Abstract
Algorithmic Advances for the
Design and Analysis of Being a Good Boy
Handsome Dan
20XX

Since the beginning of recorded history, being a good boy is one of the most fundamental societal problems facing all canines. In this dissertation, we develop a mathematical framework for being a good boy and provide algorithms for optimal good boy behavior.

In the first chapter, we present a decision theoretic framework for modeling standard good boy tricks, including "sit", "stay", "paw", and "down". We show our framework is flexible enough to incorporate Bayesian priors based on standard exponential families. As an application of our framework, we demonstrate that the problem of learning to optimally walk your human is polynomial time solvable.

In the second chapter, we present a suite of algorithms for computing optimal good boy behavior. We show that, perhaps surprisingly, greedy algorithms fail to provide even a constant factor approximation. On the other hand, we develop a class of semidefinite programming based algorithms which allow for approximately optimal good boy behavior in polynomial time.

Algorithmic Advances for the Design and Analysis of Being a Good Boy

A Dissertation
Presented to the Faculty of the Graduate School
Of
Yale University
In Candidacy for the Degree of
Doctor of Philosophy

By
Handsome Dan

Dissertation Directors: Peter Salovey

May 20XX

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Perhaps the greatest paper of all is the walks we took along the way. This dissertation is dedicated to everyone who gave me a head pat during my time here at Yale.

Acknowledgment

First and foremost, I am eternally grateful to my academic advisor, Peter Salovey. In addition to the countless hours of stimulating discussion, the sweet bluegrass sounds of his bass have inspired many of the results in this dissertation. For this and more, I offer my sincerest thanks.

Thank you to my many collaborators from whom I have learned so much. In particular, Clifford the Big Red Dog and Airbud who have been by side at the whiteboard for all these years. The work appearing in this dissertation would not be possible without the bones we've shared together. I thank those dogs who came before me, Lassie and Wishbone, for paving the way in this field.

Finally, thank you to my dearest family for their undying love: my mother, my father, and my 9 siblings in the litter. Your continued support and playtime has been the greatest gift of all.

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Contents

Chapter 1

Introduction

1.1 Motivation

The problem of good boy behavior has been well established in the literature. We follow the convention of Neyman (1923) for the potential outcomes model. Moreover, we build on the work of Harshaw et al. (2021a) and Harshaw et al. (2021b) for design and analysis of experiments. We really cited these just so we'd have a non-empty bibliography.

In order to ensure that we have made proper use of the `figure` directory, we should create a figure. Figure 1.1 shows the optimal good boy, the original Handsome Dan. Finally, we end this motivation with nonsense text to fill it out.

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

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And after the second paragraph follows the third paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest

Figure 1.1: Optimal Good Boy

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Chapter 2

Good Boy Decision Theoretic Framework

2.1 Good boy behavior

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2.2 Formal theory

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Chapter 3

Efficient Good Boy Algorithms

3.1 Greedy algorithms fail

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3.2 Semdefinite programming approaches

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Contents

Appendix A

Proof of Mathematical Theorems

This appendix contains the proofs of all claims made in main body of the dissertation.

A.1 Proof of Theorem 1

The proof is left as an exercise to the reader.