



北京理工大学

数学与统计学院学术报告

Multi-scale analysis for multilinear operators

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报告人简介： 曹明明，哈尔滨工业大学数学研究院教授，博士生导师，国家级高层次青年人才。2018年毕业于北京师范大学，2019-2025年先后在西班牙国家科学院从事博士后工作和研究员(tenure track)，并获西班牙 Juan de la Cierva-Formacion (2018)与Ramon y Cajal (2021)科研基金。主要研究领域包括调和分析、偏微分方程、几何测度论，现已发表30多篇论文，包括Adv. Math, Math Ann, Trans. AMS, JFA等国际知名期刊。

摘要： We develop a unified multi-scale framework for sparse domination of multilinear operators beyond the multilinear Calder\{'o\}n--Zygmund theory. More precisely, under mild hypotheses on a support condition, weak type and restricted strong type uniform bounds for finite partial sums, and single-scale improving and regularity estimates, we establish $(r_1, \ldots, r_m, s)$ -sparse form bound for a family of localized m -linear operators uniformly over all finite partial sums. This sparse bound yields weighted norm inequalities for the corresponding multilinear Muckenhoupt classes $A_{\{\vec{p}, (\vec{r}, s)\}}$, including the quasi-Banach range. As applications, we determine the optimal open sparse range for multilinear rough singular integrals, and characterize sparse domination for bilinear pseudo-differential operators. Further applications include sparse bounds for bilinear oscillatory Fourier multipliers, bilinear spherical maximal operators, and bilinear Bochner--Riesz means.