

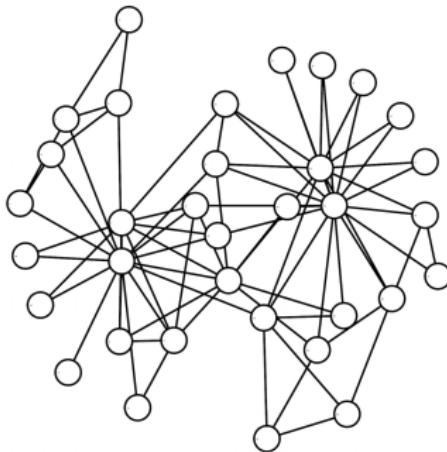
networks *introduction*

introduction to *network science in Python* (*NetPy*)

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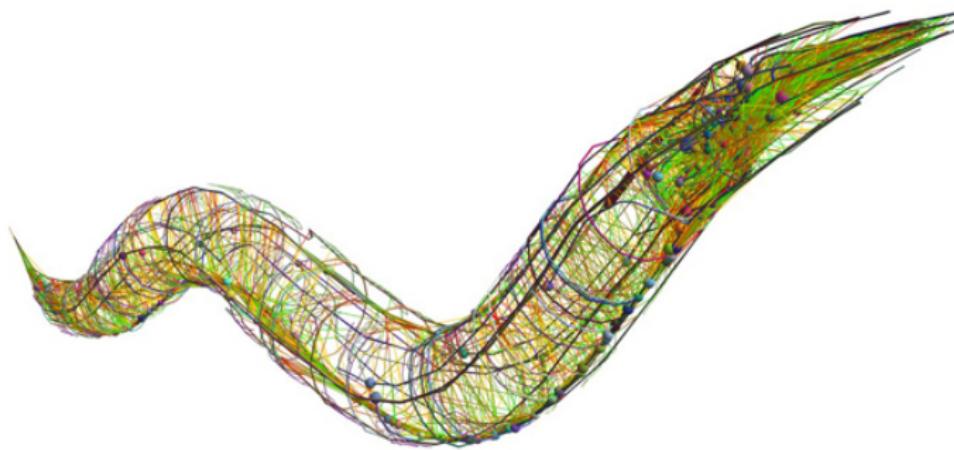
introduction *network*

