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Lectures on Automorphic *L*-functions

James W. Cogdell
Henry H. Kim
M. Ram Murty



American Mathematical Society

Lectures On Automorphic L Functions

Eric T. Sawyer



Lectures On Automorphic L Functions:

Lectures on Automorphic L-functions James W. Cogdell, Henry H. Kim, James W. Cogdell, Henry H. Kim, and M. Ram Murty, M. Ram Murty, James W Cogdell Lectures on L functions converse theorems and functoriality for GL_n Preface Modular forms and their L functions Automorphic forms Automorphic representations Fourier expansions and multiplicity one theorems Eulerian integral representations Local L functions The non Archimedean case The unramified calculation Local L functions The Archimedean case Global L functions Converse theorems Functoriality Functoriality for the classical groups Functoriality for the classical groups II Henry H Kim Automorphic L functions Introduction Chevalley groups and their properties Cuspidal representations L groups and automorphic L functions Induced representations Eisenstein series and constant terms L functions in the constant terms Meromorphic continuation of L functions Generic representations and their Whittaker models Local coefficients and non constant terms Local Langlands correspondence Local L functions and functional equations Normalization of intertwining operators Holomorphy and bounded in vertical strips Langlands functoriality conjecture Converse theorem of Cogdell and Piatetski Shapiro Functoriality of the symmetric cube Functoriality of the symmetric fourth Bibliography M Ram Murty Applications of symmetric power L functions Preface The Sato Tate conjecture Maass wave forms The Rankin Selberg method Oscillations of Fourier coefficients of cusp forms Poincare series Kloosterman sums and Selberg's conjecture Refined estimates for Fourier coefficients of cusp forms Twisting and averaging of L series The Kim Sarnak theorem Introduction to Artin L functions Zeros and poles of Artin L functions The Langlands Tunnell theorem Bibliography

Lectures on Automorphic L-functions James M. Cogdell, James W. Cogdell, Henry Hyeongsin Kim, Maruti Ram Murty, 2004 A series of lectures from a spring 2003 graduate course at the Fields Institute introduce Langlands functoriality conjecture and its consequences in number theory and representation theory focusing on how automorphic L functions play a crucial role in the theory They cover converse theorems and functionality for GL_n automorphic L functions and applications of symmetric power L functions They are not indexed Annotation 2004 Book News Inc Portland OR booknews.com

Analytic Properties of Automorphic L-Functions Stephen Gelbart, Freydoon Shahidi, 2014-07-14 Analytic Properties of Automorphic L Functions is a three chapter text that covers considerable research works on the automorphic L functions attached by Langlands to reductive algebraic groups Chapter I focuses on the analysis of Jacquet Langlands methods and the Einstein series and Langlands so called Euler products This chapter explains how local and global zeta integrals are used to prove the analytic continuation and functional equations of the automorphic L functions attached to GL_2 Chapter II deals with the developments and refinements of the zeta integrals for GL_n Chapter III describes the results for the L functions $L(s, \rho)$ which are considered in the constant terms of Einstein series for some quasimplit reductive group This book will be of value to undergraduate and graduate mathematics students

Eisenstein Series and Automorphic L-Functions Freydoon Shahidi, 2025-04-07 This book presents a treatment of the theory of L functions

developed by means of the theory of Eisenstein series and their Fourier coefficients a theory which is usually referred to as the Langlands Shahidi method The information gathered from this method when combined with the converse theorems of Cogdell and Piatetski Shapiro has been quite sufficient in establishing a number of new cases of Langlands functoriality conjecture at present some of these cases cannot be obtained by any other method These results have led to far reaching new estimates for Hecke eigenvalues of Maass forms as well as definitive solutions to certain problems in analytic and algebraic number theory This book gives a detailed treatment of important parts of this theory including a rather complete proof of Casselman Shalika's formula for unramified Whittaker functions as well as a general treatment of the theory of intertwining operators It also covers in some detail the global aspects of the method as well as some of its applications to group representations and harmonic analysis This book is addressed to graduate students and researchers who are interested in the Langlands program in automorphic forms and its connections with number theory *L-Functions and Arithmetic* J. Coates, Martin J. Taylor, 1991-02-22 Aimed at presenting nontechnical explanations all the essays in this collection of papers from the 1989 LMS Durham Symposium on L functions are the contributions of renowned algebraic number theory specialists [Contributions in Analytic and Algebraic Number Theory](#) Valentin Blomer, Preda Mihailescu, 2011-11-19 The text that comprises this volume is a collection of surveys and original works from experts in the fields of algebraic number theory analytic number theory harmonic analysis and hyperbolic geometry A portion of the collected contributions have been developed from lectures given at the International Conference on the Occasion of the 60th Birthday of S J Patterson held at the University of Göttingen July 27-29 2009 Many of the included chapters have been contributed by invited participants This volume presents and investigates the most recent developments in various key topics in analytic number theory and several related areas of mathematics The volume is intended for graduate students and researchers of number theory as well as applied mathematicians interested in this broad field *Harmonic Analysis, the Trace Formula, and Shimura Varieties* Clay Mathematics Institute. Summer School, 2005 Langlands program proposes fundamental relations that tie arithmetic information from number theory and algebraic geometry with analytic information from harmonic analysis and group representations This title intends to provide an entry point into this exciting and challenging field **Motives**, 1994-02-28 Motives were introduced in the mid 1960s by Grothendieck to explain the analogies among the various cohomology theories for algebraic varieties and to play the role of the missing rational cohomology This work contains the texts of the lectures presented at the AMS IMS SIAM Joint Summer Research Conference on Motives held in Seattle in 1991 **Advanced Analytic Number Theory: L-Functions** Carlos J. Moreno, 2005 Since the pioneering work of Euler Dirichlet and Riemann the analytic properties of L functions have been used to study the distribution of prime numbers With the advent of the Langlands Program L functions have assumed a greater role in the study of the interplay between Diophantine questions about primes and representation theoretic properties of Galois representations This book provides a complete introduction to

