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Flexible embedding of networks JUAN FERNANDEZ-GRACIA, CAROLINE BUCKEE, JUKKA-PEKKA ONNELA, Harvard T.H. Chan School of Public Health — We introduce a model for embedding one network into another, focusing on the case where network A is much bigger than network B. Nodes from network A are assigned to the nodes in network B using an algorithm where we control the extent of localization of node placement in network B using a single parameter. Starting from an unassigned node in network A, called the source node, we first map this node to a randomly chosen node in network B, called the target node. We then assign the neighbors of the source node to the neighborhood of the target node using a random walk based approach. To assign each neighbor of the source node to one of the nodes in network B, we perform a random walk starting from the target node with stopping probability α. We repeat this process until all nodes in network A have been mapped to the nodes of network B. The simplicity of the model allows us to calculate key quantities of interest in closed form. By varying the parameter α, we are able to produce embeddings from very local ($\alpha = 1$) to very global ($\alpha \to 0$). We show how our calculations fit the simulated results, and we apply the model to study how social networks are embedded in geography and how the neurons of C. Elegans are embedded in the surrounding volume.

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