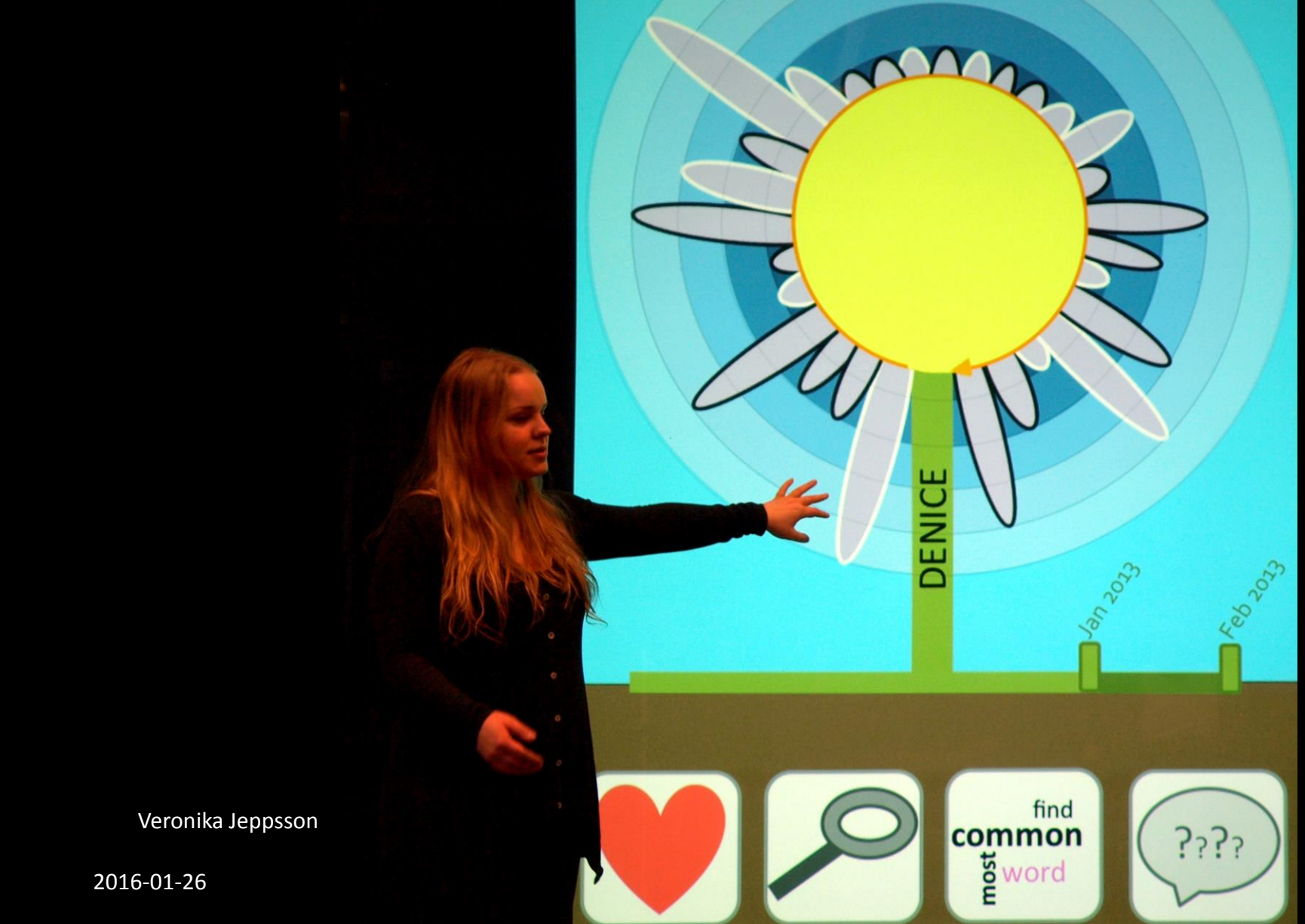
Information Visualization Lecture 2

IVIS13 student Stephanie Dawoud presenting the final project Loves Me, Loves Me Not.

