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Theory Of Semirings With Applications In Mathematics And Theoretical Computer Science ***2023-01-24***

ISAIAH POWERS

Festschrift in Honor of Gabriel Thierrin
Elsevier
In the world of mathematics, the study of fuzzy relations and its theories are well-documented and a staple in the area of calculative methods. What many researchers and scientists overlook is how fuzzy theory can be applied to industries outside of arithmetic. The framework of fuzzy logic is much broader than professionals realize. There is a lack of research on the full potential this theoretical model can reach. The Handbook of Research on Emerging Applications of Fuzzy Algebraic Structures provides emerging research exploring the theoretical and practical aspects of fuzzy set theory and its real-life applications within the fields of engineering and science. Featuring coverage on a broad range of topics such as

complex systems, topological spaces, and linear transformations, this book is ideally designed for academicians, professionals, and students seeking current research on innovations in fuzzy logic in algebra and other matrices.

Semirings and Affine Equations over Them Cambridge University Press

This volume is a collection of chapters covering recent advances in stochastic optimal control theory and algebraic systems theory. The book will be a useful reference for researchers and graduate students in systems and control, algebraic systems theory, and applied mathematics. Requiring only knowledge of undergraduate-level control and systems theory, the work may be used as a supplementary textbook in a graduate course on optimal control or algebraic systems theory.

The Algebraic Theory of Semigroups, Volume II World Scientific

This is a graduate text introducing the fundamentals of measure theory and integration theory, which is the foundation of modern real analysis. The text focuses first on the concrete setting of Lebesgue measure and the Lebesgue integral (which in turn is motivated by the more classical concepts of Jordan measure and the Riemann integral), before moving on to abstract measure and integration theory,

including the standard convergence theorems, Fubini's theorem, and the Carathéodory extension theorem. Classical differentiation theorems, such as the Lebesgue and Rademacher differentiation theorems, are also covered, as are connections with probability theory. The material is intended to cover a quarter or semester's worth of material for a first graduate course in real analysis. There is an emphasis in the text on tying together the abstract and the concrete sides of the subject, using the latter to illustrate and motivate the former. The central role of key principles (such as Littlewood's three principles) as providing guiding intuition to the subject is also emphasized. There are a large number of exercises throughout that develop key aspects of the theory, and are thus an integral component of the text. As a supplementary section, a discussion of general problem-solving strategies in analysis is also given. The last three sections discuss optional topics related to the main matter of the book.

Algebraic and Combinatorial Methods in Operations Research

Springer Science & Business Media

A collection of articles showcasing the achievements of young Russian researchers in combinatorial and algebraic geometry and topology.

Category Theory And Applications: A

Textbook For Beginners (Second Edition) Springer The primary objective of this essential text is to emphasize the deep relations existing between the semiring and dioïd structures with graphs and their combinatorial properties. It does so at the same time as demonstrating the modeling and problem-solving flexibility of these structures. In addition the book provides an extensive overview of the mathematical properties employed by "nonclassical" algebraic structures which either extend usual algebra or form a new branch of it. *Fuzzy Semirings with Applications to Automata Theory* Springer Science & Business Media The purpose of this book is to present an up to date account of fuzzy ideals of a semiring. The book concentrates on theoretical aspects and consists of eleven chapters including three invited chapters. Among the invited chapters, two are devoted to applications of Semirings to automata theory, and one deals with some generalizations of Semirings. This volume may serve as a useful hand book for graduate students and researchers in the areas of Mathematics and Theoretical Computer Science. Proceedings of the Fifth International Fez Conference on Commutative Algebra and Applications, Fez, Morocco, June 23–28, 2008 Springer Science

& Business Media This comprehensive, encyclopedic text in four parts aims to give the reader — from the graduate student to the researcher/practitioner — a detailed understanding of modern finite semigroup theory, focusing in particular on advanced topics on the cutting edge of research. The q-theory of Finite Semigroups presents important techniques and results, many for the first time in book form, thereby updating and modernizing the semigroup theory literature.

Theory and Applications World Scientific Automata theory is the oldest among the disciplines constituting the subject matter of this Monograph Series: theoretical computer science. Indeed, automata theory and the closely related theory of formal languages form nowadays such a highly developed and diversified body of knowledge that even an exposition of "reasonably important" results is not possible within one volume. The purpose of this book is to develop the theory of automata and formal languages, starting from ideas based on linear algebra. By what was said above, it should be obvious that we do not intend to be encyclopedic. However, this book contains the basics of regular and context-free languages (including some new results), as well as a rather complete theory

of pushdown automata and variations (e. g. counter automata). The wellknown AFL theory is extended to power series ("AFP theory"). Additional new results include, for instance, a grammatical characterization of the cones and the principal cones of context-free languages, as well as new decidability results.

