

Advanced Data Visualization

CS 6965

Fall 2019

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University of Utah



Lecture 09

Personal Visualization

Physical Visualization



PV

International Pie Day!

Behind the Doodle: 30th anniversary of Pi Day!



MORE VIDEOS

1:50 / 1:52

YouTube

<https://youtu.be/flV213YW0-8>

Project 4

- Project 4 is going to be different from all previous projects
- It combines Personal Visualization with Physical Visualization
- Before describing the project, we need to go over an overview of personal visualization and physical visualization

What is Physical Visualization?

Physical Visualization is Data Physicalization



Physical Visualization

- Data physicalization aims to help people explore, understand, and communicate data using computer-supported physical data representations.
- We call these representations physicalizations, analogously to visualizations – their purely visual counterpart.

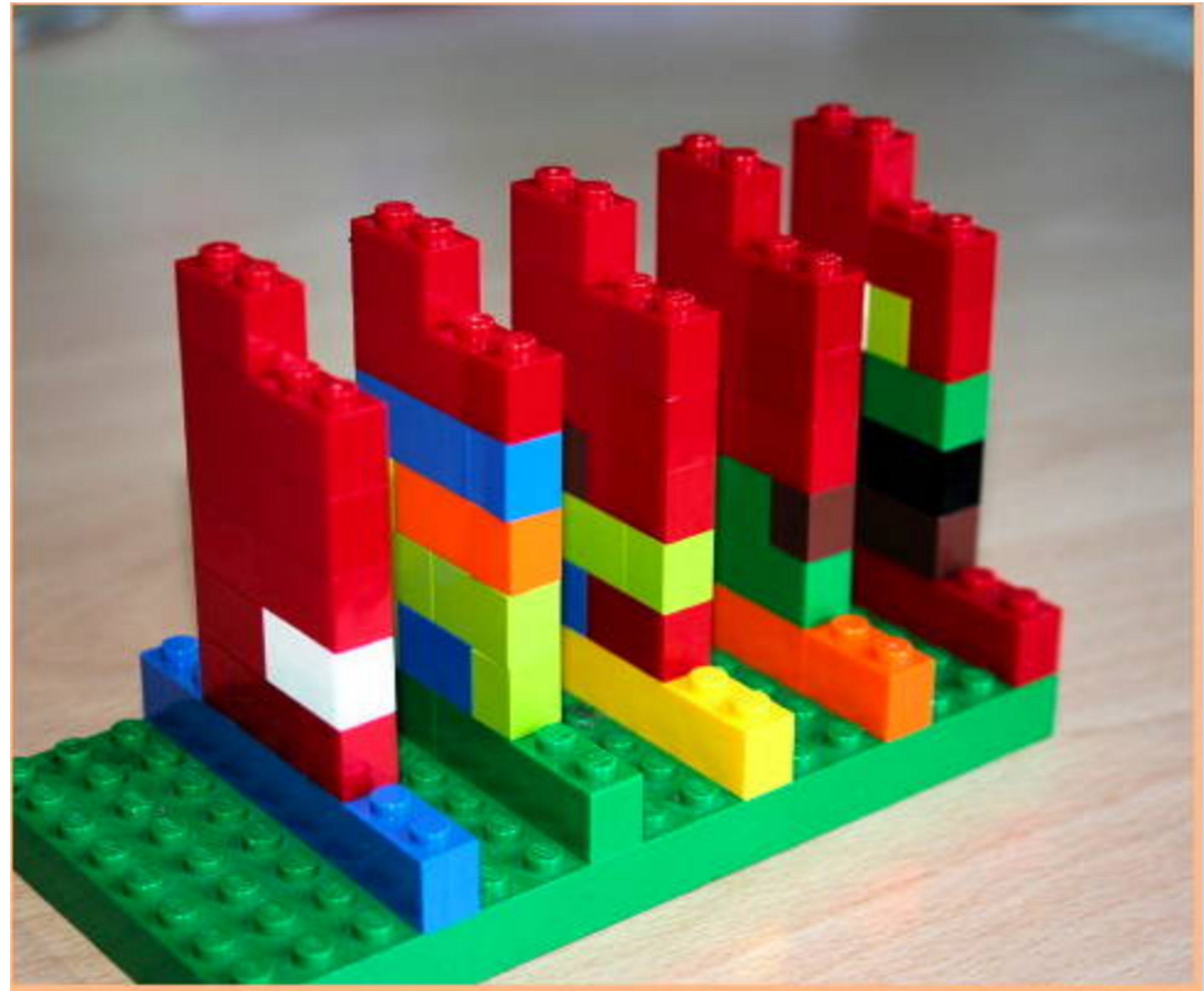
“

“...asked people to create, update and explain their own information visualizations using simple materials such as tangible building blocks. We learned that all participants, most of whom had no experience in visualization, were readily able to create and talk about their own visualizations...”

http://edutechwiki.unige.ch/en/Physical_visualization

Huron, Samuel; Yvonne Jansen, Sheelagh Carpendale (2014)

