Thesis Title

A THESIS PRESENTED
BY
AUTHOR'S NAME
TO
THE DEPARTMENT OF STATISTICS

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
BACHELOR OF ARTS (HONORS)
IN THE SUBJECT OF
STATISTICS

HARVARD UNIVERSITY
CAMBRIDGE, MASSACHUSETTS
APRIL 2020

Thesis advisor: Advisor's name Author's name

Thesis Title

Abstract

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Contents

Listing of figures

This thesis is dedicated to...

Acknowledgments

Thank you so much to...

Inspiring quote here (completely optional!).

Quoteauthor

1 The title of chapter one

There's something to be said for having a good opening line. Morbi commodo, ipsum sed pharetra gravida, orci $x = 1/a$ magna rhoncus neque, id pulvinar odio lorem non turpis [1]. Nullam sit amet enim. Suspendisse id velit vitae ligula volutpat condimentum. Aliquam erat volutpat. Sed quis velit. Nulla facilisi. Nulla libero. Vivamus pharetra posuere sapien. Nam consectetuer. Sed aliquam, nunc eget euismod ullamcorper, lectus nunc ullamcorper orci, fermentum bibendum enim nibh eget ipsum. Donec porttitor ligula eu dolor. Maecenas vitae nulla consequat libero cursus venenatis.

Also, recall that

$$\frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-x^2/2} dx = 1.$$

Three amazing histograms are shown in Figure 1.0.1.

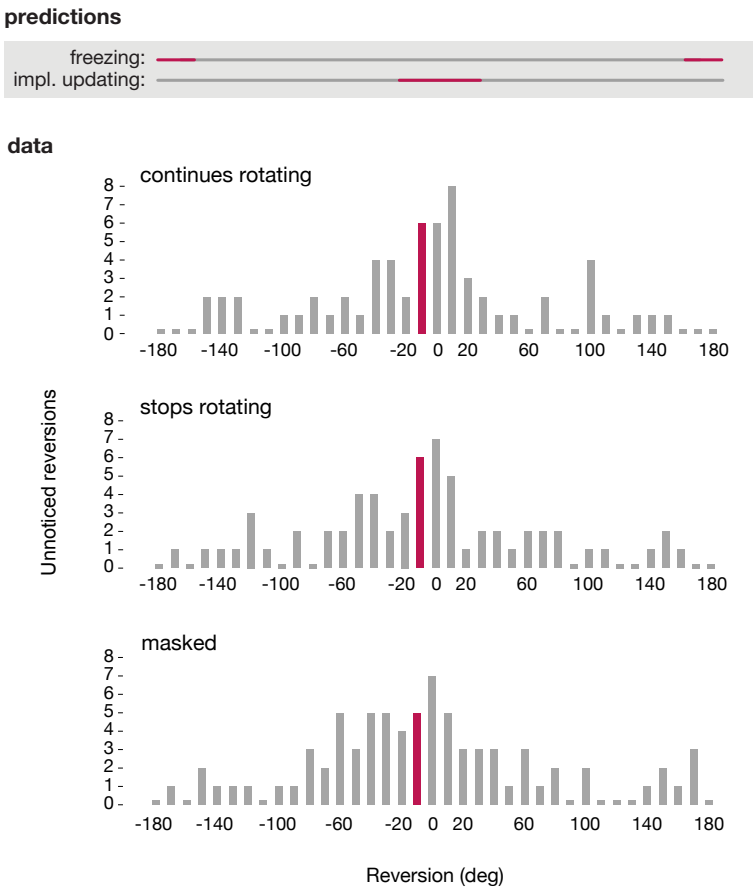

Figure 1.0.1: Three histograms are shown. Note that...

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The title of chapter two

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Some nice graphs are shown in Figure 2.0.1.

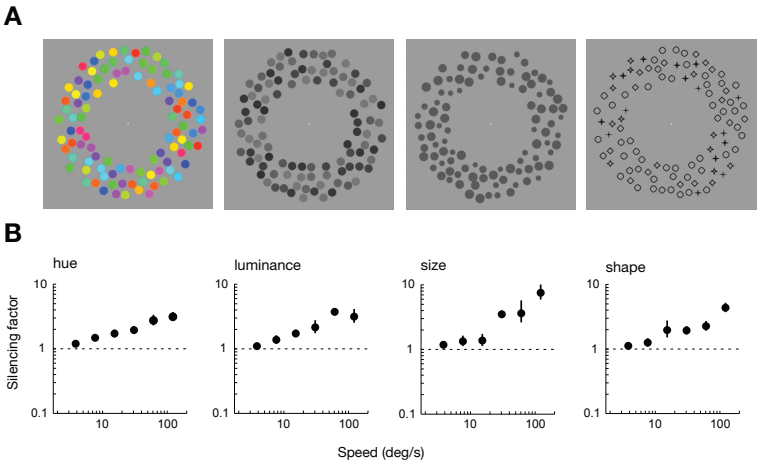

Figure 2.0.1: Some nice graphs.

