Combinatorics And Commutative Algebra Edition 2 By

Combinatorics and Commutative AlgebraSpringer Science & Business Media

This book is about toric topology, a new area of mathematics that emerged at the end of the 1990s on the border of equivariant topology, algebraic and symplectic geometry, combinatorics, and commutative algebra. It has quickly grown into a very active area with many links to other areas of mathematics, and continues to attract experts from different fields. The key players in toric topology are moment-angle manifolds, a class of manifolds with torus actions defined in combinatorial terms. Construction of moment-angle manifolds relates to combinatorial geometry and algebraic geometry of toric varieties via the notion of a quasitoric manifold. Discovery of remarkable geometric structures on moment-angle manifolds led to important connections with classical and modern areas of symplectic, Lagrangian, and non-Kaehler complex geometry. A related categorical construction of moment-angle complexes and polyhedral products provides for a universal framework for many fundamental constructions of homotopical topology. The study of polyhedral products is now evolving into a separate subject of homotopy theory. A new perspective on torus actions has also contributed to the development of classical areas of algebraic topology, such as complex cobordism. This book includes many open problems and is addressed to experts interested in new ideas linking all the subjects involved, as well as to graduate students and young researchers ready to enter this beautiful new area.

"The second volume of the authors' 'Computational commutative algebra'...covers on its 586 pages a wealth of interesting material with several unexpected applications. ... an encyclopedia on computational commutative algebra, a source for lectures on the subject as well as an inspiration for seminars. The text is recommended for all those who want to learn and enjoy an algebraic tool that becomes more and more relevant to different fields of applications." --ZENTRALBLATT MATH

Tropical geometry is a combinatorial shadow of algebraic geometry, offering new polyhedral tools to compute invariants of algebraic varieties. It is based on tropical algebra, where the sum of two numbers is their minimum and the product is their sum. This turns polynomials into piecewise-linear functions, and their zero sets into polyhedral complexes. These tropical varieties retain a surprising amount of information about their classical counterparts. Tropical geometry is a young subject that has undergone a rapid development since the beginning of the 21st century. While establishing itself as an area in its own right, deep connections have been made to many branches of pure and applied mathematics. This book offers a self-contained introduction to tropical geometry, suitable as a course text for beginning graduate students. Proofs are provided for the main results, such as the Fundamental Theorem and the Structure Theorem. Numerous examples and explicit computations illustrate the main concepts. Each of the six chapters concludes with problems that will help the readers to practice their tropical skills, and to gain access to the research literature. This wonderful book will appeal to students and researchers of all stripes: it begins at an undergraduate level and ends with deep connections to toric varieties, compactifications, and degenerations. In between, the authors provide the first complete proofs in book form of many fundamental results in the subject. The pages are sprinkled with illuminating examples, applications, and exercises, and the writing is lucid and meticulous throughout. It is that rare kind of book which will be used equally as an introductory text by students and as a reference for experts. —Matt Baker, Georgia Institute of Technology Tropical geometry is an exciting new field, which requires tools from various parts of mathematics and has connections with many areas. A short definition is given by Maclagan and Sturmfels: "Tropical geometry is a marriage between algebraic and polyhedral geometry". This wonderful book is a pleasant and rewarding journey through different landscapes, inviting the readers from a day at a beach to the hills of modern algebraic geometry. The authors present building blocks, examples and exercises as well as recent results in tropical geometry, with ingredients from algebra, combinatorics, symbolic computation, polyhedral geometry and algebraic geometry. The volume will appeal both to beginning graduate students willing to enter the field and to researchers, including experts. —Alicia Dickenstein, University of Buenos Aires, Argentina

Dedicated to Winfried Bruns on the Occasion of his 70th Birthday
In Honor of Masayoshi Nagata
An Introduction to Computational Algebraic Geometry and Commutative Algebra
Algebraic Combinatorics
Gršbner Bases in Commutative Algebra
Polytopes, Rings, and K-Theory

The theory of algebras, rings, and modules is one of the fundamental domains of modern mathematics. General algebra, more specifically non-commutative algebra, is poised for major advances in the twenty-first century (together with and in interaction with combinatorics), just as topology, analysis, and probability experienced in the twentieth century. This volume is a continuation and an in-depth study, stressing the non-commutative nature of the first two volumes of Algebras, Rings and Modules by M. Hazewinkel, N. Gubareni, and V. V. Kirichenko. It is largely independent of the other volumes. The relevant constructions and results from earlier volumes have been presented in this volume.

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.