Token-based constructive visualization



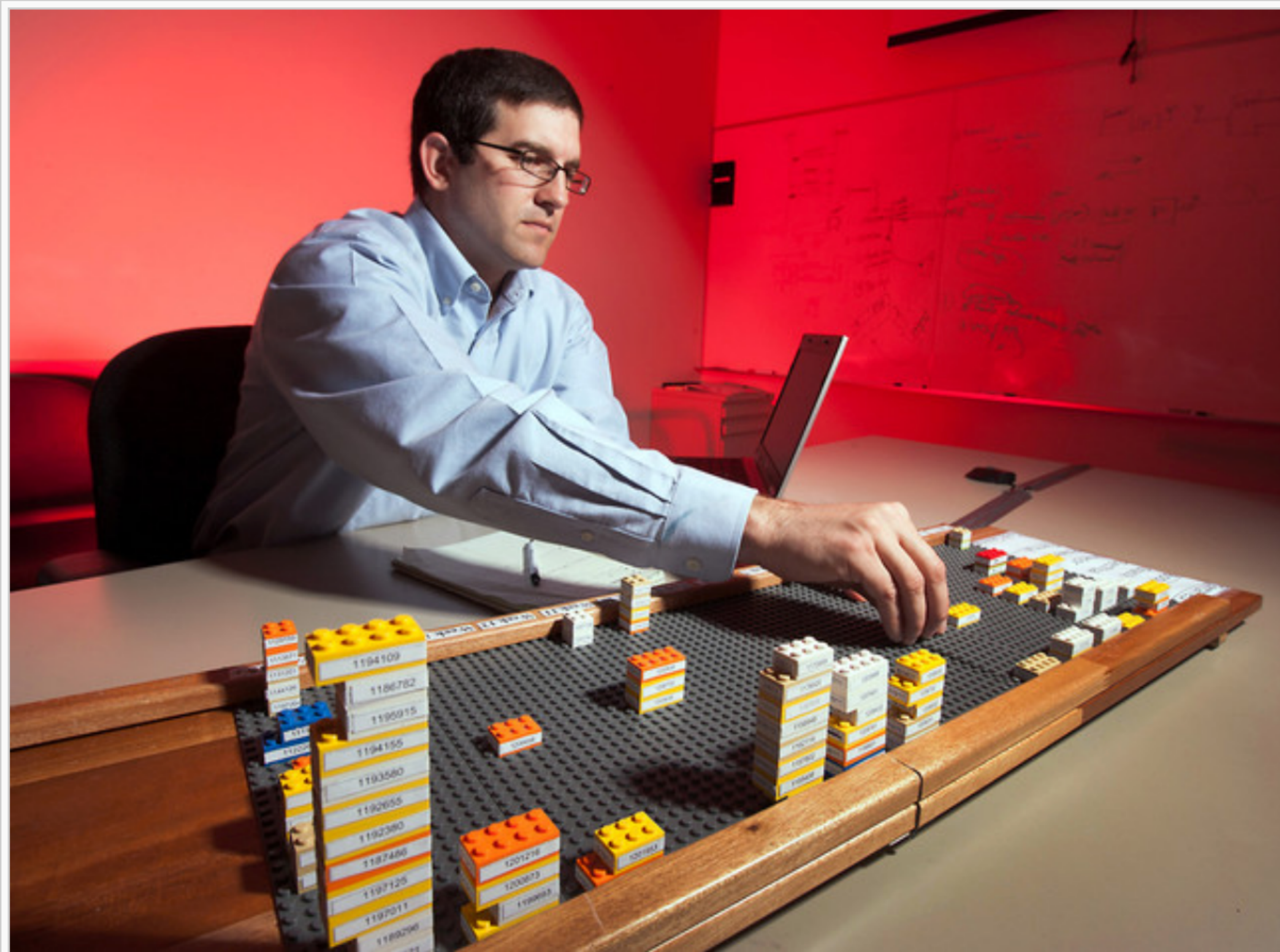
LEGO based time tracking (source [source](#))

Token Based Constructive Vis

Need:

- A set of basic units or tokens, which can be mapped to data
- A token grammar, which declares how the attributes of the tokens can signify data
- An environment in which the tokens can be placed
- An assembly model, which describes the constraints and freedom with which the tokens can be assembled

The process of developing the constructed visualization starts from initializing the environment in which the construction will take place. Then the data units are mapped to the tokens and the tokens visual attributes are assigned meaning according to the data. These tokens are then assembled in the environment. Changes in data can subsequently be expressed by manipulating the data token.



Production problem tracking, source [How GM Is Saving Cash Using Legos As A Data Viz Tool](#)



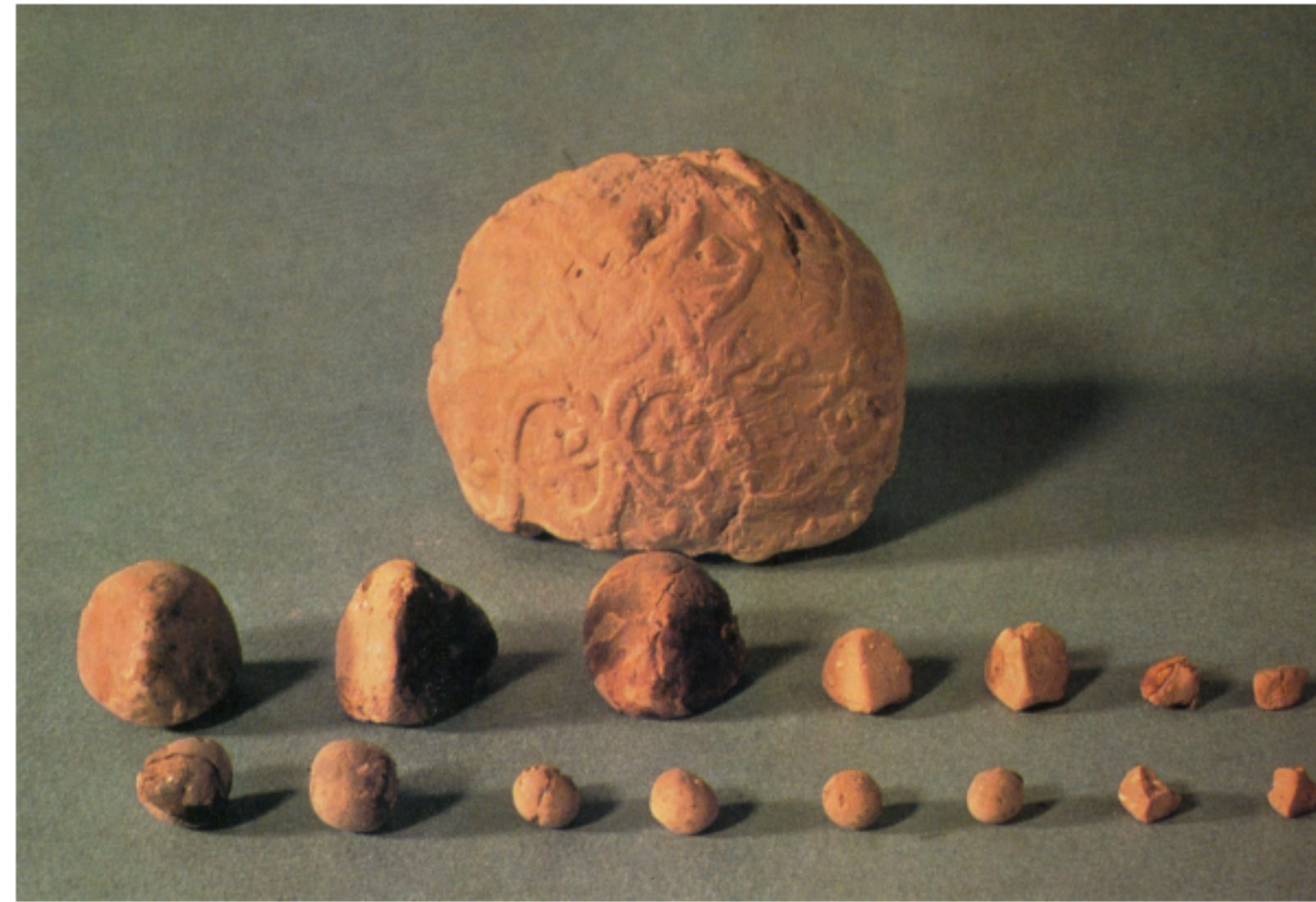
“WellStar is using the boards to track on-time starts at the doctor’s office, and even manage its physician-payee relationships--which has led to a series of fixes projected to save the company \$1 million.” (dito)

