

COMMUNITY DETECTION

The task of **finding communities** in a network
We now have all the tools to learn about **community detection**



COMMUNITY DETECTION

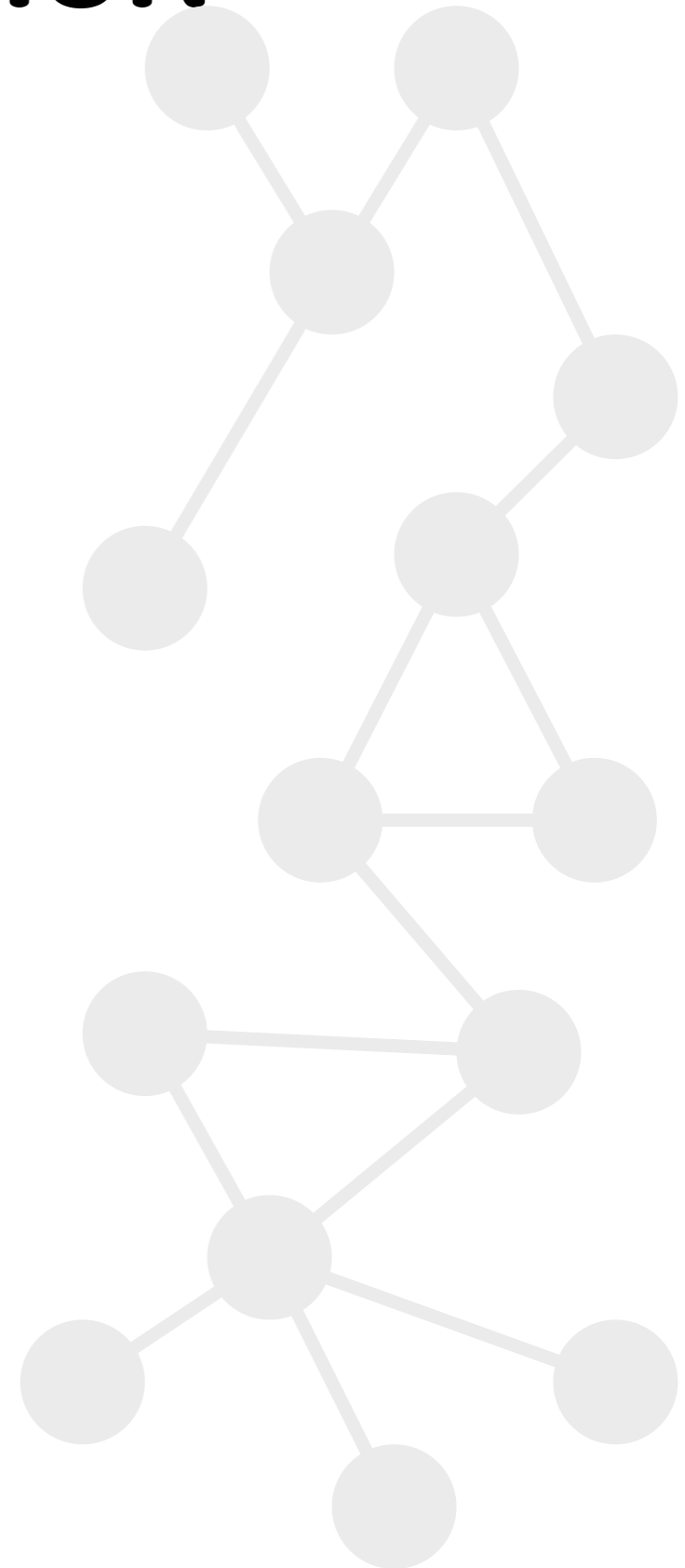
FOUR APPROACHES

