Contagion Shocks in One Dimension

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Abstract

We consider an agent-based model of emotional contagion coupled with motion in one dimension that has recently been studied in the computer science community. The model involves movement with speed proportional to a "fear' variable that undergoes a temporal consensus averaging with other nearby agents. We study the effect of Riemann initial data for this problem, leading to shock dynamics that are studied both within the agent-based model as ODEs as well as in a continuum limit as PDEs. We examine the model under distinguished limits as the characteristic contagion interaction distance and the interaction timescale both approach zero. Here, we observe a threshold for the interaction distance vs. interaction timescale that produces qualitatively different behavior for the system - in one case particle paths do not cross and there is a natural Eulerian limit involving nonlocal interactions and in the other case particle paths can cross and one may consider only a kinetic model in the continuum limit. Time permitting, we will also discuss recent extensions of the model to two dimensions.

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