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Hecke Algebras
with Unequal
Parameters

G. Lusztig



American Mathematical Society

Hecke Algebras With Unequal Parameters

Roman Wölfel



Hecke Algebras With Unequal Parameters:

Hecke Algebras with Unequal Parameters George Lusztig, 2003 Hecke algebras arise in representation theory as endomorphism algebras of induced representations One of the most important classes of Hecke algebras is related to representations of reductive algebraic groups over p -adic or finite fields In 1979 in the simplest equal parameter case of such Hecke algebras Kazhdan and Lusztig discovered a particular basis the KL basis in a Hecke algebra which is very important in studying relations between representation theory and geometry of the corresponding flag varieties It turned out that the elements of the KL basis also possess very interesting combinatorial properties In the present book the author extends the theory of the KL basis to a more general class of Hecke algebras the so called algebras with unequal parameters In particular he formulates conjectures describing the properties of Hecke algebras with unequal parameters and presents examples verifying these conjectures in particular cases Written in the author's precise style the book gives researchers and graduate students working in the theory of algebraic groups and their representations an invaluable insight and a wealth of new and useful information

Hecke Algebras with Unequal Parameters George Lusztig, 2003 Hecke algebras arise in representation theory as endomorphism algebras of induced representations One of the most important classes of Hecke algebras is related to representations of reductive algebraic groups over p -adic or finite fields In 1979 in the simplest equal parameter case of such Hecke algebras Kazhdan and Lusztig discovered a particular basis the KL basis in a Hecke algebra which is very important in studying relations between representation theory and geometry of the corresponding flag varieties It turned out that the elements of the KL basis also possess very interesting

The Representation Theory of Iwahori-Hecke Algebras with Unequal Parameters Matthew Spencer, 2014 Kazhdan-Lusztig Cells with Unequal Parameters Cédric Bonnafé, 2018-05-07 This monograph provides a comprehensive introduction to the Kazhdan Lusztig theory of cells in the broader context of the unequal parameter case Serving as a useful reference the present volume offers a synthesis of significant advances made since Lusztig's seminal work on the subject was published in 2002 The focus lies on the combinatorics of the partition into cells for general Coxeter groups with special attention given to induction methods cellular maps and the role of Lusztig's conjectures Using only algebraic and combinatorial methods the author carefully develops proofs discusses open conjectures and presents recent research including a chapter on the action of the cactus group Kazhdan Lusztig Cells with Unequal Parameters will appeal to graduate students and researchers interested in related subject areas such as Lie theory representation theory and combinatorics of Coxeter groups Useful examples and various exercises make this book suitable for self study and use alongside lecture courses Information for readers The character \mathbb{Z} has been corrupted in the print edition of this book and appears incorrectly with a diagonal line running through the symbol

Representations of Hecke Algebras at Roots of Unity Meinolf Geck, Nicolas Jacon, 2011-05-18 The modular representation theory of Iwahori Hecke algebras and this theory's connection to groups of Lie type is an area of

rapidly expanding interest it is one that has also seen a number of breakthroughs in recent years In classifying the irreducible representations of Iwahori Hecke algebras at roots of unity this book is a particularly valuable addition to current research in this field Using the framework provided by the Kazhdan Lusztig theory of cells the authors develop an analogue of James 1970 characteristic free approach to the representation theory of Iwahori Hecke algebras in general Presenting a systematic and unified treatment of representations of Hecke algebras at roots of unity this book is unique in its approach and includes new results that have not yet been published in book form It also serves as background reading to further active areas of current research such as the theory of affine Hecke algebras and Cherednik algebras The main results of this book are obtained by an interaction of several branches of mathematics namely the theory of Fock spaces for quantum affine Lie algebras and Ariki's theorem the combinatorics of crystal bases the theory of Kazhdan Lusztig bases and cells and computational methods This book will be of use to researchers and graduate students in representation theory as well as any researchers outside of the field with an interest in Hecke algebras