This book discusses regular powers and symbolic powers of ideals from three perspectives– algebra, combinatorics and geometry – and examines the interactions between them. It invites readers to explore the evolution of the set of associated primes of higher and higher powers of an ideal and explains the evolution of ideals associated with combinatorial objects like graphs or hypergraphs in terms of the original combinatorial objects. It also addresses similar questions concerning our understanding of the Castelnuovo-Mumford regularity of powers of combinatorially defined ideals in terms of the associated combinatorial data. From a more geometric point of view, the book considers how the relations between symbolic and regular powers can be interpreted in geometrical terms. Other topics covered include aspects of Waring type problems, symbolic powers of an ideal and their invariants (e.g., the Waldschmidt constant, the resurgence), and the persistence of associated primes.

Association schemes are of interest to both mathematicians and statisticians and this book was written with both audiences in mind. For statisticians, it shows how to construct designs for experiments in blocks, how to compare such designs, and how to analyse data from them. The reader is only assumed to know very basic abstract algebra. For pure mathematicians, it tells why association schemes are important and develops the theory to the level of advanced research. This book arose from a course successfully taught by the author and as such the material is thoroughly class-tested. There are a great number of examples and exercises that will increase the book's appeal to both graduate students and their instructors. It is ideal for those coming either from pure mathematics or statistics backgrounds who wish to develop their understanding of association schemes.

Progress in Commutative Algebra 1

Dedicated to David F. Anderson

Designed Experiments, Algebra and Combinatorics

Homological and Computational Methods in Commutative Algebra

Walks, Trees, Tableaux, and More

A Course in Combinatorics

Introductory account of commutative algebra, aimed at students with a background in basic algebra.

This book examines interactions of polyhedral discrete geometry and algebra. What makes this book unique is the presentation of several central results in all three areas of the exposition - from discrete geometry, to commutative algebra, and K-theory.

Now in paperback, this advanced text on Cohen-Macaulay rings has been updated and expanded.

Recent developments are covered Contains over 100 figures and 250 exercises Includes complete proofs

Cohen-Macaulay Rings

Ideals, Varieties, and Algorithms

Monomial Algebras

Introduction to Commutative Algebra and Algebraic Geometry

Binomial Ideals

Interactions Between Commutative Algebra and Combinatorics

In 2002, an introductory workshop was held at the Mathematical Sciences Research Institute in Berkeley to survey some of the many directions of the commutative algebra field. Six principal speakers each gave three lectures, accompanied by a help session, describing the interaction of commutative algebra with other areas of mathematics for a broad audience of graduate students and researchers. This book is based on those lectures, together wi papers from contributing researchers. David Benson and Srikanth Iyengar present an introduction to the uses and concepts of commutative algebra in the cohomology of groups. Mark Haiman considers the commutative algebra of n points in the plane. Ezra Miller presents an introduction to the Hilbert scheme of points to complement Professor Haiman's paper. Further contributors include David Eisenbud and Jessica Sidman; Melvin Hochster; Graham Leuschke; Rob Lazarsfeld and Manuel Blickle; Bernard Teissier; and Ana Bravo.

Commutative algebra, combinatorics, and algebraic geometry are thriving areas of mathematical research with a rich history of interaction. Connections Between Algebra and Geometry contains lecture notes, along with exercises and solutions, from the Workshop on Connections Between Algebra and Geometry held at the University of Regina from May 29-June 1, 2012. It also contains research and survey papers from academics invitec to participate in the companion Special Session on Interactions Between Algebraic Geometry and Commutative Algebra, which was part of the CMS Summer Meeting at the University of Regina held June 2–3, 2012, and the meeting Further Connections Between Algebra and Geometry, which was held at the North Dakota State University February 23, 2013. This volume highlights three mini-courses in the areas of commutative algebra and algebraic geometry: differential graded commutative algebra, secant varieties, and fat points and symbolic powers. It will serve as a useful resource for graduate students and researchers who wish to expand their knowledge of commutative algebra, algebraic geometry, combinatorics, and the intricacie of their intersection.

* Stanley represents a broad perspective with respect to two significant topics from Combinatorial Commutative Algebra: 1) The theory of invariants of a torus acting linearly on a polynomial ring, and 2) The face ring of a simplicial complex * In this new edition, the author further develops some interesting properties of face rings with application to combinatorics

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.

Connections Between Algebra, Combinatorics, and Geometry

Ideals of Powers and Powers of Ideals

Combinatorics of Coxeter Groups

Combinatorics and Homology

Computations and Combinatorics in Commutative Algebra

Combinatorial Aspects of Commutative Algebra and Algebraic Geometry

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.

