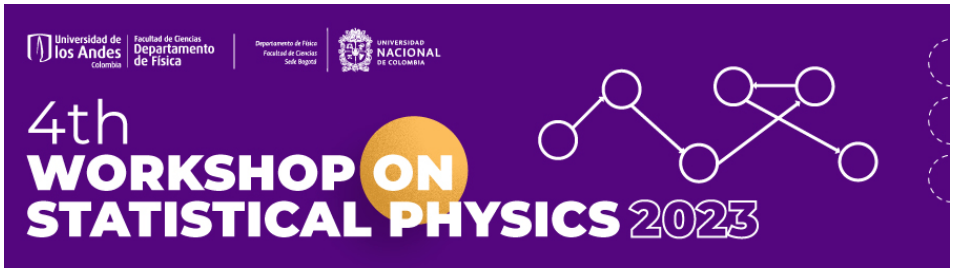

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Reaction-Diffusion Models as an optimal search mechanism in complex semantic networks

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Verbal fluency tests provide some insight into memory information and retrieval processes. These tests can be represented as a complex network, where the nodes are the words of the fluency test and the links between nodes are the semantic relationship of the words. The complex network formed in this way has been called a “semantic network”. To decipher the search mechanisms used by the brain in retrieving information from memory, various search models have been proposed on the semantic network, in order to reproduce said network and identify the information retrieval mechanism. Among the various models, we highlight the censored random walker with priming vector (CRW+PV), which better reproduces the processes of sub-category changes in the category of the verbal fluency test. We tested a new model, based on the reaction-diffusion model (R-D), initially worked on by Alan Turing, who applied it to chemical processes where characteristic patterns were observed, which were called Turing patterns. The particular reaction-diffusion model has been implemented in complex networks of neurons that define the connectome of the animal brain. The model makes it possible to show neural patterns and the movement of water in brain tissue. The application of the R-D model in complex networks made it possible to implement it in the semantic network of verbal fluency tests as a new search mechanism and compare it qualitatively with the results of the CRW+PV mechanism. A correlation was observed between the patterns of the R-D model and the results of the CRW+PV mechanism.

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