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



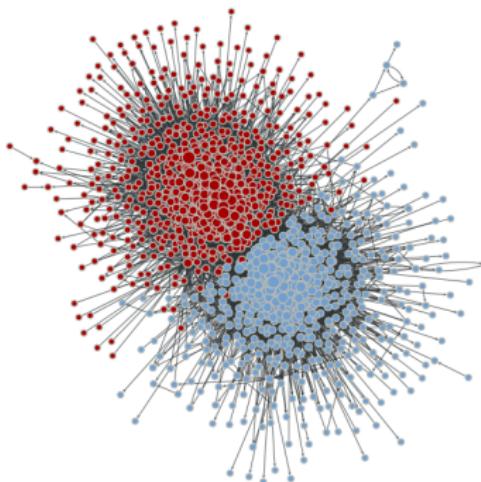
introduction *neural wiring*

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



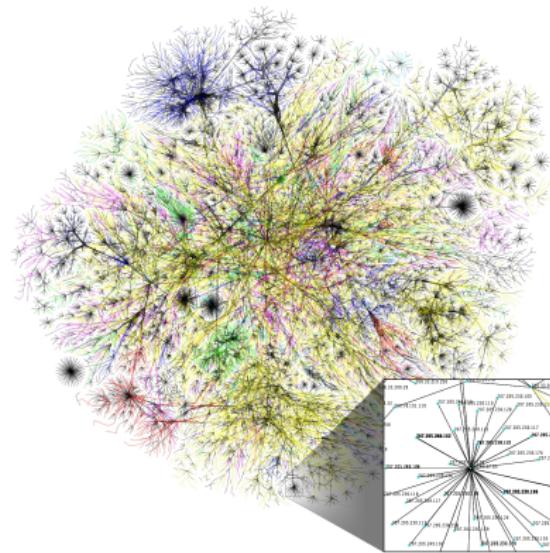
introduction *Web*

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



introduction *Internet*

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



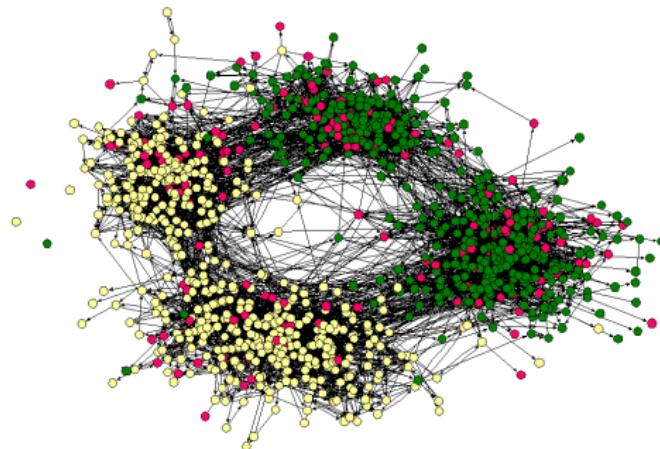
introduction *Facebook*

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



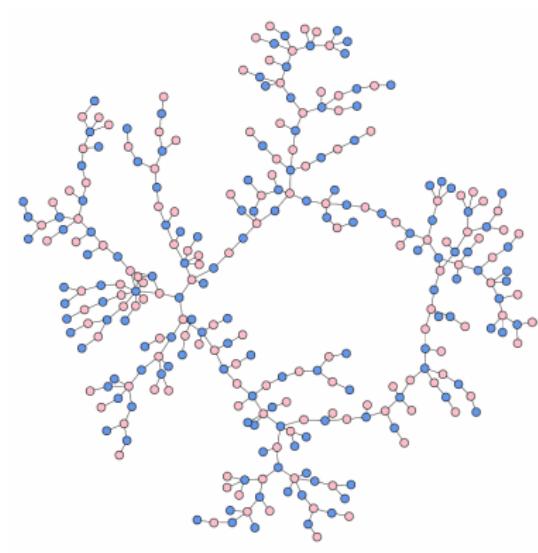
introduction *society*

- *offline social* network
- nodes are *school children*
- links are *friendship ties*