Monomial Algebras, Second Edition presents algebraic, combinatorial, and computational methods for studying monomial algebras and their ideals, including Stanley-Reisner rings, monomial subrings, Ehrhart rings, and blowup algebras. It emphasizes square-free monomials and the corresponding graphs, clutters, or hypergraphs. New to the Second Edition Four new chapters that focus on the algebraic properties of blowup algebras in combinatorial optimization problems of clutters and hypergraphs Two new chapters that explore the algebraic and combinatorial properties of the edge ideal of clutters and hypergraphs Full revisions of existing chapters to provide an up-to-date account of the subject Bringing together several areas of pure and applied mathematics, this book shows how monomial algebras are related to polyhedral geometry, combinatorial optimization, and combinatorics of hypergraphs. It directly links the algebraic properties of monomial algebras to combinatorial structures (such as simplicial complexes, posets, digraphs, graphs, and clutters) and linear optimization problems.

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.

This is the second edition of a popular book on combinatorics, a subject dealing with ways of arranging and distributing objects, and which involves ideas from geometry, algebra and analysis. The breadth of the theory is matched by that of its applications, which include topics as diverse as codes, circuit design and algorithm complexity. It has thus become essential for workers in many scientific fields to have some familiarity with the subject. The authors have tried to be as comprehensive as possible, dealing in a unified manner with, for example, graph theory, extremal problems, designs, colorings and codes. The depth and breadth of the coverage make the book a unique guide to the whole of the subject. The book is ideal for courses on combinatorical mathematics at the advanced undergraduate or beginning graduate level. Working mathematicians and scientists will also find it a valuable introduction and reference.

Algebraic Statistics

Commutative Algebra

Algebraic Combinatorics and Coinvariant Spaces

Combinatorics and Commutative Algebra

Lectures in Geometric Combinatorics

Written by one of the foremost experts in the field, Algebraic Combinatorics is a unique undergraduate textbook that will prepare the next generation of pure and applied mathematicians. The combination of the author's extensive knowledge of combinatorics and classical and practical tools from algebra will inspire motivated students to delve deeply into the fascinating interplay between algebra and combinatorics. Readers will be able to apply their newfound knowledge to mathematical, engineering, and business models. The text is primarily intended for use in a one-semester advanced undergraduate course in algebraic combinatorics, enumerative combinatorics, or graph theory. Prerequisites include a basic knowledge of linear algebra over a field, existence of finite fields, and group theory. The topics in each chapter build on one another and include extensive problem sets as well as hints to selected exercises. Key topics include walks on graphs, cubes and the Radon transform, the Matrix–Tree Theorem, and the Sperner property. There are also three appendices on purely enumerative aspects of combinatorics related to the chapter material: the RSK algorithm, plane partitions, and the enumeration of labeled trees. Richard Stanley is currently professor of Applied Mathematics at the Massachusetts Institute of Technology. Stanley has received several awards including the George Polya Prize in applied combinatorics, the Guggenheim Fellowship, and the Leroy P. Steele Prize for mathematical exposition. Also by the author: Combinatorics and Commutative Algebra, Second Edition, © Birkhauser.

Written for graduate students in mathematics or non-specialist mathematicians who wish to learn the basics about some of the most important current research in the field, this book provides an intensive, yet accessible, introduction to the subject of algebraic combinatorics. After recalling basic notions of combinatorics, representation theory, and some commutative algebra, the main material provides links between the study of

coinvariant—or diagonally coinvariant—spaces and the study of Macdonald polynomials and related operators. This gives rise to a large number of combinatorial questions relating to objects counted by familiar numbers such as the factorials, Catalan numbers, and the number of Cayley trees or parking functions. The author offers ideas for extending the theory to other families of finite Coxeter groups, besides permutation groups.
Includes a rich variety of exercises to accompany the exposition of Coxeter groups Coxeter groups have already been exposited from algebraic and geometric perspectives, but this book will be presenting the combinatorial aspects of Coxeter groups
This book provides a concise yet comprehensive and self-contained introduction to Grobner basis theory and its applications to various current research topics in commutative algebra. It especially aims to help young researchers become acquainted with fundamental tools and techniques related to Grobner bases which are used in commutative algebra and to arouse their interest in exploring further topics such as toric rings, Koszul and Rees algebras, determinantal ideal theory, binomial edge ideals, and their applications to statistics. The book can be used for graduate courses and self-study. More than 100 problems will help the readers to better understand the main theoretical results and will inspire them to further investigate the topics studied in this book.
Combinatorial Structures in Algebra and Geometry
Computational Commutative Algebra 1
Intersecting Algebra, Geometry, and Combinatorics
EACA School, Valladolid 2013
Expository Papers Dedicated to David Eisenbud on the Occasion of his 75th Birthday
Expository Papers Dedicated to David Eisenbud on the Occasion of His 65th Birthday