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Chapter 3

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Recall that

$$E(E(Y|X)) = E(Y),$$
$$\text{Var}(Y) = E(\text{Var}(Y|X)) + \text{Var}(E(Y|X)).$$

A
Some extra stuff

Here is a useful table of distributions.

Name	**Param.**	**PMF or PDF**	**Mean**	**Variance**
Bernoulli	p	$P(X=1)=p, P(X=0)=q$	p	pq
Binomial	n, p	$\binom{n}{k}p^k q^{n-k},\ k\in\{0,1,\dots,n\}$	np	npq
FS	p	$pq^{k-1},\ k\in\{1,2,\dots\}$	$1/p$	q/p^2
Geom	p	$pq^k,\ k\in\{0,1,2,\dots\}$	q/p	q/p^2
NBin	r, p	$\binom{r+k-1}{r-1}p^r q^k,\ k\in\{0,1,2,\dots\}$	rq/p	rq/p^2
HGeom	w, b, n	$\frac{\binom{w}{k}\binom{b}{n-k}}{\binom{w+b}{n}},\ k\in\{0,1,\dots,n\}$	$\mu=\frac{nw}{w+b}$	$\left(\frac{w+b-n}{w+b-1}\right)\mu\left(1-\frac{\mu}{n}\right)$
NHGeom	w, b, r	$\frac{\binom{r+k-1}{r-1}\binom{w+b-r-k}{w-r}}{\binom{w+b}{w}},\ k\in\{0,1,\dots,b\}$	$\frac{rb}{w+1}$	$\frac{rb(w+b+1)(w-r+1)}{(w+1)^2(w+2)}$
Poisson	λ	$\frac{e^{-\lambda}\lambda^k}{k!},\ k\in\{0,1,2,\dots\}$	λ	λ
Uniform	$a<b$	$\frac{1}{b-a},\ x\in(a,b)$	$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$
Normal	μ, σ^2	$\frac{1}{\sigma\sqrt{2\pi}}e^{-(x-\mu)^2/(2\sigma^2)}$	μ	σ^2
Log-Normal	μ, σ^2	$\frac{1}{x\sigma\sqrt{2\pi}}e^{-(\log x-\mu)^2/(2\sigma^2)},\ x>0$	$\theta=e^{\mu+\sigma^2/2}$	$\theta^2(e^{\sigma^2}-1)$
Expo	λ	$\lambda e^{-\lambda x},\ x>0$	$1/\lambda$	$1/\lambda^2$
Weibull	λ, γ	$\gamma\lambda e^{-\lambda x^\gamma}x^{\gamma-1},\ x>0$	$\mu=\frac{\Gamma(1+1/\gamma)}{\lambda^{1/\gamma}}$	$\frac{\Gamma(1+2/\gamma)}{\lambda^{2/\gamma}}-\mu^2$
Gamma	a, λ	$\Gamma(a)^{-1}(\lambda x)^a e^{-\lambda x}x^{-1},\ x>0$	a/λ	a/λ^2
Beta	a, b	$\frac{\Gamma(a+b)}{\Gamma(a)\Gamma(b)}x^{a-1}(1-x)^{b-1},\ 0<x<1$	$\mu=\frac{a}{a+b}$	$\frac{\mu(1-\mu)}{a+b+1}$
Chi-Square	n	$\frac{1}{2^{n/2}\Gamma(n/2)}x^{n/2-1}e^{-x/2},\ x>0$	n	$2n$
Student-t	n	$\frac{\Gamma((n+1)/2)}{\sqrt{n\pi}\Gamma(n/2)}(1+x^2/n)^{-(n+1)/2}$	0 if $n>1$	$\frac{n}{n-2}$ if $n>2$

References

[1] Manfred Eigen. Selforganization of matter and the evolution of biological macromolecules. *Naturwissenschaften*, 58(10):465–523, 1971.