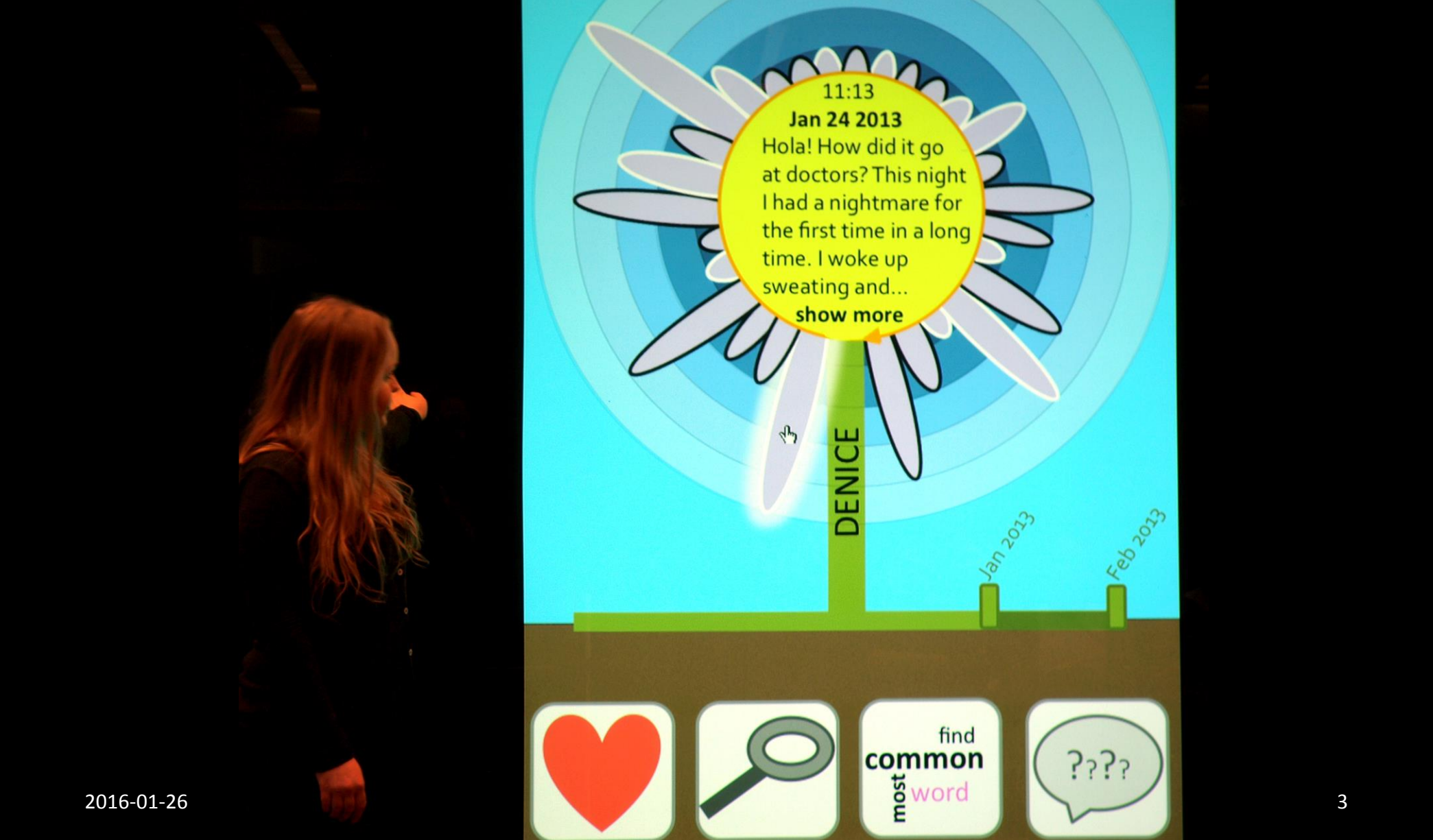
KTH VETENSKAP OCH KONST

VICSTHLM
VISUALISATION INTERACTION COLLABORATION

Mario Romero 2016/01/26



Veronika Jeppsson


11:13
Jan 24 2013
Hola! How did it go at doctors? This night I had a nightmare for the first time in a long time. I woke up sweating and...
show more
DENICE
Jan 2013
Feb 2013
find
most common word
???


MOMMY
HEARD
ONE
DON'T
SCREAMING
OUT
BEFORE
SAID
WENT
CALL
DADDY
TIME
KNOW
DENICE
Jan 2013
Feb 2013
find
most
common
word
???

Prelude Videos

- Microsoft: Productivity Future Vision (6:28) – link
- Microsoft Hololens (2:35) – link
- Precision Information Environments Envisioning the future of emergency management (4:38) – link
- Wanderers by Erik Wernquist (3:50)- link

IVIS16 Schedule

1.	Tuesday	19.1	13:15	Intro	**DUE:**
2.	**Tuesday**	**26.1**	**13:15**	**Lecture 2**	**Reading 1**
3.	Friday	29.1	**08:30**	Lectures 3, 4 (labs)	Project 1, Form Group
5.	Tuesday	02.2	13:15	Lecture 5	Reading 2
6.	Tuesday	09.2	13:15	Lecture 6	Reading 3
7.	Friday	12.2	**08:30**	Lectures 7, 8 (labs)	Project 2, Proposal
9.	Friday	19.2	**08:30**	Lecture 9	Reading 4
10.	Tuesday	23.2	13:15	Lecture 10	Reading 5
11.	Friday	26.2	**08:30**	Lectures 11, 12 (labs)	Project 3, Hello World!
13.	Tuesday	01.3	13:15	Lecture 13	Reading 6
14.	Friday	11.3	**08:15**	Lecture 14	Reading 7
15.	Friday	18.3	**08:30**	Final Demo (exam)	Project 4 Final Demo
16.	Thursday	14.4		C-Awards	

Outline

1. Questions about project 1?
2. Learning in IVIS16
3. Green Hackathon
4. Break
5. Quiz Reading 1 (14:15 – 14:25)
6. Why Information Visualization?
7. Next Lecture