Algebraic statistics uses tools from algebraic geometry, commutative algebra, combinatorics, and their computational sides to address problems in statistics and its applications. The starting point for this connection is the observation that many statistical models are semialgebraic sets. The algebra/statistics connection is now over twenty years old, and this book presents the first broad introductory treatment of the subject. Along with background material in probability, algebra, and statistics, this book covers a range of topics in algebraic statistics including algebraic exponential families, likelihood inference, Fisher's exact test, bounds on entries of contingency tables, design of experiments, identifiability of hidden variable models, phylogenetic models, and model selection. With numerous examples, references, and over 150 exercises, this book is suitable for both classroom use and independent study.
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.
This is the first of two volumes of a state-of-the-art survey article collection which originates from three commutative algebra sessions at the 2009 Fall Southeastern American Mathematical Society Meeting at Florida Atlantic University. The articles reach into diverse areas of commutative algebra and build a bridge between Noetherian and non-Noetherian commutative algebra. These volumes present current trends in two of the most active areas of commutative algebra: non-noetherian rings (factorization, ideal theory, integrality), and noetherian rings (the local theory, graded situation, and interactions with combinatorics and geometry). This volume contains combinatorial and homological surveys. The combinatorial papers document some of the increasing focus in commutative algebra recently on the interaction between algebra and combinatorics. Specifically, one can use combinatorial techniques to investigate resolutions and other algebraic structures as with the papers of Fløystad on Boij-Söderburg theory, of Geramita, Harbourne and Migliore, and of Cooper on Hilbert functions, of Clark on minimal poset resolutions and of Mermin on simplicial resolutions. One can also utilize algebraic invariants to understand combinatorial structures like graphs, hypergraphs, and simplicial complexes such as in the paper of Morey and Villarreal on edge ideals. Homological techniques have become indispensable tools for the study of noetherian rings. These ideas have yielded amazing levels of interaction with other fields like algebraic topology (via differential graded techniques as well as the foundations of homological algebra), analysis (via the study of D-modules), and combinatorics (as described in the previous paragraph). The homological articles the editors have included in this volume relate mostly to how homological techniques help us better understand rings and singularities both noetherian and non-noetherian such as in the papers by Roberts, Yao, Hummel and Leuschke.
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.
Combinatorial Commutative Algebra
Computational Commutative Algebra 2
NSA 26, Constanța, Romania, August 26–September 1, 2018
Monomial Ideals
Commutative Algebra, Algebraic Geometry, and Computational Methods
Algebras, Rings and Modules

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.
This book demonstrates current trends in research on combinatorial and computational commutative algebra with a primary emphasis on topics related to monomial ideals. Providing a useful and quick introduction to

areas of research spanning these fields, Monomial Ideals is split into three parts. Part I offers a quick introduction to the modern theory of Gröbner bases as well as the detailed study of generic initial ideals. Part II supplies Hilbert functions and resolutions and some of the combinatorics related to monomial ideals including the Kruskal—Katona theorem and algebraic aspects of Alexander duality. Part III discusses combinatorial applications of monomial ideals, providing a valuable overview of some of the central trends in algebraic combinatorics. Main subjects include edge ideals of finite graphs, powers of ideals, algebraic shifting theory and an introduction to discrete polymatroids. Theory is complemented by a number of examples and exercises throughout, bringing the reader to a deeper understanding of concepts explored within the text. Self-contained and concise, this book will appeal to a wide range of readers, including PhD students on advanced courses, experienced researchers, and combinatorialists and non-specialists with a basic knowledge of commutative algebra. Since their first meeting in 1985, Juergen Herzog (Universität Duisburg-Essen, Germany) and Takayuki Hibi (Osaka University, Japan), have worked together on a number of research projects, of which recent results are presented in this monograph.

This book presents a course in the geometry of convex polytopes in arbitrary dimension. It takes readers from the basics of polytope theory to recent developments around secondary and state polytopes arising from point configurations. The most needed concepts are developed from scratch. Text illustrates the interaction among discrete geometry, computational algebra and combinatorics. This book is published in cooperation with IAS/Park City Mathematics Institute.

This contributed volume is a follow-up to the 2013 volume of the same title, published in honor of noted Algebraist David Eisenbud's 65th birthday. It brings together the highest quality expository papers written by leaders and talented junior mathematicians in the field of Commutative Algebra. Contributions cover a very wide range of topics, including core areas in Commutative Algebra and also relations to Algebraic Geometry, Category Theory, Combinatorics, Computational Algebra, Homological Algebra, Hyperplane Arrangements, and Non-commutative Algebra. The book aims to showcase the area and aid junior mathematicians and researchers who are new to the field in broadening their background and gaining a deeper understanding of the current research in this area. Exciting developments are surveyed and many open problems are discussed with the aspiration to inspire the readers and foster further research.

