Lesson6:
Modeling the Web as a graph
Unit3:
Descriptive statistics for the Web graph

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Introduction to Web Science Part 2

Emerging Web Properties

WeST
People and Knowledge Networks

Institute for Web Science and Technologies · University of Koblenz-Landau, Germany

Completing this unit you should

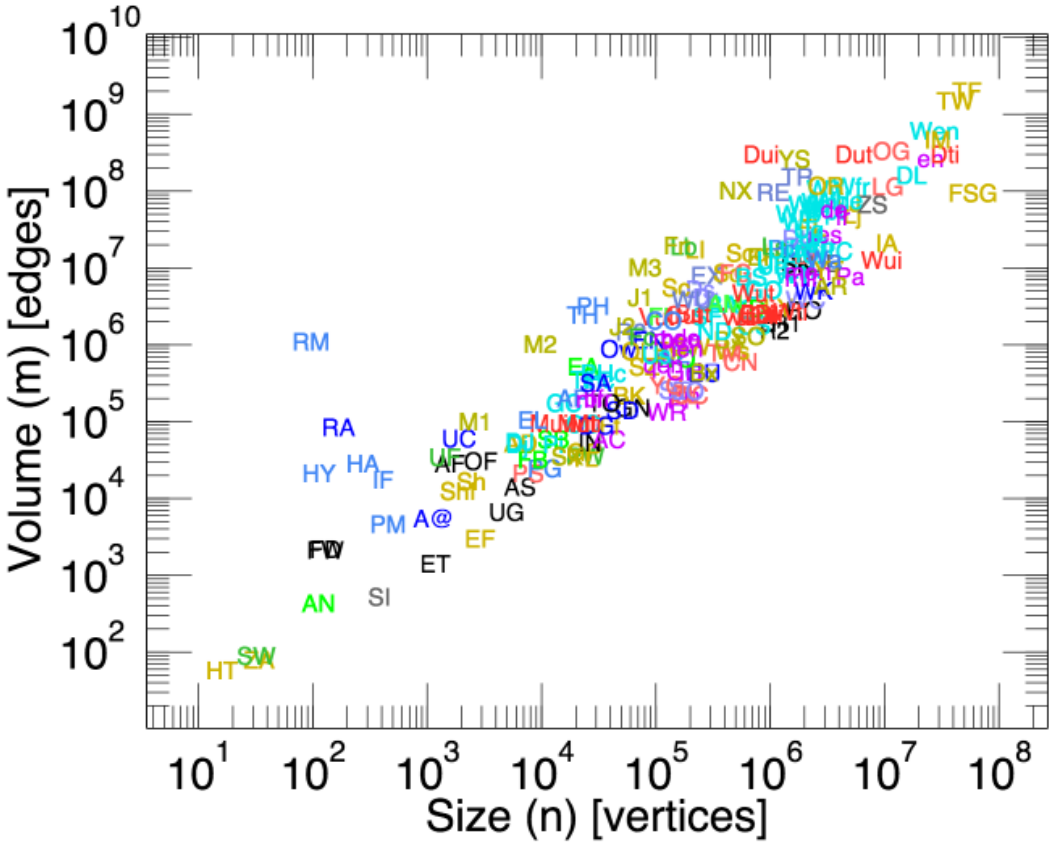
- Know terms like Size and (unique) volume
- Be able to count the in and out degree of web pages
- Have an idea what kind of law (in & out) degree distributions follow
- Know that degree is not distributed in a fair way
- Know that the Gini coefficient can be used to measure fairness

Some basic statistics about Simple English

- **Size** (Number of vertices)
  - 100‘312
- **Volume** (Number of edges)
  - 1‘627‘472
- **Unique volume** (Number of unique edges)
  - 746‘086

Empirical connection between Size and volume in over 100 networks

- There seems to be a connection
- The larger the size the larger the volume
- Beware the log log plot



Neighbors, in degree and out degree

$$In(v) = \{u \in V | \exists e \in E : e = (u, v)\}$$

$$indeg(v) = |In(v)|$$

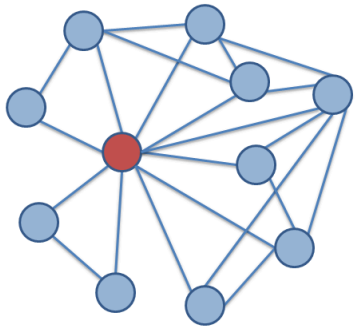
$$Out(v) = \{u \in V | \exists e \in E : e = (v, u)\}$$

