Reaction-diffusion Equations on Complex Networks and Turing Patterns, via p-Adic Analysis

W. A. Zúñiga-Galindo

ABSTRACT

The talk aims to show that p-adic analysis is the natural tool to study, in a rigorous mathematical way, reaction-diffusion systems on networks and the corresponding Turing patterns. By embedding the graph attached to the system into the field of p-adic numbers, we construct a family of continuous p-adic versions of the original system. In this way, we are able to study the original system and to obtain a new p-adic continuous version of it, which corresponds to a 'mean-field approximation' of the original system. The existence and uniqueness of the Cauchy problems for all these system are established. We show that Turing criteria remains essentially the same as in the classical case. However, the properties of the emergent patterns are very different. The classical Turing patterns consisting of alternating domains do not occur in the network case, instead of this, several domains (clusters) occur. Multistability, that is, coexistence of a number of different patterns for the same parameters values occurred.