Visualization of Information

MSDS 6390

Live Session 1

World Changers Shaped Here

SMU

Contents

- Presentation
  - Who am I?
  - Where am I?
  - What I do?
  - Who are you?
- Information Visualization
  - What is InfoVis?
  - Why is important?
  - How to create InfoVis?
  - Visualizations that make no sense
  - Live Coding

Who am I?

- Juan Camilo Ibarra Lopez M.Sc.
  - Systems and Computing Engineer (2007)
  - M.Sc. In Systems and Computing Engineering (2009)
    - Major: Computer Graphics

Where am I?

- Bogotá, Colombia, South-America

It's Colombia, not Columbia!!

- Coffee
- Singers
  - Shakira
  - Juanes
- Sports
  - James Rodriguez
  - Falcao
  - Nairo Quintana
- Writers
  - Gabriel García Marquez


COLOMBIA
COLOMBIA · 20 CTVS.
AEREO
© Can Stock Photo


visita
BOGOTA

What I do?

- I love Programming!!
- Software Engineering and Design
- Information Visualization
- Computer Graphics (2D and 3D)
- Geographic Visualization
- 3D Animation
- Teaching experience (8 years)

Who are you?

What do you love to do?

What do you expect of this course?

Before we begin…

World Changers Shaped Here

SMU

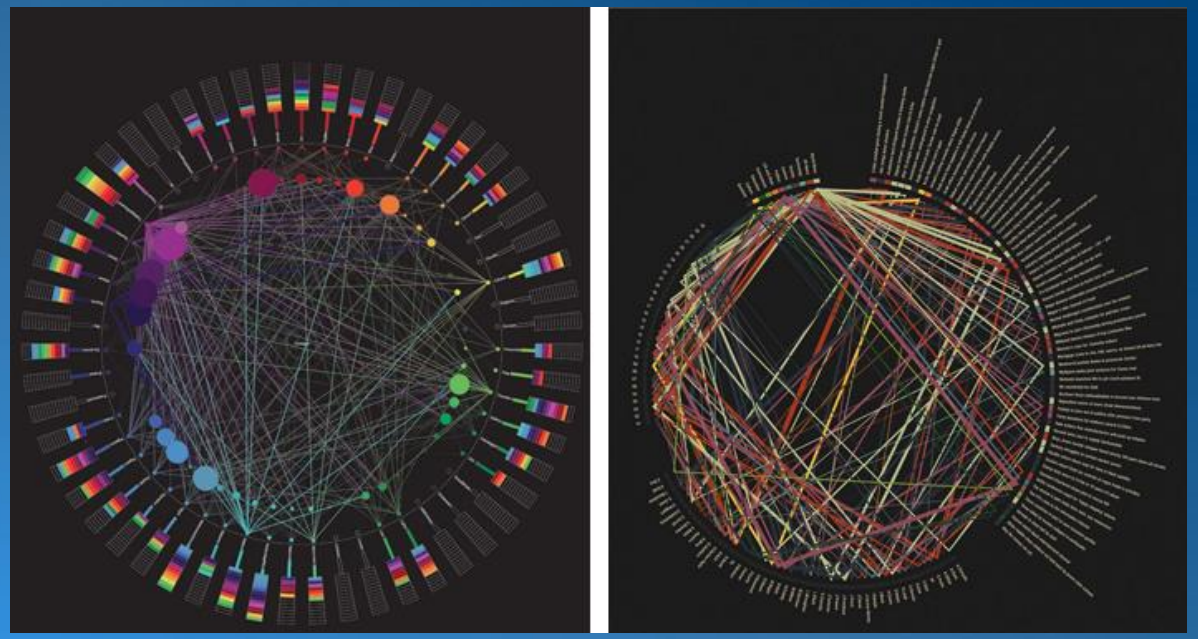
Visualization of Information

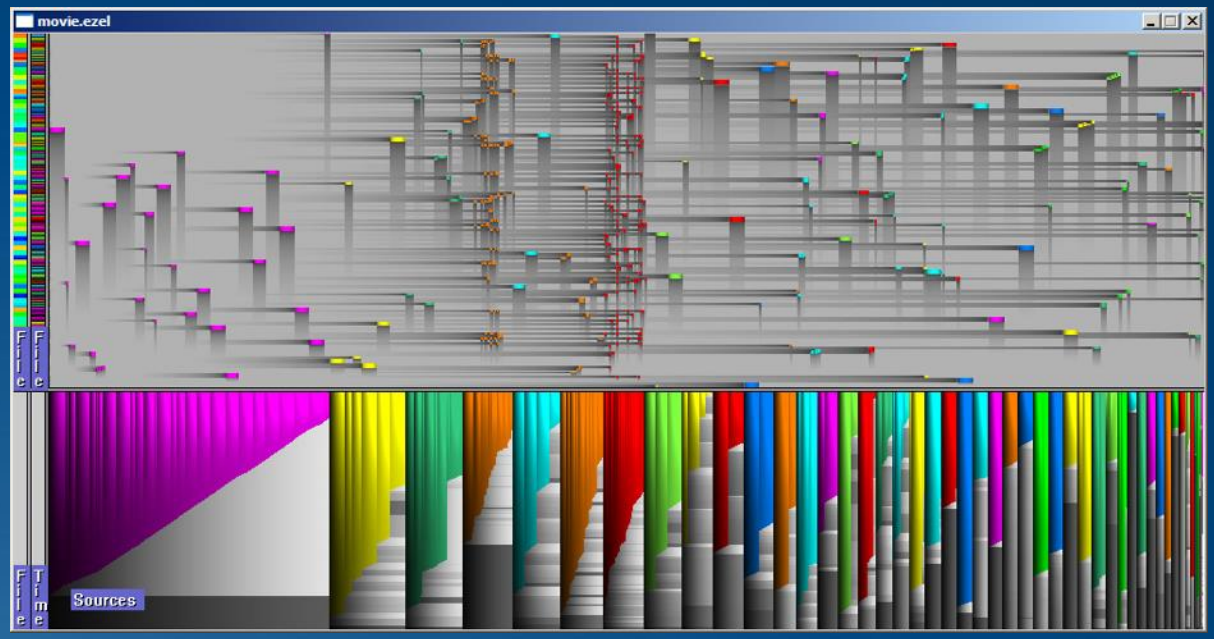
- 14 Live Sessions
- 10 assignments
  - 1 per week (8.125% each)
  - 1 mid-term (2 weeks) (15%)
  - 1 final (3 weeks) (20%)
- Communication
  - 2DS platform
  - Email: jibarralopez@mail.smu.edu.
  - **Slack: smu-infovis**
- **Repo: juanibarral/smu_vis_of_info**

Information Visualization (InfoVis)

What is InfoVis?

