Stanford University
Departments of Mathematics and Statistics

Probability Seminar

*** Special Time ***

3:15pm, Monday, November 11, 2019
Sequoia Hall Room 200

Refreshments served at 4pm in the Lounge.

Speaker: Yuri Kifer
Institute of Mathematics,
Hebrew University

Title: Geometric law for numbers of returns until a hazard

Abstract:

For a ψ-mixing sequence of identically distributed random variables $X_0, X_1, X_2, \ldots$ and pairs of shrinking disjoint sets $V_N, W_N,\ N = 1, 2, \ldots,$ we count the number $\mathcal{N}_N$ of returns to V_N by the sequence until its first arrival to W_N (hazard time). Let μ be the distribution of X_0. It turns out that if $\mu(V_N), \mu(W_N) \to 0$ as $N \to \infty$ with the same speed then $\mathcal{N}_N$ tends in distribution to a geometric random variable. A somewhat different setup deals with a $\psi-$ or ϕ-mixing stationary process with a countable state space $\mathcal{A}$ where for a fixed pair of sequences $\xi, \eta \in \mathcal{A}^{\mathbb{N}}$ we count the number $\mathcal{N}_{\xi,\eta}(n, m)$ of i's for which $(X_i, X_{i+1}, \ldots, X_{i+n-1})$ coincides with $(\xi_0, \xi_1, \ldots, \xi_{n-1})$ until the first j for which $(X_j, X_{j+1}, \ldots, X_{j+m-1})$ coincides with $(\eta_0, \eta_1, \ldots, \eta_{n-1})$. It turns out that for almost all pairs ξ, η if ratios of probabilities of cylinder sets $[\xi_0, \ldots, \xi_{n-1}]$ and $[\eta_0, \ldots, \eta_{m(n)-1}]$ converges as $n, m(n) \to \infty$, then $\mathcal{N}_{\xi,\eta}(n, m(n))$ tends in distribution to a geometric random variable. Motivations, connections, and several generalizations of these results will be discussed as well.