Introduction to Statistics

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What is Statistics

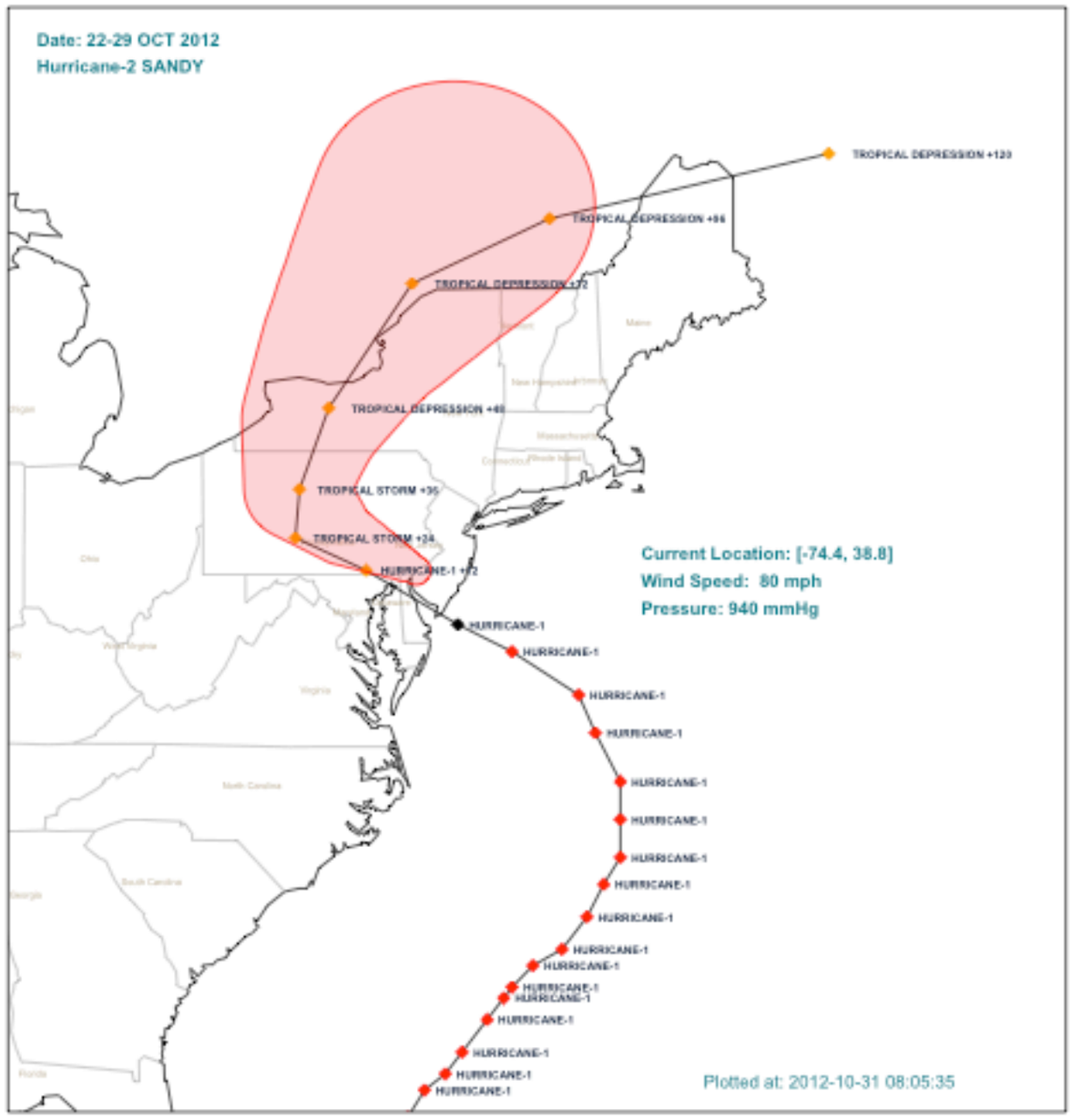
- wiki: Statistics is the study of the collection, organization, analysis, interpretation, and presentation of data.
- Statistics is *everywhere* in our life.