Questions about Project 1

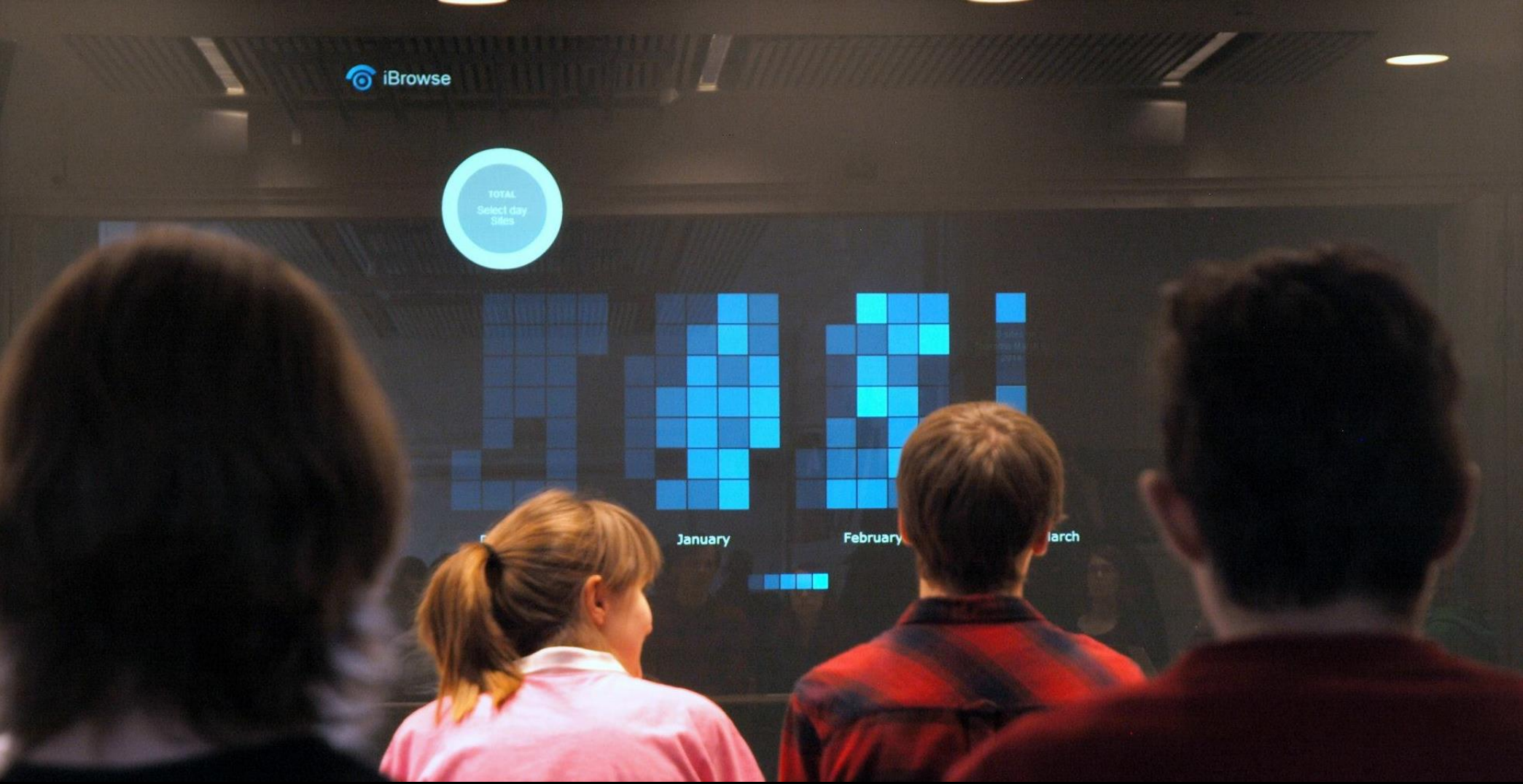
Learning Methodology
Information Visualization 2013 - 2015

