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# Diophantine Approximations And Value Distribution Theory

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Probabilistic Diophantine Approximation

Nevanlinna's Theory of Value Distribution

Applications of Diophantine Approximation to Integral Points and Transcendence

Nevanlinna Theory And Its Relation To Diophantine Approximation

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**ROCCO PONCE**

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**Probabilistic  
Diophantine  
Approximation** Springer  
The Nevanlinna theory of  
value distribution of  
meromorphic functions,

one of the milestones of  
complex analysis during  
the last century, was c-  
ated to extend the  
classical results  
concerning the  
distribution of of entire  
functions to the more  
general setting of  
meromorphic functions.  
Later on, a similar  
reasoning has been

applied to algebroid  
functions, subharmonic  
functions and  
meromorphic functions on  
Riemann surfaces as well  
as to -alytic functions of  
several complex  
variables, holomorphic  
and meromorphic  
mappings and to the  
theory of minimal  
surfaces. Moreover,

several applications of the theory have been exploited, including complex differential and functional equations, complex dynamics and Diophantine equations. The main emphasis of this collection is to direct attention to a number of recently developed novel ideas and generalizations that relate to the development of value distribution theory and its applications. In particular, we mean a recent theory that replaces the conventional consideration of counting

within a disc by an analysis of their geometric locations. Another such example is presented by the generalizations of the second main theorem to higher dimensional cases by using the jet theory. Moreover, similar ideas apparently may be applied to several related areas as well, such as to partial differential equations and to differential geometry. Indeed, most of these applications go back to the problem of analyzing zeros of certain complex

or real functions, meaning in fact to investigate level sets or level surfaces.

### **Nevanlinna's Theory of Value Distribution**

Springer Science & Business Media

This book describes the theories and developments in Nevanlinna theory and Diophantine approximation. Although these two subjects belong to the different areas: one in complex analysis and one in number theory, it has been discovered that a number of striking similarities exist between

these two subjects. A growing understanding of these connections has led to significant advances in both fields. Outstanding conjectures from decades ago are being solved. Over the past 20 years since the first edition appeared, there have been many new and significant developments. The new edition greatly expands the materials. In addition, three new chapters were added. In particular, the theory of algebraic curves, as well as the algebraic hyperbolicity, which provided the

motivation for the Nevanlinna theory. *Applications of Diophantine Approximation to Integral Points and Transcendence* Springer Science & Business Media  
A treatment of cutting-edge research on the distribution modulo one of sequences and related topics, much of it from the last decade. There are numerous exercises to aid student understanding of the topic, and researchers will appreciate the notes at the end of each chapter, extensive

references and open problems.

**Nevanlinna Theory And Its Relation To Diophantine Approximation** CUP Archive

Nevanlinna theory (or value distribution theory) in complex analysis is so beautiful that one would naturally be interested in determining how such a theory would look in the non Archimedean analysis and Diophantine approximations. There are two "main theorems" and defect relations that occupy a central place in

Nevanlinna theory. They generate a lot of applications in studying uniqueness of meromorphic functions, global solutions of differential equations, dynamics, and so on. In this book, we will introduce non-Archimedean analogues of Nevanlinna theory and its applications. In value distribution theory, the main problem is that given a holomorphic curve  $f: \mathbb{C} \rightarrow M$  into a projective variety  $M$  of dimension  $n$  and a family  $\mathcal{H}$  of hypersurfaces on  $M$ ,

under a proper condition of non-degeneracy on  $f$ , find the defect relation. If  $\mathcal{H}$  is a family of hyperplanes on  $M = \mathbb{P}^n$  in general position and if the smallest dimension of linear subspaces containing the image  $f(\mathbb{C})$  is  $k$ , Cartan conjectured that the bound of defect relation is  $2n - k + 1$ . Generally, if  $\mathcal{H}$  is a family of admissible or normal crossings hypersurfaces, there are respectively Shiffman's conjecture and Griffiths-Lang's conjecture. Here we list the process of this

problem: A. Complex analysis: (i) Constant targets: R. Nevanlinna [98] for  $n = k = 1$ ; H. Cartan [20] for  $n = k > 1$ ; E. I. Nochka [99], [100], [101] for  $n > k \sim 1$ ; Shiffman's conjecture partially solved by Hu-Yang [71]; Griffiths-Lang's conjecture (open). *Lectures on Diophantine Approximations* Courier Corporation  
This book gives a comprehensive treatment of random phenomena and distribution results in diophantine approximation, with a particular emphasis on

quadratic irrationals. It covers classical material on the subject as well as many new results developed by the author over the past decade. A range of ideas from other areas of mathematics are brought to bear with surprising connections to topics such as formulae for class numbers, special values of L-functions, and Dedekind sums. Care is taken to elaborate difficult proofs by motivating major steps and accompanying them with background explanations, enabling the reader to

