深圳北理莫斯科大学
УНИВЕРСИТЕТ МГУ-ППИ В ШЭНЬЧЖЭНЕ
SHENZHEN MSU-BIT UNIVERSITY

应用数学讲座

Научный Семинар по Прикладной Математике
Research Seminar on Applied Mathematics

应用数学报告（87）

报告人 / Докладчик / Speaker: 王凯 讲师（Central South University）

题目 / Название / Title: High-order time-stepping schemes for semilinear subdiffusion equations

时间 / Время / Time：6 Nov. 2023, 10:00-12:00， 14:00-17:00

地点 / Место / Venue: 腾讯会议（会议号：820-492-031）

摘要 / Аннотация / Abstract:

In this talk, we aim to develop and analyze high-order time stepping schemes for approximately solving semilinear subdiffusion equations. We apply the convolution quadrature generated by k-step backward differentiation formula (BDFk) to discretize the time-fractional derivative with order $\alpha > (0, 1)$ and modify the starting steps in order to achieve optimal convergence rate. This method has already been well-studied for the linear fractional evolution equations in Jin, Li, and Zhou [SIAM J. Sci. Comput., 39 (2017), pp. A3129--A3152], while the numerical analysis for the nonlinear problem is still missing in the literature. By splitting the nonlinear potential term into an irregular linear part and a smoother nonlinear part and using the generating function technique, we prove that the convergence order of the corrected BDFk scheme is $O(\tau min(k,1+2\alpha −\epsilon))$ without imposing further assumption on the regularity of the solution. Numerical examples are provided to support our theoretical results.

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王凯讲师简介：

Kai Wang is a lecturer in School of Mathematics and Statistics of Central South University. Before joining Central South University, he was a postdocral fellow in Southern University of Science and Technoloty from 2020 to 2022. He received PhD degree in 2020 from the Hong Kong Polytechnic University. His current research focus on highly accurate numerical schemes of time-dependent parabolic equations, especially discrete schemes in time. His publications are in SIAM Journal on Numerical Analysis, Journal of Scientific Computing, among others.