Proof of Chebychev's Inequality

Markov's Inequality:

$$P(Y \ge d) \le \frac{EY}{d}$$

$$EY \ge d\boxed{EZ} \to P(Y \ge d)$$

$$EY \ge d\,P(Y \ge d)$$

Chebychev's Inequality

$$P(|X-\mu| \ge c\sigma) \le \frac{1}{c^2}$$

$$E((X - \underbrace{EX}_{\mu})^2)$$

$$P[(X-\mu)^2 \ge c^2\sigma^2] \le \frac{\overset{\sigma^2}{\cancel{E[(X-\mu)^2]}}}{c^2\sigma^2}$$

$$Y = (X-\mu)^2 \qquad P(Y \ge d) \le \frac{EY}{d}$$

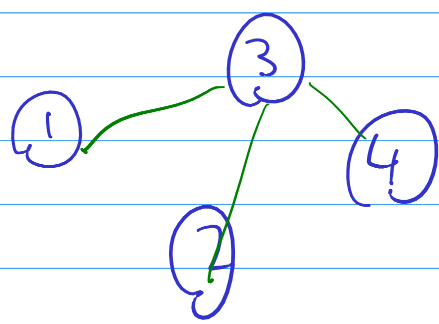
$$d = c^2\sigma^2$$

$$\le \frac{1}{c^2}$$

Feeling the Power Law

Wealth!

Social Networks



$n = 4$

$n-1$ connections per node

degree is a distribution

$$\binom{n-1}{d}(1-p)^{n-d}p^d$$

RAWAA
ASMAA
LILA

7. $p = 0.1 \qquad r = 25$

$$P(N=k) = \binom{k-1}{r-1}(1-p)^{k-r}p^r, k = r, r+1, \ldots$$

Negative binomial.

$$P(N > 200) = \sum_{i=201}^{\infty} P(N=i)$$

$$= 1 - \sum_{i=1}^{200} P(N=i)$$

Brute Force !