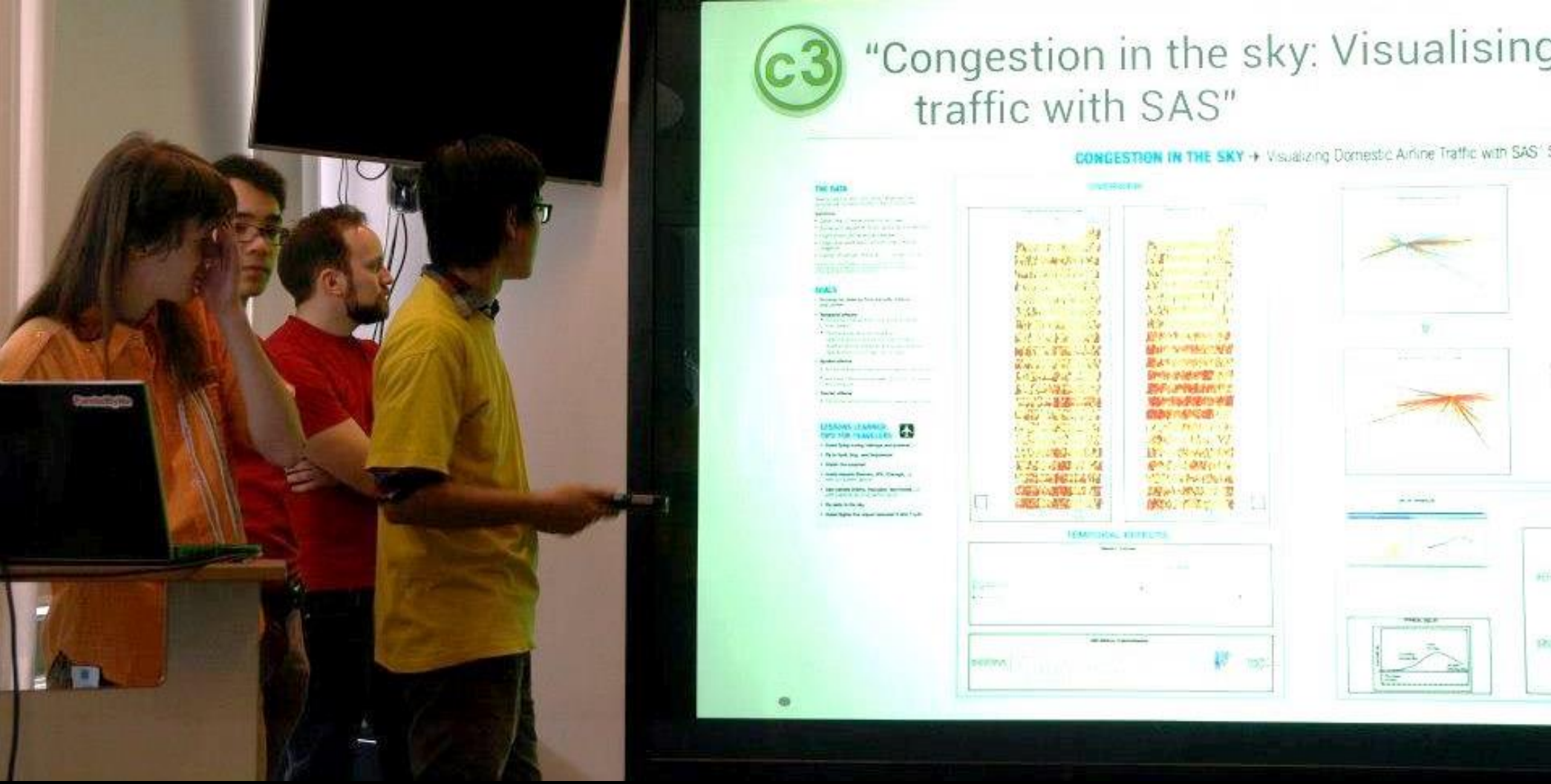
The Students

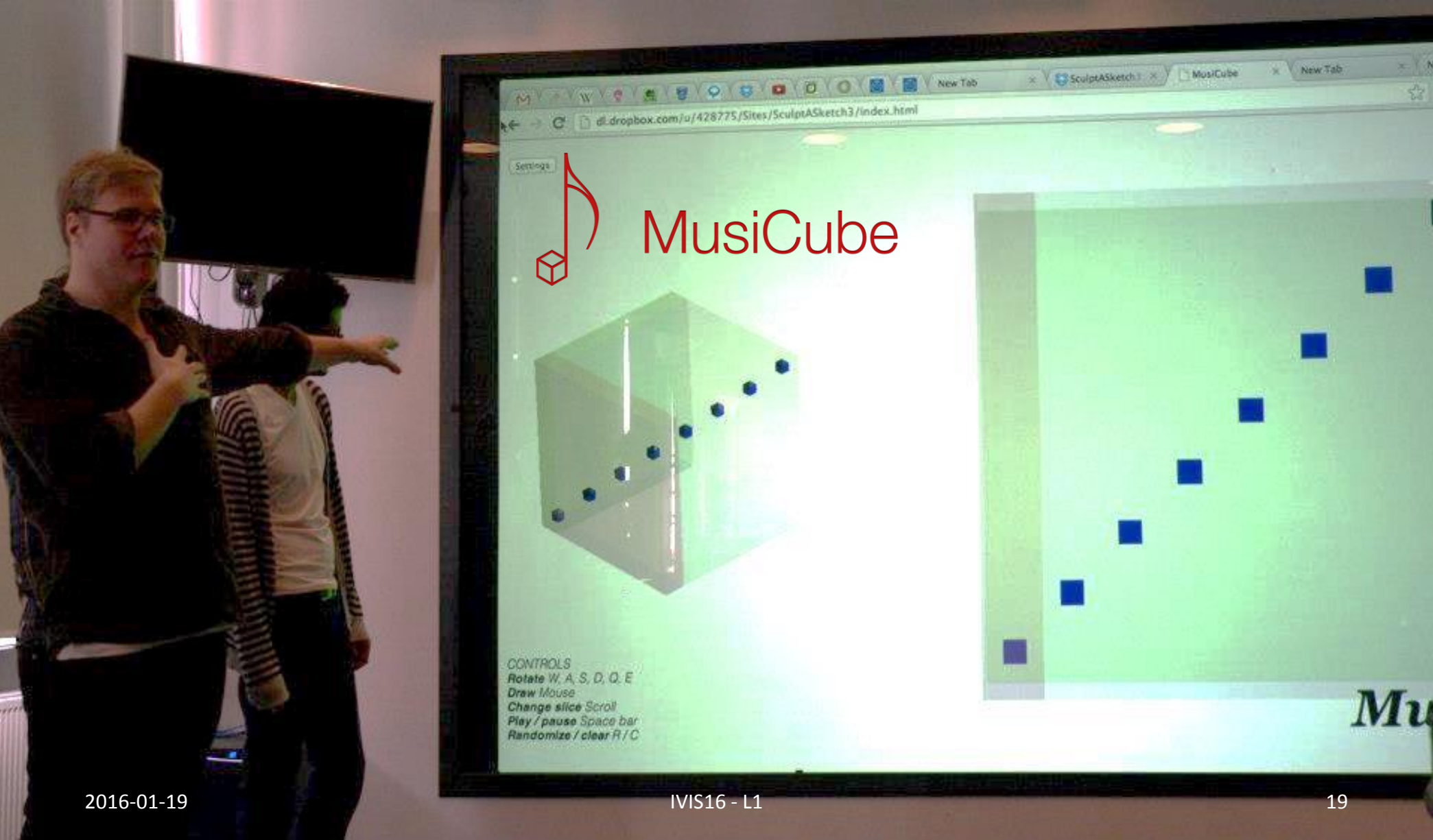
IVIS13


sleep

A First Select Portfolio


iBrowse
TOTAL
Select day
Sites
January
February


c3
"Congestion in the sky: Visualising traffic with SAS"
CONGESTION IN THE SKY → Visualizing Domestic Airline Traffic with SAS'


MusiCube
CONTROLS
Rotate W, A, S, D, Q, E
Draw Mouse
Change slice Scroll
Play / pause Space bar
Randomize / clear R / C


4 APRIL
C AWARDS
2013
C Awards
Like
You like this.
"...BETYDDE NOG MYCKET ATT JAG VUNNIT BÄSTA VISUALISERING I C AWARDS..."


jakoblindvall
Och nu inleds #cawards i #cnema. Riktigt snyggt och proffsigt får vi säga.
Oscjac
Skilligt

The Learning

IVIS14 final demo in VIC

Students teaching themselves and eachother.

VIS14 final demo in VIC

Students teaching themselves and eachother.

IVIS14 final demo in VIC

Students teaching themselves and eachother.

IVIS14 students @ C-Awards

Students presenting to the open public.

AGI12 students @ FF

Students presenting to the open public.

AGI13 students @ GAMEX

Students presenting to the open public.