Bridge removal

Modularity maximisation

Label propagation

Stochastic block modelling

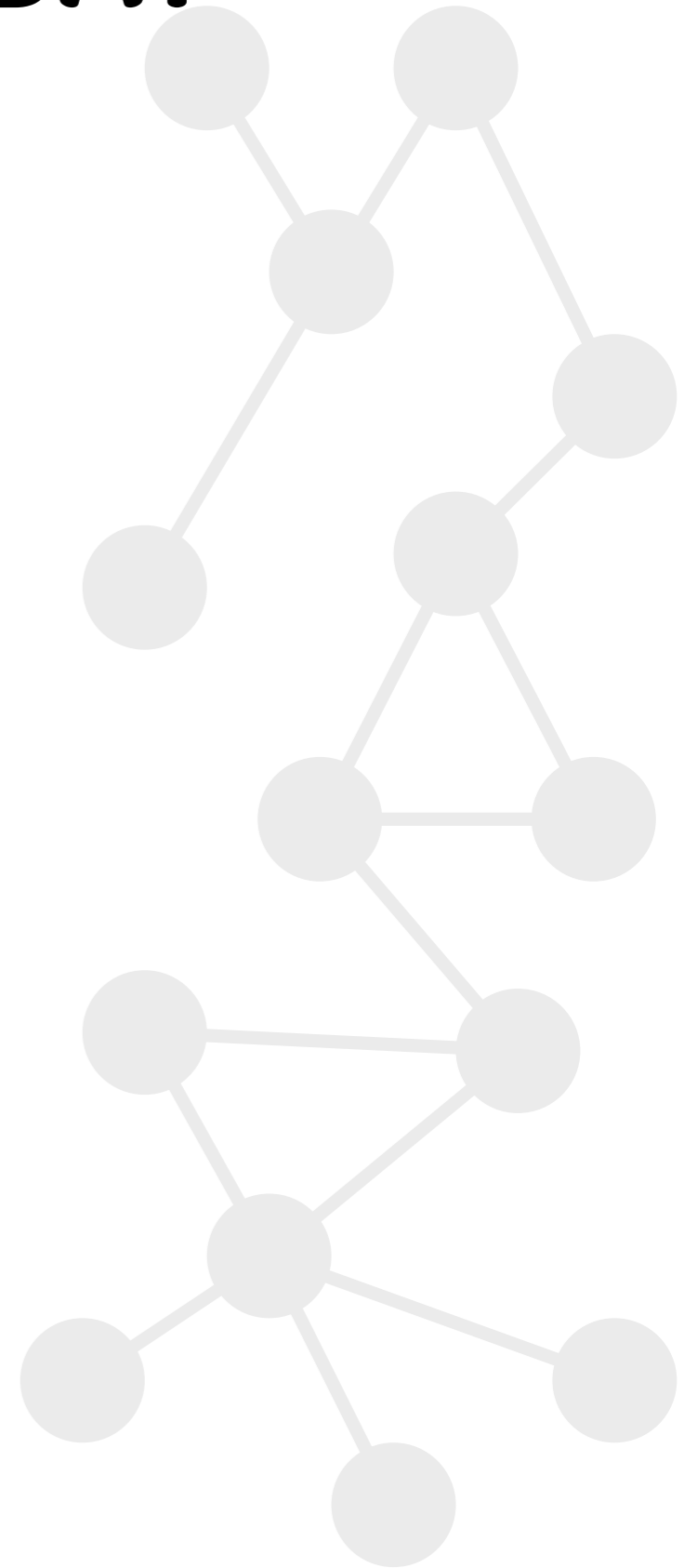


WHAT WE'LL SEE TODAY

When to use what

Fringe cases

Niche applications



WHY GO FURTHER?

