Maia Martcheva

An Introduction to Mathematical Epidemiology

Springer

Introduction To Mathematical Epidemiology

Ensheng Dong

Introduction To Mathematical Epidemiology:

An Introduction to Mathematical Epidemiology Maia Martcheva,2015-10-20 The book is a comprehensive self contained introduction to the mathematical modeling and analysis of infectious diseases It includes model building fitting to data local and global analysis techniques Various types of deterministic dynamical models are considered ordinary differential equation models delay differential equation models difference equation models age structured PDE models and diffusion models It includes various techniques for the computation of the basic reproduction number as well as approaches to the epidemiological interpretation of the reproduction number MATLAB code is included to facilitate the data fitting and the simulation with age structured models   An Introduction to Mathematical Epidemiology Maia Martcheva,2015 The book is a comprehensive self contained introduction to the mathematical modeling and analysis of infectious diseases It includes model building fitting to data local and global analysis techniques Various types of deterministic dynamical models are considered ordinary differential equation models delay differential equation models difference equation models age structured PDE models and diffusion models It includes various techniques for the computation of the basic reproduction number as well as approaches to the epidemiological interpretation of the reproduction number MATLAB code is included to facilitate the data fitting and the simulation with age structured models   *Mathematical Epidemiology* Fred Brauer,Pauline van den Driessche,J. Wu,2008-04-13 Based on lecture notes of two summer schools with a mixed audience from mathematical sciences epidemiology and public health this volume offers a comprehensive introduction to basic ideas and techniques in modeling infectious diseases for the comparison of strategies to plan for an anticipated epidemic or pandemic and to deal with a disease outbreak in real time It covers detailed case studies for diseases including pandemic influenza West Nile virus and childhood diseases Models for other diseases including Severe Acute Respiratory Syndrome fox rabies and sexually transmitted infections are included as applications Its chapters are coherent and complementary independent units In order to accustom students to look at the current literature and to experience different perspectives no attempt has been made to achieve united writing style or unified notation Notes on some mathematical background calculus matrix algebra differential equations and probability have been prepared and may be downloaded at the web site of the Centre for Disease Modeling www cdm yorku ca   Mathematical Models in Epidemiology Fred Brauer,Carlos Castillo-Chavez,Zhilan Feng,2019-10-10 The book is a comprehensive self contained introduction to the mathematical modeling and analysis of disease transmission models It includes i an introduction to the main concepts of compartmental models including models with heterogeneous mixing of individuals and models for vector transmitted diseases ii a detailed analysis of models for important specific diseases including tuberculosis HIV AIDS influenza Ebola virus disease malaria dengue fever and the Zika virus iii an introduction to more advanced mathematical topics including age structure spatial structure and mobility and iv some challenges and opportunities for the future There are exercises of varying degrees of difficulty and projects leading to new

research directions For the benefit of public health professionals whose contact with mathematics may not be recent there is an appendix covering the necessary mathematical background There are indications which sections require a strong mathematical background so that the book can be useful for both mathematical modelers and public health professionals

A Historical Introduction to Mathematical Modeling of Infectious Diseases Ivo M. Foppa,2016-10-18 A Historical Introduction to Mathematical Modeling of Infectious Diseases Seminal Papers in Epidemiology offers step by step help on how to navigate the important historical papers on the subject beginning in the 18th century The book carefully and critically guides the reader through seminal writings that helped revolutionize the field With pointed questions prompts and analysis this book helps the non mathematician develop their own perspective relying purely on a basic knowledge of algebra calculus and statistics By learning from the important moments in the field from its conception to the 21st century it enables readers to mature into competent practitioners of epidemiologic modeling Presents a refreshing and in depth look at key historical works of mathematical epidemiology Provides all the basic knowledge of mathematics readers need in order to understand the fundamentals of mathematical modeling of infectious diseases Includes questions prompts and answers to help apply historical solutions to modern day problems *An Introduction to Mathematical Modeling of Infectious Diseases* Michael Y. Li,2018-01-30 This text provides essential modeling skills and methodology for the study of infectious diseases through a one semester modeling course or directed individual studies The book includes mathematical descriptions of epidemiological concepts and uses classic epidemic models to introduce different mathematical methods in model analysis Matlab codes are also included for numerical implementations It is primarily written for upper undergraduate and beginning graduate students in mathematical sciences who have an interest in mathematical modeling of infectious diseases Although written in a rigorous mathematical manner the style is not unfriendly to non mathematicians *Mathematical Epidemiology of Infectious Diseases* O. Diekmann,J. A. P. Heesterbeek,2000-04-07 Mathematical Epidemiology of Infectious Diseases Model Building Analysis and Interpretation O Diekmann University of Utrecht The Netherlands J A P Heesterbeek Centre for Biometry Wageningen The Netherlands The mathematical modelling of epidemics in populations is a vast and important area of study It is about translating biological assumptions into mathematics about mathematical analysis aided by interpretation and about obtaining insight into epidemic phenomena when translating mathematical results back into population biology Model assumptions are formulated in terms of usually stochastic behaviour of individuals and then the resulting phenomena at the population level are unravelled Conceptual clarity is attained assumptions are stated clearly hidden working hypotheses are attained and mechanistic links between different observables are exposed Features Model construction analysis and interpretation receive detailed attention Uniquely covers both deterministic and stochastic viewpoints Examples of applications given throughout Extensive coverage of the latest research into the mathematical modelling of epidemics of infectious diseases Provides a solid foundation of modelling skills The reader will learn to translate model analyse and