$$outdeg(v) = |out(v)|$$

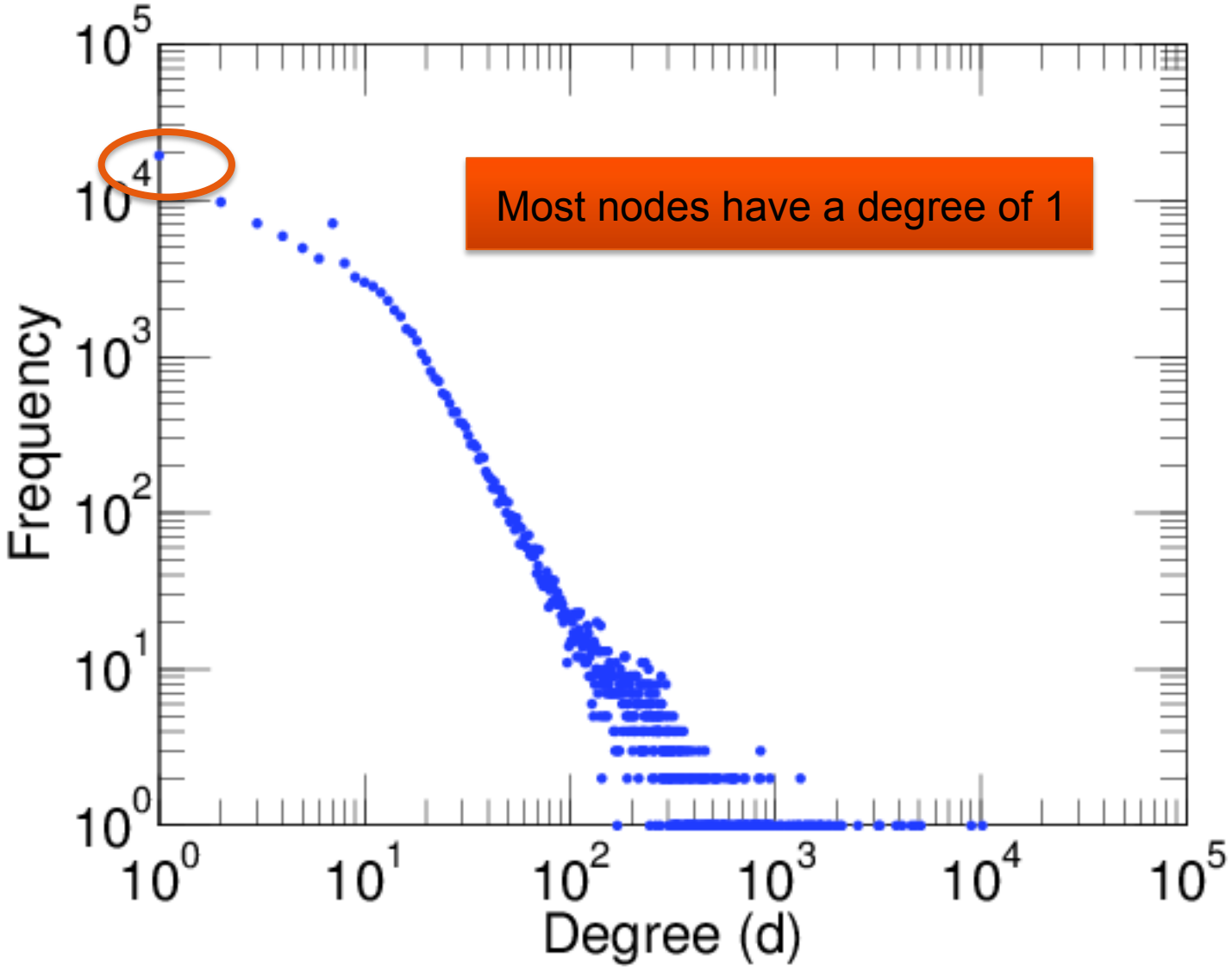
$$Neighbors(v) = In(v) \cup Out(v)$$

$$deg(v) = |Neighbours(v)|$$