Examples: politics

- General Election: Romney v.s. Obama
- States Map
- Who's going where

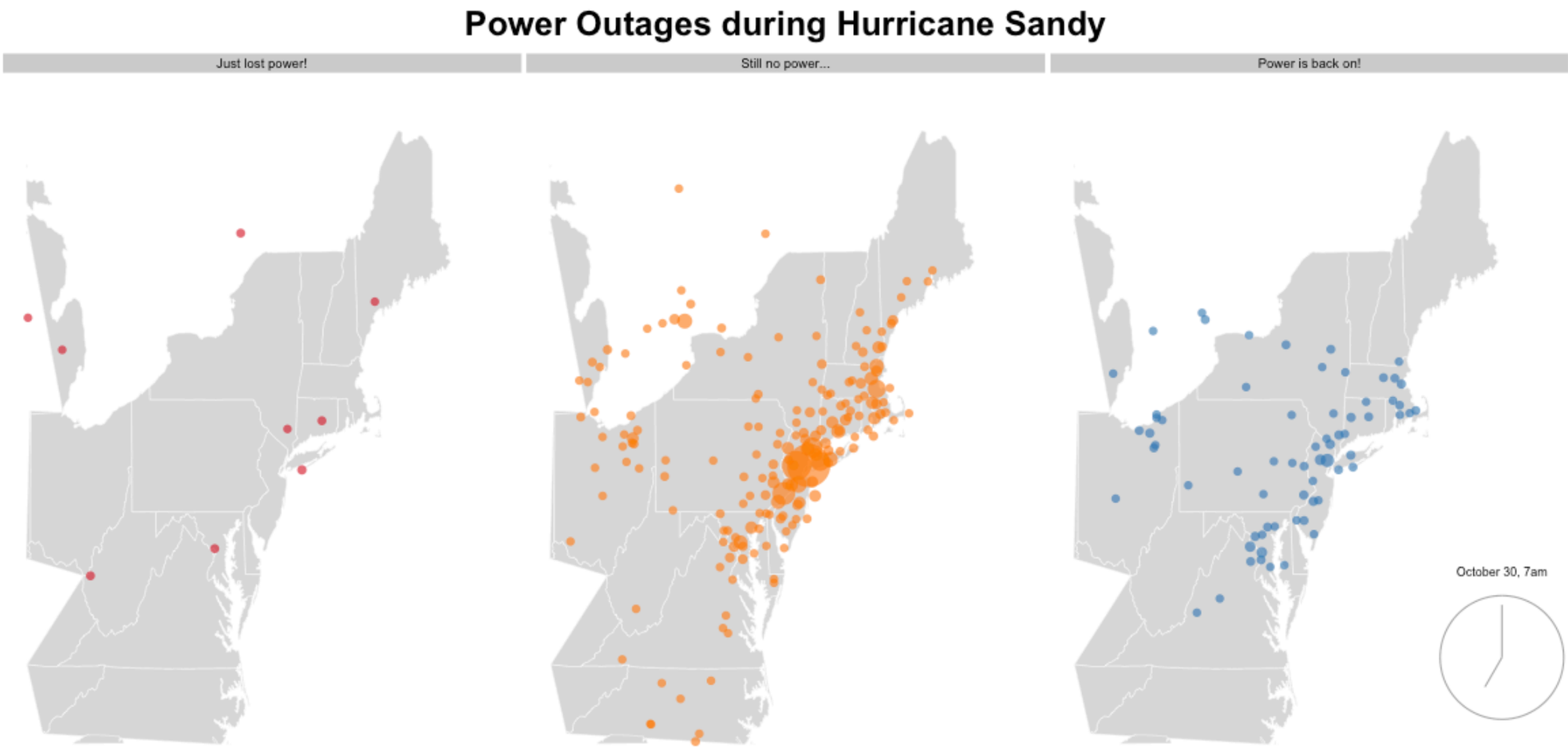
Examples: Watch Sandy

- Sandy Path



Examples: Watch Sandy

- Power Outage



Examples: When did Michael Jackson have his biggest hits ?