interpret with the help of the numerous exercises In literally working through this text the reader acquires modelling skills that are also valuable outside of epidemiology certainly within population dynamics but even beyond that In addition the reader receives training in mathematical argumentation The text is aimed at applied mathematicians with an interest in population biology and epidemiology at theoretical biologists and epidemiologists Previous exposure to epidemic concepts is not required as all background information is given The book is primarily aimed at self study and ideally suited for small discussion groups or for use as a course text *Proceedings of the Berkeley Symposium on Mathematical Statistics and Probability* Jerzy Neyman,1967 **Mathematical Modeling for Epidemiology and Ecology** Glenn Ledder,2023-04-13 Mathematical Modeling for Epidemiology and Ecology provides readers with the mathematical tools needed to understand and use mathematical models and read advanced mathematical biology books It presents mathematics in biological contexts focusing on the central mathematical ideas and the biological implications with detailed explanations The author assumes no mathematics background beyond elementary differential calculus An introductory chapter on basic principles of mathematical modeling is followed by chapters on empirical modeling and mechanistic modeling These chapters contain a thorough treatment of key ideas and techniques that are often neglected in mathematics books such as the Akaike Information Criterion The second half of the book focuses on analysis of dynamical systems emphasizing tools to simplify analysis such as the Routh Hurwitz conditions and asymptotic analysis Courses can be focused on either half of the book or thematically chosen material from both halves such as a course on mathematical epidemiology The biological content is self contained and includes many topics in epidemiology and ecology Some of this material appears in case studies that focus on a single detailed example and some is based on recent research by the author on vaccination modeling and scenarios from the COVID 19 pandemic The problem sets feature linked problems where one biological setting appears in multi step problems that are sorted into the appropriate section allowing readers to gradually develop complete investigations of topics such as HIV immunology and harvesting of natural resources Some problems use programs written by the author for Matlab or Octave these combine with more traditional mathematical exercises to give students a full set of tools for model analysis Each chapter contains additional case studies in the form of projects with detailed directions New appendices contain mathematical details on optimization numerical solution of differential equations scaling linearization and sophisticated use of elementary algebra to simplify problems *Social Computing, Behavioral-Cultural Modeling, and Prediction* Nitin Agarwal,Kevin Xu,Nathaniel Osgood,2015-03-16 This book constitutes the refereed proceedings of the 8th International Conference on Social Computing Behavioral Cultural Modeling and Prediction SBP 2015 held in Washington DC USA in March April 2015 The 24 full papers presented together with 36 poster papers were carefully reviewed and selected from 118 submissions The goal of the conference was to advance our understanding of human behavior through the development and application of mathematical computational statistical simulation predictive and other models that provide fundamental

