MPhil DIS Report 24

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Chapter 1

Executive Summary

In many areas of physics, the equations describing the observed are complex and include a large number of terms. For general use and numerical simulations, it is often necessary to simplify these equations. This report investigates the work carried out in the Callaham paper, which explores the use of unsupervised learning to identify dominant balance regimes from simulated data of the terms in the equation.

Chapter 2

Introduction

Chapter 3

Background

Chapter 4

Methodology

Get simulated data of the terms in the equation of physical variables from which terms in the equation can be derived

Group the data into feature space, with each term as a feature

Cluster the data using GMM

SPCA to identify which terms are active in each cluster

Group together clusters that have the same active terms

Chapter 5

Conducted research

Callaham has used the algorithm in a few different cases to validate how it functions.

5.1 Portability of the code

5.2 Reproducibility of the results

5.3 Exploration of other algorithms

Chapter 6

Elasto-inertial turbulence

6.1 Background

6.2 Methodology

6.3 Results

6.4 Discussion

Chapter 7

Data analysis pipeline