

From Code to Story

**Interactive Visualization in Python
for Effective Communication**

21 December 2023

Mattijn van Hoek
Michelle Rudolph





Image by tirachardz on Freepik



https://img.lemde.fr/2023/09/16/0/0/4605/3070/1440/960/60/0/263fc0_2023-09-16t094023z-225015559-rc2h93a3clkq-rtrmadp-3-libya-storm-derna.JPG



Image by Kireyonok_Yuliya on Freepik



Image by wavebreakmedia_micro on Freepik



Image by wavebreakmedia_micro on Freepik





Image by wavebreakmedia_micro on Freepik



Image by wirestock on Freepik

Who are we and why are we here?



Michelle Rudolph

Engineer, social scientist,
visual designer

rudolph@hkv.nl



Mattijn van Hoek

Data Scientist & Information
specialist.

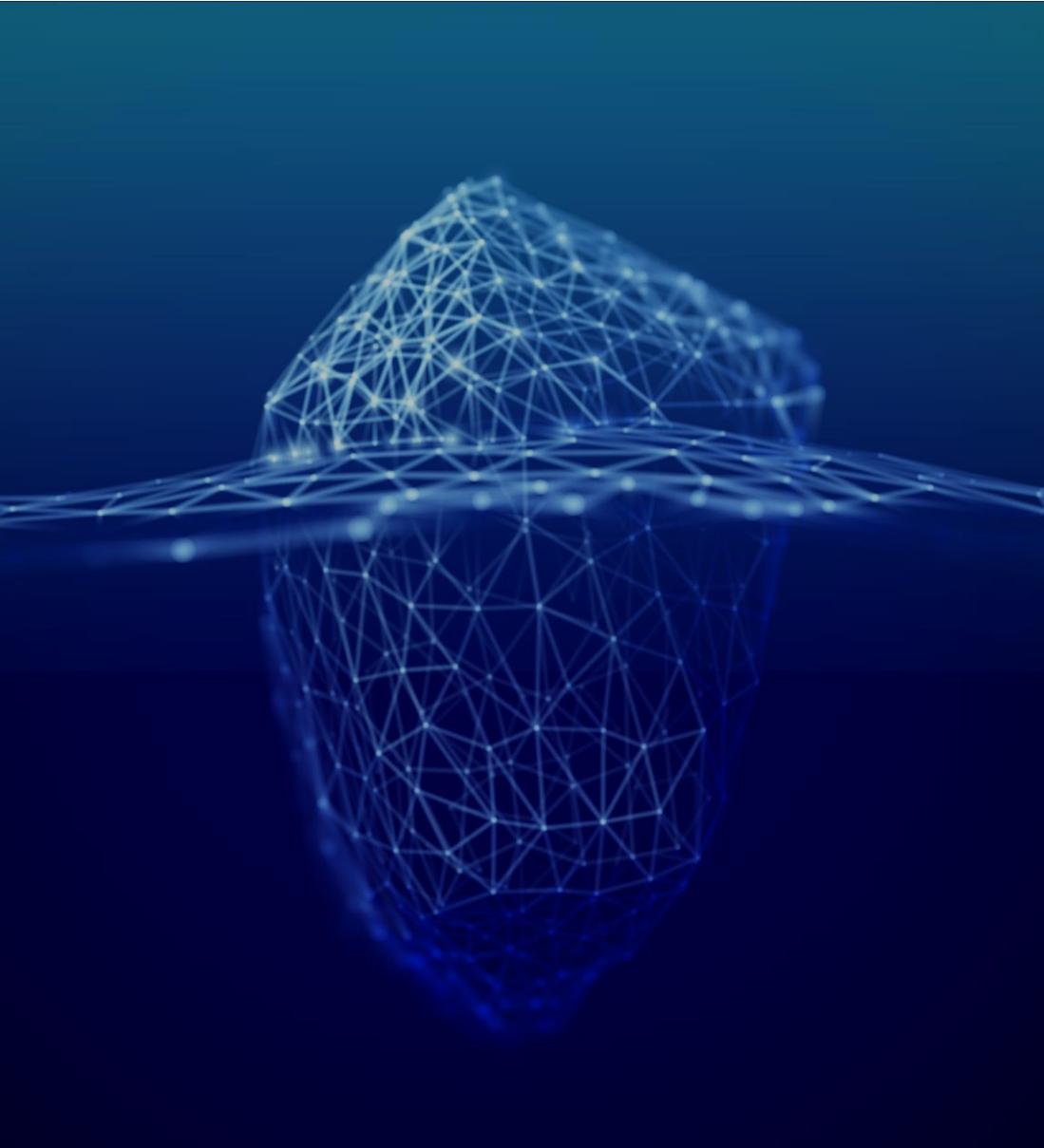
hoek@hkv.nl

"Important findings often fail to make their mark due to poor communication.

I want to contribute to a world in which our efforts have an impact and help us in reaching our full potential."

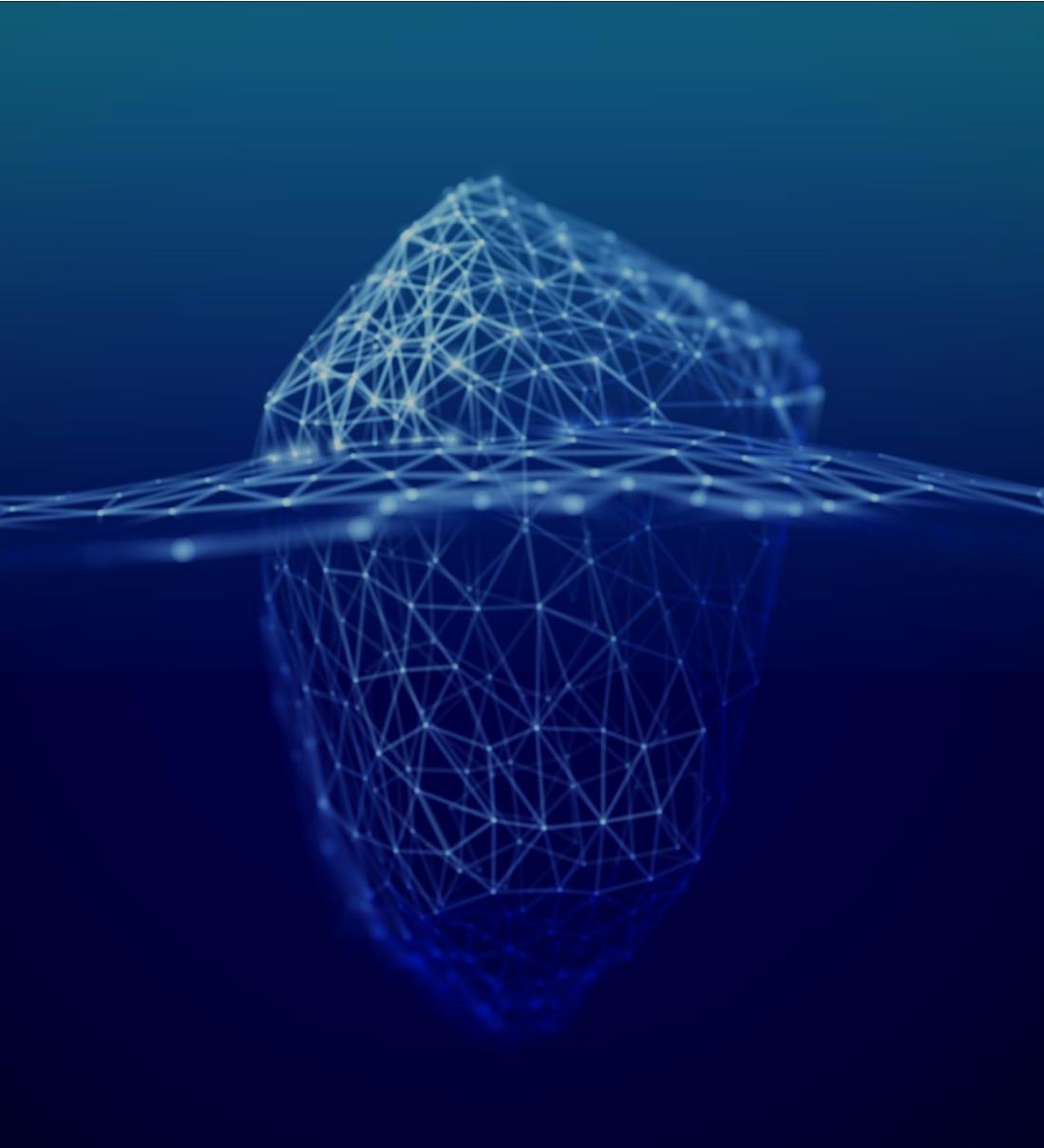
"I like to adopt innovative solutions and fresh ideas to gain improved insight.

