

Beyond Midi The Handbook Of Musical Codes

Modern technology and the development of user-centric applications have grown to encompass many of our everyday routines and interests. Such advances in music data management and information retrieval techniques have crossed the boundaries of expertise from researchers to developers to professionals in the music industry. **Intelligent Music Information Systems: Tools and Methodologies** provides comprehensive description and analysis into the use of music information retrieval from the data management perspective, and thus provides libraries in academic, commercial, and other settings with a complete reference for multimedia system applications.

The establishment of the Musical Instrument Digital Interface (MIDI) in the late 1980s allowed hobbyists and musicians to experiment with sound control in ways that previously had been possible only in research studios. MIDI is now the most prevalent representation of music, but what it represents is based on hardware control protocols for sound synthesis. Programs that support sound input for graphics output necessarily span a gamut of representational categories. What is most likely to be lost is any sense of the musical work. Thus, for those involved in pedagogy, analysis, simulation, notation, and music theory, the nature of the representation matters a great deal. An understanding of the data requirements of different applications is fundamental to the creation of interchange codes. The contributors to Beyond MIDI present a broad range of schemes, illustrating a wide variety of approaches to music representation. Generally, each chapter describes the history and intended purposes of the code, a description of the representation of the primary attributes of music (pitch, duration, articulation, ornamentation, dynamics, and timbre), a description of the file organization, some mention of existing data in the format, resources for further information, and at least one encoded example. The book also shows how intended applications influence the kinds of musical information that are encoded. Contributors David Bainbridge, Ulf Berggren, Roger D. Boyle, Donald Byrd, David Cooper, Edmund Correia, Jr., David Cottle, Tim Crawford, J. Stephen Dydo, Brent A. Field, Roger Firman, John Gibson, John Grande, Lippold Haken, Thomas Hall, David Halperin, Philip Hazel, Walter B. Hewlett, John Howard, David Huron, Werner Icking, David Jaffe, Bettye Krolick, Max V. Mathews, Toshiaki Matsushima, Steven R. Newcomb, Kia-Chuan Ng, Kjell E. Nordli, Sile O'Modhrain, Perry Roland, Helmut Schaffrath, Bill Schottstaedt, Eleanor Selfridge-Field, Peer Sitter, Donald Sloan, Leland Smith, Andranick Tanguiane, Lynn M. Trowbridge, Frans Wiering

Providing a representative selection of papers promoting synergies in the research community, this text includes papers on neural networks, computer vision, applications, machine learning, reasoning, planning and robotics, and multi-agent systems.

"This book offers a different approach to music by focusing on the information organization and the development of XML-based language, presenting a new set of tools for practical implementations, and a new investigation into the theory of music"---Provided by publisher.

The Rhythmic Voice in Rap Music

Machine Learning and Music Generation

Music Notation as Objects

An Introduction to Music Technology

Prospects, Proposals, and Realities

Structuring Music through Markup Language: Designs and Architectures

From its dynamic start at dance parties in the South Bronx in the late 1970s, hip hop and rap music have exploded into a dominant style of popular music in the United States and a force for activism and expression all over the world. So, too, has scholarship on hip hop and rap music grown. Yet much of this scholarship, employing methods drawn from sociology and literature, leaves unaddressed the expressive musical choices made by hip hop artists. Fundamental among these choices is the rhythm of the rapping voice, termed "flow." Flow presents unique theoretical and analytical challenges. It is rhythmic in the same way other music is rhythmic, but also in the way speech and poetry are rhythmic. For the first time, Mitchell Ohriner's Flow: The Rhythmic Voice in Rap Music reconciles approaches to key concepts of rhythm, such as meter, periodicity, patterning, and accent, treated independently across other branches of scholarship.

