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| Autore | Zhou Shiyu <1970-> |
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| Nota di contenuto | Intro -- Industrial Data Analytics for Diagnosis and Prognosis -- Contents -- Preface -- Acknowledgments -- Acronyms -- Table of Notation -- 1 Introduction -- 1.1 Background and Motivation -- 1.2 Scope and Organization of the Book -- 1.3 How to Use This Book -- Bibliographic Note -- Part 1 Statistical Methods and Foundation for Industrial Data Analytics -- 2 Introduction to Data Visualization and Characterization -- 2.1 Data Visualization -- 2.1.1 Distribution Plots for a Single Variable -- 2.1.2 Plots for Relationship Between Two Variables -- 2.1.3 Plots for More than Two Variables -- 2.2 Summary Statistics -- 2.2.1 Sample Mean, Variance, and Covariance -- 2.2.2 Sample Mean Vector and Sample Covariance Matrix -- 2.2.3 Linear Combination of Variables -- Bibliographic Notes -- Exercises -- 3 Random Vectors and the Multivariate Normal Distribution -- 3.1 Random Vectors -- 3.2 Density Function and Properties of Multivariate Normal Distribution -- 3.3 Maximum Likelihood Estimation for Multivariate Normal Distribution -- 3.4 Hypothesis Testing on Mean Vectors -- 3.5 Bayesian Inference for Normal Distribution -- |

Sommario/riassunto

"Today, we are facing a data rich world that is changing faster than ever before. The ubiquitous availability of data provides great opportunities for industrial enterprises to improve their process quality and productivity. Industrial data analytics is the process of collecting, exploring, and analyzing data generated from industrial operations and throughout the product life cycle in order to gain insights and improve decision-making. This book describes industrial data analytics approaches with an emphasis on diagnosis and prognosis of industrial processes and systems. A large number of textbooks/research monographs exist on diagnosis and prognosis in the engineering eld. Most of these engineering books focus on model-based diagnosis and prognosis problems in dynamic systems. The modelbased approaches adopt a dynamic model for the system, often in the form of a state space model, as the basis for diagnosis and prognosis. Dierent from these existing books, this book focuses on the concept of random effects and its applications in system diagnosis and prognosis. The impetus for this book arose from the current digital revolution. In this digital age, the essential feature of a modern engineering system is that a large amount of data from multiple similar units/machines during their operations are collected in real time. This feature poses signicant intellectual opportunities and challenges. As for opportunities, since we have observations from potentially a very large number of similar units, we can compare their operations, share the information, and extract common knowledge to enable accurate and tailored prediction and control at the individual level. As for challenges, because the data are collected in the field and not in a controlled environment, the data contain signicant variation and heterogeneity due to the large variations in working/usage conditions for dierent units. This requires that the analytics approaches should be not only general (so that the common information can be learned and shared), but also flexible (so that the behaviour of an individual unit can be captured and controlled). The random effects modeling approaches can exactly address these opportunities and challenges"--