Push adoption of developing interactive visualizations as data scientist in the water sector."



Agenda

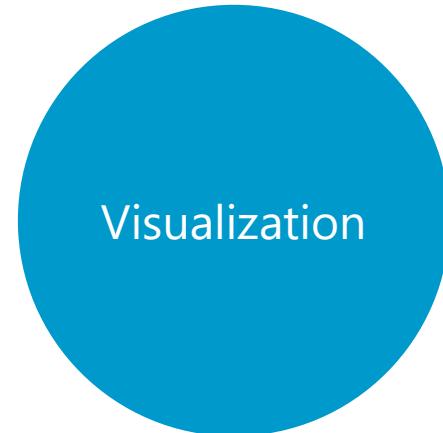
- **Point of departure**
- **Steps in the process**
- **Application**
- **Closing**



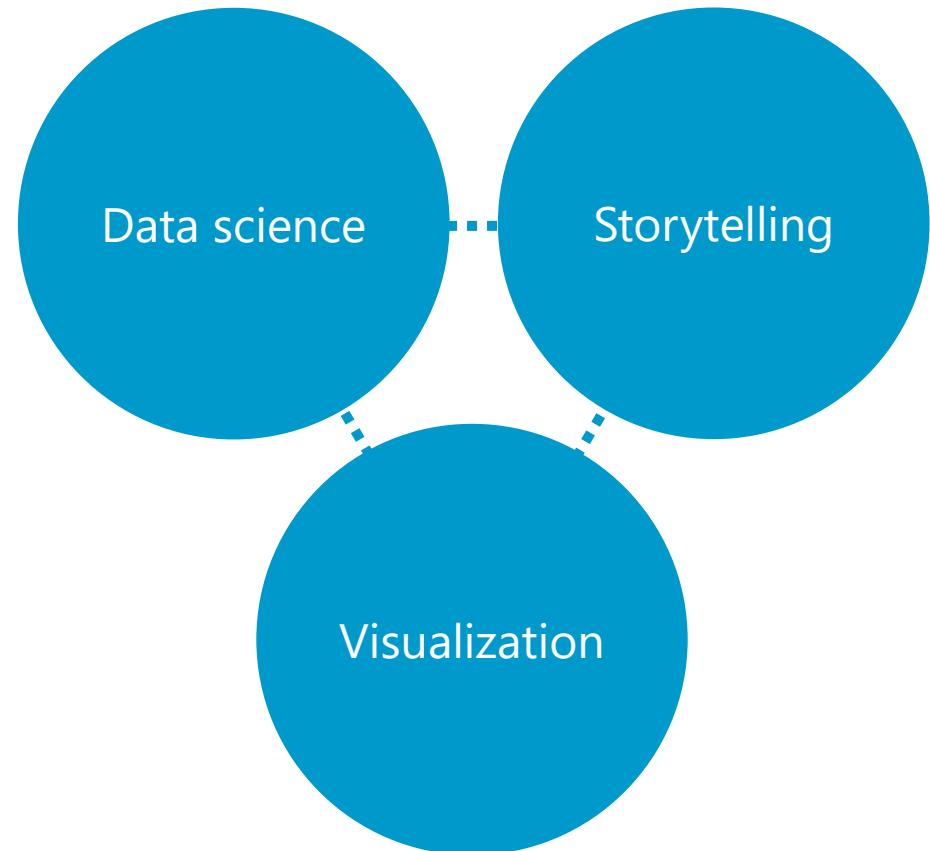
Agenda

- **Point of departure**
- **Steps in the process**
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Point of departure
Joining the dots



Point of departure
Joining the dots



Point of departure **Motivation - Storytelling**

“Research shows our brains are not hard-wired
to understand logic or retain facts for very long.

