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Editors

Computational Cardiovascular Mechanics

Modeling and Applications
in Heart Failure

Computational Cardiovascular Mechanics Modeling And Applications In Heart Failure

**Jan Bogaert, Steven
Dymarkowski, Andrew M. Taylor, Vivek
Muthurangu**

Computational Cardiovascular Mechanics Modeling And Applications In Heart Failure:

Computational Cardiovascular Mechanics Julius M. Guccione, Ghassan Kassab, Mark B. Ratcliffe, 2010-01-08

Computational Cardiovascular Mechanics provides a cohesive guide to creating mathematical models for the mechanics of diseased hearts to simulate the effects of current treatments for heart failure. Clearly organized in a two part structure this volume discusses various areas of computational modeling of cardiovascular mechanics: finite element modeling of ventricular mechanics, fluid dynamics, in addition to a description and analysis of the current applications used: solid FE modeling, CFD. Edited by experts in the field, researchers involved with biomedical and mechanical engineering will find *Computational Cardiovascular Mechanics* a valuable reference. *Computational Modeling in Biomechanics* Suvaranu De, Farshid Guilak, Mohammad Mofrad, 2010-03-10. Availability of advanced computational technology has fundamentally altered the investigative paradigm in the field of biomechanics. Armed with sophisticated computational tools, researchers are seeking answers to fundamental questions by exploring complex biomechanical phenomena at the molecular, cellular, tissue and organ levels. The computational armamentarium includes such diverse tools as the ab initio quantum mechanical and molecular dynamics methods at the atomistic scales and the finite element boundary element meshfree as well as immersed boundary and lattice Boltzmann methods at the continuum scales. Multiscale methods that link various scales are also being developed. While most applications require forward analysis e.g. finding deformations and stresses as a result of loading, others involve determination of constitutive parameters based on tissue imaging and inverse analysis. This book provides a glimpse of the diverse and important roles that modern computational technology is playing in various areas of biomechanics including biofluids and mass transfer, cardiovascular mechanics, musculoskeletal mechanics, soft tissue mechanics and biomolecular mechanics.

Mathematical Modeling of Cardiovascular Systems: From Physiology to the Clinic Julius Guccione, Ghassan S. Kassab, 2020-01-13

Biomechanics Manuel Doblare, Jose Merodio, 2015-12-30. Biomechanics is a component of Encyclopedia of Physical Sciences Engineering and Technology Resources in the global Encyclopedia of Life Support Systems EOLSS which is an integrated compendium of twenty one Encyclopedias. The enormous progress in the field of health sciences that has been achieved in the 19th and 20th centuries would have not been possible without the enabling interaction and support of sophisticated technologies that progressively gave rise to a new interdisciplinary field named alternatively as bioengineering or biomedical engineering. Although both terms are synonymous, the latter is less general since it limits the field of application to medicine and clinical practice while the former covers semantically the whole field of interaction between life sciences and engineering thus including also applications in biology, biochemistry or the many omics. We use in this book the second with more general meaning recalling the very important relation between fundamental science and engineering. And this also recognizes the tremendous economic and social impacts of direct application of engineering in medicine that maintains the health industry as one with the fastest growth in the world economy.

Biomechanics in particular aims to explain and predict the mechanics of the different components of living beings from molecules to organisms as well as to design manufacture and use of any artificial device that interacts with the mechanics of living beings. It helps therefore to understand how living systems move to characterize the interaction between forces and deformation along all spatial scales to analyze the interaction between structural behavior and microstructure with the very important particularity of dealing with adaptive systems able to adapt their internal structure size and geometry to the particular mechanical environment in which they develop their activity to understand and predict alterations in the mechanical function due to injuries diseases or pathologies and finally to propose methods of artificial intervention for functional diagnosis or recovery. Biomechanics is today a very highly interdisciplinary subject that attracts the attention of engineers mathematicians physicists chemists material specialists biologists medical doctors etc. They work in many different topics from a purely scientific objective to industrial applications and with an increasing arsenal of sophisticated modeling and experimental tools but always with the final objectives of better understanding the fundamentals of life and improve the quality of life of human beings. One purpose in this volume has been to present an overview of some of these many possible subjects in a self contained way for a general audience. This volume is aimed at the following major target audiences:

