

Network symmetry is a global characteristic of complex networks that helps understand their structure and properties. It has gained attention since MacArthur et al. showed that real-world networks contain surprisingly many symmetries. Traditional network symmetry definitions rely predominantly on graph automorphisms and are sensitive to minor changes to the network. This motivated the introduction of approximate network symmetry, a more robust metric. The thesis advances existing algorithms for approximate network symmetry computation by improving simulated annealing. Simulated annealing is enhanced to navigate the solution space by aligning similar vertices. Similarity of vertices is identified by graph centralities like PageRank, eigenvector centrality, and betweenness. We evaluate the improved annealing versions from multiple perspectives on random network models like the Barabási-Albert and Duplication-Divergence models.