Spectral Methods of Automorphic Forms

Second Edition

Henryk Iwaniec

Spectral Methods Of Automorphic Forms

Liying Dong

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   Spectral Methods of Automorphic Forms Henryk Iwaniec,2021-11-17 Automorphic forms are one of the central topics of analytic number theory In fact they sit at the confluence of analysis algebra geometry and number theory In this book Henryk Iwaniec once again displays his penetrating insight powerful analytic techniques and lucid writing style The first edition of this book was an underground classic both as a textbook and as a respected source for results ideas and references Iwaniec treats the spectral theory of automorphic forms as the study of the space of L 2 functions on the upper half plane modulo a discrete subgroup Key topics include Eisenstein series estimates of Fourier coefficients Kloosterman sums the Selberg trace formula and the theory of small eigenvalues Henryk Iwaniec was awarded the 2002 Cole Prize for his fundamental contributions to number theory   *Spectral Methods of Automorphic Forms* Henryk Iwaniec,1995 Automorphic forms are one of the central topics of analytic number theory In fact they sit at the confluence of analysis algebra geometry and number theory In this book Henryk Iwaniec once again displays his penetrating insight powerful analytic techniques and lucid writing style The first edition of this book was an underground classic both as a textbook and as a respected source for results ideas and references Iwaniec treats the spectral theory of automorphic forms as the study of the space of L 2 functions on the upper half plane modulo a discrete subgroup Key topics include Eisenstein series estimates of Fourier coefficients Kloosterman sums the Selberg trace formula and the theory of small eigenvalues Henryk Iwaniec was awarded the 2002 Cole Prize for his fundamental contributions to number theory   Equidistribution in Number Theory, An Introduction Andrew Granville,Zeév Rudnick,2007-04-08 From July 11th to July 22nd 2005 a NATO advanced study institute as part of the series Seminaire de mathematiques superieures was held at the U versite de Montreal on the subject Equidistribution in the theory of numbers There were about one hundred participants from sixteen countries around the world This volume presents details of the lecture series that were given at the school Across the broad panorama of topics that constitute modern number t ory one nds shifts of attention and focus as more is understood and better questions are formulated Over the last decade or so we have noticed incre ing interest being paid to distribution problems whether of rational points of zeros of zeta functions of eigenvalues etc Although these problems have been motivated from very di erent perspectives one nds that there is much in common and presumably it is healthy to try to view such questions as part of a bigger subject It is for this reason we decided to hold a school on Equidistribution in number theory to introduce junior researchers to these beautiful questions and to determine whether di erent approaches can in uence one another There are far more good problems than we had time for in our schedule We thus decided to focus on topics that are clearly inter related or do not requirealotofbackgroundtounderstand   **Number Theory: Dreaming In Dreams - Proceedings Of The 5th China-japan Seminar** Shigeru Kanemitsu,Takashi Aoki,Jianya Liu,2009-11-26 This volume aims at collecting survey papers which give broad and enlightening perspectives of various aspects of number theory Kitaoka s paper is a continuation of his

earlier paper published in the last proceedings and pushes the research forward Browning s paper introduces a new direction of research on analytic number theory quantitative theory of some surfaces and Bruedern et al s paper details state of the art affairs of additive number theory There are two papers on modular forms Kohnen s paper describes generalized modular forms GMF which has some applications in conformal field theory while Liu s paper is very useful for readers who want to have a quick introduction to Maass forms and some analytic number theoretic problems related to them Matsumoto et al s paper gives a very thorough survey on functional relations of root system zeta functions Hoshi Miyake s paper is a continuation of Miyake s long and fruitful research on generic polynomials and gives rise to related Diophantine problems and Jia s paper surveys some dynamical aspects of a special arithmetic function connected with the distribution of prime numbers There are two papers of collections of problems by Shparlinski on exponential and character sums and Schinzel on polynomials which will serve as an aid for finding suitable research problems Yamamura s paper is a complete bibliography on determinant expressions for a certain class number and will be useful to researchers Thus the book gives a good balance of classical and modern aspects in number theory and will be useful to researchers including enthusiastic graduate students

Modular Relations and Parity in Number Theory Kalyan Chakraborty,Shigeru Kanemitsu,Takako Kuzumaki,2025-08-19 This book describes research problems by unifying and generalizing some remote looking objects through the functional equation and the parity relation of relevant zeta functions known as the modular relation or RHB correspondence It provides examples of zeta functions introduced as absolutely convergent Dirichlet series not necessarily with the Euler product The book generalizes this to broader cases explaining the special functions involved The extension of the Chowla Selberg integral formula and the Hardy transform are key substituting the Bochner modular relation in the zeta function of Maass forms The book also develops principles to deduce summation formulas as modular relations and addresses Chowla s problem and determinant expressions for class numbers Many books define zeta functions using Euler products excluding Epstein and Hurwitz type zeta functions Euler products are constructed from objects with a unique factorization domain property This book focuses on using the functional equation called the modular relation specifically the ramified functional equation of the Hecker type Here the gamma factor is the product of two gamma functions leading to the Fourier Whittaker expansion and reducing to the Fourier Bessel expansion or the Chowla Selberg integral formula for Epstein zeta functions   *Mathematical Aspects of Quantization* Sam Evens,2012 This book is a collection of expository articles from the Center of Mathematics at Notre Dame s 2011 program on quantization Included are lecture notes from a summer school on quantization on topics such as the Cherednik algebra geometric quantization detailed proofs of Willwacher s results on the Kontsevich graph complex and group valued moment maps This book also includes expository articles on quantization and automorphic forms renormalization Berezin Toeplitz quantization in the complex setting and the commutation of quantization with reduction as well as an original article on derived Poisson brackets The primary goal of this volume is to make topics in

