Lung Mechanics: An Inverse Modeling Approach

Jason H. T. Bates

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With mathematical and computational models furthering our understanding of lung mechanics, function and disease, this book provides an all-inclusive introduction to the topic from a quantitative standpoint. Focusing on inverse modeling, the reader is guided through the theory in a logical progression, from the simplest models up to state-of-the-art models that are both dynamic and nonlinear. Key tools used in biomedical engineering research, such as regression theory, linear and nonlinear systems theory, and the Fourier transform, are explained. Derivations of important physical principles, such as the Poiseuille equation and the wave speed equation, from first principles are also provided. Example applications to experimental data throughout illustrate physiological relevance, whilst problem sets at the end of each chapter provide practice and test reader comprehension. This book is ideal for biomedical engineering and biophysics graduate students and researchers wishing to understand this emerging field.

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