http://edutechwiki.unige.ch/en/Physical_visualization#Data_as_wood_sculptures

Examples of Physical Visualization

<http://dataphys.org/list/>

5500 BC: Mesopotamian Clay Tokens



- The earliest data visualization were likely physical
- Arranging stones: the tokens could be ordered in special columns according to types of merchandise, entries and expenditures
- “Patterning, the presentation of data in a particular configuration, was developed to highlight special items (Luria 1976. 20). ”

2007 Wable: Web Behavior

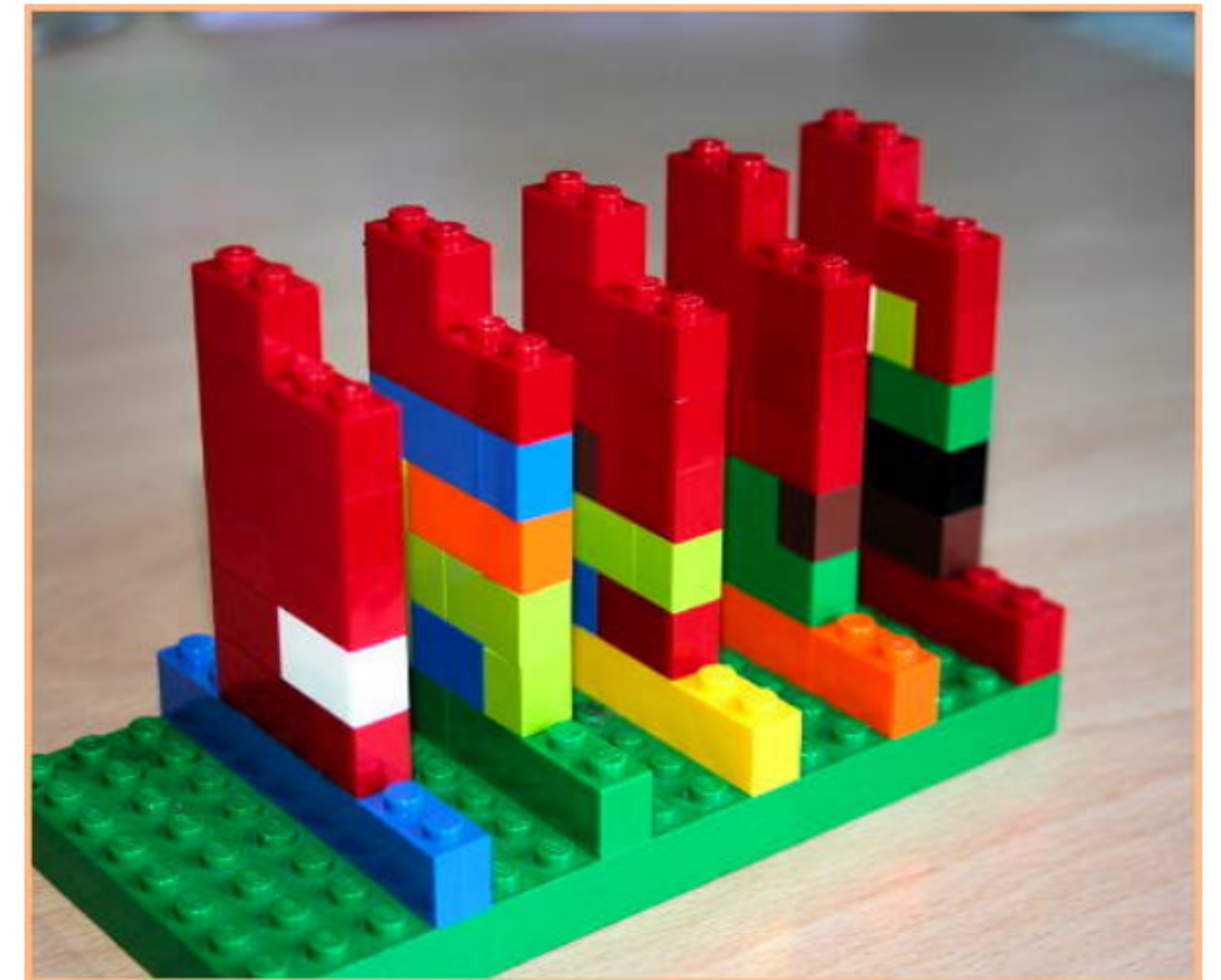


<https://youtu.be/e6G5YIICVRg>

<http://dataphys.org/list/wable-visualize-web-behavior-as-a-physical-bar-chart/>

2008: Activity Logging with LEGO

- A visualization and logging method for personal work activity.
- Every tower is a day of the week.
- A layer is one working hour, horizontally subdivided in four quarters of an hour.
- Different colors are different projects.
- The constant availability of this interface makes it easier to log personal activity data on-the-fly, before entering it in a PIM software (an automatic method involving computer vision is being considered).



Physical visualization for personalized visualization

2015 Canadian Federal Election Explained



https://www.youtube.com/watch?time_continue=7&v=laUPeXZiPEg

<http://dataphys.org/list/canadian-federal-election-first-past-the-post-vs-proportion-representation/>