Codes and Automata

Springer Science & Business Media

Semiring theory stands with a foot in each of two mathematical domains. The first being abstract algebra and the other the fields of applied mathematics such as optimization theory, the theory of discrete-event dynamical systems, automata theory, and formal language theory, as well as from the allied areas of theoretical computer science and theoretical physics. Most important applications of semiring theory in these areas turn out to revolve around the problem of finding the equalizer of a pair of affine maps between two semimodules. In this volume, we chart the state of the art on solving this problem, and present many specific cases of applications. This book is essentially the third part of a trilogy, along with Semirings and their Applications, and Power Algebras over Semirings, both written by the same author and published by Kluwer Academic Publishers in 1999. While each book can be read independently of the others, to get

the full force of the theory and applications one should have access to all three. This work will be of interest to academic and industrial researchers and graduate students. The intent of the book is to bring the applications to the attention of the abstract mathematicians and to make the abstract mathematics available to those who are using these tools in an ad-hoc manner without realizing the full force of the theory.

Basic Modern Algebra with Applications Springer Science & Business Media

This is an excellent collection of papers dealing with combinatorics on words, codes, semigroups, automata, languages, molecular computing, transducers, logics, etc., related to the impressive work of Gabriel Thierrin. This volume is in honor of Professor Thierrin on the occasion of his 80th birthday.

A Guide to the Literature on Semirings and their Applications in Mathematics and Information Sciences Springer Science & Business Media

This monograph is a continuation of several themes presented in my previous books [146, 149]. In those volumes, I was concerned primarily with the properties of semirings. Here, the objects of investigation are sets of the form RA, where R is a semiring and A is a set having a certain

structure. The problem is one of translating that structure to RA in some "natural" way. As such, it tries to find a unified way of dealing with diverse topics in mathematics and theoretical com puter science as formal language theory, the theory of fuzzy algebraic structures, models of optimal control, and many others. Another special case is the creation of "idempotent analysis" and similar work in optimization theory. Unlike the case of the previous work, which rested on a fairly established mathematical foundation, the approach here is much more tentative and docimastic. This is an introduction to, not a definitative presentation of, an area of mathematics still very much in the making. The basic philosphical problem lurking in the background is one stated suc cinctly by Hahle and Sostak [185]: ". . . to what extent basic fields of mathematics like algebra and topology are dependent on the underlying set theory?" The conflicting definitions proposed by various researchers in search of a resolution to this conundrum show just how difficult this problem is to see in a proper light.

Semirings and their Applications World Scientific

This major revision of Berstel and Perrin's classic Theory of Codes has been rewritten with a more modern focus and a much broader coverage of

the subject. The concept of unambiguous automata, which is intimately linked with that of codes, now plays a significant role throughout the book, reflecting developments of the last 20 years. This is complemented by a discussion of the connection between codes and automata, and new material from the field of symbolic dynamics. The authors have also explored links with more practical applications, including data compression and cryptography. The treatment remains self-contained: there is background material on discrete mathematics, algebra and theoretical computer science. The wealth of exercises and examples make it ideal for self-study or courses. In summary, this is a comprehensive reference on the theory of variable-length codes and their relation to automata.
16th International Conference, DLT 2012, Taipei, Taiwan, August 14-17, 2012, Proceedings Springer Science & Business Media
This monograph contains the results of our joint research over the last ten years on the logic of the fixed point operation. The intended au dience consists of graduate students and research scientists interested in mathematical treatments of semantics. We assume the reader has a good mathematical background, although we provide some

prelimi nary facts in Chapter 1. Written both for graduate students and research scientists in theoret ical computer science and mathematics, the book provides a detailed investigation of the properties of the fixed point or iteration operation. Iteration plays a fundamental role in the theory of computation: for example, in the theory of automata, in formal language theory, in the study of formal power series, in the semantics of flowchart algorithms and programming languages, and in circular data type definitions. It is shown that in all structures that have been used as semantical models, the equational properties of the fixed point operation are cap tured by the axioms describing iteration theories. These structures include ordered algebras, partial functions, relations, finitary and in finitary regular languages, trees, synchronization trees, 2-categories, and others.

