

Contents

Authorship	vii
Abstracts	ix
Contents	xv
1 Introduction	1
2 Methodology	7
2.1 Probability concepts	8
2.2 Probability distribution	13
2.3 Prediction region	20
2.4 Principle of maximum entropy	22

3	The Gompertz model subject to random fluctuations in all its parameters	25
3.1	The randomized Gompertz model	27
3.2	Examples	33
4	Random microbial growth in a competitive environment	49
4.1	Model analysis.	51
4.2	Assigning reliable probability distributions to the initial conditions	57
4.3	Application to study microbial growth in a competitive environment	58
4.4	Computational procedure design.	61
4.5	Results.	62
4.6	Conclusion	67
5	A GPU-accelerated Lagrangian particle method for solving the Liouville equation	69
5.1	Introduction	70
5.2	Methods.	71
5.3	Complete scheme and computational approach	84
5.4	Numerical examples	93
5.5	Conclusion	107
6	Generalized logistic equation	113
6.1	Stochastic solution	115
6.2	Two methods for computing the PDF of the solution stochastic process	117
6.3	Convergence when the power tends to 1 or 0.	121
6.4	Numerical examples and real data.	123
6.5	Conclusion	138

7	Random systems with impulses	143
7.1	Theory	145
7.2	Examples	156
7.3	Conclusions and future work	174
8	Conclusions and future work	177
A	Relating the Liouville equation with RDEs	181
B	Direct relation between the Liouville equation solution and the RVT theorem	189
	Bibliography	193