Automatic Differentiation Of Algorithms

Automatic Differentiation of AlgorithmsAutomatic Differentiation of AlgorithmsEvaluating DerivativesThe Art of Differentiating Computer ProgramsAlgorithmic Differentiation in Finance ExplainedComputational DifferentiationAutomatic differentiation of algorithms : theory, implementation, and application [proceedings of the First SIAM Workshop on Automatic Differentiation, held in Breckenridge, Colorado, January 6-8, 1991/ edited by Andreas Griewank, George F. CorlissExpression Continuity and the Formal Differentiation of AlgorithmsRecent Advances in Algorithmic DifferentiationEvaluating DerivativesMathematics, the Science of AlgorithmsAutomatic Backward Differentiation for American Monte-Carlo Algorithms - ADD for Conditional Expectations and Indicator FunctionsStanford Exploration ProjectAutomatic DifferentiationCalc2 - a PLATO IV Lesson on DifferentiationThe Art of Computer Programming: Fundamental algorithmsInternational Conference on Transparent Optical NetworksAnnales Universitatis Mariae Curie-SkłodowskaCSA Neurosciences AbstractsTrends in Theoretical Computer Science George Corliss Andreas Griewank Andreas Griewank Uwe Naumann Marc Henrard M. Berz Andreas Griewank Robert Paige Shaun Forth Andreas Griewank James Byrnie Shaw Christian P. Fries Louis B. Rall Axel T. Schreiner Donald Ervin Knuth Egon Börger

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Science *George Corliss Andreas Griewank Andreas Griewank Uwe Naumann Marc Henrard M. Berz Andreas Griewank Robert Paige Shaun Forth Andreas Griewank James Byrnie Shaw Christian P. Fries Louis B. Rall Axel T. Schreiner Donald Ervin Knuth Egon Börger*

automatic differentiation ad is a maturing computational technology and has become a mainstream tool used by practicing scientists and computer engineers the rapid advance of hardware computing power and ad tools has enabled practitioners to quickly generate derivative enhanced versions of their code for a broad range of applications in applied research and development automatic differentiation of algorithms provides a comprehensive and authoritative survey of all recent developments new techniques and tools for ad use the book covers all aspects of the subject mathematics scientific programming i e use of adjoints in optimization and implementation i e memory management problems a strong theme of the book is the relationships between ad tools and other software tools such as compilers and parallelizers a rich variety of significant applications are presented as well including optimum shape design problems for which ad offers more efficient tools and techniques

mathematics of computing numerical analysis

this title is a comprehensive treatment of algorithmic or automatic differentiation the second edition covers recent developments in applications and theory including an elegant np completeness argument and an introduction to scarcity

in this entry level book on algorithmic also known as automatic differentiation ad the author covers the mathematical underpinnings as well as applications to real world numerical simulation programs readers will find many examples and exercises including hints to solutions a supplementary website contains software sources additional exercises useful links and errata

this book provides the first practical guide to the function and implementation of algorithmic differentiation in finance written in a highly accessible way algorithmic differentiation explained will take readers through all the major applications of ad in the derivatives setting with a focus on implementation algorithmic differentiation ad has been popular in engineering and computer science in areas such as fluid dynamics and data assimilation for many years over the last decade it has been increasingly and

successfully applied to financial risk management where it provides an efficient way to obtain financial instrument price derivatives with respect to the data inputs calculating derivatives exposure across a portfolio is no simple task it requires many complex calculations and a large amount of computer power which in prohibitively expensive and can be time consuming algorithmic differentiation techniques can be very successfully in computing greeks and sensitivities of a portfolio with machine precision written by a leading practitioner who works and programmes ad it offers a practical analysis of all the major applications of ad in the derivatives setting and guides the reader towards implementation open source code of the examples is provided with the book with which readers can experiment and perform their own test scenarios without writing the related code themselves

this volume encompasses both the automatic transformation of computer programs as well as the methodologies for the efficient exploitation of mathematical underpinnings or program structure

the proceedings represent the state of knowledge in the area of algorithmic differentiation ad the 31 contributed papers presented at the ad2012 conference cover the application of ad to many areas in science and engineering as well as aspects of ad theory and its implementation in tools for all papers the referees selected from the program committee and the greater community as well as the editors have emphasized accessibility of the presented ideas also to non ad experts in the ad tools arena new implementations are introduced covering for example java and graphical modeling environments or join the set of existing tools for fortran new developments in ad algorithms target the efficiency of matrix operation derivatives detection and exploitation of sparsity partial separability the treatment of nonsmooth functions and other high level mathematical aspects of the numerical computations to be differentiated applications stem from the earth sciences nuclear engineering fluid dynamics and chemistry to name just a few in many cases the applications in a given area of science or engineering share characteristics that require specific approaches to enable ad capabilities or provide an opportunity for efficiency gains in the derivative computation the description of these characteristics and of the techniques for successfully using ad should make the proceedings a valuable source of information for users of ad tools

algorithmic or automatic differentiation ad is concerned with the accurate and efficient evaluation of derivatives for functions defined by computer programs no truncation errors are incurred and the resulting numerical derivative values can be used for all scientific computations that are based on linear quadratic or even higher order approximations to nonlinear scalar or vector

functions in particular ad has been applied to optimization parameter identification equation solving the numerical integration of differential equations and combinations thereof apart from quantifying sensitivities numerically ad techniques can also provide structural information e g sparsity pattern and generic rank of jacobian matrices

in this note we derive a modified backward automatic differentiation a k a adjoint automatic differentiation adjoint algorithmic differentiation for algorithms containing conditional expectation operators and or indicator functions bermudan option and xva valuation are prototypical examples we consider the bermudan product valuation but the method is applicable in full generality featuring a clean and simple implementation the method improves accuracy and performance for conditional expectation operators it offers the ability to use different estimators in the valuation and the differentiation for the indicator function the method allows to use per operator differentiation of the indicator function enabling an accurate treatment of each individual exercise boundary which is not possible in a classic finite difference applied to the bermudan valuation

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