the most significant class of L functions the Artin Hecke L functions associated to finite dimensional representations of Weil groups and to automorphic L functions of principal type on the general linear group In addition to establishing functional equations growth estimates and non vanishing theorems a thorough presentation of the explicit formulas of Riemann type in the context of Artin Hecke and automorphic L functions is also given The survey is aimed at mathematicians and graduate students who want to learn about the modern analytic theory of L functions and their applications in number theory and in the theory of automorphic representations The requirements for a profitable study of this monograph are a knowledge of basic number theory and the rudiments of abstract harmonic analysis on locally compact abelian groups **Level One**

Algebraic Cusp Forms of Classical Groups of Small Rank Gaëtan Chenevier, David A. Renard, 2015-08-21 The authors determine the number of level 1 polarized algebraic regular cuspidal automorphic representations of GL_n over \mathbb{Q} of any given infinitesimal character for essentially all $n \geq 8$ For this they compute the dimensions of spaces of level 1 automorphic forms for certain semisimple Z forms of the compact groups SO_7 SO_8 SO_9 and G_2 and determine Arthur's endoscopic partition of these spaces in all cases They also give applications to the 121 even lattices of rank 25 and determinant 2 found by Borcherds to level one self dual automorphic representations of GL_n with trivial infinitesimal character and to vector valued Siegel modular forms of genus 3 A part of the authors results are conditional to certain expected results in the theory of twisted endoscopy **Theory of Fundamental Bessel Functions of High Rank** Zhi Qi, 2021-02-10 In this article the

author studies fundamental Bessel functions for GL_n arising from the Vorono summation formula for any rank n and field \mathbb{F} \mathbb{R} or \mathbb{C} with focus on developing their analytic and asymptotic theory The main implements and subjects of this study of fundamental Bessel functions are their formal integral representations and Bessel differential equations The author proves the asymptotic formulae for fundamental Bessel functions and explicit connection formulae for the Bessel differential equations **On Certain L-Functions** James Arthur, 2011 Illuminate various areas of

the study of geometric analytic and number theoretic aspects of automorphic forms and their L functions and both local and global theory are addressed Topics discussed in the articles include Langlands functoriality the Rankin Selberg method the Langlands Shahidi method motivic Galois groups Shimura varieties orbital integrals representations of p -adic groups Plancherel formula and its consequences and the Gross Prasad conjecture **Eisenstein Series and Applications** Wee Teck

Gan, Stephen S. Kudla, Yuri Tschinkel, 2007-12-22 Eisenstein series are an essential ingredient in the spectral theory of automorphic forms and an important tool in the theory of L functions They have also been exploited extensively by number theorists for many arithmetic purposes Bringing together contributions from areas which do not usually interact with each other this volume introduces diverse users of Eisenstein series to a variety of important applications With this juxtaposition of perspectives the reader obtains deeper insights into the arithmetic of Eisenstein series The central theme of the exposition focuses on the common structural properties of Eisenstein series occurring in many related applications **Arithmetic**

Groups and Their Generalizations Lizhen Ji, 2008 In one guise or another many mathematicians are familiar with certain arithmetic groups such as \mathbf{Z} or $\mathrm{SL}_n(\mathbf{Z})$. Yet many applications of arithmetic groups and many connections to other subjects within mathematics are less well known. Indeed arithmetic groups admit many natural and important generalizations. The purpose of this expository book is to explain through some brief and informal comments and extensive references what arithmetic groups and their generalizations are, why they are important to study, and how they can be understood and applied to many fields such as analysis, geometry, topology, number theory, representation theory, and algebraic geometry. It is hoped that such an overview will shed a light on the important role played by arithmetic groups in modern mathematics. Titles in this series are co-published with International Press, Cambridge, MA.

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the author deserves credit for having done the tremendous job of encompassing every aspect of arithmetic groups visible in today's mathematics in a systematic manner; the book should be an important guide for some time to come.

