

OST

Ostschweizer
Fachhochschule

WEB
DEVELOPMENT

Web Development Fundamentals

Data Visualisation with D3.js

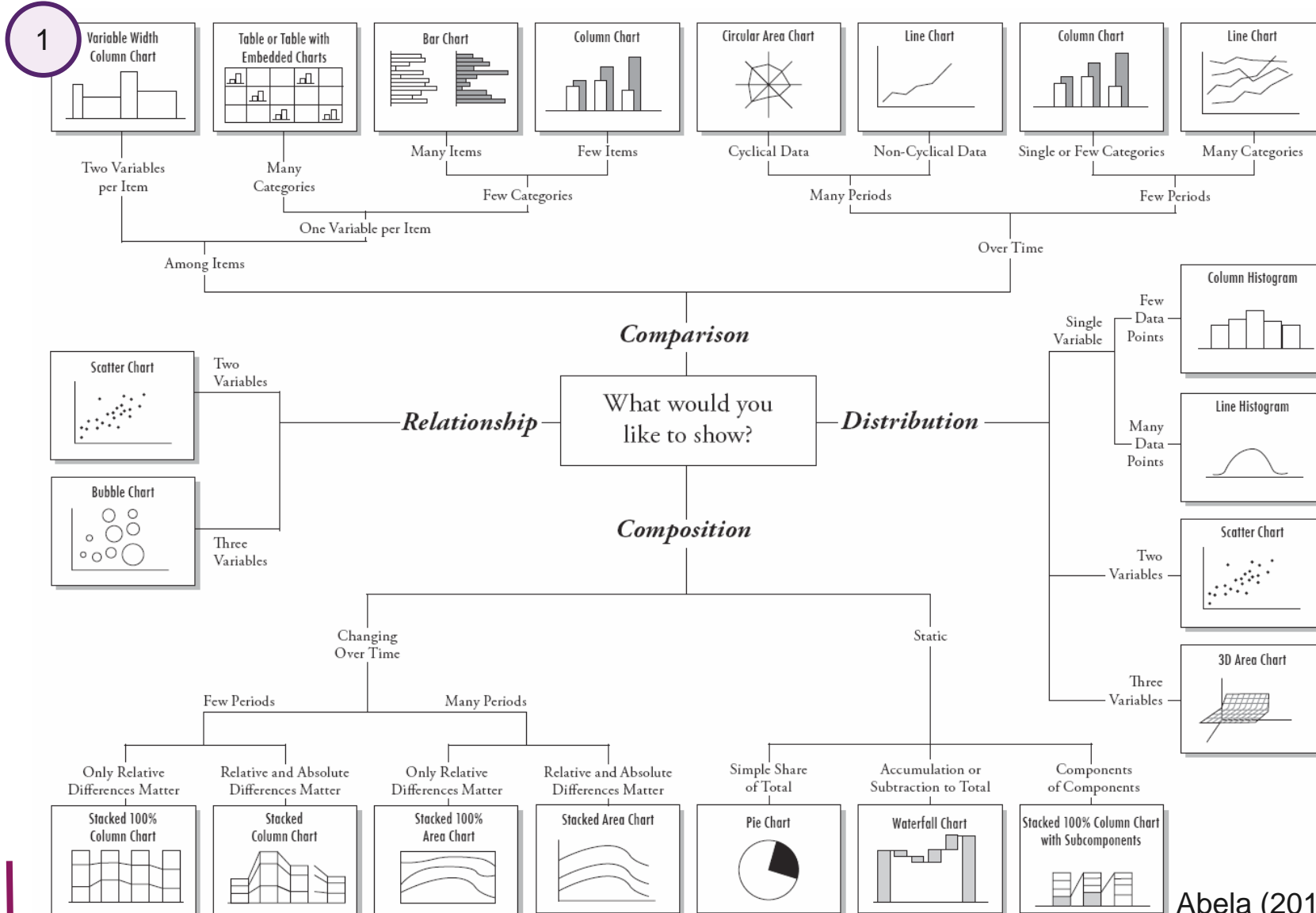
Prof. Dr. Matthias Baldauf

School of Management / Institute for Information and Process Management

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- Frameworks for Data Visualisation
- Introduction to D3.js
 - What's D3.js
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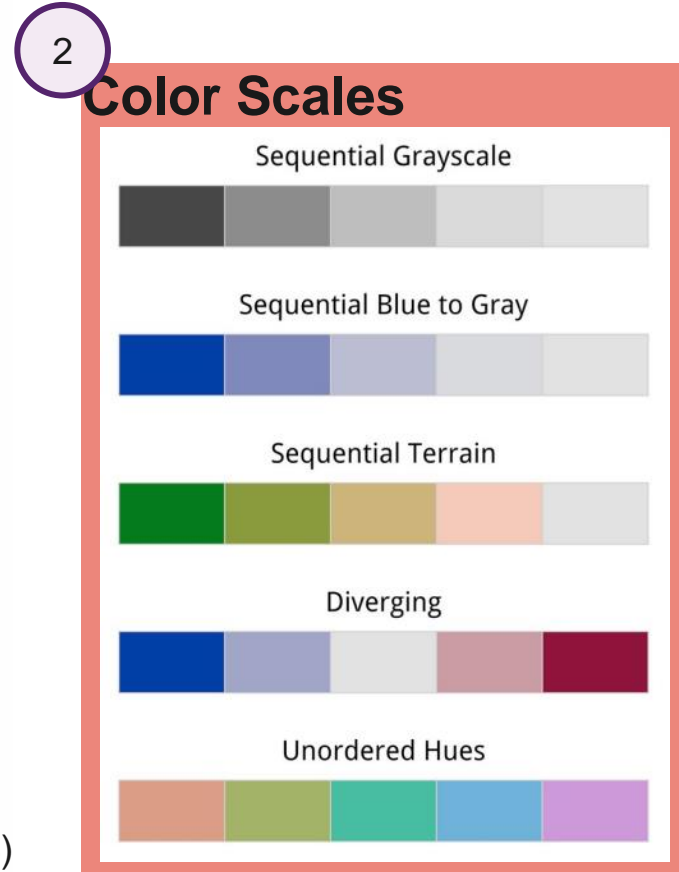
Data Visualisation in a Nutshell



3

Data-ink-ratio

$$= \frac{\text{Data - ink}}{\text{total ink used}}$$



Libraries for Data Visualisation on the Web

three.js

Pixi^{JS}



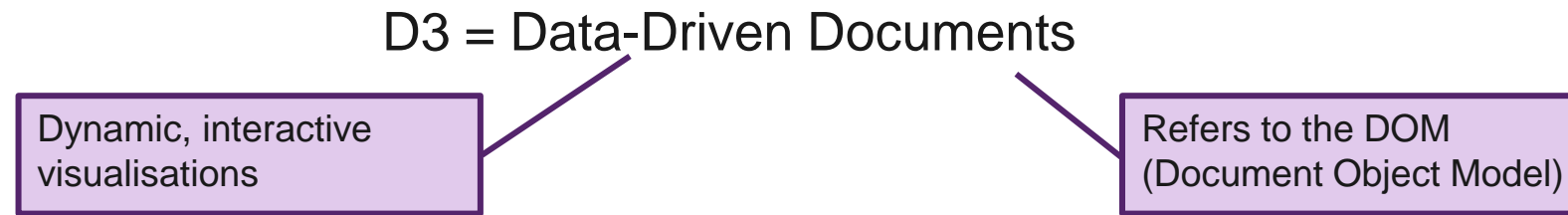
D3.js



Chart.js



D3.js: Introduction



- Open-source JavaScript library for visualizing data – since 2011
- Builds on existing web standards
- D3 is very flexible, BUT is a low-level toolbox
 - No concept of «charts» → you have to compose a variety of elements (shapes, axis, animation, ...)
 - Even easy visualisations need significant amount of coding
 - D3 is for maximum individualisation and expressiveness, not quick standard visualisations

D3.js: The SVG HTML-Tag

- SVG = Scalable Vector Graphics (W3C standard)
- XML-based vector image format (2D)
- Various shapes (lines, circles, rectangles, text, ...)
- Supports interactivity and animation
- All major desktop browser support SVG
- Probably some limited support on mobile browsers

→ A D3.js chart is a set of SVG shapes!

```
<!DOCTYPE html>
<h1>First html document</h1>
<p>This is my first sentence</p>
<svg>
  <circle style="fill: #69b3a2"
    stroke="black" cx=50 cy=50
    r=40></circle>
</svg>
```



