First mathematical model to explain how things go viral

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Scientists have come up with the first ever mathematical model to explain explosive contagion in social networks - in other words, how things go viral.

Using epidemic models that draw comparisons between the transmission of complex social phenomena and infectious diseases, scientists at the Universities of Aberdeen, Cambridge, Zaragoza and Nacional de Colombia have developed a model that includes the impact of friends and acquaintances in the sudden spread of new ideas.

Dr Francisco Perez-Reche, from the University of Aberdeen's School of Natural and Computing Sciences, is the lead author of the study, which has been published in *Nature Scientific Reports*.

"We often witness social phenomena that become accepted by many people overnight, especially now in the age of social media," he said.

"This is especially relevant to social contexts in which individuals initially hesitate to join a collective movement, for example a strike, because they fear becoming part of a minority that could be punished. But it also applies to new ideas or products.

"Mathematical models proposed in the past typically neglected the synergistic effects of acquaintances and were unable to explain explosive contagion, but we show that these effects are ultimately responsible for whether something catches on quickly.

"In very basic terms our model shows that people's opposition to accept a new idea acts as a barrier to large contagion, until the transmission of the phenomenon becomes strong enough to overcome that reluctance – at this point, explosive contagion happens."

The research acknowledges the important role that social media can play

in this process, making explosive contagion more apparent in our everyday lives than ever before.

However, it is the intrinsic value of the idea or product, and whether friends and acquaintances adopt it or not, that remains the crucial factor.

Dr Perez-Reche added that the model could potentially be used to address social issues, or by companies to give their product the edge over rivals.

"Our conclusions rely on numerical simulations and analytical calculations for a variety of contagion models, and we anticipate that the new understanding provided by our study will have important implications in real social scenarios," he explained.

"For instance, it could lead to better strategies to minimise the risk of sudden and often unexpected epidemics of undesired social behaviour. Similarly, it will suggest methods to engineer explosive diffusion of innovative products and ideas."

More information: J. Gómez-Gardeñes et al. Explosive Contagion in Networks, *Scientific Reports* (2016). DOI: 10.1038/srep19767

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