

A Tutorial on the Non-Asymptotic Theory of System Identification

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Abstract

This tutorial serves as an introduction to recently developed non-asymptotic methods in the theory of—mainly linear—system identification. We emphasize tools we deem particularly useful for a range of problems in this domain, such as the covering technique, the Hanson-Wright Inequality and the method of self-normalized martingales. We then employ these tools to give streamlined proofs of the performance of various least-squares based estimators for identifying the parameters in autoregressive models. We conclude by sketching out how the ideas presented herein can be extended to certain nonlinear identification problems.

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Jean-Pierre Rozelot, Coralie Neiner



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Asymptotic Theory of Dynamic Boundary Value Problems in Irregular Domains Dmitrii Korikov, Boris Plamenevskii, Oleg Sarafanov, 2021-04-01 This book considers dynamic boundary value problems in domains with singularities of two types The first type consists of edges of various dimensions on the boundary in particular polygons cones lenses polyhedra are domains of this type Singularities of the second type are singularly perturbed edges such as smoothed corners and edges and small holes A domain with singularities of such type depends on a small parameter whereas the boundary of the limit domain as the parameter tends to zero has usual edges i e singularities of the first type In the transition from the limit domain to the perturbed one the boundary near a conical point or an edge becomes smooth isolated singular points become small cavities and so on In an irregular domain with such singularities problems of elastodynamics electrodynamics and some other dynamic problems are discussed The purpose is to describe the asymptotics of solutions near singularities of the boundary The presented results and methods have a wide range of applications in mathematical physics and engineering The book is addressed to specialists in mathematical physics partial differential equations and asymptotic methods

Non-Classical Problems in the Theory of Elastic Stability Isaac Elishakoff, Yiwei Li, James H. Starnes, 2001-01-29 When a structure is put under an increasing compressive load it becomes unstable and buckling occurs Buckling is a particularly significant concern in designing shell structures such as aircraft automobiles ships or bridges This book discusses stability analysis and buckling problems and offers practical tools for dealing with uncertainties that exist in real systems The techniques are based on two complementary theories which are developed in the text First the probabilistic theory of stability is presented with particular emphasis on reliability Both theoretical and computational issues are discussed Secondly the authors present the alternative to probability based on the notion of anti optimization a theory that is valid when the necessary information for probabilistic analysis is absent that is when only scant data are available Design engineers researchers and graduate students in aerospace mechanical marine and civil engineering who are concerned with issues of structural integrity will find this book a useful reference source

Problems of the Asymptotic Theory of Non-stationary Vibrations J. A. Barnard, 1965

Non-Linear Mass Transfer and Hydrodynamic Stability C.B. Boyadjiev, V.N. Babak, 2000-08-16 Surveyed in this book are the kinetics of non linear mass transfer and its effects on hydrodynamic stability in systems with intensive interphase mass transfer in electrochemical systems with high current density and in chemically reacting systems In Part 1 the non linear mass transfer as a result of an intensive interphase mass transfer in the gas liquid solid surface gas liquid and liquid liquid systems is considered in the diffusion boundary layer approximation as well as in flat channel taking the longitudinal diffusion into account The influence of the direction of the intensive interphase mass transfer on heat transfer and multi component mass transfer is illustrated Part 2 discusses non linear mass transfer in electrochemical systems with high current density using the examples of the anode dissolving of metals in the electrolyte flow and the electro separation of

metals out of concentrated solutions The theory of the measured electrochemical treatment of metals and alloys which is a method of wide practical use has been elaborated on this basis In Part 3 the non linear mass transfer in chemically reacting systems is considered in the cases of non linearity of the equations of the chemical reaction s kinetics and intensive interphase mass transfer or thermo capillary effect due to chemical reactions On this basis the mechanisms and the macro kinetics of the chemical transformations in the gas liquid systems are discussed Part 4 is dedicated to the chemical reaction kinetics in stationary two phase systems at an arbitrary contact time between phases In Part 5 the effects of concentration gradients are considered in the approximations of the linear theory of the hydrodynamic stability of almost parallel flows In systems with intensive interphase mass transfer the Marangoni effect could also be observed beside the effect of non linear mass transfer A comparative analysis of both effects is made in this book

Modeling and Inverse Problems in the Presence of Uncertainty H. T. Banks, Shuhua Hu, W. Clayton Thompson, 2014-04-01 Modeling and Inverse Problems in the Presence of Uncertainty collects recent research including the authors own substantial projects on uncertainty propagation and quantification It covers two sources of uncertainty where uncertainty is present primarily due to measurement errors and where uncertainty is present due to the modeling formulation i

