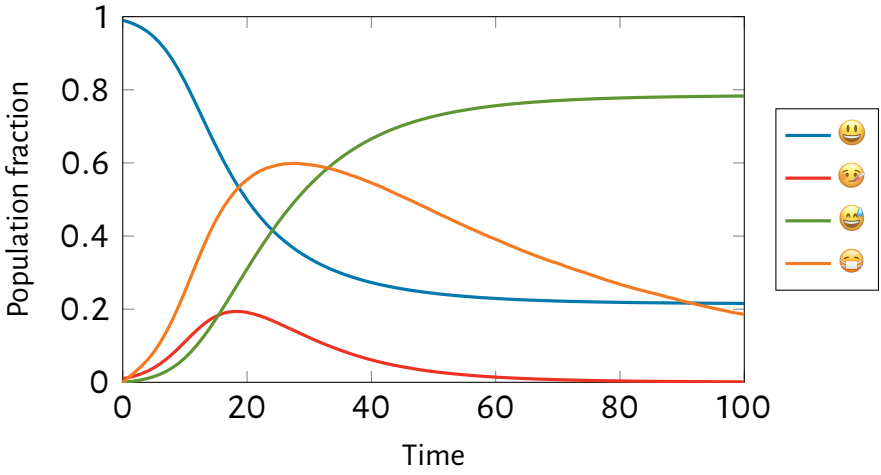
William Waites, Matteo Cavaliere, David Manheim, et al. “Rule-based epidemic models”. In: *Journal of Theoretical Biology* (July 31, 2021), p. 110851. ISSN: 0022-5193. DOI: 10.1016/j.jtbi.2021.110851

An epidemic of masks

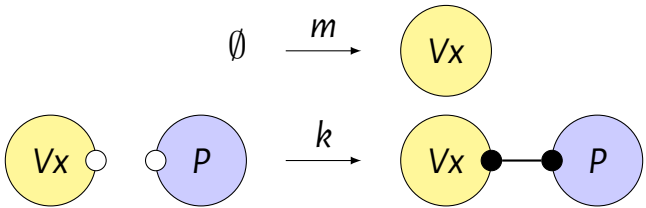
University of Strathclyde Science



An epidemic of masks



Finite resources



Vaccination choice

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$$\varphi(\mathbf{x}) : \mathbb{R}^3 \to \mathbb{R}^3$$

$\varphi_E(\mathbf{x})$	Epidemic to steady state
$\varphi_V(\mathbf{x})$	Vaccination choice
$\varphi = \varphi_V \circ \varphi_E$	One simulation step

Irena Papst, Kevin P. O'Keeffe, and Steven H. Strogatz. *Modeling the interplay between seasonal flu outcomes and individual vaccination decisions*. Jan. 19, 2021. arXiv: 2101 . 07926

Vaccination choice

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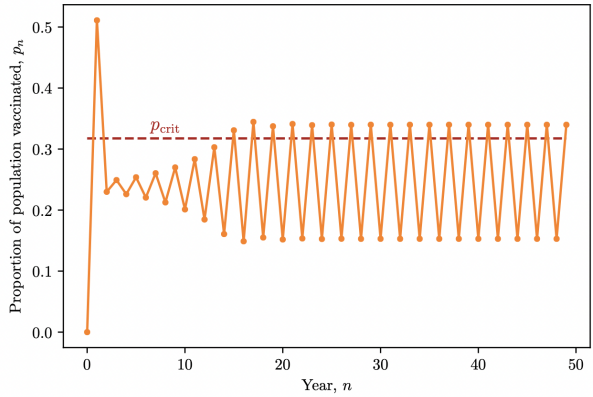
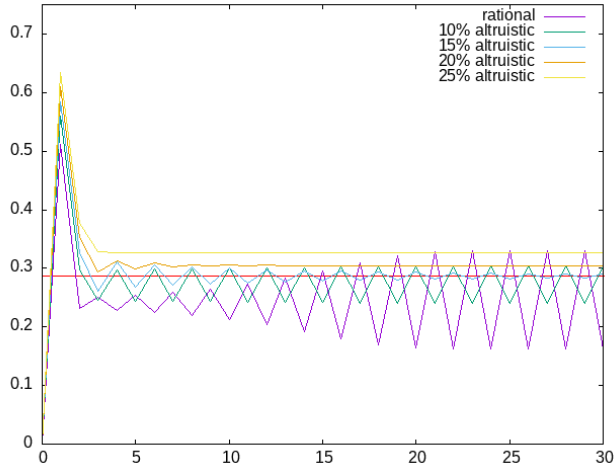
Figure 3: Vaccine coverage level over time in the regime where herd immunity eventually occurs every other year ($\mathcal{R}_0 = 1.4, r = 0.55, s = 0.9$). The system converges to a state where the vaccine coverage level oscillates asymmetrically about the critical vaccination threshold, $p = p_{\text{crit}}$, denoted by the dashed line.



