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lecture notes in pure and applied mathematics



computational algebra

edited by
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Philippe Loustau
Jay Shapiro
Edward L. Green
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about the book . . .

This valuable reference, based on the fifth Mid-Atlantic Algebra Conference held recently at George Mason University, Fairfax, Virginia, focuses on both the practical **and** theoretical aspects of computational algebra.

Integrating the fields of classical algebra, geometry, computer science, and engineering, *Computational Algebra* demonstrates specific computer packages, including the use of CREP to study the representation of theory for finite dimensional algebras and Axiom to study algebras of finite rank...introduces the theoretical concepts and problems of computational algebra...presents **recent results** that utilize the techniques of computational algebra...emphasizes the implementation of algorithms to compute classical algebraic results...provides a tutorial on Gröbner bases within noncommutative rings...supplies information on a host of applications for **new** computational tools...and more.

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Additional Volumes in Preparation

Preface

This volume consists of papers contributed to the special session of the Mid-Atlantic Algebra Conference on Computational Algebra held at George Mason University from May 20 - 23, 1993. This was the fifth meeting of the Mid-Atlantic Algebra Conference, a conference that usually reflects the active research groups in algebra from the region. However, because of the fast-growing importance of computational problems in algebra, the organizers of the conference felt a need to enlarge the scope of this meeting so as to be a forum for scientists from different fields whose research is algebraic in nature. We proposed the present conference to focus on practical and theoretical aspects of computational algebra, an area where classical algebra (commutative and non-commutative), geometry, computer science and engineering interact. In addition to regional participants, we invited national and international speakers and subsequently received funding from both the National Science Foundation and the National Security Agency whose support we gratefully acknowledge.

The primary goal of the conference was to introduce the theoretical concepts and problems of computational algebra, share and demonstrate specific computer packages, provide information on the myriad of applications of such computational tools, and to disseminate recent classical mathematical results whose techniques utilized such computational tools. Its secondary goal was to provide a continued outlet for algebraic research within the Mid-Atlantic region. The papers in this volume adhere to these goals. Specifically, the papers include a tutorial on Gröbner bases within non-commutative rings (E. Green), the consideration of algorithms to be implemented on CREP so as to study the representation theory of finite dimensional algebras (P. Dräxler), the utilization of the computer package Axiom to study algebras of finite ranks (J. Grabmeier, R. Wisbauer) and computer calculations of classical objects within algebraic geometry such as the Hilbert series (V. Ufnarovski). Hence, the articles reflect a spirit of experimentation and a concern with the implementation and effectiveness of algorithms within algebra. The impact of these efforts on classical algebraic results is only starting to be felt.

We are grateful to the participants who made the conference a success and, in particular, thank the main speakers for providing the appropriate mathematical background. The main speakers included W. Adams, E. Green, C. Hoffmann, T. Mora, L. Robbiano, M. Sweedler and V. Ufnarovski.

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