- The study of **interactive representation** of abstract data to **improve** the cognitive processing of information



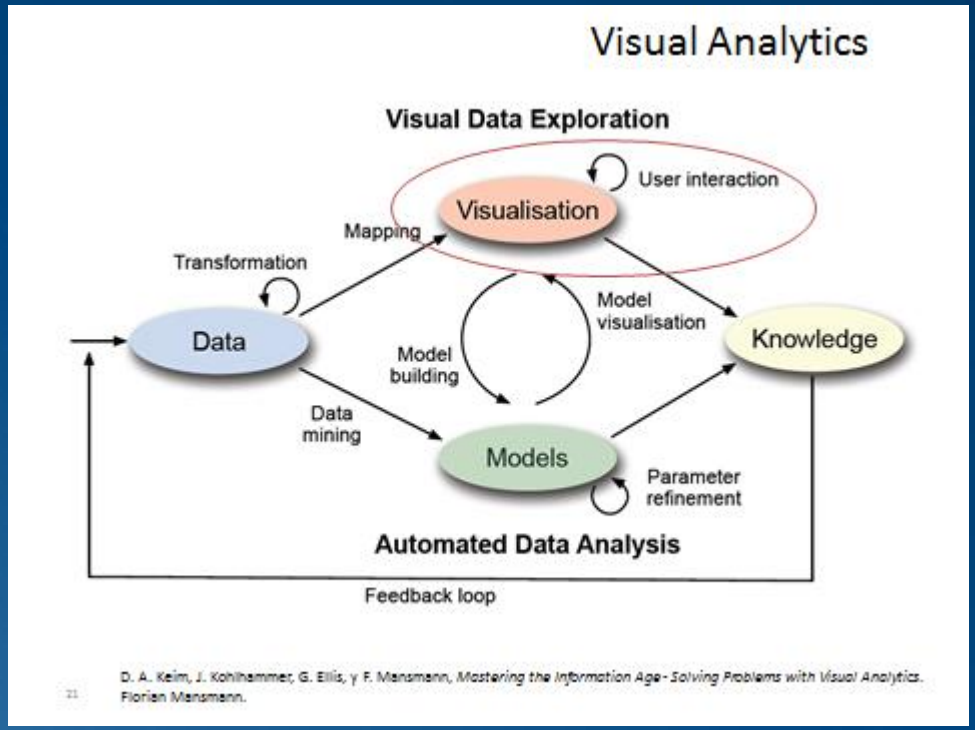


Information Visualization (InfoVis)