June 25, 2009

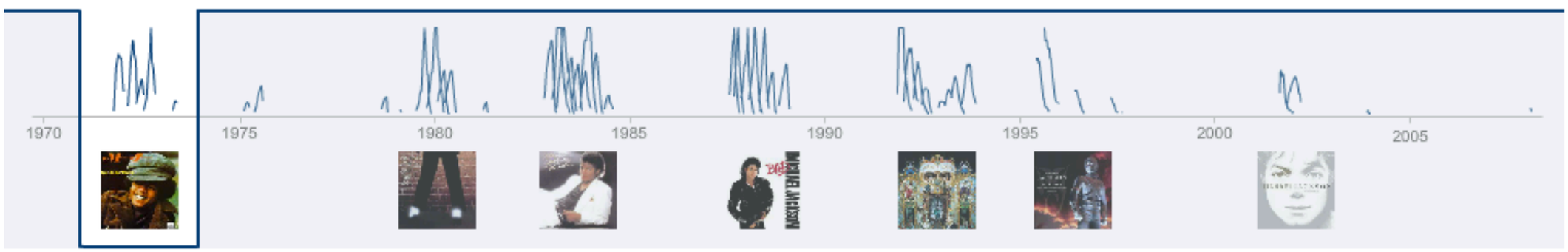
SIGN IN TO E-MAIL | FEEDBACK

Jackson's Billboard Rankings Over Time

A timeline of how Michael Jackson's songs performed on the Billboard Hot 100 chart.

◄ Previous Next ►

Got To Be There 1972



http://www.nytimes.com/interactive/2009/06/25/arts/0625-jackson-graphic.html

Statistics is More Than Just About Data

- Statistics deals with all aspects of data, including planning of data collection.
  - Design of Survey
  - Design of Experiments.

Design of Survey

- How to construct effective surveys.

Here is an example of a double-barreled question:

Bad Question: Double-barreled Question	Good Question
How have teachers and students at your school responded to the new 45-minute lunch period? ( ) Satisfied ( ) Unsatisfied	How have <u>teachers</u> at your school reacted to the new 45-minute lunch period? ( ) Satisfied ( ) Unsatisfied How have <u>students</u> at your school reacted to the new 45-minute lunch period? ( ) Satisfied ( ) Unsatisfied

Example 1 Balanced:

