

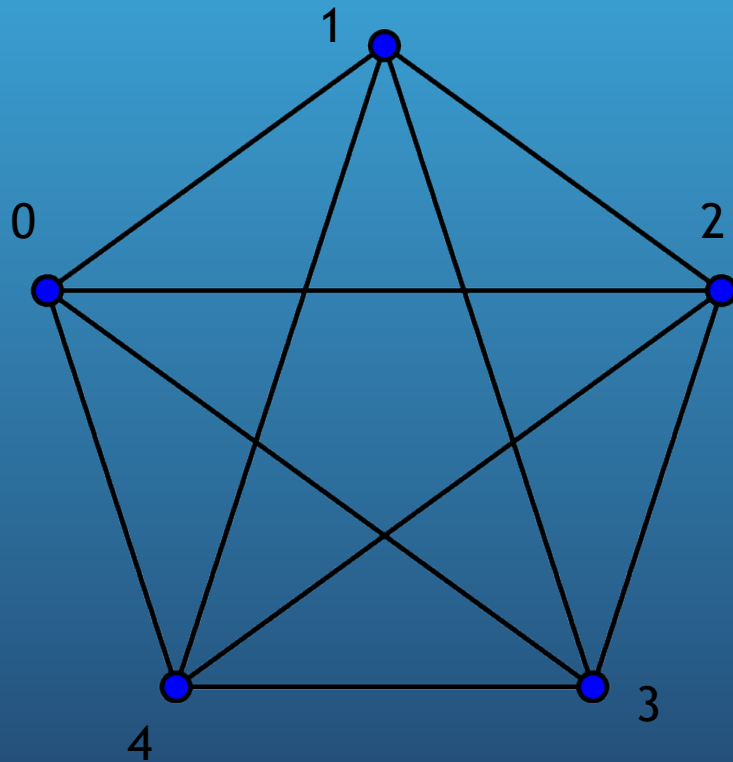
The Complex Networks of Tolkien, Rowling, and Other Great Story-Tellers

Gabriel Triggs

Mentor: Dr. Lazaros Gallos

Simple Networks (Graphs)

- Set of vertices V and set of edges E
- Elements of E are unordered pairs of elements of V



$$V = \{0, 1, 2, 3, 4\}$$

$$E = \{\{0, 1\}, \{0, 2\}, \{0, 3\}, \{0, 4\}, \{1, 2\}, \{1, 3\}, \{1, 4\}, \{2, 3\}, \{2, 4\}, \{3, 4\}\}$$

Complex Networks

- Can have varying types of vertices and edges within one network
- Social networks are complex
- Variation amongst vertices (sex, age, income, nationality, ...)
- Variation amongst edges (friendship, animosity, geographical proximity, ...)

Examples of Complex Networks

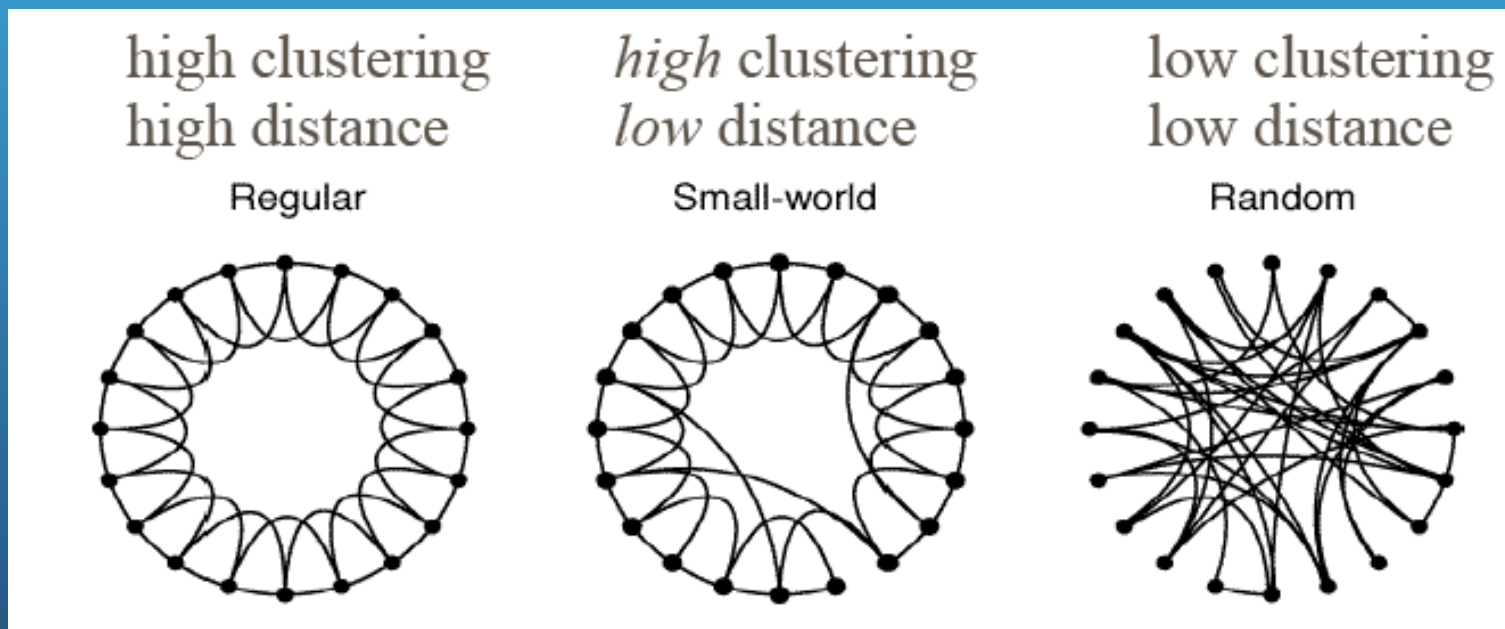
- Social networks - friendship, collaboration, business relationships
- Technological networks - roads, power grids
- Biological networks - cardiovascular system, food web