quantization more accessible to graduate students and researchers **Number Theory** Takashi Aoki,Shigeru Kanemitsu,Jianya Liu,2010 This volume aims at collecting survey papers which give broad and enlightening perspectives of various aspects of number theory Kitaoka s paper is a continuation of his earlier paper published in the last proceedings and pushes the research forward Browning s paper introduces a new direction of research on analytic number theory quantitative theory of some surfaces and Bruedern et al s paper details state of the art affairs of additive number theory There are two papers on modular forms Kohnen s paper describes generalized modular forms GMF which has some applications in conformal field theory while Liu s paper is very useful for readers who want to have a quick introduction to Maass forms and some analytic number theoretic problems related to them Matsumoto et al s paper gives a very thorough survey on functional relations of root system zeta functions Hoshi Miyake s paper is a continuation of Miyake s long and fruitful research on generic polynomials and gives rise to related Diophantine problems and Jia s paper surveys some dynamical aspects of a special arithmetic function connected with the distribution of prime numbers There are two papers of collections of problems by Shparlinski on exponential and character sums and Schinzel on polynomials which will serve as an aid for finding suitable research problems Yamamura s paper is a complete bibliography on determinant expressions for a certain class number and will be useful to researchers Thus the book gives a good balance of classical and modern aspects in number theory and will be useful to researchers including enthusiastic graduate students **Traces of Hecke Operators** Andrew Knightly,Charles Li,2006 The Fourier coefficients of modular forms are of widespread interest as an important source of arithmetic information In many cases these coefficients can be recovered from explicit knowledge of the traces of Hecke operators The original trace formula for Hecke operators was given by Selberg in 1956 Many improvements were made in subsequent years notably by Eichler and Hijikata This book provides a comprehensive modern treatment of the Eichler Selberg Hijikata trace formulafor the traces of Hecke operators on spaces of holomorphic cusp forms of weight $\mathtt{k} \geq 2$ for congruence subgroups of $\operatorname{SL}_2 \mathbf{Z}$ The first half of the text brings together the background from number theory and representation theory required for the computation Thisincludes detailed discussions of modular forms Hecke operators adeles and ideles structure theory for $\operatorname{GL}_2 \mathbf{A}$ strong approximation integration on locally compact groups the Poisson summation formula adelic zeta functions basic representation theory for locally compact groups the unitary representations of $\operatorname{GL}_2 \mathbf{R}$ and the connection between classical cusp forms and their adelic counterparts on $\operatorname{GL}_2 \mathbf{A}$ Thesecond half begins with a full development of the geometric side of the Arthur Selberg trace formula for the group $\operatorname{GL}_2 \mathbf{A}$ This leads to an expression for the trace of a Hecke operator which is then computed explicitly The exposition is virtually self contained withcomplete references for the occasional use of auxiliary results The book concludes with several applications of the final formula **The Spectrum of Hyperbolic Surfaces** Nicolas Bergeron,2016-02-19 This text is an introduction to the spectral theory of the Laplacian on

compact or finite area hyperbolic surfaces For some of these surfaces called arithmetic hyperbolic surfaces the eigenfunctions are of arithmetic nature and one may use analytic tools as well as powerful methods in number theory to study them After an introduction to the hyperbolic geometry of surfaces with a special emphasis on those of arithmetic type and then an introduction to spectral analytic methods on the Laplace operator on these surfaces the author develops the analogy between geometry closed geodesics and arithmetic prime numbers in proving the Selberg trace formula Along with important number theoretic applications the author exhibits applications of these tools to the spectral statistics of the Laplacian and the quantum unique ergodicity property The latter refers to the arithmetic quantum unique ergodicity theorem recently proved by Elon Lindenstrauss The fruit of several graduate level courses at Orsay and Jussieu The Spectrum of Hyperbolic Surfaces allows the reader to review an array of classical results and then to be led towards very active areas in modern mathematics **Encyclopaedia of Mathematics, Supplement III** Michiel Hazewinkel,2007-11-23 This is the third supplementary volume to Kluwer s highly acclaimed twelve volume Encyclopaedia of Mathematics This additional volume contains nearly 500 new entries written by experts and covers developments and topics not included in the previous volumes These entries are arranged alphabetically throughout and a detailed index is included This supplementary volume enhances the existing twelve volumes and together these thirteen volumes represent the most authoritative comprehensive and up to date Encyclopaedia of Mathematics available **Acta Arithmetica** ,2018 *Harmonic Maass Forms and Mock Modular Forms* Kathrin Bringmann,Amanda Folsom,Ken Ono,Larry Rolen,2017 A Torsion Jacquet-Langlands Correspondence Frank Calegari,Akshay Venkatesh,2019 We prove a numerical form of a Jacquet Langlands correspondence for torsion classes on arithmetic hyperbolic 3 manifolds Prov de l editor **Annales Scientifiques de L'École Normale Supérieure** ,2007 **Seminar on Mathematical Sciences** ,2007 **Interplay Between Weak Maass Forms and Modular Forms and Statistical Properties of Number Theoretic Objects** Robert C. Rhoades,2008 *Bulletin (new Series) of the American Mathematical Society* ,2006 Mathematical Reviews ,2005 **The Asian Journal of Mathematics** ,2004 **Subject Guide to Books in Print** ,1991

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