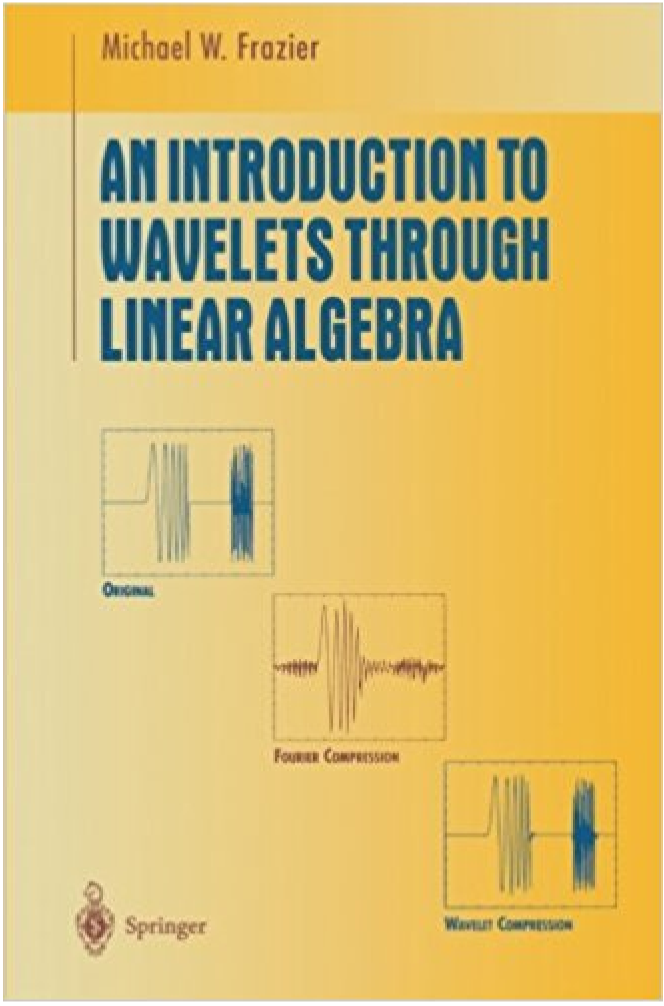
An Introduction To Wavelets Through Linear Algebra (Undergraduate Texts In Mathematics)



Synopsis

Mathematics majors at Michigan State University take a "Capstone" course near the end of their undergraduate careers. The content of this course varies with each offering. Its purpose is to bring together different topics from the undergraduate curriculum and introduce students to a developing area in mathematics. This text was originally written for a Capstone course. Basic wavelet theory is a natural topic for such a course. By name, wavelets date back only to the 1980s. On the boundary between mathematics and engineering, wavelet theory shows students that mathematics research is still thriving, with important applications in areas such as image compression and the numerical solution of differential equations. The author believes that the essentials of wavelet theory are sufficiently elementary to be taught successfully to advanced undergraduates. This text is intended for undergraduates, so only a basic background in linear algebra and analysis is assumed. We do not require familiarity with complex numbers and the roots of unity.

Book Information

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Customer Reviews

I used this book for my first course in wavelets. Professor Frazier did a nice job bringing the material down to the undergrad by not starting off in hilbert space. He motivates it through linear algebra (for which the first chapter is an excellent review of the basics!). My only complaint is that the notation gets a bit overwhelming starting in chapter 3 (though I dont' know if I could come up with a better way to do it; just my experience). If you're looking into the subject, check out this book. It'll get you going in the right direction.

i use this book in order to write my bachelor thesis, it is great, very dynamic, and with a lot of examples and exercises.It also has an excellent walk through from linear algebra to wavelets, giving a more understanding point of view of this signal analysis tool.

I consider this one of the best books on both Fourier and wavelet theory. The introduction on linear algebra is very clear and the presence of multiple exercises makes the book ideal for professors and students. Before passing to more complicated and complete books as, e.g., Mallat's, I strongly suggest to study this one.

While I don't consider myself a math expert, I have certainly had to navigate my way through undergrad level math texts on more than a few occasions. In preparation for this book, I re-read Strang's "Linear Algebra and Its Applications" (an excellent text) and felt confident that I should be able to assimilate the material from this book. From the outset, the order of presentation of material in this book seemed promising: start with a review of Linear algebra and complex numbers, continue with Discrete Fourier Transforms, and then develop discrete wavelet transforms followed by continuous wavelet transforms.Unfortunately, in spite of a promising game plan, this book serves to obscure the subject rather than providing a accessible introduction. The writing style is very terse and takes the reader through Lemma after Lemma without much in the way of explaining the motivation of these theorems or providing connecting narratives. The the reader is required to assimilate numerous disconnected mathematical ideas before a attempt is made to pull together the main ideas. And when the main points are developed, the treatment is uneven and generally too sparse. The only illustrations in this book come from MatLab or some other wavelet software package and there is a lack of conceptually oriented diagrams found in other types of text books.Overall this book seems to be a compilation of material drawn from various sources and "sewn" together with mathematical proofs. Rather than focus on the main problems that wavelets are supposed to address (namely temporal and spatial localization) and develop the mathematics from that perspective, the emphasis on Lemmas and proofs drowns the reader in too much detail too fast. While this book may be a good supplement with other material, I found that this book too tedious to read and is a poor introduction to the subject without the benefit of a good instructor.

Wavelet theory is one of the newest branches of mathematics, originally emerged from the broader harmonic analysis, but now making its own way because of its multiple applications.There are several possible approaches to the subject, but maybe this one is both the easiest and the best one. Modern analysis relies more and more on operator theory (linear algebra in infinite-dimensional spaces) so this approach fits nicely in the overall framework of modern mathematics.This kind of introductory expositions are essential for a subject to get widespread, and this one really deserves full attention because by using these kind of techniques we are now able to solve better a lot of problems involving pulses, signals, oscillations, etc. Right, this is achieved normally using Fourier methods, but mathematics has improved a lot since the times of Fourier, and now we know that classical Fourier analysis is not always suitable for our particular needs. Wavelet analysis provides a means for constructing a specific Fourier-like method to solve our problem according to its intrinsic nature.Contents: Prologue: Compression of the FBI Fingerprint Files; Background: Complex Numbers and Linear Algebra; The Discrete Fourier Transform; Wavelets on Z_N; Wavelets on Z; Wavelets on R; Wavelets and Differential Equations.Originally intended for undergrads, but useful as a more advanced reference. Includes full explanations and lots of excercises. Extensive bibliography. Nice hardbound (as usual in Springer).

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