Scientific presentation:
clear thinking
made visible

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@PCRcmu
Presentations are boring
Presentations are overwhelming
Volume Regularization for Binary Classification

Number of wins of BoW vs SVM on all 45 pairs of USPS data-set

- BoW-S
- SVM
- TIE
BoW-S outperforms SVM on noisy data

<table>
<thead>
<tr>
<th>Training label noise</th>
<th>BoW-S</th>
<th>SVM</th>
<th>TIE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>20</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>10%</td>
<td>15</td>
<td>15</td>
<td>10</td>
</tr>
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<td>20%</td>
<td>10</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>30%</td>
<td>5</td>
<td>25</td>
<td>20</td>
</tr>
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</table>
BoW-S outperforms SVM on noisy data

# of wins out of 45
Your main message goes in the title

Evidence

“Assertion-evidence approach”
Michael Alley (2006)
Your main message goes in the title

Evidence, with visual emphasis on the crux of your argument

“Assertion-evidence approach”
Michael Alley (2006)
We will cover a 2-step process for comprehensible slide design:

1. **Distill your message** into a complete sentence

2. **Build visual evidence** that emphasizes your message
1. **Distill your message into a complete sentence (identify your duck)**
Survey results

What should this writing course cover?

- Grant Proposals: 13%
- Writing for the public: 16%
- Writing papers: 30%
- All of the above: 41%

n = 60
Students are interested in many topics in writing

What should this writing course cover?

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% respondents n = 60
Sentence titles state the point, not the topic

### Topic

**Survey results**

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</table>

% respondents n = 60

### Main point

**Students are interested in many topics in writing**

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% respondents n = 60

---

**Stars**

**Duck**
Students are interested in many topics in writing

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% respondents
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Most students don’t care about grant proposals

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% respondents: n = 60
Your turn
Average nominal hourly wage

$21 an hour

ALL PRIVATE-SECTOR JOBS

MANUFACTURING

$20.13

$19.29

'90  '95  '00  '05  '10  '13
Manufacturing jobs used to pay better than average, but they have trailed since 2007.

Average nominal hourly wage

- $20.13 for all private-sector jobs
- $19.29 for manufacturing

Graph shows trends from '90 to '13.
Median usual weekly earnings of full-time wage and salary workers age 25 and older by educational attainment, 2014 annual averages

- Total
- Men
- Women
- White
- African American
- Asian
- Hispanic

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Total</th>
<th>Men</th>
<th>Women</th>
<th>White</th>
<th>African American</th>
<th>Asian</th>
<th>Hispanic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than a high school diploma</td>
<td></td>
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<tr>
<td>High school graduates, no college</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Some college or associate degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor's degree only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor's degree and higher</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Advanced degree</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Black workers with advanced degrees make the same as white workers with B.A.’s.
From theory to practice

- Although many white papers discuss inter-network wireless roaming, no services announced

- Strexcorp has built a working network environment with 802.1X wireless access-points and separate Access Controllers combined with an efficient RADIUS server

- The solution has been in testing for the last six months
  - No major problems have occurred
StrexCorp has built the first deployable wireless roaming network

- Although many white papers discuss inter-network wireless roaming, no services announced.

- StrexCorp has built a working network environment with 802.1X wireless access-points and separate Access Controllers combined with an efficient RADIUS server.

- The solution has been in testing for the last six months – No major problems have occurred.
1. Distill your message into a complete sentence.
2. Build visual evidence that **emphasizes** your message

(draw your duck)
StrexCorp has built the first deployable wireless roaming network

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“Speaker notes” slides are not effective for two reasons

They split the audience’s attention

They miss the opportunity to add visual value
You can make good use of the visual medium with two tools

I. Impose hierarchy on your information

II. Visually reinforce the structure of your argument
I. Impose hierarchy on your information
StrexCorp has built the first deployable wireless roaming network

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  - No major problems have occurred
StrexCorp has built the first deployable wireless roaming network based on industry standards 802.1x, efficient RADIUS server. Previously only theoretical. No major problems in 6 months of testing.
StrexCorp has built the first deployable wireless roaming network.

Previously only theoretical.

Based on industry standards 802.1x, efficient RADIUS server.

No major problems in 6 months of testing.
StrexCorp has built the first deployable wireless roaming network based on industry standards. Previously only theoretical, the technology is efficient and has 802.1x standards with a fast RADIUS server. No major problems have occurred in the first 6 months of testing.
### Which would you rather read from the back of a room?

**From theory to practice**

- Although many white papers discuss inter-network wireless roaming, no services announced.
- Strexcorp has built a working network environment with 802.1X wireless access-points and separate Access Controllers combined with an efficient RADIUS server.
- The solution has been in testing for the last six months.
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**StrexCorp has built the first deployable wireless roaming network**

- Previously only theoretical.
- Based on industry standards.
- 802.1x, efficient RADIUS server.
- No major problems in 6 months of testing.
Use 3 layers of emphasis

Background

Data

Emphasis
Use 3 layers of emphasis

Background
Reduce emphasis on things that aren’t your data

• Eliminate it
• Make it small
• Make it a neutral, less saturated color
Use 3 layers of emphasis

**Emphasis**
Increase emphasis on your main message

- Make it large
- Use an accent color
- Increase saturation
- Make it bold
Using 3 layers of emphasis increases comprehension.
Using 3 layers of emphasis increases comprehension.

