

Cambridge Elements

Elements in the Structure and Dynamics of Complex Networks

edited by

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GILLESPIE ALGORITHMS FOR STOCHASTIC MULTIAGENT DYNAMICS IN POPULATIONS AND NETWORKS

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CAMBRIDGE
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Shaftesbury Road, Cambridge CB2 8EA, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre,
New Delhi – 110025, India

103 Penang Road, #05–06/07, Visioncrest Commercial, Singapore 238467

Cambridge University Press is part of Cambridge University Press & Assessment,
a department of the University of Cambridge.We share the University's mission to contribute to society through the pursuit of
education, learning and research at the highest international levels of excellence.www.cambridge.orgInformation on this title: www.cambridge.org/9781009239141

DOI: 10.1017/9781009239158

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DOI 10.1017/9781009239158

First published 2022

A catalogue record for this publication is available from the British Library.

ISBN 978-1-009-23914-1 Paperback

ISSN 2634-4645 (online)

ISSN 2634-4637 (print)

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Gillespie Algorithms for Stochastic Multiagent Dynamics in Populations and Networks

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DOI: 10.1017/9781009239158

First published online: December 2022

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Abstract: Many multiagent dynamics can be modeled as a stochastic process in which the agents in the system change their state over time in interaction with each other. The Gillespie algorithms are popular algorithms that exactly simulate such stochastic multiagent dynamics when each state change is driven by a discrete event, the dynamics are defined in continuous time, and the stochastic law of event occurrence is governed by independent Poisson processes. The first main part of this Element provides a tutorial on the Gillespie algorithms focusing on simulation of social multiagent dynamics occurring in populations and networks. The authors clarify why one should use the continuous-time models and the Gillespie algorithms in many cases instead of easier-to-understand discrete-time models. The remainder of the Element reviews recent extensions of the Gillespie algorithms aiming to add more reality to the model (i.e., non-Poissonian cases) or to speed up the simulations. This title is also available as open access on Cambridge Core.

Keywords: numerical simulations, jump processes, Poisson processes, renewal processes, complex systems

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ISBNs: 9781009239141 (PB), 9781009239158 (OC)

ISSNs: 2634-4645 (online), 2634-4637 (print)

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