



Fundamentals of Music Processing: Audio, Analysis, Algorithms, Applications

By Meinard Müller

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This textbook provides both profound technological knowledge and a comprehensive treatment of essential topics in music processing and music information retrieval. Including numerous examples, figures, and exercises, this book is suited for students, lecturers, and researchers working in audio engineering, computer science, multimedia, and musicology.

The book consists of eight chapters. The first two cover foundations of music representations and the Fourier transform?concepts that are then used throughout the book. In the subsequent chapters, concrete music processing tasks serve as a starting point. Each of these chapters is organized in a similar fashion and starts with a general description of the music processing scenario at hand before integrating it into a wider context. It then discusses?in a mathematically rigorous way?important techniques and algorithms that are generally applicable to a wide range of analysis, classification, and retrieval problems. At the same time, the techniques are directly applied to a specific music processing task. By mixing theory and practice, the book's goal is to offer detailed technological insights as well as a deep understanding of music processing applications. Each chapter ends with a section that includes links to the research literature, suggestions for further reading, a list of references, and exercises. The chapters are organized in a modular fashion, thus offering lecturers and readers many ways to choose, rearrange or supplement the material. Accordingly, selected chapters or individual sections can easily be integrated into courses on general multimedia, information science, signal processing, music informatics, or the digital humanities.

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Fundamentals of Music Processing: Audio, Analysis, Algorithms, Applications By Meinard Müller Bibliography

- Sales Rank: #488078 in Books
- Published on: 2015-07-27
- Original language: English
- Number of items: 1
- Dimensions: 9.21" h x 1.13" w x 6.14" l, .2 pounds
- Binding: Hardcover
- 487 pages



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Editorial Review

Review

“The book … covers a range of important and popular music processing topics, and strikes a balance between providing succinct and informative background theory and discussing applied examples in the context of real-world problem-solving. … Müller introduces the reader to analysis and processing techniques, algorithms and key underpinning theoretical concepts within the context of applied music analysis and processing tasks. … this is a very impressive book, and an excellent course in music processing.” (Don Knox, *Musicæ Scientiae*, Vol. 60 (2), June, 2016)

“If you are looking for a sound textbook in music analysis and music information retrieval, I would recommend this one. … The book may be used as a textbook at the postgraduate or advanced undergraduate levels in computational music science. It is also suitable for musicologists and researchers in music. Those with engineering backgrounds will find it easier to grasp. I enjoyed reading this book.” (Soubhik Chakraborty, *Computing Reviews*, March, 2016)

Review

“This is a massively impressive piece of work. Müller is meticulous in the way he has constructed this text book, and it is clear that it will serve both higher level taught students, like those on masters programmes, as well as researchers of all levels. In fact, I would say this will become a required bookshelf companion for every MIR researcher in the world. If I were to write a book, this would be it. Too late however, Müller just wrote it – and way better than I ever would have. … Müller has thought deeply about a subject he clearly cares about greatly. The result is a carefully constructed text built on secure theoretical foundations. It’s a must-have.” (Mark Sandler, Director of the Centre for Digital Music (C4DM) and Director of the EPSRC/AHRC CDT in media and arts technology (MAT), Queen Mary University of London, UK)

“This is a superb textbook for students in music processing and music information retrieval (MIR). It is particularly remarkable in presenting and discussing how numerous concepts introduced in related disciplines ranging from signal processing to musicology are applied or further developed in a number of well-chosen challenges in today’s MIR research. Very well written, with many illustrations, examples and exercises, this textbook is promised a huge success in the field and beyond.” (Gaël Richard, Head of the Signal and Image Processing Department, Télécom ParisTech, France)

“This book is a very informative introduction written by a world-class leading researcher, Meinard Müller, on the subject of music processing. I know that he has dedicated tremendous efforts and time to write this comprehensive book with consistent descriptions and many figures. I am especially impressed by the fact that this book is carefully designed so that it can be used from different views such as "A First Course in Music Processing", "Introduction to Fourier Analysis and Applications", and "Data Representations and Algorithms". I believe that this book will be one of the greatest contributions to promote our research field that has been called by various names such as music processing, music technologies, music information processing, music information retrieval, or music information research.” (Masataka Goto, Prime Senior Researcher, National Institute of Advanced Industrial Science and Technology (AIST), Japan)

"Music information retrieval (MIR) is quickly morphing from an emerging field to a well-established area of scholarship in music, computer science and engineering. As a result, MIR education, and in particular training on the algorithmic methods needed to extract high-level information from music audio, is becoming more mainstream, both as part of dedicated courses and as specific applications of a variety of concepts and techniques in science, technology, engineering and mathematics (STEM). In this context, "Fundamentals of Music Processing" is not only timely but also a much-needed resource to support MIR and STEM education both on and off the classroom. That it is written by one of the leading scholars in the field is an added bonus that brings the depth, comprehensiveness and pedagogy necessary to make the book informative and engaging to a multi-disciplinary audience at different stages of their learning process. If your interests lie at the intersection of music, sound and computation, I recommend this book as essential reading." (Juan Pablo Bello, Associate Professor, Music Technology, New York University, USA)

From the Back Cover

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