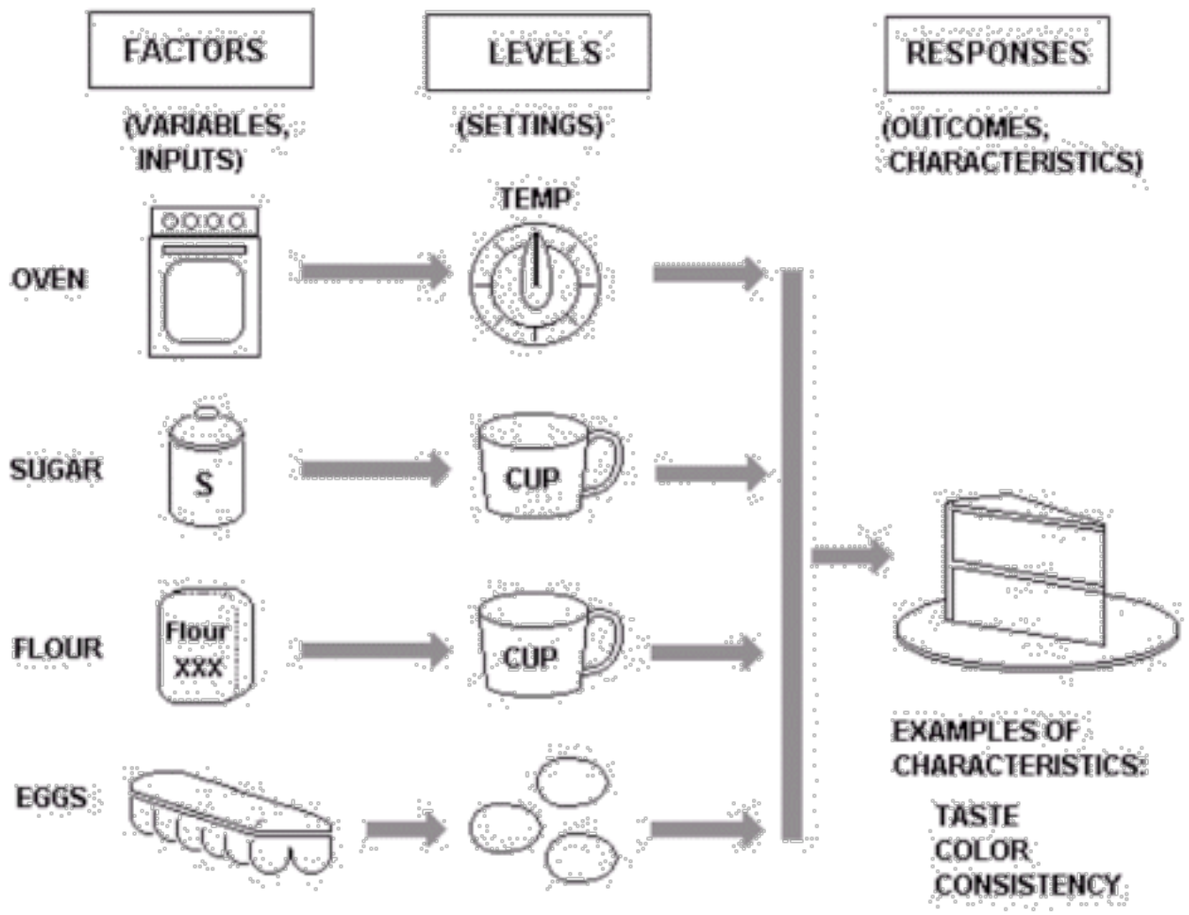
Very Poor	Poor	Average	Good	Excellent
1	2	3	4	5

Example 2 Unbalanced:

