

Splines and Fractals in Approximation and Interpolation Theory

Overview

Splines and fractals share the same basic ideas, namely the approximation and interpolation of mathematical or natural objects by means of fundamental building blocks or, equivalently, by classes of functions with certain desirable properties reflecting the nature of the object that is to be modeled. The course supplements the classical theory of splines by fractal interpolation and in this synthesis reveals several beautiful and deep underlying relationships.

This course consists of three parts. In the first part, the main aspects of the classical approximation and interpolation theory of univariate splines are presented. Emphasis is put on polynomial and exponential splines and their properties, as well as their associated B-splines. The second part deals with the construction of fractal sets and the concept of fractal interpolation. Approximation and interpolation techniques and properties are exhibited. This includes the recently developed theory of local fractal interpolation and fractal elements, so called fractels. In the third part, focus is placed on the connections between splines and fractals, their commonalities, and their underlying multiscale structure.

Course participants will learn these topics through lectures, assignments, and self-studies. These will be shared to stimulate research motivation of participants, and benefit of the subject in industries. The course contents are based on original research publications, the textbook *Interpolation and Approximation with Splines and Fractals*, and the new second edition of the research monograph *Fractal Functions, Fractal Surfaces, and Wavelets*.

Dates for the Course	15th July, 2016 to 29th July, 2016
Host Institute	IIT Madras
No. of Credits	2
Maximum No. of Participants	40
You Should Attend If...	<ul style="list-style-type: none">▪ You are a mathematician interested in the classical and modern aspects of approximation and interpolation theory.▪ You are an engineer or physicist interested in learning how a synthesis of splines and fractals can be used and applied in your profession.▪ You are a student or faculty from an academic institution interested in learning how to do research in approximation and interpolation theory based on splines or fractals or to employ these concepts in your future work.▪ You are an engineer/scientist working in signal/Image processing or computer graphics.
Course Registration Fees	<p>The participation fees for taking the course is as follows:</p> <p>Student Participants: Rs.2000 Faculty Participants: Rs.5000 Government Research Organization Participants: Rs. 8000 Industry Participants: Rs.10000</p> <p>The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges. The participants may be provided with hostel accommodation, depending on the availability, on payment basis.</p>

Course Faculty



PD Dr. Peter Massopust is in the faculty of the Centre of Mathematics at the Technische Universität München, Germany. His research interests include fractal geometry, harmonic analysis, splines, and approximation and interpolation theory. He worked in academia, research laboratories, and industry, and published two research monographs and one textbook on fractals, splines and wavelets.



Dr. Arya Kumar Bedabrata Chand is an Associate Professor of Indian Institute of Technology, Madras. His research interests are Fractal Functions, Fractal Approximation, Wavelets and Computer Aided Geometric Design. Recently, his research group has introduced shape preserving fractal splines/surfaces in the literature.

Course Coordinator

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