- **Detect the expected, discover the unexpected**

Data + models + analysis tools

Knowledge and good decisions

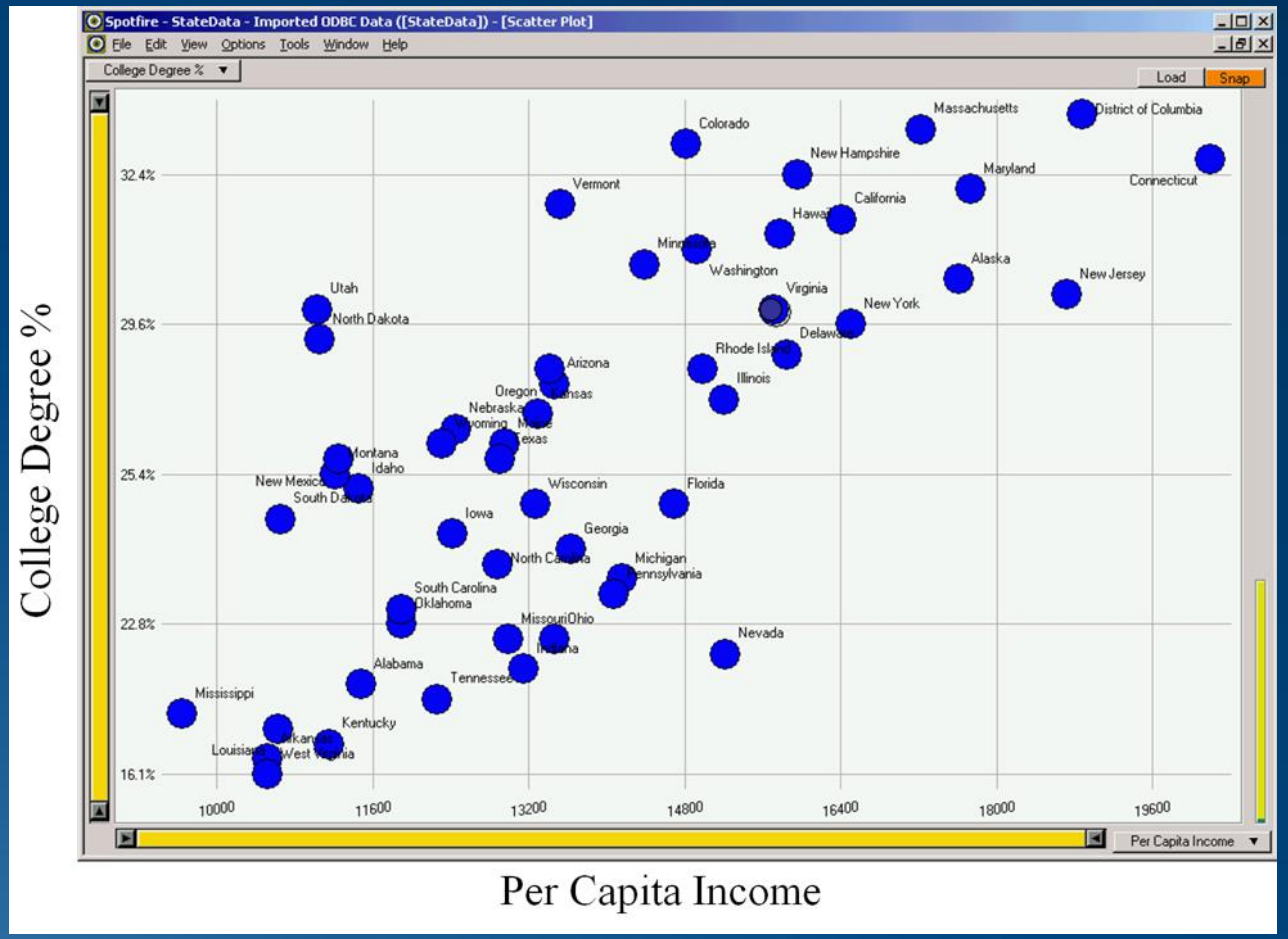


Why is important?

- A picture is worth a thousands words
- Preattentive processing
- InfoVis vs Statistics
- Visualizations that make no sense

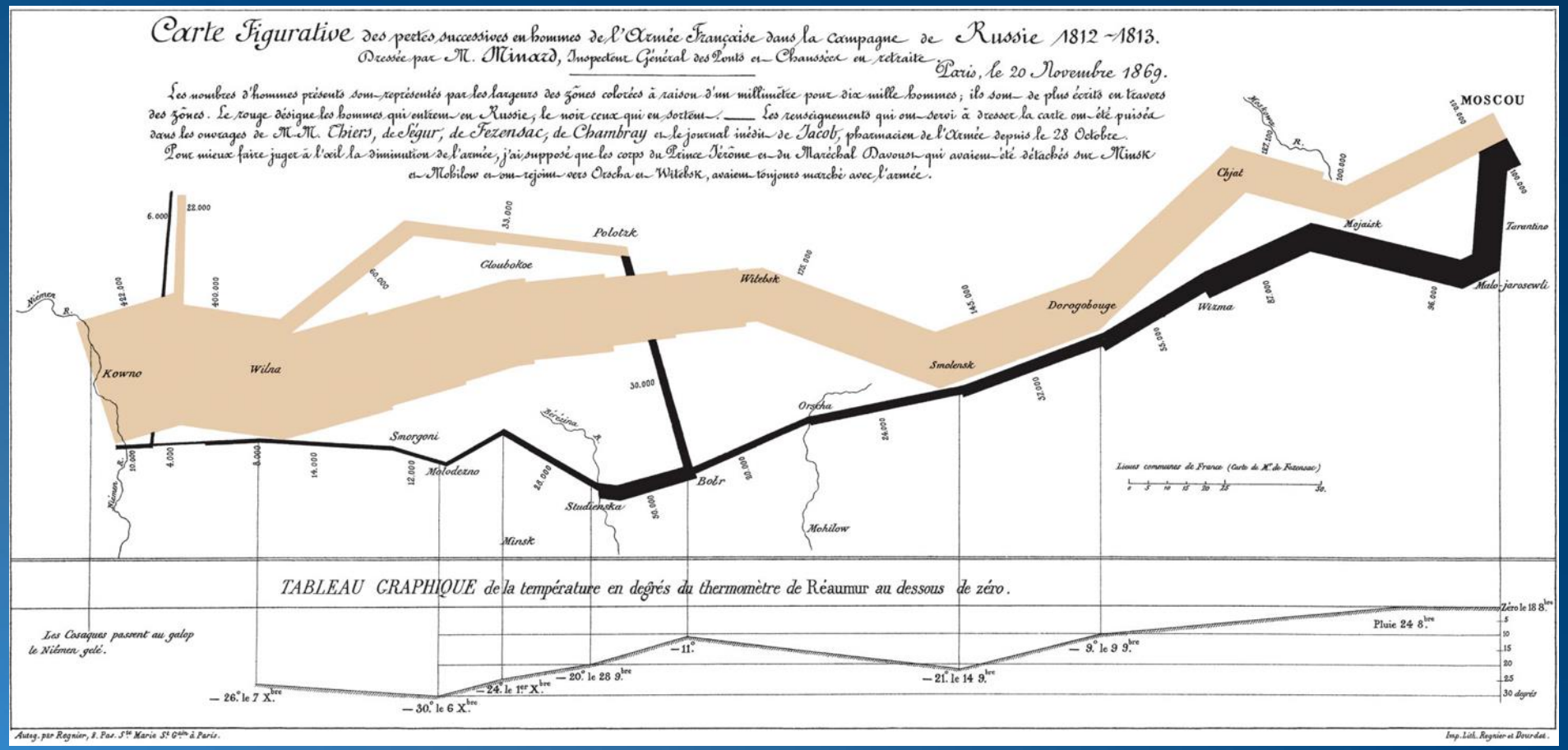
A picture is worth a thousands words

State	College Degree %	Per Capita Income
Alabama	20.6%	11486
Alaska	30.3%	17610
Arizona	27.1%	13461
Arkansas	17.0%	10520
California	31.3%	16409
Colorado	33.9%	14821
Connecticut	33.8%	20189
Delaware	27.9%	15854
District of Columbia	36.4%	18881
Florida	24.9%	14698
Georgia	24.3%	13631
Hawaii	31.2%	15770
Idaho	25.2%	11457
Illinois	26.8%	15201
Indiana	20.9%	13149
Iowa	24.5%	12422
Kansas	26.5%	13300
Kentucky	17.7%	11153
Louisiana	19.4%	10635
Maine	25.7%	12957