Our brains are wired to understand and
retain stories.”

Jennifer Aaker



<https://www.mindgardener.com/blog/2018/4-simple-storytelling-rule>; https://wildanacrow.com/wp-content/uploads/2020/03/20200223-DSC_0314.jpg

Point of departure **Motivation - Storytelling**

"When the brain detects an emotionally charged event, the amygdala releases dopamine into the system. Because dopamine greatly aids memory and information processing, you could say it creates a Post It note that reads, 'Remember this.'"

John Medina



<https://www.mindgardener.com/blog/2018/4-simple-storytelling-rule>; Image by lcd2020 on Freepik

Point of departure

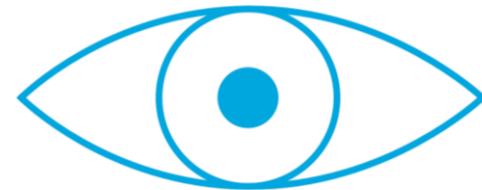
Motivation – Two numbers



Stories are about

12 times

more memorable than statistics.



90 %

of information is transmitted to
the brain is visual.

Heath and House, 2007

<https://blog.videoscribe.co/5-storytelling-facts-that-will-blow-your-mind>

<https://demandspring.com/blog/the-science-behind-storytelling/>

<https://www.shiftelelearning.com/blog/bid/350326/studies-confirm-the-power-of-visuals-in-elearning>

Point of departure **KnowWonder**

What do you **know** already?

and

What do you **wonder** about?



