

Network Analysis in Python: Getting Started

INTRODUCING NETWORKX AND NETWORK SCIENCE



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Overview



Network science vs. graph theory

What is NetworkX?

Manipulating networks in NetworkX

Graph theory through NetworkX

Accessing and modifying attributes

Graph storage formats



Course Prerequisites



Tools

Python

Jupyter



Jupyter Notebook Setup

anaconda.com/download/

docs.anaconda.com/anaconda/user-guide/tasks/install-packages/

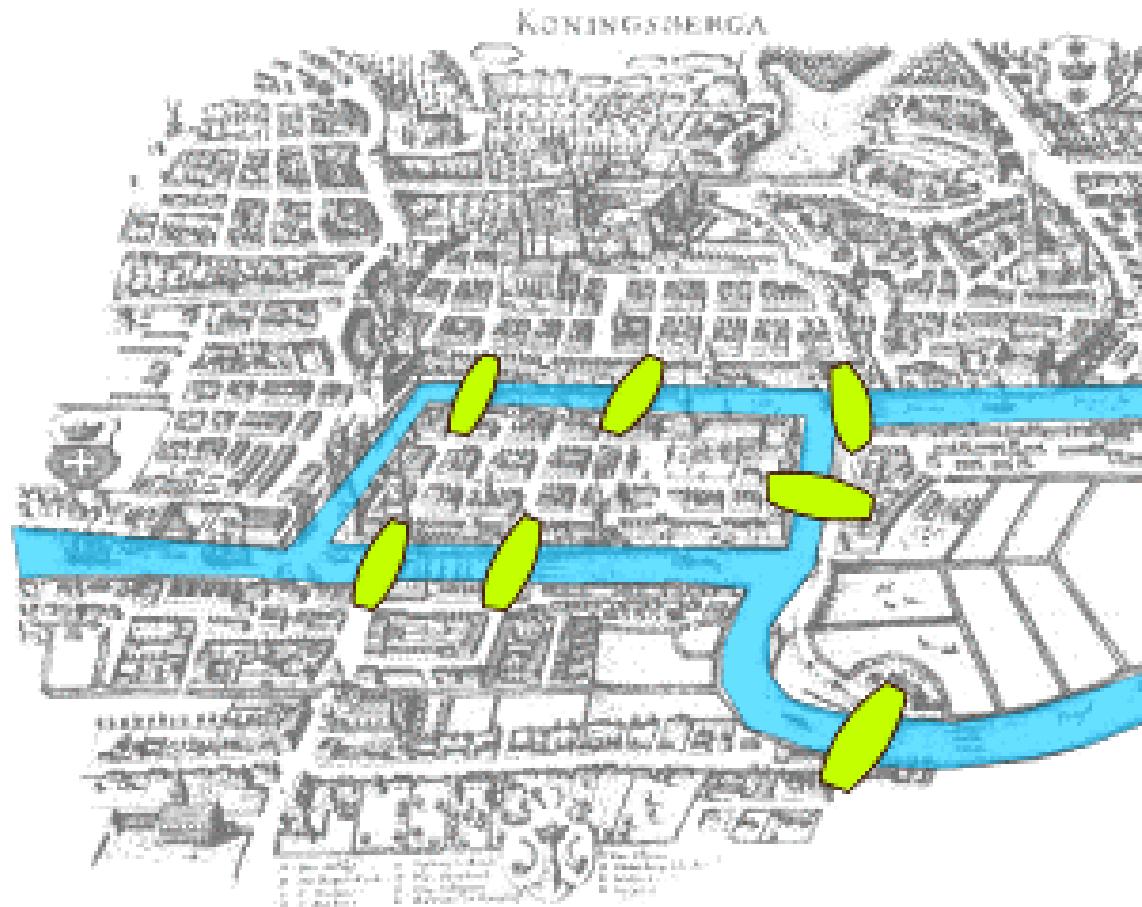
These links are available in the downloadable exercise files!