Theory and Applications Infinite Study

For the first time, this book unites different algebraic approaches for discrete optimization and operations research. The presentation of some fundamental directions of this new fast developing area shows the wide range of its applicability. Specifically, the book contains contributions in the following fields: semigroup and semiring theory applied to

combinatorial and integer programming, network flow theory in ordered algebraic structures, extremal optimization problems, decomposition principles for discrete structures, Boolean methods in graph theory and applications.

Proceedings of the First Multidisciplinary International Symposium on Positive Systems: Theory and Applications (POSTA 2003), Rome, Italy, August 28-30, 2003. Cambridge University Press

This book provides an introduction to the algebraic theory of semirings and, in this context, to basic algebraic concepts as e.g. semigroups, lattices and rings. It includes an algebraic theory of infinite sums as well as a detailed treatment of several applications in theoretical computer science. Complete proofs, various examples and exercises (some of them with solutions) make the book suitable for self-study. On the other hand, a more experienced reader who looks for information about the most common concepts and results on semirings will find cross-references throughout the book, a comprehensive bibliography and various hints to it. Contents: Basic ConceptsExtensions of SemiringsPartially Ordered SemiringsSemirings with Infinite SumsSemialgebras,

Semigroup Semirings and Semirings of Formal Power Series Readership: Pure mathematicians and computer scientists. Keywords:Semirings;Semigroups;Lattices;Rings;Partially Ordered Semirings;Infinite Sums;Semialgebras

The q-theory of Finite Semigroups World Scientific

This book provides an introduction to the algebraic theory of semirings, including a detailed treatment of some applications in theoretical computer science. The focus is on the general concepts and statements of the algebraic theory of semirings and those aspects of the theory which are needed for the aforementioned applications. The book also deals with a concept of semirings that includes commutativity of addition, as is usually done for rings.

Noncommutative Rational Series with Applications Springer Science & Business Media

This book contains original reviews by well-known workers in the field of mathematical linguistics and formal language theory, written in honour of Professor Solomon Marcus on the occasion of his 70th birthday.Some of the papers deal with contextual grammars, a class of generative devices introduced by Marcus, motivated by descriptive linguistics. Others are devoted to grammar systems, a very modern branch of formal language

theory. Automata theory and the algebraic approach to computer science are other well-represented areas. While the contributions are mathematically oriented, practical issues such as cryptography, grammatical inference and natural language processing are also discussed.

Power Algebras over Semirings Springer Science & Business Media

Category theory reveals commonalities between structures of all sorts. This book shows its potential in science, engineering, and beyond.

The Equational Logic of Iterative Processes

Semirings and their Applications

The book is primarily intended as a textbook on modern algebra for undergraduate mathematics students. It is also useful for those who are interested in supplementary reading at a higher level. The text is designed in such a way that it encourages independent thinking and motivates students towards further study. The book covers all major topics in group, ring, vector space and module theory that are usually contained in a standard modern algebra text. In addition, it studies semigroup, group action, Hopf's group, topological groups and Lie groups with their actions, applications of ring theory to algebraic geometry, and defines Zariski topology, as well as applications of module theory to

structure theory of rings and homological algebra. Algebraic aspects of classical number theory and algebraic number theory are also discussed with an eye to developing modern cryptography. Topics on applications to algebraic topology, category theory, algebraic geometry, algebraic number theory, cryptography and theoretical computer science interlink the subject with different areas. Each chapter discusses individual topics, starting from the basics, with the help of illustrative examples. This comprehensive text with a broad variety of concepts, applications, examples, exercises and historical notes represents a valuable and unique resource.

New Models and Algorithms Springer Science & Business Media

The purpose of this Handbook is to highlight both theory and applications of weighted automata. Weighted finite automata are classical nondeterministic finite automata in which the transitions carry weights. These weights may model, e. g. , the cost involved when executing a transition, the amount of resources or time needed for this,or the probability or reliability of its successful execution. The behavior of weighted finite automata can then be considered as the function (suitably defined) associating with each word the weight of its execution.

Clearly, weights can also be added to classical automata with infinite state sets like pushdown automata; this extension constitutes the general concept of weighted automata. To illustrate the diversity of weighted automata, let us consider the following scenarios. Assume that a quantitative system is modeled by a classical automaton in which the transitions carry as weights the amount of resources needed for their execution. Then the amount of resources needed for a path in this weighted automaton is obtained simply as the sum of the weights of its transitions. Given a word, we might be interested in the minimal amount of resources needed for its execution, i. e. , for the successful paths realizing the given word. In this example, we could also replace the “resources” by “profit” and then be interested in the maximal profit realized, correspondingly, by a given word.