AGI13 students @ GAMEX

Students presenting to the open public.

AGI13 students @ GAMEX

Students presenting to the open public.

IVIS13 C-Awards

Students winning competitions.

IVIS15 @ C-AWARDS

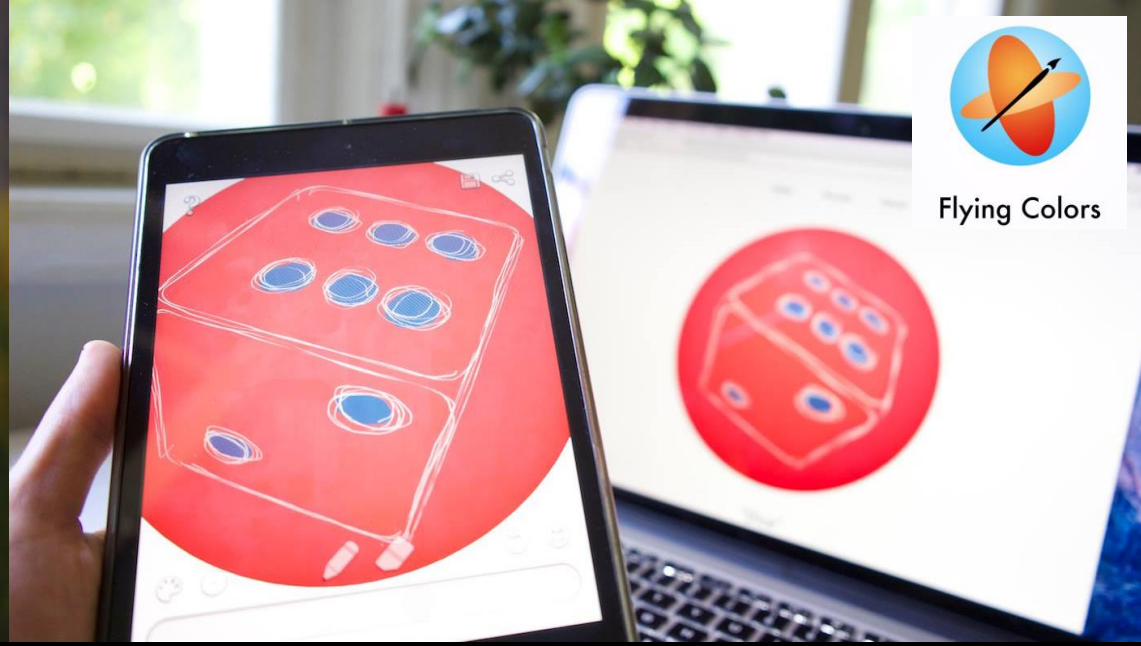
Students winning competitions.

Nora Tejada with Speakasso

Students winning competitions.

Erik Dahlström opening Tidebanan at Spårvägsmuseet, Sept 2015

Students incorporating start-ups.



Students incorporating start-ups.

Joakim Rasmuson and Mario Romero's Flying Colors at Student Inc. 2015

DangeRoads at Metro 2013

Students in the Headlines.

Test Reading 1

http://goo.gl/forms/cN3l7IfVwP

WHY INFORMATION VISUALIZATION?

http://www.thehumanfaceofbigdata.com/

The trouble with data

https://www.emc.com/infographics/digital-universe-business-infographic.htm

Challenges

- Transform data into information
- Transform information into insight

Human Vision

- Highest bandwidth
- Fast, parallel
- Pattern Recognition
- Pre-attentive
- Extends memory and cognitive capacity
- People think visually
- Brain: 30% vision, 8% touch, 3% hearing