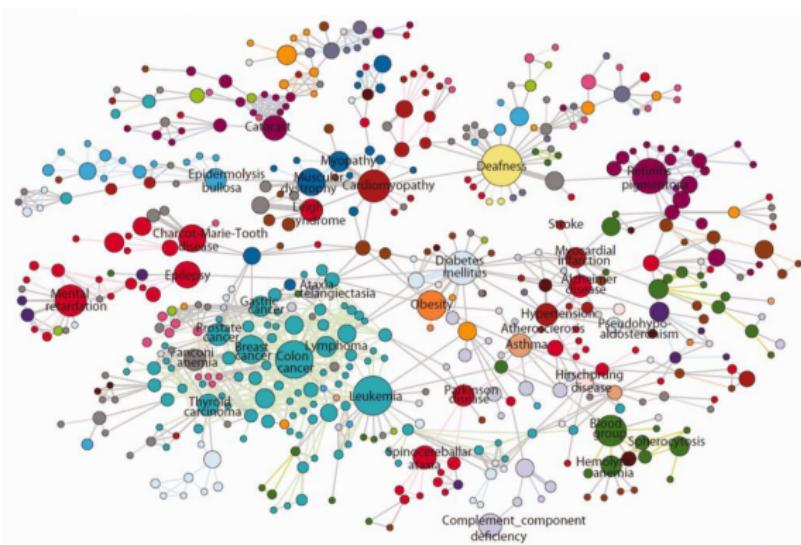
introduction *sex*

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



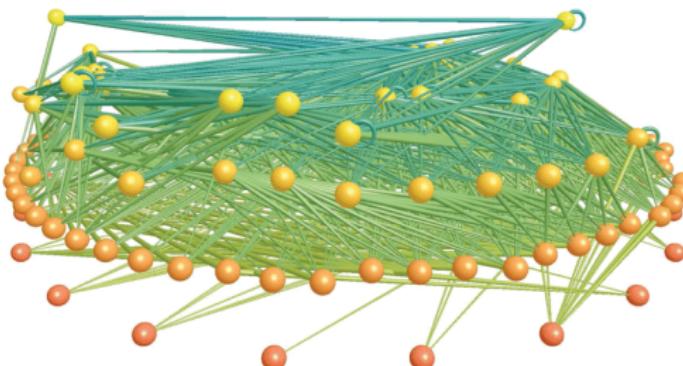
introduction *biology*

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



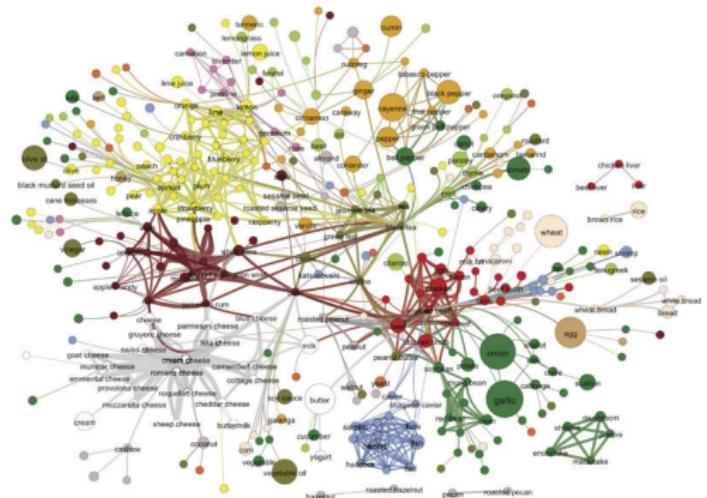
introduction *ecology*

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



introduction *gastronomy*

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



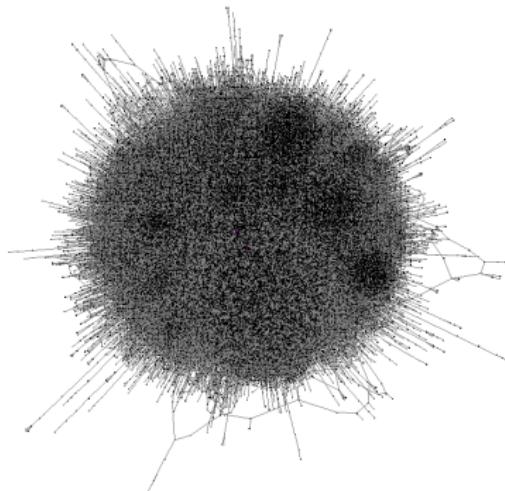
introduction *transport*

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



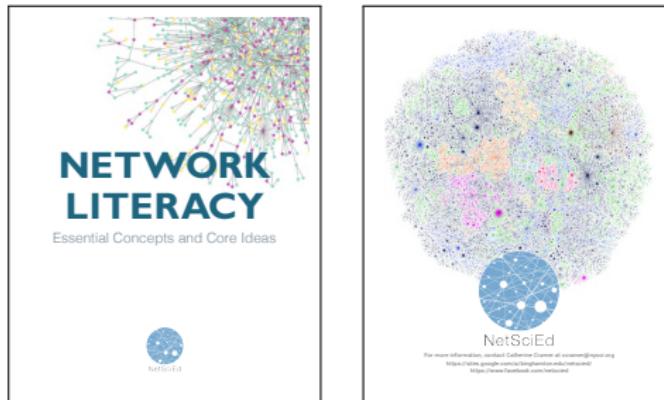
introduction *hairballs*

- most networks are *large/dense/complex*
- visualizations look like *ridiculograms*
 - visually stunning but scientifically worthless



introduction *networks*

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



introduction *documentary*

connected the power of six degrees

documentary on small-world and scale-free networks



[WS98]



[BA99]



[AJB00]

introduction *references*

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