Project Report

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Implementation Details:

For Gossip Protocol, we are assuming that the network converges when 90% of nodes have received the gossip at least 10 times. We can change the convergence factor to some other value as well but after running many tests, we concluded the value of 90 to be apt.

Whereas for Push-Sum Algorithm, the network converges when 90% of node's s/w ratio isn't changing even after three rounds of receiving a message.

Both gossip protocols and push-sum algorithms behave differently in different topologies. Our implementation details are as follows:

1) Full Topology: Each actor will randomly select random no. of nodes from its list of neighbors and pass on the gossip. The same process will occur in for push-sum algorithm in full topology.

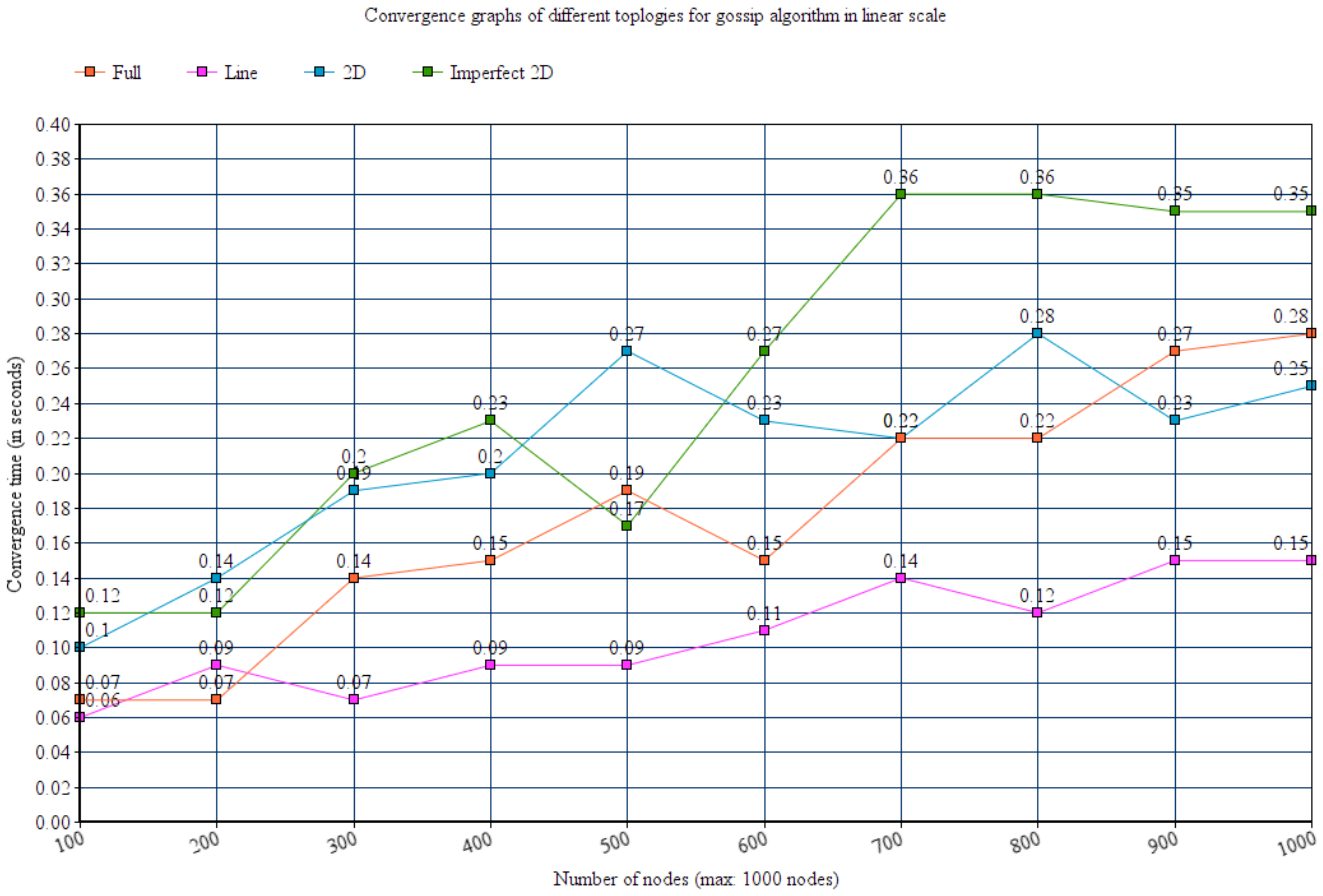
2) 2D Topology: For gossip protocol we select random no. of nodes from its four (up, down, left, right) neighbors and carry on the message passing. Whereas for push-sum algorithm, only one random node will be selected from its list of neighbors.

