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| Record Nr. | UNINA9910897979803321 |
| Autore | Jahn Johannes |
| Titolo | Order Analysis, Deep Learning, and Connections to Optimization / / by Johannes Jahn |
| Pubbl/distr/stampa | Cham : , : Springer Nature Switzerland : , : Imprint : Springer, , 2024 |
| ISBN | 9783031674228 |
| | 3031674227 |
| Edizione | [1st ed. 2024.] |
| Descrizione fisica | 1 online resource (189 pages) |
| Collana | Vector Optimization, , 1867-898X |
| Disciplina | 515 |
| Soggetti | Operations research |
| | Mathematical optimization |
| | Functional analysis |
| | Operations Research and Decision Theory |
| | Optimization |
| | Functional Analysis |
| Lingua di pubblicazione | Inglese |
| Formato | Materiale a stampa |
| Livello bibliografico | Monografia |
| Nota di contenuto | Preliminaries -- C Representing Functionals -- Application in Nonlinear Optimization -- Application in Vector Optimization -- Application in Set Optimization -- Basics of Deep Learning -- Deep Learning with Set-Valued Inputs. |
| Sommario/riassunto | This book introduces readers to order analysis and various aspects of deep learning, and describes important connections to optimization, such as nonlinear optimization as well as vector and set optimization. Besides a review of the essentials, this book consists of two main parts. The first main part focuses on the introduction of order analysis as an application-driven theory, which allows to treat order structures with an analytical approach. Applications of order analysis to nonlinear optimization, as well as vector and set optimization with fixed and variable order structures, are discussed in detail. This means there are close ties to finance, operations research, and multicriteria decision making. Deep learning is the subject of the second main part of this book. In addition to the usual basics, the focus is on gradient methods, which are investigated in the context of complex models with a large |

number of parameters. And a new fast variant of a gradient method is presented in this part. Finally, the deep learning approach is extended to data sets given by set-valued data. Although this set-valued approach is more computationally intensive, it has the advantage of producing more robust predictions. This book is primarily intended for researchers in the fields of optimization, order theory, or artificial intelligence (AI), but it will also benefit graduate students with a general interest in these fields. The book assumes that readers have a basic understanding of functional analysis or at least basic analysis. By unifying and streamlining existing approaches, this work will also appeal to professionals seeking a comprehensive and straightforward perspective on AI or order theory approaches.