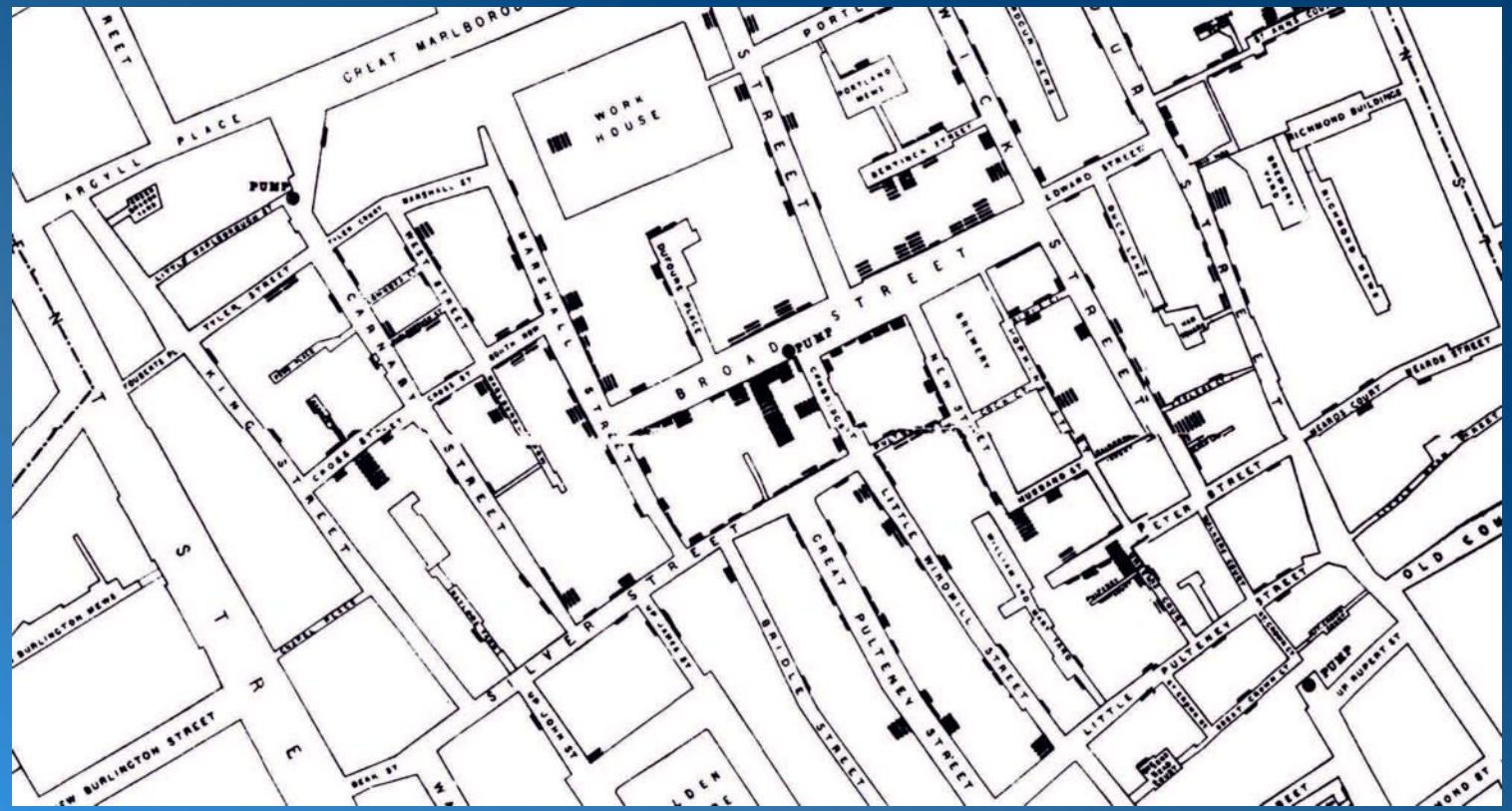


http://www.aviz.fr/Research/ValueOfInfoVis

Visualization Of Napoleon's 1812 March (Charles Minard)



1854 London Cholera Outbreak (Dr. John Snow)



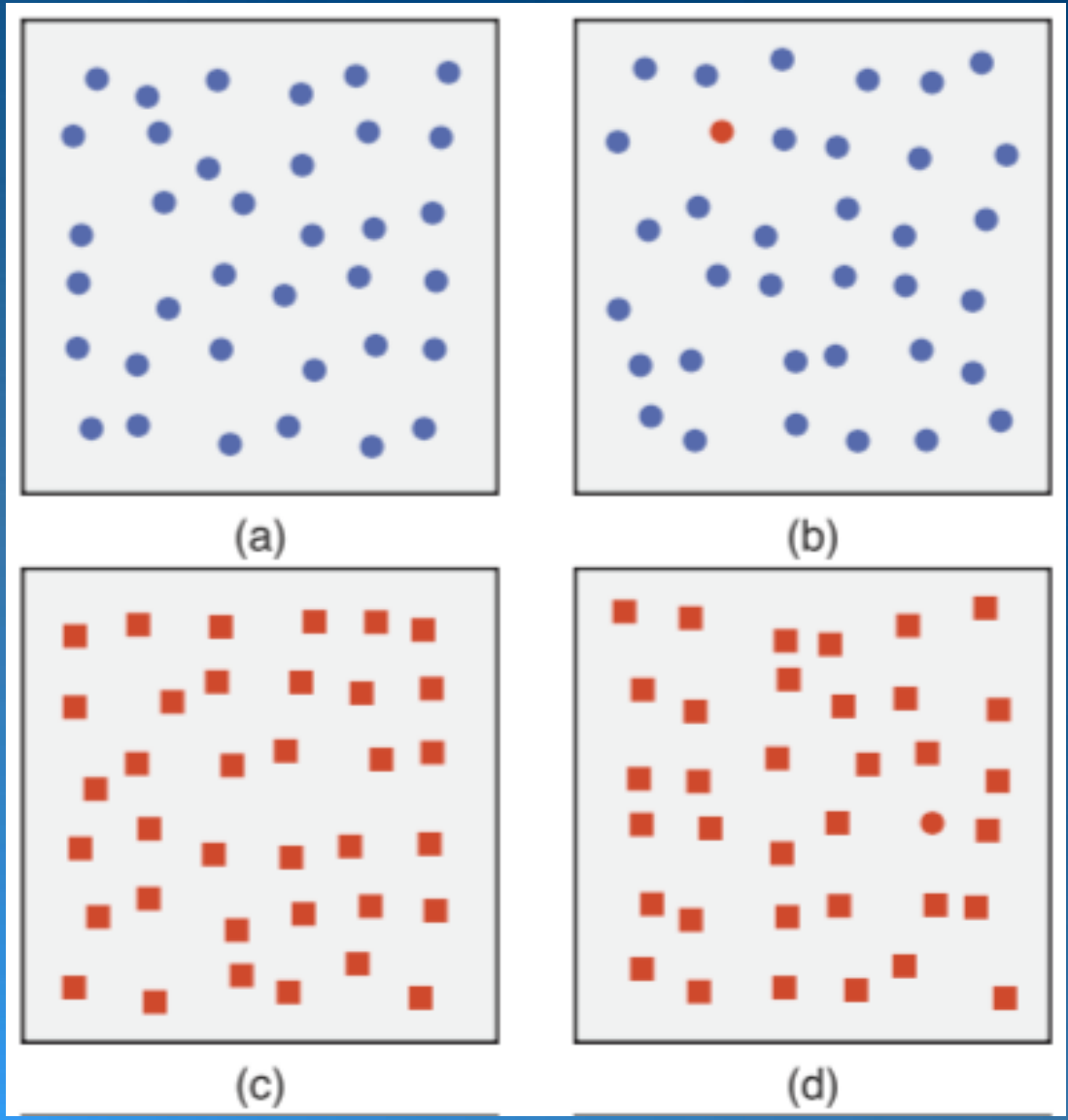
Preattentive processing:

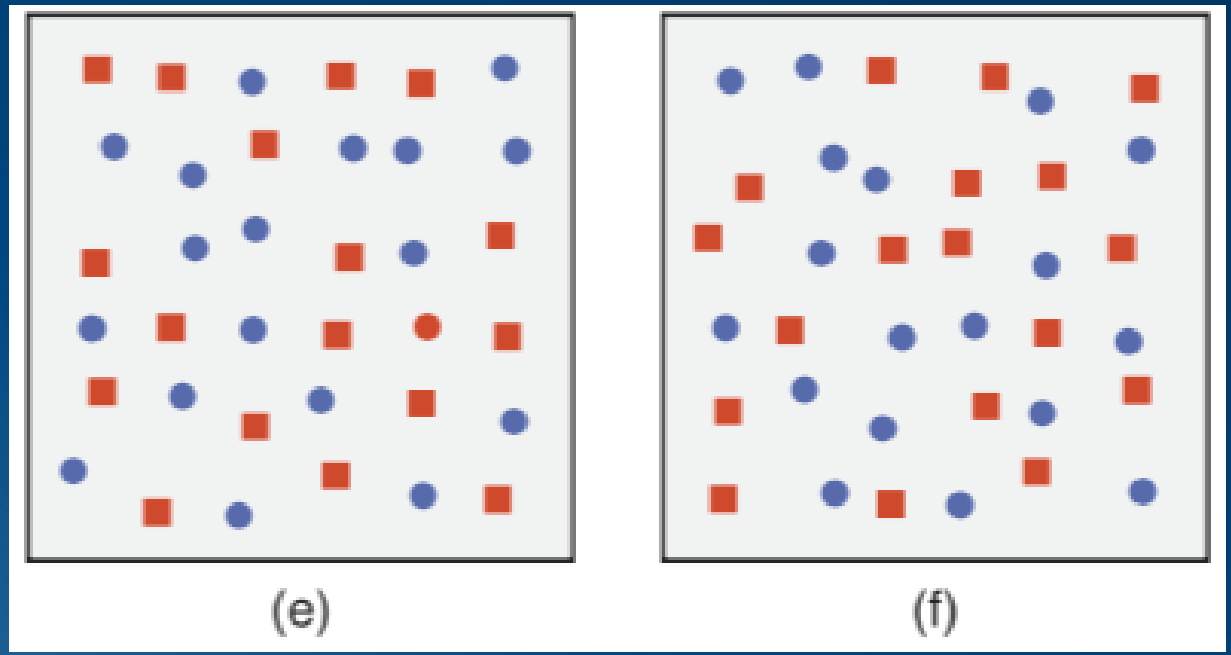
THE HUMAN BRAIN IS ABLE TO SPOT THE SALIENT INFORMATION IN A FRACTION OF A SECOND

Preattentive processing:

THE HUMAN BRAIN IS ABLE TO SPOT THE SALIENT INFORMATION IN A FRACTION OF A SECOND

Which images have a red circle?