3) Imperfect 2D Topology: For gossip protocol, we select random no. of nodes from its list of neighbors to pass on the gossip. Whereas for push-sum algorithm, we'll select only one random node from the list of neighbors. For gossip protocol, we select random non-neighbor every time during the gossip passing whereas for push-sum algorithm the random non-neighbor for every node is selected during initialization of the node.

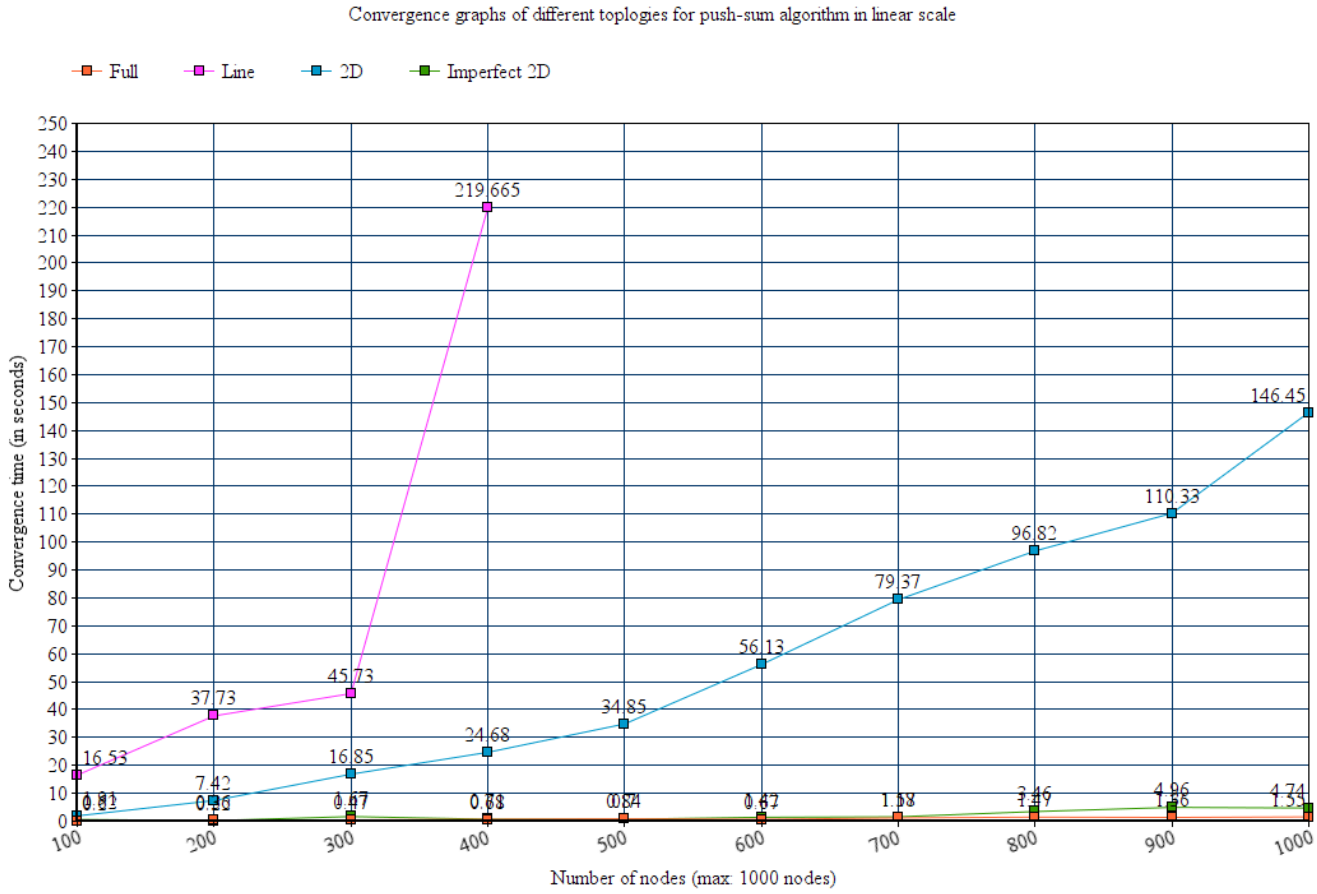
4) Line Topology: For gossip protocol, we select both the left and right neighbors to send gossips to neighbors. Whereas for push-sum algorithm, we select either left or right neighbor at a single time. For a large number of nodes, the network doesn't converge and we were able to test it till 400 nodes.

Graphs plotting convergence time vs size of the network for different topologies and algorithms:

Gossip Algorithm:



Push-Sum Algorithm:



The graphs above plot the convergence time vs no. of nodes in a network ie. size of the network for topologies Full, 2D, Imperfect 2D and Line topologies and for gossip protocol and push-sum algorithms. In our graph, we've restricted the no. of nodes to 1000.