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Institute of Mathematics

Numerical Fourier Analysis

Winter semester 2018/19 (2 SWS V)

Contents of the lecture:

Fourier methods are fundamental tools for computing the frequency representation of signals. They play a central role in mathematical physics and digital signal processing. First of all, essential properties of Fourier series (of periodic functions) and of Fourier transforms (of nonperiodic functions) are presented. The numerical realizations of Fourier methods lead to discrete Fourier transforms (of vectors) and corresponding fast algorithms, the so-called fast Fourier transforms.
A script of this lecture will be available. This lecture is based on a monograph of G. Plonka (U Göttingen), D. Potts (TU Chemnitz), G. Steidl (TU Kaiserslautern), and me which will be published 2019 by Springer/Birkhäuser.

Outline of the lecture:

1. Fourier series
2. Fourier transforms
3. Discrete Fourier transforms
4. Fast Fourier transforms

References:

G. Steidl & M. Tasche, Schnelle Fouriertransformationen – Theorie und Anwendungen, FernUniversität Hagen, 1996.
G.P. Tolstov, Fourier Series, Dover Publications, New York, 1976.
R. Bhatia, Fourier Series, Cambridge University Press, Cambridge, 2005.
W.L. Briggs & V.E. Henson, The DFT. An Owner's Manual for the Discrete Fourier Transform, SIAM, Philadelphia, 1995.
C. Van Loan, Computational Frameworks for the Fast Fourier Transform, SIAM, Philadelphia, 1992.
G.B. Folland, Fourier Analysis and its Applications, Brooks/Cole Publishing Company, Pacific Grove, 1992.
M.A. Pinsky, Introduction to Fourier Analysis and Wavelets, AMS, Providence, 2002.

This lecture will start on Wednesday, 17.10.18, at 15.15 in SR I, Institute of Physics, A.-Einstein-Str. 24.