Lectures On Algebraic Geometry I Sheaves Cohomology Of Sheaves And Applications To Riemann Surfaces Aspects Of Mathematics

A self-contained introduction to logarithmic geometry, a key tool for analyzing compactification and degeneration in algebraic geometry.

Lectures on Algebraic Geometry ISheaves, Cohomology of Sheaves, and Applications to Riemann SurfacesSpringer Spektrum

Modern introduction to algebraic geometry for undergraduates; uses analytic ideas to access algebraic theory.

This book presents four lectures on recent research in commutative algebra and its applications to algebraic geometry. Aimed at researchers and graduate students with an advanced background in algebra, these lectures were given during the Commutative Algebra program held at the Vietnam Institute of Advanced Study in Mathematics in the winter semester 2013 -2014. The first lecture is on Weyl algebras (certain rings of differential operators) and their D-modules, relating non-commutative and commutative algebra to algebraic geometry and analysis in a very appealing way. The second lecture concerns local systems, their homological origin, and applications to the classification of Artinian Gorenstein rings and the computation of their invariants. The third lecture is on the representation type of projective varieties and the classification of arithmetically Cohen -Macaulay bundles and Ulrich bundles. Related topics such as moduli spaces of sheaves, liaison theory, minimal resolutions, and Hilbert schemes of points are also covered. The last lecture addresses a classical problem: how many equations are needed to define an algebraic variety set-theoretically? It systematically covers (and improves) recent results for the case of toric varieties.

How does an algebraic geometer studying secant varieties further the understanding of hypothesis tests in statistics? Why would a statistician working on factor analysis raise open problems about determinantal varieties? Connections of this type are at the heart of the new field of "algebraic statistics". In this field, mathematicians and statisticians come together to solve statistical inference problems using concepts from algebraic geometry as well as related computational and combinatorial techniques. The goal of these lectures is to introduce newcomers from the different camps to algebraic statistics. The introduction will be centered around the following three observations: many important statistical models correspond to algebraic or semi-algebraic sets of parameters; the geometry of these parameter spaces determines the behaviour of widely used statistical inference procedures; computational algebraic geometry can be used to study parameter spaces and other features of statistical models.

A significant part of the 2004 Summer Research Conference on Algebraic Geometry (Snowbird, UT) was devoted to lectures introducing the participants, in particular, graduate students and recent Ph.D.'s, to a wide swathe of algebraic geometry and giving them a working familiarity with exciting, rapidly developing parts of the field. One of the main goals of the organizers was to allow the participants to broaden their horizons beyond the narrow area in which they are working. A fine selection of topics and a noteworthy list of contributors made the resulting collection of articles a useful resource for everyone interested in getting acquainted with the modern topic of algebraic geometry.The book consists of ten articles covering, among others, the following topics: the minimal model program, derived categories of sheaves on algebraic varieties, Kobayashi hyperbolicity, groupoids and quotients in algebraic geometry, rigid analytic varieties, and equivariant cohomology. Suitable for independent study, this unique volume is intended for graduate students and researchers interested in algebraic geometry.

This book is a timely survey of much of the algebra developed during the last several centuries including its applications to algebraic geometry and its potential use in geometric modeling. The present volume makes an ideal textbook for an abstract algebra course, while the forthcoming sequel. Lectures on Algebra II, will serve as a textbook for a linear algebra course. The author's fondness for algebraic geometry shows up in both volumes, and his recent preoccupation with the applications of group theory to the calculation of Galois groups is evident in the second volume which contains more local rings and more algebraic geometry. Both books are based on the author's lectures at Purdue University over the last few years.

This book introduces the reader to modern algebraic geometry. It presents Grothendieck's technically demanding language of schemes that is the basis of the most important developments in the last fifty years within this area. A systematic treatment and motivation of the theory is emphasized, using concrete examples to illustrate its usefulness. Several examples from the realm of Hilbert modular surfaces and of determinantal varieties are used methodically to discuss the covered techniques. Thus the reader experiences that the further development of the theory yields an ever better understanding of these fascinating objects.

The text is complemented by many exercises that serve to check the comprehension of the text, treat further examples, or give an outlook on further results. The volume at hand is an introduction to schemes. To get startet, it requires only basic knowledge in abstract algebra and topology. Essential facts from commutative algebra are assembled in an appendix. It will be complemented by a second volume on the cohomology of schemes.

This book and the following second volume is an introduction into modern algebraic geometry. In the first volume the methods of homological algebra, theory of sheaves, and sheaf cohomology are developed. These methods are indispensable for modern algebraic geometry, but they are also fundamental for other branches of mathematics and of great interest in their own. In the last chapter of volume I these concepts are applied to the theory of compact Riemann surfaces. In this chapter the author makes clear how influential the ideas of Abel, Riemann and Jacobi were and that many of the modern methods have been anticipated by them.

This English edition of Yuri I. Manin's well-received lecture notes provides a concise but extremely lucid exposition of the basics of algebraic geometry and sheaf theory. The lectures were originally held in Moscow in the late 1960s, and the corresponding preprints were widely circulated among Russian mathematicians. This book will be of interest to students majoring in algebraic geometry and theoretical physics (high energy physics, solid body, astrophysics) as well as to researchers and scholars in these areas. "This is an excellent introduction to the basics of Grothendieck's theory of schemes; the very best first reading about the subject that I am aware of. I would heartily recommend every grad student who wants to study algebraic geometry to read it prior to reading more advanced textbooks."- Alexander Beilinson

These lectures, delivered by Professor Mumford at Harvard in 1963-1964, are devoted to a study of properties of families of algebraic curves, on a non-singular projective algebraic curve defined over an algebraically closed field of arbitrary characteristic. The methods and techniques of Grothendieck, which have so changed the character of algebraic geometry in recent years, are used systematically throughout. Thus the classical material is presented from a new viewpoint.

