Numerical Analysis (2023)

Instructor: Tiejun Li (Professor of Math, PKU)

Required Background: Mathematical analysis, linear algebra and ODEs. Elementary probability is also preferred.

Outline

Lect01 Introduction
Lect02 Lagrange Interpolation and Newton's Formula
Lect03 Cubic and B-Splines
Lect04 Least Squares Approximation
Lect05 Uniform Approximation
Lect06 Special Topics: ENO, Sparse Grid, Neural Network
Lect07 Numerical Quadrature
Lect08 Error Analysis, Gaussian Quadrature
Lect09 Special Topics: Spectral Accuracy, Adaptivity
Lect10 Multidimensional quadrature, Numerical Differentiation
Lect11 Monte Carlo Integration: Basics
Lect12 Metropolis Algorithm
Lect13 Numerical Solution of Nonlinear Equation: Scalar
Lect14 Numerical Solution of Nonlinear Equations: System
Lect15 Fast Fourier Transform: Basics
Lect16 Fast Fourier Transform: Applications
Lect17 Fast Gauss Transform
Lect18 Numerical ODEs: Background and Basics
Lect19 Numerical Stability and Convergence Theory
Lect20 Runge-Kutta Methods
Lect21 Stiff and Multiscale ODEs
Lect22 Symplectic Methods and Boundary Value Problems
Lect23 Introduction to Numerical Software Development