Poor	Average	Good	Very Good	Excellent
1	2	3	4	5

Design of Experiments

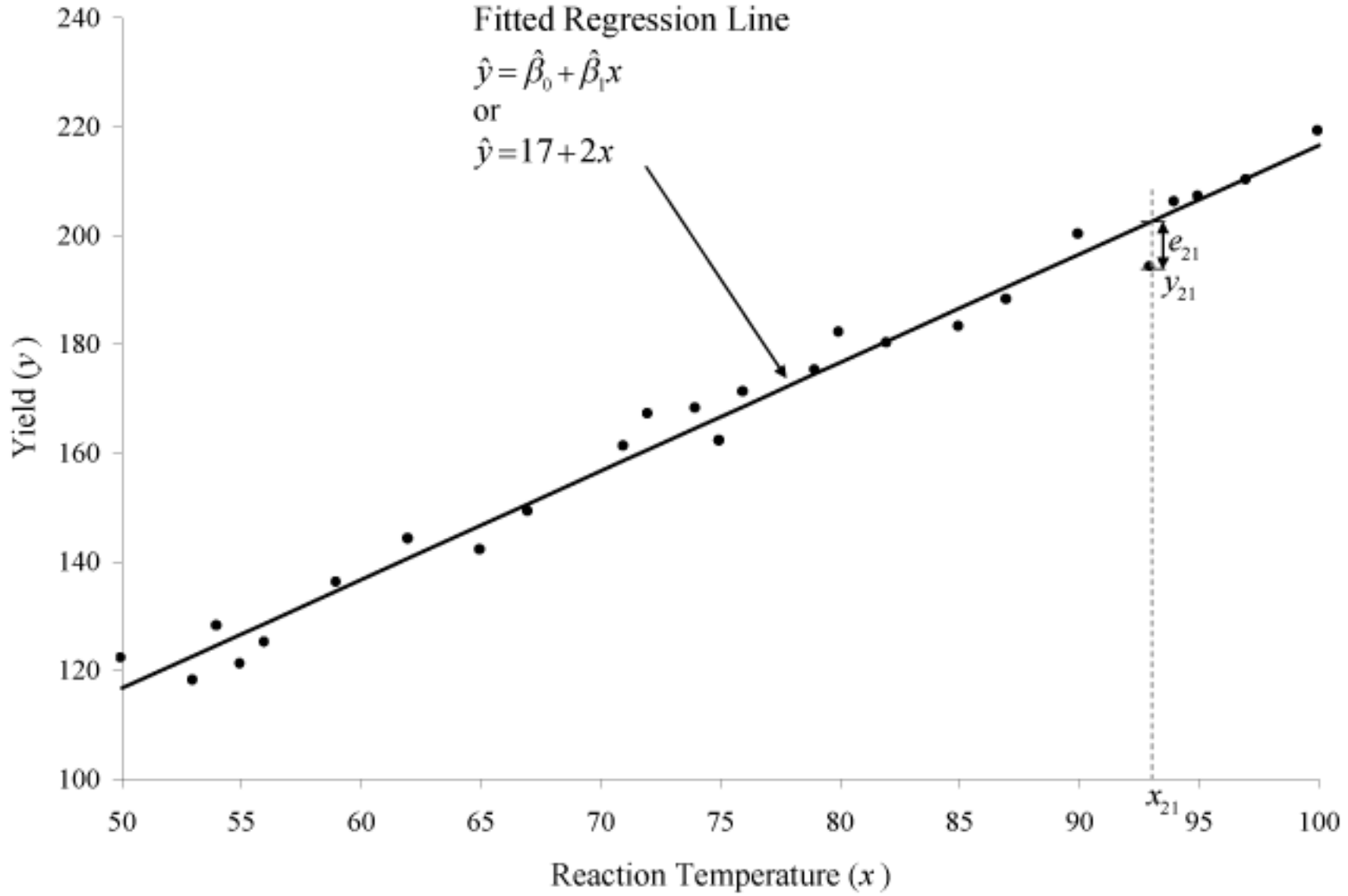
- What is the best recipe?
  - Oven Temperature
  - Sugar
  - Flour
  - Eggs



http://www.moresteam.com/toolbox/design-of-experiments.cfm#purposeExperimentation