insights into factors contributing to human socio cultural dynamics The topical areas addressed by the papers are social and behavioral sciences health sciences engineering computer and information science **Current Problems of Applied Mathematics and Computer Systems** Irina Samoylenko,Anatoly Alikhanov,Dmitrii Kaplun,Pavel Lyakhov,Aslan Apekov,2025-11-18 This book based on the best papers accepted for presentation during the International Conference on Current Problems of Applied Mathematics and Computer Systems CPAMCS 2024 Russia This book includes research focused on contemporary mathematical challenges and their resolutions within scientific computing data analysis and modular computing This book presents original studies on numerical methods in scientific computing optimization problem solving function approximation techniques among other topics Furthermore it encompasses research contributions in data analysis and modular computing highlighting advancements in deep learning neural networks mathematical statistics machine learning techniques residue number systems and artificial intelligence Additionally this book addresses critical issues in mathematical education This book intends for professionals engaged in scientific computing parallel computing computer technology machine learning information security and mathematics education **Dynamical Systems and Their Applications in Biology** Shigui Ruan,Gail Susan Kohl Wolkowicz,Jianhong Wu,Fields Institute for Research in Mathematical Sciences,2003-01-01 This volume is based on the proceedings of the International Workshop on Dynamical Systems and their Applications in Biology held at the Canadian Coast Guard College on Cape Breton Island Nova Scotia Canada It presents a broad picture of the current research surrounding applications of dynamical systems in biology particularly in population biology The book contains 19 papers and includes articles on the qualitative and or numerical analysis of models involving ordinary partial functional and stochastic differential equations Applications include epidemiology population dynamics and physiology The material is suitable for graduate students and research mathematicians interested in ordinary differential equations and their applications in biology Also available by Ruan Wolkowicz and Wu is Differential Equations with Applications to Biology Volume 21 in the AMS series Fields Institute Communications *Hybrid Models of Tropical Infections* Ingemar Nasell,2013-11-11 These notes are an extended version of lectures given in the Symposium on Mathematics and Development arranged by the School of Mathematical Sciences of the University of Khartoum Sudan in 1982 The purpose of the notes is to discuss some models for the transmission of tropical infections This area of mathematical epidemiology has previously received only minor attention by mathematicians but is now growing in importance The term hybrid model is used to denote a model with both stochastic and deterministic ingredients We describe how a hybrid model approach can be used to formulate and study both some classical models for malaria and schistosomiasis and some extensions of these models The formulation of the models requires some familiarity with Markov chains in continuous time and discrete state space The analysis of the models uses concepts and methods in the qualitative theory of ordinary differential equations The presentation is aimed at the senior undergraduate or beginning graduate level **American**

Journal of Epidemiology ,1921 Vols 2 7 include Proceedings of the Society of Hygiene of the School of Hygiene and Public Health of Johns Hopkins University   Functional Differential Equation Models in Epidemiology with Theoretical and Numerical Studies Ende Zhang,1992   Mathematical and Statistical Estimation Approaches in Epidemiology Gerardo Chowell,James M. Hayman,Luís M. A. Bettencourt,Carlos Castillo-Chavez,2009-06-06 Mathematical and Statistical Estimation Approaches in Epidemiology compiles t oretical and practical contributions of experts in the analysis of infectious disease epidemics in a single volume Recent collections have focused in the analyses and simulation of deterministic and stochastic models whose aim is to identify and rank epidemiological and social mechanisms responsible for disease transmission The contributions in this volume focus on the connections between models and disease data with emphasis on the application of mathematical and statistical approaches that quantify model and data uncertainty The book is aimed at public health experts applied mathematicians and sci tists in the life and social sciences particularly graduate or advanced undergraduate students who are interested not only in building and connecting models to data but also in applying and developing methods that quantify uncertainty in the context of infectious diseases Chowell and Brauer open this volume with an overview of the classical disease transmission models of Kermack McKendrick including extensions that account for increased levels of epidemiological heterogeneity Their theoretical tour is followed by the introduction of a simple methodology for the estimation of the basic reproduction number R The use of this methodology 0 is illustrated using regional data for 1918 1919 and 1968 in uenza pandemics   GeNeDis 2018 Panayiotis Vlamos,2020-05-28 The 3rd World Congress on Genetics Geriatrics and Neurodegenerative Disease Research GeNeDis 2018 focuses on recent advances in genetics geriatrics and neurodegeneration ranging from basic science to clinical and pharmaceutical developments It also provides an international forum for the latest scientific discoveries medical practices and care initiatives Advanced information technologies are discussed including the basic research implementation of medico social policies and the European and global issues in the funding of long term care for elderly people   An Introduction to Infectious Disease Modelling Emilia Vynnycky,Richard White,2010-05-13 Mathematical models are increasingly used to guide public health policy decisions and explore questions in infectious disease control Written for readers without advanced mathematical skills this book provides an introduction to this area   *Human Biology* Raymond Pearl,2000 Includes section Recent literature useful in the study of human biology   *The American Mathematical Monthly* ,1919 Includes section Recent publications

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