2015 – Dan Gilbert's TV Ads



<https://www.youtube.com/watch?v=rV7c9LHdE8Y>

<http://dataphys.org/list/dan-gilberts-tv-ads/>

2014: Making Mocktails + Heart Beats



<https://www.youtube.com/watch?v=RRKR0dekPxo>

<https://www.youtube.com/watch?v=hIdMvfV16tA>

2015 – Multivariate Beer



<http://dataphys.org/list/multivariate-beer/>

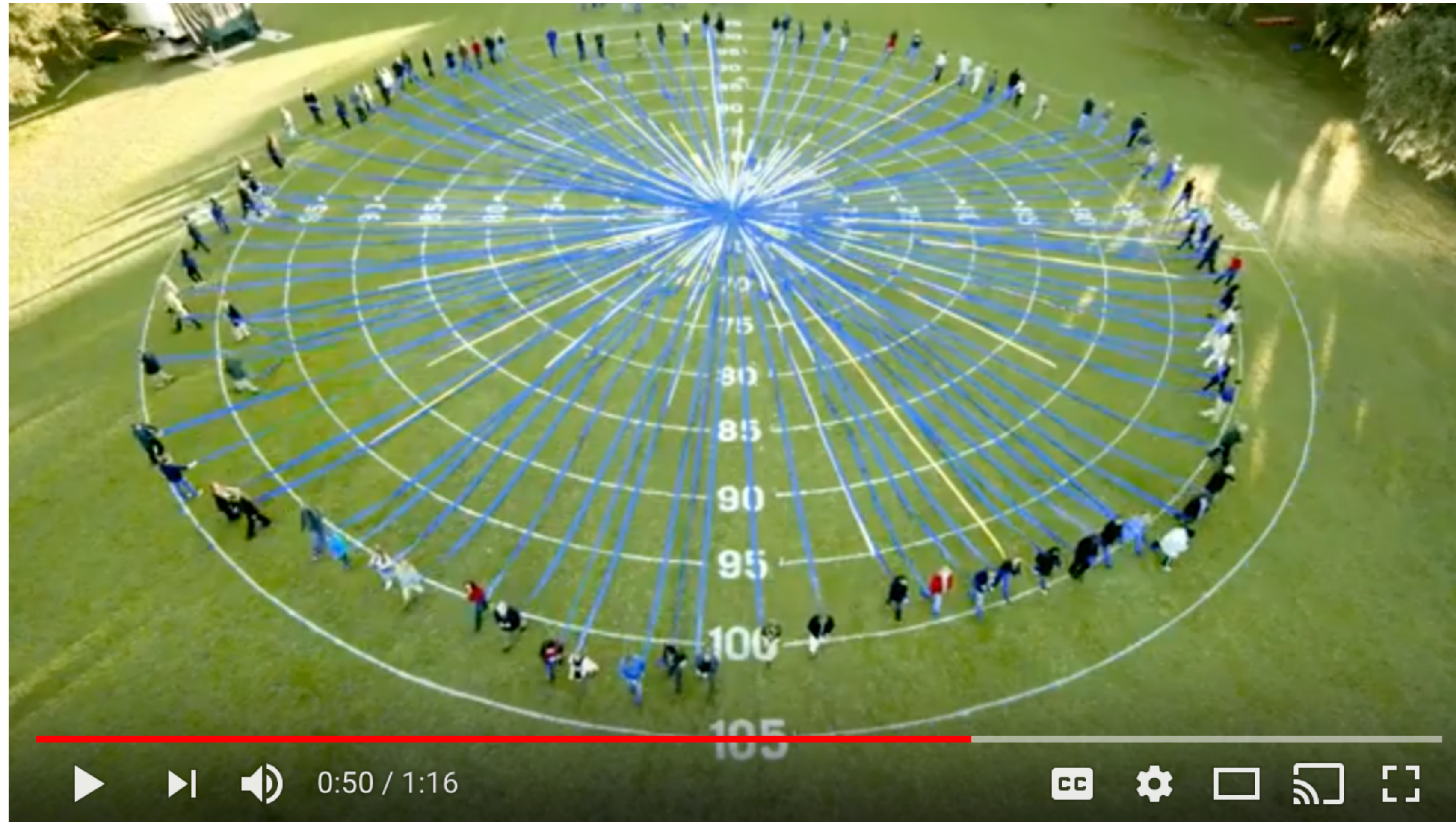
- 4 different types of beer based on county demographics.
- Population density: total amount of hops
- Race percentages: type of hops used

2017 – Green Berlin

- Tangible data visualization of green areas and water in Berlin.
- A living map showing parks and forests in Berlin. The green areas on the wooden map are laser cut, with moss growing through the holes.