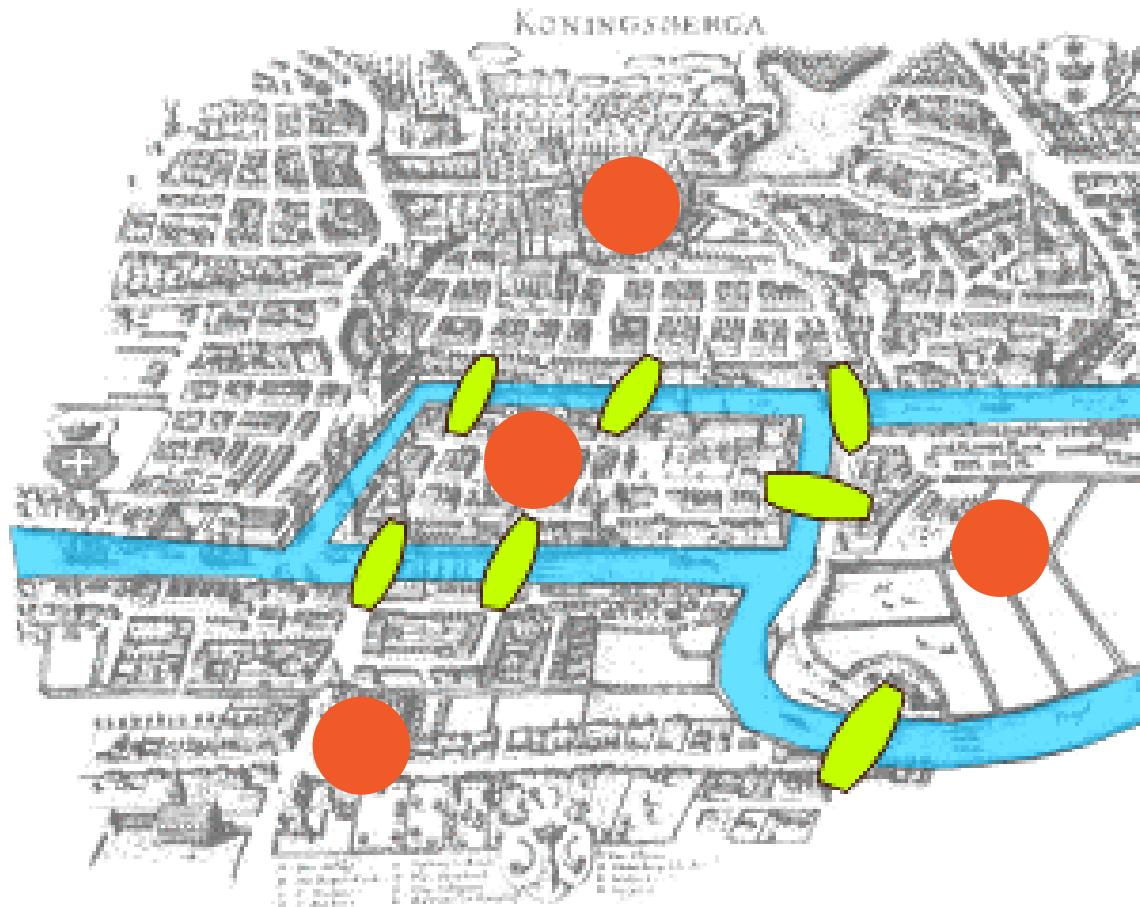
Network Science vs. Graph Theory



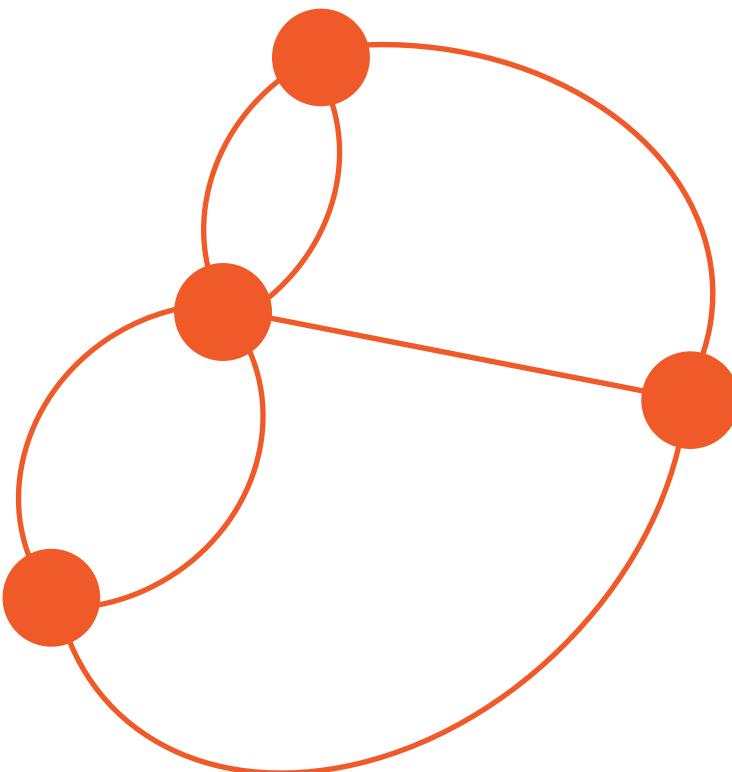
Seven Bridges of Königsberg



Seven Bridges of Königsberg



Seven Bridges of Königsberg

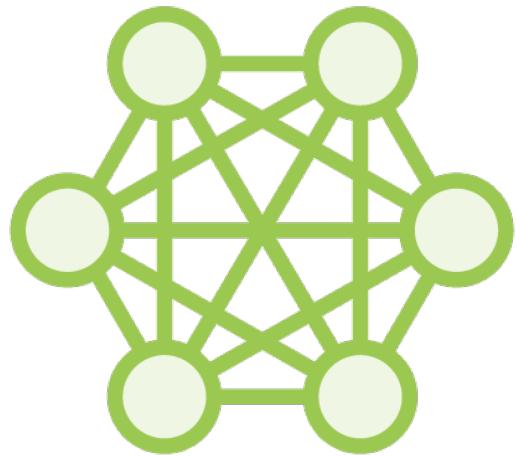


Theorem (Euler)

If traversal exists, then a graph has exactly zero or two nodes with odd number of edges.



