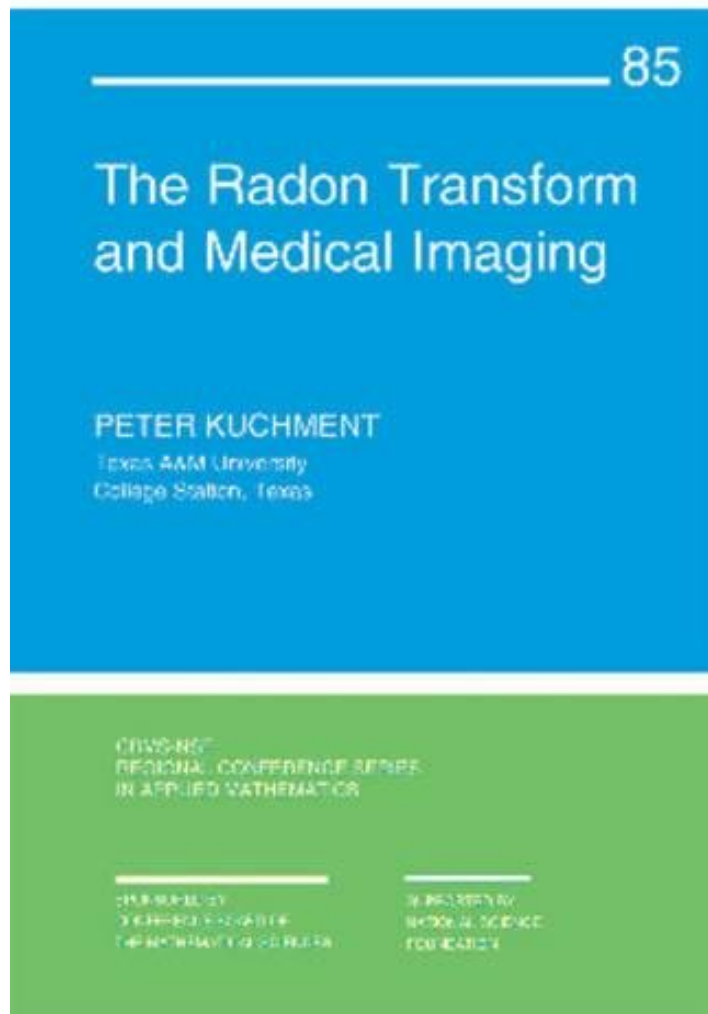


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The Radon Transform and Medical Imaging (C B M S - N S F Regional Conference Series in Applied Mathematics)

Peter Kuchment

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This book surveys the main mathematical ideas and techniques behind some well-established imaging modalities such as X-ray CT and emission tomography, as well as a variety of newly developing coupled-physics or hybrid techniques, including thermoacoustic tomography. The Radon Transform and Medical Imaging emphasizes mathematical techniques and ideas arising across the spectrum of medical imaging modalities and explains important concepts concerning inversion, stability, incomplete data effects, the role of interior information, and other issues critical to all medical imaging methods. For nonexperts, the author provides appendices that cover background information on notation, Fourier analysis, geometric rays, and linear operators. The vast bibliography, with over 825 entries, directs readers to a wide array of additional information sources on medical imaging for further study. Audience: Graduate students and researchers in mathematics, physics, and engineering who are interested in the mathematics behind medical imaging will find this book useful. Contents: Part I: Introduction; Chapter 1: Why Use Mathematics in Medical Imaging?; Chapter 2: A Brief and Incomplete History of CT; Chapter 3: Some Major CT Modalities and Their Features to Watch for; Chapter 4: Organization of the Book; Part II: Traditional Computed Tomography Techniques and Integral Geometry; Chapter 5: Standard CT and X-ray and Radon Transforms; Chapter 6: Emission Tomography; Chapter 7: Artifacts, Incomplete Data, Microlocal Analysis, and Such; Chapter 8: More About 3D Radon and X-ray Transforms; Chapter 9: A Brief Overview of Numerical Methods; Chapter 10: MRI, EIT, OT, Elastography, UT; Part III: Hybrid (Coupled Physics) Imaging Techniques; Chapter 11: Thermo-, Photo-, and Optoacoustic Tomography (TAT/PAT/OAT); Chapter 12: Ultrasound Modulation in EIT and OT; Chapter 13: Inverse Problems with Interior Information; Part IV: Appendices; Appendix A: Notation; Appendix B: Brief Notes on the Fourier Transform and Harmonic Analysis; Appendix C: Geometric Rays, Trapping, Energy Decay; Appendix D: Some Classes of Linear Operators and Operator Functions.