learn the theory and relevant techniques. Written by one of the acknowledged experts in the field, Probabilistic Diophantine Approximation is presented in a clear and informal style with sufficient detail to appeal to both advanced students and researchers in number theory. *Diophantine Approximation* Springer Science & Business Media Diophantine number theory is an active area that has seen tremendous growth over the past

century, and in this theory unit equations play a central role. This comprehensive treatment is the first volume devoted to these equations. The authors gather together all the most important results and look at many different aspects, including effective results on unit equations over number fields, estimates on the number of solutions, analogues for function fields and effective results for unit equations over finitely generated domains. They also

present a variety of applications. Introductory chapters provide the necessary background in algebraic number theory and function field theory, as well as an account of the required tools from Diophantine approximation and transcendence theory. This makes the book suitable for young researchers as well as experts who are looking for an up-to-date overview of the field.

Meromorphic Functions over Non-Archimedean Fields Springer Science &

Business Media  
This monograph serves as a self-contained introduction to Nevanlinna's theory of value distribution as well as a valuable reference for research specialists. Authors present, for the first time in book form, the most modern and refined versions of the Second Main Theorem with precise error terms, in both the geometric and logarithmic derivative based approaches. A unique feature of the monograph is its number theoretic digressions

These special sections assume no background in number theory and explore the exciting interconnections between Nevanlinna theory and the theory of Diophantine approximation.

*Distribution Theory of Algebraic Numbers*  
Springer

It was discovered recently that Nevanlinna theory and Diophantine approximation bear striking similarities and connections. This book provides an introduction to both Nevanlinna theory and Diophantine



approximation, with emphasis on the analogy between these two subjects. Each chapter is divided into part A and part B. Part A deals with Nevanlinna theory and part B covers Diophantine approximation. At the end of each chapter, a table is provided to indicate the correspondence of theorems.

**Approximations  
Diophantiennes et  
Nombres  
Transcendants.  
Diophantine  
Approximations and  
Transcendental**

**Numbers** Springer  
Science & Business Media  
The book timely surveys new research results and related developments in Diophantine approximation, a division of number theory which deals with the approximation of real numbers by rational numbers. The book is appended with a list of challenging open problems and a comprehensive list of references. From the contents: Field extensions  
• Algebraic numbers • Algebraic geometry •

Height functions • The abc-conjecture • Roth's theorem • Subspace theorems • Vojta's conjectures • L-functions.  
*Diophantine Approximation and Its Applications* Springer  
These notes present recent results in the value-distribution theory of L-functions with emphasis on the phenomenon of universality. Universality has a strong impact on the zero-distribution: Riemann's hypothesis is true only if the Riemann zeta-function can

approximate itself uniformly. The text proves universality for polynomial Euler products. The authors' approach follows mainly Bagchi's probabilistic method. Discussion touches on related topics: almost periodicity, density estimates, Nevanlinna theory, and functional independence.

*Introduction to*

*Diophantine*

*Approximations*

Cambridge University Press

This book gives a comprehensive treatment

of random phenomena and distribution results in diophantine approximation, with a particular emphasis on quadratic irrationals. It covers classical material on the subject as well as many new results developed by the author over the past decade. A range of ideas from other areas of mathematics are brought to bear with surprising connections to topics such as formulae for class numbers, special values of L-functions, and Dedekind sums. Care is taken to elaborate difficult

proofs by motivating major steps and accompanying them with background explanations, enabling the reader to learn the theory and relevant techniques.

Written by one of the acknowledged experts in the field, Probabilistic Diophantine

Approximation is presented in a clear and informal style with sufficient detail to appeal to both advanced students and researchers in number theory.

**Distribution Modulo One and Diophantine**

**Approximation**

Cambridge University  
Press

This volume contains six detailed papers written by participants of the special session on value distribution theory and complex dynamics held in Hong Kong at the First Joint International Meeting of the AMS and the Hong Kong Mathematical Society in December 2000. It demonstrates the strong interconnections between the two fields and introduces recent progress of leading researchers from Asia. In

the book, W. Bergweiler discusses proper analytic maps with one critical point and generalizes a previous result concerning Leau domains. W. Cherry and J. Wang discuss non-Archimedean analogs of Picard's theorems. P.-C. Hu and C.-C. Yang give a survey of results in non-Archimedean value distribution theory related to unique range sets, the  $abc$ -conjecture, and Shiffman's conjecture. L. Keen and J. Kotus explore the dynamics of the family of  $\lambda(z) = \lambda \tan(z$

) and show that it has much in common with the dynamics of the familiar quadratic family  $f_c(z) = z^2 + c$ . R. Oudkerk discusses the interesting phenomenon known as parabolic implosion and, in particular, shows the persistence of Fatou coordinates under perturbation. Finally, M. Taniguchi discusses deformation spaces of entire functions and their combinatorial structure of singularities of the functions. The book is intended for graduate students and research

mathematicians interested in complex dynamics, function theory, and non-Archimedean function theory.

