Algebraic Geometry And Commutative Algebra

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Computations in Algebraic Geometry with Macaulay 2 - David Eisenbud 2013-03-14
This book presents algorithmic tools for algebraic geometry, with experimental applications. It also introduces Macaulay 2, a computer algebra system supporting research in algebraic geometry, commutative algebra, and their applications. The algorithmic tools presented here are designed to serve readers wishing to bring such tools to bear on their own problems. The first part of the book covers Macaulay 2 using concrete applications; the second emphasizes details of the mathematics.
Noncommutative Algebraic Geometry and Representations of Quantized Algebras - As Rosenberg 2013-03-09
This book is based on lectures delivered at Harvard in the Spring of 1991 and at the University of Utah during the academic year 1992-93. Formally, the book assumes only general algebraic knowledge (rings, modules, groups, Lie algebras, functors etc.). It is helpful, however, to know some basics of algebraic geometry and representation theory. Each chapter begins with its own introduction, and most sections even have a short overview. The purpose of what follows is to explain the spirit of the book and how different parts are linked together without entering into details. The point of departure is the notion of the left spectrum of an associative ring, and the first natural steps of general theory of noncommutative affine, quasi-affine, and projective schemes. This material is presented in Chapter I. Further developments originated from the requirements of several important examples I tried to understand, to begin with the first Weyl algebra and the quantum plane. The book reflects these developments as I worked them out in reallife and in my lectures. In Chapter 11, we study the left spectrum and irreducible representations of a whole lot of rings which are of interest for modern mathematical physics. The dasses of rings we consider indude as special cases: quantum plane, algebra of q-differential operators, (quantum) Heisenberg and Weyl algebras, (quantum) enveloping algebra ofthe Lie algebra sl(2) , coordinate algebra of the quantum group SL(2), the twisted SL(2) of Woronowicz, so called dispin algebra and many others.

Introduction to Commutative Algebra and Algebraic Geometry - Ernst Kunz 2012-11-06
Originally published in 1985, this classic textbook is an English translation of Einführung in die kommutative Algebra und algebraische Geometrie. As part of the Modern Birkhäuser Classics series, the publisher is proud to make Introduction to Commutative Algebra and Algebraic Geometry available to a wider audience. Aimed at students who have taken a basic course in algebra, the goal of the text is to present important results concerning the representation of algebraic varieties as intersections of the least possible number of hypersurfaces and—a closely related problem—with the most economical generation of ideals in Noetherian rings. Along the way, one

encounters many basic concepts of commutative algebra and algebraic geometry and proves many facts which can then serve as a basic stock for a deeper study of these subjects.

Algebraic K-theory, Commutative Algebra, and Algebraic Geometry - R. Keith Dennis 1992
In the mid-1960s, several Italian mathematicians began to study the connections between classical arguments in commutative algebra and algebraic geometry, and the contemporaneous development of algebraic K-theory in the U.S. These connections were exemplified by the work of Andreotti-Bombieri, Salmon, and Traverso on seminormality, and by Bass-Murthy on the Picard groups of polynomial rings. Interactions proceeded far beyond this initial point to encompass Chow groups of singular varieties, complete intersections, and applications of K-theory to arithmetic and real geometry. This volume contains the proceedings from a U.S.-Italy Joint Summer Seminar, which focused on this circle of ideas. The conference, held in June 1989 in Santa Margherita Ligure, Italy, was supported jointly by the Consiglio Nazionale delle Ricerche and the National Science Foundation. The book contains contributions from some of the leading experts in this area.

Ulrich Bundles - Laura Costa 2021-05-10
The goal of this book is to cover the active developments of arithmetically Cohen-Macaulay and Ulrich bundles and related topics in the last 30 years, and to present relevant techniques and multiple applications of the theory of Ulrich bundles to a wide range of problems in algebraic geometry as well as in commutative algebra.

Commutative Algebra and its Interactions to Algebraic Geometry - Nguyen Tu CUONG 2018-08-02
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.

Undergraduate Commutative Algebra - Miles Reid 1995-11-30
For those looking for an introduction to the area of commutative algebra, this book opens all the right doors and provides a clarity of understanding that all will welcome.

Ideals, Varieties, and Algorithms - David Cox 1995-03-09
Written at a level appropriate to undergraduates, this book covers such topics as the Hilbert Basis Theorem, the Nullstellensatz, invariant theory, projective geometry, and dimension theory. Contains a new section on Axiom and an update about MAPLE, Mathematica and REDUCE.