Representations of Affine Hecke Algebras Nanhua Xi, 2006-11-15 Kazhdan and Lusztig classified the simple modules of an affine Hecke algebra H_q $q \in \mathbb{C}$ provided that q is not a root of 1 Invent Math 1987 Ginzburg had some very interesting work on affine Hecke algebras Combining these results simple H_q modules can be classified provided that the order of q is not too small These Lecture Notes of N Xi show that the classification of simple H_q modules is essentially different from general cases when q is a root of 1 of certain orders In addition the based rings of affine Weyl groups are shown to be of interest in understanding irreducible representations of affine Hecke algebras Basic knowledge of abstract algebra is enough to read one third of the book Some knowledge of K theory algebraic group and Kazhdan Lusztig cell of Coxeter group is useful for the rest

Categorification and Higher Representation Theory Anna Beliakova, Aaron D. Lauda, 2017-02-21 The emergent mathematical philosophy of categorification is reshaping our view of modern mathematics by uncovering a hidden layer of structure in mathematics revealing richer and more robust structures capable of describing more complex phenomena Categorified representation theory or higher representation theory aims to understand a new level of structure present in representation theory Rather than studying actions of algebras on vector spaces where algebra elements act by linear endomorphisms of the vector space higher representation theory describes the structure present when algebras act on categories with algebra elements acting by functors The new level of structure in higher representation theory arises by studying the natural transformations between functors This enhanced perspective brings into play a powerful new set of tools that deepens our understanding of traditional representation theory This volume exhibits some of the current trends in higher representation theory and the diverse techniques that are being employed in this field with the aim of showcasing the many applications of higher representation theory The companion volume Contemporary Mathematics Volume 684 is devoted to categorification in geometry topology and physics

Forty Years Of Algebraic Groups, Algebraic Geometry, And Representation Theory In

China: In Memory Of The Centenary Year Of Xihua Cao's Birth Jie Du, Jianpan Wang, Lei Lin, 2022-10-21 Professor Xihua Cao 1920 2005 was a leading scholar at East China Normal University ECNU and a famous algebraist in China His contribution to the Chinese academic circle is particularly the formation of a world renowned ECNU School in algebra covering research areas include algebraic groups quantum groups algebraic geometry Lie algebra algebraic number theory representation theory and other hot fields In January 2020 in order to commemorate Professor Xihua Cao s centenary birthday East China Normal University held a three day academic conference Scholars at home and abroad gave dedications or delivered lectures in the conference This volume originates from the memorial conference collecting the dedications of scholars reminiscences of family members and 16 academic articles written based on the lectures in the conference covering a wide range of research hot topics in algebra The book shows not only scholars respect and memory for Professor Xihua Cao but also the research achievements of Chinese scholars at home and abroad

Characters of Finite Coxeter Groups and Iwahori-Hecke Algebras Meinolf Geck, Götz Pfeiffer, 2000 An important book The authors make full use of recent advances The book is both a valuable resource for the expert and good starting point for the beginning researcher in this field this is a very fine book which belongs on the shelves of anyone who is interested in the representation theory of Coxeter groups Iwahori Hecke algebras and more generally the groups of Lie type Zentralblatt MATH What makes the book especially valuable are the facts that the authors develop the various necessary theories nearly from the scratch and that they include the algorithmic theory as well Monatshefte für Mathematik Written in an engaging and intelligible style well structured and clearly printed EMS It will be a valuable reference for many years to come Bulletin of the LMS Finite Coxeter groups and related structures arise naturally in several branches of mathematics for example Lie algebras or theory of knots and links This is the first book which develops the character theory of finite Coxeter groups and Iwahori Hecke algebras in a systematic way ranging from classical results to recent developments

Finite Dimensional Algebras and Quantum Groups Bangming Deng, 2008 The interplay between finite dimensional algebras and Lie theory dates back many years In more recent times these interrelations have become even more strikingly apparent This text combines for the first time in book form the theories of finite dimensional algebras and quantum groups More precisely it investigates the Ringel Hall algebra realization for the positive part of a quantum enveloping algebra associated with a symmetrizable Cartan matrix and it looks closely at the Beilinson Lusztig MacPherson realization for the entire quantum \mathfrak{gl}_n The book begins with the two realizations of generalized Cartan matrices namely the graph realization and the root datum realization From there it develops the representation theory of quivers with automorphisms and the theory of quantum enveloping algebras associated with Kac Moody Lie algebras These two independent theories eventually meet in Part 4 under the umbrella of Ringel Hall algebras Cartan matrices can also be used to define an important class of groups Coxeter groups and their associated Hecke algebras Hecke algebras associated with symmetric groups give rise to an interesting class of quasi hereditary algebras the

quantum Schur algebras The structure of these finite dimensional algebras is used in Part 5 to build the entire quantum gl_n through a completion process of a limit algebra the Beilinson Lusztig MacPherson algebra The book is suitable for advanced graduate students Each chapter concludes with a series of exercises ranging from the routine to sketches of proofs of recent results from the current literature Publisher's website