Non-commutative Algebras and Rings

Introduction to Tropical Geometry

Algebraic Geometry and Commutative Algebra

ADVANCES IN COMMUTATIVE ALGEBRA

Steps in Commutative Algebra

The Abel Symposium 2009

This textbook provides an introduction to the combinatorial and statistical aspects of commutative algebra with an emphasis on binomial ideals. In addition to thorough coverage of the basic concepts and theory, it explores current trends, results, and applications of binomial ideals to other areas of mathematics. The book begins with a brief, self-contained overview of the modern theory of Gröbner bases and the necessary algebraic and homological concepts from commutative algebra. Binomials and binomial ideals are then considered in detail, along with a short introduction to convex polytopes. Chapters in the remainder of the text can be read independently and explore specific aspects of the theory of binomial ideals, including edge rings and edge polytopes, join-meet ideals of finite lattices, binomial edge ideals, ideals generated by 2-minors, and binomial ideals arising from statistics. Each chapter concludes with a set of exercises and a list of related topics and results that will complement and offer a better understanding of the material presented. Binomial Ideals is suitable for graduate students in courses on commutative algebra, algebraic combinatorics, and statistics. Additionally, researchers interested in any of these areas but familiar with only the basic facts of commutative algebra will find it to be a valuable resource.

This contributed volume brings together the highest quality expository papers written by leaders and talented junior mathematicians in the field of Commutative Algebra. Contributions cover a very wide range of topics, including core areas in Commutative Algebra and also relations to Algebraic Geometry, Algebraic Combinatorics, Hyperplane Arrangements, Homological Algebra, and String Theory. The book aims to showcase the area, especially for the benefit of junior mathematicians and researchers who are new to the field; it will aid them in broadening their background and to gain a deeper understanding of the current research in this area. Exciting developments are surveyed and many open problems are discussed with the aspiration to inspire the readers and foster further research.

Featuring up-to-date coverage of three topics lying at the intersection of combinatorics and commutative algebra, namely Koszul algebras, primary decompositions and subdivision operations in simplicial complexes, this book has its focus on computations. "Computations and Combinatorics in Commutative Algebra" has been written by experts in both theoretical and computational aspects of these three subjects and is aimed at a broad audience, from experienced researchers who want to have an easy but deep review of the topics covered to postgraduate students who need a quick introduction to the techniques. The computational treatment of the material, including plenty of examples and code, will be useful for a wide range of professionals interested in the connections between commutative algebra and combinatorics.

This volume collects contributions by leading experts in the area of commutative algebra related to the INdAM meeting "Homological and Computational Methods in Commutative Algebra" held in Cortona (Italy) from May 30 to June 3, 2016 . The conference and this volume are dedicated to Winfried Bruns on the occasion of his 70th birthday. In particular, the topics of this book strongly reflect the variety of Winfried Bruns' research interests and his great impact on commutative algebra as well as its applications to related fields. The authors discuss recent and relevant developments in algebraic geometry, commutative algebra, computational algebra, discrete geometry and homological algebra. The book offers a unique resource, both for young and more experienced researchers seeking comprehensive overviews and extensive bibliographic references.

Computations in Algebraic Geometry with Macaulay 2

Toric Topology

Association Schemes

Trends in Commutative Algebra

This proceedings volume presents selected, peer-reviewed contributions from the 26th National School on Algebra, which was held in Constan ț a, Romania, on August 26-September 1, 2018. The works cover three fields of mathematics: algebra, geometry and discrete mathematics, discussing the latest developments in the theory of monomial ideals, algebras of graphs and local positivity of line bundles. Whereas interactions between algebra and geometry go back at least to Hilbert, the ties to combinatorics are much more recent and are subject of immense interest at the forefront of contemporary mathematics research. Transplanting methods between different branches of mathematics has proved very fruitful in the past – for example, the application of fixed point theorems in topology to solving nonlinear differential equations in analysis. Similarly, combinatorial structures, e.g., Newton-Okounkov bodies, have led to significant advances in our understanding of the asymptotic properties of line bundles in geometry and multiplier ideals in algebra. This book is intended for advanced graduate students, young scientists and established researchers with an interest in the overlaps between different fields of mathematics. A volume for the 24th edition of this conference was previously published with Springer under the title "Multigraded Algebra and Applications" (ISBN 978-3-319-90493-1).