

Séminaire du CAMS

Systèmes complexes en sciences sociales

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Triggering novelties and innovation in human activities

One new thing often leads to another. Such correlated novelties are a familiar part of daily life. They are also thought to be fundamental to the evolution of biological systems, human society, and technology. By opening new possibilities, one novelty can pave the way for others in a process that Kauffman has called "expanding the adjacent possible". The dynamics of correlated novelties, however, have yet to be quantified empirically or modeled mathematically. Nowadays, thanks to the availability of extensive longitudinal records of human activity online, it has become possible to test whether everyday novelties crop up by chance alone, or whether one truly does pave the way for another. In this talk I will propose a simple mathematical framework that mimics the process of exploring a physical, biological or conceptual space that enlarges whenever a novelty occurs. The model predicts statistical laws for the rate at which novelties happen (analogous to Heaps' law) and for the probability distribution on the space explored (analogous to Zipf's law), as well as signatures of the hypothesized process by which one novelty sets the stage for another. These predictions have been tested on four data sets of human activity: the edit events of Wikipedia pages, the emergence of tags in annotation systems, the sequence of words in texts, and listening to new songs in online music catalogues. By quantifying the dynamics of correlated novelties, these results provide a starting point for a deeper understanding of the ever-expanding adjacent possible and its role in triggering innovations in biological, linguistic, cultural, and technological systems. I will highlight several interesting directions ahead, e.g.: the interplay between individual and collective effects, the different mechanisms supposedly leading to innovation as well as the relevant time-scales involved.

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