Steps in Commutative Algebra - Rodney Y. Sharp 2000
Introductory account of commutative algebra, aimed at students with a background in basic algebra.

Introduction To Commutative Algebra - Michael Atiyah 2018-03-09
First Published in 2018. Routledge is an imprint of Taylor & Francis, an Informa company.

The Geometry of Syzygies - David Eisenbud 2005-02-01
First textbook-level account of basic examples and techniques in this area. Suitable for self-study by a reader who knows a little commutative algebra and algebraic geometry already. David Eisenbud is a well-known mathematician and current president of the American Mathematical Society, as well as a successful Springer author.

Constructive Commutative Algebra - Ihsen Yengui 2015-12-11
The main goal of this book is to find the constructive content hidden in abstract proofs of concrete theorems in Commutative Algebra, especially in well-known theorems concerning projective modules over polynomial rings (mainly the Quillen-Suslin theorem) and syzygies of multivariate polynomials with coefficients in a valuation ring. Simple and constructive proofs of some results in the theory of projective modules over polynomial rings are also given, and light is cast upon recent progress on the Hermite ring and Gröbner ring conjectures. New conjectures on unimodular completion arising from our constructive approach to the unimodular completion problem are presented. Constructive algebra can be understood as a first preprocessing step for computer algebra that leads to the discovery of general algorithms, even if they are sometimes not efficient. From a logical point of view, the dynamical evaluation gives a constructive substitute for two highly nonconstructive tools of abstract algebra: the Law of Excluded Middle and Zorn's Lemma. For instance, these tools are required in order to construct the complete prime factorization of an ideal in a Dedekind ring, whereas the dynamical method reveals the computational content of this construction. These lecture notes follow this dynamical philosophy.

Commutative Algebra and Algebraic Geometry - Sudhir Ghorpade 2005
The first Joint AMS-India Mathematics Meeting was held in Bangalore (India). This book presents articles written by speakers from a special session on commutative algebra and algebraic geometry. Included are contributions from some leading researchers around the world in this subject area. The volume contains new and original research papers and survey articles suitable for graduate students and researchers interested in commutative algebra and algebraic geometry.

Commutative Algebra and Noncommutative Algebraic Geometry - David Eisenbud 2015-11-19
This book surveys fundamental current topics in these two areas of research, emphasising the lively interaction between them. Volume 1 contains expository papers ideal for those entering the field.

Commutative Algebra - David Eisenbud 2013-12-01
This is a comprehensive review of commutative algebra, from localization and primary decomposition through dimension theory, homological methods, free resolutions and duality, emphasizing the origins of the ideas and their connections with other parts of mathematics. The book gives a concise treatment of Grobner basis theory and the constructive methods in commutative algebra and algebraic geometry that flow from it. Many exercises included.

Algebraic Geometry - Daniel Perrin 2007-12-16
Aimed primarily at graduate students and beginning researchers, this book provides an introduction to algebraic geometry that is particularly suitable for those with no previous contact with the subject; it assumes only the standard background of undergraduate algebra. The book starts with easily-formulated problems with non-trivial solutions and uses these problems to introduce the fundamental tools of modern algebraic geometry: dimension; singularities; sheaves; varieties; and cohomology. A range of exercises is provided for each topic discussed, and a selection of problems and exam papers are collected in an appendix to provide material for further study.

Combinatorial Aspects of Commutative Algebra and Algebraic Geometry - Gunnar Fløystad 2011-05-16
The Abel Symposium 2009 "Combinatorial aspects of Commutative Algebra and Algebraic Geometry", held at Voss, Norway, featured talks by leading researchers in the field. This is the proceedings of the Symposium, presenting contributions on syzygies, tropical geometry, Boij-Söderberg theory, Schubert calculus, and quiver varieties. The volume also includes an introductory survey on binomial ideals with applications to hypergeometric series, combinatorial games and chemical reactions. The contributions pose interesting problems, and offer up-to-date research on some of the most active fields of commutative algebra and algebraic geometry with a combinatorial flavour.

