1. Record Nr. UNISA996546820903316

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Titolo	Communication Principles for Data Science [[electronic resource] /] / by Changho Suh
Pubbl/distr/stampa	Singapore : , : Springer Nature Singapore : , : Imprint : Springer, , 2023
ISBN	981-19-8008-X
Edizione	[1st ed. 2023.]
Descrizione fisica	1 online resource (294 pages)
Collana	Signals and Communication Technology, , 1860-4870
Disciplina	381
Soggetti	Artificial intelligence—Data processing Digital media Computer science—Mathematics Mathematical statistics Signal processing Data Science Digital and New Media Probability and Statistics in Computer Science Signal, Speech and Image Processing
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	Preface -- Acknowledgements -- Part 1. Communication over the Gaussian channel -- Chapter 1.Overview of the book -- Chapter 2. A statistical model for additive noise channels -- Chapter 3. Additive Gaussian noise model -- Problem Set 1 -- Chapter 4. Optimal receiver: maximum A Posteriori (MAP) principle -- Chapter 5. Analysis of error probability -- Chapter 6. Multiple bits transmission via pulse amplitude modulation -- Problem Set 2 -- Chapter 7. Multi-shot communication -- Chapter 8. Repetition coding -- Chapter 9: Capacity of the additive white Gaussian noise channel -- Problem Set 3 -- Part 2. Communication over inter-symbol interference (ISI) channels -- Chapter 10. Signal conversion from discrete to continuous time (1/2) -- Chapter 11. Signal conversion from discrete to continuous time (2/2) -- Chapter 12. Optimal receiver architecture -- Problem Set 4 -- Chapter 13. Optimal receiver in ISI channels: maximum likelihood (ML) sequence detection -- Chapter 14. Optimal receiver in ISI channels:

Viterbi algorithm -- Problem Set 5 -- Chapter 15.Orthogonal frequency division multiplexing (1/3) -- Chapter 16. Orthogonal frequency division multiplexing (2/3) -- Chapter 17. Orthogonal frequency division multiplexing (3/3) -- Problem Set 6 -- Part 3.Data science applications -- Chapter 18. Community detection as a communication problem -- Chapter 19. Community detection: ML principle -- Chapter 20. Community detection: An efficient algorithm -- Chapter 21. Community detection: Python implementation -- Problem Set 7 -- Chapter 22.Haplotype phasing as a communication problem -- Chapter 23. Haplotype phasing: ML principle -- Chapter 24: Haplotype phasing: An efficient algorithm. .

Sommario/riassunto

This book introduces the basic principles underlying the design and analysis of the digital communication systems that have heralded the information revolution. One major goal of the book is to demonstrate the role of the digital communication principles in a wide variety of data science applications, including community detection, computational biology, speech recognition and machine learning. One defining feature of this book is to make an explicit connection between the communication principles and data science problems, as well as to succinctly deliver the “story” of how the communication principles play a role for trending data science applications. All the key “plots” involved in the story are coherently developed with the help of tightly coupled exercise problem sets, and the associated fundamentals are explored mostly from first principles. Another key feature is that it includes programming implementation of a variety of algorithms inspired by fundamentals, together with a brief tutorial of the used programming tools. The implementation is based on Python and TensorFlow. This book does not follow a traditional book-style organization, but is streamlined via a series of lecture notes that are intimately related, centered around coherent storylines and themes. It serves as a textbook mainly for a junior- or senior-level undergraduate course, yet is also suitable for a first-year graduate course. Readers benefit from having a good background in probability and random processes, and basic familiarity with Python. But the background can be supplemented by almost self-contained materials, as well as by numerous exercise problems intended for elaborating on non-trivial concepts. In addition, Part III for data science applications should provide motivation and insights to students and even professional scientists who are interested in the field.