Example

Cereal Data

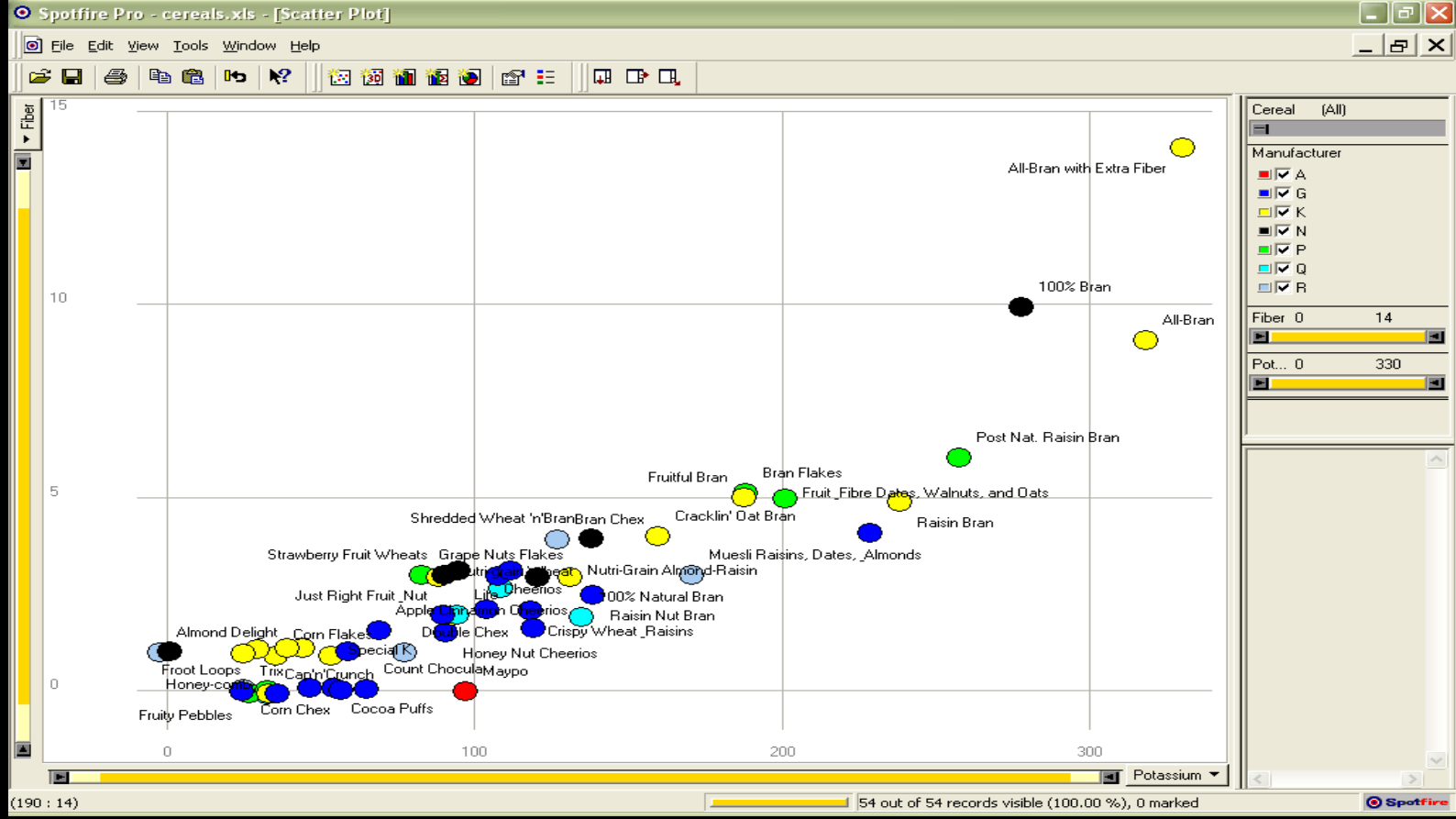
Look for…

- Which cereals have the most and least potasium?
- Is there a relationship between potasium and fiber?

Cereal Data

	A	B	C	D
1	Cereal	Manufacturer	Fiber	Potassium
2	100% Bran	N	10	280
3	100% Natural Bran	Q	2	135
4	All-Bran	K	9	320
5	All-Bran with Extra Fiber	K	14	330
6	Almond Delight	R	1	0
7	Apple Cinnamon Cheeric	G	1.5	70
8	Bran Chex	R	4	125
9	Bran Flakes	P	5	190
10	Cap'n'Crunch	Q	0	35
11	Cheerios	G	2	105
12	Cocoa Puffs	G	0	55
13	Corn Chex	R	0	25
14	Corn Flakes	K	1	35
15	Count Chocula	G	0	65
16	Cracklin' Oat Bran	K	4	160
17	Cream of Wheat (Quick)	N	1	0
18	Crispy Wheat & Raisins	G	2	120
19	Double Chex	R	1	80
20	Froot Loops	K	1	30
21	Frosted Flakes	K	1	25
22	Fruit & Fibre Dates, Wal	P	5	200
23	Fruitful Bran	K	5	190
24	Fruity Pebbles	P	0	25
25	Golden Grahams	G	0	45
26	Grape Nuts Flakes	P	3	85
27	Honey Nut Cheerios	G	1.5	90
28	Honey-comb	P	0	35
29	Just Right Fruit & Nut	K	2	95
30	Life	Q	2	95
31	Lucky Charms	G	0	55
32	Maypo	A	0	95
33	Muesli Raisins, Dates, &	R	3	170
34	Multi-Grain Cheerios	G	2	90
35	Nutri-Grain Almond-Rais	K	3	130
36	Nutri-grain Wheat	K	3	90
37	Oatmeal Raisin Crisp	G	1.5	120
38	Post Nat. Raisin Bran	P	6	260
39	Product 19	K	1	45
40	Quaker Oatmeal	Q	2.7	110
41	Raisin Bran	K	5	240
42	Raisin Nut Bran	G	2.5	140
43	Rice Krispies	K	0	35
44	Shredded Wheat	N	3	95
45	Shredded Wheat 'n'Bran	N	4	140
46	Shredded Wheat spoon	N	3	120
47	Smacks	K	1	40
48	Special K	K	1	55
49	Strawberry Fruit Wheats	N	3	90
50	Total Corn Flakes	G	0	35
51	Total Raisin Bran	G	4	230
52	Total Whole Grain	G	3	110
53	Trix	G	0	25
54	Wheaties	G	3	110
55	Wheaties Honey Gold	G	1	60

Cereal Data Visualized



Thought

There are a number of screen readers for visually impaired or situationally blind people. Explore Apple’s Voice Over for example.

- What if I read the data to you?