Point of departure

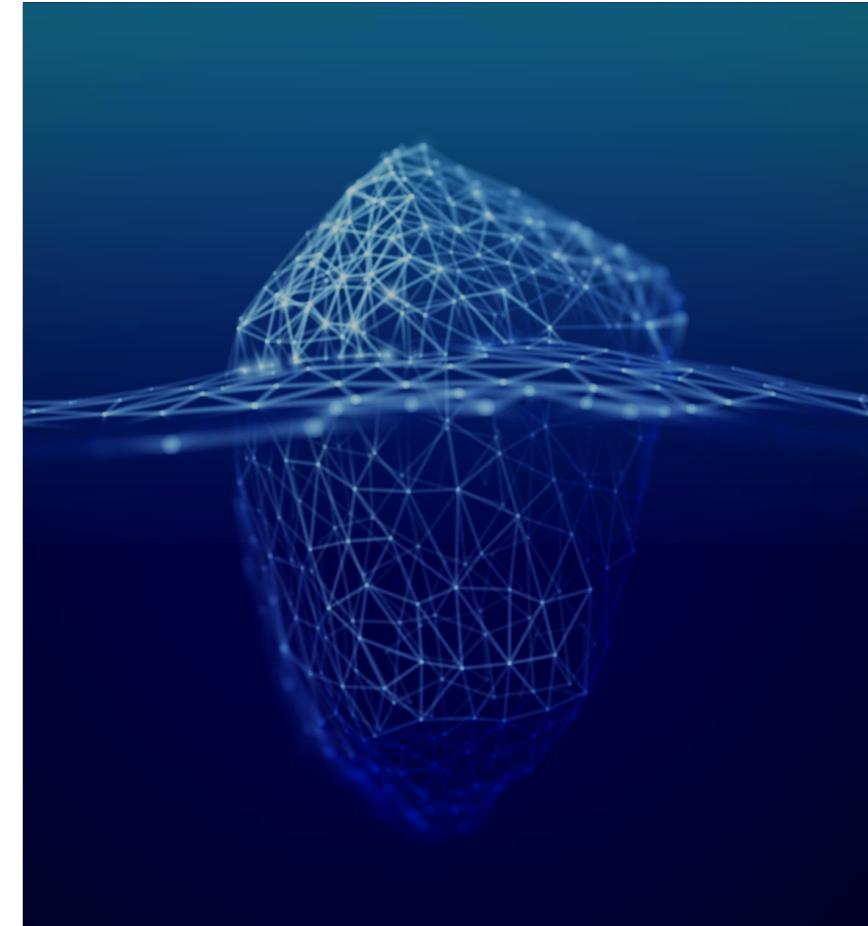
Our objectives

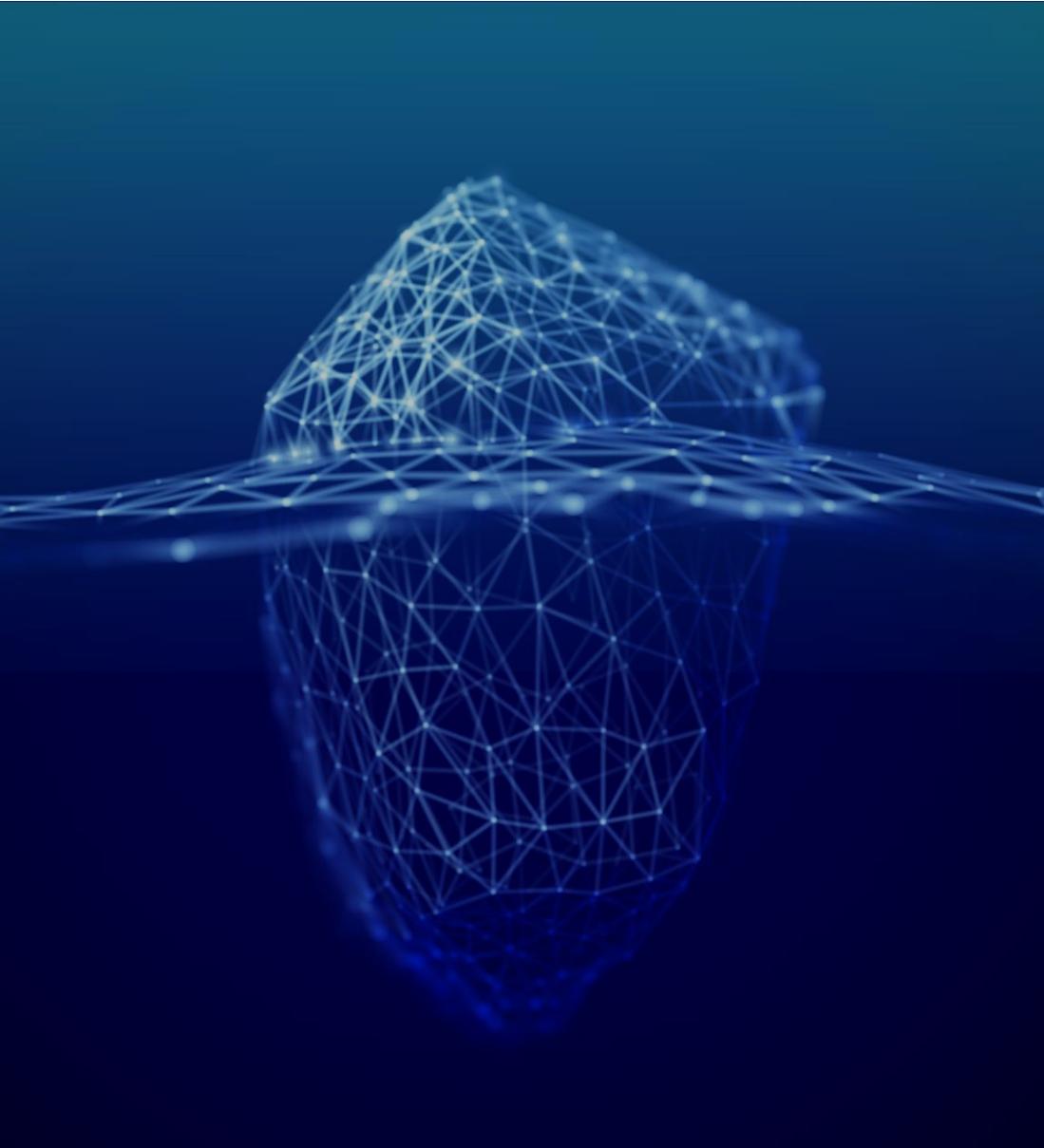
By the end of the session, you have

- learned and applied the basics of effective (visual) communication
- written your own Vega-Altair code
- used storytelling to convey your message
- had fun ☺

Bonus

- gotten enthusiastic about the topic and want to learn more





Agenda

- **Point of departure**
- **Steps in the process**
- **Application**
- **Closing**

