

# Cluster Synchronization in Multiplex Networks

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Networks of transport, power grids, banks, genes, neurons, cells, the stock market and many other real-world systems consist of multiple levels of interactions. Therefore, interactions among the nodes in one layer affect the functionality of the same nodes in the other layer. Using coupled dynamics on multiplex networks model, we demonstrate that while multiplexing of a sparse network with the other sparse networks enhances the cluster synchronizability of the individual layer, multiplexing with dense networks suppresses the cluster synchronizability with the network architecture deciding the impact of the enhancement and the suppression. Additionally, at weak couplings the enhancement in the cluster synchronizability, due to multiplexing, remains of the driven type, while for strong couplings the multiplexing may lead to a transition to the self-organized mechanism. The results and the framework have applicability in regulating the synchronizability of a particular layer of real-world systems having multiplex architecture.

## References

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