Problems of Nonlinear Mechanics and Physics of Materials Igor V. Andrianov, Arkadiy I. Manevich, Yuri V. Mikhlin, Oleg V. Gendelman, 2018-07-31 This book presents contributions on the current problems in a number of topical areas of nonlinear dynamics and physics written by experts from Russia Ukraine Israel Germany Poland Italy the Netherlands the USA and France The book is dedicated to Professor Leonid I Manevitch an outstanding scholar in the fields of Mechanics of Solids Nonlinear Dynamics and Polymer Physics on the occasion of his 80th birthday

Elements of the Mathematical Theory of Multi-Frequency Oscillations Anatolii M. Samoilenko, 2012-12-06 *Transonic Shock-turbulent Boundary Layer Interactions on Spinning Axisymmetric Bodies at Zero Angle of Attack* George R. Inger, 1983 This report presents a detailed triple deck theory of the transonic shock nonseparating turbulent boundary layer interaction zones on spinning axisymmetric bodies at zero angle of attack The theory allows a general non equilibrium turbulent boundary layer history upstream of the interaction We further describe the application of this theory as a local interactive module imbedded in a global composite viscous inviscid transonic flow field prediction method which can handle two or more such interaction zones Detailed comparisons with both experimental data and thin layer Navier Stokes code predictions are presented to verify the accuracy and reliability of the composite method solutions for pressure displacement thickness velocity profiles shape factor and skin friction distributions along the body over a wide range of Mach Reynolds number conditions Author

The Pulsations of the Sun and the Stars Jean-Pierre Rozelot, Coralie Neiner, 2011-07-03 This volume of lecture notes brings together the knowledge on pulsations of the Sun and the stars with a particular emphasis on recent observations and modelling and on the influence of pulsations of other physical processes The book begins with an extensive introduction to helioseismology The solar cycle and gravity modes are discussed before the

focus is widened from helioseismology to asteroseismology which is detailed in a series of specific chapters Based on courses given at a graduate school these tutorial lecture notes will be of interest and useful to a rather broad audience of scientists and students

Electromagnetic Wave Theory J. C. Brown, 2013-10-22 Electromagnetic Wave Theory Part 2 contains the proceedings of a Symposium on Electromagnetic Wave Theory held at Delft The Netherlands in September 1965 The symposium provided a forum for discussing electromagnetic wave theory and tackled a wide range of topics from propagation in nonlinear media to electromagnetic wave propagation and amplification in solid state plasmas Electromagnetic waves in nonlinear transmission lines with active parameters are also considered along with the phase dependence of maser active material Q factor on pump intensity and frequency Comprised of four sections this volume begins with an analysis of two modes of propagation that are coupled through parametric modulation in nonlinear media The discussion then turns to symmetry restrictions in nonlinear non absorbing non dispersive media nonlinear interaction between two beams of plane electromagnetic waves in an anisotropic medium radiation in periodically non stationary media and electromagnetic wave propagation in time varying media Subsequent chapters explore the diffraction of electromagnetic waves by plasma structures resonant electromagnetic scattering from gyrotropic plasmas scattering and transmission of electromagnetic waves at a statistically rough boundary between two dielectric media and developments in wavefront reconstruction This book will be useful for students practitioners and researchers in physics

Issues in Logic, Operations, and Computational Mathematics and Geometry: 2011 Edition, 2012-01-09 Issues in Logic Operations and Computational Mathematics and Geometry 2011 Edition is a ScholarlyEditions eBook that delivers timely authoritative and comprehensive information about Logic Operations and Computational Mathematics and Geometry The editors have built Issues in Logic Operations and Computational Mathematics and Geometry 2011 Edition on the vast information databases of ScholarlyNews You can expect the information about Logic Operations and Computational Mathematics and Geometry in this eBook to be deeper than what you can access anywhere else as well as consistently reliable authoritative informed and relevant The content of Issues in Logic Operations and Computational Mathematics and Geometry 2011 Edition has been produced by the world s leading scientists engineers analysts research institutions and companies All of the content is from peer reviewed sources and all of it is written assembled and edited by the editors at ScholarlyEditions and available exclusively from us You now have a source you can cite with authority confidence and credibility More information is available at <http://www.ScholarlyEditions.com>