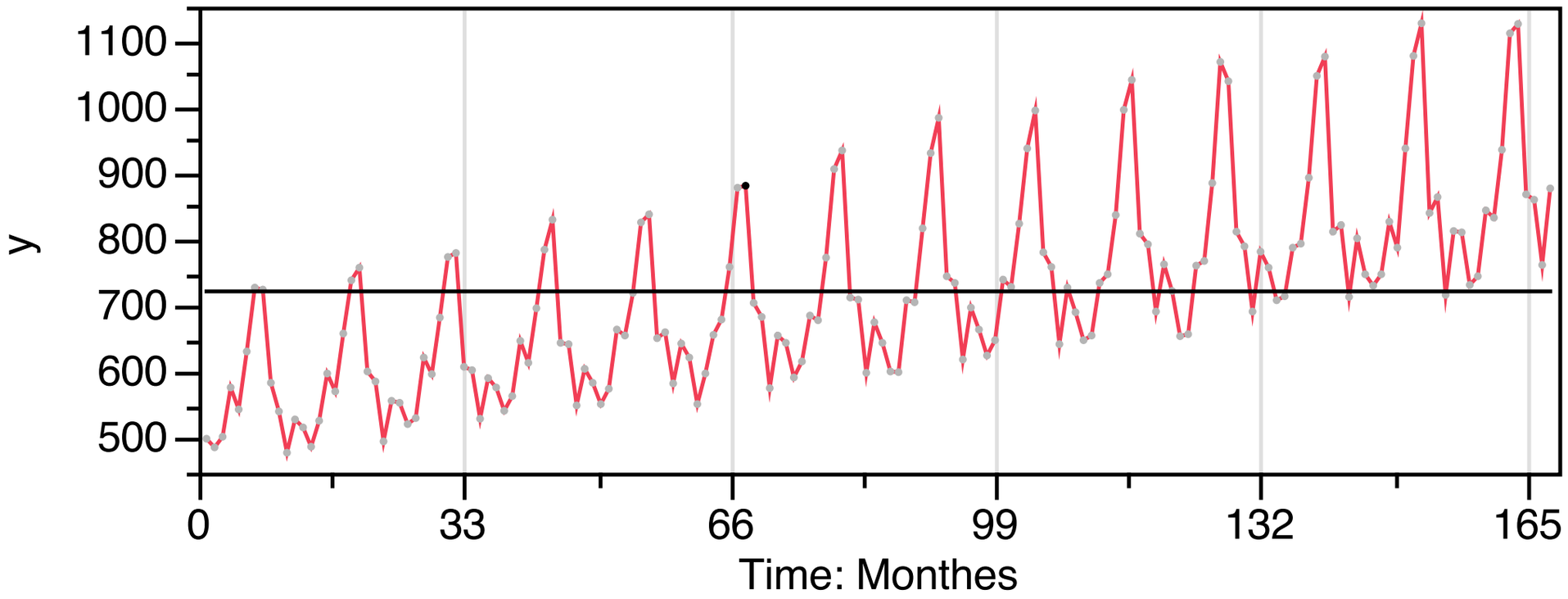
Data Analysis

- There are so many data analysis techniques. Simplest one: linear regression.



Data Analysis

- Time Series Model: y-hotel sales v.s. months



Data Analysis

- Classification

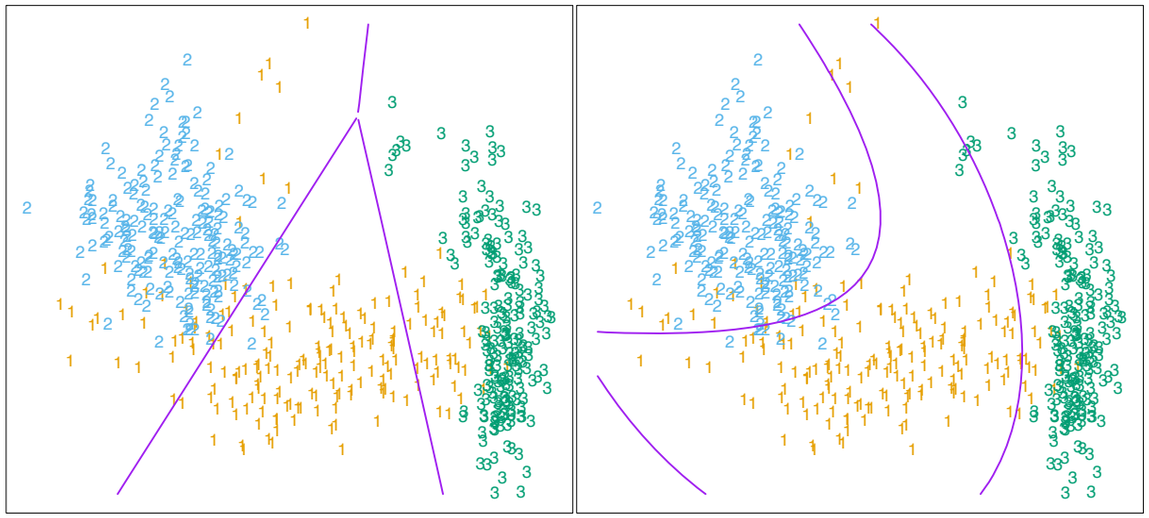


FIGURE 4.1. *The left plot shows some data from three classes, with linear decision boundaries found by linear discriminant analysis. The right plot shows quadratic decision boundaries. These were obtained by finding linear boundaries in the five-dimensional space* $X_1, X_2, X_1X_2, X_1^2, X_2^2$. *Linear inequalities in this space are quadratic inequalities in the original space.*

