

# Contents

<b>1</b>	<b>Conflict Data Sets and Point Patterns</b>	<b>1</b>
1.1	Conflict Data	2
1.2	Abstracting Conflicts: Micro- and Macro-Scale Modeling	5
1.3	Spatio-Temporal Modeling in Practice	7
1.4	Quantifying Uncertainty: The Bayesian Way	8
1.5	Conclusion	11
	References	12
<b>2</b>	<b>Theory</b>	<b>15</b>
2.1	Point Processes	16
2.1.1	Random Point Patterns and the Poisson Process	17
2.1.2	The Cox Process	18
2.1.3	The Poisson Process Likelihood Function	19
2.2	Spatio-Temporal Dynamic Models	20
2.2.1	Partial Differential Equations and Their Stochastic Counterpart	20
2.2.2	Integro-Difference Equation Models	21
2.2.3	Dimensionality Reduction in Spatio-Temporal Models	24
2.3	Smoothing and Approximate Inference	28
2.3.1	State Estimation	30
2.3.2	Filtering and Smoothing	30
2.3.3	The VBEM Algorithm	32
2.4	Implementation Tools	35
2.4.1	Non-Parametric Description of Point Patterns	35
2.4.2	Basis Selection from Point-Process Observations	37
2.4.3	Approximate Inference from Point Observations	40
2.4.4	VB-Laplace Inference from Point-Process Observations	42
2.5	Conclusion	43
	References	43

<b>3 Modeling and Prediction in Conflict: Afghanistan</b> . . . . .	47
3.1 Background to the Afghan Conflict . . . . .	47
3.2 The WikiLeaks Afghan War Diary . . . . .	48
3.3 Exploratory Study . . . . .	50
3.3.1 Consistency with Other Data Sets . . . . .	50
3.3.2 Non-Parametric Analysis and Model Construction . . . . .	51
3.3.3 Adding Spatial Fixed Effects . . . . .	56
3.4 Results . . . . .	58
3.4.1 Conflict Intensity and Fixed Effects . . . . .	58
3.4.2 Escalation and Volatility . . . . .	60
3.4.3 Prediction. . . . .	62
3.5 Conclusion . . . . .	64
References . . . . .	65
<b>Epilogue</b> . . . . .	67
<b>Appendix A: VB-Laplace Inference for the AWD</b> . . . . .	69
<b>Index</b> . . . . .	73

Modeling Conflict Dynamics with Spatio-temporal Data

Zammit-Mangion, A.; Dewar, M.; Kadiramanathan, V.;

Flesken, A.; Sanguinetti, G.

2013, VIII, 74 p. 13 illus., 1 illus. in color., Softcover

ISBN: 978-3-319-01037-3