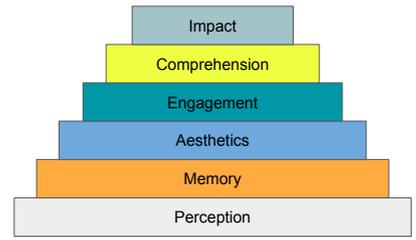# Slide 1

Beyond Memorability: Visualization Recognition and Recall

Borkin, M., Bylinskii, Z., Kim, N.W., Bainbridge C.M., Yeh, C.S., Borkin, D., Pfister, H., & Oliva, A.
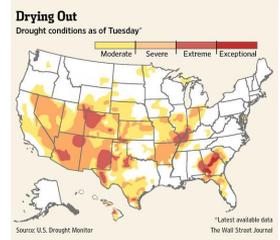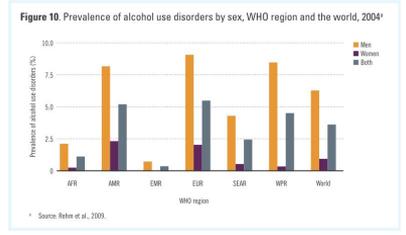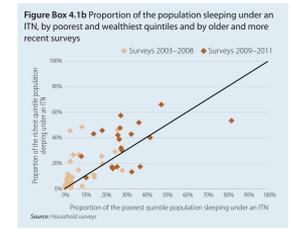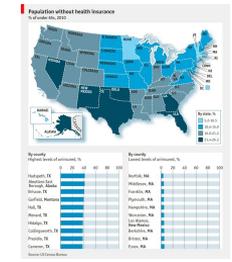IEEE Transactions on Visualization and Computer Graphics, 2015

Presented by Julieta Martinez

Slide 2

What makes an image memorable?

What makes a face memorable?

What makes a vis memorable?

vs.   vs.   vs.

Slide 3

| Impact |
| Comprehension |
| Engagement |
| Aesthetics |
| Memory |
| Perception |

Slide 4

| Memory |
| Perception |

Slide 5

What makes a visualization memorable?

Slide 6

Let's play a game

If you see a repeated visualization, clap

Seriously, get ready to clap

Slide 7

Population without health insurance

Slide 8

Figure Box 4.1b Proportion of the population sleeping under an ITN, by poorest and wealthiest quintiles and by older and more recent surveys

Source: Household surveys

Slide 9

Checking Out | Sales at grocers have been mixed and their stocks have soared

Slide 10

Figure 10. Prevalence of alcohol use disorders by sex, WHO region and the world, 2004ª

Source: Rehn et al., 2009.

Slide 11

Drying Out
Drought conditions as of Tuesday¹

Moderate   Severe   Extreme   Exceptional

Source: U.S. Drought Monitor
¹Latest available data
The Wall Street Journal

Slide 12

Only one third of countries estimate that hygiene promotion programmes are scaled up in primary schools (Figure 7.3).

FIGURE 7.3 Are hygiene promotion programmes implemented in primary schools?

Source: 2011 GLAAS country survey (66 country respondents)

Slide 13

Checking Out | Sales at grocers have been mixed and their stocks have soared

Slide 14

HOW WOULD YOU LIKE YOUR GRAPHIC DESIGN?
(YOU MAY PICK TWO)

Slide 15

THE PART-TIME BARISTA

Slide 16

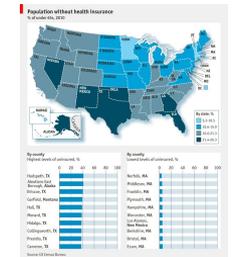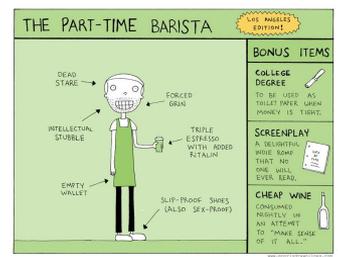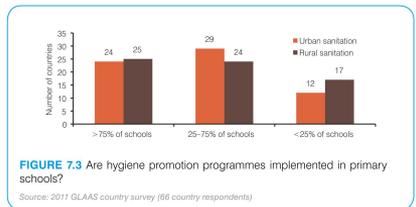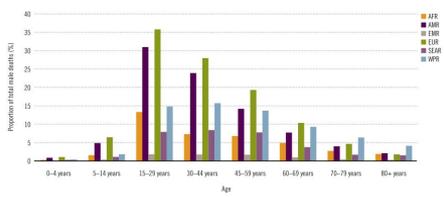
Population without health insurance

