

Network Theory — Graph Construction & Topological Measures — Hands-on

Gain a practical, systems-level understanding of network theory for biology. This module walks you from graph fundamentals and network construction from omics data to computing and interpreting topological measures, centralities, communities, and robustness indicators for real biological networks.

Network Theory — Graph Construction & Topological Measures

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Session 1

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Graph Basics & Network Types

Graph theory foundations for biology

[nodes, edges, degree](#) [paths, walks, cycles](#) [directed vs undirected](#)

Types of biological networks

[PPI & co-expression networks](#) [metabolic & pathway graphs](#) [gene regulatory networks](#)

Representations & data structures

adjacency matrices & lists edge tables weighted & signed edges

Session 2

Fee: Rs 11800 Apply Now

Graph Construction from Biological Data

Building networks from omics & interaction data

co-expression thresholds correlation & mutual information PPI & STRING integration

Cleaning, filtering & weighting edges

confidence scores edge pruning & sparsity multi-layer networks preview

Implementation toolkit for graph building

Python / networkx R / igraph Cytoscape I/O (SIF, GraphML)

Session 3

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Topological Measures & Centralities

Global network topology metrics

degree distribution clustering coefficient path length & small-world

Node centralities & hubs/bottlenecks

degree & betweenness closeness & eigenvector PageRank & influence scores

Communities, modules & enrichment hooks

Louvain / Leiden clustering module detection in

[Cytoscape](#) [link to GO/pathway enrichment](#)

Session 4

Fee: Rs 18800 [Apply Now](#)

Mini Capstone: Analyze a Biological Network

Construct and analyze a PPI or pathway network

Theory + Practical

Compute key metrics & identify hubs/modules

centrality ranking tables **community visualization**
biological interpretation

Deliverables: scripts, network files & summary

Python/R notebook **GraphML / SIF / CSV** **PDF/HTML**
network report