Saccadic Biases

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June 10, 2015

Abstract

More bias modelling! Cause who can be bothered running actual experiments?

1 Introduction

Improve on last year's [Clarke and Tatler, 2014] effort. More sophisticated biases. And some examples of how to use biases for improved data analysis.

2 Methods

2.1 Datasets

2.2 Pre-processing

Normalise fixation positions relative to image frame.

Boot-strapping?

Merge datasets or model individually?

What about trasforming the data so that it is unbounded: $x' = \frac{x}{1-x}$?

3 Biases

We will model and discuss saccadic flow, coarse-to-fine, and left v right.

3.1 Saccadic Flow

Saccadic flow can be thought of as a generalisation of the central bias. Instead of computing the distribution of all saccadic endpoints in a dataset, we look at the distribution of saccade endpoints given the start points. So for a saccade from (x_0, y_0) to $(x_1, y1)$ we want to model $p(x_1, y_1|x_0, y0)$ This is illustrated in 1.

Figure 1: Empirical example of saccadic flow from blah dataset.

3.1.1 Modelling

We will model saccadic flow using multivariate skew-t distributions [Azzalini, 2015]. The multivariate skew-normal distribution [Azzalini and Dalla Valle, 1996] is given by:

$$\phi(z;\lambda) = 2\phi(z)\Phi(\lambda z) \tag{1}$$

for $z \in \mathbb{R}$. I think.

3.1.2 Results

3.1.3 Discussion

3.2 Coarse-to-fine

People make shorter saccades over time. Include $1/f$ dynamics?

3.3 Left v Right

Initially more fixations to the left half of the image [Nuthmann and Matthias, 2014].

4 Using Biases for Better Analysis

We will use the the central bias [Clarke and Tatler, 2014] and *saccadic flow* in some different contexts to see what biases can do for vision research. :p

4.1 Attentional Landscapes

Or do we call them hotspot maps?

4.2 ROC Analysis

Example of using our models rather than shuffle approaches.

4.3 Flow and Coarse to fine

To what extent does saccadic flow account for coarse-to-fine dynamics

4.4 Inverse Yarbus

Do these biases allow us to improve inverse yarbus performance?

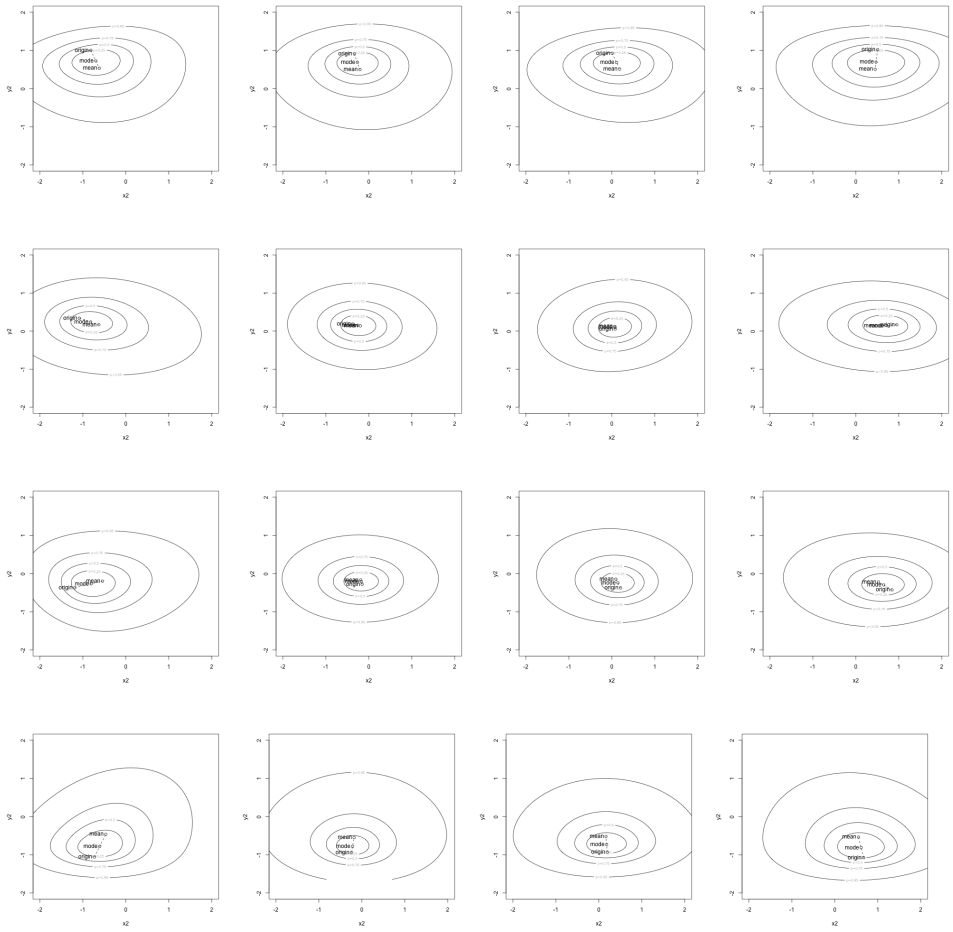

Figure 2: Multivariate skew-normal distributions fitted to fixation location, by saccade start point.

4.5 Salience

Does salience explain the less likely saccades?

5 Discussion

Acknowledgements

Thanks to Adelchi Azzalini for advice on using the `sn` package for `R`. And mention grants.

References

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