InfoVis vs Statistics

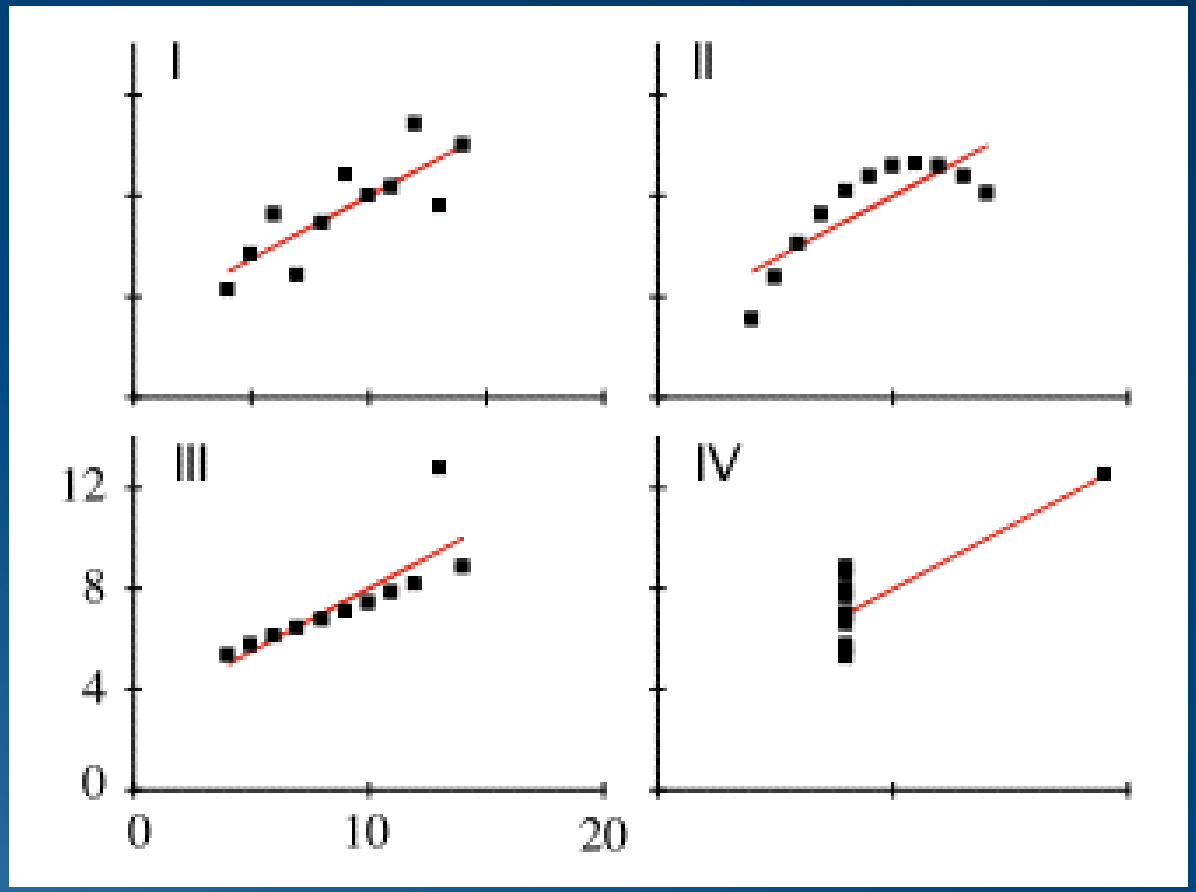
- Anscombe's Quartet and Robust Fitting

I		II		III		IV	
x	y	x	y	x	y	x	y
10	8.04	10	9.14	10	7.46	8	6.58
8	6.95	8	8.14	8	6.77	8	5.76
13	7.58	13	8.74	13	12.74	8	7.71
9	8.81	9	8.77	9	7.11	8	8.84
11	8.33	11	9.26	11	7.81	8	8.47
14	9.96	14	8.10	14	8.84	8	7.04
6	7.24	6	6.13	6	6.08	8	5.25
4	4.26	4	3.10	4	5.39	19	12.50
12	10.84	12	9.13	12	8.15	8	5.56
7	4.82	7	7.26	7	6.42	8	7.91
5	5.68	5	4.74	5	5.73	8	6.89

- mean of the x values = 9.0
- mean of the y values = 7.5
- equation of the least-squared regression line is: $y = 3 + 0.5x$
- sums of squared errors (about the mean) = 110.0
- regression sums of squared errors (variance accounted for by x) = 27.5
- residual sums of squared errors (about the regression line) = 13.75
- correlation coefficient = 0.82
- coefficient of determination = 0.67

Anscombe's Quartet

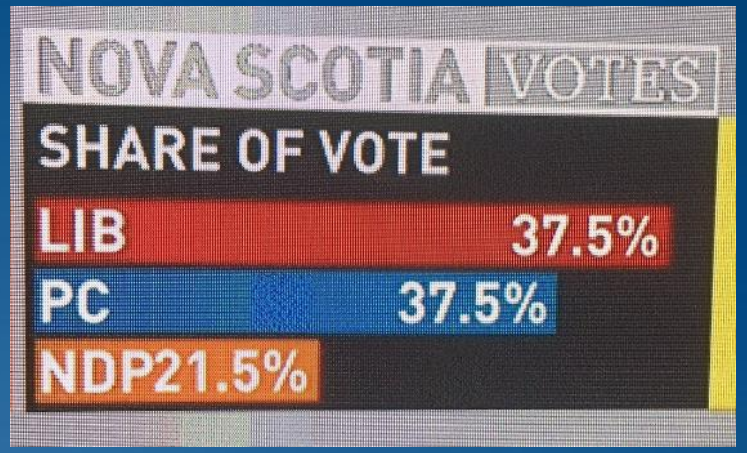
I		II		III		IV	
x	y	x	y	x	y	x	y
10	8.04	10	9.14	10	7.46	8	6.58
8	6.95	8	8.14	8	6.77	8	5.76
13	7.58	13	8.74	13	12.74	8	7.71
9	8.81	9	8.77	9	7.11	8	8.84
11	8.33	11	9.26	11	7.81	8	8.47
14	9.96	14	8.10	14	8.84	8	7.04
6	7.24	6	6.13	6	6.08	8	5.25
4	4.26	4	3.10	4	5.39	19	12.50
12	10.84	12	9.13	12	8.15	8	5.56
7	4.82	7	7.26	7	6.42	8	7.91
5	5.68	5	4.74	5	5.73	8	6.89