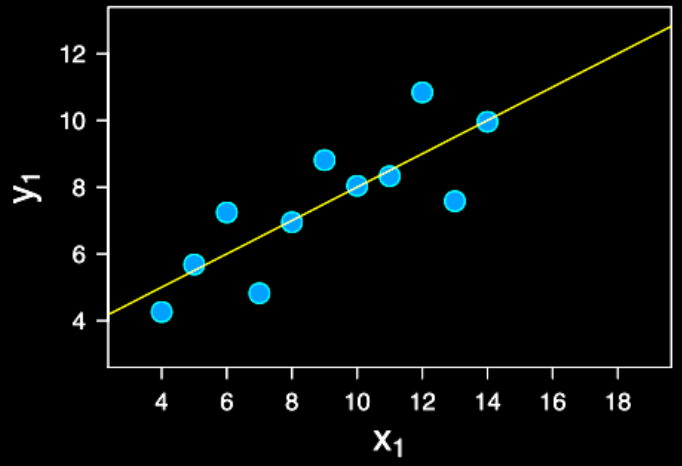
Anscombe's quartet

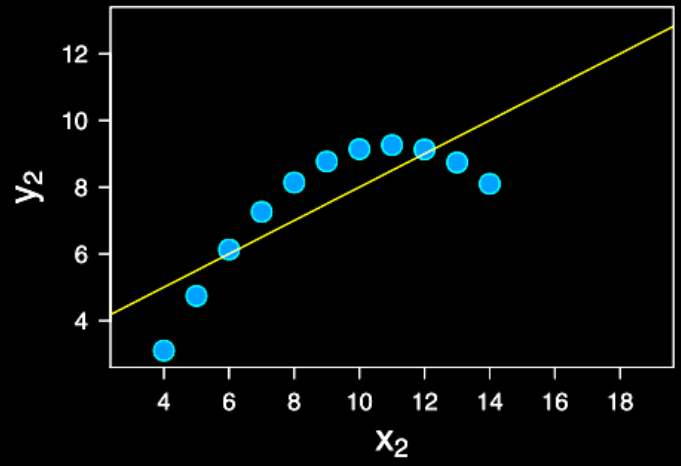
I		II		III		IV	
X	Y	X	Y	X	Y	X	Y
10.00	8.04	10.00	9.14	10.00	7.46	8.00	6.58
8.00	6.95	8.00	8.14	8.00	6.77	8.00	5.76
13.00	7.58	13.00	8.74	13.00	12.74	8.00	7.71
9.00	8.81	9.00	8.77	9.00	7.11	8.00	8.84
11.00	8.33	11.00	9.26	11.00	7.81	8.00	8.47
14.00	9.96	14.00	8.10	14.00	8.84	8.00	7.04
6.00	7.24	6.00	6.13	6.00	6.08	8.00	5.25
4.00	4.26	4.00	3.10	4.00	5.39	19.00	12.50
12.00	10.84	12.00	9.13	12.00	8.15	8.00	5.56
7.00	4.82	7.00	7.26	7.00	6.42	8.00	7.91
5.00	5.68	5.00	4.74	5.00	5.73	8.00	6.89

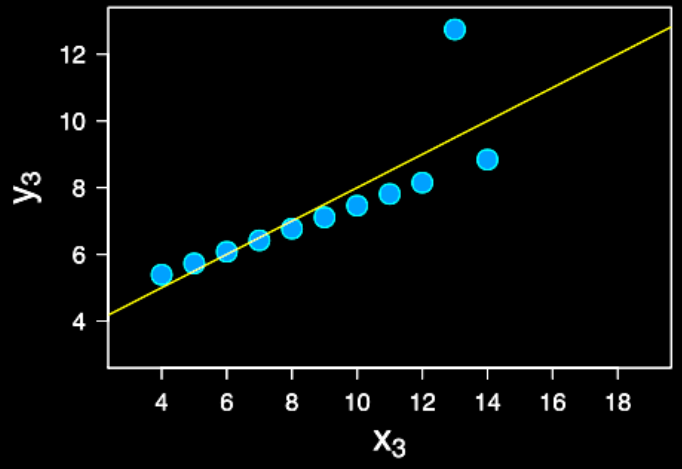
Statistics of the quartet

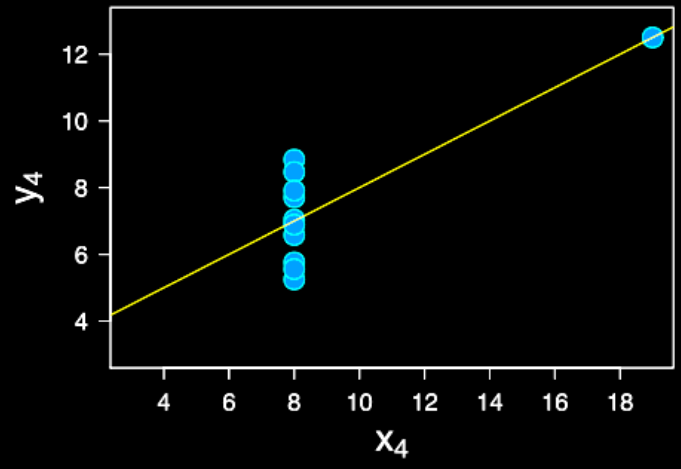
Property	Value
Mean of *x* in each case	9 (exact)
Variance of *x* in each case	11 (exact)
Mean of *y* in each case	7.50 (to 2 decimal places)
Variance of *y* in each case	4.122 or 4.127 (to 3 decimal places)
Correlation between *x* and *y* in each case	0.816 (to 3 decimal places)
Linear regression line in each case	$y = 3.00 + 0.500x$ (to 2 and 3 decimal places, respectively)

Anscombe's quartet Visualized









Visualization

"The use of computer-supported, interactive visual representations of data to amplify cognition."

Card, Mackinlay Shneiderman 1998

Visualization

- Often considered the process of making graphics or images
- Really it is a cognitive process
  - Form a mental image of something
  - Internalize an understanding
- “The purpose of visualization is insight, not pictures”
- Insight: discovery, decision making, explanation

Main Idea

- Visuals help us think
  - Provide a frame of reference, a temporary storage area
- Perception → Cognition
- Pattern matching
- External cognition aid
  - Role of external world in thinking and reason

Larkin & Simon ’87 Card, Mackinlay, Shneiderman ‘98

Pragmatically

“Contained within the data of any investigation is information that can yield conclusions to questions not even originally asked. That is, there can be surprises in the data. To regularly miss surprises by failing to probe thoroughly with visualization tools is terribly inefficient because the cost of intensive data analysis is typically very small compared with the cost of data collection.”

W. Cleveland - The Elements of Graphing Data

Purpose

- Analysis
  - Understand your data better and act upon that understanding
- Presentation
  - Communicate and inform others more effectively

Analysis

- Find extremes
- Compute
  - mean, variance, standard deviation, ...
- Observe Relations
- Determine what's missing
- Identify ambiguity and noise
- Determine Commonality, mode

When to apply InfoVis?

