Numerical Analysis (2018)

Instructor: Tiejun Li (Professor of Math, PKU)

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

Outline

Lect 01 Introduction
Lect02 Lagrange Interpolation and Newton’s Formula
Lect03 Cubic and B-Splines
Lect04 Uniform Approximation
Lect05 Least Squares Approximation
Lect06 Special Topics: ENO, Rational Approximation

Uncovered: Manifold Learning, Compressed Sensing, Wavelets

Lect07 Numerical Quadrature
Lect08 Error Analysis, Gaussian Quadrature
Lect09 Special Topics 1: Spectral Accuracy, Adaptivity
Lect10 Special Topics 2: Sparse Grid, Numerical Differentiation
Lect11 Monte Carlo Integration: Basics
Lect12 Generation of RVs and Variance Reduction
Lect13 Metropolis Algorithm
Lect14 Numerical Solution of Nonlinear Equation: Scalar
Lect15 Numerical Solution of Nonlinear Equations: System
Lect16 Fast Fourier Transform: Basics
Lect17 Fast Fourier Transform: Applications
Lect18 Fast Gauss Transform and Fast Multipole Method
Lect19 Numerical ODEs: Background and Basics
Lect20 Numerical Stability and Convergence Theory
Lect21 Runge-Kutta Methods
Lect22 Stiff and Multiscale ODEs
Lect23 Symplectic Methods and Boundary Value Problems