

# Hybrid and Advanced Compression Techniques for Medical Images

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# Preface

In recent years, the use of image compression has become necessary in medical imaging science due to the number of images stored in the systems of large hospital and health centers for better diagnosis and better health-related solution. This incorporation of compression into more and more medical images is required to solve problems related to the storage of medical images. In this book, we discuss various advanced and hybrid compression techniques and standards for medical images, and have included information on new compression techniques such as compressive sensing (CS)-based and hybrid compression using various image transforms.

## Audience

When we started working on compressive sensing (CS) theory, we felt there was a research gap in how medical images are simultaneously compressed and acquired. Many researchers, doctors, and signal processing engineers have been confronted with problems in medical image compression that need to be solved. We have made every effort to incorporate interesting studies on medical image compression in the book, but have not covered all aspects of compression techniques. Thus, this book does not claim to cover the whole subject of medical image compression. The targeted audience of the book are faculty, researchers, scientists, and engineers who want to learn about compression problems for medical images, how compression of medical imaging is done, and how it benefits medical science.

## Approach

In this book, we cover both lossless and lossy compression techniques with applications to medical image compression. The various lossless and lossy compression techniques are discussed with necessary mathematical theory and MATLAB codes. The mathematical theories are introduced before the explanation of compression techniques. Therefore, a chapter on mathematical preliminaries is added in this book. In this chapter, we discussed various mathematical theories and image transforms. Although this book is an *introductory* text on medical image techniques, the word introductory may have a different meaning as per the audience's requirement. We have tried to accommodate the needs of different audiences by taking different approaches, wherever we felt there was a material that could enhance the understanding of the technique being discussed using their pseudocode.

## Content and Organization

The organization of the chapters is as follows: in Chapter 1, we introduce the basic concept of data compression and its application in medical image science. In this chapter, we discuss various types of compression techniques, various coding techniques, and the need for compression in medical imaging science. The various compression standards for medical images are also discussed. Chapter 2 discusses various data compression techniques with its characteristics. Chapter 3 discusses mathematical concepts necessary to an understanding of compression techniques. Chapter 4 gives implementation steps for various lossless compression techniques for grayscale medical images. Chapter 5 discusses new advanced and hybrid compression techniques based on compressive sensing (CS) theory with pseudocodes for grayscale medical images. The experimental results of these techniques are also discussed in this chapter. Chapter 6 gives some medical compression algorithms and its performance for color medical images.

## Acknowledgments

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