networks motivation

introduction to network analysis (ina)

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motivation *network*

- network/graph as wiring diagram
- points are called *nodes/vertices*
- points are connected by *links/edges*



motivation neural wiring

- human brain $\approx 10^{11}$ neurons
- nodes are *C. elegans neurons*
- links are *synapses*



motivation Web

- Web graph $> 10^{12}$ pages
- nodes are *web pages*
- links are *hyperlinks*



motivation Internet

- Internet overlay map
- nodes are *class C subnets*
- links are *packet routes*



motivation Facebook

- online social network $> 10^9$ users
- nodes are *Facebook users*
- links are *social connections*



motivation *society*

- offline social network
- nodes are *high schoolers*
- links are *friendship ties*



motivation collaboration

- author collaboration network
- nodes are Slovenian computer scientists
- links are *paper coauthorships* until 2010



motivation sex

- sexual contact network
- nodes are *men/women*
- links are *sexual contacts*



motivation science

- map of science network
- nodes are *scientific fields*
- links are *journal citations*



motivation *medicine*

- human diseaseome network
- nodes are *human diseases*
- links show *shared genes*



motivation *biology*

- protein interaction network
- nodes are S. cerevisiae proteins
- links are *physical interactions*



motivation *ecology*

- ecosystem food web
- nodes are *lake species*
- links are *predatory interactions*



motivation gastronomy

- ingredient/flavor network
- nodes are *recipe ingredients*
- links show *shared flavors*



motivation entertainment

- Game of Thrones network
- nodes are GoT characters
- links show who killed whom



motivation sports

- football player network
- nodes are *player positions*
- links are *successful passes*



motivation transport

- air transportation network
- nodes are *world airports*
- links show *passenger flux*



motivation *Europe*

- road infrastructure network
- nodes are *European cities*
- links are *highways*



motivation Slovenia

- technological/infrastructure networks
- nodes are geographical locations
- links are *pipes/highways*



motivation Ljubljana

- LPP bus map
- nodes are *bus stops*
- links are *bus routes*



motivation hairballs

- but most networks are too large/dense/complex
- thus visualizations look like *ridiculograms*

visually stunning but scientifically worthless



motivation *networks*

- must study networks to understand real systems
- how to "see" networks too complex to visualize?
- through their structure, evolution and dynamics



motivation *documentary*

connected the power of six degrees

documentary on small-world and scale-free networks

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