Sheaves In Geometry And Logic A First Introduction To Topos Theory

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Higher Topos Theory (AM-170) Oxford University Press

This text introduces topos theory, a development in category theory that unites important but seemingly diverse notions from algebraic geometry, set theory, and intuitionistic logic. Topics include local set theories, fundamental properties of toposes, sheaves, local-valued sets, and natural and real numbers in local set theories. 1988 edition.

Etale Homotopy Springer Science & Business Media

Sheaves arose in geometry as coefficients for cohomology and as descriptions of the functions appropriate to various kinds of manifolds. Sheaves also appear in logic as carriers for models of set theory. This text presents topos theory as it has developed from the study of sheaves. Beginning with several examples, it explains the underlying ideas of topology and sheaf theory as well as the general theory of elementary toposes and geometric morphisms and their relation to logic.

Topology Courier Corporation

Category Theory has developed rapidly. This book aims to present those ideas and methods which can now be effectively used by Mathe maticians working in a variety of other fields of Mathematical research. This occurs at several levels. On the first level, categories provide a convenient conceptual language, based on the notions of category, functor, natural transformation, contravariance, and functor category. These notions are presented, with appropriate

examples, in Chapters I and II. Next comes the fundamental idea of an adjoint pair of functors. This appears in many substantially equivalent forms: That of universal construction, that of direct and inverse limit, and that of pairs offunctors with a natural isomorphism between corresponding sets of arrows. All these forms, with their interrelations, are examined in Chapters III to V. The slogan is "Adjoint functors arise everywhere". Alternatively, the fundamental notion of category theory is that of a monoid -a set with a binary operation of multiplication which is associative and which has a unit; a category itself can be regarded as a sort of general ized monoid. Chapters VI and VII explore this notion and its generaliza tions. Its close connection to pairs of adjoint functors illuminates the ideas of universal algebra and culminates in Beck's theorem characterizing categories of algebras; on the other hand, categories with a monoidal structure (given by a tensor product) lead inter alia to the study of more convenient categories of topological spaces.

Homology Springer

This book offers an introductory course in algebraic topology. Starting with general topology, it discusses differentiable manifolds, cohomology, products and duality, the fundamental group, homology theory, and homotopy theory. From the reviews: "An interesting and original graduate text in topology and geometry...a good lecturer can use this text to create a fine course....A beginning graduate student can use this text to learn a great deal of mathematics."—-MATHEMATICAL REVIEWS

An Introduction to Partially Ordered Structures and Sheaves Springer Science & Business Media

This textbook provides a concise and self-contained introduction to mathematical logic, with a focus on the fundamental topics in first-order logic and model theory. Including examples from several areas of mathematics (algebra, linear algebra and analysis), the book illustrates the relevance and usefulness of logic in the study of these subject areas. The authors start with an exposition of set theory and the axiom of choice as used in everyday mathematics. Proceeding at a gentle pace, they go on to present some of the first important results in model theory, followed by a careful exposition of Gentzen-style natural deduction and a detailed proof of Gödel's completeness theorem for first-order logic. The book then explores the formal axiom system of Zermelo and Fraenkel before concluding with an extensive list of suggestions for further study. The present volume is primarily aimed at mathematics students who are already familiar with basic analysis, algebra and linear algebra. It contains numerous exercises of varying difficulty and can be used for self-study, though it is ideally suited as a text for a one-semester university course in the second or third year.

Foundations of Algebraic Geometry. --; 29 Springer Science & Business Media

Third in a three part set, this volume introduces topos theory and the idea of sheaves.

Foundations of Relational Realism Springer Science & Business Media

New corrected printing of a well-established text on logic at the introductory level.

Vertex Algebras and Algebraic Curves: Second Edition Lexington Books

Foundations of Relational Realism presents an intuitive interpretation of quantum mechanics, based on a revised decoherent histories interpretation, structured within a category theoretic topological formalism.

Global Calculus Springer

This two-volume monograph obtains fundamental notions and results of the standard differential geometry of smooth (CINFINITY) manifolds, without using differential calculus. Here, the sheaf-theoretic character is emphasised. This has theoretical advantages such as greater perspective, clarity and unification, but also practical benefits ranging from elementary particle physics, via gauge theories and theoretical cosmology (`differential spaces'), to non-linear PDEs (generalised functions). Thus, more general applications, which are no longer `smooth' in the classical sense, can be coped with. The treatise might also be construed as a new systematic endeavour to confront the ever-increasing notion that the `world around us is far from being smooth enough'. Audience: This work is intended for postgraduate students and researchers whose work involves differential geometry, global analysis, analysis on manifolds, algebraic topology, sheaf theory, cohomology, functional analysis or abstract harmonic analysis.

Sheaves in Geometry and Logic Polimetrica s.a.s.

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.

Projective Geometry Springer Science & Business Media

The first of its kind, this book presents a widely accessible exposition of topos theory, aimed at the philosopher-logician as well as the mathematician. It is suitable for individual study or use in class at the graduate level (it includes 500 exercises). It begins with a fully motivated introduction to category theory itself, moving always from the particular example to the abstract concept. It then introduces the notion of elementary topos, with a wide range of examples and goes on to develop its theory in depth, and to elicit in detail its relationship to Kripke's intuitionistic semantics, models of classical set theory and the conceptual framework of sheaf theory (``localization'' of truth). Of particular interest is a Dedekind-cuts style construction of number systems in topoi, leading to a model of the intuitionistic continuum in which a ``Dedekind-real'' becomes represented as a ``continuously-variable classical real number''. The second edition contains a new chapter, entitled Logical Geometry, which introduces the reader to the theory of geometric morphisms of Grothendieck topoi, and its model-theoretic rendering by Makkai and Reyes. The aim of this chapter is to explain why Deligne's theorem about the existence of points of coherent topoi is equivalent to the classical Completeness theorem for ``geometric'' first-order formulae.

