Computational Immunology: Models and Tools

Description:

Computational Immunology: Models and Tools encompasses the methodological framework and application of cutting-edge tools and techniques to study immunological processes at a systems level, along with the concept of multi-scale modeling.

The book's emphasis is on selected cases studies and application of the most updated technologies in computational modeling, discussing topics such as computational modeling and its usage in immunological research, bioinformatics infrastructure, ODE based modeling, agent based modeling, and high performance computing, data analytics, and multiscale modeling.

There are also modeling exercises using recent tools and models which lead the readers to a thorough comprehension and applicability.

The book is a valuable resource for immunologists, computational biologists, bioinformaticians, biotechnologists, and computer scientists, as well as all those who wish to broaden their knowledge in systems modeling.

- Offers case studies with different levels of complexity
- Provides a detailed view on cutting-edge tools for modeling that are useful to experimentalists with limited computational skills
- Explores the usage of simulation for hypothesis generation, helping the reader to understand the most valuable points on experimental setting

Contents:

1. Introduction to Computational Immunology
   Overview
   Modeling tools and techniques
   Use Cases Illustrating the Application of Computational Immunology Technologies

2. Computational Modeling
   Overview on Computational Modeling
   Translational Research Iterative Modeling Cycle
   Information and knowledge extraction from the Literature
   Collect new data and data from public repositories
   Model Development
   In silico Experimentation
   Validation of Computational Hypotheses and New Knowledge
   Considerations on Computational Modeling Technologies
   Computational Modeling Tools for Immunology and Infectious Disease Research
   Concluding Remarks

3. Use of Computational Modeling in Immunological Research
   Introduction
   Computational and mathematical modeling of the immune response to Helicobacter pylori
   Inflammatory bowel disease
   ODE model of CD4+ T cell differentiation
T follicular helper cell differentiation

Concluding remarks

4. Immunoinformatics cyberinfrastructure for modeling and analytics

Introduction
Web Portal
LabKey-based Laboratory Information Management System
Public Repositories: ImmPort
Global gene expression analysis
High Performance Computing Environment
HPC infrastructure for ENISI MSM modeling
CyberInfrastructure for NETwork science (CINET)
Pathosystems Resource Integration Center (Patric)
Clinical Data Integration
Concluding Remarks

5. Ordinary Differential Equations (ODE) based Modeling

Introduction
ODE based modeling pipeline
Model development
Model Calibration
Deterministic simulations
Sensitivity analysis
Model driven hypothesis generation
Case studies: CD4+ T cell differentiation model
Concluding Remarks

6. Agent-Based Modeling and High Performance Computing

Introduction and basic definitions
Related work
Technical implementation of ENISI
Formal Representation of ENISI
Agent Based Modeling using ENISI
Calibration and validation of the preliminary model
Sensitivity Analysis for ABM
Scaling the sensitivity analysis calculations
Scalability and Performance
Modeling Study investigating immune responses to H. pylori

Use case: Predictive computational modeling of the mucosal immune responses during H. pylori infection

Concluding remarks

7. From Big Data Analytics and Network Inference to Systems Modeling

Introduction

Big Data drives Big Models

Experimental planning and power analysis
RNA-Seq analysis pipeline
Read summarization
Differential expression analysis
Time series data
Unsupervised high-resolution clustering

Tools, techniques and pipelines

RNA-Seq analysis in the cloud
RNA Rocket at the PAThosystems Resource Integration Center
Network inference and analytics
Supervised Machine learning methods
NetGenerator
Adaptive Robust Integrative Analysis for finding Novel Association (ARIANA)
Case study: Reconstructing the Th17 differentiation network

Concluding remarks


Introduction

Multiscale modeling concepts and techniques

Modeling Technologies and Tools
From Single Scale to Multiscale Modeling

Sensitivity analysis

Global versus local sensitivity analysis
Sparse experimental design for sensitivity analysis
Temporal significance of modeling parameters
Sensitivity analysis across scales

Multiscale Modeling of Mucosal Immune Responses

The scales of ENISI platform
Challenges and opportunities

Case Study

Modeling mucosal immunity in the Gut
Multiscale modeling of mucosal immune responses

Concluding remarks

9. Modeling exercises

Modeling tools

Models
Computational model of immune responses to Clostridium difficile infection
Computational model of the 3-node T helper type 17 model
Computational model of the 9-node Th1/Th17/Treg model

Model complexity and model-driven hypothesis generation

Concluding remarks

Ordering:

Order Online - http://www.researchandmarkets.com/reports/3336079/

Order by Fax - using the form below

Order by Post - print the order form below and send to

Research and Markets,
Guinness Centre,
Taylors Lane,
Dublin 8,
Ireland.
Fax Order Form
To place an order via fax simply print this form, fill in the information below and fax the completed form to 646-607-1907 (from USA) or +353-1-481-1716 (from Rest of World). If you have any questions please visit http://www.researchandmarkets.com/contact/

Order Information
Please verify that the product information is correct.

Product Name: Computational Immunology: Models and Tools
Web Address: http://www.researchandmarkets.com/reports/3336079/
Office Code: SCPLYNPY

Product Format
Please select the product format and quantity you require:

<table>
<thead>
<tr>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard Copy (Paper back):</td>
</tr>
</tbody>
</table>

* Shipping/Handling is only charged once per order.

Contact Information
Please enter all the information below in BLOCK CAPITALS

Title: [ ] Mr [ ] Mrs [ ] Dr [ ] Miss [ ] Ms [ ] Prof
First Name: __________________________ Last Name: __________________________
Email Address: * __________________________
Job Title: __________________________
Organisation: __________________________
Address: __________________________
City: __________________________
Postal / Zip Code: __________________________
Country: __________________________
Phone Number: __________________________
Fax Number: __________________________

* Please refrain from using free email accounts when ordering (e.g. Yahoo, Hotmail, AOL)
Payment Information

Please indicate the payment method you would like to use by selecting the appropriate box.

☐ Pay by credit card: You will receive an email with a link to a secure webpage to enter your credit card details.

☐ Pay by check: Please post the check, accompanied by this form, to:
Research and Markets,
Guinness Center,
Taylors Lane,
Dublin 8,
Ireland.

☐ Pay by wire transfer: Please transfer funds to:
Account number 833 130 83
Sort code 98-53-30
Swift code ULSBIE2D
IBAN number IE78ULSB98533083313083
Bank Address Ulster Bank,
27-35 Main Street,
Blackrock,
Co. Dublin,
Ireland.

If you have a Marketing Code please enter it below:

Marketing Code: ________________________

Please note that by ordering from Research and Markets you are agreeing to our Terms and Conditions at http://www.researchandmarkets.com/info/terms.asp

Please fax this form to:
(646) 607-1907 or (646) 964-6609 - From USA
+353-1-481-1716 or +353-1-653-1571 - From Rest of World