Terminology

- Degree - number of edges connected to a vertex
- Component - set of vertices reachable from a given vertex
 - Giant component - largest, most nearly spanning component
- Geodesic path - shortest path by number of edges from one vertex to another
- Diameter - longest geodesic path within a network
- Clustering - connectedness of the neighbors of a vertex

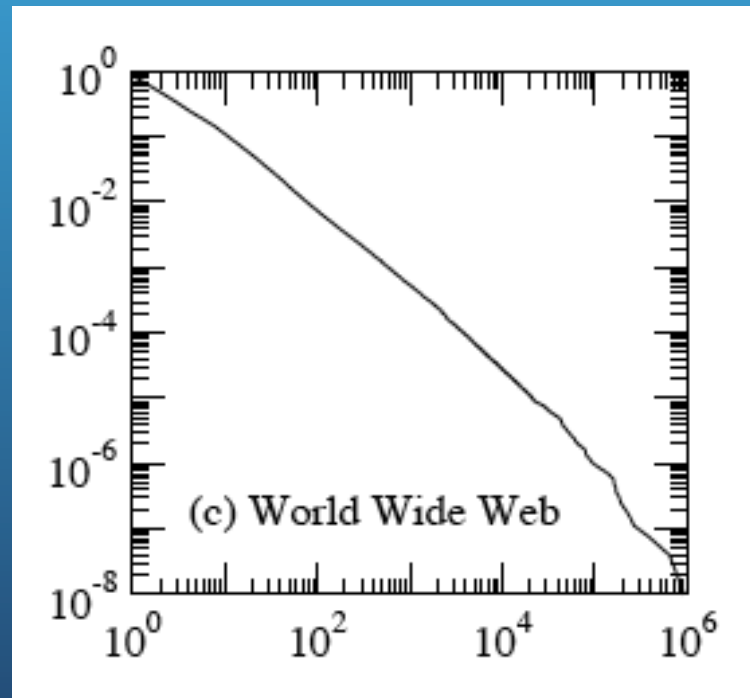
Small-world Networks

- Most vertices are not neighbors but can be reached from any other vertex in a number of steps proportional to the log of the number of vertices



