De Domenico, Manlio, Vincenzo Nicosia, Alexandre Arenas, and Vito Latora. "Structural reducibility of multilayer networks." Nature communications 6, no. 1 (2015): 6864.

In the 2015 article "Structural reducibility of multilayer networks" published in Nature Communications, De Domenico et al. delve into the complexity of multilayer networks, highlighting the emergent structural properties and physical phenomena that surface when considering multi-dimensional interdependent systems. The research addresses the issue of redundancy in multilayer networks, probing the potential for reducing the number of layers while maintaining maximum information about the system. This quest for an optimal and economical description of phenomena is both a theoretical endeavor and a practical necessity, given the superlinear or exponential computational demands posed by the analysis of multiple layers in networks.

The authors introduce a method to condense layers of a multilayer system, thereby enhancing its distinguishability from the aggregated network. This process employs the quantum Jensen-Shannon divergence, guided by the Von Neumann entropy, to measure the similarity (or dissimilarity) between layers. The proposed algorithm aggregates similar layers to reduce complexity without introducing artificial patterns. This is visualized through a dendrogram, representing the hierarchical integration of layers, ultimately informing a strategy to select the configuration that maximizes distinguishability.

Their approach to reducing redundancy in multilayer networks is not just theoretically appealing but has been applied to various systems, including biological, social, and transportation networks, indicating its broad applicability. This methodology facilitates more manageable computations while retaining critical network structures, thus offering a significant contribution to the analysis of complex systems within a multilayer network framework.