Representations of Reductive Groups Monica Nevins, Peter E. Trapa, 2015-12-18 Over the last forty years David Vogan has left an indelible imprint on the representation theory of reductive groups His groundbreaking ideas have led to deep advances in the theory of real and p -adic groups and have forged lasting connections with other subjects including number theory automorphic forms algebraic geometry and combinatorics Representations of Reductive Groups is an outgrowth of the conference of the same name dedicated to David Vogan on his 60th birthday which took place at MIT on May 19-23 2014 This volume highlights the depth and breadth of Vogan's influence over the subjects mentioned above and point to many exciting new directions that remain to be explored Notably the first article by McGovern and Trapa offers an overview of Vogan's body of work placing his ideas in a historical context Contributors Pramod N Achar Jeffrey D Adams Dan Barbasch Manjul Bhargava Cédric Bonnaf Dan Ciubotaru Meinolf Geck William Graham Benedict H Gross Xuhua He Jing Song Huang Toshiyuki Kobayashi Bertram Kostant Wenjing Li George Lusztig Eric Marberg William M McGovern Wilfried Schmid Kari Vilonen Diana Shelstad Peter E Trapa David A Vogan Jr Nolan R Wallach Xiaoheng Wang Geordie Williamson

Group Representation Theory Meinolf Geck, 2007-05-07 After the pioneering work of Brauer in the middle of the 20th century in the area of the representation theory of groups many entirely new developments have taken place and the field has grown into a very large field of study This progress and the remaining open problems e.g. the conjectures of Alperin Dade Broué James etc have ensured that group representation theory remains a lively area of research In this book the leading researchers in the field contribute a chapter in their field of specialty namely Broué Finite reductive groups and Deligne-Lusztig theory Carlson Cohomology and representations of finite groups Geck Representations of Hecke algebras Seitz Topics in algebraic groups Kessar and Linckelmann Fusion systems and blocks Serre On finite subgroups of Lie groups Thévenaz The classification of endo-permutation modules and Webb Representations and cohomology of categories

Trends in Representation Theory of Algebras and Related Topics Andrzej Skowroński, 2008 This book is concerned with recent trends in the representation theory of algebras and its exciting interaction with geometry topology commutative algebra Lie algebras quantum groups homological algebra invariant theory combinatorics model theory and theoretical physics The collection of articles written by leading researchers in the field is conceived as a sort of handbook providing easy access to the present state of knowledge and stimulating further development The topics under discussion include diagram algebras Brauer algebras cellular algebras quasi-hereditary algebras Hall algebras Hecke algebras symplectic reflection algebras Cherednik algebras Kashiwara crystals Fock spaces preprojective algebras cluster algebras rank varieties varieties of algebras and modules moduli of representations of quivers semi-invariants of quivers Cohen

Macaulay modules singularities coherent sheaves derived categories spectral representation theory Coxeter polynomials Auslander Reiten theory Calabi Yau triangulated categories Poincare duality spaces selfinjective algebras periodic algebras stable module categories Hochschild cohomologies deformations of algebras Galois coverings of algebras tilting theory algebras of small homological dimensions representation types of algebras and model theory This book consists of fifteen self contained expository survey articles and is addressed to researchers and graduate students in algebra as well as a broader mathematical community They contain a large number of open problems and give new perspectives for research in the field

Noncommutative Geometry and Number Theory Caterina Consani, Matilde Marcolli, 2007-12-18 In recent years number theory and arithmetic geometry have been enriched by new techniques from noncommutative geometry operator algebras dynamical systems and K Theory This volume collects and presents up to date research topics in arithmetic and noncommutative geometry and ideas from physics that point to possible new connections between the fields of number theory algebraic geometry and noncommutative geometry The articles collected in this volume present new noncommutative geometry perspectives on classical topics of number theory and arithmetic such as modular forms class field theory the theory of reductive p adic groups Shimura varieties the local L factors of arithmetic varieties They also show how arithmetic appears naturally in noncommutative geometry and in physics in the residues of Feynman graphs in the properties of noncommutative tori and in the quantum Hall effect