Challenges in Fluid Dynamics R.Kh. Zeytounian, 2017-12-21 This monograph presents a synopsis of fluid dynamics based on the personal scientific experience of the author who has contributed immensely to the field The interested reader will also benefit from the general historical context in which the material is presented in the book The book covers a wide range of relevant topics of the field and the main tool being rational asymptotic modelling RAM approach The target audience primarily comprises experts in the field of fluid dynamics but the book may

also be beneficial for graduate students Geometric and Computational Spectral Theory Alexandre Girouard, Dmitry Jakobson, Michael Levitin, Nilima Nigam, Iosif Polterovich, Frédéric Rochon, 2017-10-30 A co publication of the AMS and Centre de Recherches Mathématiques The book is a collection of lecture notes and survey papers based on the mini courses given by leading experts at the 2015 Séminaire de Mathématiques Supérieures on Geometric and Computational Spectral Theory held from June 15-26 2015 at the Centre de Recherches Mathématiques Université de Montréal Montréal Québec Canada The volume covers a broad variety of topics in spectral theory highlighting its connections to differential geometry mathematical physics and numerical analysis bringing together the theoretical and computational approaches to spectral theory and emphasizing the interplay between the two Theory and Modeling of Rotating Fluids Keke Zhang, Xinhao Liao, 2017-05-23 A systematic account of the theory and modelling of rotating fluids that highlights the remarkable advances in the area and brings researchers and postgraduate students in atmospheres oceanography geophysics astrophysics and engineering to the frontiers of research Sufficient mathematical and numerical detail is provided in a variety of geometries such that the analysis and results can be readily reproduced and many numerical tables are included to enable readers to compare or benchmark their own calculations Traditionally there are two disjointed topics in rotating fluids convective fluid motion driven by buoyancy discussed by Chandrasekhar 1961 and inertial waves and precession driven flow described by Greenspan 1968 Now for the first time in book form a unified theory is presented for three topics thermal convection inertial waves and precession driven flow to demonstrate that these seemingly complicated and previously disconnected problems become mathematically simple in the framework of an asymptotic approach that incorporates the essential characteristics of rotating fluids *Air Force Research Resumés* , **Theory and Computation of Electromagnetic Fields** Jian-Ming Jin, 2011-03-16 This book is intended to serve as a textbook for an entry level graduate course on electromagnetics first seven chapters and for an advanced level graduate course on computational electromagnetics last five chapters Whereas there are several textbooks available for the graduate electromagnetics course no textbook is available for the advanced course on computational electromagnetics This book is intended to fill this void and present electromagnetic theory in a systematic manner so that students can advance from the first course to the second without much difficulty Even though the first part of the book covers the standard basic electromagnetic theory the coverage is different from that in existing textbooks This is mainly the result of the undergraduate curriculum reform that occurred during the past two decades Many universities reduced the number of required courses in order to give students more freedom to design their own portfolio As a result only one electromagnetics course is required for undergraduate students in most electrical engineering departments in the country New graduate students come to take the graduate electromagnetics course with a significant difference in their knowledge of basic electromagnetic theory To meet the challenge to benefit all students of backgrounds this book covers both fundamental theories such as vector analysis Maxwell's equations and boundary conditions and transmission line theory

and advanced topics such as wave transformation addition theorems and scattering by a layered sphere Predictions in Time Series Using Regression Models Frantisek Stulajter, 2013-06-29 Books on time series models deal mainly with models based on Box Jenkins methodology which is generally represented by autoregressive integrated moving average models or some nonlinear extensions of these models such as generalized autoregressive conditional heteroscedasticity models Statistical inference for these models is well developed and commonly used in practical applications due also to statistical packages containing time series analysis parts The present book is based on regression models used for time series These models are used not only for modeling mean values of observed time series but also for modeling their covariance functions which are often given parametrically Thus for a given finite length observation of a time series we can write the regression model in which the mean value vectors depend on regression parameters and the covariance matrices of the observation depend on variance covariance parameters Both these dependences can be linear or nonlinear The aim of this book is to give an unified approach to the solution of statistical problems for such time series models and mainly to problems of the estimation of unknown parameters of models and to problems of the prediction of time series modeled by regression models

Modern Aspects of Random Matrix Theory Van H. Vu, 2014-07-16 The theory of random matrices is an amazingly rich topic in mathematics Random matrices play a fundamental role in various areas such as statistics mathematical physics combinatorics theoretical computer science number theory and numerical analysis This volume is based on lectures delivered at the 2013 AMS Short Course on Random Matrices held January 6 7 2013 in San Diego California Included are surveys by leading researchers in the field written in introductory style aiming to provide the reader a quick and intuitive overview of this fascinating and rapidly developing topic These surveys contain many major recent developments such as progress on universality conjectures connections between random matrices and free probability numerical algebra combinatorics and high dimensional geometry together with several novel methods and a variety of open questions **Spectral Theory and Asymptotics of Differential Equations** , 2011-09-21 Spectral Theory and Asymptotics of Differential Equations

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mit helmut newton polaroids präsentiert die helmut newton stiftung erstmalig den werkaspekt der sofortbild fotografie im

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