Main takeaways

▷ Local connection rules can enforce strict global topological features.

▷ These rules can be leveraged to design
  - new mathematical frameworks (ex.: ODEs, PGFs)
  - new sampling algorithms (ex.: edge swapping)

Multi-scale structure and topological anomaly detection via a new network statistic: The onion decomposition

Laurent Hébert-Dufresne[1], Joshua A. Grochow[1] & Antoine Allard[2]

Sci. Rep. 6, 31708 (2016)

Percolation and the Effective Structure of Complex Networks

Antoine Allard[1,2] and Laurent Hébert-Dufresne[3,1]

Phys. Rev. X 9, 011023 (2019)

Modeling critical connectivity constraints in random and empirical networks

Laurent Hébert-Dufresne,[1,2,3] Márton Pósfai,[4] and Antoine Allard[3,5,1]

arXiv:2307.03559

On the Uniform Sampling of the Configuration Model with Centrality Constraints

François Thibault,[1,2] Laurent Hébert-Dufresne,[3,4] and Antoine Allard[1,5]

arXiv:2409.20493

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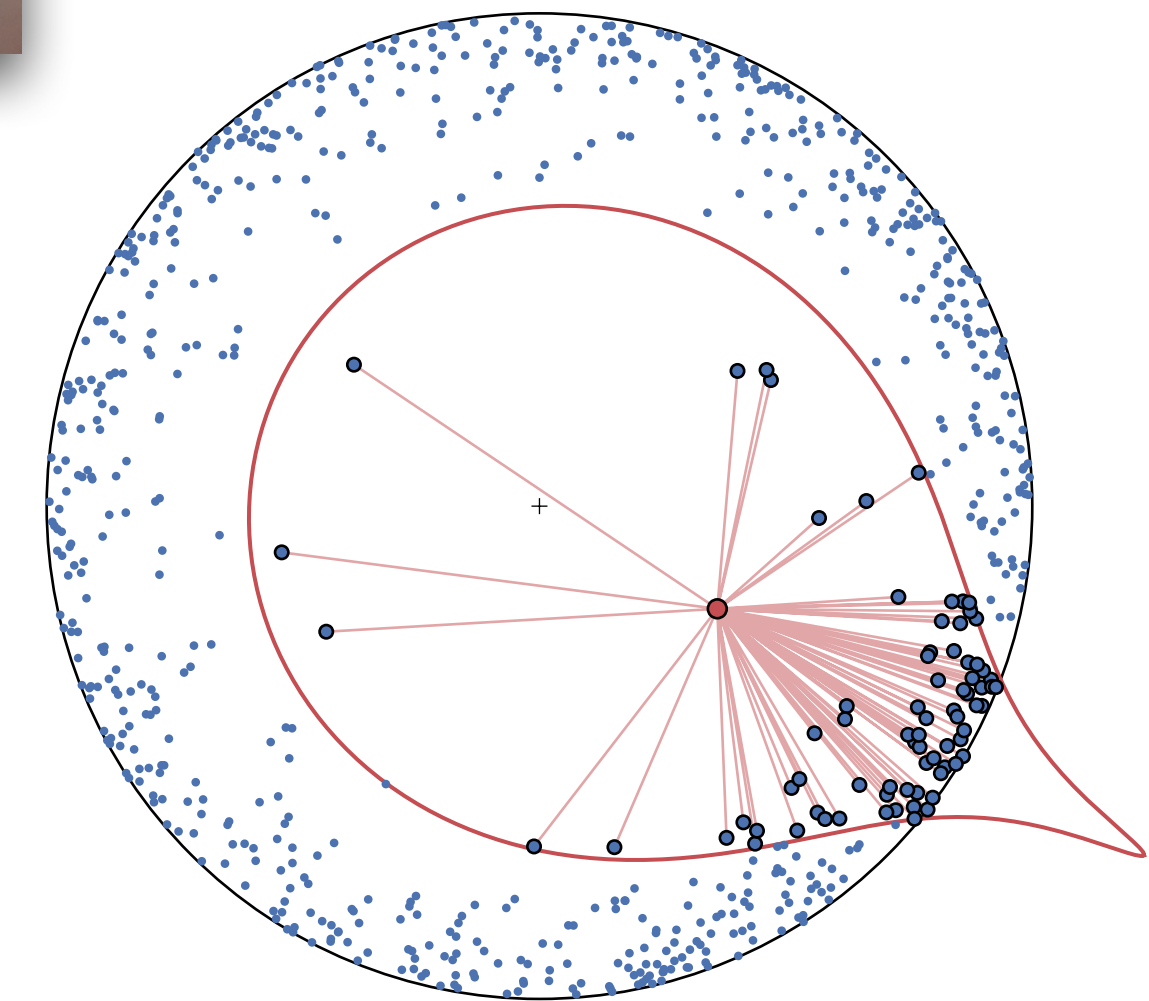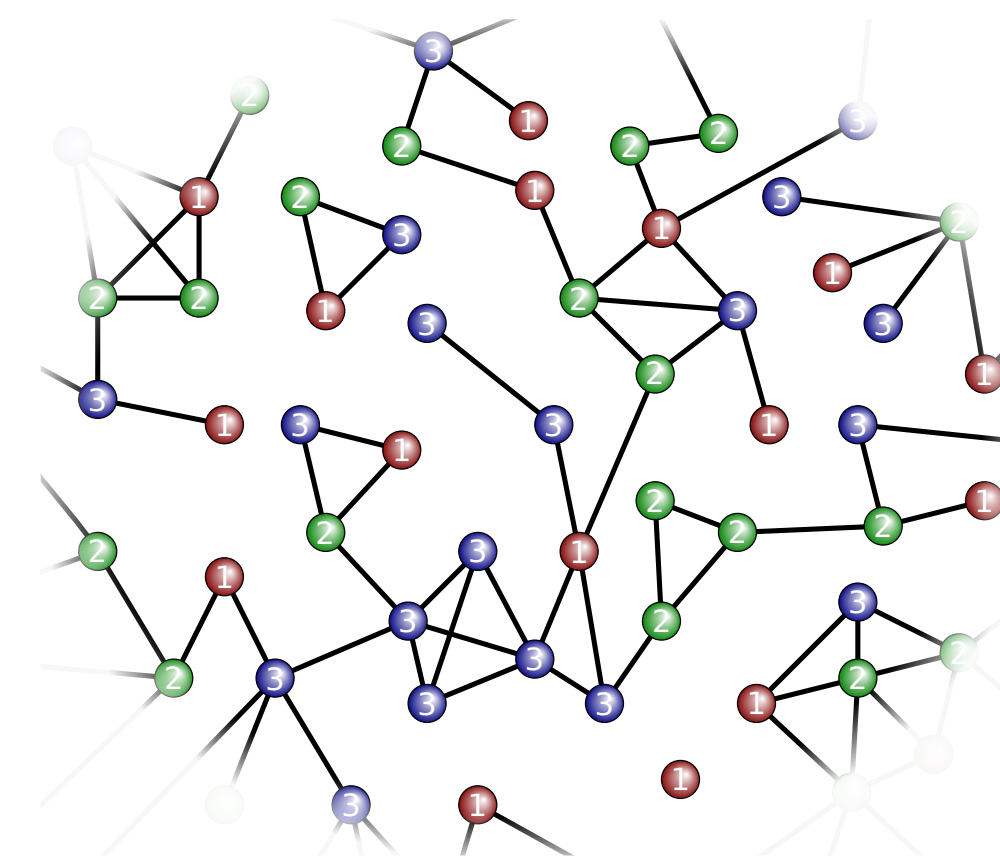
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Theoretical justifications exist for the use of "simple" models of complex networks and of the dynamics they support.

Simple models can reproduce nontrivial complex connections patterns observed in real networks, but there are still several challenges ahead to bridge the gap between our models and real networks.

Slides