On the Use of the `ubcdiss` Template

by

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

Doctor of Philosophy

in

THE FACULTY OF XXX

(Basket Weaving)

The University of British Columbia

(Vancouver)

April 2192

Abstract

This document provides brief instructions for using the `ubcdiss` class to write a University of British Columbias (UBCS)-conformant dissertation in LaTeX. This document is itself written using the `ubcdiss` class and is intended to serve as an example of writing a dissertation in LaTeX. This document has embedded Unique Resource Locators (URLS) and is intended to be viewed using a computer-based Portable Document Format (PDF) reader.

Note: Abstracts should generally try to avoid using acronyms.

Note: at UBC, both the Graduate and Postdoctoral Studies (GPS) Ph.D. defence programme and the Library's online submission system restricts abstracts to 350 words.

Preface

At UBC, a preface may be required. Be sure to check the GPS guidelines as they may have specific content to be included.

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Glossary

This glossary uses the handy `acroynym` package to automatically maintain the glossary. It uses the package's `printonlyused` option to include only those acronyms explicitly referenced in the LaTeX source.

GPS Graduate and Postdoctoral Studies

PDF Portable Document Format

URL Unique Resource Locator, used to describe a means for obtaining some resource on the world wide web

Acknowledgments

Thank those people who helped you.

Don’t forget your parents or loved ones.

You may wish to acknowledge your funding sources.

Chapter 1

Introduction

If I have seen farther it is by standing on the shoulders of Giants.
— Sir Isaac Newton (1855)

1.1 What problems

Geophysical inversions, specifically potential fields include formulation of non-regularized inverse problem

1.2 Difficulties with said problems

The standard way to fit a set of parameters to a set of data (especialy when they are related by a linear operator) is least squares optimization. This is redered problematic since n general geo-physical inversions are ill-conditioned (define) and underdertermined (define) (Oldenburg and Li 2005 other sources I'm sure). In specific potential fields are particularly under-determined due to the lack of any depth information in the data.

show some form of problems with forward operator matrix in PF inversion

1.3 Solutions to said dificultlies

To mitigate the difficulties presented above an extra term is added to the optimization.

$$\phi = \phi_d + \beta \phi_m \tag{1.1}$$

where ϕ_m is called the model objective function. This ϕ_m can be defined in many ways, following (Oldenburg and Li 2005)

$$\phi_m(m) = \alpha_s \int (m - m_{ref})^2 dx + \alpha_x \int \left(\frac{d}{dx}(m - m_{ref}) \right)^2 dx \tag{1.2}$$

$$= \alpha_s \|\mathbf{W}_s(m - m_{ref})\|^2 + \alpha_x \|\mathbf{W}_x(m - m_{ref})\|^2 \tag{1.3}$$

in higher dimmesions more smootheness terms can be added. The $\mathbf{W}$ terms contain both the operator (indentity for $\mathbf{W}_s$ and derivative for $\mathbf{W}_x$ and other dimensions) and the relative weight each cell or face contributes to the model norm. This gives us several levers to add a-priori information into the inversion.

1.3.1 α coefficients

broad strokes

1.3.2 Weighting matrices

1.3.3 Reference Models

Appendix A

Supporting Materials

This would be any supporting material not central to the dissertation. For example:

- additional details of methodology and/or data;
- diagrams of specialized equipment developed.;
- copies of questionnaires and survey instruments.