Title: Record Values, Poisson Mixtures, and the Joint Distribution of Counts of Strings in Bernoulli Sequences

Abstract: Let $U_1, U_2, U_3, \ldots$ be iid continuous random variables and $Y_1, Y_2, Y_3, \ldots$ be Bernoulli rv's which indicate the position of the record values in this sequence, that is, $Y_j = 1$ if $U_i < U_j$ for all $i < j$. Let $Z_1$ be the number of occurrences of consecutive record values in the infinite sequence $U_1, U_2, U_3, \ldots$, and, more generally, $Z_k$ be the number of occurrences of two record values separated by exactly $k - 1$ non-record values. It is a well known but still quite surprising fact that $Z_1, Z_2, Z_3, \ldots$ are independent Poisson rv's with $EZ_k = 1/k$ for all $k$. We show how this may be proved by embedding the record sequence in a marked Poisson process. If we have only a finite sequence of trials $U_1, U_2, \ldots, U_N$, then the record counts $Z_1, Z_2, \ldots$ will no longer be exactly Poisson or exactly independent. But if $N$ is random with an appropriately chosen distribution, we can retain these properties exactly. This also can be proved by embedding in a marked Poisson process. This is joint work with Jayaram Sethuraman and Sunder Sethuraman.