Math 590 – Meshfree Methods

Course Description from Bulletin: Fundamentals of multivariate meshfree radial basis function and moving least squares methods; applications to multivariate interpolation and least squares approximation problems; applications to the numerical solution of partial differential equations; implementation in Matlab. (3-0-3)

Enrollment: Advanced graduate course in computational mathematics. Also suitable for graduate students in other (engineering) departments.

Textbook(s): G. Fasshauer, *Meshfree Approximation Methods with Matlab*, Lecture Notes, IIT, 2005.

Other required material:

Prerequisites: Some exposure to computational mathematics and advanced analysis, consent of the instructor

Objectives:
1.

6. Fast Algorithms   5
   a. Fast Fourier Transform for Non-uniform Data
   b. Partition of Unity Methods and Approximation of Point Cloud Data in R^3
   c. Residual Iteration
   d. Adaptive Iteration
   e. Fast Multipole-type Algorithms
7. Preconditioning Techniques   3
8. Generalized Hermite Interpolation   2
9. Solution of Partial Differential Equations   8
   a. Elliptic PDEs via RBF Collocation
   b. RBF-Pseudospectral Methods for Time-Dependent PDEs

Assessment:

Homework	10-30%
Computer Programs/Project	10-20%
Quizzes/Tests	20-50%
Final Exam	30-50%

Syllabus prepared by: Greg Fasshauer and Xiaofan Li
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