Steps in the process

From code to story

- Objective
- Audience
- Data exploration
- Key insights
- Storyline
- Visualization
- Testing and iterating
- Presenting



<https://img.oastatic.com/img2/54455918/max/variant.jpg?revbust=e02e7349>

Steps in the process

From code to story

- **Objective**
- **Audience**
- Data exploration
- Key insights
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<https://img.oastatic.com/img2/54455918/max/variant.jpg?revbust=e02e7349>

Steps in the process

Objective

- Define the purpose of your study
 - What do you aim to convey or discover through analysing the data?
- Examples
 - Enhancing understanding
 - Supporting a decision
 - Eliciting behavioural change



Image by wirestock on Freepik

Steps in the process

Audience

- Know your target audience
 - What is their knowledge over the topic?
 - What are their interests and information needs?
- Tips:
 - Gather information about your audience
 - Talk to your audience
 - Empathize with your audience
 - Create personas (detailed fictional representations)



Image by Freepik

Steps in the process

From code to story

- Objective
- Audience
- **Data exploration**
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<https://img.oastatic.com/img2/54455918/max/variant.jpg?revbust=e02e7349>

Steps in the process

Data exploration – In Python

- Focus on Python
- Focus on Vega Altair.
 - Theory on interactive grammar of graphics

DATA



SORTED



ARRANGED



PRESENTED VISUALLY



EXPLAINED WITH A STORY

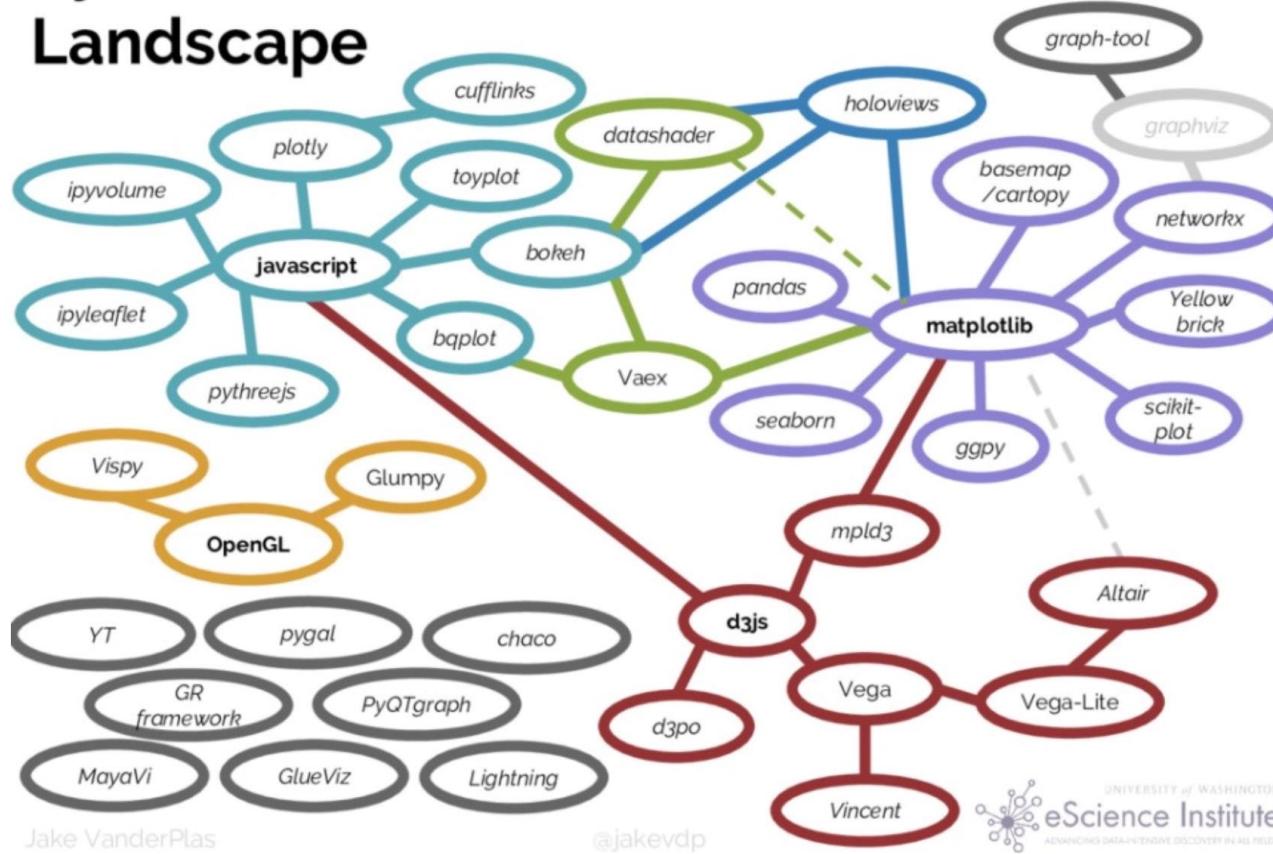


https://es.linkedin.com/posts/m%C3%B3nicarosalesa_comunicacionnumerica-datastorytelling-activity-6835938645531344896-Wi6Z

Steps in the process

History of data visualization in Python

Python's Visualization Landscape

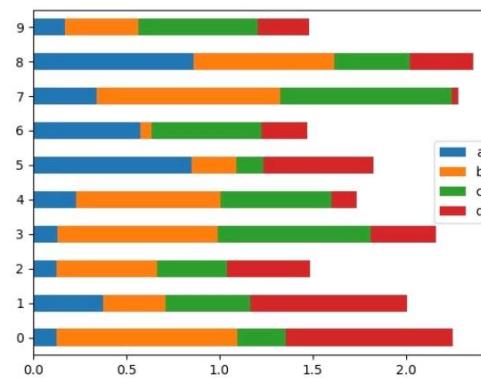
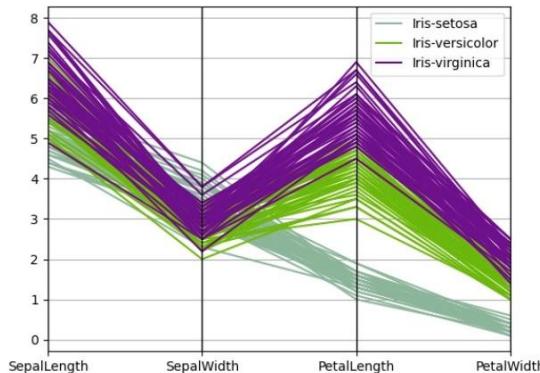
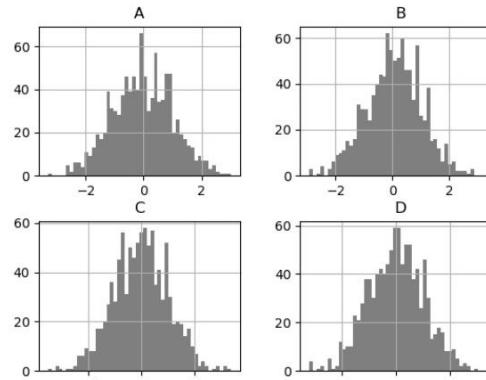
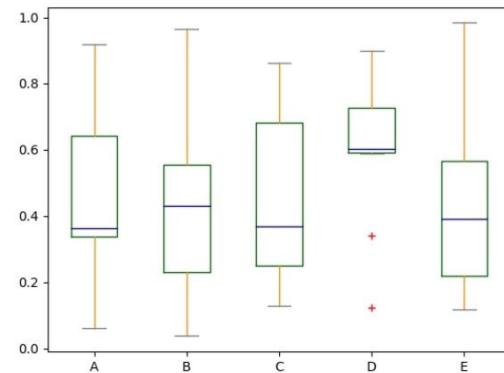


Jake VanderPlas – <https://speakerdeck.com/jakevdp/pythons-visualization-landscape-pycon-2017?slide=36>

