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Layer-layer competition in multiplex complex networks

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The coexistence of multiple types of interactions within social, technological and biological networks has moved the focus of the physics of complex systems towards a multiplex description of the interactions between their constituents. This novel approach has unveiled that the multiplex nature of complex systems has strong influence in the emergence of collective states and their critical properties. Here we address an important issue that is intrinsic to the coexistence of multiple means of interactions within a network: their competition. To this aim, we study a two-layer multiplex in which the activity of users can be localized in each of the layer or shared between them, favoring that neighboring nodes within a layer focus their activity on the same layer. This framework mimics the coexistence and competition of multiple communication channels, in a way that the prevalence of a particular communication platform emerges as a result of the localization of users activity in one single interaction layer. Our results indicate that there is a transition from localization (use of a preferred layer) to delocalization (combined usage of both layers) and that the prevalence of a particular layer (in the localized state) depends on their structural properties.

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