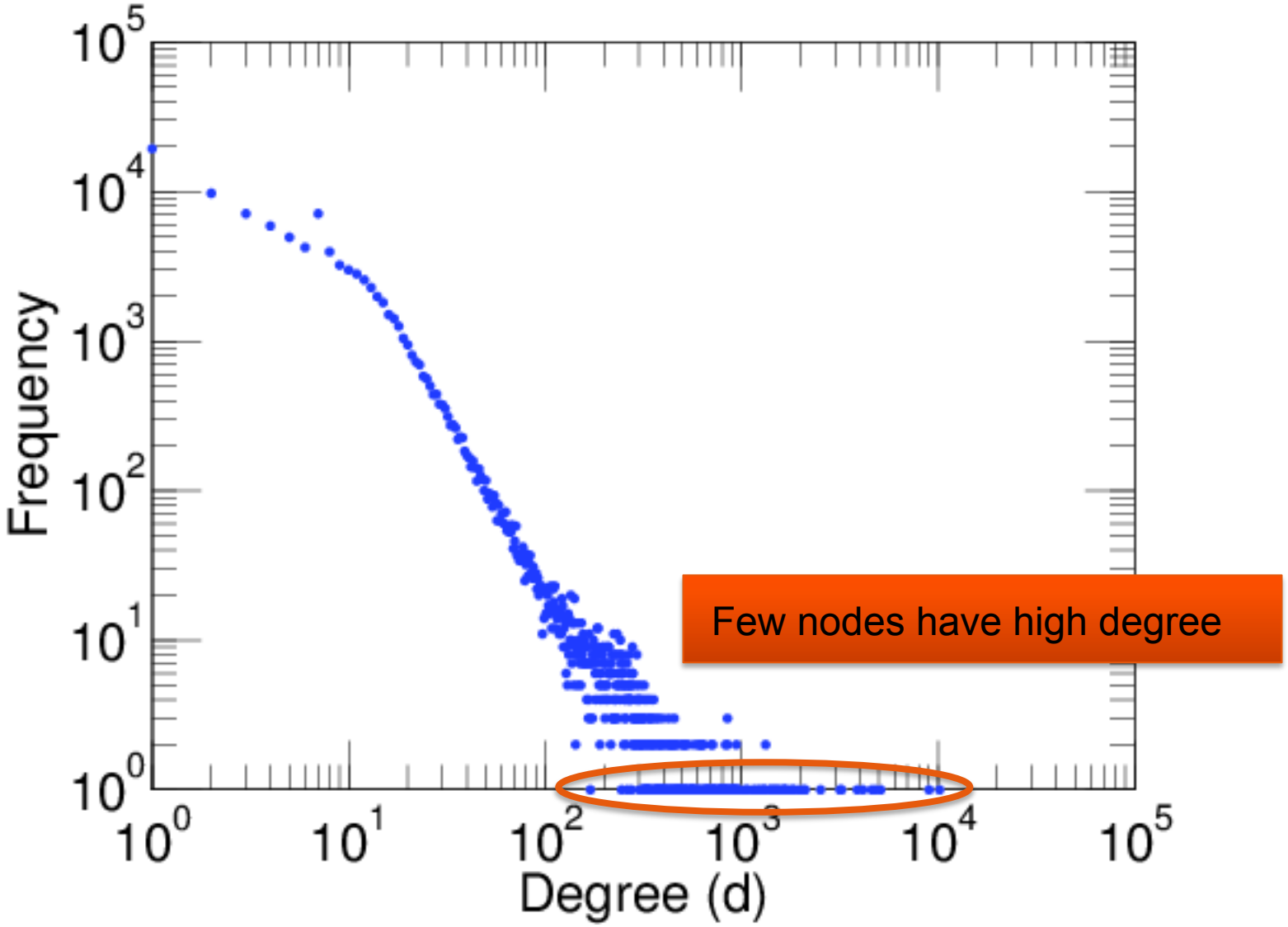
$$deg(v) \leq indeg(v) + outdeg(v)$$



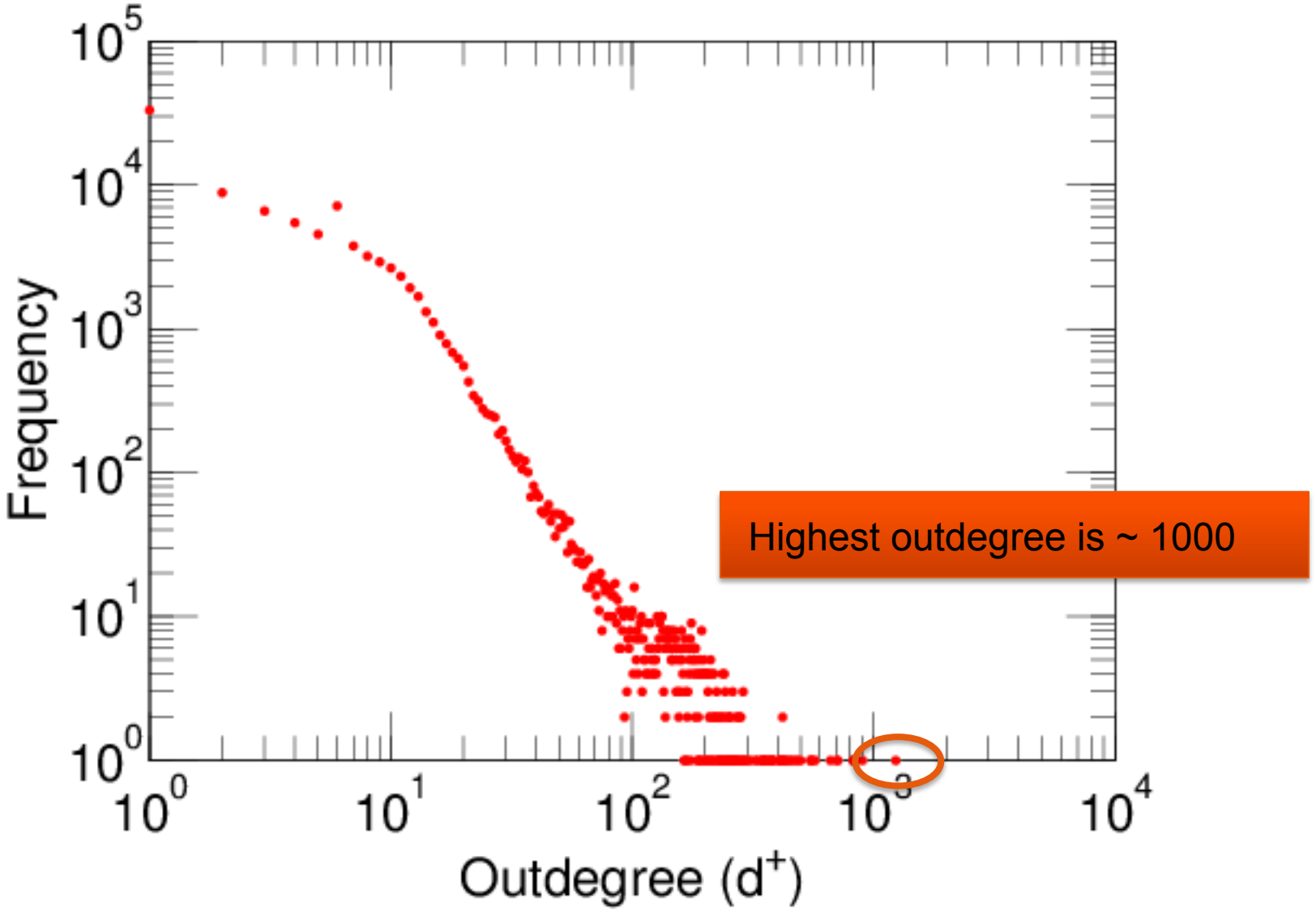