Ohriner theorizes flow by weaving between the methods of computational music analysis and humanistic close reading. Through the analysis of large collections of verses and individual tracks, the book addresses theories of rhythm, meter, and groove in the unique ecology of rap music. In a series of case studies in the second half, the work of Eminem clarifies how flow can relate to text, the work of Black Thought of The Roots clarifies how flow can relate to other instrumental streams, and the work of Talib Kweli clarifies how flow can relate to rap's persistent meter. While Ohriner focuses on rap music throughout the book, the methods he introduces will be useful for other musical genres that feature the voice freely interacting with a more rigid metric framework.

Music is much more than listening to audio encoded in someunreadable binary format. It is, instead, an adventure similar toreading a book and entering its world, complete with a story, plot,sound, images, texts, and plenty of related data with, forinstance, historical, scientific, literary, and musicologicalcontents. Navigation of this world, such as that of an opera, ajazz suite and jam session, a symphony, a piece from non-Westernculture, is possible thanks to the specifications of new standardIEEE 1599, IEEE Recommended Practice for Defining a CommonlyAcceptable Musical Application Using XML, which uses symbols inlanguage XML and music layers to express all its multimediacharacteristics. Because of its encompassing features, thisstandard allows the use of existing audio and video standards, aswell as recuperation of material in some old format, the events ofwhich are managed by a single XML file, which is human and machine-readable - musical symbols have been read by humans for at leastforty centuries. Anyone wanting to realize a computer application using IEEE 1599-- music and computer science departments, computer generated musicresearch laboratories (e.g. CCRMA at Stanford, CNMAT at Berkeley,and IRCAM in Paris), music library conservationists, music industryfrontrunners (Apple, TDK, Yamaha, Sony), etc. -- will need thisfirst book-length explanation of the new standard as areference. The book will include a manual teaching how to encode music withIEEE 1599 as an appendix, plus a CD-R with a video demonstratingthe applications described in the text and actual sampleapplications that the user can load onto his or her PC andexperiment with.

Susan Ella George addresses the computer recognition of music notation, its interpretation, and its use within various application contexts. Her book includes research in the field of image processing and pen-based computing, representation languages and Web-based applications.

Beyond MIDIThe Handbook of Musical CodesMIT Press

Interactive Multimedia Music Technologies

An Open Design for Computer-Aided Algorithmic Music Composition

Handbook of Research on Natural Computing for Optimization Problems

Internet of Things, Infrastructures and Mobile Applications

Structural, Syntactic, and Statistical Pattern Recognition

Music: A Mathematical Offering

Foundations and Applications

This best-selling book introduces you to the principles of sound, perception, audio technology and systems. Whilst offering vital reading for audio students and trainee engineers, this guide is ideal for anyone concerned with audio, sound and recording, beginners and professionals alike. Comprehensive and easy to understand, this fifth edition is bang up to date, with expanded information on digital well as an extensively updated chapter on MIDI and synthetic audio control.

The study of music is always, to some extent, "empirical," in that it involves testing ideas and interpretations against some kind of external reality. But in musicology, the kinds of empirical approaches familiar in the social sciences have played a relatively marginal role, being generally restricted to inter-disciplinary areas such as psychology and sociology of music. Rather than advocating a new kind of guide to empirical approaches that are ready for incorporation into the contemporary musicologist's toolkit. Its nine chapters cover perspectives from music theory, computational musicology, ethnomusicology, and the psychology and sociology of music, as well as an introduction to musical data analysis and statistics. This book shows that such approaches could play an important role in the only through the application of statistical and modeling methods to musical scores but also--and perhaps more importantly--in terms of understanding music as a complex social practice.