Commutative Algebra, Algebraic Geometry, and Computational Methods - David Eisenbud 1999-07

This volume contains papers presented at the International Conference on Commutative Algebra, Algebraic geometry, and Computational methods held in Hanoi in 1996, as well as papers written subsequently. It features both expository articles as well as research papers on a range of currently active areas in commutative algebra, algebraic geometry (particularly surveys on intersection theory) and combinatorics. In addition, a special feature is a section on the life and work of Wolfgang Vogel, who was an organiser of the conference.

Singularities, Algebraic Geometry, Commutative Algebra, and Related Topics - Gert-Martin Greuel 2018-09-18
This volume brings together recent, original research and survey articles by leading experts in several fields that include singularity theory, algebraic geometry and commutative algebra. The motivation for this collection comes from the wide-ranging research of the distinguished mathematician, Antonio Campillo, in these and related fields. Besides his influence in the mathematical community stemming from his research, Campillo has also endeavored to promote mathematics and mathematicians' networking everywhere, especially in Spain, Latin America and Europe. Because of his impressive achievements throughout his career, we dedicate this book to Campillo in honor of his 65th birthday. Researchers and students from the world-wide, and in particular Latin American and European, communities in singularities, algebraic geometry, commutative algebra, coding theory, and other fields covered in the volume, will have interest in this book.

Using Algebraic Geometry - David A. Cox 2013-04-17
An illustration of the many uses of algebraic geometry, highlighting the more recent applications of Groebner bases and resultants. Along the way, the authors provide an introduction to some algebraic objects and techniques more advanced than typically encountered in a first course. The book is accessible to non-specialists and to readers with a diverse range of backgrounds, assuming readers know the material covered in standard undergraduate courses, including abstract algebra. But because the text is intended for beginning graduate students, it does not require

graduate algebra, and in particular, does not assume that the reader is familiar with modules.
Undergraduate Algebraic Geometry - Miles Reid 1988-12-15
Algebraic geometry is, essentially, the study of the solution of equations and occupies a central position in pure mathematics. This short and readable introduction to algebraic geometry will be ideal for all undergraduate mathematicians coming to the subject for the first time. With the minimum of prerequisites, Dr Reid introduces the reader to the basic concepts of algebraic geometry including: plane conics, cubics and the group law, affine and projective varieties, and non-singularity and dimension. He is at pains to stress the connections the subject has with commutative algebra as well as its relation to topology, differential geometry, and number theory. The book arises from an undergraduate course given at the University of Warwick and contains numerous examples and exercises illustrating the theory.
Number Theory, Algebraic Geometry and Commutative Algebra - Yasuo Akizuki 1973

Algebraic Geometry and Commutative Algebra - Hiroaki Hijikata 2014-05-10
Algebraic Geometry and Commutative Algebra in Honor of Masayoshi Nagata presents a collection of papers on algebraic geometry and commutative algebra in honor of Masayoshi Nagata for his significant contributions to commutative algebra. Topics covered range from Weierstrass models and endomorphism algebras of abelian varieties to the generic Torelli theorem for hypersurfaces in compact irreducible hermitian symmetric spaces. Coarse moduli spaces for curves are also discussed, along with discriminants of curves of genus 2 and arithmetic surfaces. Comprised of 14 chapters, this volume begins by describing a basic fibration as a Weierstrass model, with emphasis on elliptic threefolds with a section. The reader is then introduced to canonical bundles of analytic surfaces of class VII0 with curves; Lifting Problem on ideal-adically complete noetherian rings; and the canonical ring of a curve. Subsequent chapters deal with algebraic surfaces for regular systems of weights; elementary transformations of algebraic vector bundles; the irreducibility of the

first differential equation of Painlevé; and F-pure normal rings of dimension two. The book concludes with an assessment of the existence of some curves. This monograph will be a useful resource for practitioners and researchers in algebra and geometry.

Computational Commutative Algebra 1 - Martin Kreuzer 2008-07-15
This introduction to polynomial rings, Gröbner bases and applications bridges the gap in the literature between theory and actual computation. It details numerous applications, covering fields as disparate as algebraic geometry and financial markets. To aid in a full understanding of these applications, more than 40 tutorials illustrate how the theory can be used. The book also includes many exercises, both theoretical and practical.

