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Nota di contenuto	BAYESIAN METHODS FOR STRUCTURAL DYNAMICS AND CIVIL ENGINEERING; Contents; Preface; Acknowledgements; Nomenclature; 1 Introduction; 1.1 Thomas Bayes and Bayesian Methods in Engineering; 1.2 Purpose of Model Updating; 1.3 Source of Uncertainty and Bayesian Updating; 1.4 Organization of the Book; 2 Basic Concepts and Bayesian Probabilistic Framework; 2.1 Conditional Probability and Basic Concepts; 2.1.1 Bayes' Theorem for Discrete Events; 2.1.2 Bayes' Theorem for Continuous-valued Parameters by Discrete Events; 2.1.3 Bayes' Theorem for Discrete Events by Continuous-valued Parameters 2.1.4 Bayes' Theorem between Continuous-valued Parameters 2.1.5 Bayesian Inference; 2.1.6 Examples of Bayesian Inference; 2.2 Bayesian Model Updating with Input-output Measurements; 2.2.1 Input-output Measurements; 2.2.2 Bayesian Parametric Identification; 2.2.3 Model Identifiability; 2.3 Deterministic versus Probabilistic Methods; 2.4 Regression Problems; 2.4.1 Linear Regression Problems; 2.4.2 Nonlinear Regression Problems; 2.5 Numerical Representation of the Updated PDF; 2.5.1 General Form of Reliability Integrals; 2.5.2 Monte Carlo Simulation

2.5.3 Adaptive Markov Chain Monte Carlo Simulation; 2.5.4 Illustrative Example; 2.6 Application to Temperature Effects on Structural Behavior; 2.6.1 Problem Description; 2.6.2 Thermal Effects on Modal Frequencies of Buildings; 2.6.3 Bayesian Regression Analysis; 2.6.4 Analysis of the Measurements; 2.6.5 Concluding Remarks; 2.7 Application to Noise Parameters Selection for the Kalman Filter; 2.7.1 Problem Description; 2.7.2 Kalman Filter; 2.7.3 Illustrative Examples; 2.8 Application to Prediction of Particulate Matter Concentration; 2.8.1 Introduction; 2.8.2 Extended-Kalman-filter based Time-varying Statistical Models; 2.8.3 Analysis with Monitoring Data; 2.8.4 Conclusion; 3 Bayesian Spectral Density Approach; 3.1 Modal and Model Updating of Dynamical Systems; 3.2 Random Vibration Analysis; 3.2.1 Single-degree-of-freedom Systems; 3.2.2 Multi-degree-of-freedom Systems; 3.3 Bayesian Spectral Density Approach; 3.3.1 Formulation for Single-channel Output Measurements; 3.3.2 Formulation for Multiple-channel Output Measurements; 3.3.3 Selection of the Frequency Index Set; 3.3.4 Nonlinear Systems; 3.4 Numerical Verifications; 3.4.1 Aliasing and Leakage; 3.4.2 Identification with the Spectral Density Approach; 3.4.3 Identification with Small Amount of Data; 3.4.4 Concluding Remarks; 3.5 Optimal Sensor Placement; 3.5.1 Information Entropy with Globally Identifiable Case; 3.5.2 Optimal Sensor Configuration; 3.5.3 Robust Information Entropy; 3.5.4 Discrete Optimization Algorithm for Suboptimal Solution; 3.6 Updating of a Nonlinear Oscillator; 3.7 Application to Structural Behavior under Typhoons; 3.7.1 Problem Description; 3.7.2 Meteorological Information of the Two Typhoons; 3.7.3 Analysis of Monitoring Data; 3.7.4 Concluding Remarks

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## Sommario/riassunto

Bayesian methods are a powerful tool in many areas of science and engineering, especially statistical physics, medical sciences, electrical engineering, and information sciences. They are also ideal for civil engineering applications, given the numerous types of modeling and parametric uncertainty in civil engineering problems. For example, earthquake ground motion cannot be predetermined at the structural design stage. Complete wind pressure profiles are difficult to measure under operating conditions. Material properties can be difficult to determine to a very precise level - especially conc

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