- Other techniques:
  - Statistics
  - Data mining
  - Machine Learning
- InfoVis:
  - Exploratory data analysis
    - Don’t know what you are looking for
    - Don’t have a hypothesis
    - Want to know what question to ask

H. Wainer

“A graphic display has many purposes but it achieves its highest value when it forces us to see what we were not expecting.”

InfoVis Tasks

- Search
  - Find a specific piece of information
    - How many games has Sweden won in the world cup?
    - How many rental apartments are available in Stockholm?
- Browse
  - Look over or inspect something in a more casual manner
    - Learn about nutrition
    - How does the weather affect transportation in Stockholm?

InfoVis Taks (cont.)

- Analysis
  - Compare
  - Contrast
  - Outliers
  - Extremes
  - Patterns
- Assimilation
- Monitoring
- Awareness

Presentation

- Use visualization to communicate
  - Ideas
  - Influence
  - Explain
  - Persuade
- Evidence and support
- Summarize
- Aggregate
- Unite

Two Key Challenges of InfoVis

- Scale
  - Large datasets
  - Datasets with largely varying scales
    - Seconds
    - Days
    - Years
    - Centuries
- Diversity
  - Data types
  - Forms
  - Sizes

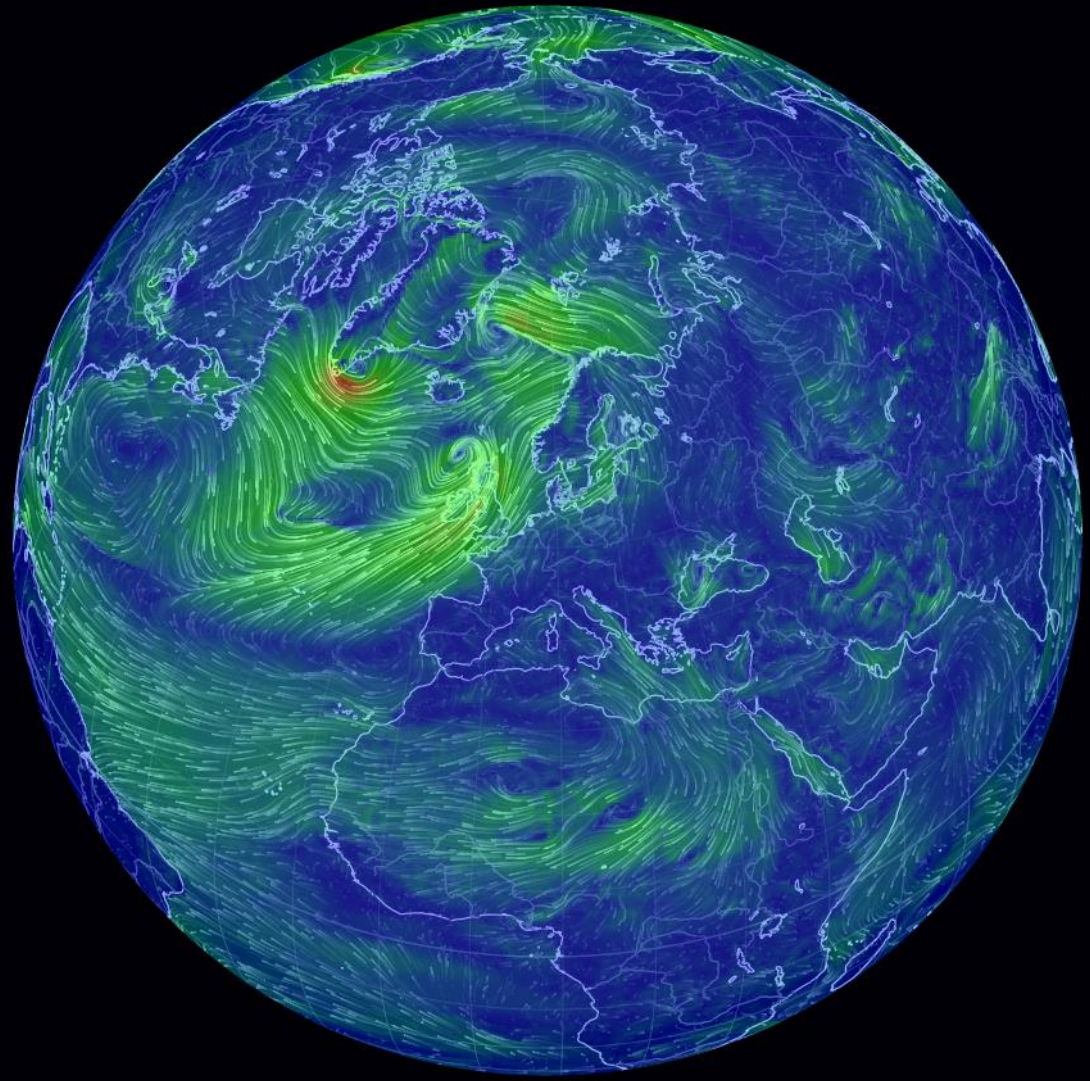
Lets Explore!

Pruek Laochaiyapruek shared this excellent visualization with the group. Thanks!

From GIT Hub:

earth

"earth" is a personal project I've used to learn javascript and browser programming, and is based on the earlier Tokyo Wind Map project. Feedback and contributions are welcome! ...especially those that clarify accepted best practices.



Next Lectures

Lecture 3 and 4 on Friday January 29

Starting at 8:30

- Present Project 1
- Discuss Readings
- Form Groups
- Brainstorm Project Ideas

Reading Assignments due Feb 2

- A knowledge task-based framework for design and evaluation of information visualizations –Bob Amar and John Stasko - link
- Watch this set of videos http://datajournalism.stanford.edu/

Thank you!

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