Computational Methods in Commutative Algebra and Algebraic Geometry - Wolmer Vasconcelos 2004-05-18
This ACM volume deals with tackling problems that can be represented by data structures which are essentially matrices with polynomial entries, mediated by the disciplines of commutative algebra and algebraic geometry. The discoveries stem from an interdisciplinary branch of research which has been growing steadily over the past decade. The author covers a wide range, from showing how to obtain deep heuristics in a computation of a ring, a module or a morphism, to developing means of solving nonlinear systems of equations - highlighting the use of advanced techniques to bring down the cost of computation. Although intended for advanced students and researchers with interests both in algebra and computation, many parts may be read by anyone with a basic abstract algebra course.

A Course in Commutative Algebra - Gregor Kemper 2010-12-02
This textbook offers a thorough, modern introduction into commutative algebra. It is intended mainly to serve as a guide for a course of one or two semesters, or for self-study. The carefully selected subject matter concentrates on the concepts and results at the center of the field. The book maintains a constant view on the natural geometric context, enabling the reader to gain a deeper understanding of the material. Although it emphasizes theory, three chapters

are devoted to computational aspects. Many illustrative examples and exercises enrich the text.

Introduction to Commutative Algebra and Algebraic Geometry - Ernst Kunz 1985

Commutative Algebra and Noncommutative Algebraic Geometry David Eisenbud 2015-11-19
This book surveys fundamental current topics in these two areas of research, emphasising the lively interaction between them. Volume 2 focuses on the most recent research.

Computational Algebraic Geometry - Hal Schenck 2003-10-06
Table of contents

Algebraic Geometry and Commutative Algebra Siegfried Bosch 2022-04-23
Algebraic Geometry is a fascinating branch of Mathematics that combines methods from both Algebra and Geometry. It transcends the limited scope of pure Algebra by means of geometric construction principles. Putting forward this idea, Grothendieck revolutionized Algebraic Geometry in the late 1950s by inventing schemes. Schemes now also play an important role in Algebraic Number Theory, a field that used to be far away from Geometry. The new point of view paved the way for spectacular progress, such as the proof of Fermat's Last Theorem by Wiles and Taylor. This book explains the scheme-theoretic approach to Algebraic Geometry for non-experts, while more advanced readers can use it to broaden their view on the subject. A separate part presents the necessary prerequisites from Commutative Algebra, thereby providing an accessible and self-contained introduction to advanced Algebraic Geometry. Every chapter of the book is preceded by a motivating introduction with an informal discussion of its contents and background. Typical examples, and an abundance of exercises illustrate each section. Therefore the book is an excellent companion for self-studying or for complementing skills that have already been acquired. It can just as well serve as a convenient source for (reading) course material and, in any case, as supplementary literature. The present edition is a critical revision of the earlier text.

A Singular Introduction to Commutative

Algebra - Gert-Martin Greuel 2012-12-06
This book can be understood as a model for teaching commutative algebra, and takes into account modern developments such as algorithmic and computational aspects. As soon as a new concept is introduced, the authors show how the concept can be worked on using a computer. The computations are exemplified with the computer algebra system Singular, developed by the authors. Singular is a special system for polynomial computation with many features for global as well as for local commutative algebra and algebraic geometry. The book includes a CD containing Singular as well as the examples and procedures explained in the book.

Introduction to Algebraic Geometry - Brendan Hassett 2007-05-03
Algebraic geometry, central to pure mathematics, has important applications in such fields as engineering, computer science, statistics and computational biology, which exploit the computational algorithms that the theory provides. Users get the full benefit, however, when they know something of the underlying theory, as well as basic procedures and facts. This book is a systematic introduction to the central concepts of algebraic geometry most useful for computation. Written for advanced undergraduate and graduate students in mathematics and researchers in application areas, it focuses on specific examples and restricts development of formalism to what is needed to address these examples. In particular, it introduces the notion of Gröbner bases early on and develops algorithms for almost everything covered. It is based on courses given over the past five years in a large interdisciplinary programme in computational algebraic geometry at Rice University, spanning mathematics, computer science, biomathematics and bioinformatics.

Free Resolutions in Commutative Algebra and Algebraic Geometry - Taylor & Francis Group 2020-09-30
The selected contributions in this volume originated at the Sundance conference, which was devoted to discussions of current work in the area of free resolutions. The papers include new research, not otherwise published, and expositions that develop current problems likely to influence future developments in the field.