What is Network Science?



Applied science

**Combination of statistics, linear algebra,
mathematical modelling, graph theory**

Aims to model real-life systems as graphs









Sources of Network-like Data

Internet

Big Data
Technologies

IoT Sensors

Blockchain

Social Media



What Is NetworkX?



NetworkX

Python package for the creation, manipulation,
and study of the structure, dynamics, and functions of
complex networks.



Friendship Network

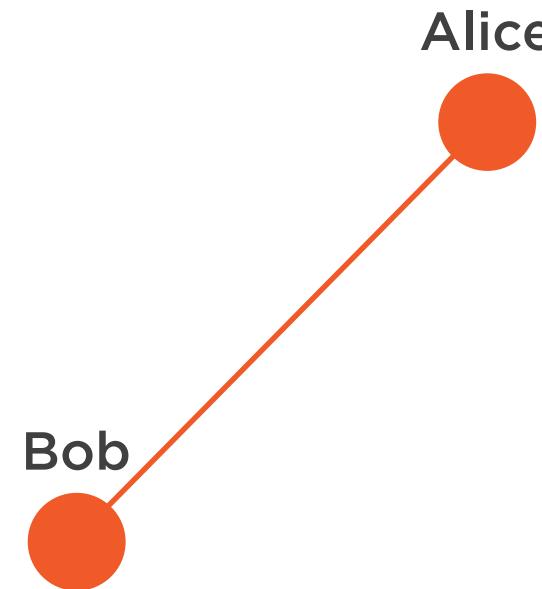
Alice



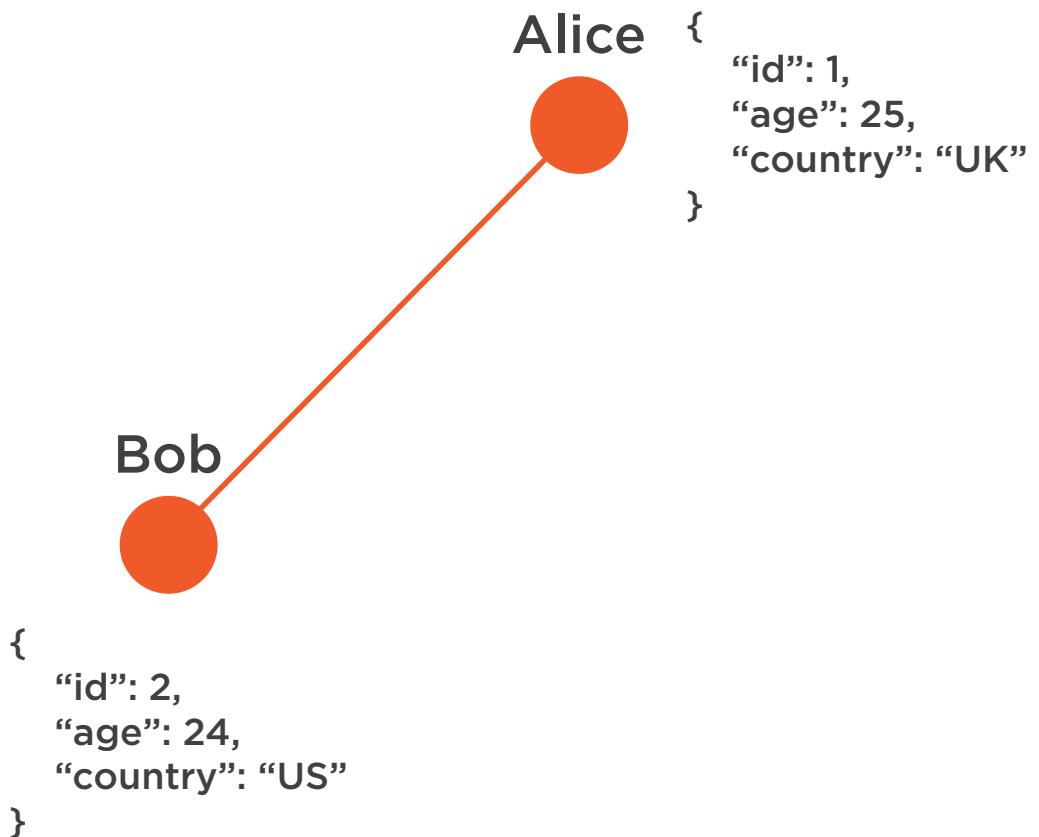
Bob



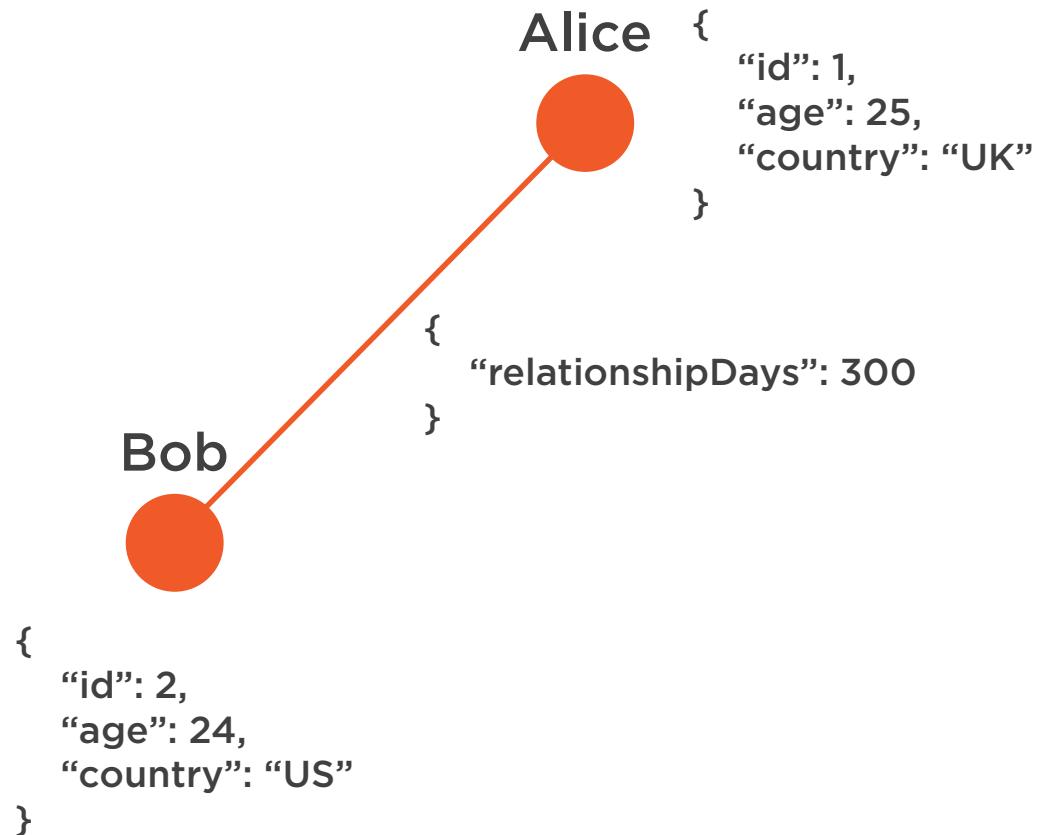
Friendship Network



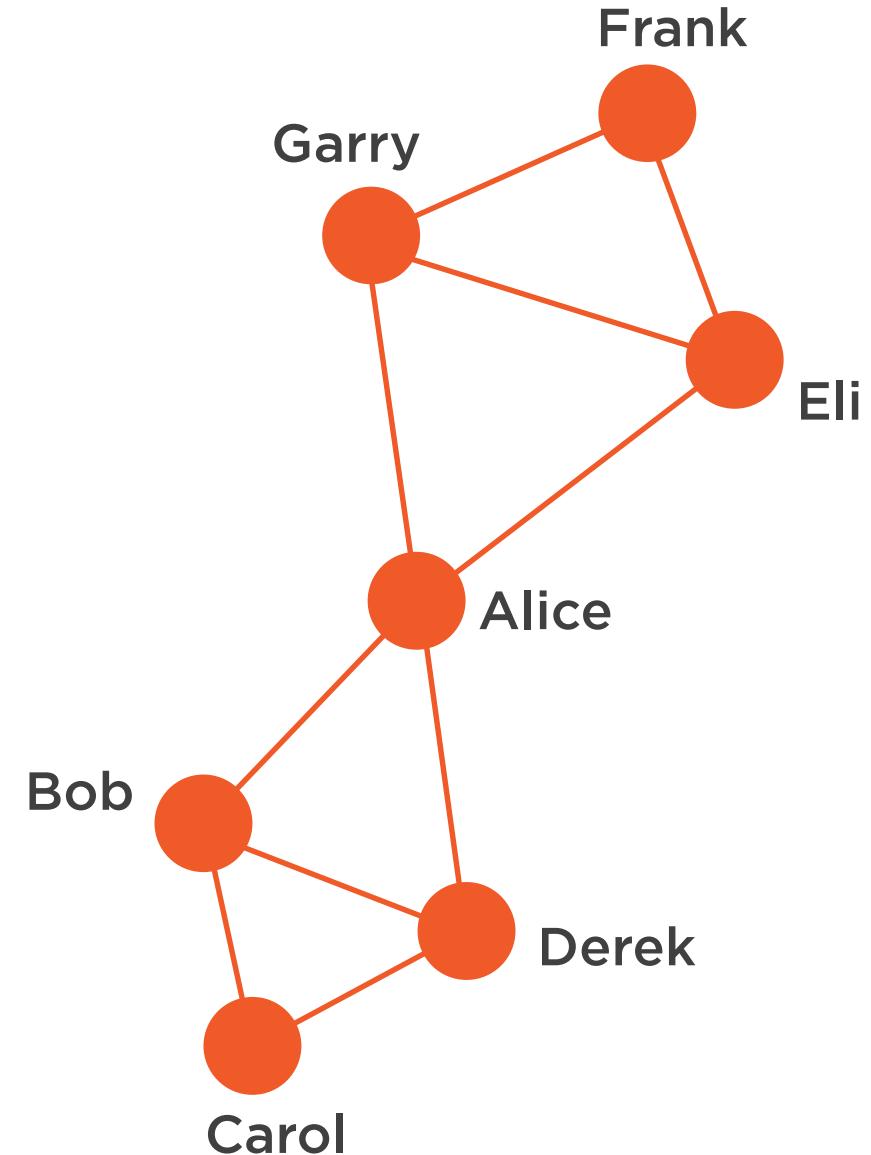
