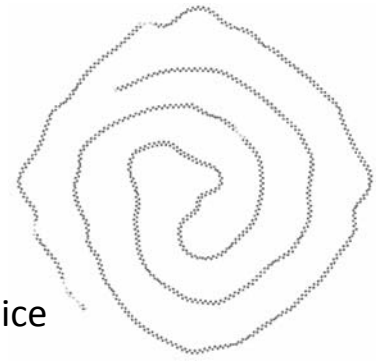
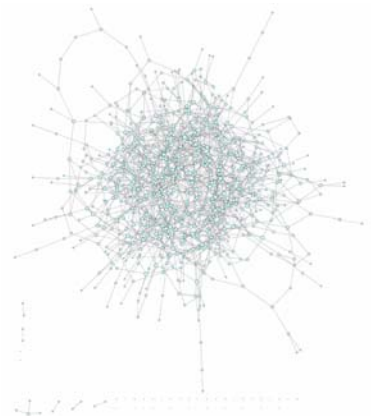
Attack Tolerance



Lattice



Random

Small World

Disassembled!

Scale-Free

Information Visualization MOOC

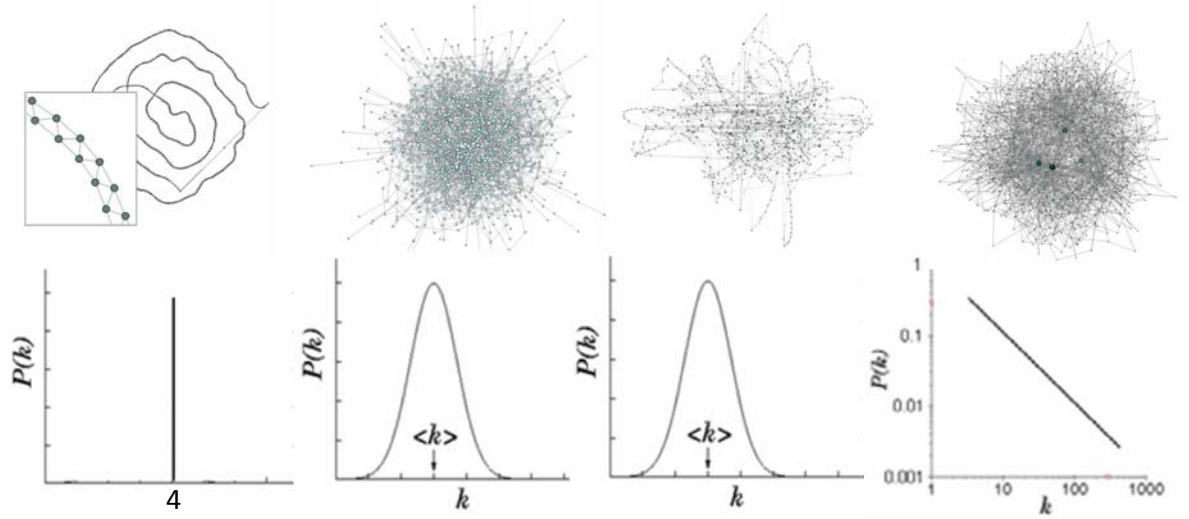
Unit 6 – "With Whom": Networks

Error and Attack Tolerance

Reference:
Börner, Katy, Soma Sanyal, and Alessandro Vespignani. 2007. "Network Science." Chap. 12 in *Annual Review of Information Science & Technology*, edited by Blaise Cronin, 537-607. Medford, NJ: Information Today, Inc./American Society for Information Science and Technology.

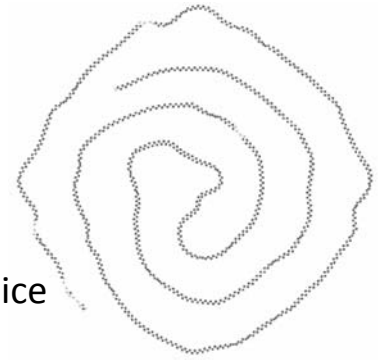
Generate Three Networks (see Network Types)

- Random Networks using the model by Erdös and Rényi, 1957.
- Small World Networks using the model by Watts and Strogatz, 1998.
- Scale-Free Networks using the model by Barabasi and Albert, 2000.