Compiled by the CROSSTALKS program for policy-probing scientific issues, this volume reflects on the meaning and impact of existing and future interfaces--and what the added value could be. Offering a broad analysis of the individual, social, and economic impacts that the next generation of interfaces will have, its unique interdisciplinary approach combines the perspectives of artists, academic

Musicians begin formal training by acquiring a body of musical concepts commonly known as musicianship. These concepts underlie the musical skills of listening, performance, and composition. Like humans, computer music programs can benefit from a systematic foundation of musical knowledge. This book explores the technology of implementing musical processes such as segmentation, pattern computer programs. It shows how the resulting applications can be used to accomplish tasks ranging from the solution of simple musical problems to the live performance of interactive compositions and the design of musically responsive installations and Web sites. Machine Musicianship is both a programming tutorial and an exploration of the foundational concepts of musical analysis, performance

are derived from the fields of music theory, computer music, music cognition, and artificial intelligence. The book will be of interest to practitioners of those fields, as well as to performers and composers.The concepts are programmed using C++ and Max. The accompanying CD-ROM includes working versions of the examples, as well as source code and a hypertext document showing how the c

Historical and Social Explorations

Designs and Architectures

Music Retrieval

Music Navigation with Symbols and Layers

Digital audio and MIDI principles

The Handbook of Musical Codes

Software Engineering

This book gathers papers on interactive and collaborative mobile learning environments, assessment, evaluation and research methods in mobile learning, mobile learning models, theory and pedagogy, open and distance mobile learning, life-long and informal learning using mobile devices, wearables and the Internet of Things, game-based learning, dynamic learning experiences, mobile systems and services for opening up education, mobile healthcare and training, case studies on mobile learning, and 5G network infrastructure. Today, interactive mobile technologies have become the core of many—if not all—fields of society. Not only do the younger generation of students expect a mobile working and learning environment, but also the new ideas, technologies and solutions introduced on a nearly daily basis also boost this trend. Discussing and assessing key trends in the mobile field were the primary aims of the 13th International Conference on Interactive Mobile Communication Technologies and Learning (IMCL2019), which was held in Thessaloniki, Greece, from 31 October to 01 November 2019. Since being founded in 2006, the conference has been devoted to new approaches in interactive mobile technologies, with a focus on learning. The IMCL conferences have since become a central forum of the exchange of new research results and relevant trends, as well as best practices. The book ’s intended readership includes policymakers, academics, educators, researchers in pedagogy and learning theory, schoolteachers, further education lecturers, practitioners in the learning industry, etc.

This unique reference book offers a holistic description of the multifaceted field of systematic musicology, which is the study of music, its production and perception, and its cultural, historical and philosophical background. The seven sections reflect the main topics in this interdisciplinary subject. The first two parts discuss musical acoustics and signal processing, comprehensively describing the mathematical and physical fundamentals of musical sound generation and propagation. The complex interplay of physiology and psychology involved in sound and music perception is covered in the following sections, with a particular focus on psychoacoustics and the recently evolved research on embodied music cognition. In addition, a huge variety of technical applications for professional training, music composition and consumer electronics are presented. A section on music ethnology completes this comprehensive handbook. Music theory and philosophy of music are imbedded throughout. Carefully edited and written by internationally respected experts, it is an invaluable reference resource for professionals and graduate students alike.

This book presents refereed and revised papers presented at GREC 2001, the 4th IAPR International Workshop on Graphics Recognition, which took place in Kingston, Ontario, Canada in September 2001. Graphics recognition is a branch of document image analysis that focuses on the recognition of two-dimensional notations such as engineering drawings, maps, mathematical notation, music notation, tables, and chemical structure diagrams. Due to the growing demand for both o?-line and on-line document recognition systems, the ?eld of graphics recognition has an excitingand promisingfuture. The GREC workshops provide an opportunity for researchers at all levels of experience to share insights into graphics recognition methods. The workshops enjoy strongparticipation from researchers in both industry and academia. They are sponsored by IAPR TC-10, the Technical Committee on Graphics Recog- tion within the International Association for Pattern Recognition. Edited v- umes from the previous three workshops in this series are available as Lecture Notes in Computer Science, Vols. 1072, 1389, and 1941. After the GREC 2001 workshop, authors were invited to submit enhanced versions of their papers for review. Every paper was evaluated by three reviewers. We are grateful to both authors and reviewers for their careful work during this review process. Many of the papers that appear in this volume were thoroughly revised and improved, in response to reviewers ’ suggestions.