2015 – The Prudential Ribbons Experiment 60



<https://www.youtube.com/watch?v=Ol-nEn0c0w4>

2017 –The Prudential Walkways

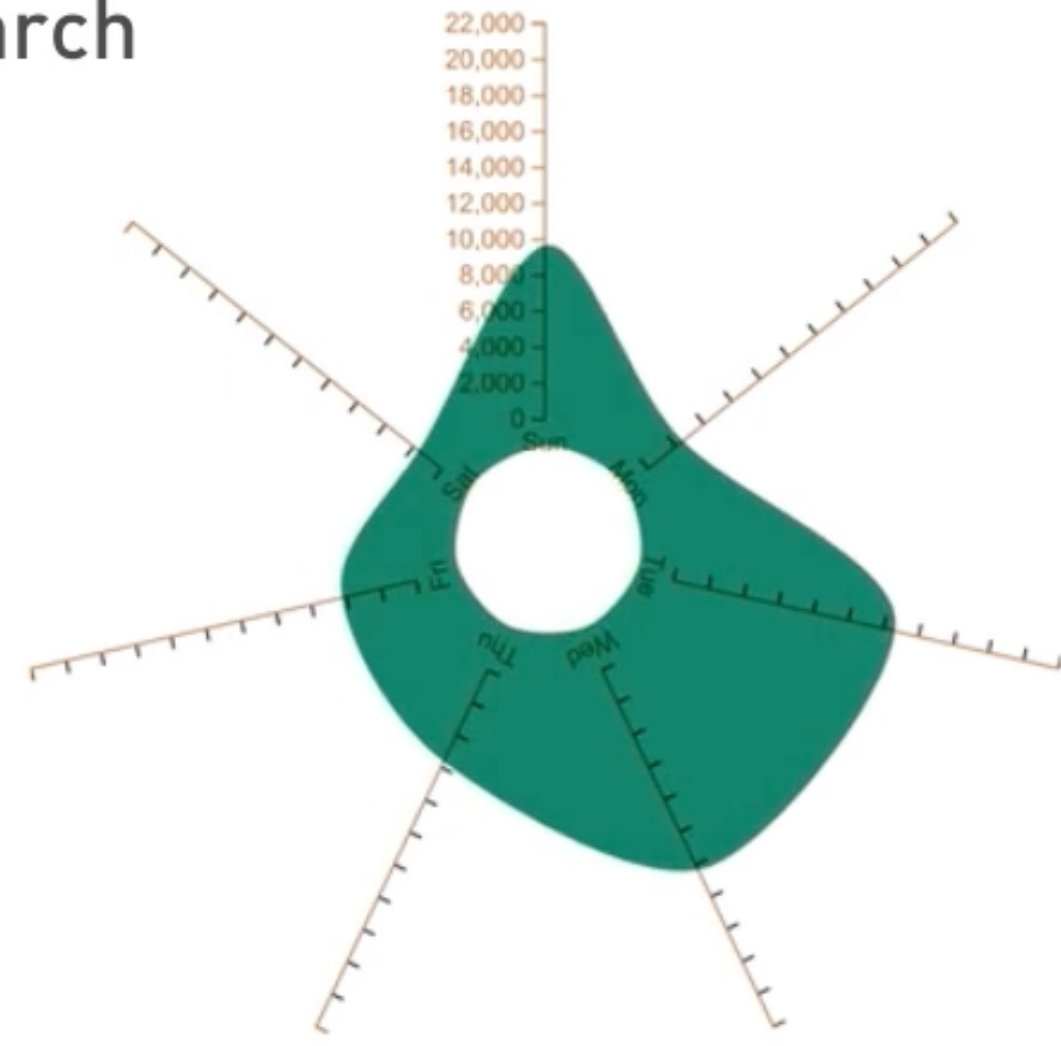


Physical visualization for personalized visualization

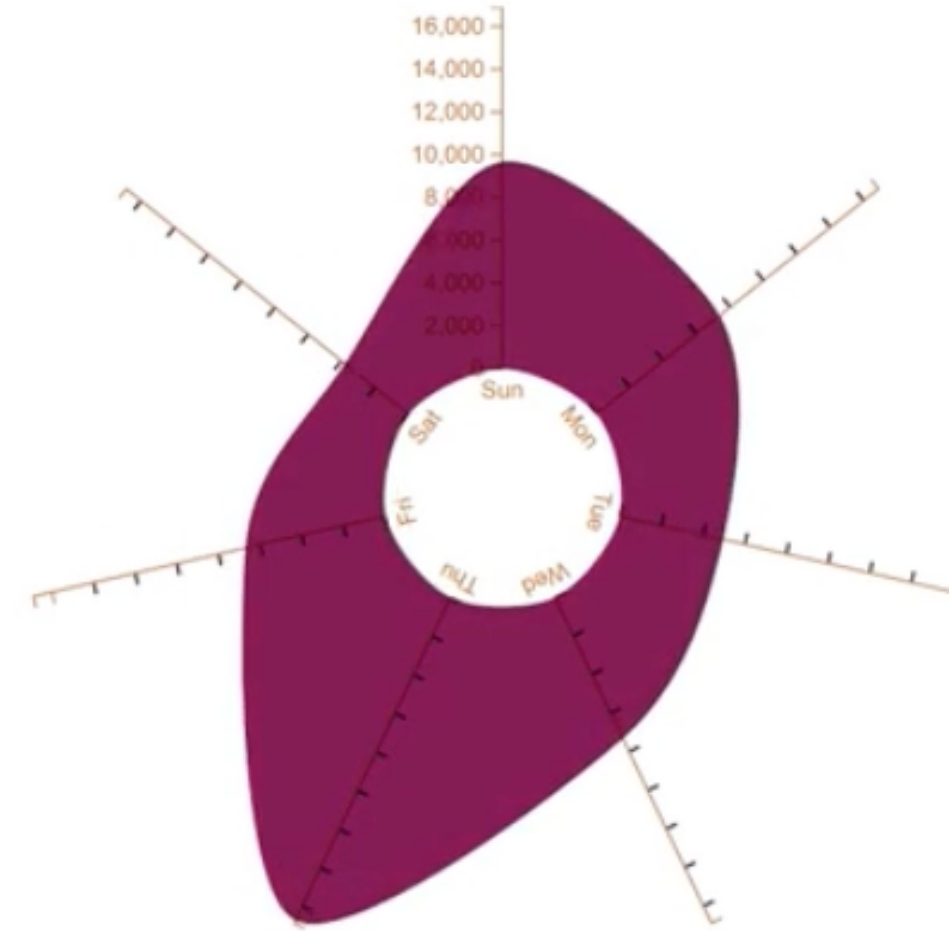
<https://www.youtube.com/watch?v=Ol-nEn0c0w4>

