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On the Asymptotic Statistics of the Number of Occurrences of Multiple Permutation Patterns.

In this talk, we will discuss statistical properties of the random variables $X_\sigma(\pi)$, the number of occurrences of the pattern σ in the permutation π . We present two contrasting approaches to this problem: traditional probability theory and the “less traditional” computational approach. Through the perspective of the first one, we prove that for any pair of patterns σ and τ , the random variables X_σ and X_τ are jointly asymptotically normal (when the permutation is chosen from S_n). From the other perspective, we develop algorithms that can show asymptotic normality and joint asymptotic normality (up to a point) and derive explicit formulas for quite a few moments and mixed moments empirically, yet rigorously. The computational approach can also be extended to the case where permutations are drawn from a set of pattern avoiders to produce many empirical moments and mixed moments. This data suggests that some random variables are not asymptotically normal in this setting. (Received September 16, 2014)