

Title: "Probabilistic phenomena in the space of contingency tables"

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Abstract:

We consider the set of all non-negative integer matrices (contingency tables) with prescribed row and column sums (margins) and describe some counter-intuitive probabilistic phenomena there. For example, if the row and column sums are sufficiently non-uniform then, in the uniform probability space of all non-negative integer matrices of a given size and with the given total sum of entries, the event consisting of the matrices with prescribed row sums and the event consisting of the matrices with prescribed column sums are positively correlated. Considering the set of contingency tables with given margins as a finite probability space, we show that a random table from the space concentrates about some particular typical matrix which can be very different from the intuitive "independence" matrix with the entries proportional to the products of row and column sums. Similarly, one can consider the set of all 0-1 matrices (binary contingency tables) with prescribed row and columns. In this case, the event consisting of the matrices with prescribed row sums and the event consisting of the matrices with prescribed column sums are negatively correlated as long as the row and column sums are sufficiently non-uniform. We also describe what a typical binary contingency table with prescribed margins looks like.