AMSIP 43 *Computations with Modular Forms* Gebhard Böckle, Gabor Wiese, 2014-01-23 This volume contains original research articles, survey articles, and lecture notes related to the Computations with Modular Forms 2011 Summer School and Conference held at the University of Heidelberg. A key theme of the Conference and Summer School was the interplay between theory, algorithms, and experiment. The 14 papers offer readers both instructional courses on the latest algorithms for computing modular and automorphic forms, as well as original research articles reporting on the latest developments in the field. The three Summer School lectures provide an introduction to modern algorithms together with some theoretical background for computations of and with modular forms, including computing cohomology of arithmetic groups, algebraic automorphic forms, and overconvergent modular symbols. The 11 Conference papers cover a wide range of themes related to computations with modular forms, including lattice methods for algebraic modular forms, on classical groups, a generalization of the Maeda conjecture, an efficient algorithm for special values of p -adic Rankin triple product L -functions, arithmetic aspects, and experimental data of Bianchi groups, a theoretical study of the real Jacobian of modular

curves results on computing weight one modular forms and more *Motives* Uwe Jannsen, Jean-pierre Serre, Steven Kleiman, 1994-02-28 Motives were introduced in the mid 1960s by Grothendieck to explain the analogies among the various cohomology theories for algebraic varieties to play the role of the missing rational cohomology and to provide a blueprint for proving Weil's conjectures about the zeta function of a variety over a finite field Over the last ten years or so researchers in various areas Hodge theory algebraic K theory polylogarithms automorphic forms L functions ℓ -adic representations trigonometric sums and algebraic cycles have discovered that an enlarged and in part conjectural theory of mixed motives indicates and explains phenomena appearing in each area Thus the theory holds the potential of enriching and unifying these areas These two volumes contain the revised texts of nearly all the lectures presented at the AMS IMS SIAM Joint Summer Research Conference on Motives held in Seattle in 1991 A number of related works are also included making for a total of forty seven papers from general introductions to specialized surveys to research papers **The Mathematical Legacy of**

Srinivasa Ramanujan M. Ram Murty, V. Kumar Murty, 2012-10-06 Srinivasa Ramanujan was a mathematician brilliant beyond comparison who inspired many great mathematicians There is extensive literature available on the work of Ramanujan But what is missing in the literature is an analysis that would place his mathematics in context and interpret it in terms of modern developments The 12 lectures by Hardy delivered in 1936 served this purpose at the time they were given This book presents Ramanujan's essential mathematical contributions and gives an informal account of some of the major developments that emanated from his work in the 20th and 21st centuries It contends that his work still has an impact on many different fields of mathematical research This book examines some of these themes in the landscape of 21st century mathematics These essays based on the lectures given by the authors focus on a subset of Ramanujan's significant papers and show how these papers shaped the course of modern mathematics **Endoscopy for $\mathrm{GSp}(4)$ and the Cohomology of**

Siegel Modular Threefolds Rainer Weissauer, 2009-04-28 This volume grew out of a series of preprints which were written and circulated between 1993 and 1994 Around the same time related work was done independently by Harder 40 and Laumon 62 In writing this text based on a revised version of these preprints that were widely distributed in summer 1995 I finally did not pursue the original plan to completely reorganize the original preprints After the long delay one of the reasons was that an overview of the results is now available in 115 Instead I tried to improve the presentation modestly in particular by adding cross references wherever I felt this was necessary In addition Chaps 11 and 12 and Sects 5.1, 5.4 and 5.5 were added these were written in 1998 I will give a more detailed overview of the content of the different chapters below Before that I should mention that the two main results are the proof of Ramanujan's conjecture for Siegel modular forms of genus 2 for forms which are not cuspidal representations associated with parabolic subgroups CAP representations and the study of the endoscopic lift for the group $\mathrm{GSp}(4)$ Both topics are formulated and proved in the first two chapters assuming the stabilization of the trace formula All the remaining technical results which are necessary to obtain the stabilized trace formula are presented in the

remaining chapters Chapter 1 gathers results on the cohomology of Siegel modular threefolds that are used in later chapters notably in Chap 3 At the beginning of Chap Function Theory Eric T. Sawyer, Geometries in Interaction Y. Eliashberg,V. Milman,L. Polterovich,R. Schoen,2012-12-06 In the last decades of the 20th century tremendous progress has been achieved in geometry The discovery of deep interrelations between geometry and other fields including algebra analysis and topology has pushed it into the mainstream of modern mathematics This Special Issue of Geometric And Functional Analysis GAFA in honour of Mikhail Gromov contains 14 papers which give a wide panorama of recent fundamental developments in modern geometry and its related subjects The book is a collection of important results and an enduring source of new ideas for researchers and students in a broad spectrum of directions related to all aspects of geometry and its applications to functional analysis PDE analytic number theory and physics This is a reprint from GAFA Vol 5 1995 No 2 enlarged by a short biography of Mikhail Gromov and a list of his publications

Reviewing **Lectures On Automorphic L Functions**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is truly astonishing. Within the pages of "**Lectures On Automorphic L Functions**," an enthralling opus penned by a very acclaimed wordsmith, readers embark on an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve in to the book is central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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