Network Science

Exploring the world of STEM

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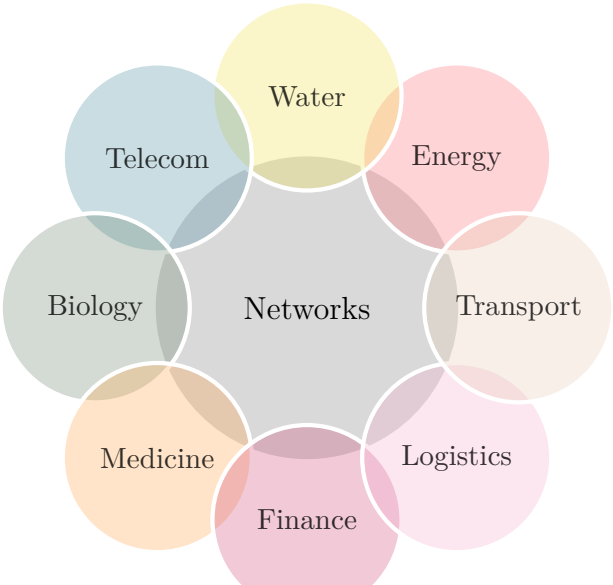
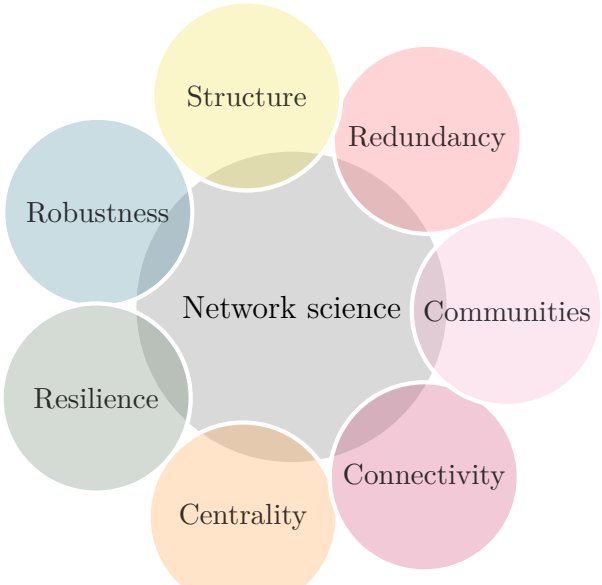
Warm-up activity: underlying principles of AI

https://satuelisa.github.io/teaching/features/

Complex networks are omnipresent



Properties of networked systems



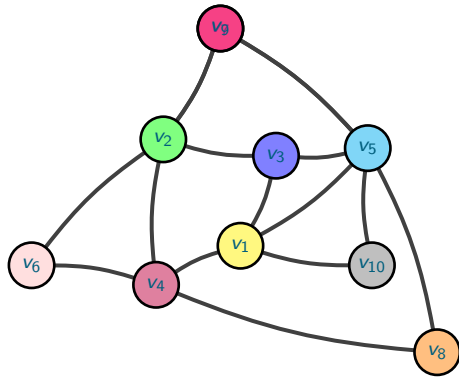
Graph theory — key terminology

Vertex	Basic element of the network (often called a *node*)
Edge	A connection between two vertices (possibly directed or weighted)
Neighbour	A pair of vertices are neighbours if they share an edge
Degree	The number of neighbours of a vertex

$G = (V, E)$ with two vertices and one edge.

```
import networkx as nx
G = nx.Graph()
G.add_edge('u', 'v')
```

Network analysis



An example of a small power-law cluster graph.

```
from network2tikz import plot
import networkx as nx
from nx.generators.random_graphs import powerlaw_cluster_graph
G = powerlaw_cluster_graph(10, 2, 0.05)
opt = {}
opt['node_label'] = [ f'V{v}' for v in G.nodes() ]
opt['node_color'] = 'green'
opt['node_opacity'] = 0.5
opt['edge_curved'] = 0.1
l = nx.spectral_layout(G)
plot((G.nodes(), G.edges()), 'graph.tex', **opt, layout = l)
```

Let's go try it out

https://github.com/satuelisa/misc/blob/master/stem2024.ipynb

Wrap-up activity: networks and AI

What kind of a *network model* can one build based on **typing patterns** of a person?

What *other* network models could one build to use to **identify** people?

What kind of **privacy** risks lie underneath?

Stay in touch!

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