Graph showing output power vs. frequency, with measured and calculated data points, and a peak at 17.2 GHz with 650 mW output power. The graph also indicates a frequency range of 15 to 20 GHz and a specific measurement at 630 MHz.
Students are interested in many topics in writing

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Grad students are shockingly naïve

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% respondents
n = 60
Your turn
DISTRIBUTION OF THE NUMBER OF SLEEP HOURS FOR ADULTS

- 5 HOURS OR LESS: 28%
- 6 HOURS: 9%
- 7 HOURS: 22%
- 8 HOURS OR MORE: 41%

L’hebdo au féminin 106, p. 3, November 12, 1991
Only 28% of adults sleep the recommended 8 hours.

- 8 HOURS OR MORE: 41%
- 7 HOURS: 28%
- 6 HOURS: 22%
- 5 HOURS OR LESS: 9%

L'hebdo au féminin 106, p. 3, November 12, 1991
Only 28% of adults sleep the recommended 8 hours
Typical Slides vs. Evidence-Assertion

• Slides are often used as speaker notes, with lots of text and extra information the speaker wants to say

• Research shows that this is ineffective: audiences can’t listen and read simultaneously, and it’s hard to see the main point

• The evidence-assertion paradigm places the main message up front and center
  *
  The rest of the slide emphasizes the main message; anything that doesn’t support it is eliminated
  *
  Research shows up to 11% improvement in long-term recall (Garner et al. 2011)
The evidence-assertion approach makes slides more comprehensible

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- Research shows that this is ineffective: audiences can’t listen and read simultaneously, and it’s hard to see the main point.

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  * The rest of the slide emphasizes the main message; anything that doesn’t support it is eliminated.

  * Research shows up to 11% improvement in long-term recall (Garner et al. 2011).
The evidence-assertion approach makes slides more comprehensible.

The main message is front and center.
Typical slides require audiences to tease it out.

The rest of the slide supports the message.
Typical slides include lots of distracting information.

~11% improvement in long-term recall
(Garner et al. 2011)
You can make good use of the visual medium with two tools

I. Impose hierarchy on your information

II. Visually reinforce the structure of your argument
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Do Errors Matter?

• Yes – Imputation, Haplotype reconstruction
• Maybe – GWAS for low frequency SNPs
• No – GS, genetic distance
Whether errors matter depends on the application

- Yes – Imputation, Haplotype reconstruction
- Maybe – GWAS for low frequency SNPs
- No – GS, genetic distance
Whether errors matter depends on the application

- **Errors do matter**
  - Imputation
  - Haplotype reconstruction

- **Errors may matter**
  - GWAS for low frequency SNPs

- **Errors don’t matter**
  - GS
  - Genetic distance
Your turn
“Higher calorie intake has improved nutrition and health.”


- “Merely producing more food does not ensure food security or improved nutrition.” (Herforth (2012) World Bank)

- “Agriculture interventions do not always contribute to positive nutritional outcomes.” (FAO 2012)
Views have changed on whether calorie intake improves nutrition

1996

“Higher calorie intake has improved nutrition and health.”

CGIAR Annual Report 1995-96

2012

“Merely producing more food does not ensure food security or improved nutrition.”

Herforth World Bank 2012

“Agroecology interventions do not always contribute to positive nutritional outcomes.”

FAO 2012
Expectation of Marker Distribution

Humans:
- 40% PAV
- 23% non-polymorphic
- 20% too repetitive
- 17% multi-allelic

Maize:
- 50% PAV
- 29% multi-allelic
- 11% too repetitive
- 10% non-polymorphic
Maize genome has more informative markers than human genome.

For humans:
- PAV (informative): 40%
- Too repetitive: 20%
- Non-polymorphic: 23%
- Multi-allelic (informative): 17%

For maize:
- PAV (informative): 50%
- Too repetitive: 11%
- Non-polymorphic: 10%
- Multi-allelic (informative): 29%
Maize genome has more informative markers than human genome.

<table>
<thead>
<tr>
<th></th>
<th>PAV</th>
<th>multi-allelic</th>
<th>too repetitive</th>
<th>non-polymorphic</th>
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Informative markers
You now know a 2-step process for comprehensible slide design

1. **Distill your message** into a complete sentence

2. Build visual evidence that **emphasizes** your message
   
   I. **Impose hierarchy** on your information
   
   II. Visually **reinforce the structure** of your argument
You now know a 2-step process for comprehensible slide design

1. **Distill your message** into a complete sentence

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- **Volume Regularization for Binary Classification**
  - Key elements: BoW, SVM, TIE
  - Number of wins of BoW vs SVM on all 45 pairs of USPS data set

- **BoW-S outperforms SVM on noisy data**
  - Number of wins vs Training Label Error

- **BoW-S outperforms SVM on noisy data**
  - Graph showing # of wins vs Training Label Error
“Good design is clear thinking made visible.”

Edward Tufte
These great works shaped our thinking

Our website, Public Communication for Researchers
http://www.cmu.edu/student-org/pcr/resources/design-resources.html

Adobe Color, a resource for choosing color schemes:
https://kuler.adobe.com/

Evidence-assertion paradigm: http://writing.engr.psu.edu/assertion_evidence.html

Dumont, Jean-luc (2005) Trees, Maps, and Theorems


Duarte, Nancy (2010) Resonate


Tufte, Edward (1990) Envisioning information
Scientific presentation: clear thinking made visible
Match your color scheme to your data
Qualitative
Equally distributed hues imply categories
Qualitative
Equally distributed hues imply categories
Accent
One contrasting hue stands alone
Sequential
Only change saturation = continuous variable
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Only change saturation = continuous variable
Divergent
Polar colors imply movement from center
Divergent
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Color schemes have meaning

**Qualitative**
Equally distributed hues imply categories

**Accent**
One contrasting hue stands alone

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Only change saturation = continuous variable

**Divergent**
Polar colors imply movement from center