Friendship Network



Friendship Network



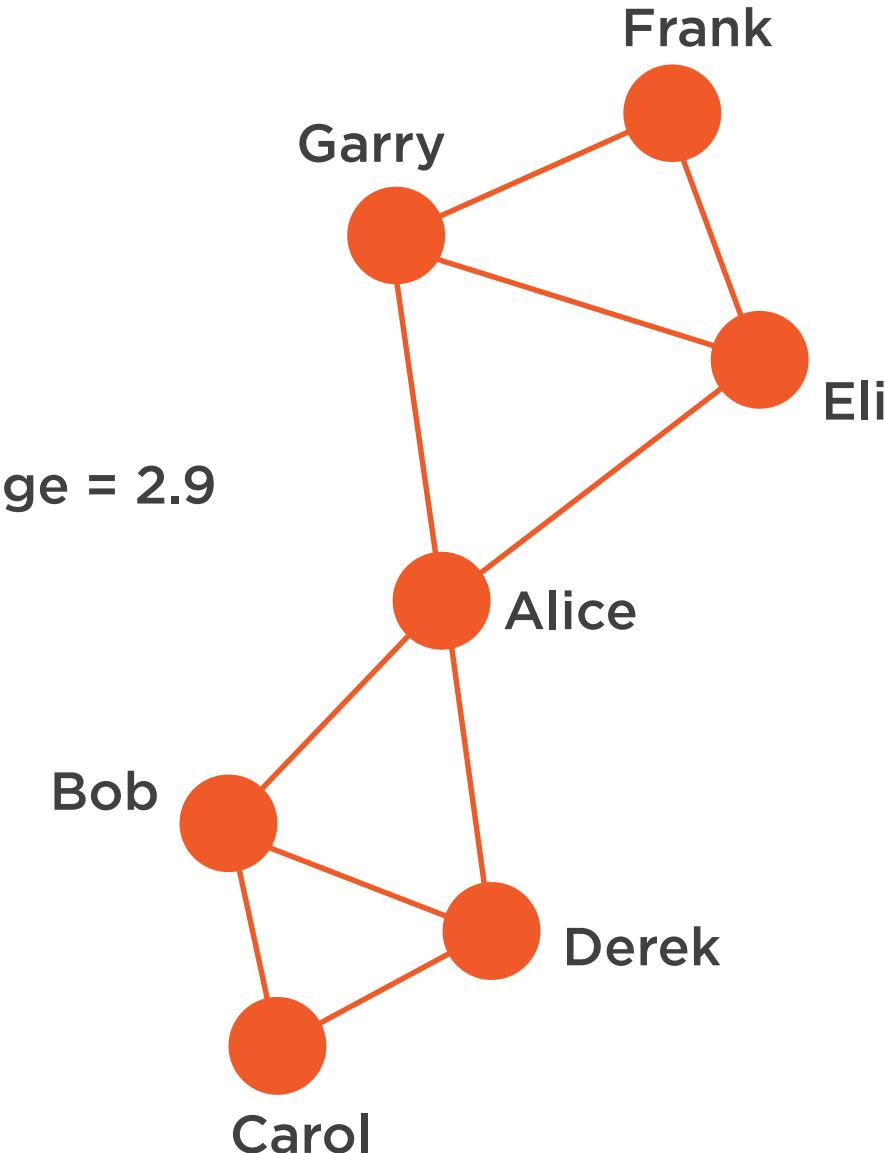
Network manipulation



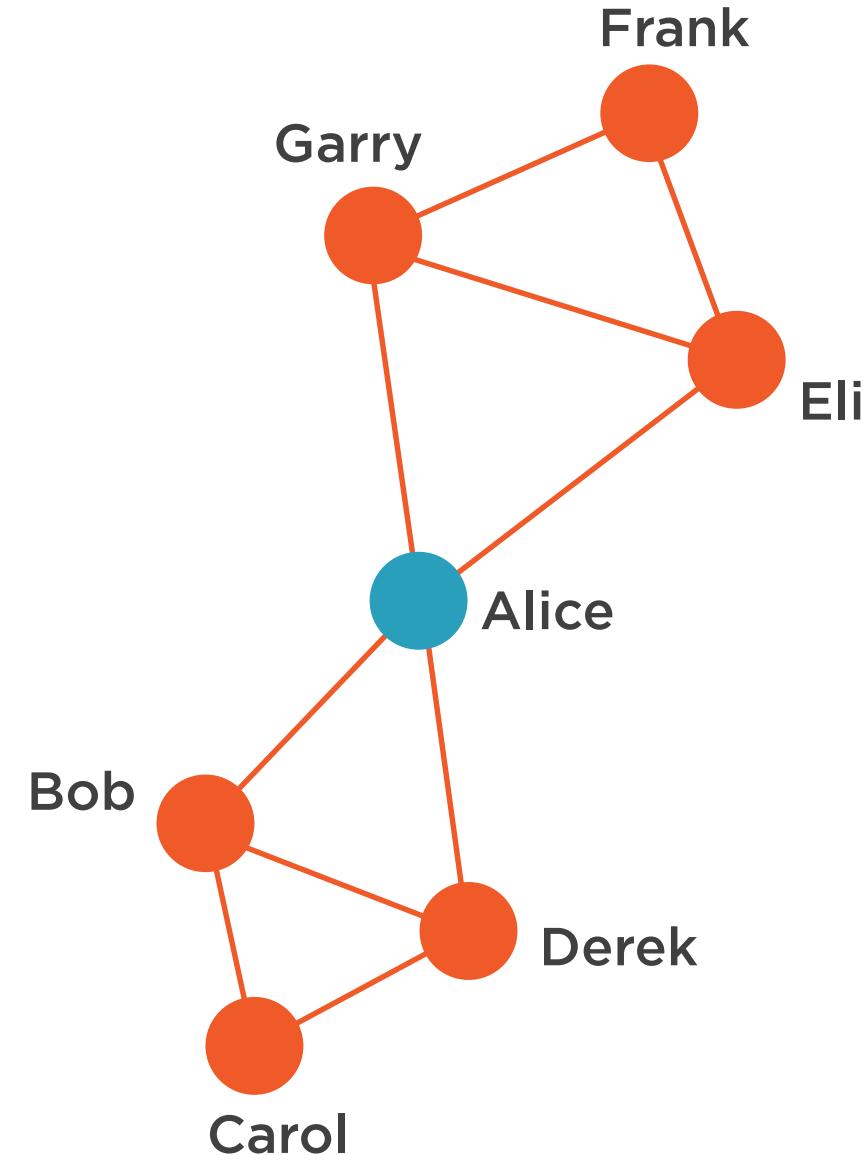
Network manipulation

Descriptive statistics

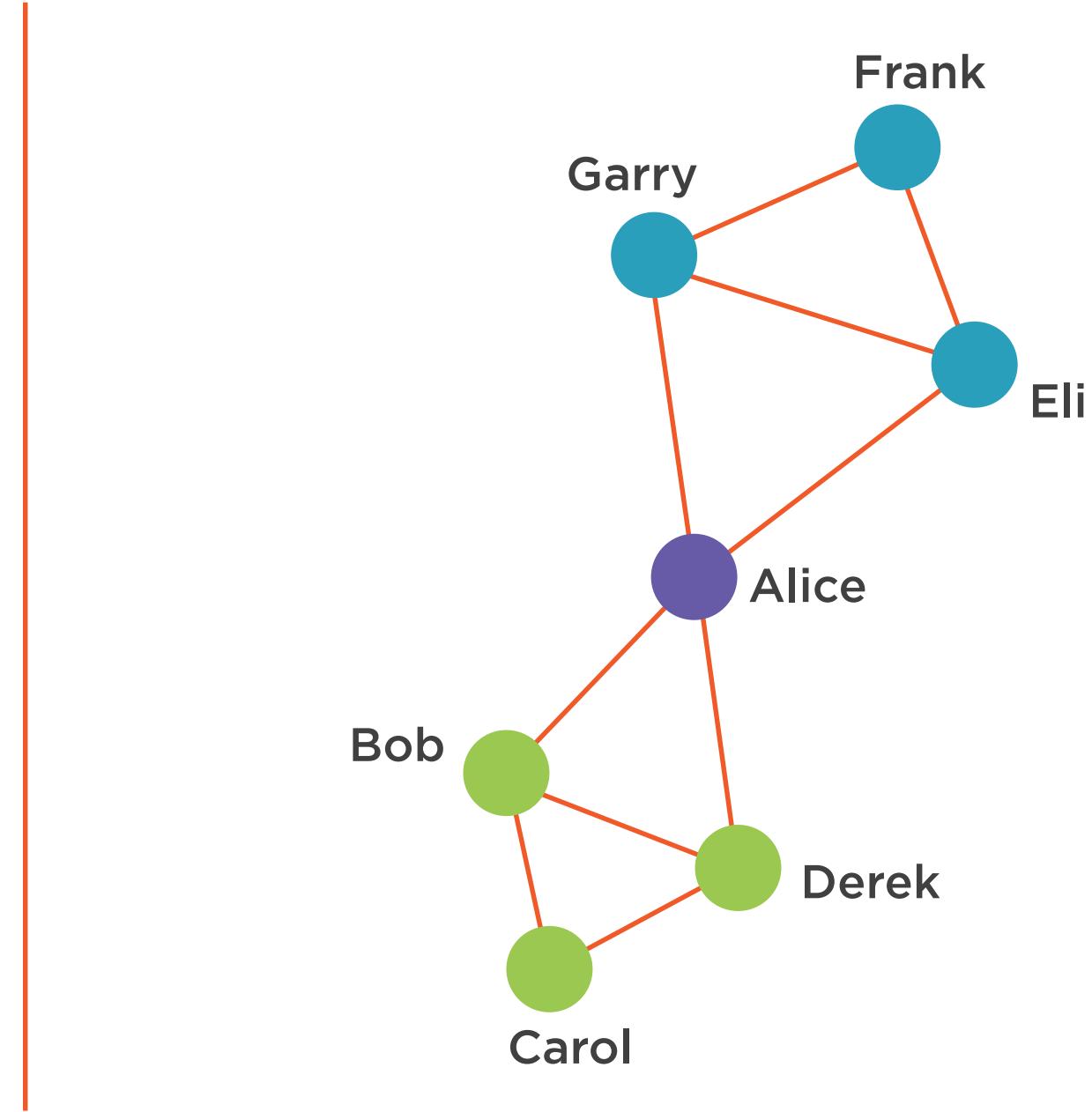
Average = 2.9



Network manipulation
Descriptive statistics
Node importance