**An Introduction to Diophantine**

**Approximation** Springer Science & Business Media  
This introduction to the theory of Diophantine approximation pays special regard to Schmidt's subspace theorem and to its applications to Diophantine equations and related topics. The geometric viewpoint on

Diophantine equations has been adopted throughout the book. It includes a number of results, some published here for the first time in book form, and some new, as well as classical material presented in an accessible way. Graduate students and experts alike will find the book's broad approach useful for their work, and will discover new techniques and open questions to guide their research. It contains concrete examples and many exercises (ranging from the relatively simple

to the much more complex), making it ideal for self-study and enabling readers to quickly grasp the essential concepts.

**Unit Equations in Diophantine Number Theory** World Scientific

This monograph serves as a self-contained introduction to Nevanlinna's theory of value distribution as well as a valuable reference for research specialists. Authors present, for the first time in book form, the most modern and refined versions of the

Second Main Theorem with precise error terms, in both the geometric and logarithmic derivative based approaches. A unique feature of the monograph is its number theoretic digressions. These special sections assume no background in number theory and explore the exciting interconnections between Nevanlinna theory and the theory of Diophantine approximation.

[An Introduction to Diophantine Approximation](#) Springer Science & Business Media

The purpose of this research monograph is to build up a modern value distribution theory for complex analytic mappings between abstract Riemann surfaces. All results presented herein are new in that, apart from the classical background material in the last chapter, there is no overlapping with any existing monograph on meromorphic functions. Broadly speaking the division of the book is as follows: The Introduction and Chapters I to III deal mainly with the

theory of mappings of arbitrary Riemann surfaces as developed by the first named author; Chapter IV, due to Nakai, is devoted to meromorphic functions on parabolic surfaces; Chapter V contains Matsumoto's results on Picard sets; Chapter VI, pre dominantly due to the second named author, presents the so-called nonintegrated forms of the main theorems and includes some joint work by both authors. For a complete list of writers whose results have been

discussed we refer to the Author Index.

**Distribution Modulo One and Diophantine Approximation** Springer

This volume contains 21 research and survey papers on recent developments in the field of diophantine approximation, which are based on lectures given at a conference at the Erwin Schrödinger-Institute (Vienna, 2003). The articles are either in the spirit of more classical diophantine analysis or of a geometric or combinatorial flavor.

Several articles deal with estimates for the number of solutions of diophantine equations as well as with congruences and polynomials.

*Diophantine Approximations and Value Distribution Theory*  
Springer Science & Business Media

The subject of the book is Diophantine approximation and Nevanlinna theory. This book proves not just some new results and directions but challenging open problems in Diophantine approximation and

Nevanlinna theory. The authors' newest research activities on these subjects over the past eight years are collected here. Some of the significant findings are the proof of Green-Griffiths conjecture by using meromorphic connections and Jacobian sections, generalized abc-conjecture, and more. *Nevanlinna Theory in Several Complex Variables and Diophantine Approximation* Cambridge University Press  
The 13 chapters of this book centre around the

proof of Theorem 1 of Faltings' paper "Diophantine approximation on abelian varieties", Ann. Math.133 (1991) and together give an approach to the proof that is accessible to Ph.D-level students in number theory and algebraic geometry. Each chapter is based on an instructional lecture given by its author at a special conference for graduate students, on the topic of Faltings' paper. *Probabilistic Diophantine Approximation* Springer Science & Business Media  
This volume represents

the proceedings of a Conference on Diophantine Approximation and Its Applications held in Washington, D.C., June 6-8, 1972, and sponsored by the Mathematics Research Center of the Naval Research Laboratory. The purpose of this meeting was to stimulate research in the area of Diophantine approximation by bringing together many of the leading researchers in this field so that they could exchange information and ideas. Fourteen formal

lectures were presented at the conference, and these are the papers contained in this volume. **Lecture Notes on Diophantine Analysis** Springer  
This book presents state-of-the-art research on the distribution modulo one of sequences of integral powers of real numbers and related topics. Most of the results have never before appeared in one book and many of them were proved only during the last decade. Topics covered include the distribution modulo one of

the integral powers of  $3/2$  and the frequency of occurrence of each digit in the decimal expansion of the square root of two. The author takes a point of view from combinatorics on words and introduces a variety of techniques, including

explicit constructions of normal numbers, Schmidt's games, Riesz product measures and transcendence results. With numerous exercises, the book is ideal for graduate courses on Diophantine

approximation or as an introduction to distribution modulo one for non-experts. Specialists will appreciate the inclusion of over 50 open problems and the rich and comprehensive bibliography of over 700 references.

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