Models for Smooth Infinitesimal Analysis University of Chicago Press

The aim of this book is to construct categories of spaces which contain all the C?-manifolds, but in addition infinitesimal

spaces and arbitrary function spaces. To this end, the techniques of Grothendieck toposes (and the logic inherent to them) are explained at a leisurely pace and applied. By discussing topics such as integration, cohomology and vector bundles in the new context, the adequacy of these new spaces for analysis and geometry will be illustrated and the connection to the classical approach to C?-manifolds will be explained.

Logic and Structure American Mathematical Soc.

Algebraic topology is a basic part of modern mathematics, and some knowledge of this area is indispensable for any advanced work relating to geometry, including topology itself, differential geometry, algebraic geometry, and Lie groups. This book provides a detailed treatment of algebraic topology both for teachers of the subject and for advanced graduate students in mathematics either specializing in this area or continuing on to other fields. J. Peter May's approach reflects the enormous internal developments within algebraic topology over the past several decades, most of which are largely unknown to mathematicians in other fields. But he also retains the classical presentations of various topics where appropriate. Most chapters end with problems that further explore and refine the concepts presented. The final four chapters provide sketches of substantial areas of algebraic topology that are normally omitted from introductory texts, and the book concludes with a list of suggested readings for those interested in delving further into the field.

Categories for the Working Mathematician Cambridge University Press

Topos Theory is an important branch of mathematical logic of interest to theoretical computer scientists, logicians and philosophers who study the foundations of mathematics, and to those working in differential geometry and continuum physics. This compendium contains material that was previously available only in specialist journals. This is likely to become the standard reference work for all those interested in the subject.

First Order Categorical Logic Springer Science & Business Media

Publisher Description

Theories, Sites, Toposes Sheaves in Geometry and Logic

The book covers elementary aspects of category theory and topos theory. It has few mathematical prerequisites, and uses categorical methods throughout rather than beginning with set theoretic foundations. It works with key notions such as cartesian closedness, adjunctions, regular categories, and the internal logic of a topos. Full statements and elementary proofs are given for the central theorems, including the fundamental theorem of toposes, the sheafification theorem, and the construction of Grothendieck toposes over any topos as base. Three chapters discuss applications of toposes in detail, namely to sets, to basic differential geometry, and to recursive analysis. - ;Introduction; PART I: CATEGORIES: Rudimentary structures in a category; Products, equalizers, and their duals; Groups; Sub-objects, pullbacks, and limits; Relations; Cartesian closed categories; Product operators and others; PART II: THE CATEGORY OF CATEGORIES: Functors and categories; Natural transformations; Adjunctions; Slice categories; Mathematical foundations; PART III: TOPOSES: Basics; The internal language; A soundness proof for topos logic; From the internal language to the topos; The fundamental theorem; External semantics; Natural number objects; Categories in a topos; Topologies; PART IV: SOME TOPOSES: Sets; Synthetic differential geometry; The effective topos; Relations in regular categories; Further reading; Bibliography; Index. -

An Introduction to Noncommutative Geometry Springer Science & Business

Media

Higher category theory is generally regarded as technical and forbidding, but part of it is considerably more tractable: the theory of infinity-categories, higher categories in which all higher morphisms are assumed to be invertible. In Higher Topos Theory, Jacob Lurie presents the foundations of this theory, using the language of weak Kan complexes introduced by Boardman and Vogt, and shows how existing theorems in algebraic topology can be reformulated and generalized in the theory's new language. The result is a powerful theory with applications in many areas of mathematics. The book's first five chapters give an exposition of the theory of infinity-categories that emphasizes their role as a generalization of ordinary categories. Many of the fundamental ideas from classical category theory are generalized to the infinity-categorical setting, such as limits and colimits, adjoint functors, ind-objects and pro-objects, locally accessible and presentable categories, Grothendieck fibrations, presheaves, and Yoneda's lemma. A sixth chapter presents an infinity-categorical version of the theory of Grothendieck topoi, introducing the notion of an infinity-topos, an infinity-category that resembles the infinity-category of topological spaces in the sense that it satisfies certain axioms that codify some of the basic principles of algebraic topology. A seventh and final chapter presents applications that illustrate connections between the theory of higher topoi and ideas from classical topology.

Handbook of Categorical Algebra: Volume 3, Sheaf Theory Springer

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Applications of Sheaves Cambridge University Press

In Euclidean geometry, constructions are made with ruler and compass. Projective geometry is simpler: its constructions require only a ruler. In projective geometry one never measures anything, instead, one relates one set of points to another by a projectivity. The first two chapters of this book introduce the important concepts of the subject and provide the logical foundations. The third and fourth chapters introduce the famous theorems of Desargues and Pappus. Chapters 5 and 6 make use of projectivities on a line and plane, respectively. The next three chapters develop a self-contained account of von Staudt's approach to the theory of conics. The modern approach used in that development is exploited in Chapter 10, which deals with the simplest finite geometry that is rich enough to illustrate all the theorems nontrivially. The concluding chapters show the connections among projective, Euclidean, and analytic geometry.

Sheaf Theory Springer

Algebraic Geometry has been at the

center of much of mathematics for hundreds of years. It is not an easy field to break into, despite its humble beginnings in the study of circles, ellipses, hyperbolas, and parabolas. This text consists of a series of ex