Lattice Random Small World Scale-Free

Error Tolerance: Delete 100 random nodes



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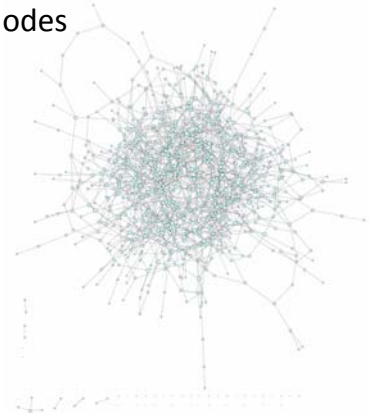
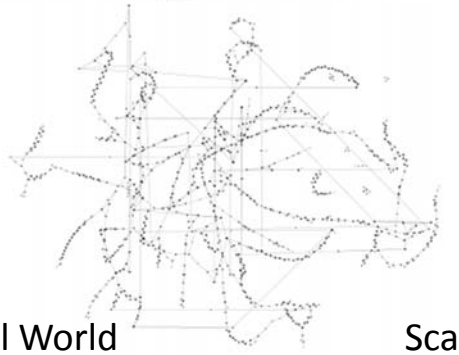
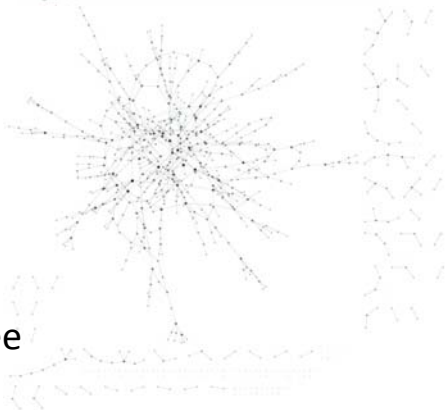


Random

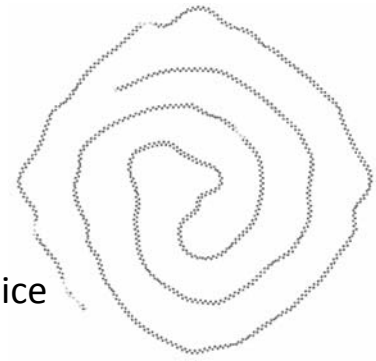


Small World

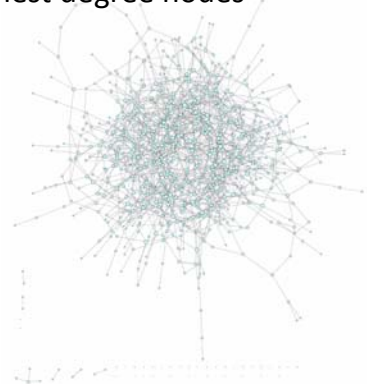


Scale-Free

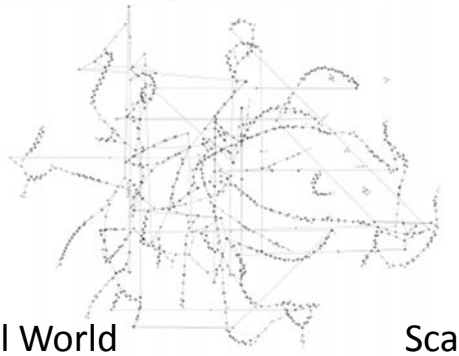
Attack Tolerance: Delete top-100 highest degree nodes



Lattice



Random



Small World

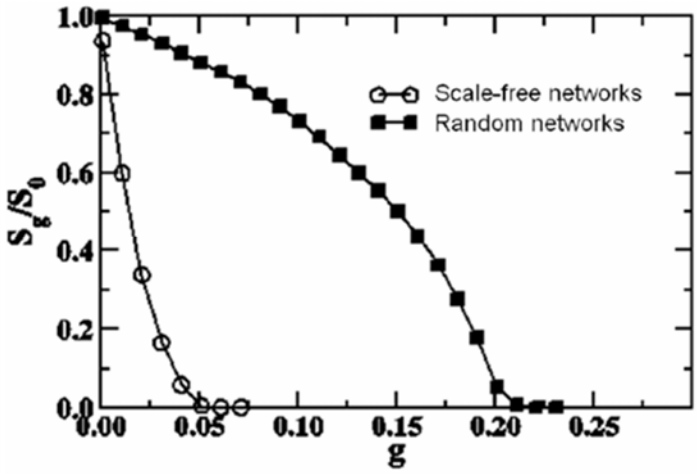
Scale-Free

Disassembled!

Example: Topological resilience to targeted attacks

Two networks are studied:

- Scale-free Internet Router level network
- Erdös and Rényi random network



Scale-free network is more fragile. Removal density as low as g=0.05 suffices to fragment entire network.

Acknowledgments

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Many visualizations used in the course come from the *Places & Spaces: Mapping Science* exhibit, online at http://scimaps.org, and from the *Atlas of Science: Visualizing What We Know*, MIT Press (2010).