

# Discovering Latent Structure in Point Process Data

A DISSERTATION PRESENTED  
BY  
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# Discovering Latent Structure in Point Process Data

ABSTRACT

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THIS IS THE DEDICATION.

# Acknowledgments

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## Introduction

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# Background

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### 1.1.1 GENERATIVE GRAPHICAL MODELS

### 1.1.2 BAYESIAN INFERENCE

### 1.1.3 MODEL COMPARISON

## 1.2 POINT PROCESSES

### 1.2.1 THE POISSON PROCESS

### 1.2.2 THE HAWKES PROCESS

### 1.2.3 THE NONLINEAR HAWKES PROCESS

## 1.3 TIME SERIES MODELS

### 1.3.1 HIDDEN MARKOV MODELS

### 1.3.2 DYNAMICAL SYSTEMS MODELS

### 1.3.3 AUTOREGRESSIVE MODELS

## 1.4 NETWORK MODELS

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### 2.1.1 AUGMENTATION WITH PARENT VARIABLES

### 2.1.2 BACKGROUND MODELS

### 2.1.3 PROCESS IDENTITY MODELS

## 2.2 MAP INFERENCE

## 2.3 BAYESIAN INFERENCE WITH MCMC

## 2.4 VARIATIONAL INFERENCE

### 2.4.1 MEAN FIELD APPROXIMATION

### 2.4.2 STOCHASTIC VARIATIONAL INFERENCE

## 2.5 EXPERIMENTS

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## Nonlinear Hawkes Processes with Latent Network Structure

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3.2 MAP INFERENCE

3.3 PÓLYA-GAMMA AUGMENTATION

3.4 BAYESIAN INFERENCE WITH MCMC

3.5 VARIATIONAL INFERENCE

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## Dynamic Network Models

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4.0.2 DYNAMIC HAWKES PROCESS MODELS

4.1 BAYESIAN INFERENCE

4.1.1 BLOCK GIBBS SAMPLING

4.1.2 PARTICLE GIBBS SAMPLING

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## Latent State Space Models for Point Processes

5.1 SWITCHING LINEAR DYNAMICAL SYSTEMS

5.2 BAYESIAN INFERENCE WITH MCMC

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## Bayesian Inference with Neural Circuits

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## Conclusion



Some extra stuff

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