Irena Papst, Kevin P. O'Keeffe, and Steven H. Strogatz. *Modeling the interplay between seasonal flu outcomes and individual vaccination decisions.* Jan. 19, 2021. arXiv: 2101 . 07926

Altruism



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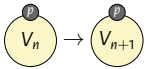
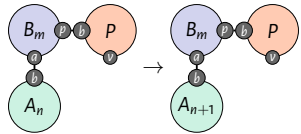
Eunha Shim, Gretchen B. Chapman, Jeffrey P. Townsend, et al. “The influence of altruism on influenza vaccination decisions”. In: *Journal of The Royal Society Interface* 9.74 (Sept. 7, 2012), pp. 2234–2243. ISSN: 1742-5689, 1742-5662. DOI: 10.1098/rsif.2012.0115

Adaptive immune response

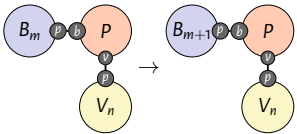
Virus replication



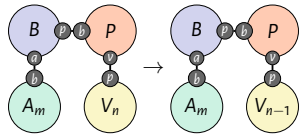
Antibody production



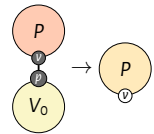
Affinity maturation



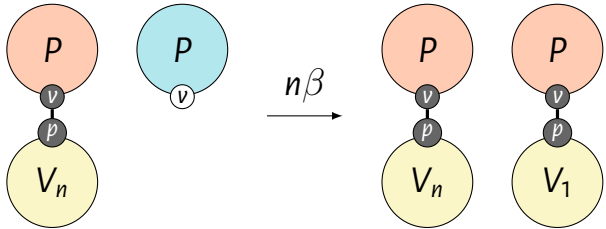
Virus neutralisation



Recovery



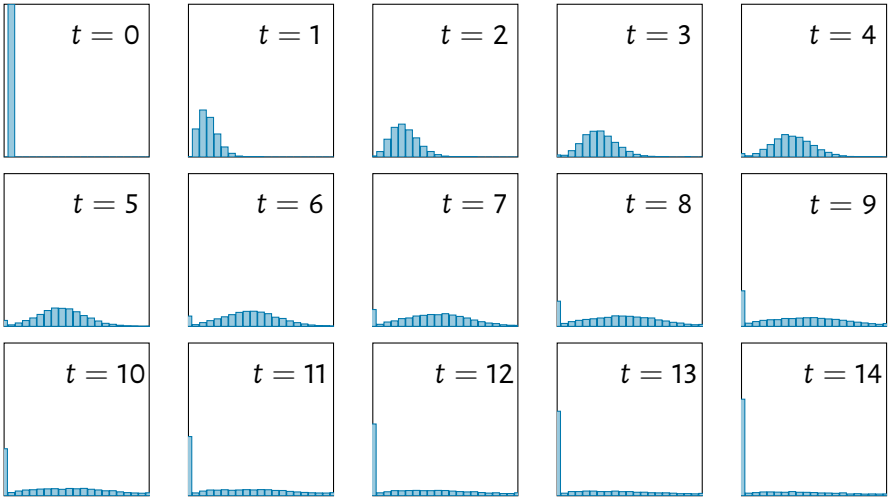
Transmission



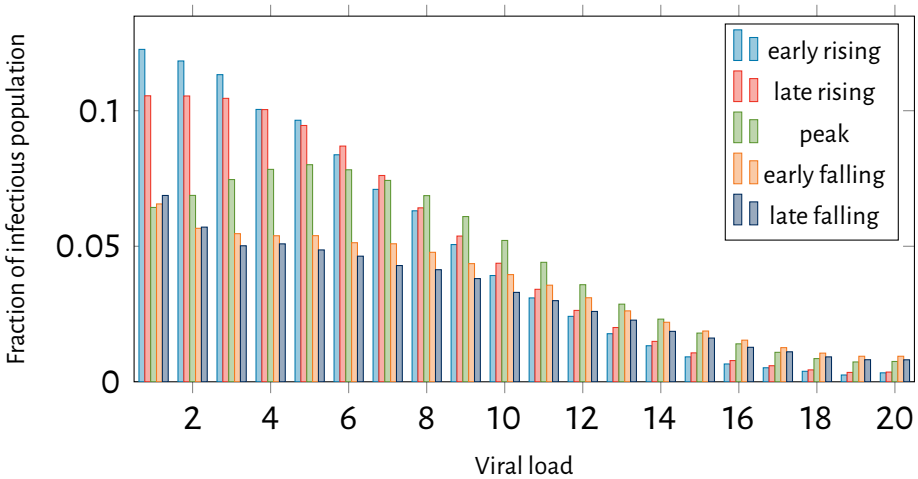
$$S = \left| \begin{array}{c} b \\ P \\ v \end{array} \right| \qquad I = \left| \begin{array}{c} P \\ v \end{array} \right| \qquad R = \left| \begin{array}{c} b \\ P \\ v \end{array} \right|$$

William Waites, Matteo Cavaliere, Vincent Danos, et al. *Compositional modelling of immune response and virus transmission dynamics*. Nov. 3, 2021. arXiv: 2111.02510

Viral Load Distribution – $\Pr(V_n)$



Shifting viral load distributions



Thank you

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https://kappalanguage.org/

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