

Network modelling: future directions

Tom Britton, Stockholm University

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Many of us mathematicians are working on networks for its beautiful and interesting theory . . .

Still we should of course every now and then ask ourselves \boldsymbol{why} and $\boldsymbol{how}!$

My excuse for this presentation: I am not more specialist than anyone else here ...



Applications of networks

. . .

Biological populations - social interactions

Computers/sites - electronic communication/links

cells/particles/proteins - bonds/interactions



Knowledge about networks

Two types of network knowledge

- a) Some networks are (potentially) completely/globally observed (i.e. digital): web-communities, computer networks, ...
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Which of these type of networks networks should affect the mathematical treatment!



Scientific questions

Common scientific questions:

- Summarize network properties (a)
- Draw conclusion about global network properties (b)
- Study effects of changing network: thinning of edges/nodes, addition of edges/nodes, changing local (or global) characteristics, ...
- Analyse processes taking place "on" the network: epidemics, spread of information, ...





Important extensions

- $\bullet \ Static \rightarrow Dynamic \ network$
- Different type of edges/nodes
- $\bullet~$ Undirected $\rightarrow~$ directed edges



Potential criticism

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- Do our network *models* produce the networks we want/think? How can we know?
- Some networks are hard to reach. How do we estimate local network properties (unbiased)? RDS?
- Many models are based on certain local properties. Which local proprties are most "important"? Which models captures global properties best?
- Which extensions are most important?