This book offers a wide-ranging introduction to algebraic geometry along classical lines. It consists of lectures on topics in classical algebraic geometry, including the basic properties of projective algebraic varieties, linear systems of hypersurfaces, algebraic curves (with special emphasis on rational curves), linear series on algebraic curves, Cremona transformations, rational surfaces, and notable examples of special varieties like the Segre, Grassmann, and Veronese varieties. An integral part and special feature of the presentation is the inclusion of many exercises, not easy to find in the literature and almost all with complete solutions. The text is aimed at students in the last two years of an undergraduate program in mathematics. It contains some rather advanced topics suitable for specialized courses at the advanced undergraduate or beginning graduate level, as well as interesting topics for a senior thesis. The prerequisites have been deliberately limited to basic elements of projective geometry and abstract algebra. Thus, for example, some knowledge of the geometry of subspaces and properties of fields is assumed. The book will be welcomed by teachers and students of algebraic geometry who are seeking a clear and panoramic path leading from the basic facts about linear subspaces, conics and quadrics to a systematic discussion of classical algebraic varieties and the tools needed to study them. The text provides a solid foundation for approaching more advanced and abstract literature.

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This second volume introduces the concept of shemes, reviews some commutative algebra and introduces projective schemes. The finiteness theorem for coherent sheaves is proved, here again the techniques of homological algebra and sheaf cohomology are needed. In the last two chapters, projective curves over an arbitrary ground field are discussed, the theory of Jacobians is developed, and the existence of the Picard scheme is proved. Finally, the author gives some outlook into further developments- for instance étale cohomology- and states some fundamental theorems.

This volume contains three long lecture series by J.L. Colliot-Thelene, Kazuya Kato and

P. Vojta. Their topics are respectively the connection between algebraic K-theory and the torsion algebraic cycles on an algebraic variety, a new approach to Iwasawa theory for Hasse-Weil L-function, and the applications of arithemetic geometry to Diophantine approximation. They contain many new results at a very advanced level, but also surveys of the state of the art on the subject with complete, detailed profs and a lot of background. Hence they can be useful to readers with very different background and experience. CONTENTS: J.L. Colliot-Thelene: Cycles algebriques de torsion et K-theorie algebrique.- K. Kato: Lectures on the approach to Iwasawa theory for Hasse-Weil L-functions.- P. Vojta: Applications of arithmetic algebraic geometry to diophantine approximations.

Starting in the middle of the 80s, there has been a growing and fruitful interaction between algebraic geometry and certain areas of theoretical high-energy physics, especially the various versions of string theory. Physical heuristics have provided inspiration for new mathematical definitions (such as that of Gromov-Witten invariants) leading in turn to the solution of problems in enumerative geometry. Conversely, the availability of mathematically rigorous definitions and theorems has benefited the physics research by providing the required evidence in fields where experimental testing seems problematic. The aim of this volume, a result of the CIME Summer School held in Cetraro, Italy, in 2005, is to cover part of the most recent and interesting findings in this subject.

The 12 lectures presented in Representation Theories and Algebraic Geometry focus on the very rich and powerful interplay between algebraic geometry and the representation theories of various modern mathematical structures, such as reductive groups, quantum groups, Hecke algebras, restricted Lie algebras, and their companions. This interplay has been extensively exploited during recent years, resulting in great progress in these representation theories. Conversely, a great stimulus has been given to the development of such geometric theories as D-modules, perverse sheafs and equivariant intersection cohomology. The range of topics covered is wide, from equivariant Chow groups, decomposition classes and Schubert varieties, multiplicity free actions, convolution algebras, standard monomial theory, and canonical bases, to annihilators of quantum Verma modules, modular representation theory of Lie algebras and combinatorics of representation categories of Harish-Chandra modules.

"This book succeeds brilliantly by concentrating on a number of core topics...and by treating them in a hugely rich and varied way. The author ensures that the reader will learn a large amount of classical material and perhaps more importantly, will also learn that there is no one approach to the subject. The essence lies in the range and interplay of possible approaches. The author is to be congratulated on a work of deep and enthusiastic scholarship."

--MATHEMATICAL REVIEWS

"Analytic and algebraic geometers often study the same geometric structures but bring different methods to bear on them. While this dual approach has been spectacularly successful at solving problems, the language differences between algebra and analysis also represent a difficulty for students and researchers in geometry, particularly complex geometry. The PCMI program was designed to partially address this language gulf, by presenting some of the active developments in algebraic and analytic geometry in a form suitable for students on the 'other side' of the analysis-algebra language divide. One focal point of the summer school was multiplier ideals, a subject of wide current interest in both subjects. The present volume is based on a series of lectures at the PCMI summer school on analytic and algebraic geometry. The series is designed to give a high-level introduction to the advanced techniques behind some recent developments in algebraic and analytic geometry. The lectures contain many illustrative examples, detailed computations, and new perspectives on the topics presented, in order to enhance access of this material to non-specialists."--Publisher's description.

The aim of this work is to offer a concise and self-contained 'lecture-style' introduction to the theory of classical rigid geometry established by John Tate, together with the formal algebraic geometry approach launched by Michel Raynaud. These Lectures are now viewed commonly as an ideal means of learning advanced rigid geometry, regardless of the reader's level of background. Despite its parsimonious style, the presentation illustrates a number of key facts even more extensively than any other previous work. This Lecture Notes Volume is a revised and slightly expanded version of a preprint that appeared in 2005 at the University of Münster's Collaborative Research Center "Geometrical Structures in Mathematics".