Optimal Gradient Estimates of Solutions to the Insulated Conductivity Problem in Dimension Greater than Two

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ABSTRACT
We study the insulated conductivity problem with inclusions embedded in a bounded domain in $\mathbb{R}^n$. The gradient of solutions may blow up as $\varepsilon$, the distance between inclusions, approaches to 0. It was known that the optimal blow up rate in dimension $n = 2$ is of order $\varepsilon^{-1/2}$. It has recently been proved that in dimensions $n \geq 3$, an upper bound of the gradient is of order $\varepsilon^{-1/2 + \beta}$ for some $\beta > 0$. On the other hand, optimal values of $\beta$ have not been identified. In this paper, we prove that when the inclusions are balls, the optimal value of $\beta$ is $\left[\frac{1}{2}(n - 1) + \sqrt{(n - 1)^2 + 4(n - 2)}\right]/4 \in (0.1/2)$ in dimensions $n \geq 3$.

This is a joint work with Hongjie Dong and Zhuolun Yang.

BIOGRAPHY
Professor Yanyan Li is a Distinguished Professor at Rutgers University, and the Director of The Center for Nonlinear Analysis. He received the B.S. degree from University of Science and Technology of China in 1982, the M.S. from Institute of Systems Science, Academia Sinica in 1983, and the Ph.D. degree from Courant Institute of Mathematical Sciences, New York University in 1988. His main research interest is in nonlinear partial differential equations and applications. Professor Li was an invited speaker at the International Congress of Mathematicians in 2002, and has been a member of the Inaugural Class of Fellows of the American Mathematical Society since 2012. He was an Alfred P. Sloan Research Fellow in 1993–1995, a Simons Fellow in Mathematics and Theoretical Physics in 2020, and received the Rutgers Board of Trustees Award for excellence in Research in 2008. He is a member of the editorial board of Advances in Mathematics, among several other academic journals.

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Date: 15 December 2021 (Wednesday)
Time: 10am – 11am (HK Time)
Venue: Online via Zoom
Meeting link: https://polyu.hk/zHDzm

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