2017: Wearable Self: your data jewelry

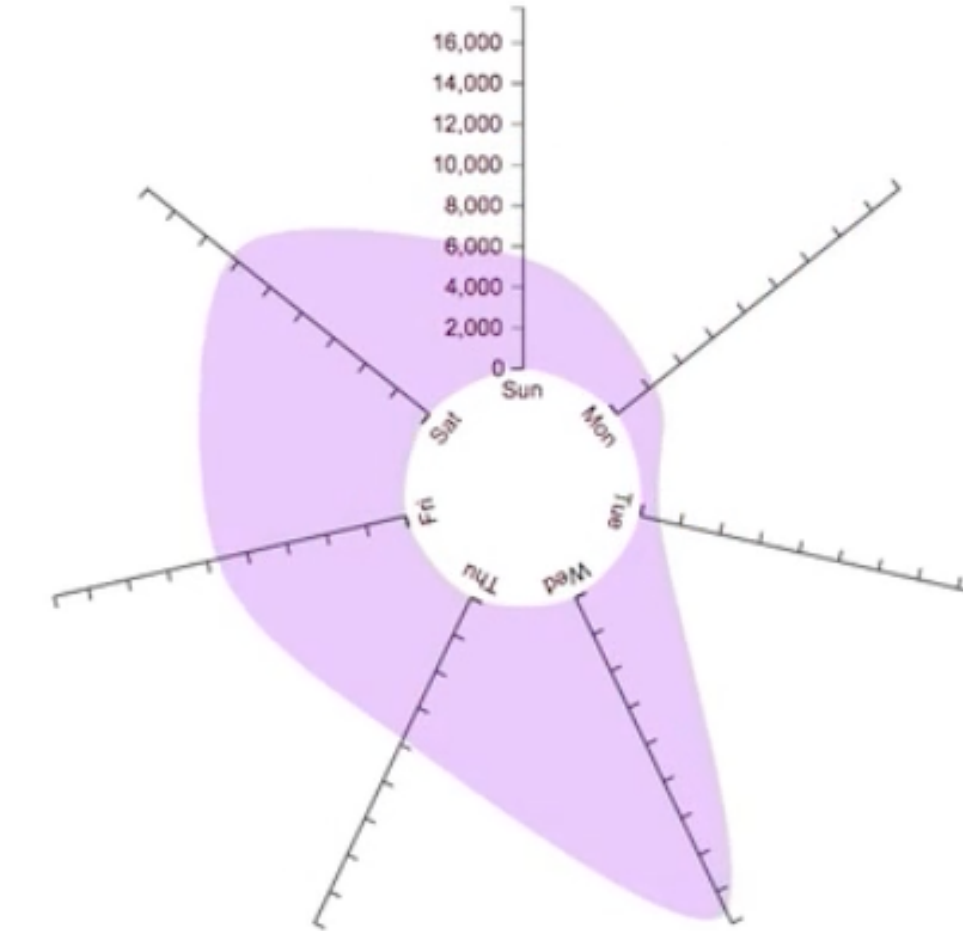
March



April

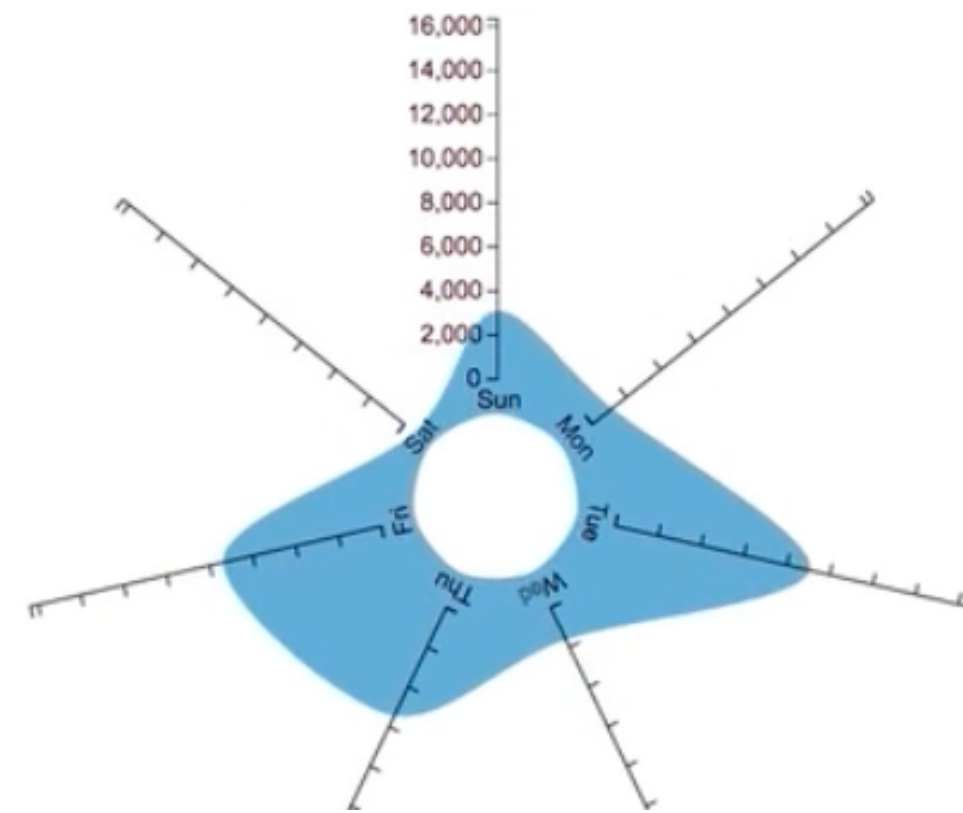


May

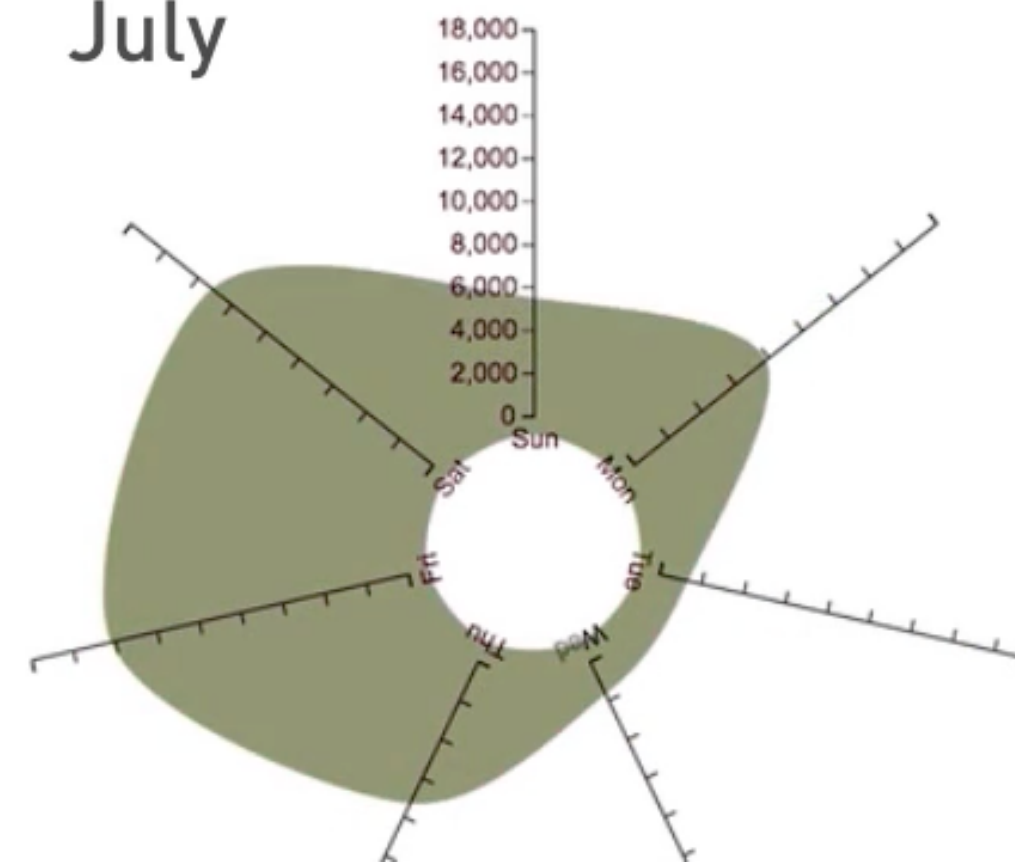


Week 3

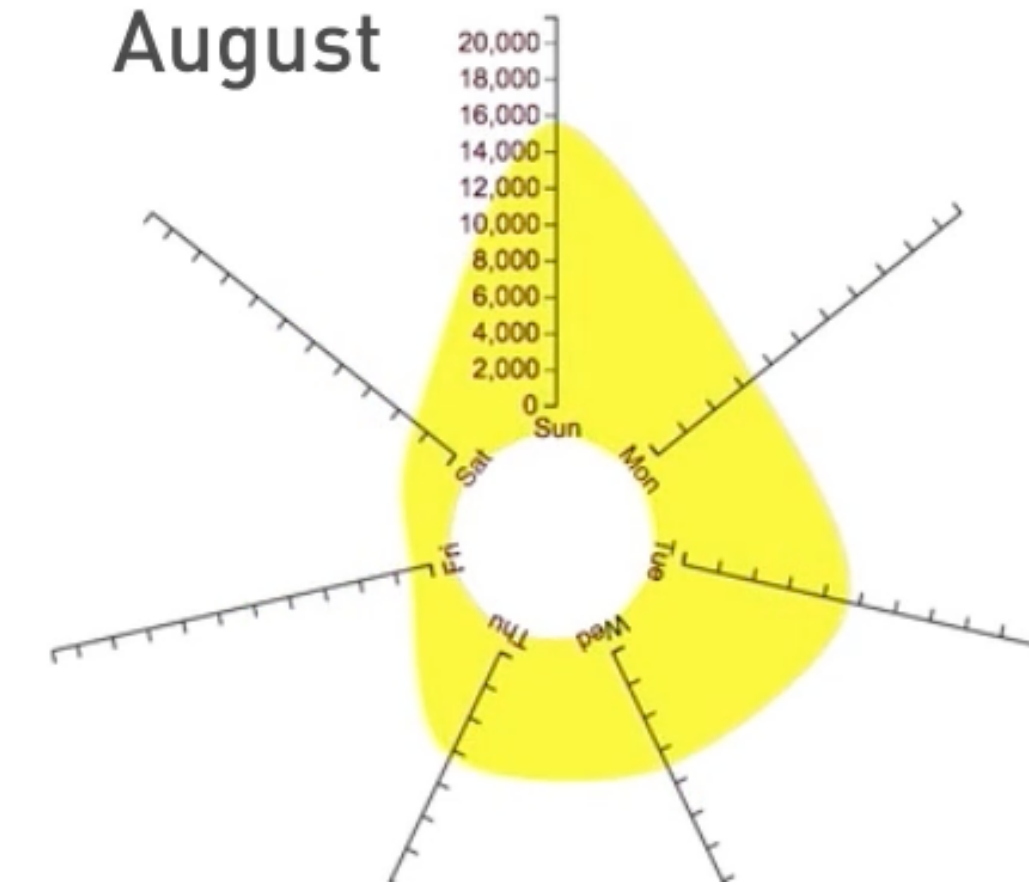
June



July



August



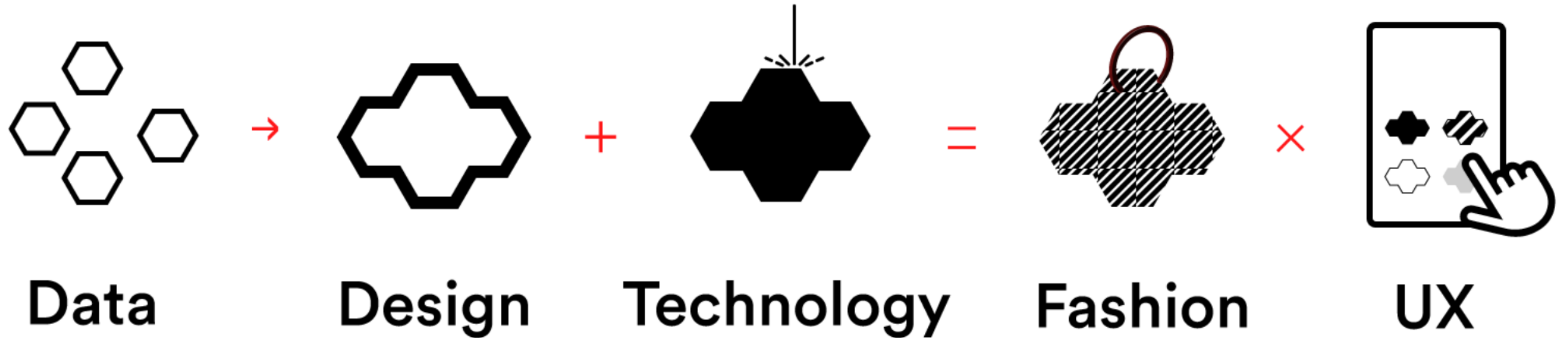
<https://vimeo.com/208423272>