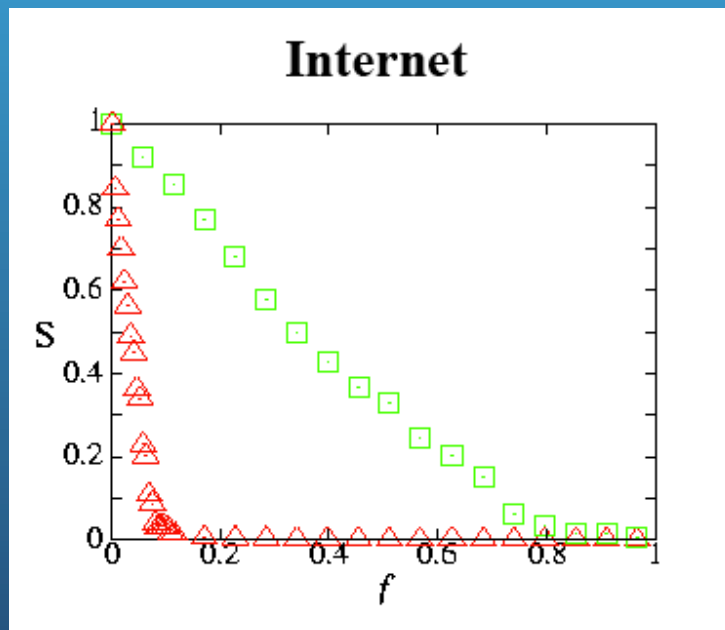
Scale-free Networks

- Network whose degree distribution follows a power law
- Knowing the mean degree does not reveal anything about the degrees of the outliers



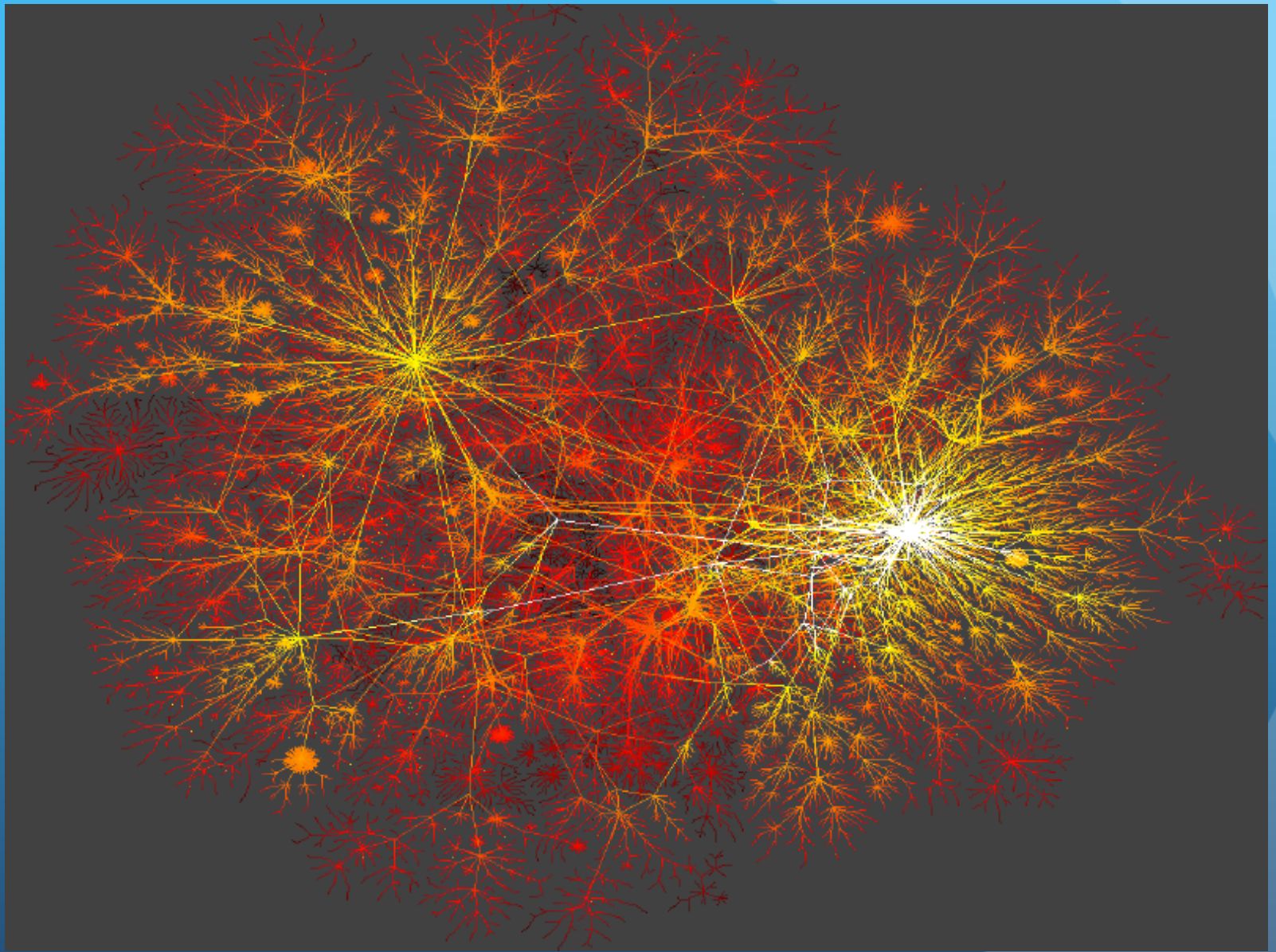
Scale-free Networks

- Hub - vertex of degree much higher than the mean
- Disconnection of random vertices does not affect scale-free networks, but disconnection of the hubs is crippling