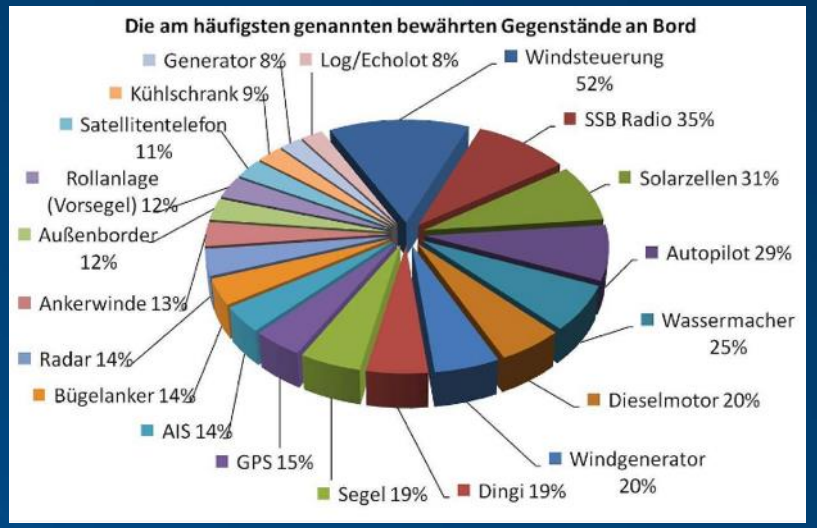


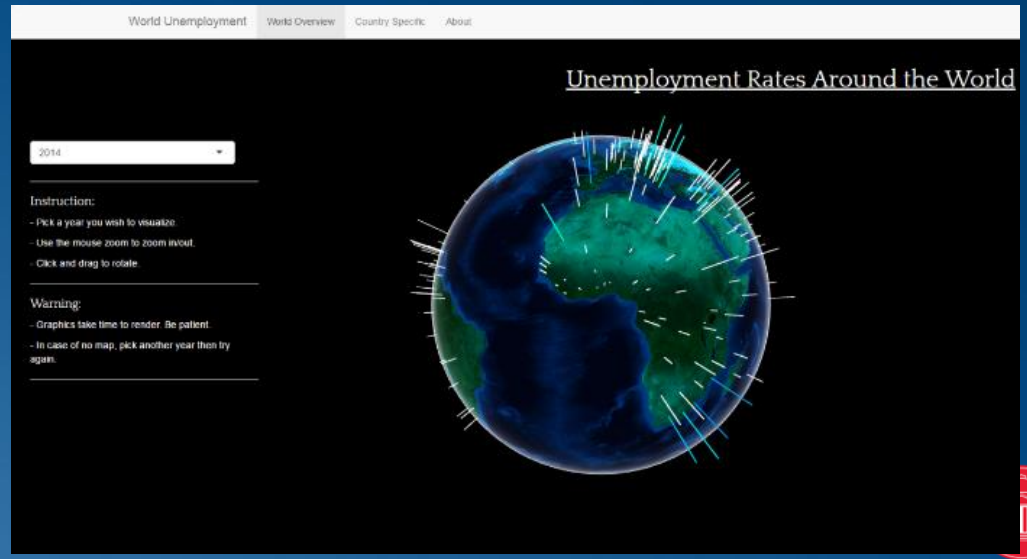
The best stats you've ever seen

https://www.ted.com/talks/hans_rosling_shows_the_best_stats_you_ve_ever_seen#t-475803

Visualizations that make no sense







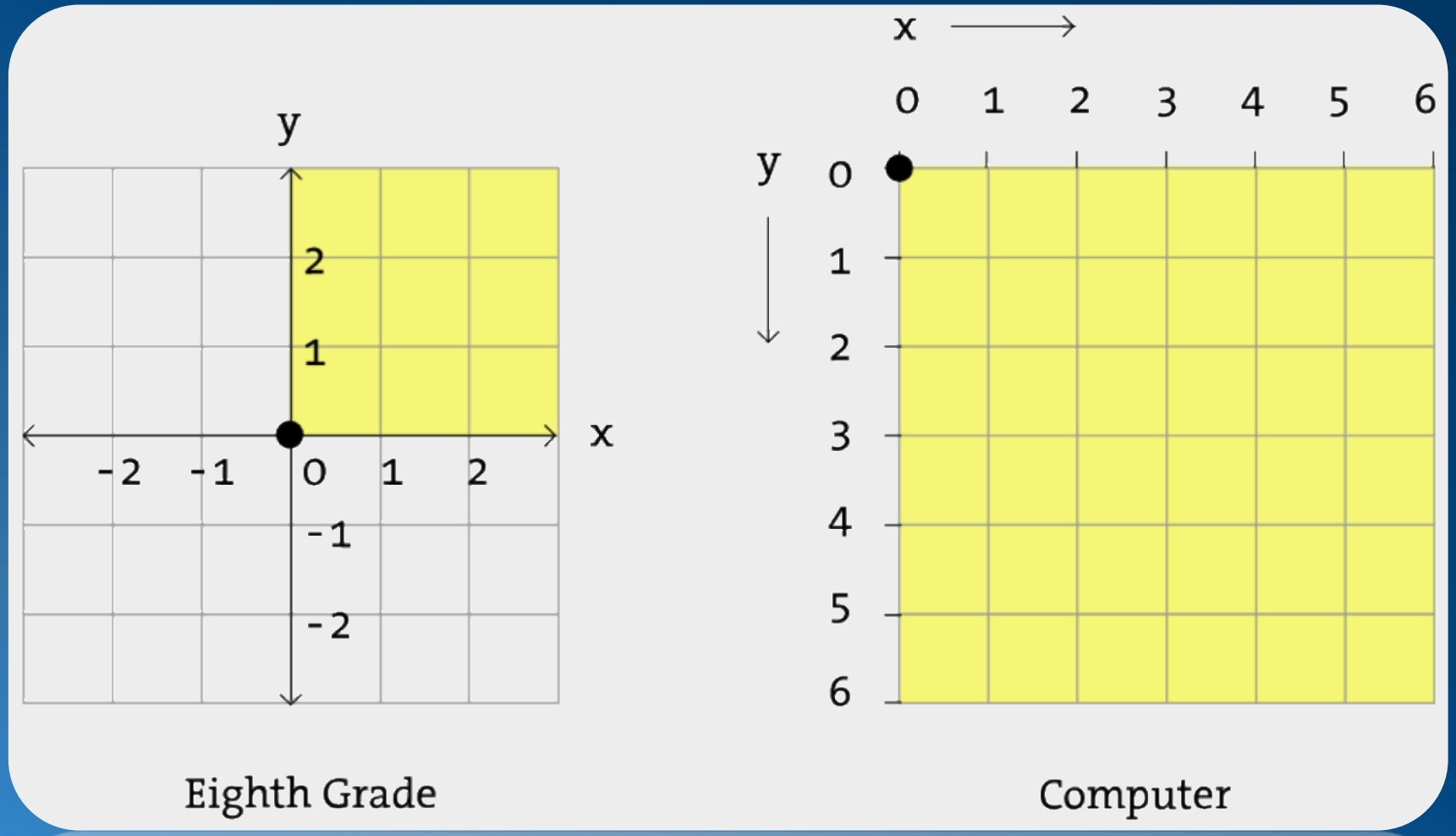
SMU

How to create InfoVis?