<https://vimeo.com/217167660>

<https://jennykang.me/wearable-self-2/>

Physical visualization for personalized visualization meet art <http://dataphys.org/list/wearable-self/>

2017 – Wearable Self



User experience

Physical visualization and art for personalized visualization

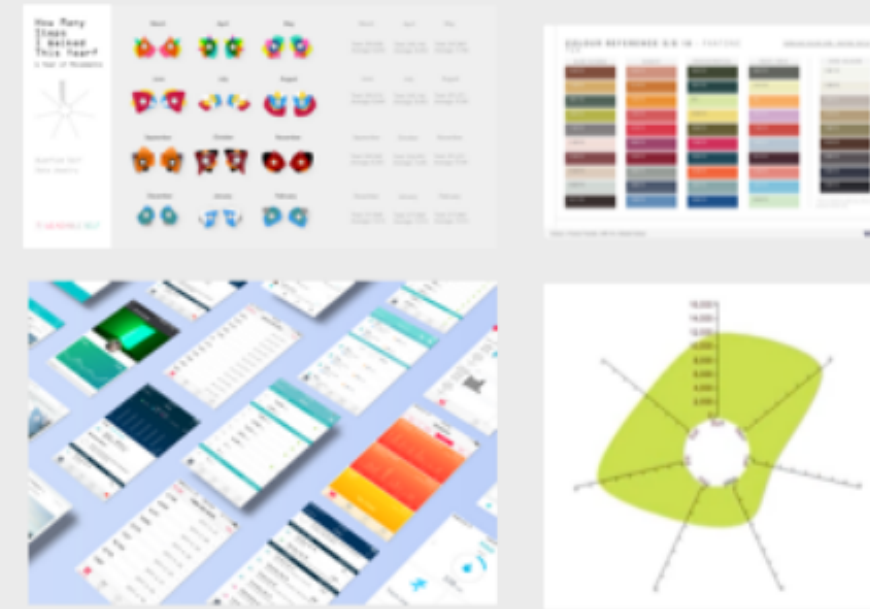
2017 – Wearable Self

"Wearable Self"