Degree distribution for Simple English Wiki



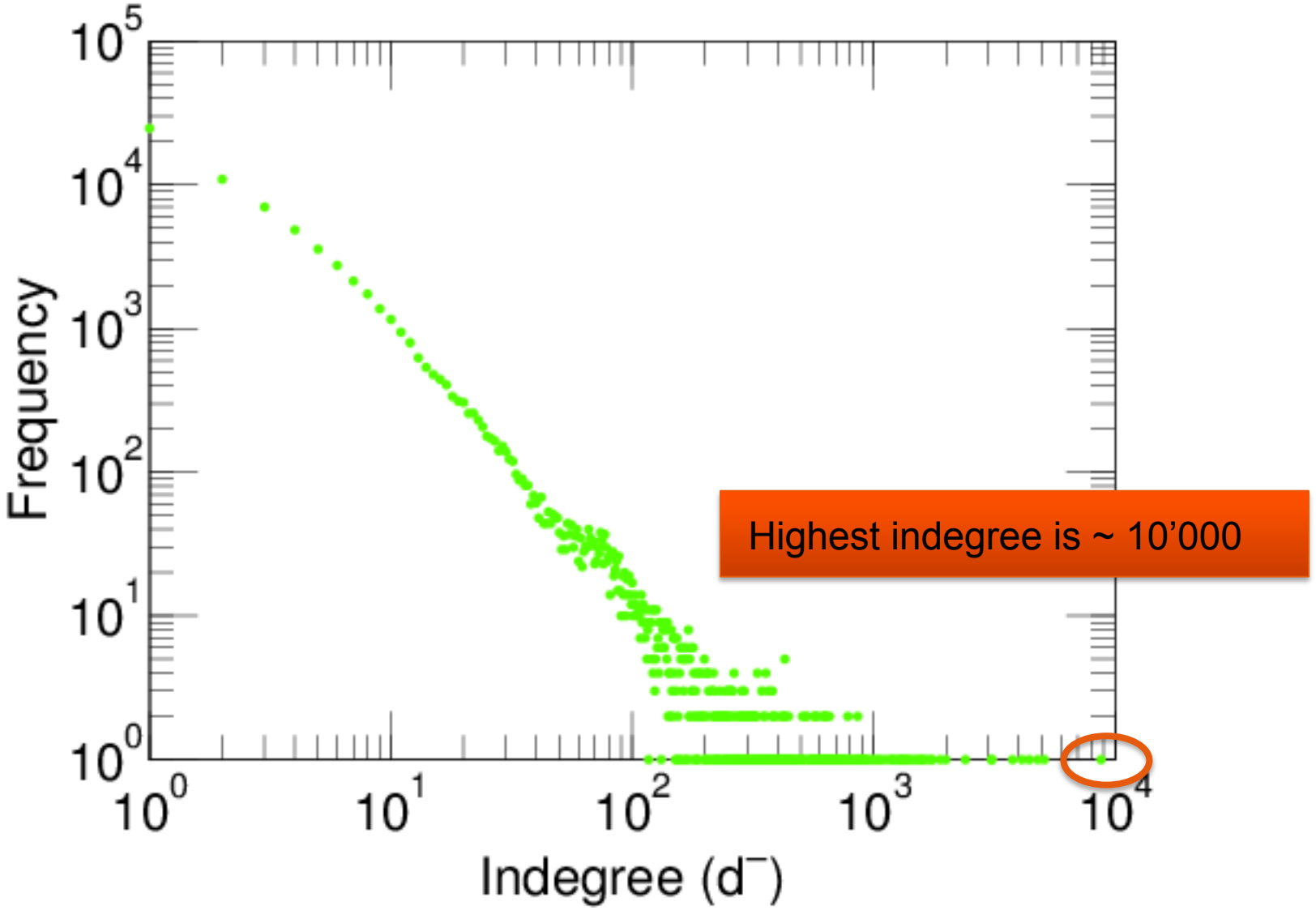
Degree distribution for Simple English Wiki