University and College Students Educators Professional Practitioners and Research Personnel *Heart Mechanics* El-Sayed

H. Ibrahim, 2017-09-19 MRI techniques have been recently introduced for non invasive qualification of regional myocardial mechanics which is not achievable with other imaging modalities. Covering more than twenty three years of developments in MRI techniques for accessing heart mechanics this book provides a plethora of techniques and concepts that assist readers choose the best technique for their purpose. It reviews research studies and clinical trials that implemented MRI techniques for studying heart mechanics. Cardiology Science and Technology Dhanjoo N. Ghista, 2016-04-27 Cardiology Science and

Technology comprehensively deals with the science and biomedical engineering formulations of cardiology. As a textbook it addresses the teaching research and clinical aspects of cardiovascular medical engineering and computational cardiology.

The book consists of two sections. The first section deals with left ventricular Clinical Cardiac MRI Jan Bogaert, Steven

Dymarkowski, Andrew M. Taylor, Vivek Muthurangu, 2012-02-04 Clinical Cardiac MRI is a comprehensive textbook intended for everyone involved in magnetic resonance imaging of the heart. It is designed both as a useful guide for newcomers to the field and as an aid for those who routinely perform such studies. The first edition published in 2004 was very well received within the cardiac imaging community and has generally been considered the reference because of its completeness its clarity and the number and quality of the illustrations. Moreover the addition of a CD ROM showing 50 real life cases significantly enhanced the value of the book. In this second edition the aim has been to maintain the same quality while incorporating the newest insights and developments in this rapidly evolving domain of medical imaging. The four editors all experts in the field have taken great care to ensure a homogeneous high standard throughout the book. Finally the selection

of 100 real life cases added as online material will further enhance the value of this textbook

Coronary Circulation
Ghassan S. Kassab, 2019-05-15 This comprehensive text examines both global and local coronary blood flow based on morphometry and mechanical properties of the coronary vasculature Using a biomechanical approach this book addresses coronary circulation in a quantitative manner based on models rooted in experimental data that account for the various physical determinants of coronary blood flow including myocardial vessel interactions and various mechanisms of autoregulation This is the first text dedicated to a distributive analysis as opposed to lumped and provides digital files for detailed anatomical data e g diameters lengths node to node connections of the coronary vessels This book also provides appendices with specific mathematical formulations for the biomechanical analyses and models in the text Written by Dr Ghassan S Kassab a leader in the field of coronary biomechanics *Coronary Circulation Anatomy Mechanical Properties and Biomechanics* is a synthesis of seminal topics in the field and is intended for clinicians bioengineers and researchers as a compendium on the topic The detailed anatomical and mechanical data provided are intended to be used as a platform to address new questions in this exciting and clinically very important research area

Computational Biomechanics for Ventricle-arterial Dysfunction and Remodeling in Heart Failure ,2021-08-24

Coronary Graft Failure Ion C.

Tintoiu, Malcolm John Underwood, Stephane Pierre Cook, Hironori Kitabata, Amer Abbas, 2016-03-24 Coronary artery bypass surgery has been developed since 1960s to overcome proximal coronary artery disease Worldwide the number of patients that are undergoing coronary artery bypass surgery is steadily increasing Depending on diverse risk factors one fifth of grafts are occluded at 1 year For the remaining graft patency last usually 8 15 years This book brings together the main specialists in the field to review the current evidence on epidemiology pathophysiology diagnostic new imaging techniques and specific therapeutic modalities This volume aims to update a complex subject represented by coronary graft failure The authors of this monograph are interventional cardiologists cardiovascular surgeons and research scientists who will be creating four parts and 71 chapters that are divided in order to give a uniform interpretation of this condition including all aspects of coronary graft failure This book not only provides the most up to dated scientific evidence in the field but in a two step manner Each chapter is divided into a at a glance part that reflects the basic evidence on the topic and a full picture part that brings all what the advanced reader should be brought with

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