

Probability in Analysis——Boundary Harnack principle for non-local operators

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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.

系列讲座三: Boundary Harnack principle for non-local operators

The classical boundary Harnack principle asserts that two positive harmonic functions that vanish on a portion of the boundary of a smooth domain decay at the same rate. It is well known that scale invariant boundary Harnack inequality holds for Laplacian Δ on uniform domains and holds for fractional Laplacians Δ^s on any open sets. It has been an open problem whether the scale-invariant boundary Harnack inequality holds on bounded Lipschitz domains for Levy processes with Gaussian components such as the independent sum of a Brownian motion and an isotropic stable process (which corresponds to $\Delta + \Delta^s$).

In this talk, after a gentle introduction of boundary Harnack inequality and some of its history, I will present a necessary and sufficient condition for the scale-invariant boundary Harnack inequality to hold for a class of non-local operators on metric measure spaces through a probabilistic consideration. This result will then be applied to give a sufficient geometric condition for the scale-invariant boundary Harnack inequality to hold for subordinate Brownian motion on bounded Lipschitz domains in Euclidean spaces. This condition is almost optimal and a counterexample will be given showing that the scale-invariant BHP may fail on some bounded Lipschitz domains with large Lipschitz constants.

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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