

1. Record Nr.	UNINA9910484854803321
Autore	Galindez Olascoaga Laura Isabel
Titolo	Hardware-aware probabilistic machine learning models : learning, inference and use cases // Laura Isabel Galindez Olascoaga, Wannas Meetr, Marian Verhelst
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2021] ©2021
ISBN	3-030-74042-0
Edizione	[1st ed. 2021.]
Descrizione fisica	1 online resource (XII, 163 p. 51 illus.)
Disciplina	006.31
Soggetti	Machine learning
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Introduction -- Background -- Hardware-Aware Cost Models -- Hardware-Aware Bayesian Networks for Sensor Front-End Quality Scaling -- Hardware-Aware Probabilistic Circuits -- Run-Time Strategies -- Conclusions.
Sommario/riassunto	This book proposes probabilistic machine learning models that represent the hardware properties of the device hosting them. These models can be used to evaluate the impact that a specific device configuration may have on resource consumption and performance of the machine learning task, with the overarching goal of balancing the two optimally. The book first motivates extreme-edge computing in the context of the Internet of Things (IoT) paradigm. Then, it briefly reviews the steps involved in the execution of a machine learning task and identifies the implications associated with implementing this type of workload in resource-constrained devices. The core of this book focuses on augmenting and exploiting the properties of Bayesian Networks and Probabilistic Circuits in order to endow them with hardware-awareness. The proposed models can encode the properties of various device sub-systems that are typically not considered by other resource-aware strategies, bringing about resource-saving opportunities that traditional approaches fail to uncover. The performance of the proposed models and strategies is empirically evaluated for several use cases. All of the considered examples show

the potential of attaining significant resource-saving opportunities with minimal accuracy losses at application time. Overall, this book constitutes a novel approach to hardware-algorithm co-optimization that further bridges the fields of Machine Learning and Electrical Engineering. Introduces a new, systematic approach for the realization of hardware-awareness with probabilistic models; Enables readers to accommodate various systems and applications, as demonstrated with multiple use cases targeting distinct types of devices; Describes novel methods to deal with some of the challenges of extreme-edge computing, a paradigm that has recently garnered attention as a complementary approach to cloud computing; Represents one of the first efforts systematically to bring probabilistic inference to the world of edge computing, by means of novel algorithmic insights and strategies. .
