Lecture Introduction to Network Science
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BIONETS

Solution 7

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Question 1

a) Nodes are fixed, only edges change over time; we always have complete information of the entire time range; static view on temporal system; evolving networks consider dynamic changes such as node/edge insertion/deletion

b) See Slide 21.

c) Take snapshots of empirical network at two timepoints and estimate change in node degrees averaged over time (see Slide 24 for more details).

d) In Erös-Renyi graphs degrees fall into a narrow scope around mean degree (i.e. they have an internal scale). Barabasi-Albert networks do not have an internal scale, i.e. randomly drawn node could have very small or very large degree equally likely (see Slide 31).

Question 2

The values listed below are the probabilities for a new node E to connect to each of the existing nodes if we assume that E establishes exactly one new edge:

a) $P(X) = \frac{1}{4}$ for all $X \in \{A, B, C, D\}$.

b) $P(X) = \frac{1}{8} + \frac{1}{16} \cdot \deg(X)$ for $X \in \{A, B, C, D\}$.

c) $P(X) = \frac{1}{8} \deg(X)$ for all $X \in \{A, B, C, D\}$.

d) $P(X) = \frac{1}{8} \deg(x)$ for all $X \in \{A, B, C, D\}$.

Question 3

See example implementation in the notebook `barabasi.ipynb`.