Physics > Physics and Society

Analysis of complex contagions in random multiplex networks

Osman Yagan, Virgil Gligor

(Submitted on 2 Apr 2012 (v1), last revised 8 Jun 2012 (this version, v3))

We study the diffusion of influence in random multiplex networks where links can be of r different types, and for a given content (e.g., rumor, product, political view), each link type is associated with a content dependent parameter c_i in $[0,\infty]$ that measures the relative bias type-i links have in spreading this content. In this setting, we propose a linear threshold model of contagion where nodes switch state if their "perceived" proportion of active neighbors exceeds a threshold \tau. Namely, a node connected to m_i active neighbors and k_i-m_i inactive neighbors via type-i links will turn active if $\sum{c_i m_i}/\sum{c_i k_i}$ exceeds its threshold \tau. Under this model, we obtain the condition, probability and expected size of global spreading events. Our results extend the existing work on complex contagions in several directions by i) providing solutions for coupled random networks whose vertices are neither identical nor disjoint, (ii) highlighting the effect of content on the dynamics of complex contagions, and (iii) showing that content-dependent propagation over a multiplex network leads to a subtle relation between the giant vulnerable component of the graph and the global cascade condition that is not seen in the existing models in the literature.

Comments:	Revised 06/08/12. 11 Pages, 3 figures
Subjects:	**Physics and Society (physics.soc-ph)**; Social and Information Networks (cs.SI)
Journal reference:	Phys. Rev. E 86, 036103 (2012)
DOI:	10.1103/PhysRevE.86.036103
Cite as:	**arXiv:1204.0491 [physics.soc-ph]**
	(or **arXiv:1204.0491v3 [physics.soc-ph]** for this version)

Submission history

From: Osman Yagan [view email]
[v1] Mon, 2 Apr 2012 18:36:12 GMT (347kb)
[v2] Wed, 4 Apr 2012 13:19:14 GMT (347kb)
[v3] Fri, 8 Jun 2012 16:19:01 GMT (701kb)

Which authors of this paper are endorsers?