Daily step data from iPhone Health

Jewelry: plexiglass, metal

Symposium, Interactive show, exhibition



Design Research

Ideation, planning

Data collecting, visualization

Prototyping & user testing

PR & exhibition

Research the problem

Develop the solutions

Data collecting, mining

Create physical prototypes

Branding, Identity design

Observation

Imagine the future

Programming: d3.js

Choosing materials, colors

Website design

1:1 Interviews

Domains and precedents

2D Fabrication

3D printing, laser cut

User interaction design

Contextualization

User scenario

Digital to physical

User testing and re-design

Exhibition design

Market research

Technical research

Fashion trend research

Usability test

Presentation design

Define a design goal

Color testing

Survey, user feedback

Video, photo shoot

<https://jennykang.me/wearable-self-2/>

Physical visualization and art for personalized visualization

2018: Global Life Expectancy

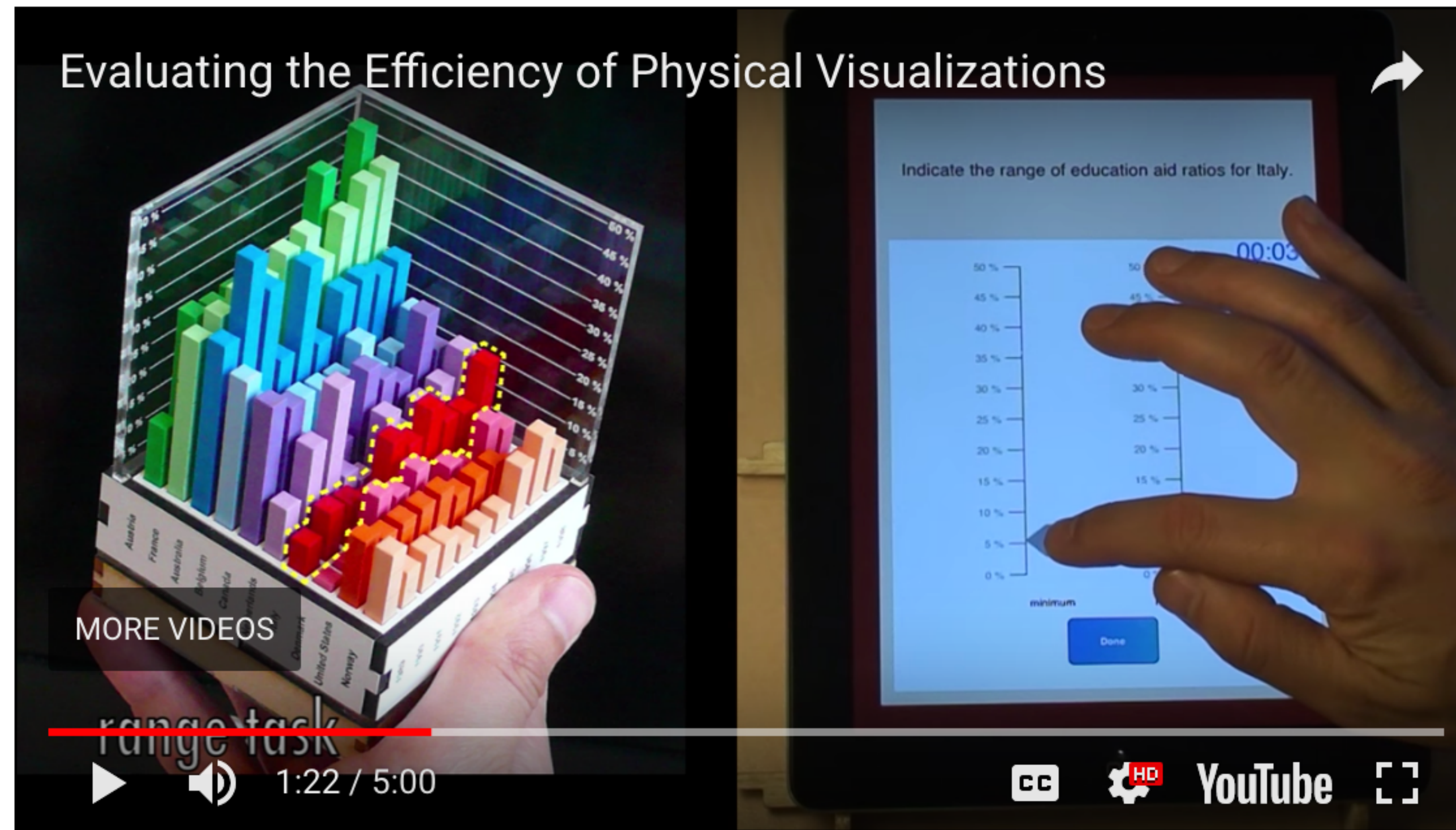


<https://youtu.be/zXJPlwaYKzo>

<http://dataphys.org/list/steven-pinker-explains-global-life-expectancy-with-physical-line-charts/>

On the “research” side

An Empirical Investigation of Physical Visualizations



What is personalized
visualization?

Personalized visualization

- Making data meaningful to a person in the context of daily life
- Visualizing personal (one's own) data
- Personalization in visualization
- Visualization that targets specific person: e.g. personalized visualization of web information
- Personalized e-learning
- Adaptive visualization that does not neglect individual differences, instead of one-size-fits-all approaches
- ...

Project 2: An Overview

Project 2: Getting started

- What type of personal data would you like to visualize? (The one from **yourself**, or someone you know closely)
- How do you obtain the data?
- Why studying such a data set is important and meaningful for **you**?
- What sort of insights do you expect to get out of this visualization project? (And what sort of insights you end up getting?)

Other requirements

- Creative and original
- Interpretable and Informative

Possible medium or building blocks



- Legos, Play-Doh, threads...
- Being creative: cereals, mud, grass...
- Be cost-effective



Thanks!

Any questions?

You can find me at: beiwang@sci.utah.edu

CREDITS

Special thanks to all people who made and share these awesome resources for free:

- ☐ Presentation template designed by [Slidesmash](#)
- ☐ Photographs by [unsplash.com](#) and [pexels.com](#)
- ☐ Vector Icons by [Matthew Skiles](#)

Presentation Design

This presentation uses the following typographies and colors:

Free Fonts used:

<http://www.1001fonts.com/oswald-font.html>

<https://www.fontsquirrel.com/fonts/open-sans>

Colors used