In this thorough introduction to the technology behind audio workstations, Dr Francis Rumsey explains not only how digital audio works but also how to make best use of its capabilities. A combined revision of his two successful titles, MIDI Systems and Control and The Audio Workstation Handbook, this new book covers recent developments such as surround sound formats, direct stream digital, new audio project formats, new interfaces and alternatives to MIDI. Desktop Audio Technology begins by setting out principles of digital audio and how these are applied in recording, replay and editing within workstations. MIDI and synthetic audio control is then covered, looking at the means by which artificial sounds can be controlled and manipulated. This is followed by explanations of hardware, including storage devices, buses, computer interfaces and audio processing options. Dr Rumsey then focuses on transferring audio between systems, including coverage of audio interfaces, networking and file formats. The next section examines audio software, providing working examples of different commercial packages that exemplify some of the concepts previously described. The final chapter considers operational issues such as recent spatial reproduction formats, consumer format mastering and quality control issues, as well as troubleshooting and systems issues. If you are a student, lecturer or practitioner in the field of audio and are looking for an authoritative technical guide to the underlying principles of digital audio and MIDI, this book is for you. Dr Francis Rumsey is a Reader in Sound Recording at the University of Surrey (UK) and a Visiting Professor at the School of Music in Piteå (Sweden). He is a Fellow of the Audio Engineering Society and a regular contributor to the AES Journal. Dr Rumsey is also author of Spatial Audio and co-author of Sound and Recording (with Tim McCormick) and The Digital Interface Handbook (with John Watkinson), all published by Focal Press.

Artificial Intelligence Research and Development

Graphics Recognition. Algorithms and Applications

RILM Abstracts of Music Literature

Machine Musicianship

Implementation and Application of Automata

Let ’ s Calculate Bach

Revolutions in Music Education

This volume contains all papers presented at SSSPR 2002 and SPR 2002 hosted by the University of Windsor, Windsor, Ontario, Canada, August 6-9, 2002. This was the third time these two workshops were held back-to-back. SSSPR was the ninth International Workshop on Structural and Syntactic Pattern Recognition and the SPR was the fourth International Workshop on Statis- cal Techniques in Pattern Recognition. These workshops have traditionally been held in conjunction with ICPR (International Conference on Pattern Recog- tion), and are the major events for technical committees TC2 and TC1, resp- tively, of the International Association of Pattern Recognition (IAPR). The workshops were held in parallel and closely coordinated. This was an attempt to resolve the dilemma of how to deal, in the light of the progressive specialization of pattern recognition, with the need for narrow-focus workshops without further fragmenting the ?eld and introducing yet another conference that would compete for the time and resources of potential participants. A total of 116 papers were received from many countries with the submission and reviewingprocesses beingcarried out separately for each workshop. A total of 45 papers were accepted for oral presentation and 35 for posters. In addition four invited speakers presented informative talks and overviews of their research. They were: Tom Dietterich, Oregon State University, USA Sven Dickinson, the University of Toronto, Canada Edwin Hancock, University of York, UK Anil Jain, Michigan State University, USA SSSPR 2002 and SPR 2002 were sponsored by the IAPR and the University of Windsor.

Computational approaches to music composition and style imitation have engaged musicians, music scholars, and computer scientists since the early days of computing. Music generation research has generally employed one of two strategies: knowledge-based methods that model style through explicitly formalized rules, and data mining methods that apply machine learning to induce statistical models of musical style. The five chapters in this book illustrate the range of tasks and design choices in current music generation research applying machine learning techniques and highlighting recurring research issues such as training data, music representation, candidate generation, and evaluation. The contributions focus on different aspects of modeling and generating music, including melody, chord sequences, ornamentation, and dynamics. Models are induced from audio data or symbolic data. This book was originally published as a special issue of the Journal of Mathematics and Music.

