1. Record Nr. UNINA9910483687703321

Autore	Tanimoto Jun <1965->
Titolo	Sociophysics approach to epidemics / / Jun Tanimoto
Pubbl/distr/stampa	Singapore : , : Springer, , [2021] ©2021
ISBN	981-336-481-5
Descrizione fisica	1 online resource (297 pages) : illustrations
Collana	Evolutionary Economics and Social Complexity Science ; ; v.23
Disciplina	614.4015118
Soggetti	Epidemiology - Mathematical models Game theory
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Includes index.
Nota di contenuto	Intro -- Preface -- Acknowledgments -- Contents -- About the Author -- Chapter 1: A Social-Physics Approach to Modeling and Analyzing Epidemics -- 1.1 Modeling of a Social-Complex System: A Human-Physics System -- 1.2 How the Spread of an Infectious Disease Can be Modeled?-Mathematical Epidemiology -- 1.3 How Human Behavior Can be Modeled?-Evolutionary Game Theory -- References -- Chapter 2: Evolutionary Game Theory: Fundamentals and Applications for Epidemiology -- 2.1 Two-Player and Two-Strategy Games -- 2.1.1 Theoretical Foundation -- 2.1.2 Social Viscosity -- 2.1.3 Multi-Agent-Simulation Approach -- 2.2 Multi-Player Games -- 2.3 Social Dilemma and its Mathematical Quantification -- 2.3.1 Concept of the Universal Scaling for Dilemma Strength -- 2.3.1.1 Direct Reciprocity -- 2.3.1.2 Indirect Reciprocity -- 2.3.1.3 Kin Selection -- 2.3.1.4 Group Selection -- 2.3.1.5 Network Reciprocity -- 2.3.2 Concept of a Social Efficiency Deficit -- 2.3.2.1 Donor and Recipient Game -- 2.3.2.2 Public Goods Game -- 2.3.2.3 PD with Social Viscosity -- 2.3.2.4 Chicken Game -- 2.3.3 Application of SED -- 2.3.3.1 Derivation of SED -- 2.3.3.2 Discussion -- References -- Chapter 3: Fundamentals of Mathematical Epidemiology and the Vaccination Game -- 3.1 Basic Model: SIR, SIS, and SEIR -- 3.1.1 Formulation of the SIR Model -- 3.1.2 Herd Immunity -- 3.1.3 Formulation of the SIS Model -- 3.1.4 Formulation of the SEIR Model -- 3.2 Theoretical Framework of a Vaccination Game -- 3.2.1

