

# Tom's awesome thesis on buses

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# Abstract

This is the abstract.



## Chapter 1

# Introduction

This is the intro. Literature review, the problem, and the goals of this work (i.e., to make better predictions that don't rely on the timetable).





## **Part I**

# **Real-time bus models**



## Chapter 2

# Literature review

This is a “review” of what’s been happening in the field of bus arrival-time prediction and modeling. From its routes in Kalman filtering, through fancy ANN and SVM models, to computer intensive particle filter models (not for real-time applications).

What’s missing: focus on improved arrival-time prediction, rather than an OR approach.



## Chapter 3

# GTFS data and route segmentation

Talk about the data itself: where it comes from, the important aspects we care about (trips/routes, shapes, stops, and stop times).

### 3.1 Real-time data

What's involved, frequency, and some of the quirks (at least in our Auckland Transport example).

### 3.2 Segmentation of routes

This is cool — by segmenting routes (at intersections) we remove dependency of speed/travel time on *route* and instead relate it to the physical road the vehicle is traveling along.



## Chapter 4

# Transit vehicle model

This chapter should be about the model itself, including traffic lights, dwell times, speed, etc. It's a recursive Bayesian model, which means the state at time  $k$  is a function of the state at time  $k - 1$ .

### 4.1 Particle filter

About how it's actually implemented using a particle filter, and the reasons why we chose that.





## **Part II**

# **Transit network**



## Chapter 5

# Introduction

Here we give a detailed overview of what exactly the transit network is (in the previous chapter, we only alluded to it, and assumed segments where known).

The basic idea of splitting shapes at intersections, which we get manually, or could potentially obtain using shape-processing methods.



## Chapter 6

# Real-time network model

The modified Kalman filter approach to modeling travel times as vehicles travel along each road segment.



## Chapter 7

# Historical data based priors

How we use Bayesian hierarchical models to estimate the typical speed along roads in the network, based on historical data.