"This book illustrates how interactive music can be used for valorizing cultural heritage, content and archives not currently distributed due to lack of safety, suitable coding, or conversion technologies. It explains new methods of promoting music for entertainment, teaching, commercial and non-commercial purposes, and provides new services for those connected via PCs, mobile devices, whether sighted or print-impaired"---Provided by publisher.

This volume presents the most up-to-date collection of neural network models of music and creativity gathered together in one place. Chapters by leaders in the field cover new connectionist models of pitch perception, tonality, musical streaming, sequential and hierarchical melodic structure, composition, harmonization, rhythmic analysis, sound generation, and creative evolution. The collection combines journal papers on connectionist modeling, cognitive science, and music perception with new papers solicited for this volume. It also contains an extensive bibliography of related work. Contributors: Shumeet Baluja, M. I. Bellgard, Michael A. Casey, Garrison W. Cottrell, Peter Desain, Robert O. Gjerdingen, Mike Greenhough, Niall Griffith, Stephen Grossberg, Henkjan Honing, Todd Jochem, Bruce F. Katz, John F. Kolen, Edward W. Large, Michael C. Mozer, Michael P. A. Page, Caroline Palmer, Jordan B. Pollack, Dean Pomerleau, Stephen W. Smoliar, Ian Taylor, Peter M. Todd, C. P. Tsang, Gregory M. Werner.

Bibliographic Format

Empirical Musicology

Music Data Analysis

Tools and Methodologies

Applying Information Theory and Statistics to Numbers in Music

On-line and Off-line Recognition

Modern Methods for Musicology

This book provides a comprehensive overview of music data analysis, from introductory material to advanced concepts. It covers various applications including transcription and segmentation as well as chord and harmony, instrument and tempo recognition. It also discusses the implementation aspects of music data analysis such as architecture, user interface and hardware. It is ideal for use in university classes with an interest in music data analysis. It also could be used in computer science and statistics as well as musicology.

The capability to design quality software and implement modern information systems is at the core of economic growth in the 21st century. This book aims to review and analyze software engineering technologies, focusing on the evolution of design and implementation platforms as well as on novel computer systems. Today’s computers provide music theorists with unprecedented opportunities to analyze music more quickly and accurately than ever before. Where analysis once required several weeks or even months to complete—often replete with human errors, computers now provide the means to accomplish these same analyses in a fraction of the time and with far more accuracy. However, while such computer music analyses represent significant improvements in the field, computational analyses using traditional approaches by themselves do not constitute the true innovations in music theory that computers offer. In *Hidden Structure: Music Analysis Using Computers* David Cope introduces a series of analytical processes that—by virtue of their concept and design—can be better, and in some cases, only accomplished by computer programs, thereby presenting unique opportunities for music theorists to understand more thoroughly the various kinds of music they study. Following the introductory chapter that covers several important premises, *Hidden Structure* focuses on several unique approaches to music analysis offered by computer programs. While these unique approaches do not represent an all-encompassing and integrated global theory of music analysis, they do represent significantly more than a compilation of loosely related computer program descriptions. For example, Chapter 5 on function in post-tonal music, firmly depends on the scalar foundations presented in chapter 4. Likewise, chapter 7 presents a multi-tiered approach to musical analysis that builds on the material found in all of the preceding chapters. In short, *Hidden Structure* uniquely offers an integrated view of computer music analysis for today’s musicians.

Outlines advances in dynamic, cognitive, and ecological investigations of auditory perception and ties this work to findings in more traditional areas of psychoacoustics. This book examines basic psychoacoustics from a more cognitive and ecological perspective. It provides coverage including both basic and applied research in auditory perception.

