

THE UNIVERSITY OF CHICAGO

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ABSTRACT

CHAPTER 1

PRIMER ON EXACT BAYESIAN METHODS AND VARIATIONAL INFERENCE

1.1 Markov Chain Monte Carlo

1.1.1 Metropolis-Hastings and Gibbs sampling

1.1.2 Langevin Monte Carlo

1.1.3 Hamiltonian Monte Carlo

1.1.4 Stochastic Gradient Langevin Dynamics

1.2 Variational Inference

1.2.1 Neural networks represent probability distributions

1.2.2 Training criteria for neural networks

1.2.3 The evidence lower bound

CHAPTER 2

DECONVOLVING IMMUNOGENIC TUMOR SUBSTRUCTURE

WITH VARIATIONAL INFERENCE

CHAPTER 3

**A BAYESIAN APPROACH FOR INFERRING NEURONAL
CONNECTIVITY FROM Ca^{2+} IMAGING DATA AND
MONTE CARLO SIMULATIONS**

CHAPTER 4

**BAYESIAN INFERENCE OF THE KINETIC PARAMETERS
OF INTERFERON-GAMMA INDUCED TRANSCRIPTION**