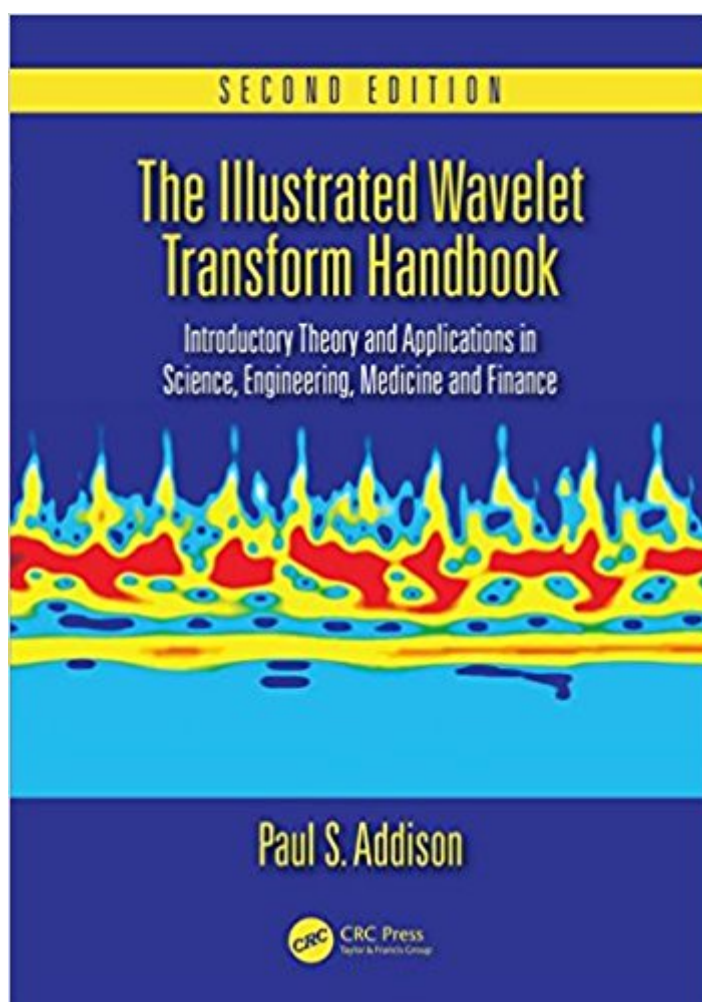


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# The Illustrated Wavelet Transform Handbook: Introductory Theory And Applications In Science, Engineering, Medicine And Finance, Second Edition





## Synopsis

This second edition of *The Illustrated Wavelet Transform Handbook: Introductory Theory and Applications in Science, Engineering, Medicine and Finance* has been fully updated and revised to reflect recent developments in the theory and practical applications of wavelet transform methods. The book is designed specifically for the applied reader in science, engineering, medicine and finance. Newcomers to the subject will find an accessible and clear account of the theory of continuous and discrete wavelet transforms, while readers already acquainted with wavelets can use the book to broaden their perspective. One of the many strengths of the book is its use of several hundred illustrations, some in colour, to convey key concepts and their varied practical uses. Chapters exploring these practical applications highlight both the similarities and differences in wavelet transform methods across different disciplines and also provide a comprehensive list of over 1000 references that will serve as a valuable resource for further study. Paul Addison is a Technical Fellow with Medtronic, a global medical technology company. Previously, he was co-founder and CEO of start-up company, CardioDigital Ltd (and later co-founded its US subsidiary, CardioDigital Inc) - a company concerned with the development of novel wavelet-based methods for biosignal analysis. He has a master's degree in engineering and a PhD in fluid mechanics, both from the University of Glasgow, Scotland (founded 1451). His former academic life as a tenured professor of fluids engineering included the output of a large number of technical papers, covering many aspects of engineering and bioengineering, and two textbooks: *Fractals and Chaos: An Illustrated Course* and the first edition of *The Illustrated Wavelet Transform Handbook*. At the time of publication, the author has over 100 issued US patents concerning a wide range of medical device technologies, many of these concerning the wavelet transform analysis of biosignals. He is both a Chartered Engineer and Chartered Physicist.

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## Customer Reviews

"Paul Addison has written a masterfully clear and readable primer on wavelet analysis methods and their many uses in science and engineering. His mathematical expressions are elegant and useful. This book was indispensable to me as I worked to apply wavelet analysis to the radial structure of Saturn's rings. I am excited now to see this second edition appear with an extensively updated discussion of how wavelet methods are being used across a wide variety of disciplines." Matthew S. Tiscareno, Senior Research Scientist, SETI