Interactions of Quantum Affine Algebras with Cluster Algebras, Current Algebras and Categorification Jacob Greenstein, David Hernandez, Kailash C. Misra, Prasad Senesi, 2022-03-11 This volume collects chapters that examine representation theory as connected with affine Lie algebras and their quantum analogues in celebration of the impact Vyjayanthi Chari has had on this area The opening chapters are based on mini courses given at the conference Interactions of Quantum Affine Algebras with Cluster Algebras Current Algebras and Categorification held on the occasion of Chari's 60th birthday at the Catholic University of America in Washington D C June 2018 The chapters that follow present a broad view of the area featuring surveys original research and an overview of Vyjayanthi Chari's significant contributions Written by distinguished experts in representation theory a range of topics are covered including String diagrams and categorification Quantum affine algebras and cluster algebras Steinberg groups for Jordan pairs Dynamical quantum determinants and Pfaffians Interactions of Quantum Affine Algebras with Cluster Algebras Current Algebras and Categorification will be an ideal resource for researchers in the fields of representation theory and mathematical physics

Representation Theory, Number Theory, and Invariant Theory Jim Cogdell, Ju-Lee Kim, Chen-Bo Zhu, 2017-10-19 This book contains selected papers based on talks given at the Representation Theory Number Theory and Invariant Theory conference held at Yale University from June 1 to June 5 2015 The meeting and this resulting volume are in honor of Professor Roger Howe on the occasion of his 70th birthday whose work and insights have been deeply influential in the development of these fields The speakers who contributed to this work include Roger Howe's doctoral

students Roger Howe himself and other world renowned mathematicians Topics covered include automorphic forms invariant theory representation theory of reductive groups over local fields and related subjects

Representations of Reductive Groups Avraham Aizenbud,Dmitry Gourevitch,David Kazhdan,Erez M. Lapid,2019-02-20 This volume contains the proceedings of the Conference on Representation Theory and Algebraic Geometry held in honor of Joseph Bernstein from June 11 16 2017 at the Weizmann Institute of Science and The Hebrew University of Jerusalem The topics reflect the decisive and diverse impact of Bernstein on representation theory in its broadest scope The themes include representations of p adic groups and Hecke algebras in all characteristics representations of real groups and supergroups theta correspondence and automorphic forms

Affine Flag Varieties and Quantum Symmetric Pairs Zhaobing Fan,Chun-Ju Lai,Yiqiang Li,Li Luo,Weiqliang Wang,2020-09-28 The quantum groups of finite and affine type A admit geometric realizations in terms of partial flag varieties of finite and affine type A Recently the quantum group associated to partial flag varieties of finite type B C is shown to be a coideal subalgebra of the quantum group of finite type A

Representations of Reductive p -adic Groups Anne-Marie Aubert,Manish Mishra,Alan Roche,Steven Spallone,2019-04-16 This book consists of survey articles and original research papers in the representation theory of reductive p adic groups In particular it includes a survey by Anne Marie Aubert on the enormously influential local Langlands conjectures The survey gives a precise and accessible formulation of many aspects of the conjectures highlighting recent refinements due to the author and her collaborators and their current status It also features an extensive account by Colin Bushnell of his work with Henniart on the fine structure of the local Langlands correspondence for general linear groups beginning with a clear overview of Bushnell Kutzko's construction of cuspidal types for such groups The remaining papers touch on a range of topics in this active area of modern mathematics group actions on root data explicit character formulas classification of discrete series representations unicity of types local converse theorems completions of Hecke algebras p adic symmetric spaces All meet a high level of exposition The book should be a valuable resource to graduate students and experienced researchers alike

Tensor Categories and Hopf Algebras Nicolás Andruskiewitsch,Dmitri Nikshych,2019-04-18 This volume contains the proceedings of the scientific session Hopf Algebras and Tensor Categories held from July 27 28 2017 at the Mathematical Congress of the Americas in Montreal Canada Papers highlight the latest advances and research directions in the theory of tensor categories and Hopf algebras Primary topics include classification and structure theory of tensor categories and Hopf algebras Gelfand Kirillov dimension theory for Nichols algebras module categories and weak Hopf algebras Hopf Galois extensions graded simple algebras and bialgebra coverings

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