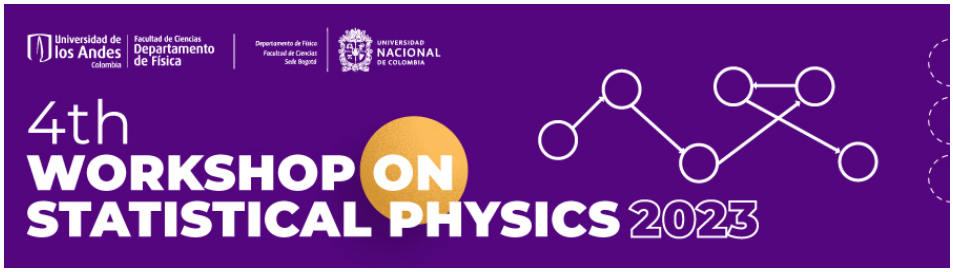

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Random walks on networks with preferential cumulative damage: Generation of bias and aging

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In this paper, we explore the reduction of functionality in a complex system as a consequence of cumulative random damage and imperfect reparation, a phenomenon modeled as a dynamical process on networks. We analyze the global characteristics of the diffusive movement of random walkers on networks where the walkers hop considering the capacity of transport of each link. The links are susceptible to damage that generates bias and aging. We describe the algorithm for the generation of damage and the bias in the transport producing complex eigenvalues of the transition matrix that defines the random walker for different types of graphs, including regular, deterministic, and random networks. The evolution of the asymmetry of the transport is quantified with local information in the links and further with non-local information associated with the transport on a global scale such as the matrix of the mean first passage times and the fractional Laplacian matrix. Our findings suggest that systems with greater complexity live longer.

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