Financial networks are often:

Weighted and directed

Bipartite

With overlapping communities

Modularity maximisation

Louvain

Two-phase greedy optimisation

Pros: very fast, scales well

Cons: resolution limit, disconnected communities, uncertainty

Modularity maximisation

Leiden

Ensures that communities are well-connected

Modularity maximisation

Leiden

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Better convergence -> fewer iterations

Modularity maximisation

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More stable partitions

Modularity maximisation

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More stable partitions

Handles weighted networks

Modularity maximisation

Leiden

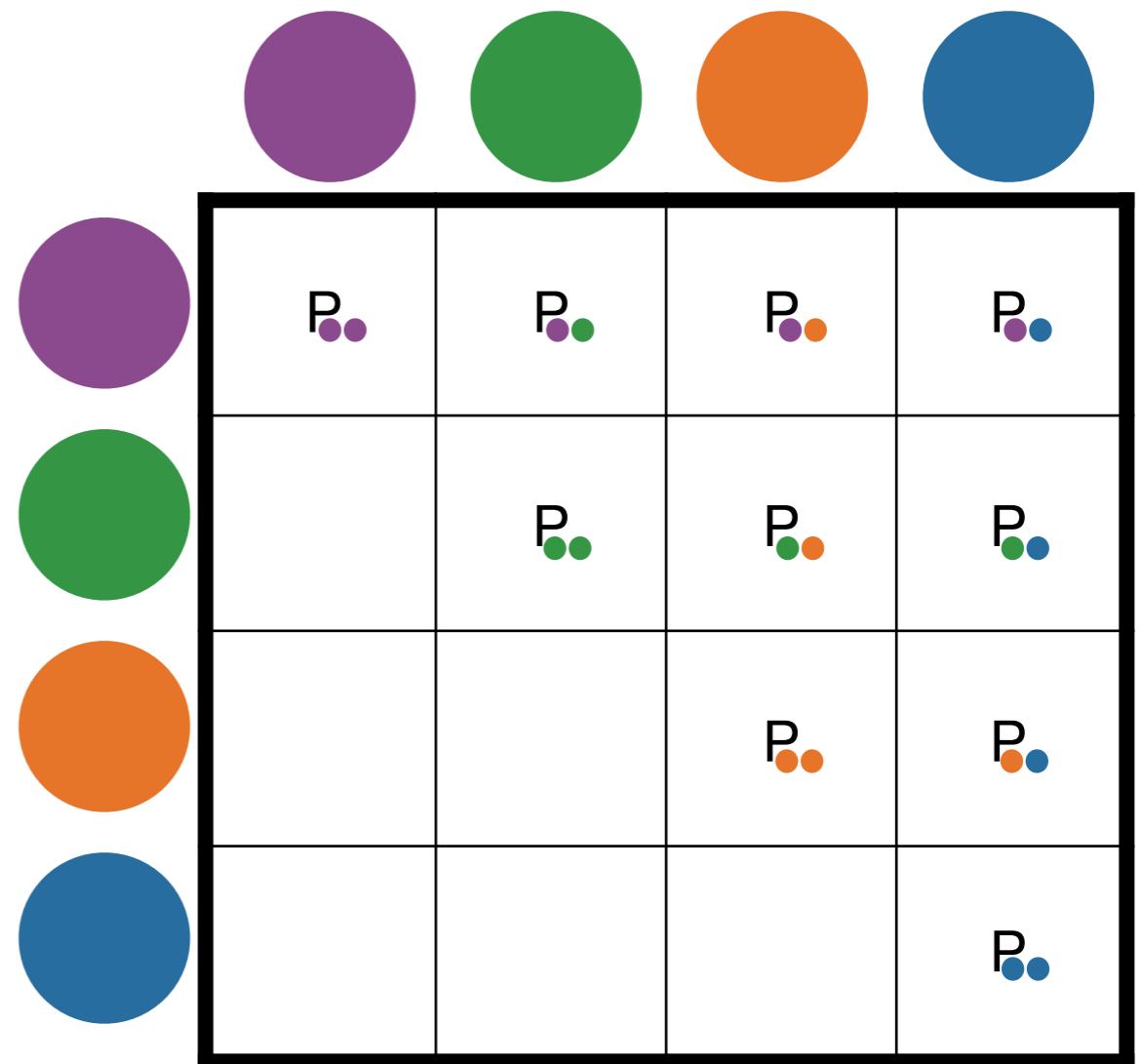
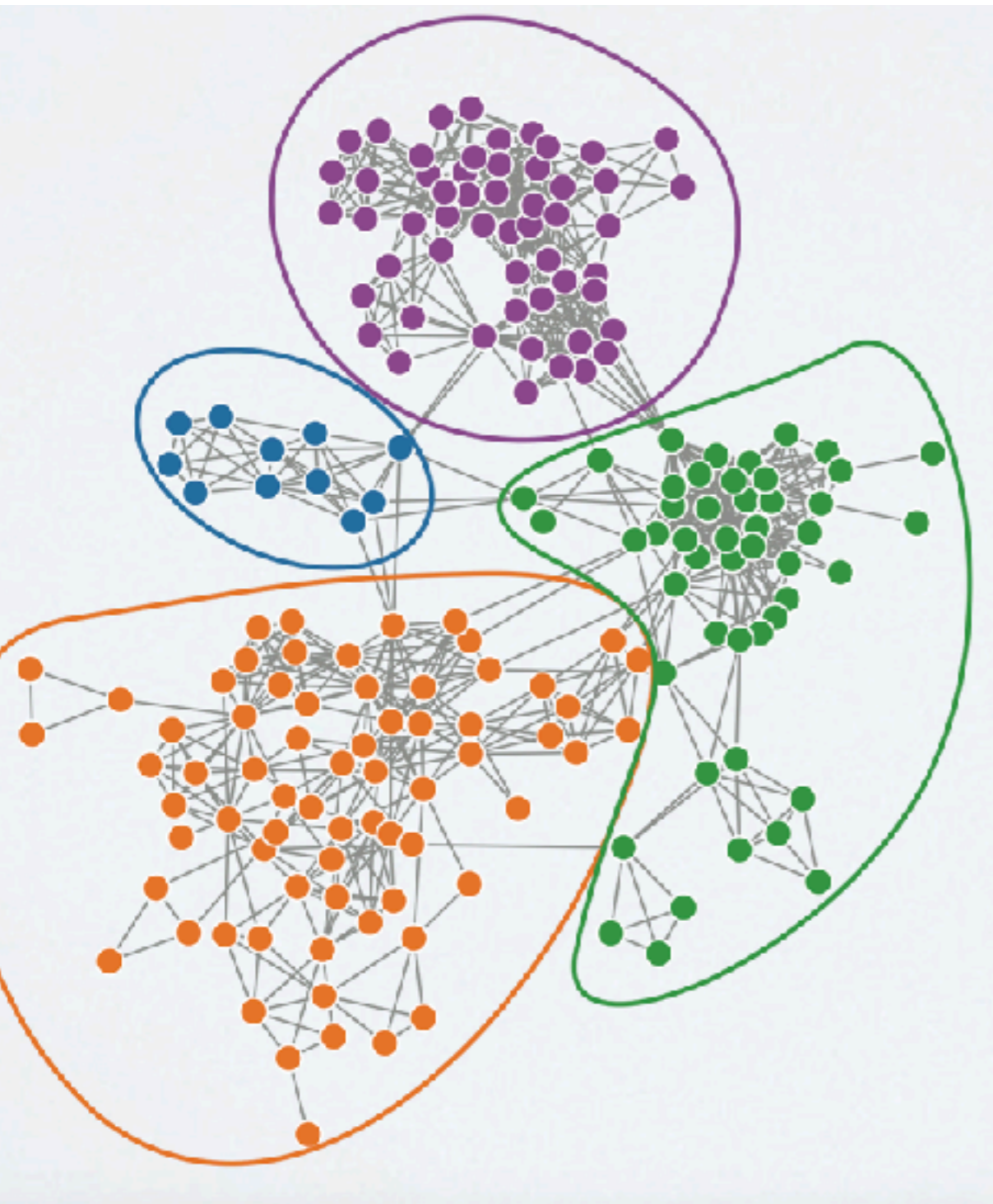
Ensures that communities are well-connected