Two Models to Represent Stochastic Vaccination: Effectiveness and Efficiency -- 3.2.1.1 Effectiveness Model -- 3.2.1.2 Efficiency Model -- 3.2.2 Strategy-Updating Rule -- 3.2.2.1 Individual-Based Risk Assessment (IB-RA) -- 3.2.2.2 Strategy-Based Risk Assessment (SB-RA) -- 3.2.2.3 Direct Commitment (DC) -- 3.2.3 Global Dynamics for Strategy Updating -- 3.3 MAS Approach to the Vaccination Game.
3.3.1 Spatial Structure When Taking the MAS Approach -- 3.3.2 Effective Transmission Rate, e, and Effective Recovery Rate, e -- 3.3.3 Result of the Vaccination Game -- Comparison Between the MAS and ODE Models -- 3.4 Effect of the Underlying Topology -- 3.4.1 Degree Distribution -- 3.4.2 Networked SIR Model -- 3.4.3 Networked SIR/V Process with an Effectiveness Model -- 3.4.4 Networked SIR/V Process with an Efficiency Model -- 3.4.5 Payoff Structure and Global Dynamics for Strategy Updating -- 3.4.6 Result of the Networked Vaccination Game -- Comparison of Different Degree Distributions -- References -- Chapter 4: Plural Strategies: Intervention Game -- 4.1 Alternative Provisions Featuring Different Combinations of Cost-Effect Performances -- 4.2 Model Structure -- 4.2.1 Formulation of the SVMBIR Model -- 4.2.2 Payoff Structure -- 4.2.3 Strategy-Updating and Global Dynamics -- 4.2.3.1 Individual-Based Risk Assessment (IB-RA) -- 4.2.3.2 Strategy-Based Risk Assessment (SB-RA) -- 4.2.3.3 Direct Commitment (DC) -- 4.3 Result and Discussion -- References -- Chapter 5: Quarantine and Isolation -- 5.1 Social Background -- Quarantine or Isolation? -- 5.2 Model Structure -- 5.2.1 Formulation of the SVEIR Model -- 5.2.2 Payoff Structure -- 5.2.3 Strategy Updating and Global Dynamics -- 5.3 Result and Discussion -- 5.3.1 Local Dynamics in a Single Season -- 5.3.2 Social Equilibrium from Global Dynamics -- 5.3.3 Public-Based (Passive) Provision: Quarantine and Isolation vs. Individual-Based (Active) Provision: Vaccination -- 5.3.4 Passive Provision Rather Compensates the Shadow by Active Provision Than Mutually Competing -- 5.3.5 Comprehensive Discussion -- References -- Chapter 6: Media Information Effect Hampering the Spread of Disease -- 6.1 Positive Effect of Media Helps to Suppress the Spread of an Epidemic -- 6.2 Model Structure.
6.2.1 Formulation of the SVIR-UA Model -- 6.2.2 Payoff Structure -- 6.2.3 Strategy Updating and Global Dynamics -- 6.2.3.1 Individual-Based Risk Assessment (IB-RA) -- 6.2.3.2 Strategy-Based Risk Assessment (SB-RA) -- 6.2.4 Spatial Structure -- 6.2.5 Initial Condition and Numerical Procedure -- 6.3 Results and Discussion -- References -- Chapter 7: Immunity Waning Effect -- 7.1 Introduction and Background: Immunity and Its Degrading in View of Infectious Disease -- 7.2 Model Structure -- 7.2.1 Formulation of the SVnIR2n Model -- 7.2.2 Parameterization for Immunity Waning Effect -- 7.2.3 Time Evolution of Vaccination by Behavior Model -- 7.3 Result and Discussion -- 7.3.1 Fundamental Characteristic of Time Evolution -- 7.3.2 Dynamics Observed in Trajectory -- 7.3.3 Phase Diagram Analysis -- 7.3.4 Comprehensive Discussion -- References -- Chapter 8: Pre-emptive Vaccination Versus Antiviral Treatment -- 8.1 Introduction and Background: Behavioral Incentives in a Vaccination-Dilemma Setting with an Optional Treatment -- 8.2 Model Structure -- 8.2.1 Formulation of the SVITR Model -- 8.2.2 Reproduction Number -- 8.2.3 Payoff Structure -- 8.2.4 Strategy Updating and Global Dynamics -- 8.2.4.1 Individual-Based Risk Assessment (IB-RA) -- 8.2.4.2 Strategy-Based Risk Assessment (SB-RA) -- 8.2.5 Utility of Treatment -- 8.3 Result and Discussion -- 8.3.1 SVITR Dynamics -- 8.3.2 Interplay Between Vaccination and Treatment Costs -- 8.3.3 Individual-Versus Society-Centered Decision Making -- 8.3.4 Interplay Between Vaccine and Treatment Characteristics -- 8.3.5

Comprehensive Discussion -- References -- Chapter 9: Pre-emptive Vaccination Versus Late Vaccination -- 9.1 Introduction and Background: Is Pre-Emptive or Late Vaccination More Beneficial? -- 9.2 Model Structure -- 9.2.1 Formulation of the Dynamics of the Epidemic and Human Behavior -- 9.2.2 Payoff Structure.
9.2.3 Strategy Updating and Global Dynamics -- 9.3 Result and Discussion -- References -- Chapter 10: Influenza Vaccine Uptake -- 10.1 Introduction and Background: Multiple Strains and Multiple Vaccines -- 10.2 Model Structure -- 10.2.1 Dynamics of Epidemic Spread -- 10.2.2 Payoff Structure -- 10.2.3 Strategy Updating and Global Dynamics -- 10.3 Result and Discussion -- 10.3.1 Dynamics in a Single Season -- 10.3.2 Evolutionary Outcome of Vaccination Coverage -- 10.3.3 Phase Diagrams -- 10.3.4 Analysis of Social-Efficiency Deficit (SED) -- 10.3.5 Comprehensive Discussion -- Chapter 11: Optimal Design of a Vaccination-Subsidy Policy -- 11.1 Introduction and Background: Free Ticket, Discount Ticket, or a Combination of the Two-Which Subsidy Policy Is Socially O... -- 11.2 Model Design -- 11.2.1 Vaccination Game on a Scale-Free Network -- 11.2.2 Subsidy Policies -- 11.2.3 MAS Approach -- 11.3 Result and Discussion -- Chapter 12: Flexible Modeling -- 12.1 Introduction and Background: A New Cyclic Epidemic-Vaccination Model: Embedding the Attitude of Individuals Toward Vaccin... -- 12.2 Model Depiction -- 12.3 Result and Discussion -- Postscript -- Index.