Institute, California "Everything you want to know about wavelets in one book from the inception of the wavelet transform to its widespread application across the World of Science! This 2nd edition of The Illustrated Wavelet Transform Handbook contains additional details about theoretical aspects of continuous and discrete wavelet transforms and provides state-of-the-art examples of wavelet applications. The numerous illustrations that the book contains make complex wavelet concepts accessible to university students and practitioners across many fields like astronomy, engineering, finance, geophysics and medicine." Mathieu J. Duchesne, Research Geoscientist, Geological Survey of Canada "Being familiar with the basic concepts and tools provided by wavelet methods is essential for those working with time-frequency analysis of signals. Therefore, this completely revised and enlarged second edition of The Illustrated Wavelet Transform Handbook will be invaluable for students and professionals working in the natural sciences, in particular in engineering and biomedicine, who wish to analyse and interpret complex time-series without delving into too much mathematical depth. The book is clearly written and, due to a multitude of graphical representations and illustrative real-life examples, it is easy to understand the basic ideas of the different wavelet techniques. This 2nd edition contains interesting new material; for example, exploring the testing and monitoring of engineering structures, in addition to damage detection and control, and an analysis of biomedical time-series. These discussions reflect the expertise the author has gained working in a global medical device company. This comprehensive treatise on the wavelet transform is, therefore, highly recommended." Dr. Maria Haase, formerly of the Institut für Hochleistungsrechnen, Universität Stuttgart "This second edition of The Illustrated Wavelet Transform Handbook treats the reader to a

beautifully balanced coverage of its field. The theory behind wavelets is presented thoroughly for both continuous and discrete wavelet transforms, enabling the reader easily to gain a firm understanding of the theoretical underpinning of what can be a somewhat daunting mathematical concept for newcomers. These two chapters alone would make the book a highly valuable resource for students and researchers wanting to gain a thorough understanding of the field; however, there then follow four further chapters that illustrate how wavelets have been used in an enormously wide range of contexts. The applications cover an astonishing variety of topics and the inclusion of them all within a single volume should encourage the reader to explore how techniques with which they might be familiar have been exploited in contexts with which they are unfamiliar. This book is thus not just a valuable textbook for students, but a highly useful resource for anybody working (or wanting to work) in the field of wavelet analysis. It should be the first point of reference in its field.

— Stephen Payne, Associate Professor in Biomedical Engineering, University of Oxford

"Wavelets are now a developed powerful tool in data analysis used in many disciplines to gain insights into complex phenomena. This book provides not only an excellent fundamental guide to the mathematical basis of wavelet transforms but more importantly a thorough presentation on their application and interpretation. Graphical representation is ever more important in the analysis and interrogation of large data sets hence the author's emphasis on an illustrated enunciation.

The first edition of the book was the reference most consulted personally and recommended to students and colleagues alike and the second edition will undoubtedly be more so.

— Paul Brandner, Cavitation Research Laboratory, University of Tasmania, Australia

Praise for the First Edition: "The book works on two levels: it is an excellent introduction for readers new to wavelet transforms, and it is a useful source of information and some inspiration to anyone who has been working in the field for some time. The book presents the field in an authoritative way but not too deeply. It has been designed as an overview and introduction to this dynamic area of computational analysis, and it achieves this with complete success. To conclude, I found this a thought provoking book on a fascinating subject: in fact once into the text I found it hard to put down."

— Dr. K.O. Jones, *Measurement+Control*, Vol. 36/7, Sept. 2003 "The book is extremely well put together and lavishly illustrated (as one might infer from the title). I

largely enjoyed reading this book and I strongly recommend it to anyone with an interest in wavelets, or in the general field of signal processing for that matter.

— Keith Worden, *Journal of Sound and Vibration*, 274 (2004) 1135-1136

The book is very much 'figure driven' and they are extremely useful for illustrating the mathematics and conveying the concepts in an uncomplicated matter an

eminently readable style in motivating and explaining wavelets throughout the course. This book, written as it is in a simple, forthright, and stimulating manner with balanced blend will prove a worthy addition to the understanding of wavelet transforms across disciplines." Guruprasad Madhavan, Stony Brook Heart Center, IEEE-EMBS "The book provide[s] the reader with an overview of theory and practical applications of wavelet transforms methods, a new time-frequency decomposition tool for data analysis. The book can be recommended to the people interested above all in applications in science, engineering, medicine, finance, or elsewhere. An account of the theory of continuous and discrete wavelet transforms, with a large number of examples of their use across a wide range of disciplines, is convenient both for newcomers to the subject and readers already acquainted with wavelets methods working in particular area of application." Miloslav Duchori "Illustrations really do help in understanding wavelet transforms. It might be taken for granted that illustrations can aid in the understanding of a subject matter as this, but there is sound logical reasoning behind this claim that makes it especially true for this particular subject matter and also a great motivation for the text. This handbook goes the distance and shows that wavelet transforms are powerful data analysis tools that readily lend themselves to intuitive visual analysis and graphical representation, both of which can be critical to correct analysis in practice." Raymond Martin

Paul S. Addison is a technical fellow who currently runs the R&D Department at Covidien.

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