Better convergence -> fewer iterations

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Handles weighted networks

STOCHASTIC BLOCK MODEL



STOCHASTIC BLOCK MODEL

Degree-corrected SBM

Weighted SBM

Directed SBM*

Bipartite/Multipartite SBM*

Overlapping SBM

Overlapping SBM

Graph-tool

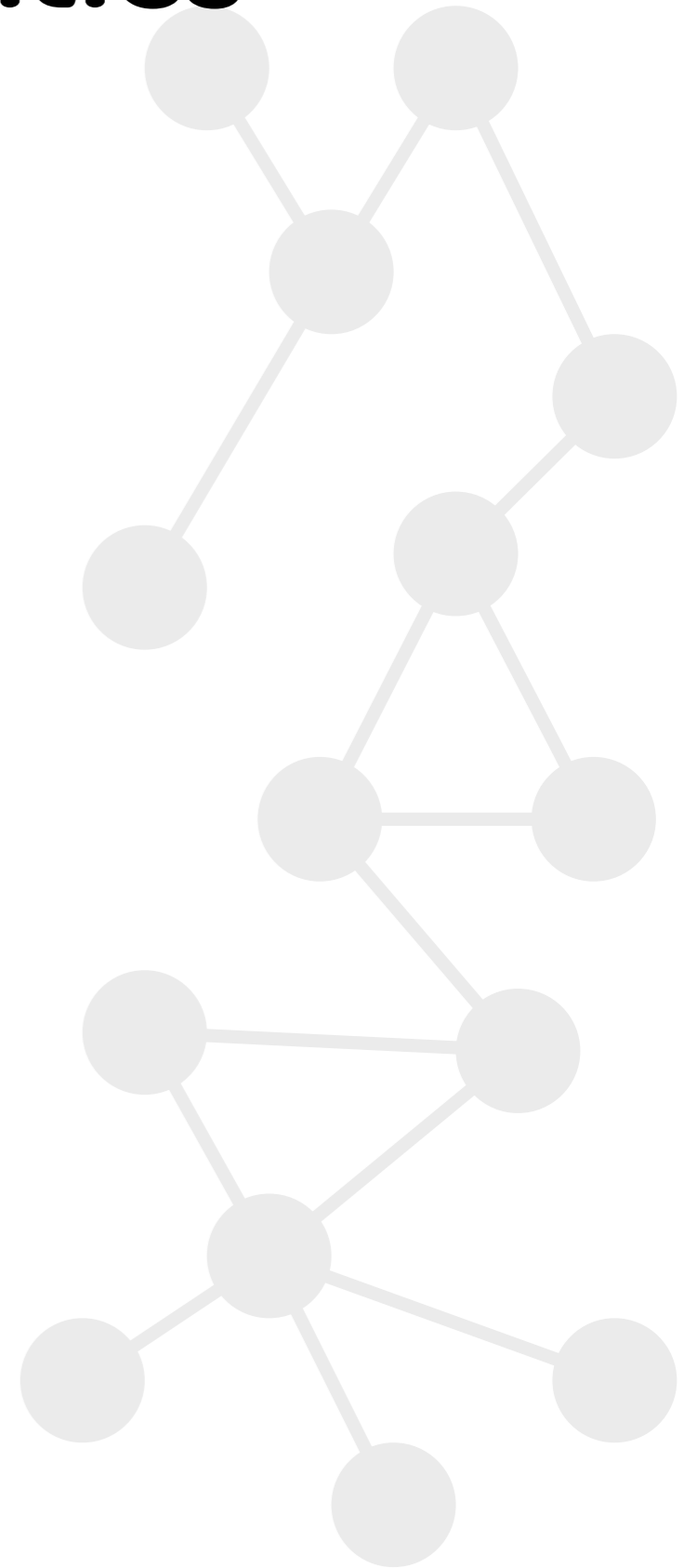
<https://graph-tool.skewed.de/static/docs/stable/demos/inference/inference.html>



Overlapping communities

SBM

DEMON (from CDLib)



Summary

What communities are

How we can identify them

How to choose the tools to identify them

