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	Nota di contenuto	MOTIVATION FOR COMPUTING FIRST- AND SECOND-ORDER SENSITIVITIES OF SYSTEM RESPONSES TO THE SYSTEMS PARAMETERS -- The Fundamental Role of Response Sensitivities for Uncertainty Quantification -- The Fundamental Role of Response Sensitivities for Predictive Modeling -- Advantages and Disadvantages of Statistical and Deterministic Methods for Computing Response Sensitivities -- ILLUSTRATIVE APPLICATION OF THE SECOND-ORDER ADJOINT SENSITIVITY ANALYSIS METHODOLOGY (2nd-ASAM) TO A LINEAR EVOLUTION PROBLEM -- Exact Computation of the 1st-Order Response Sensitivities -- Exact Computation of the 2nd-Order Response Sensitivities -- Computing the 2nd-Order Response Sensitivities Corresponding to the 1st-Order Sensitivities -- Discussion of the Essential Features of the 2nd-ASAM -- Illustrative Use of Response Sensitivities for Predictive Modeling -- THE SECOND-ORDER ADJOINT SENSITIVITY ANALYSIS METHODOLOGY (2nd-ASAM) FOR LINEAR SYSTEMS -- Mathematical Modeling of a General Linear System -- The 1st-Level Adjoint Sensitivity System (1st-LASS) for Computing Exactly and Efficiently 1st-Order Sensitivities of Scalar-Valued Responses for

Linear Systems -- The 2nd-Level Adjoint Sensitivity System (2nd-LASS) for Computing Exactly and Efficiently 1st-Order Sensitivities of Scalar-Valued Responses for Linear Systems -- APPLICATION OF THE 2nd-ASAM TO A LINEAR HEAT CONDUCTION AND CONVECTION BENCHMARK PROBLEM -- Heat Transport Benchmark Problem: Mathematical Modeling -- Computation of First-Order Sensitivities Using the 2nd-ASAM -- Computation of first-order sensitivities of the heated rod temperature -- Computation of first-order sensitivities of the coolant temperature -- Verification of the "ANSYS/FLUENT Adjoint Solver" -- Applying the 2nd-ASAM to Compute the Second-Order Sensitivities and Uncertainties for the Heat Transport Benchmark Problem -- APPLICATION OF THE 2nd-ASAM TO A LINEAR PARTICLE DIFFUSION PROBLEM -- Paradigm Diffusion Problem Description -- Applying the 2nd-ASAM to Compute the First-Order Response Sensitivities to Model Parameters -- Applying the 2nd-ASAM to Compute the Second-Order Response Sensitivities to Model Parameters -- Role of Second-Order Response Sensitivities for Quantifying Non-Gaussian Features of the Response Uncertainty Distribution -- Illustrative Application of First-Order Response Sensitivities for Predictive Modeling -- APPLICATION OF THE 2nd-ASAM FOR COMPUTING SENSITIVITIES OF DETECTOR RESPONSES TO UNCOLLIDED RADIATION TRANSPORT -- The Ray-Tracing Form of the Forward and Adjoint Boltzmann Transport Equation -- Application of the 2nd-ASAM to Compute the First-Order Response Sensitivities to Variations in Model Parameters -- Application of the 2nd-ASAM to Compute the Second-Order Response Sensitivities to Variations in Model Parameters -- THE SECOND-ORDER ADJOINT SENSITIVITY ANALYSIS METHODOLOGY (2nd-ASAM) FOR NONLINEAR SYSTEMS -- Mathematical Modeling of a General Nonlinear System -- The 1st-Level Adjoint Sensitivity System (1st-LASS) for Computing Exactly and Efficiently the 1st-Order Sensitivities of Scalar-Valued Responses -- The 2nd-Level Adjoint Sensitivity System (2nd-LASS) for Computing Exactly and Efficiently the 2nd-Order Sensitivities of Scalar-Valued Responses for Nonlinear Systems -- APPLICATION OF THE 2nd-ASAM TO A NONLINEAR HEAT CONDUCTION PROBLEM -- Mathematical Modeling of Heated Cylindrical Test Section -- Application of the 2nd-ASAM for Computing the 1st-Order Sensitivities -- Application of the 2nd-ASAM for Computing the 2nd-Order Sensitivities.

Sommario/riassunto

The Second-Order Adjoint Sensitivity Analysis Methodology generalizes the First-Order Theory presented in the author’s previous books published by CRC Press. This breakthrough has many applications in sensitivity and uncertainty analysis, optimization, data assimilation, model calibration, and reducing uncertainties in model predictions. The book has many illustrative examples that will help readers understand the complexity of the subject and will enable them to apply this methodology to problems in their own fields. Highlights: • Covers a wide range of needs, from graduate students to advanced researchers • Provides a text positioned to be the primary reference for high-order sensitivity and uncertainty analysis • Applies to all fields involving numerical modeling, optimization, quantification of sensitivities in direct and inverse problems in the presence of uncertainties. About the Author: Dan Gabriel Cacuci is a South Carolina SmartState Endowed Chair Professor and the Director of the Center for Nuclear Science and Energy, Department of Mechanical Engineering at the University of South Carolina. He has a Ph.D. in Applied Physics, Mechanical and Nuclear Engineering from Columbia University. He is also the recipient of many awards including four honorary doctorates, the Ernest Orlando Lawrence Memorial award from the U.S. Dept. of Energy and the Arthur

Holly Compton, Eugene P. Wigner and the Glenn Seaborg Awards from the American Nuclear Society.