The Topos Of Music Geometric Logic Of Concepts Theory And Performance Hardcover

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The Topos Of Music Geometric

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With contributions by numerous experts

With contributions by numerous experts

This four-volume set is the second edition of the now classic book "The Topos of Music". In Vol. I the author explains the theory's conceptual framework of denotators and forms, the classification of local and global musical objects, the mathematical models of harmony and counterpoint, and topologies for rhythm and motives. In Vol. II the author explains his theory of musical performance, developed in the language of differential geometry, introducing performance vector fields that generalize tempo and intonation. Volume III presents gesture theory, including a gesture philosophy for music, the mathematics of gestures, concept architectures and software for musical gesture theory, the multiverse perspective which reveals the relationship between gesture theory and the string theory in theoretical physics, and applications of gesture theory to a number of musical themes, including counterpoint, modulation theory, free jazz, Hindustani music, and vocal gestures. Finally, Vol. IV contains appendices, explaining background topics in sound, mathematics, and music.

This is the first volume of the second edition of the now classic book "The Topos of Music". The author explains the theory's conceptual framework of denotators and forms, the classification of local and global musical objects, the mathematical models of harmony and counterpoint, and topologies for rhythm and motives.

This book explains the state of the art in the use of the discrete Fourier transform (DFT) of musical structures such as rhythms or scales. In particular the author explains the DFT of pitch-class distributions, homometry and the phase retrieval problem, nil Fourier coefficients and tilings, saliency, extrapolation to the continuous Fourier transform and continuous spaces, and the meaning of the phases of Fourier coefficients. This is the first textbook dedicated to this subject, and with supporting examples and exercises this is suitable for researchers and advanced undergraduate and graduate students of music, computer science and engineering. The author has made online supplementary material available, and the book is also suitable for practitioners who want to learn about techniques for understanding musical notions and who want to gain musical insights into mathematical problems.

Focusing on topos theory's integration of geometric and logical ideas into the foundations of mathematics and theoretical computer science, this volume explores internal category theory, topologies and sheaves, geometric morphisms, and other subjects. 1977 edition.

According to Grothendieck, the notion of topos is "the bed or deep river where come to be married geometry and algebra, topology and arithmetic, mathematical logic and category theory, the world of the continuous and that of discontinuous or discrete structures". It is what he had "conceived of most broad to perceive with finesse, by the same language rich of geometric resonances, an "essence" which is common to situations most distant from each other, coming from one region or another of the vast universe of mathematical things". The aim of this book is to present a theory and a number of techniques which allow to give substance to Grothendieck's vision by building on the notion of classifying topos educed by categorical logicians. Mathematical theories (formalized within first-order logic) give rise to geometric objects called sites; the passage from sites to their associated toposes embodies the passage from the logical presentation of theories to their mathematical content, i.e. from syntax to semantics. The essential ambiguity given by the fact that any topos is associated in general with an infinite number of theories or different sites allows to study the relations between different theories, and hence the theories themselves, by using toposes as 'bridges' between these different presentations. The expression or calculation of invariants of toposes in terms of the theories associated with them or their sites of definition generates a great number of results and notions varying according to the different types of presentation, giving rise to a veritable mathematical morphogenesis.

This book represents a new approach to musical creativity, dealing with the semiotics, mathematical principles, and software for creativity processes. After a thorough introduction, the book offers a first practical part with a detailed tutorial for students in composition and improvisation, using musical instruments and music software. The second, theoretical part deals with historical, actual, and new principles of creative processes in music, based on the results and methods developed in the first author's book Topos of Music and referring to semiotics, predicative objects, topos theory, and object-oriented concept architectures. The third part of the book details four case studies in musical creativity, including an analysis of the six variations of Beethoven's sonata op. 109, a discussion of the creative process in a CD coproduced in 2011 by the first and second authors, a recomposition of Boulez's "Structures pour deux pianos" using the Rubato software module BigBang developed by the third author, and the Escher theorem from mathematical gesture theory in music. This is both a textbook addressed to undergraduate and graduate students of music composition and improvisation, and also a state-of-the-art survey addressed to researchers in creativity studies and music technology. The book contains summaries and end-of-chapter questions, and the authors have used the book as the main reference to teach an undergraduate creativity studies program and also to teach composition. The text is supported throughout with musical score examples.

This textbook is a first introduction to mathematics for music theorists, covering basic topics such as sets and functions, universal properties, numbers and recursion, graphs, groups, rings, matrices and modules, continuity, calculus, and gestures. It approaches these abstract themes in a new way: Every concept or theorem is motivated and illustrated by examples from music theory (such as harmony, counterpoint, tuning), composition (e.g., classical combinatorics, dodecaphonic composition), and gestural performance. The book includes many illustrations, and exercises with solutions.

Contains all the mathematics that computer scientists need to know in one place.