Algebraic Geometry - Robin Hartshorne 2013-06-29
An introduction to abstract algebraic geometry, with the only prerequisites being results from commutative algebra, which are stated as needed, and some elementary topology. More than 400 exercises distributed throughout the book offer specific examples as well as more specialised topics not treated in the main text, while three appendices present brief accounts of some areas of current research. This book can thus be used as textbook for an introductory course in algebraic geometry following a basic graduate course in algebra. Robin Hartshorne studied algebraic geometry with Oscar Zariski and David Mumford at Harvard, and with J.-P. Serre and A. Grothendieck in Paris. He is the author of "Residues and Duality", "Foundations of Projective Geometry", "Ample Subvarieties of Algebraic Varieties", and numerous research titles.

Ideals, Varieties, and Algorithms - David Cox 2013-04-17
Written at a level appropriate to undergraduates, this book covers such topics as the Hilbert Basis Theorem, the Nullstellensatz, invariant theory, projective geometry, and dimension theory. Contains a new section on Axiom and an update about MAPLE, Mathematica and REDUCE.

Local Algebra Jean-Pierre Serre 2012-12-06
This is an English translation of the now classic "Algèbre Locale - Multiplicités" originally published by Springer as LNM 11. It gives a short account of the main theorems of commutative algebra, with emphasis on modules, homological methods and intersection multiplicities. Many modifications to the original French text have been made for this English edition, making the text easier to read, without changing its intended informal character.

Introduction to Commutative Algebra and Algebraic Geometry Ernst Kunz 1984
It has been estimated that, at the present stage of our knowledge, one could give a 200 semester course on commutative algebra and algebraic geometry without ever repeating himself. So any introduction to this subject must be highly selective. I first want to indicate what point of view guided the selection of material for this

book. This introduction arose from lectures for students who had taken a basic course in algebra and could therefore be presumed to have a knowledge of linear algebra, ring and field theory, and Galois theory. The present text shouldn't require much more. In the lectures and in this text I have undertaken with the fewest possible auxiliary means to lead up to some recent results of commutative algebra and algebraic geometry concerning the representation of algebraic varieties as intersections of the least possible number of hypersurfaces and- a closely related problem- with the most economical generation of ideals in Noetherian rings. The question of the equations needed to describe an algebraic variety was addressed by Kronecker in 1882. In the 1940s it was chiefly Perron who was interested in this question; his discussions with Severi made the problem known and contributed to sharpening the rei event concepts. Thanks to the general progress of commutative algebra many beautiful results in this circle of questions have been obtained, mainly after the solution of Serre's problem on projective modules. Because of their relatively elementary character they are especially suitable for an introduction to commutative algebra.

Commutative Algebra - David Eisenbud 1995-03-30
This is a comprehensive review of commutative algebra, from localization and primary decomposition through dimension theory, homological methods, free resolutions and duality, emphasizing the origins of the ideas and their connections with other parts of mathematics. The book gives a concise treatment of Grobner basis theory and the constructive methods in commutative algebra and algebraic geometry that flow from it. Many exercises included.

Algebraic Geometry and Commutative Algebra - Hiroaki Hijikata 2014-05-10
Algebraic Geometry and Commutative Algebra in Honor of Masayoshi Nagata presents a collection of papers on algebraic geometry and commutative algebra in honor of Masayoshi Nagata for his significant contributions to commutative algebra. Topics covered range from power series rings and rings of invariants of finite linear groups to the convolution algebra of distributions on totally disconnected locally compact groups. The discussion begins with a description of several formulas for enumerating certain types of objects, which may be tabular arrangements of integers called Young tableaux or some types of monomials. The next chapter explains how to establish these enumerative formulas, with emphasis on the role played by transformations of determinantal polynomials and recurrence relations satisfied by them. The book then turns to several applications of the enumerative formulas and universal identity, including including enumerative proofs of the straightening law of Doubilet-Rota-Stein and computations of Hilbert functions of polynomial ideals of certain determinantal loci. Invariant differentials and quaternion extensions are also examined, along with the moduli of Todorov surfaces and the classification problem of embedded lines in characteristic p. This monograph will be a useful resource for practitioners and researchers in algebra and geometry.

Introduction to Algebraic Geometry and Commutative Algebra - Dilip P. Patil 2010
Along the lines developed by Grothendieck, this book delves into the rich interplay between algebraic geometry and commutative algebra. With concise yet clear definitions and synopses a selection is made from the wealth of meterial in the disciplines including the Riemann-Roch theorem for arbitrary projective curves."--pub. desc.