- Tools
  - Tableau
  - MS PowerBI
  - Sisense
- Visualization Libraries
  - Processing
  - D3.js
  - OpenFrameworks

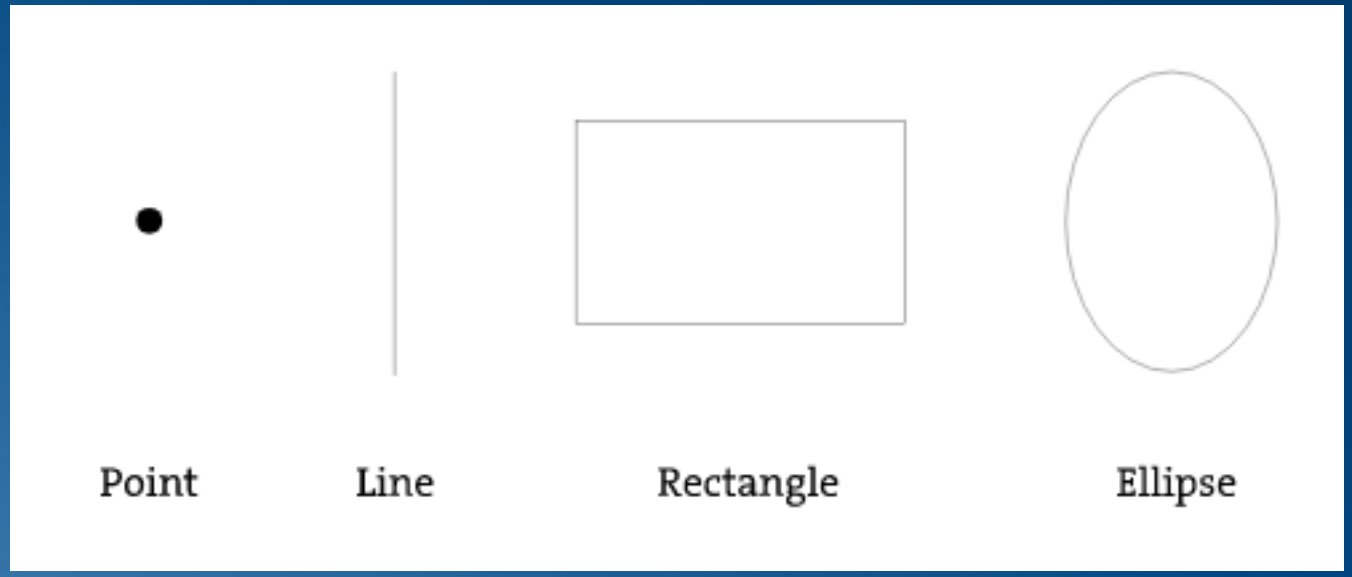
How to use Processing?

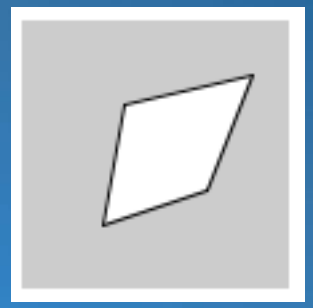
Processing coordinates system



https://processing.org/tutorials/drawing/

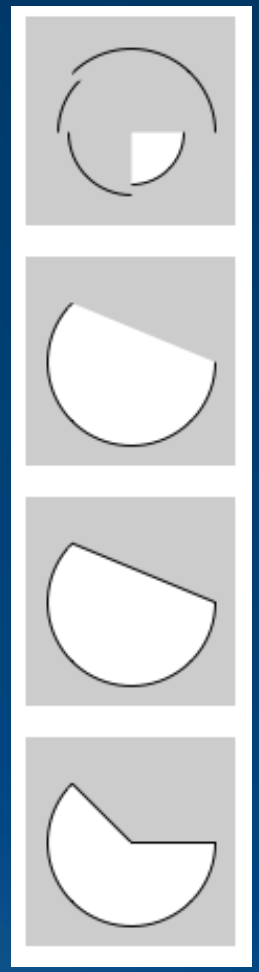
Basic shapes





Quad

Triangle



Arc

Live Coding

Using Processing

World Changers Shaped Here

SMU

Basic use

- Canvas, pixels
- Size of canvas
- Background
- Style: stroke weight, stroke color, fill color

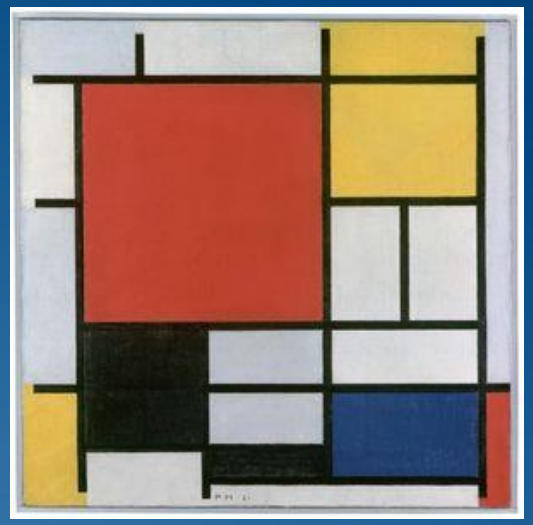
Shape	Processing drawing function
Line	`line(x1, y1, x2, y2)`
Rectangle	`rect(x, y, width, height)`
Circle	`ellipse(x, y, width, height)`
Triangle	`triangle(x1, y1, x2, y2, x3, y3)`

Assignment 1

- Using Processing's 2D primitive functions, re-create a painting by an artist connected to the Bauhaus, Suprematist, or Modernist movements. Please select a painting that you find engaging, and be prepared to discuss what you find engaging. Also discuss the re-creation process, including your honest assessment of the experience

Kazimir Malevich

Paul Smith



Piet Mondrain

Questions?

jibarralopez@mail.smu.edu

World Changers Shaped Here

SMU