THE UNIVERSITY OF HONG KONG

Institute of Mathematical Research
Department of Mathematics

Numerical Analysis Seminar

Can hyperinterpolation part with quadrature exactness?

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Abstract We discuss the approximation of continuous functions on the unit sphere by spherical polynomials of degree n via hyperinterpolation. Hyperinterpolation of degree n is a discrete approximation of the L2-orthogonal projection of degree n with its Fourier coefficients evaluated by a positive-weight quadrature rule that exactly integrates all spherical polynomials of degree at most 2n. This talk aims to bypass this quadrature exactness assumption by replacing it with the Marcinkiewicz--Zygmund property. Consequently, hyperinterpolation can be constructed by a positive-weight quadrature rule--not necessarily with quadrature exactness. This scheme is called unfettered hyperinterpolation. We provide a reasonable error estimate for unfettered hyperinterpolation. The error estimate generally consists of two terms: a term representing the error estimate of the original hyperinterpolation of full quadrature exactness and another introduced as compensation for the loss of exactness degrees. A guide to controlling the newly introduced term in practice is provided. In particular, if the quadrature points form a quasi-Monte Carlo design, then there is a refined error estimate. Numerical experiments verify the error estimates and the practical guide.

Date:	April 9, 2025 (Wednesday)
Time:	11:00 am – 12:00 noon
Venue:	ZOOM: https://hku.zoom.us/j/ Meeting ID: 913 6532 3891 Password: 310656

All are welcome