

Perceptual Metric Development

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Problem

Visualization creators need a way
to *easily ascertain* a chart's
perceptual effectiveness

Prior Work

Redesign existing charts —————
([ReVision](#))

Analyze cognitive load in graph perception —————
([Measuring effectiveness of graph visualizations: A cognitive load perspective](#))

How We're Different

Evaluate *effectiveness* of existing graphs
Visualize effectiveness easily

Analyze cognitive load *and* other graph visual design principles

*Help designers **learn, improve, and iterate**

Metric Component Goals

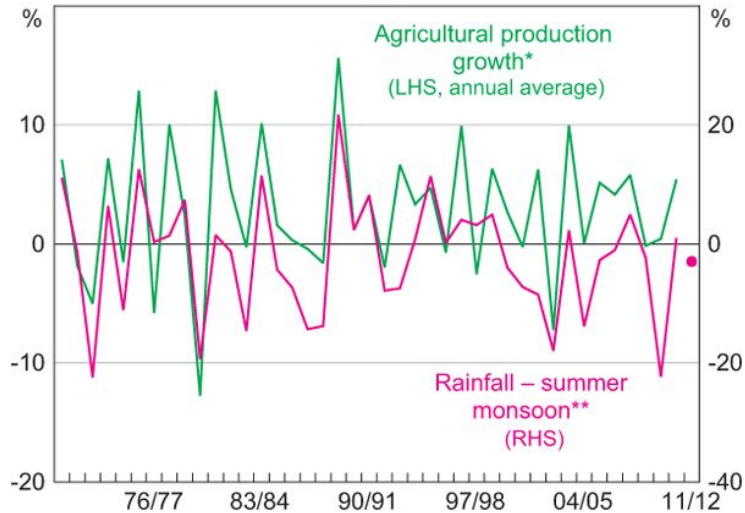
- Easily Automated Analysis
- Backed by Perceptual Effectiveness

Mapping Perceptual Tasks to Design Principles

Cognitive Load	→	Data Ink
Length, Area, Volume	→	Data Dimensions
Hue Processing	→	Hue/Category Mapping
Shading/Saturation	→	Non-Data Less Saturated
Positioning	→	Scaling (Proportionality?)

