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A fixed point theorem for a general epidemic model ADAM LUCAS, Saint Mary's College of California — We provide a rigorous axiomatic framework to study the critical behavior of disease spreading on top of a complex network. A necessary and sufficient condition for our general epidemic model to undergo a phase transition is proven. It is known that an *epidemic state* undergoes a phase transition when the infection rate surpasses the epidemic threshold. However, for networks having degree-degree correlations, the epidemic threshold has never formally been defined. We define the epidemic threshold as, $\lambda_c := 1/\lambda'$ with λ' denoting the largest positive eigenvalue of an operator T given in the axioms of our model. When the *epidemic state* is a strictly positive solution to a fixed point equation our model is guaranteed to have a single phase transition. Percolation as well as SIS/SIR epidemic models on complex correlated networks satisfy the axioms of our model. A benefit of our axiomatic framework is that it highlights commonalities in a variety of interacting particle systems.

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