Slide 17:
Figure 16. Proportion of alcohol-attributable male deaths (%) of all male deaths by age group and WHO region, 2004

Proportion of total male deaths (%)

Age: 0–4 years, 5–14 years, 15–29 years, 30–44 years, 45–59 years, 60–69 years, 70–79 years, 80+ years

Legend: AFR, AMR, EMR, EUR, SEAR, WPR

Slide 18:
That's it. Thanks!

Slide 19:
memory check · attention check · likely to be a false positive
HOW WOULD YOU LIKE YOUR SHOPPING TODAY? · PAST/TIME/QUESTION

Slide 20:
Data

Slide 22:
WSJ · The Economist · NP · visual.ly · nature
Government · News · Infographics · Science

Slide 23:
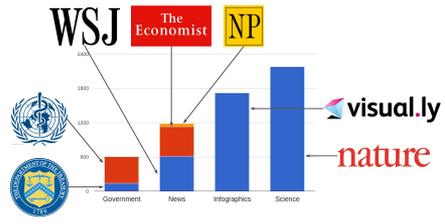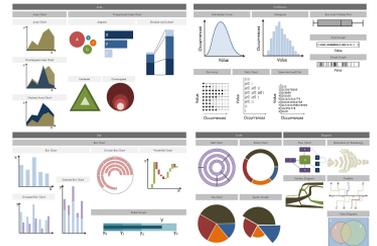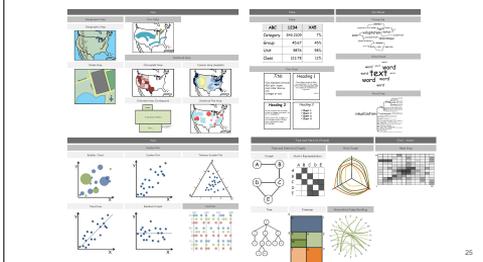"These particular web sites were chosen because each contained a large number of static visualizations that could be automatically scraped without requiring a large manual clean-up effort."
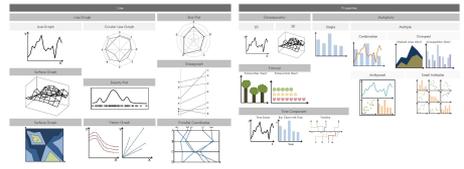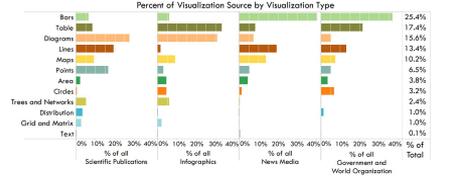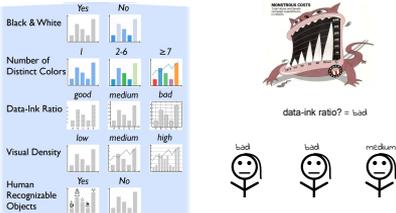
Slide 25:

Slide 26:

Slide 27:
Percent of Visualization Source by Visualization Type

Type	% of all Scientific Publications	% of all Infographics	% of all News Media	% of all Government and World Organization	% of Total
Bars					25.4%
Table					17.4%
Diagrams					15.6%
Lines					13.4%
Maps					10.2%
Points					6.5%
Area					3.8%
Circles					3.2%
Trees and Networks					2.4%
Distribution					1.0%
Grid and Matrix					1.0%
Text					0.1%

"The annotations were done by ten Harvard University undergraduates who had completed the Harvard introductory visualization course"

