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Dissemination models: applications in epidemiology, rumour spreading, wealth distribution, and opinion formation

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Stellingen

Behorende bij het proefschrift

Dissemination Models

*Applications in
epidemiology, rumour spreading,
wealth distribution, and opinion formation*

1. In compartmental models with an acyclic transition graph, cycles in the dependency graph do not preclude a sharp asymptotic characterisation.
2. Incorporating a rumour-spreading process into an epidemiological model can generate multi-wave dynamics in the evolution of number of infectious individuals.
3. In the group-structured SIR model under a linear bilateral contact pattern, increasing the size of a servant group decreases R_0 and increases the susceptible fraction remaining in every group.
4. The relative opinion model provides an elementary linear framework in which consensus, polarisation, and periodic long-run behaviour can all arise in well-connected populations.
5. Even with an acyclic transition graph, vanishing states in compartmental models need not decay exponentially; convergence can be slower.
6. In Markovian dissemination models, a distribution-level description need not be analytically intractable: probability-generating-function analysis may yield coupled differential equations that reduce to linear systems for moments.
7. Oscillations in collective behaviour need not indicate exogenous shocks; they can arise endogenously.
8. The choice of diffusion-object state space is a key modelling ingredient that can change which long-run phenomena are possible.
9. Mathematics is most enjoyable with others, where questions are welcome, criticism nudges, and the main results show up unexpectedly.
10. Rumours spread like butter; hot glide, cold stick.
11. In office, the disappearance rate of ballpoint pens exceeds the creation rate, suggesting a conservation law has been violated.

Kit Ming Danny Chan
Leiden, 16 September 2026