- A Tutorial and Review**
- Fundamentals of Music Processing**
- Proceedings of the 13th IMCL Conference**
- Introduction to Computer Music**
- Sound and Recording**
- Brave New Interfaces**
- Ecological Psychoacoustics**

This volume explores music education locally and globally, and critically investigates where music education has come from, where it is, and where it may be going in the future, as well as what this means to us in the twenty-first century. The UNIMARC Authorities Format was designed in the early 1990s to allow the creation of authority and reference records for the management of controlled access points in a bibliographic database. Incorporated in this work is relevant information from other IFLA working groups and from UNIMARC users. It is published under the auspices of the IFLA Cataloguing Section. This is the 3rd, completely updated and enlarged edition. This title deals with both the practical use of technology in music and the key principles underpinning the discipline. It targets both musicians exploring computers, and technologists engaging with music, and does so in the confidence that both groups can learn tremendously from the cross-disciplinary encounter. Nature-inspired computation is an interdisciplinary topic area that connects the natural sciences to computer science. Since natural computing is utilized in a variety of disciplines, it is imperative to research its capabilities in solving optimization issues. The Handbook of Research on Natural Computing for Optimization Problems discusses nascent optimization procedures in nature-inspired computation and the innovative tools and techniques being utilized in the field. Highlighting empirical research and best practices concerning various optimization issues, this publication is a comprehensive reference for researchers, academicians, students, scientists, and technology developers interested in a multidisciplinary perspective on natural computational systems.

- Aims, Methods, Prospects*
- Springer Handbook of Systematic Musicology*
- UNIMARC Manual*
- Using Python and Jupyter Notebooks*

Intelligent Music Information Systems: Tools and Methodologies
An Object-oriented Analysis of the Common Western Music Notation System

4th International Workshop, GREC 2001, Kingston, Ontario, Canada, September 7-8, 2001. Selected Papers

The third edition succeeds the fifth update of second edition. One of the main features has been the adoption of new and revised international standards, notably the International Standard Identifier for Libraries and Related Organizations, the ISBN 13 and the linking ISSN. New fields have been added for recording the Persistent Record Identifier. Uniform Conventional Headings for Legal and Religious texts are now catered for with separate fields. A number of fields have been revised: archival materials, manuscripts and documentation produced by the ISSN International Centre.

A comprehensive, ongoing guide to publications on music from all over the world, with abstracts written in English. All scholarly works are included: articles, books, bibliographies, catalogues, dissertations, Festschriften, films and videos, iconographies, critical commentaries to complete works, ethnographic recordings, conference proceedings, electronic resources, and reviews.

An Introduction to Music Technology, Second Edition provides a clear overview of the essential elements of music technology for today’s musician. This book focuses on the topics that underlie the hardware and software in use today: Sound, Audio, MIDI, Computer Notation, and Computer-Assisted Instruction. Appendices cover necessary computer hardware and software concepts. Written for both music technology majors and non-majors, this textbook introduces fundamental principles and practices so students can learn to work with a wide range of software programs, adapt to new music technologies, and apply music technology in their performance, composition, teaching, and analysis. Features: Thorough explanations of key topics in music technology Content applicable to all software and hardware, not linked to just one piece of software or gear In-depth discussion of digital audio topics, such as sampling rates, resolutions, and file formats Explanations of standard audio plug-ins including dynamics processors, EQs, and delay based effects Coverage of synthesis and sampling in software instruments Pedagogical features, including: Further Reading sections that allow the student to delve deeper into topics of interest Suggested Activities that can be carried out with a variety of different programs Key Terms at the end of each chapter What Do I Need? Chapters covering the types of hardware and software needed in order to put together Audio and MIDI systems A companion website with links to audio examples that demonstrate various concepts, step-by-step tutorials, relevant hardware, software, and additional audio and video resources. The new edition has been fully updated to cover new technologies that have emerged since the first edition, including iOS and mobile platforms, online notation software, alternate controllers, and Open Sound Control (OSC).