First html
document

This is my first sentence



D3.js: An easy Example

```
<div id="scatter_area"></div>
```

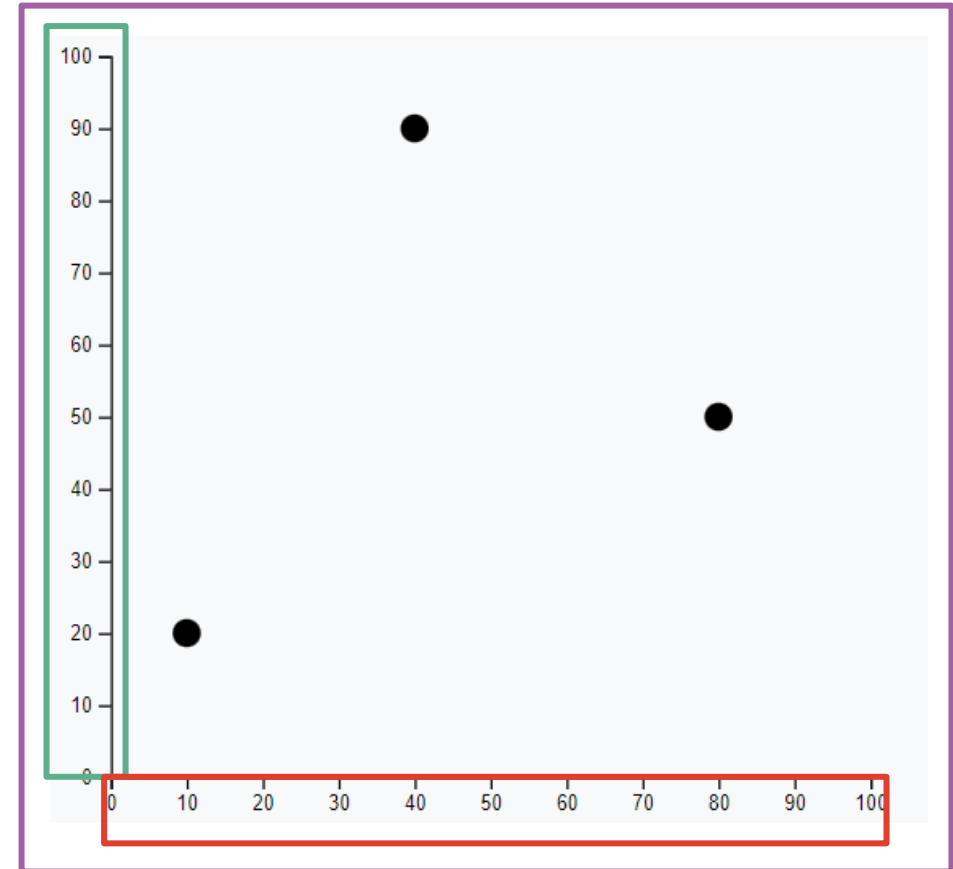
```
var svg = d3.select("#scatter_area")
    .append("svg")
      .attr("width", 450)
      .attr("height", 400)
    .append("g")
      .attr("transform", "translate(30, 20)");

var data = [ {x:10, y:20}, {x:40, y:90}, {x:80, y:50} ]

var x = d3.scaleLinear()
    .domain([0, 100])
    .range([0, 420]);
svg.append('g')
    .attr("transform", "translate(0," + 450 + ")")
    .call(d3.axisBottom(x));

var y = d3.scaleLinear()
    .domain([0, 100])
    .range([380, 0]);
svg.append('g')
    .call(d3.axisLeft(y));

svg.selectAll("whatever")
    .data(data)
    .enter()
    .append("circle")
      .attr("cx", function(d){ return x(d.x) })
      .attr("cy", function(d){ return y(d.y) })
      .attr("r", 7)
```



SmartFactory@OST: Production Sites

Rapperswil



Buchs



SmartFactory@OST: REST-API

The screenshot displays the 'Hybride Lernfabrik - Campus Buchs' interface. The main content area is titled 'Muskelpresse' and includes a 'Modulfoto' of a mechanical press. The control panel features buttons for 'Connect', 'Disconnect', 'Live', 'Store', 'Start', and 'Stopp'. The 'Letzte Messung' section shows a graph with the following data series: actForce (red), setForce (black), actPressure (green), and setPressure (blue). The graph shows force and pressure increasing over time and then dropping to zero.

