Preface

The constantly changing landscape of medical imaging makes it challenging for experts and practitioners to stay informed of the field’s most up-to-date research. That is why Medical Information Science Reference is pleased to offer this four-volume reference collection that will empower students, researchers, and academicians with a strong understanding of critical issues within medical imaging by providing both broad and detailed perspectives on cutting-edge theories and developments. This reference is designed to act as a single reference source on conceptual, methodological, technical, and managerial issues, as well as provide insight into emerging trends and future opportunities within the discipline.

*Medical Imaging: Concepts, Methodologies, Tools and Applications* is organized into six distinct sections that provide comprehensive coverage of important topics. The sections are:

1. Fundamental Concepts and Theories;
2. Development and Design Methodologies;
3. Tools and Technologies;
4. Utilization and Application;
5. Issues and Challenges; and

The following paragraphs provide a summary of what to expect from this invaluable reference tool. Section 1, “Fundamental Concepts and Theories,” serves as a foundation for this extensive reference tool by addressing crucial theories essential to the understanding of medical imaging. Introducing the book is *History of the T-Scan System Development from 1984 to the Present Day* by Robert B. Kerstein, DMD; a great foundation laying the groundwork for the basic concepts and theories that will be discussed throughout the rest of the book. Section 1 concludes, and leads into the following portion of the book with a nice segue chapter, *Automated Text Detection and Recognition in Annotated Biomedical Publication Images* by Soumya De, R. Joe Stanley, Beibei Cheng, Sameer Antani, Rodney Long, and George Thoma.

Section 2, “Development and Design Methodologies,” presents in-depth coverage of the conceptual design and architecture of medical imaging. Opening the section is *Research and Developments in Medical Image Reconstruction Methods and its Applications* by Shailendra Tiwari and Rajeev Srivastava. Through case studies, this section lays excellent groundwork for later sections that will get into present and future applications for medical imaging. The section concludes with an excellent work by Joel Braga, Isabel Laranjo, Carla Rolanda, Luís Lopes, Jorge Correia-Pinto, and Victor Alves, titled *Endoscopic Imaging Results: Web-Based Solution for Video Diffusion with Real-Time Assistance.*
Section 3, “Tools and Technologies,” presents extensive coverage of the various tools and technologies used in the implementation of medical imaging. Section 3 begins where Section 2 left off, though this section describes more concrete tools at place in the modeling, planning, and applications of medical imaging. The first chapter, *Nanotechnology, Metal Nanoparticles, and Biomedical Applications of Nanotechnology* by M. Amin Bhat, B. K. Nayak, Anima Nanda, and Imtiyaz H. Lone, lays a framework for the types of works that can be found in this section. The section concludes with *Compressed Sensing and Its Application in CT and EEG* by Saib Saha and Murat Tahtalı. Where Section 3 described specific tools and technologies at the disposal of practitioners, Section 4 describes the use and applications of the tools and frameworks discussed in previous sections.

Section 4, “Utilization and Application,” describes how the broad range of medical imaging efforts has been utilized and offers insight on and important lessons for their applications and impact. The first chapter in the section is titled *Application of Phage Biotechnology in Nanobiotechnology* written by Rana Singleton, Carrie Sanders, and Alain B. Waffo. This section includes the widest range of topics because it describes case studies, research, methodologies, frameworks, architectures, theory, analysis, and guides for implementation. The breadth of topics covered in the chapter is also reflected in the diversity of its authors, from countries all over the globe. The section concludes with *Cluster Based Medical Image Registration Using Optimized Neural Network* by Joydev Hazra, Aditi Roy Chowdhury, and Paramartha Dutta, a great transition chapter into the next section.

Section 5, “Issues and Challenges,” presents coverage of academic and research perspectives on medical imaging tools and applications. The section begins with *Automatic Diagnosis of Brain Magnetic Resonance Images based on Riemannian Geometry* by Mohamed Gouskir, Belaid Bouikhalene, Hicham Aissaoui, and Benachir Elhadadi. Chapters in this section will look into theoretical approaches and offer alternatives to crucial questions on the subject of medical imaging. The section concludes with *An Approach for the Semantic Interoperability of SNOMED: Improving Quality of Health Records* by Magda Amorim and Filipe Miranda.

Section 6, “Emerging Trends,” highlights areas for future research within the field of medical imaging, opening with *Advanced Approaches to Diagnose and Treat the Chronic Autoimmune Disorders: Multimodal Molecular Imaging* by Tomasz Sołtysiński. This section contains chapters that look at what might happen in the coming years that can extend the already staggering amount of applications for medical imaging. The final chapter of the book looks at an emerging field within medical imaging, in the excellent contribution, *A New Heuristic Function of Ant Colony System for Retinal Vessel Segmentation* by Ahmed Hamza Asad, Ahmad Taher Azar, and Aboul Ella Hassanien.

Although the primary organization of the contents in this multi-volume work is based on its six sections, offering a progression of coverage of the important concepts, methodologies, technologies, applications, social issues, and emerging trends, the reader can also identify specific contents by utilizing the extensive indexing system listed at the end of each volume. As a comprehensive collection of research on the latest findings related to using technology to providing various services, *Medical Imaging: Concepts, Methodologies, Tools and Applications*, provides researchers, administrators and all audiences with a complete understanding of the development of applications and concepts in medical imaging. Given the vast number of issues concerning usage, failure, success, policies, strategies, and applications of medical imaging in countries around the world, *Medical Imaging: Concepts, Methodologies, Tools and Applications* addresses the demand for a resource that encompasses the most pertinent research in technologies being employed to globally bolster the knowledge and applications of medical imaging.