This book shows how information theory, probability, statistics, mathematics and personal computers can be applied to the exploration of numbers and proportions in music. It brings the methods of scientific and quantitative thinking to questions like: What are the ways of encoding a message in music and how can we be sure of the correct decoding? How do claims of names hidden in the notes of a score stand up to scientific analysis? How many ways are there of obtaining proportions and are they due to chance? After thoroughly exploring the ways of encoding information in music, the ambiguities of numerical alphabets and the words to be found “hidden” in a score, the book presents a novel way of exploring the proportions in a composition with a purpose-built computer program and gives example results from the application of the techniques. These include information theory, combinatorics, probability, hypothesis testing, Monte Carlo simulation and Bayesian networks, presented in an easily understandable form including their development from ancient history through the life and times of J. S. Bach, making connections between science, philosophy, art, architecture, particle physics, calculating machines and artificial intelligence. For the practitioner the book points out the pitfalls of various psychological fallacies and biases and includes succinct points of guidance for anyone involved in this type of research. This book will be useful to anyone who intends to use a scientific approach to the humanities, particularly music, and will appeal to anyone who is interested in the intersection between the arts and science. With a foreword by Ruth Tatlow (Uppsala University), award winning author of *Bach’s Numbers: Compositional Proportion and Significance* and *Bach and the Riddle of the Number Alphabet*. “With this study Alan Shepherd opens a much-needed examination of the wide range of mathematical claims that have been made about J. S. Bach’s music, offering both tools and methodological cautions with the potential to help clarify old problems.” Daniel R. Melamed, Professor of Music in Musicology, Indiana University

- Musical Networks*
- Individual, Social and Economic Impact of the Next Generation Interfaces*
- Hidden Structure*
- Beyond MIDI*
- Evolution and Emerging Technologies*
- Emotion in Video Game Soundtracking*
- Authorities Format*

This book constitutes the thoroughly refereed post-proceedings of the International Computer Music Modeling and Retrieval Symposium, CMMR 2004, held in Esbjerg, Denmark in May 2004. The 26 revised full papers presented were carefully selected during two rounds of reviewing and improvement. Due to the interdisciplinary nature of the area, the papers address a broad variety of topics. The papers are organized in topical sections on pitch and melody detection; rhythm, tempo, and beat; music generation and knowledge; music performance, rendering, and interfaces; music scores and synchronization; synthesis, timbre, and musical playing; music representation and retrieval; and music analysis.

Music Accessing and Retrieval is the first comprehensive survey of the vast new field of Music Information Retrieval (MIR). It describes a number of issues which are peculiar to the language of music - including forms, formats, and dimensions of music - together with the typologies of users and their information needs. To fulfil these needs a number of approaches are discussed, from direct search to information filtering and clustering of music documents. The emphasis is on tools, techniques, and approaches for content-based MIR, rather than on the systems that implement them. The interested reader can, however, find descriptions of more than 35 systems for music retrieval with links to their Web sites. Music Accessing and Retrieval can be used as both a guide for beginners who are embarking on research in this relatively new area, and a useful reference for established researchers in this field.

Since the time of the Ancient Greeks, much has been written about the relation between mathematics and music: from harmony and number theory, to musical patterns and group theory. Benson provides a wealth of information here to enable the teacher, the student, or the interested amateur to understand, at varying levels of technicality, the real interplay between these two ancient disciplines. The story is long as well as broad and involves physics, biology, psycho acoustics, the history of science, and digital technology as well as, of course, mathematics and music. Starting with the structure of the human ear and its relationship with Fourier analysis, the story proceeds via the mathematics of musical instruments to the ideas of consonance and dissonance, and then to scales and temperaments. This is a must-have book if you want to know about the music of the spheres or digital music and many things in between.