User Testing

India – Rainfall and Agricultural Production

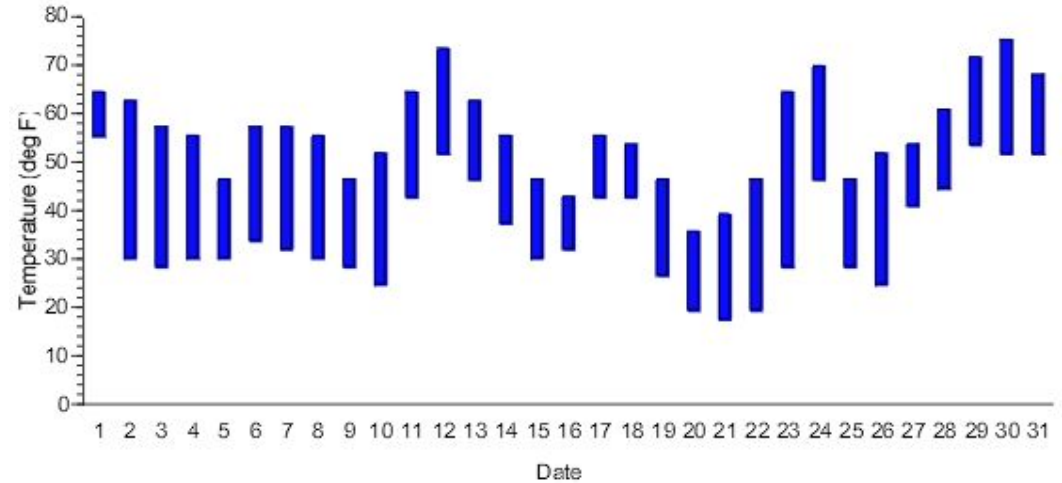


* Indian Government estimate for 2010/11

** Percentage deviation from long-run average; Indian Meteorological Department's first forecast for 2011/12 monsoon

Sources: CEIC; Indian Meteorological Department; RBA

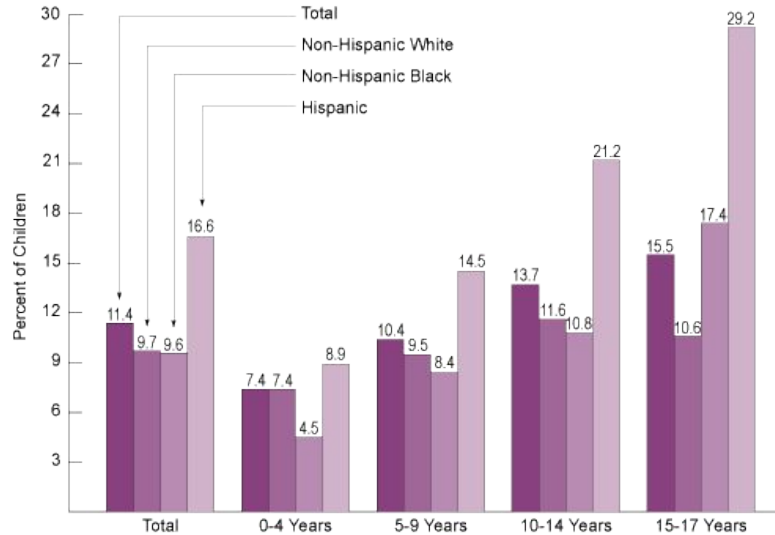
Min/Max Air Temperature
Raleigh-Durham Airport
December 1996



User Testing (cont.)

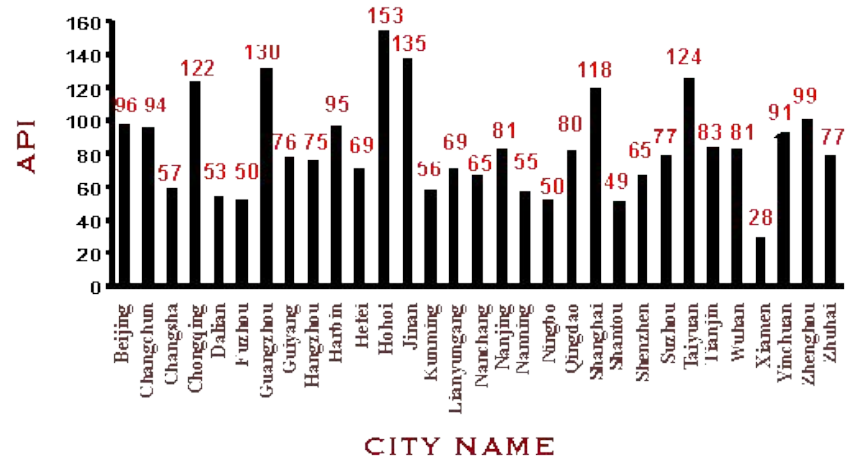
Children Reported to Have Not Seen a Physician or Other Health Care Professional* in the Past 12 Months, by Age and Race/Ethnicity, 2007

Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Health Interview Survey



*Does not include overnight hospitalizations, emergency department visits, home health care, and dental care.

Air Pollution Index (API) in Major Chinese Cities (Aug, 28-Sept, 3)



0-50 : Excellent
 51-100 : Good
 101-200 : Slight pollution
 201-300 : Medium pollution
 301-500 : Heavy pollution

Source: China Environmental Monitoring Center

None of our algorithms were great:

- Overweighting some
- Weighting was always arbitrary
- Same concepts expressed, but ~10 point difference
- Qualitative Contributors are important

Pivoting

We will now just score **individual metrics** and continue user testing on such metrics.

Code

Javascript (D3)

SVG Processing (SVG Tags)

Git

Interface Storyboard

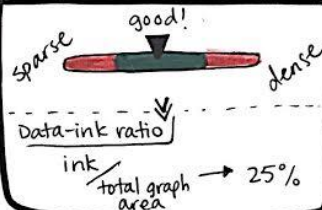


DESIGN-GUIDED GRAPH EVALUATION

- cognitive load
- dimensional measures
- color usage
- proportionality

maybe remove this info?

COGNITIVE LOAD



DIMENSIONAL MEASURES

Length
(lines)

an effective encoding for quantities and measurable variables

PROPORTIONALITY

how to measure/
display this?

COLOR USAGE

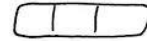
Category Mapping



palette used
4 variables

GOOD

Shading/Saturation



Data
(saturated)



non-data

Our Questions

- Overall aggregate ranking score - yes or no?
- Suggestions on how to measure proportionality?
- General feedback on metric component selection