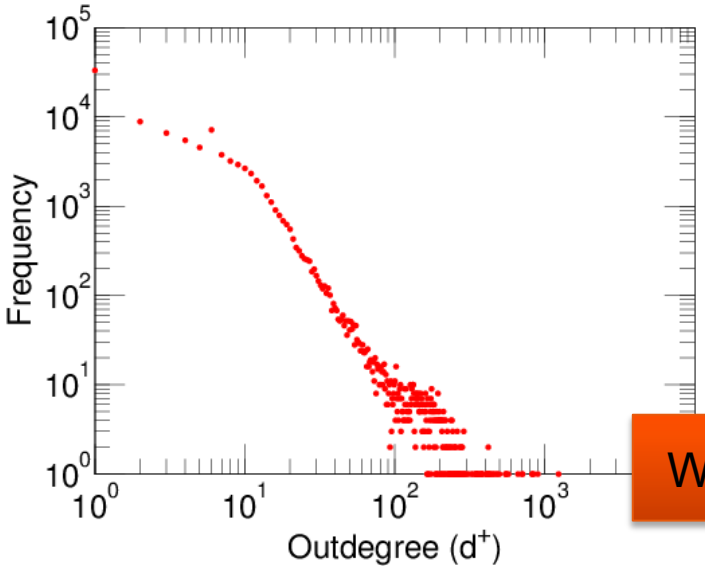
Out degree distribution

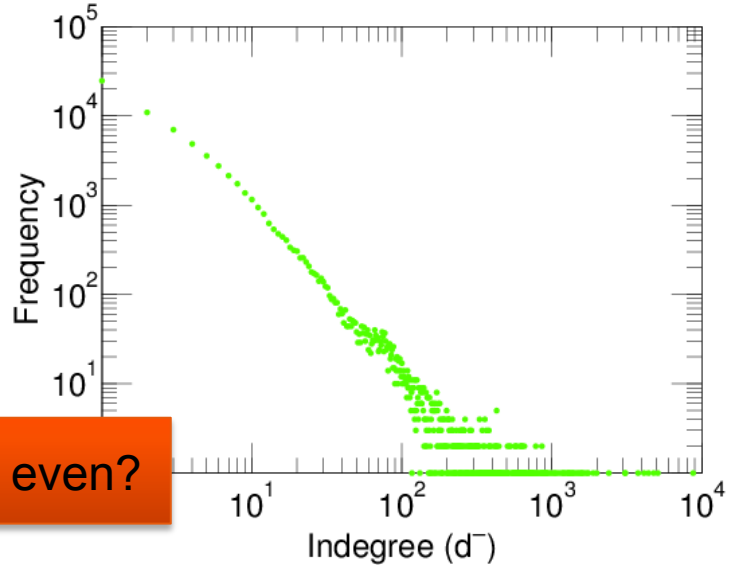


In degree distribution

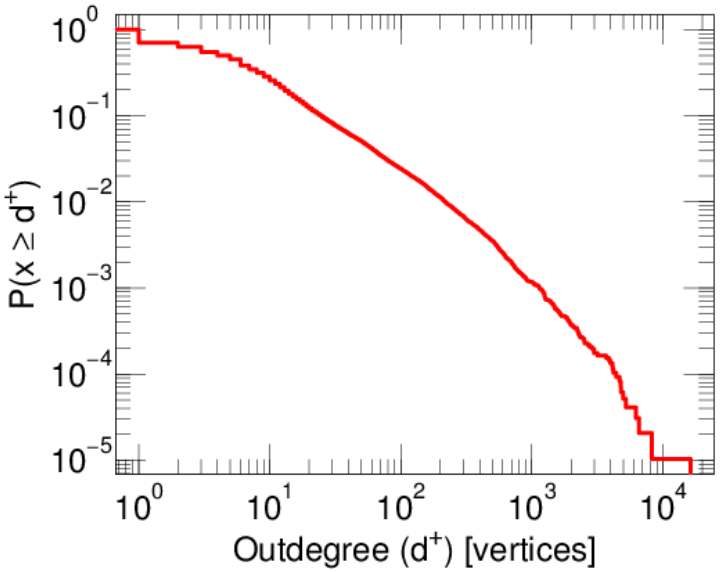


