
Contents

Preface	V
List of Contributors	XIII
Reverse Automatic Differentiation of Linear Multistep Methods <i>Adrian Sandu</i>	1
Call Tree Reversal is NP-Complete <i>Uwe Naumann</i>	13
On Formal Certification of AD Transformations <i>Emmanuel M. Tadjouddine</i>	23
Collected Matrix Derivative Results for Forward and Reverse Mode Algorithmic Differentiation <i>Mike B. Giles</i>	35
A Modification of Weeks' Method for Numerical Inversion of the Laplace Transform in the Real Case Based on Automatic Differentiation <i>Salvatore Cuomo, Luisa D'Amore, Mariarosaria Rizzardi, and Almerico Murli</i>	45
A Low Rank Approach to Automatic Differentiation <i>Hany S. Abdel-Khalik, Paul D. Hovland, Andrew Lyons, Tracy E. Stover, and Jean Utke</i>	55
Algorithmic Differentiation of Implicit Functions and Optimal Values <i>Bradley M. Bell and James V. Burke</i>	67
Using Programming Language Theory to Make Automatic Differentiation Sound and Efficient <i>Barak A. Pearlmutter and Jeffrey Mark Siskind</i>	79

A Polynomial-Time Algorithm for Detecting Directed Axial Symmetry in Hessian Computational Graphs <i>Sanjukta Bhowmick and Paul D. Hovland</i>	91
On the Practical Exploitation of Scarsity <i>Andrew Lyons and Jean Utke</i>	103
Design and Implementation of a Context-Sensitive, Flow-Sensitive Activity Analysis Algorithm for Automatic Differentiation <i>Jaewook Shin, Priyadarshini Malusare, and Paul D. Hovland</i>	115
Efficient Higher-Order Derivatives of the Hypergeometric Function <i>Isabelle Charpentier, Claude Dal Cappello, and Jean Utke</i>	127
The Diamant Approach for an Efficient Automatic Differentiation of the Asymptotic Numerical Method <i>Isabelle Charpentier, Arnaud Lejeune, and Michel Potier-Ferry</i>	139
Tangent-on-Tangent vs. Tangent-on-Reverse for Second Differentiation of Constrained Functionals <i>Massimiliano Martinelli and Laurent Hascoët</i>	151
Parallel Reverse Mode Automatic Differentiation for OpenMP Programs with ADOL-C <i>Christian Bischof, Niels Guertler, Andreas Kowarz, and Andrea Walther</i>	163
Adjoint for Time-Dependent Optimal Control <i>Jan Riehme, Andrea Walther, Jörg Stiller, and Uwe Naumann</i>	175
Development and First Applications of TAC++ <i>Michael Voßbeck, Ralf Giering, and Thomas Kaminski</i>	187
TAPENADE for C <i>Valérie Pascual and Laurent Hascoët</i>	199
Coping with a Variable Number of Arguments when Transforming MATLAB Programs <i>H. Martin Bücker and Andre Vehreschild</i>	211
Code Optimization Techniques in Source Transformations for Interpreted Languages <i>H. Martin Bücker, Monika Petera, and Andre Vehreschild</i>	223
Automatic Sensitivity Analysis of DAE-systems Generated from Equation-Based Modeling Languages <i>Alya Elsheikh and Wolfgang Wiechert</i>	235

Index Determination in DAEs Using the Library <code>indexdet</code> and the ADOL-C Package for Algorithmic Differentiation <i>Dagmar Monett, René Lamour, and Andreas Griewank</i>	247
Automatic Differentiation for GPU-Accelerated 2D/3D Registration <i>Markus Grabner, Thomas Pock, Tobias Gross, and Bernhard Kainz</i>	259
Robust Aircraft Conceptual Design Using Automatic Differentiation in Matlab <i>Mattia Padulo, Shaun A. Forth, and Marin D. Guenov</i>	271
Toward Modular Multigrid Design Optimisation <i>Armen Jaworski and Jens-Dominik Müller</i>	281
Large Electrical Power Systems Optimization Using Automatic Differentiation <i>Fabrice Zaoui</i>	293
On the Application of Automatic Differentiation to the Likelihood Function for Dynamic General Equilibrium Models <i>Houtan Bastani and Luca Guerrieri</i>	303
Combinatorial Computation with Automatic Differentiation <i>Koichi Kubota</i>	315
Exploiting Sparsity in Jacobian Computation via Coloring and Automatic Differentiation: A Case Study in a Simulated Moving Bed Process <i>Assefaw H. Gebremedhin, Alex Pothén, and Andrea Walther</i>	327
Structure-Exploiting Automatic Differentiation of Finite Element Discretizations <i>Philipp Stumm, Andrea Walther, Jan Riehme, and Uwe Naumann</i>	339
Large-Scale Transient Sensitivity Analysis of a Radiation-Damaged Bipolar Junction Transistor via Automatic Differentiation <i>Eric T. Phipps, Roscoe A. Bartlett, David M. Gay, and Robert J. Hoekstra</i>	351