An Introduction to Approximation Theory

1. Introduction and Preliminary Observation
   • Norms, Convexity, Strict Convexity, Uniform Convexity
2. Weierstrass Theorem and Bernstein Polynomial
   • Weirestrass Theorem and the Bernstein Constructive proof of convergence
3. Best Uniform Approximation
   • Sufficient Conditions for Uniqueness of the Best Approximation, Characterization of the Best Approximation in the Uniform Norm, Jackson Theorems and It’s Applications
4. Interpolation and Optimal Approximation
   • Optimal interpolation and Chebyshev polynomials
5. Best Approximation in $L_2$-norm and Orthogonal Polynomials
   • Orthogonal Polynomials and Best $L_2$ Approximation, Trigonometric Approximation
6. Properties of orthogonal polynomials
   • Orthogonal polynomials and it’s applications in best $L_2$ approximation
7. Best $L_1$-norm Approximation
   • Existence and Uniqueness of the best approximation in $L_1$ norm
8. Piecewise Polynomials and Spline Theory
   • Interpolation and approximation using splines
9. High Dimensional Interpolation and Approximation using Radial Basis Functions
   • Radial basis functions and interpolation in higher dimension
10. Compressed Sensing and Best $k$-term Approximation
    • Introduction to CS and Best $k$-term approximation
References:

- and some recent papers.