

MOUNT ALLISON UNIVERSITY

Improving the Contrast of Neutron
Interferometry Phase Measurements
Using Online Bayesian Markov Chain
Monte Carlo Methods (Super Tentative
Crappy Title)

by

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A thesis submitted in partial fulfillment for the
degree of Bachelor of Science with Honours

in the
Faculty of Science
Department of Physics

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Declaration of Authorship

I, Thomas Alexander, declare that this thesis titled, 'THESIS TITLE' and the work presented in it are my own. I confirm that:

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- Where I have consulted the published work of others, this is always clearly attributed.
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- I have acknowledged all main sources of help.
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

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Date:

“Such is the vastness of his genius that he can outwit even himself.”

Steven Erikson

MOUNT ALLISON UNIVERSITY

Abstract

Faculty of Science
Department of Physics

Bachelors of Science with Honours

by Thomas Alexander

The Thesis Abstract is written here (and usually kept to just this page). The page is kept centered vertically so can expand into the blank space above the title too...

Acknowledgements

The acknowledgements and the people to thank go here, don't forget to include your project advisor...

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Abbreviations

LAH List Abbreviations **Here**

Physical Constants

Speed of Light $c = 2.997\,924\,58 \times 10^8 \text{ ms}^{-\text{s}}$ (exact)

Symbols

a	distance	m
P	power	W (Js^{-1})
ω	angular frequency	rads^{-1}

For/Dedicated to/To my...

Chapter 1

Introduction

1.1 Neutron Interferometry

1.1.1 History

1.1.2 Application to Quantum Information

1.1.3 Application to Quantum Fundamentals

1.1.4 National Institute of Standards and Technology

1.2 Bayesian Markov Chain Monte Carlo Methods

Chapter 2

Theory

2.1 Neutron Interferometry

2.1.1 History

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Chapter 3

Experimental Setup

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3.3.1 Interaction with NI-Engine

3.3.2 GPU Implementations of Likelihood functions

Chapter 4

Discussion

4.1 Application to Quantum Information

4.2 Application to Quantum Fundamentals

4.3 Application to Materials Science

4.4 Outside of Neutron Interferometry

Chapter 5

Conclusion

5.1 Contrast Improvement with MCMC Methods

5.2 The Experimental Setup

5.3 Application of Findings

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