The textbook provides both profound technological knowledge and a comprehensive treatment of essential topics in music processing and music information retrieval (MIR). Including numerous examples, figures, and exercises, this book is suited for students, lecturers, and researchers working in audio engineering, signal processing, computer science, digital humanities, and musicology. The book consists of eight chapters. The first two cover foundations of music representations and the Fourier transform—concepts used throughout the book. Each of the subsequent chapters starts with a general description of a concrete music processing task and then discusses—in a mathematically rigorous way—essential techniques and algorithms applicable to a wide range of analysis, classification, and retrieval problems. By mixing theory and practice, the book’s goal is to offer detailed technological insights and a deep understanding of music processing applications. As a substantial extension, the textbook’s second edition introduces the FMP (fundamentals of music processing) notebooks, which provide additional audio-visual material and Python code examples that implement all computational approaches step by step. Using Jupyter notebooks and open-source web applications, the FMP notebooks yield an interactive framework that allows students to experiment with their music examples, explore the effect of parameter settings, and understand the computed results by suitable visualizations and sonifications. The FMP notebooks are available from the author’s institutional web page at the International Audio Laboratories Erlangen.

- Music Analysis Using Computers*
- Joint IAPR International Workshops SSPR 2002 and SPR 2002, Windsor, Ontario, Canada, August 6-9, 2002. Proceedings*
- Parallel Distributed Perception and Performance*
- Desktop Audio Technology*

- Flow*
- CMMR 2004*
- Toward Content Browsing with IEEE 1599 XML Encoding*

This dissertation introduces a new design for a computer-aided algorithmic music composition system. Rather than exploring specific algorithms, this study focuses on system and component design. The design introduced here is demonstrated through its implementation in athenaCL, a modular, polyphonic, poly-paradigm algorithmic music composition system in a cross-platform interactive command-line environment. The athenaCL system offers an open-source, object-oriented composition tool written in Python. The system can be scripted and embedded, and includes integrated instrument libraries, post-tonal and microtonal pitch modeling tools, multiple-format graphical outputs, and musical output in Csound, MIDI, audio file, XML, and text formats. Software design analysis is framed within a broad historical and intertextual study of the themes, approaches, and systems of computer-aided algorithmic composition (CAAC). A detailed history of the earliest experiments, as well as analysis of the foundational CAAC systems, is provided. Common problems and interpretations of CAAC are then presented in a historical and intertextual context, drawn from the writings and systems of numerous composers and developers. Toward the goal of developing techniques of comparative software analysis, a survey of system design archetypes, based on seven descriptors of CAAC systems, is presented. With this foundation, athenaCL system components are analyzed in detail. System components are divided into abstractions of musical materials, abstractions of musical procedures, and system architecture. For each component, object models, Python examples, and diagrams are provided. Further, each component is given context in terms of its compositional implications and relation to alternative and related models from the history of CAAC.

Written by leading experts, this volume provides a picture of the realities of current ICT use in musicology as well as prospects and proposals for how it could be fruitfully used in the future. Through its coverage of topics spanning content-based sound searching/retrieval, sound and content analysis, markup and text encoding, audio resource sharing, and music recognition, this book highlights the breadth and inter-disciplinary nature of the subject matter and provides a valuable resource to technologists, musicologists, musicians and music educators. It facilitates the identification of worthwhile goals to be achieved using technology and effective interdisciplinary collaboration.

This book presents an overview of the emerging field of emotion in videogame soundtracking. The emotional impact of music has been well-documented, particularly when used to enhance the impact of a multimodal experience, such as combining images with audio as found in the videogames industry. Soundtracking videogames presents a unique challenge compared to traditional composition (for example film music) in that the narrative of gameplay is non-linear – Player dependent actions can change the narrative and thus the emotional characteristics required in the soundtrack. Historical approaches to emotion measurement, and the musical feature mapping and music selection that might be used in video game soundtracking are outlined, before a series of cutting edge examples are given. These examples include algorithmic composition techniques, automated emotion matching from biosensors, motion capture techniques, emotionally-targeted speech synthesis and signal processing, and automated repurposing of existing music (for example from a players own library). The book concludes with some possibilities for the future.

- An Introduction
- Visual Perception of Music Notation