

## Probability in Analysis — Heat kernel and transition density function

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**摘要:** There is a rich and fruitful interplay between analysis and probability theory. In this series of three lectures, I will present a sample of these. These talks are aimed at the general audience and will be given independently of each other.

**系列讲座一:** Heat kernel and transition density function

Transition density function of a Markov process is the fundamental solution, also called heat kernel, of its infinitesimal generator in analysis. In this talk, I will explain how the probabilistic insights can help in the study of heat kernels in the context of cylindrical fractional Laplacians. These non-local operators are the infinitesimal generators of cylindrical  $\alpha$ -stable processes, which are Levy processes on  $\mathbb{R}^d$  whose coordinate processes are independent copies of one-dimensional  $\alpha$ -stable processes. They have many distinct properties from that of isotropic fractional Laplacians. I will discuss the geometric characterization of an open subset  $D$  so that the Dirichlet heat kernels  $p_D(t, x, y)$  on  $D$  are strictly positive. I will further present results on the properties of  $p_D(t, x, y)$  including its regularity as well as the sharp two-sided bounds on  $C^{1,1}$  open set  $D$ .

**个人简介:** 美国华盛顿大学（西雅图）数学系终身教授，分别于2007年和2014年当选为美国数理统计学会会士和美国数学学会会士。主要从事概率论及随机过程的研究，主要研究方向包括马尔可夫过程和狄氏空间理论、位势理论、随机微分方程、扩散过程、稳定过程以及偏微分方程中的概率方法等。现（曾）担任国际著名期刊Potential Analysis的主编以及AOP、AAP、SPA、EJP、JTP、PAMS等期刊编委，2019年荣获伊藤奖 (Itô Prize)。出版专著一部，在JEMS、MAMS、Math. Ann.、Adv. Math.、CMP、AOP、PTRF、TAMS、JFA等顶尖期刊发表论文近200篇。

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