

Bayesian Dynamic Regression Trees
PhD Thesis for Computer Science and Statistics
Trinity College, Dublin

Candidate: Michael Ferreira
Supervisor: Professor Simon Wilson

Contents

Preface	vii
1 Introduction	1
2 Theory	3
3 Methodology	5
4 The Base Case	7
5 Bayesian Dynamic Regression Trees	9
6 Experiments	11
7 Results	13
8 Critical Assessment	15
9 Further Work	17
10 Conclusions	19
Bibliography	25

Abstract

Preface

Introduction

Theory

Methodology

Chapter 1

The Base Case

This section describes the simplest case in which we have a single fixed tree and a first-order polynomial model. The case to be argued here is that combining two well known models into a single framework has benefits to the analyst. It would be nice to show that this also contributes something to the art of Statistics.

A fixed tree implies:

- K_T leaves and $K_T - 1$ internal nodes,
- which implies a fixed number number of known covariates with fixed threshold values,
- and a fixed number of Kalman filters (KFs).
- If we then consider that $\lambda_a = \lambda_s$ (that the rate of arrival of inputs is that same as the rate of computation) then *a priori* we can assume that the leaves have probability $\frac{1}{K_T}$ of updating at each iteration.

Thus the tree is trying to solve the following:

$$Y_t = f(X_t, \epsilon_t)$$

where X_t are explanatory covariates, and ϵ_t are the errors in estimating Y_t .

The model at each leaf is:

Bayesian Dynamic Regression Trees

Experiments

Results

Critical Assessment

Further Work

Conclusions

Appendix A

Appendix B

Bibliography