Network manipulation
Descriptive statistics
Node importance
Community detection



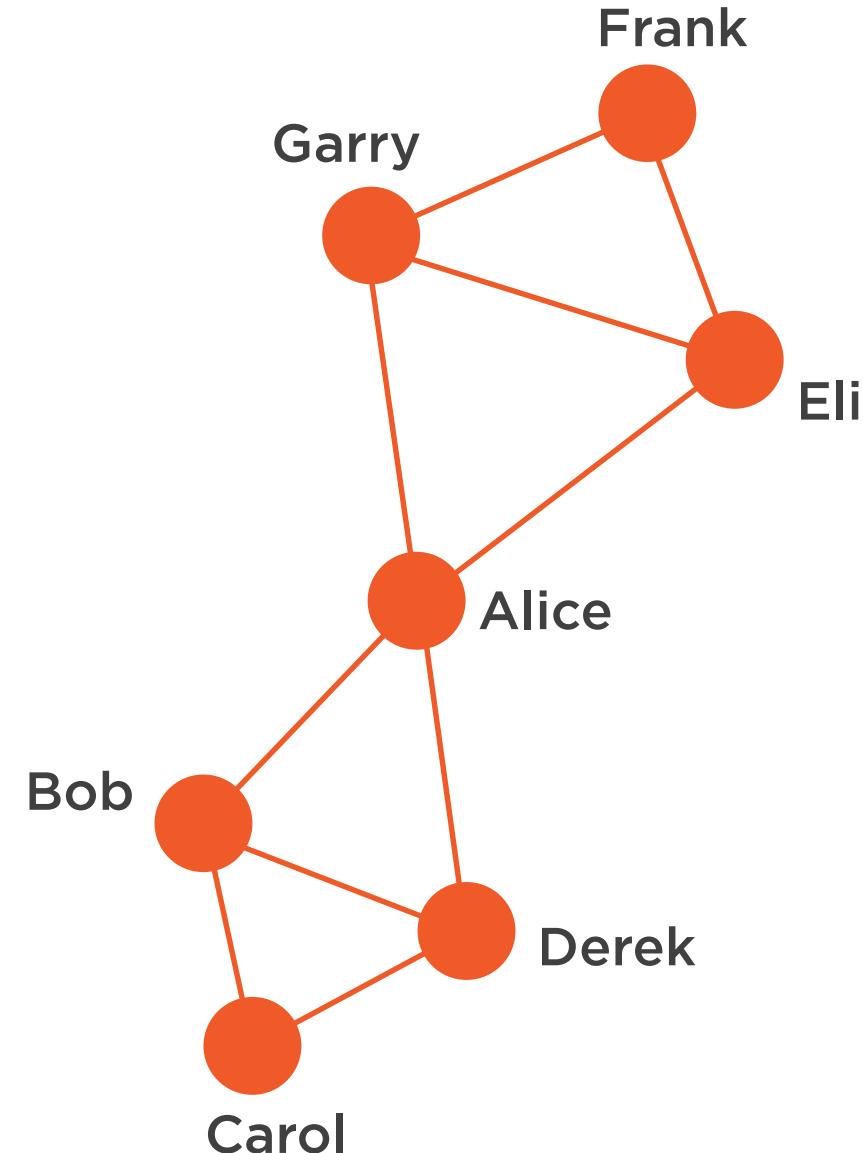
Network manipulation

Descriptive statistics

Node importance

Community detection

Network visualization



Network manipulation

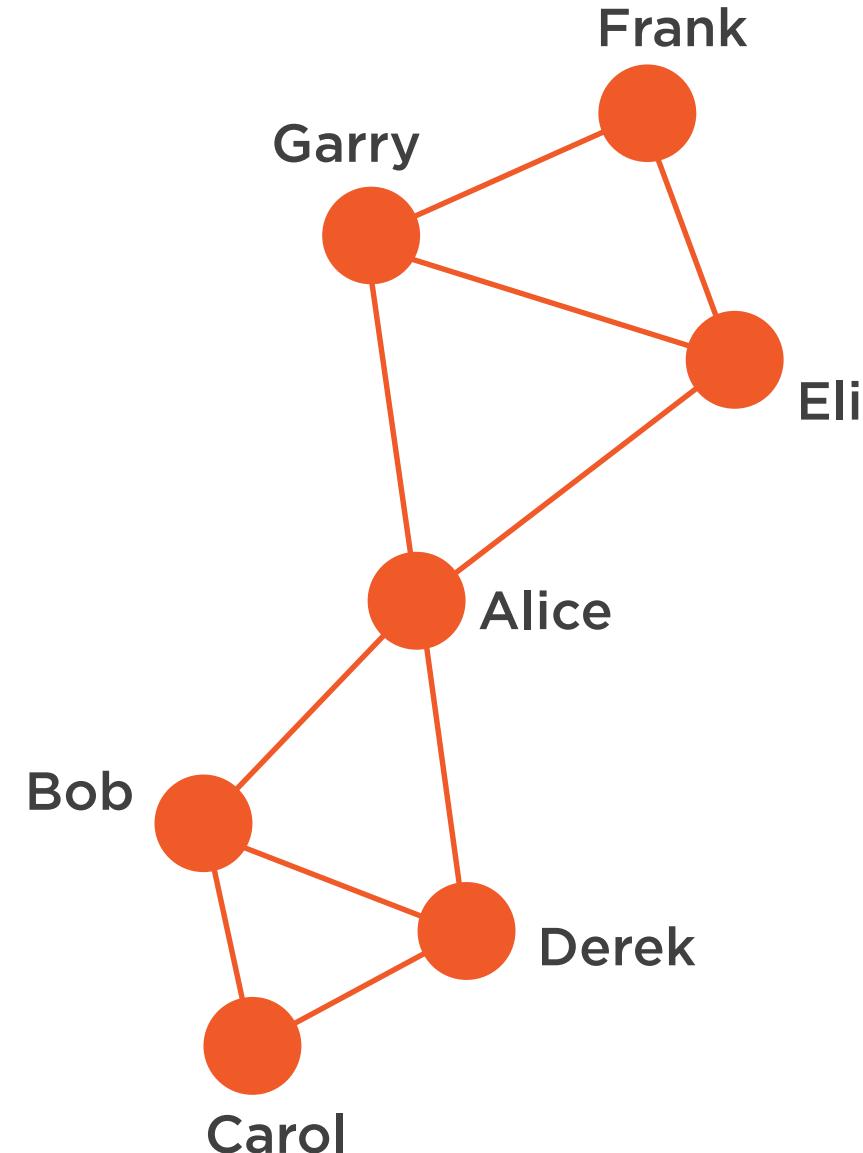
Descriptive statistics

