Class Note for

Computer Science Theory for the Information Age

Day 4

Homework:

3.11

search www for an undirected graph or a data base that can be converted tp a graph. Find the connected components and count the number of each size.

Proposition 1.

another stress! no matter how large the graphy $G\left(n, \frac{d}{n}\right)$ is, the expection of triangles in each is indepent from n.

a review for first moment method and second moment argument.

Proposition 2. *see into thresholе for hamilton circle*

There's $\frac{1}{2}(n-1)!$ posible circles(without direction) in a n-graphy.

$E(x)=\frac{1}{2}(n-1)!\left(\frac{d}{n}\right)^n \approx \left(\frac{n}{e}\right)^n \left(\frac{d}{n}\right)^n = \left(\frac{d}{e}\right)^n$

with a thrshole in d=e.

however usually $d=\ln n$ is a thresholе,

Next for giant component

Proposition 3. *ask how much giant component a graph has*

breadth first search

grenerate the graph with when search the graph! NOT break the independence of edges.

probabity that a vertix is noy discovered in frest i steps is $\left(1-\frac{d}{n}\right)^n$

Let Z_i be the number of vertices discovered in i steps.

$Z_i = \text{binomial}\left(n-1, 1-\left(1-\frac{d}{n}\right)^n\right).$

Proposition 4. *if there would be two giant component?*

answer is no.

next for Branching process

Proposition 5. *denote P_i as a root has i children.*

make a generating function of $f(x)=\sum_{i=0}^{\infty} p_i x^i$!see into generating function

to prove $f_{j+1}(x)=f_j(f(x))$

the generating function for x_1+x_2 where x_1 and x_2 are independent random variable with gemerate function $f(x)$ is $f^2(x)$.for:

$f(x)=\sum_{i=0}^{\infty} p_i x^i$

$f^2(x)=p_0^2+(p_0p_1+p_1p_0)\,x+(p_0p_2+p_1p_1+p_2p_0)\,x^2+\ldots$ *obviously.*

Let z_j be number of children in jth generation.