Data Analysis

- Tree Model

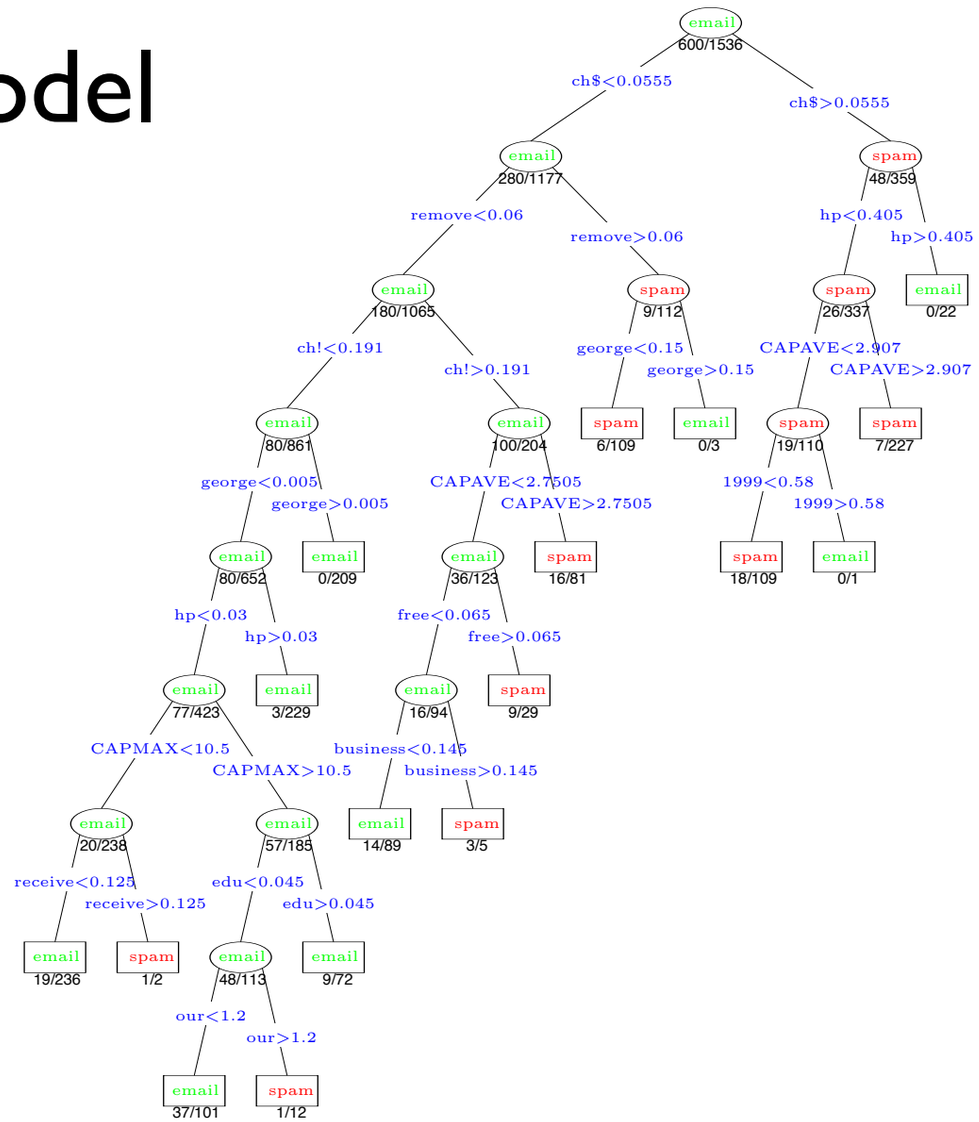
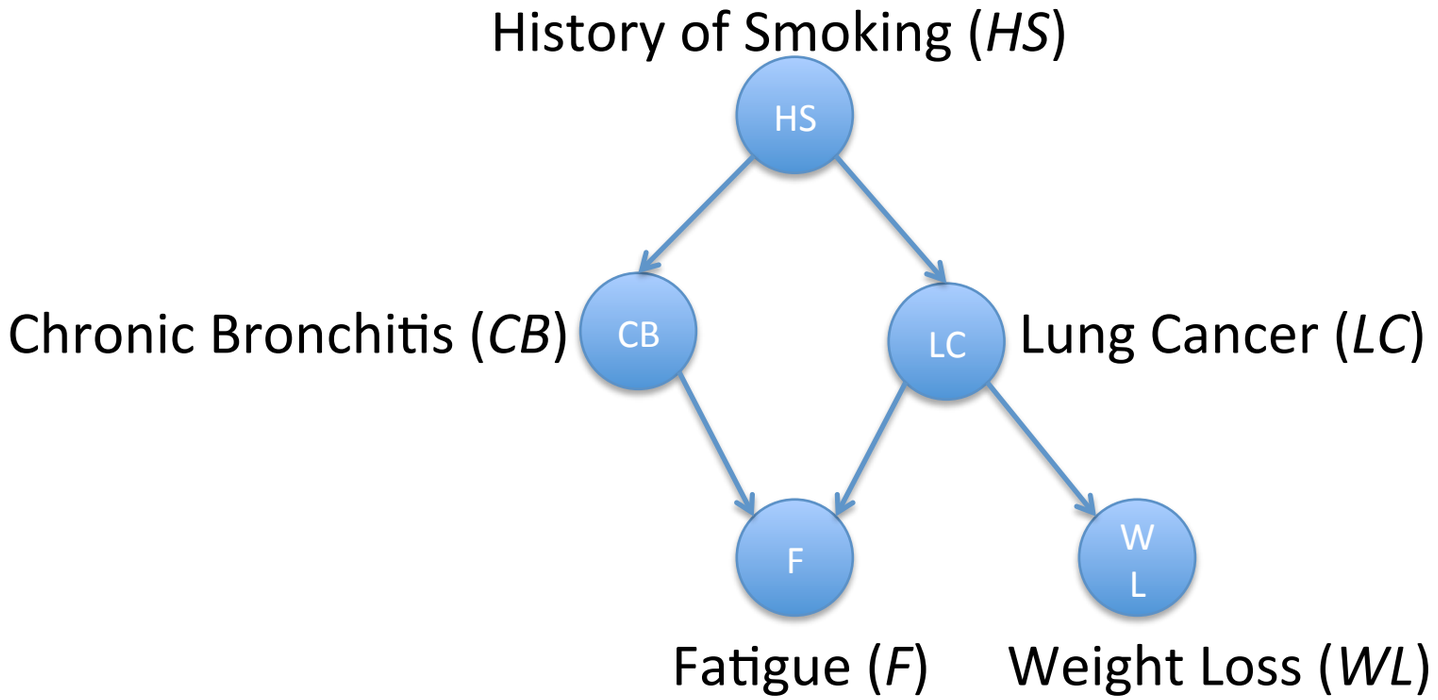


FIGURE 9.5. *The pruned tree for the* `spam` *example. The split variables are shown in blue on the branches, and the classification is shown in every node. The numbers under the terminal nodes indicate misclassification rates on the test data.*

Data Analysis

- Graphical Model



Data Visualization

- How to present data: more than just important!
- What's your Economic Outlook?
- The iPhone Economy
- Degree of Debt
- Facebook IPO

How Statistics can do to you?

- "I keep saying that the sexy job in the next 10 years will be statisticians," said Hal Varian, chief economist at Google. "And I'm not kidding." (http://www.nytimes.com/2009/08/06/technology/06stats.html)

- http://www.youtube.com/watch?v=D4FQsYTbLoI

To begin with

- MATH 474: probability and statistics
- MATH 476: Statistics
- MATH 484: Regression and Forecasting
- MATH 569: Statistical Learning
- ...