IQSS Beamer Class Demonstration

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IQSS

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Outline

Beamer Features

Some of Gary’s Examples

Other Features

Structural Features

More Features

Blocks

Appendix
What’s this course about?

• Specific statistical methods for many research problems - How to learn (or create) new methods - Inference: Using facts you know to learn about facts you don’t know
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- How to write a publishable scholarly paper
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• **Specific statistical methods for many research problems** - How to learn (or create) new methods - **Inference**: Using facts you know to learn about facts you don’t know
• **How to write a publishable scholarly paper**
• **All the practical tools of research** — theory, applications, simulation, programming, word processing, plumbing, whatever is useful
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- [Outline and class materials](http://j.mp/G2001)

The syllabus gives topics, not a weekly plan. We will go as fast as possible subject to everyone following along. We cover different amounts of material each week.
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How much math will you scare us with?

• All math requires two parts: **proof** and **concepts & intuition**
• Different classes emphasize:
  • **Baby Stats**: dumbed down proofs, vague intuition
  • **Math Stats**: rigorous mathematical proofs
  • **Practical Stats**: deep concepts and intuition, proofs when needed
    • Goal: how to do empirical research, in depth
    • Use rigorous statistical theory — when needed
    • Insure we understand the intuition — always
    • Always traverse from theoretical foundations to practical applications
    • Includes “how to” computation
    • ↦ Fewer proofs, more concepts, better practical knowledge
• Do you have the background for this class?

\[ b = (X'X)^{-1}X'y \]
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**A Test: What’s this?**

\[ b = (X'X)^{-1}X'y \]
• \( E(Y_i) \equiv \mu_i = X_i \beta = \beta_0 + \beta_1 X_{1i} + \cdots + \beta_k X_{ki} \)

• \( \Pr(Y_i = 1) \equiv \pi_i = \frac{1}{1 + e^{-x_i \beta}} \)

• \( V(Y_i) \equiv \sigma_i^2 = e^{x_i \beta} \)

• Interpretation:
  • Each is a class of functional forms
  • Set \( \beta \) and it picks out one member of the class
  • \( \beta \) in each is an “effect parameter” vector, with different meaning
Negative Binomial Derivation

Recall:

one two three
Negative Binomial Derivation

Recall:

\[ \Pr(A|B) = \frac{\Pr(AB)}{\Pr(B)} \implies \Pr(AB) = \Pr(A|B) \Pr(B) \]

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\[ \text{NegBin}(y|\phi, \sigma^2) = \int_0^{\infty} \text{Poisson}(y|\lambda) \times \text{gamma}(\lambda|\phi, \sigma^2) d\lambda \]
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Recall:

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one two three

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\text{NegBin}(y|\phi, \sigma^2) = \int_{0}^{\infty} \text{Poisson}(y|\lambda) \times \text{gamma}(\lambda|\phi, \sigma^2) d\lambda
\]

\[
= \int_{0}^{\infty} \mathcal{C}(y, \lambda|\phi, \sigma^2) d\lambda
\]

\[
= \frac{\Gamma \left( \frac{\phi}{\sigma^2-1} + y_i \right)}{y_i! \Gamma \left( \frac{\phi}{\sigma^2-1} \right)} \left( \frac{\sigma^2 - 1}{\sigma^2} \right)^{y_i} \left( \sigma^2 \right)^{-\frac{\phi}{\sigma^2-1}}
\]
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Structural Features

Levels of Structure

• usual \section, \subsection commands
• frame environments provide slides
• block environments divide slides into logical sections
• columns environments divide slides vertically (example later)
• overlays (‘a la prosper) change content of slides dynamically

Overlay Alerts

On the first overlay, this text is highlighted (or alerted).

On the second, this text is.
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# Code blocks

```r
# Say hello in R
hello <- function(name) paste("hello", name)
```

```python
def hello(name):
    return ("Hello" + " " + name)
```

```haskell
hello name = "Hello" ++ " " ++ name
```

```c
#include<stdio.h>

int main()
{
    char name[256];
    fgets(name, sizeof(name), stdin);
    printf("Hello %s", name);
    return (0);
}
```
# Say hello in R

```r
hello <- function(name) paste("hello", name)
```

# Say hello in Python

```python
def hello(name):
    return "Hello" + name + name
```

/* Say hello in C */

```c
#include <stdio.h>

int main()
{
    char name[256];
    fgets(name, sizeof(name), stdin);
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    return (0);
}
```
# Say hello in R

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hello <- function(name) paste("hello", name)
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# Say hello in Python

```python
def hello(name):
    return("Hello" + " " + name)
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-- Say hello in Haskell

```haskell
hello name = "Hello" ++ " " ++ name
```
# Say hello in R
hello <- function(name) paste("hello", name)

# Say hello in Python
def hello(name):
    return("Hello" + " " + name)

-- Say hello in Haskell
hello name = "Hello" ++ " " ++ name

/* Say hello in C */
#include <stdio.h>
int main()
{
    char name[256];
    fgets(name, sizeof(name), stdin);
    printf("Hello %s", name);
    return(0);
}
Alerts

- First level alert
- Second level alert
- Third level alert
- Fourth level alert
- Fifth level alert
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Levels of Structure

- Clean, extensively customizable visual style
- Hyperlinks (http://github.com/izahn/iqss-beamer-theme)
- No weird scaling prosper
  - slides are 96\text{mm} \times 128\text{mm}
  - text is 10-12pt on slide
  - slide itself magnified with Adobe Reader/xpdf/gv to fill screen
- pgf graphics framework easy to use
- include external JPEG/PNG/PDF figures
- output directly to pdf: no PostScript hurdles
- detailed User’s Manual (with good presentation advice, too)
Theorems and Proofs

The proof uses *reductio ad absurdum*.

**Theorem**

There is no largest prime number.

**Proof**

- Suppose $p$ were the largest prime number.
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**Proof**
- Suppose $p$ were the largest prime number.
- Let $q$ be the product of the first $p$ numbers.
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**Theorem**
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**Proof**
- Suppose $p$ were the largest prime number.
- Let $q$ be the product of the first $p$ numbers.
- Then $q + 1$ is not divisible by any of them.
Theorems and Proofs
The proof uses *reductio ad absurdum*.

**Theorem**
There is no largest prime number.

**Proof**
- Suppose \( p \) were the largest prime number.
- Let \( q \) be the product of the first \( p \) numbers.
- Then \( q + 1 \) is not divisible by any of them.
- But \( q + 1 \) is greater than 1, thus divisible by some prime number not in the first \( p \) numbers.
### Normal block

A set consists of elements.

### Alert block

$$2 = 2.$$  

### Example block

The set \{1, 2, 3, 5\} has four elements.
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Backup Slides
Details
Text omitted in main talk.
More details
Even more details