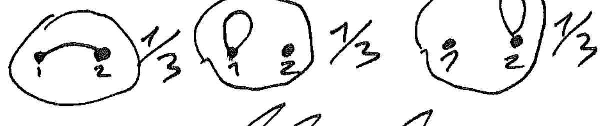
Lecture 10

Classical random graphs:

(a) Erdős-Rényi random graph: (G_{NL})

Stat. ensamble of labelled graphs with N (# vertices) & L (# edges) fixed. (all possible configurations) with equal stat. weights ≡ ≡ "max random" graphs under these conditions: e.g. $G_{2,1}$:



(b) Gilbert model ≡ Bernoulli ≡ binomial ≡ G_{Np}:

Stat. ens with N fixed & fixed prob p that the link is present

e.g. $G_{2,p}$:

p $\quad$ $1-p$

L - fluctuates here: $L=1$ $\quad$ $L=0$

(for different members of the stat. ens)

If $N\to\infty$, $\frac{L}{N}\left(\frac{\langle L\rangle}{N}\right)$ = finite, G_{NL} & G_{Np} are equivalent

Generalizations

(a) The configuration model - - random graphs with a given degree sequence

(b) random graphs with desired degree sequence.

These alow one to construct uncorrelated networks with given degree distributions

How to explain fat-tailed degree distributions:

Growing networks:

(a) Random recursive graphs =>
=> exponentially decaying degree distributions

(b) Recursive graphs with preferential attachment
=> power-law degree distributions

See "Lectures on Complex Networks" 3

Secs. 2.1 – 2.3; 3.4; 5.1 – 5.4