

TOWSON UNIVERSITY

MASTER'S THESIS

Aiding Linear Television Media Planning Through Bayesian Inference and Forecasting

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Declaration of Authorship

I, Matthew TIGER, declare that this thesis titled, “Aiding Linear Television Media Planning Through Bayesian Inference and Forecasting” and the work presented in it are my own. I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University.
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.
- Where I have consulted the published work of others, this is always clearly attributed.
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
- I have acknowledged all main sources of help.
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

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Abstract

Department of Mathematics

Master of Science

Aiding Linear Television Media Planning Through Bayesian Inference and Forecasting

by Matthew TIGER

The Thesis Abstract is written here (and usually kept to just this page). The page is kept centered vertically so can expand into the blank space above the title too...

Acknowledgements

The acknowledgments and the people to thank go here, don't forget to include your project advisor...

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List of Abbreviations

LAH List Abbreviations Here
WSF What (it) Stands For

For/Dedicated to/To my...

Chapter 1

Introduction

The world of advertising today consists of

We are trying to provide better linear tv media plans.

We will use the theory of Bayesian statistics to develop a model that will forecast future telecast airings' audience impression concentration distributions corrected for small sample sizes present in the measurement training data.

1.1 Background

TV sellers have airtime available for sale to be used to air advertisements. TV buyers purchase airtime from sellers in order to air their desired advertisements.

TV buyers want to buy ad airtime that will help them share their message with a target audience.

Audience measurement companies provide measurements television viewership. Some companies take these measurements using a statistical sample of the TV viewing population and tracking the viewership of that sample and extrapolating to the population at large.

TV sellers bundle together airtime into a unit called a selling title. This unit contains logically grouped airings of content. Sometimes the content within the selling title is specific, other times it's a blend of content packaged together.

An example of a piece of content available is *Funny Animated Cartoon* and an example of a selling title would be *Funny Animated Cartoon M-F 8PM*.

TV sellers accept media plans allocated at the selling title/week level and then as the flight date approaches determine the actual ad schedule that will air. This is known as trafficking the ads.

The planning is done based off of demo estimates, which are impression estimates of a particular age/gender demographic. The TV seller provided these estimates using their substantive knowledge. The planning for strategic targets is done by forecasting a percentage. The resulting forecast is then the percentage multiplied by the forecasted demo estimate

1.2 Motivation

The sample sizes used for the majority of telecasts in the measurement source are too small to be trusted on their own. This is the major challenge of providing forecasts for media plans; using the data on its own will produce inaccurate forecasts that do not take into account the small sample size.

A motivating example is related to e-commerce reviews: players are judged by their batting average but this metric is not informative with few at-bats. With more information about the league and past historical performances we can use bayesian

inference to come up with a better estimate that takes such factors into account as well as the observed at-bats.

Simiarly, we hope to use the data from past airings to perform better inference on telecasts with small sample sizes.

1.3 Challenges

Low sample size must be addressed. Variance within selling-title/week. Impression estimates are tied to demo forecasts.

For the purposes of this thesis we will be addressing the first issue alone. We will assume for testing that we know the outcome of the demo with prescience.