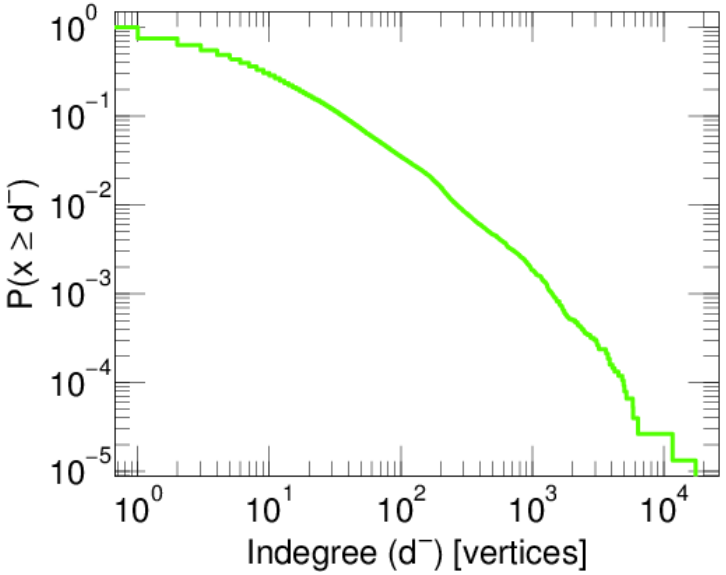
Comparing in and out degree distributions I





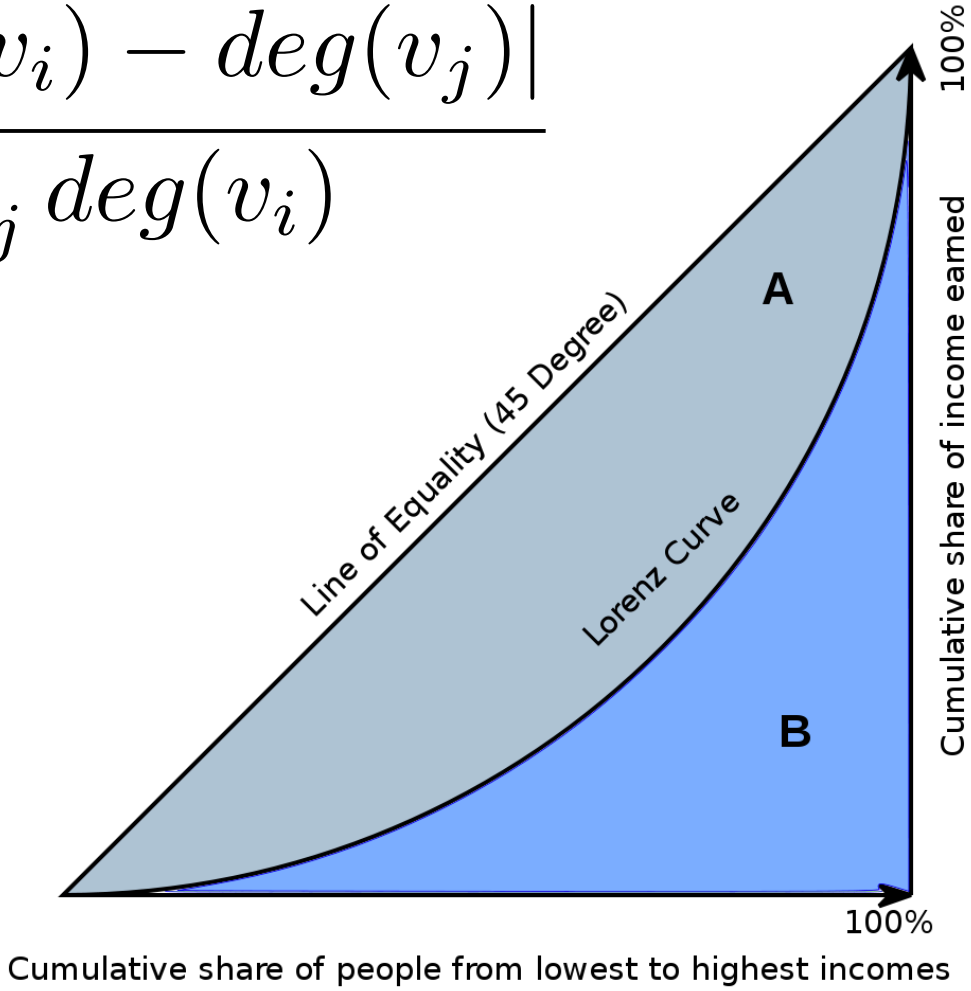
Which one is more even?