Green: Degradation of network as random vertices disconnect

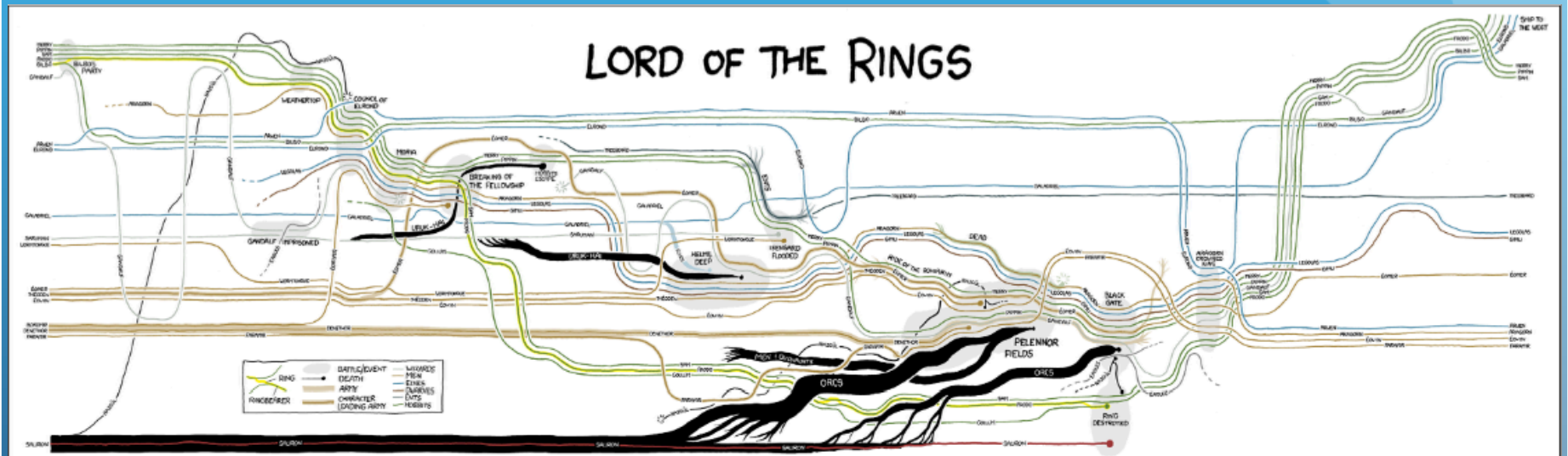
Red: Degradation of network as hubs disconnect



The Project

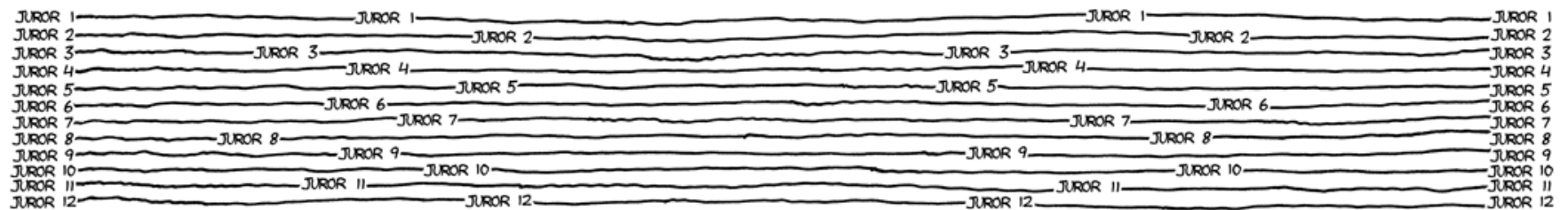
- Perform data mining to extract the social networks of characters in fictional works.
- Examine the social networks present in long works of fiction, such as *The Lord of the Rings*, *Harry Potter*, *Les Misérables*, *War and Peace*, etc.
- Perform comparative analysis on these complex networks, comparing structural components and searching for patterns within and across genres and time periods.

Inspiration



Inspiration

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Inspiration

