# 550.400: Mathematical Modeling and Consulting

Lecture Notes

Instructor:

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JHU AMS 2012 FALL

Last Complied on September 4, 2012

reliminaries Principles Tools Arguments from Scale Graphical Methods Basic Optimization

### **Outline**

**Preliminaries** 

Principles

**Tools** 

Arguments from Scale

**Graphical Methods** 

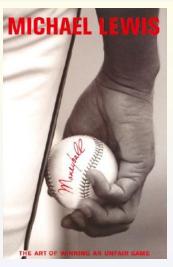
**Basic Optimization** 

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# **Syllabus**

- Grade Policy
- Attendance
- Tentative Schedule
- Blackboard
- Misc.

### What is Mathematical Modeling?



Money Ball

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### What is Mathematical Modeling?

#### NOVA Online | Trillion Dollar Bet

www.pbs.org/wgbh/nova/stockmarket/

Welcome to the companion Web site to "Trillion Dollar Bet," originally broadcast on February 8, 2000. The film tells the fascinating story of the invention of the ...

The Formula that Shook The ... - Transcripts - A Trader's Lexicon - Resources

#### Videos for trillion dollar bet - Report videos



Trillion Dollar Bet 1 -YouTube youtube.com Jan 8, 2009



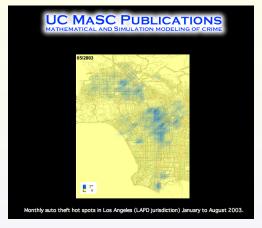
The Trillion Dollar
Bet - YouTube
youtube.com
Sep 15, 2007



The Midas Formula Stockmarket ... youtube.com Aug 23, 2011

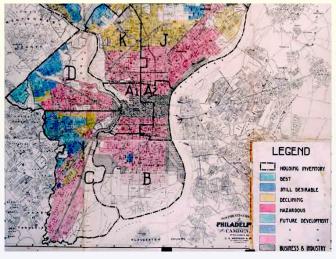
Trillion Dollar Bet

### What is Mathematical Modeling?



LAPD Fighting Crime with Math

### What is Mathematical Modeling?



Insurance Redlining

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### **Example: Insurance Redlining**

### Insurance Redlining

Insurance redlining refers to the practice of refusing to issue insurance to certain types of people or within some geographic area.

#### **FAIR**

The FAIR plan was offered by the city of Chicago as a default policy to homeowner who had been rejected by the voluntary market.

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### **Example: Insurance Redlining**

### **Sponsor**

The U.S. Commission on Civil Rights examined charges by several Chicago community organizations that insurance companies were redlining their neighborhoods.

#### Data

The number of FAIR plan policies written and renewed in Chicago by zip code for the number of months of December 1977 through May 1978.

### **Example: Insurance Redlining**

#### Variables to consider:

```
race Racial composition in percentage of minority,

fire Fire per 100 housing units,

theft Theft per 100 housing units,

age Theft per 1000 population,

involact New FAIR plan policies and renewal per 100 housing units,

income Median family income in thousands of dollars,

side North or South side of Chicago.
```

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### **Example: Insurance Redlining**

#### Frequently Recurring Elements of doing a Project in Industry:

- 1. Work Statement,
- 2. Midterm Presentation,
- 3. Progress Report,
- 4. Final Presentation,
- 5. Final Report.

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### **Programmings in this class**

- R:
  - tikzDevice
  - lm
- ATEX :
  - moderncv
  - beamer
  - report
  - tikz
- Git
  - git gui

## Tutorial: LATEX

LATEX is a computer language for writing a scholarly paper:

	HTML	LAT <sub>E</sub> X
Code		
	<html></html>	\begin{document}
		\end{document}
Complier	Firefox and etc.	pdflatex and etc.
Output	Webpage	PDF file

Table: HTML vs LATEX

# Tutorial: LATEX

- Demo on preparing a resume using LATEX moderncv package:
  - Install LATEX (MikTex in Windows and MacTex in OSX),
  - Download moderncv package files from the course folder,
  - Change file names to reflect you,
  - Edit the tex file,
  - Compile using your favorite LATEX editor,
  - · Look at the resulting PDF file.

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### **Tutorial: Git**

sudo apt-get install git



#### About

Documentation

#### **Downloads**

**GUI Clients** 

Logos

Community

### **GUI Clients**

Git comes with built-in GUI tools for comma third-party tools for users looking for plat

Show GUIs for all OSes

7 Mac GUIs a

An alternative: git gui

### **Tutorial: Git**

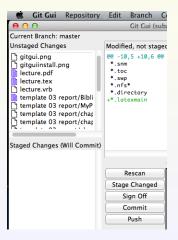
cd ~/
git clone http://cis.jhu.edu/~nhlee/550400.git



An alternative: git gui

### **Tutorial: Git**

```
cd ~/550400.git
git reset --hard HEAD
git pull origin master
```



An alternative: git gui

### **Tutorial: Git**

- Demo I: build a personal Git folder
  - Create some files
  - Stage the files
  - Commit the files
- Demo II: build the course Git folder

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### **Seven Basic Principles**

- 1. Set the context
- 2. Choose effective examples and analogies
- 3. Choose vocabulary to suit your readers
- 4. Decide whether to present #s in text, tables, or figures
- 5. Report and interpret #s in the text
- 6. Specify the direction and size of an association between variables
- 7. For many #s, summarize overall pattern

# **Creating Effective Tables**

## **Example: Cost of Packaging**

### **Example: The Nuclear Mission Arms Race**

### **Example: Maintaining Inventory**