SPEAKER: Jim Fill

TITLE: Breaking Multivariate Records

ABSTRACT: For general dimension $d$, we identify, with proof, the asymptotic conditional distribution of the number of (Pareto) records broken by an observation given that the observation sets a record.

Fix $d$, and let $K(d)$ be a random variable with this distribution. We show that the (right) tail of $K(d)$ satisfies

$$\Pr(K(d) \geq k) \leq \exp \left[ -\Omega \left( k^{(d-1)/(d^2-2)} \right) \right] \text{ as } k \to \infty$$

and

$$\Pr(K(d) \geq k) \geq \exp \left[ -O \left( k^{1/(d-1)} \right) \right] \text{ as } k \to \infty.$$ 

When $d = 2$, the description of $K(2)$ in terms of a Poisson process agrees with the main result from Fill [Comb. Probab. Comput. 30 (2021) 105–123] that the distribution of $K(2)$ is Geometric$(1/2)$ with support $\{0, 1, \ldots\}$.

We show that $\Pr(K(d) \geq 1) = \exp[-\Theta(d)]$ as $d \to \infty$; in particular, $K(d) \to 0$ in probability as $d \to \infty$. 