



復旦大學  
FUDAN UNIVERSITY

Applied Math  
Ph.D. Seminar

## A BDF-Spectral Method for Nonlocal PDEs With Long Time Delay

**Speaker:** Shuxun Shi (Fudan University)

**Time:** 2025-03-06, 16:10 to 17:00

**Location:** Rm 1801, Guanghai East Tower

**Advisor:** Wenbin Chen (Fudan University)

**Abstract:** In this talk, a numerical method for a class of nonlocal PDEs with long time delay is designed. The system involves a variable on  $\Omega \times \mathbb{R} \times \mathbb{R}^+$ , in which case for  $\Omega \subset \mathbb{R}^d$ , a  $(d+2)$ -dimensional problem is to be solved numerically, which is challenging, especially for  $d = 2$  or  $d = 3$ . In this talk, we propose an effective numerical method: BDF schemes and Fourier spectral method are applied for time and space discretization respectively, and the long time delay term is treated by Laguerre spectral method. The unique solvability of the numerical schemes is proved, and the energy upper bound of the numerical solution for the long time is given by energy estimation. By applying the generalized Laguerre orthogonal projection, we obtain the error estimate within finite final time for the fully discretization. We present some numerical experiments to verify the energy bound and convergence order. Also, examples are given to show how the solutions evolve and approach the global attractor.