Carrier-ID	Starttime
3	15.11.2022 16h 3min 17s 104ms

Force (N) vs. Time since start of measurement (ms) and Pressure (bar) vs. Time since start of measurement (ms) graph data (approximate values):

Time (ms)	actForce (N)	setForce (N)	actPressure (bar)	setPressure (bar)
0	0	0	0	0
2000	15	40	1.5	2.5
4000	45	55	2.5	3.0
6000	55	60	3.0	3.0
8000	60	60	3.0	3.0
10000	60	60	3.0	3.0
12000	0	0	0	0

Letzte 5 Messungen

Zum Download auf das jeweilige Icon drücken

1671116597104	1671116571333	1671116554602	1671116536558	1671116519897
---------------	---------------	---------------	---------------	---------------

SmartFactory@OST: JSON Data from REST-API

```
{"datapoints":
```

```
[
```

```
{
```

```
"time": "2022-12-15T14:31:53.908Z",  
"actForce": 0.9033478498458862,  
"actPressure": 0.03900265693664551,  
"setForce": 0.0,  
"setPressure": 5.548867557081394E-5,  
"carrierID": "3",  
"startTime": "1671114713908"
```

```
},
```

```
{
```

```
...
```

```
}
```

```
]
```

```
}
```

Timestamp of measurement

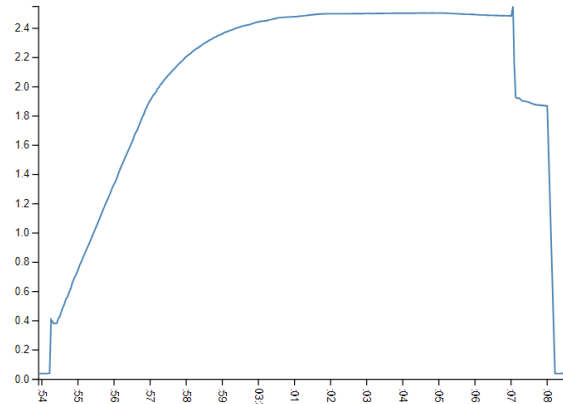
Measurement values

Transportation box

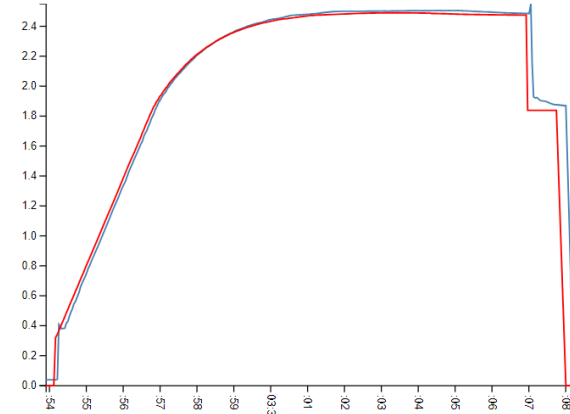
Start time of production

SmartFactory@OST: Exercises

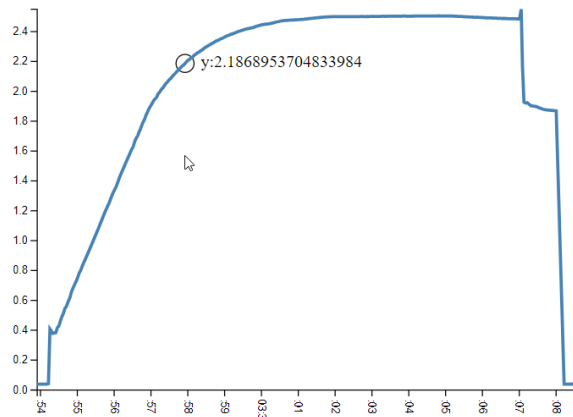
Aufgabe 1 - Single Line-Chart



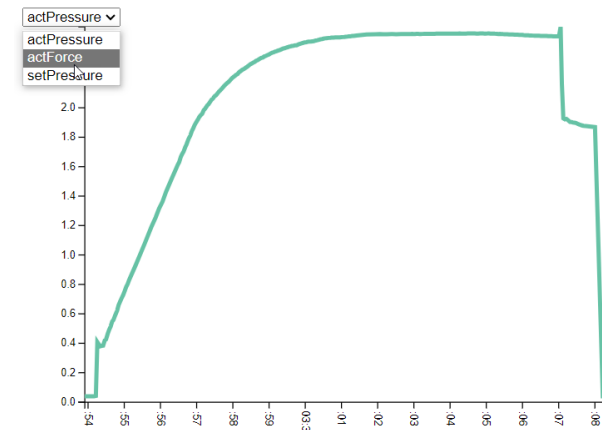
Aufgabe 2 - Multi Line-Chart



Aufgabe 3 - Single Line-Chart (Tooltip)



Aufgabe 4 - Single Line-Chart (Selection)



Literature

Abela, A. V. (2013). *Advanced presentations by design: Creating communication that drives action* (Second edition). Pfeiffer, A Wiley Imprint.