Node importance

Community detection

Network visualization

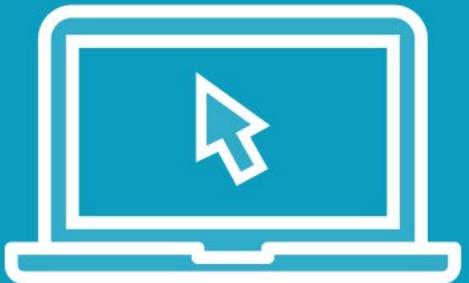
Big data processing?



Big Networks



Demo



Manipulating networks in NetworkX



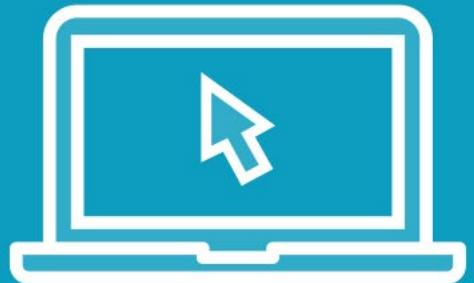
Demo



Graph theory through NetworkX



Demo



Accessing and modifying attributes



Demo



Graph storage formats



Summary



**Graph theory answers abstract questions;
network science models real-life systems**

**NetworkX allows to manipulate graphs,
find communities and importances**

NetworkX is not for big data processing

Directed vs. undirected

Attributes in NetworkX

GML and GraphML for attribute storage