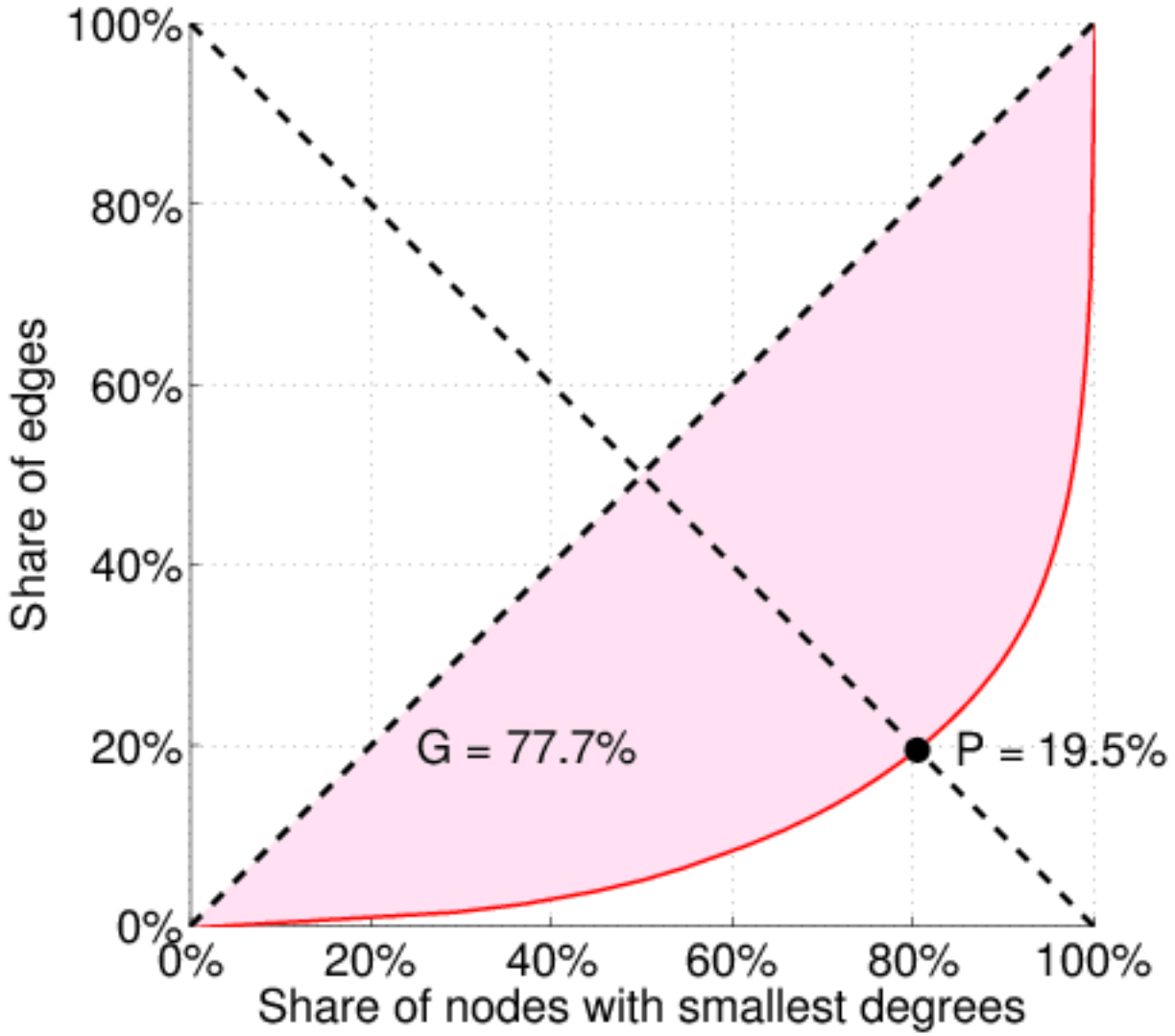


Use the Gini coefficient to describe Fairness

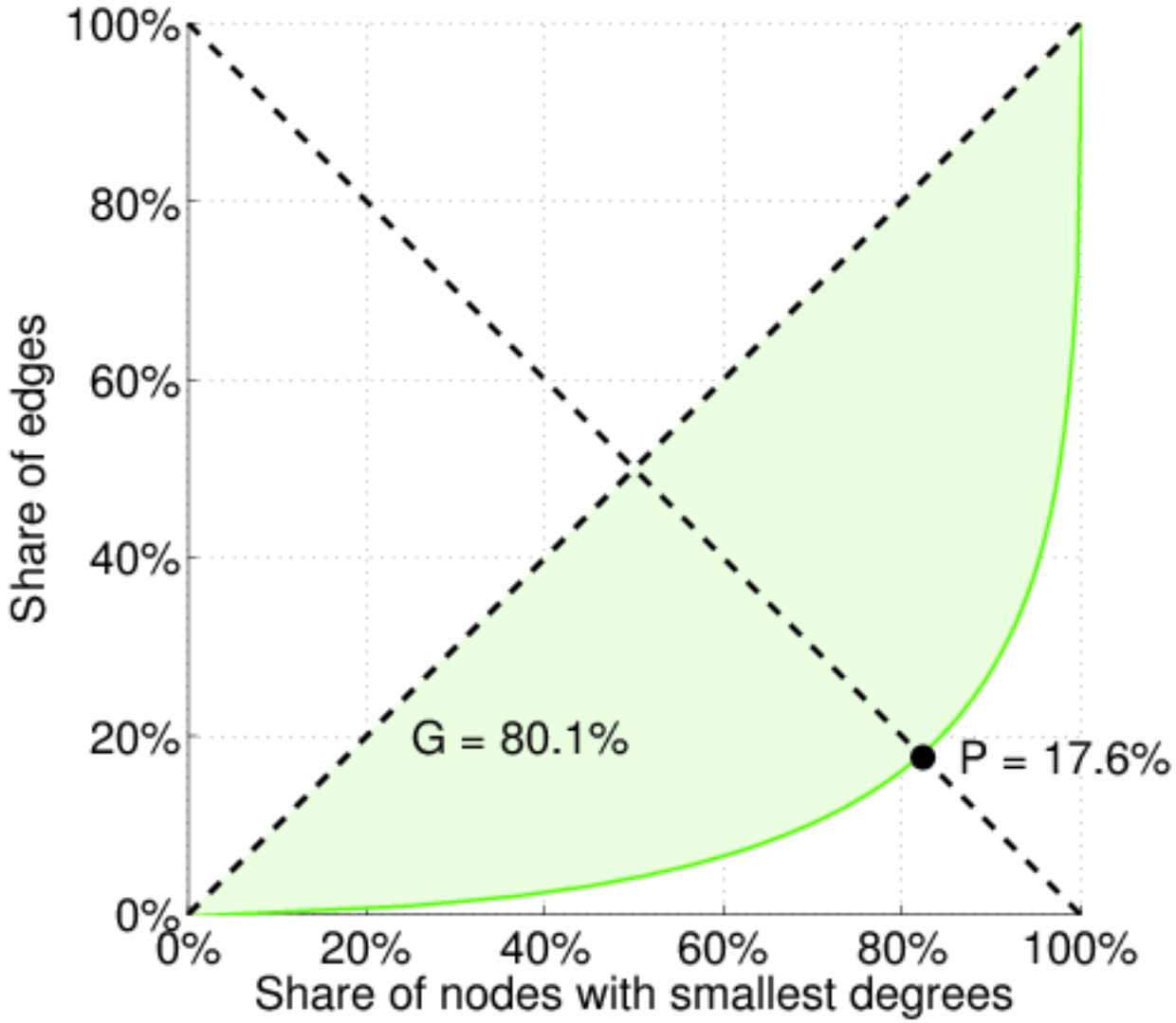
- $G = \frac{\sum_i \sum_j |deg(v_i) - deg(v_j)|}{2 \sum_i \sum_j deg(v_i)}$
- $G = A/(A+B)$
- $G \in [0, 1]$
  - 0 = fair
  - 1 = unfair



Out degree lorenz curve



In degree lorenz curve



Thank you for your attention!

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