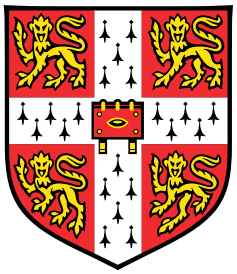
Abstractions, Representations and Latent Spaces



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This dissertation is submitted for the degree of
Doctor of Philosophy

Jesus College November 2019

I would like to dedicate this thesis to my loving parents ...

Declaration

I hereby declare that except where specific reference is made to the work of others, the contents of this dissertation are original and have not been submitted in whole or in part for consideration for any other degree or qualification in this, or any other university. This dissertation is my own work and contains nothing which is the outcome of work done in collaboration with others, except as specified in the text and Acknowledgements. This dissertation contains fewer than 65,000 words including appendices, bibliography, footnotes, tables and equations and has fewer than 150 figures.

Paul Kishan Rubenstein
November 2019

Acknowledgements

And I would like to acknowledge ...

Abstract

This is where you write your abstract ...

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Nomenclature

Roman Symbols

F	complex function

Greek Symbols

γ	a simply closed curve on a complex plane
$\imath$	unit imaginary number $\sqrt{-1}$
π	$\simeq 3.14\ldots$

Superscripts

j	superscript index

Subscripts

0	subscript index
crit	Critical state

Other Symbols

$\oint_\gamma$	integration around a curve γ

Acronyms / Abbreviations

ALU	Arithmetic Logic Unit
BEM	Boundary Element Method
CD	Contact Dynamics
CFD	Computational Fluid Dynamics

CIF Cauchy's Integral Formula

CK Carman - Kozeny

DEM Discrete Element Method

DKT Draft Kiss Tumble

DNS Direct Numerical Simulation

EFG Element-Free Galerkin

FEM Finite Element Method

FLOP Floating Point Operations

FPU Floating Point Unit

FVM Finite Volume Method

GPU Graphics Processing Unit

LBM Lattice Boltzmann Method

LES Large Eddy Simulation

MPM Material Point Method

MRT Multi-Relaxation Time

PCI Peripheral Component Interconnect

PFEM Particle Finite Element Method

PIC Particle-in-cell

PPC Particles per cell

RVE Representative Elemental Volume

SH Savage Hutter

SM Streaming Multiprocessors

USF Update Stress First

USL Update Stress Last

Chapter 1

Introduction

1.1 Outline

1.2 Contributions

1.3 Summary of PhD work not included in this thesis

Chapter 2

Literature review

In this chapter we review the literature relevant to the thesis.

Chapter 3

Causal Abstractions

This chapter is based on the paper *Causal Consistency of Structural Equation Models* published at UAI 2017.

Chapter 4

Nonlinear Independent Component Analysis

This chapter is based on the paper *The Incomplete Rosetta Stone Problem: Identifiability Results for Multi-View Nonlinear ICA* published at UAI 2019.

Chapter 5

Generative modelling / autoencoders

This chapter is based on the paper *On the Latent Space of Wasserstein Auto-Encoders*. This work was published as two separate workshop papers at ICLR 2018.

Chapter 6

Latent space learning theory

This chapter is based on the paper *Practical and Consistent Estimation of f-Divergences* published at NeurIPS 2019.

Chapter 7

Conclusion / Future directions

This chapter summarises the work presented in this thesis and discusses where the field is going.

References

Appendix A

First Appendix

I’m not sure yet what will go here.

Appendix B

Second Appendix

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