Slide 28:
Black & White: Yes / No
Number of Distinct Colors: 1 / 2–6 / ≥ 7
Data-Ink Ratio: good / medium / bad
Visual Density: low / medium / high
Human Recognizable Objects: Yes / No
MONSTROUS COSTS
data-ink ratio? = bad
bad / bad / medium

Slide 29:
Results

Slide 30:
A visualization is memorable if…

Slide 31:
Human Recognizable Objects: Yes / No
… it has a pictogram
(M=1.93 vs. M=1.14)
Thus, all results are presented with and without pictograms

Slide 32:
… it is colorful
Number of Distinct Colors: 1 / 2–6 / ≥ 7
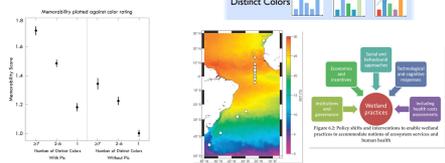
Slide 33
… it has *low* data-ink ratio

Memorability plotted against data-ink ratio

Data-Ink Ratio
good · medium · bad

Slide 34
… it is visually dense

Memorability plotted against visual density ranking

Visual Density
low · medium · high
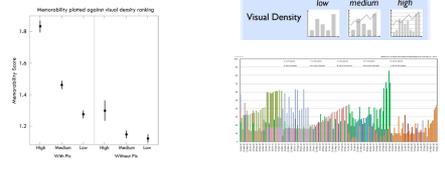
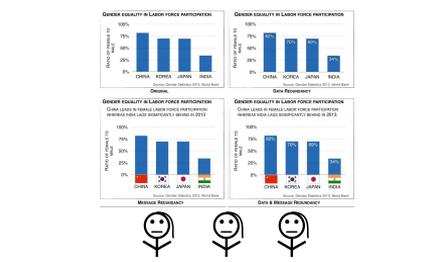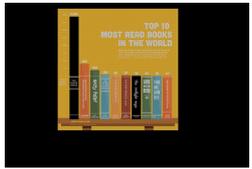## Slide 35
Some questions remain

- What visual elements do people use to
  - store into memory?
  - retrieve from memory?
- Does giving more time make a difference?
- What do people remember?

- Same data
- More labels
- Less participants (33)
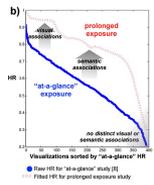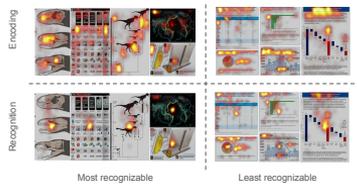- More time
- + Eye tracking
- + Word descriptions

Slide 36

Slide 37

Slide 38
Step 1: Encode

Slide 39
Step 2: Recognize

Slide 40
Step 3: recall

Slide 41
Does giving more time make a difference?

Slide 42
What do people look at?

Encoding

Recognition

Most recognizable · Least recognizable

Slide 43
Evaluating recall

"Percent of people born on each day of the year. X-axis is month Y-axis is day. Most popular birthdays are in late summer and early fall."

"this was a chart of most common birthdays. the darker the color the more common the birthday. september was the darkest month"

- Quality was rated from 0 to 3
  - 0 → incorrect or incoherent
  - 3 → visualization topic, what data or information is presented in the visualization, the main message of the visualization, and one additional specific detail about the visualization

Slide 44
Titles help!

Titles improve recall quality

With title · Without title

So does redundancy!

With redundancy · Without redundancy
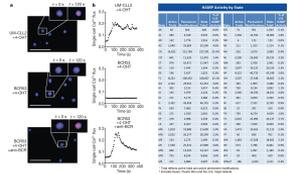

Slide 45
Strengths and weaknesses

Slide 46
Strengths

- First dataset of its kind
- High quality, transparent research. All the data is available online.
- Props for collecting verbal descriptions of visualizations → machine learning (:

a group of people sitting around a table with laptops
logprob: -5.95

a man flying a kite in a field
logprob: -6.13

Slide 47
Weaknesses

- Data is very skewed
- Who would think tables are memorable?
- Infographics != infovis
- Maybe scientific visualizations are inherently harder to understand

Slide 48
Beyond Memorability: Visualization Recognition and Recall

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