Probability

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11 February 2014

Main ideas

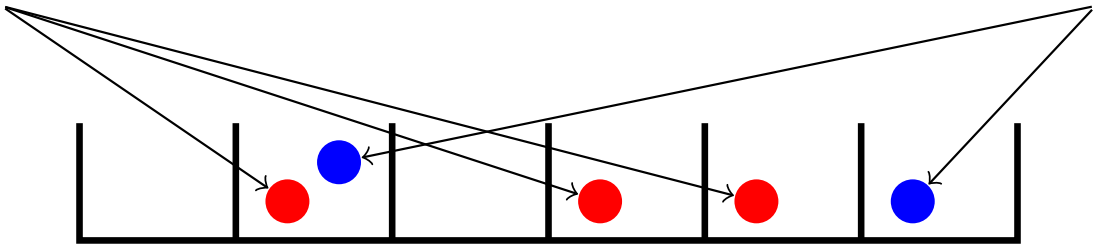
1. Given two pages, we want to estimate how many pages would be linked by both if links were created randomly.
2. If the actual number is smaller, then we conclude that those pages are not related. If it's bigger, we assign a score between 0 and 1.
3. This estimate depends on how we model random link creation between pages.

The Barabási–Albert model

Balls and bins, 1/2

Problem

Suppose that we have W bins, n_1 red balls and n_2 blue balls. When we throw a ball it falls in bin i with probability p_i. When we are done throwing all the balls, what's the expected number of bins with both a blue and a red ball?



Balls and bins, 2/2

Solution

If **all throws are independent**, *then, by linearity of expectation, we have*

$$\mathrm{E}[|N_1 \cap N_2|] = \sum_{i,j=1}^{n_1,n_2} \mathrm{E}[I_{ij}] = n_1 n_2 \sum_{i=1}^{W} p_i^2 = n_1 n_2 \mathbf{P}$$

where I_{ij} is random indicator variable denoting that red ball i and blue ball j landed in the same bin.

Results

	group3	0.594	0.660	0.539	+