Steps in the process

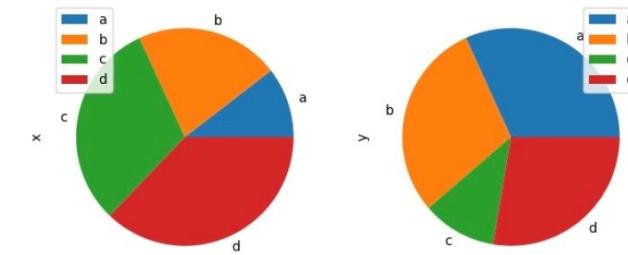
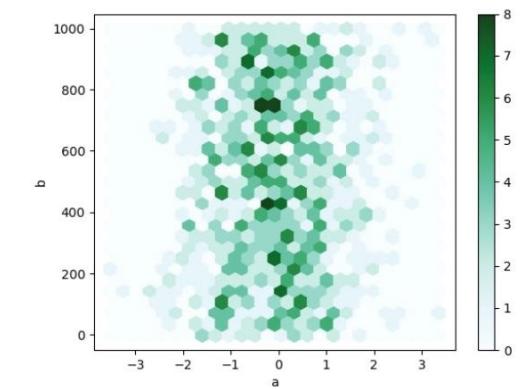
Pandas

https://pandas.pydata.org/pandas-docs/stable/user_guide/visualization.html



Very handy when just need some simple visualizations while you're already using Pandas

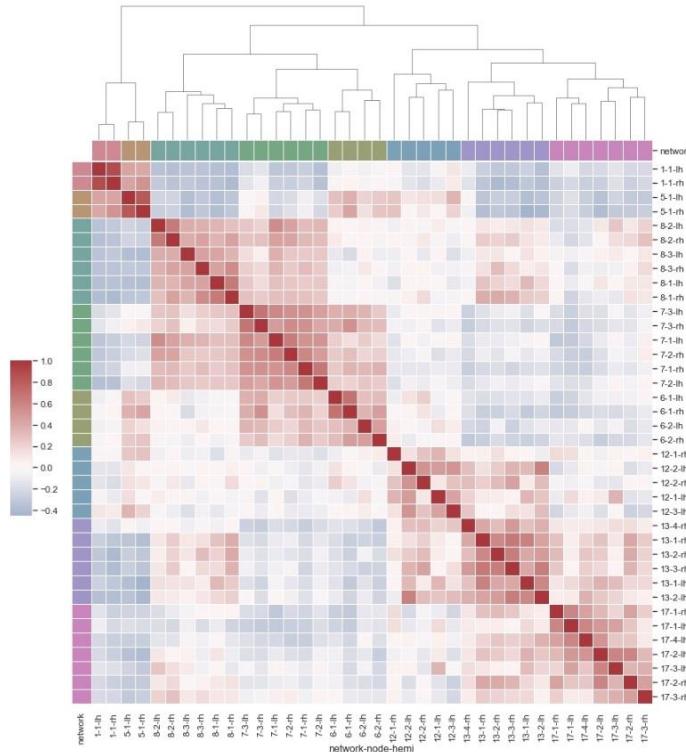
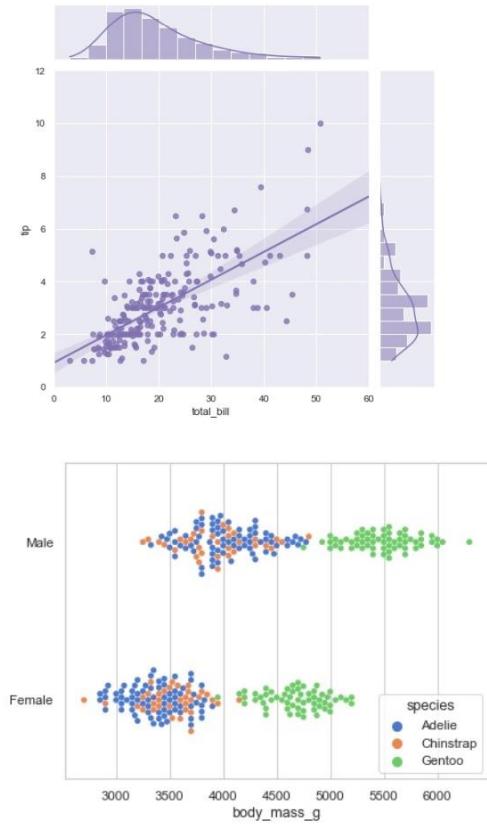
- Doesn't want tidy data (good/bad)
- Includes subplots



Steps in the process

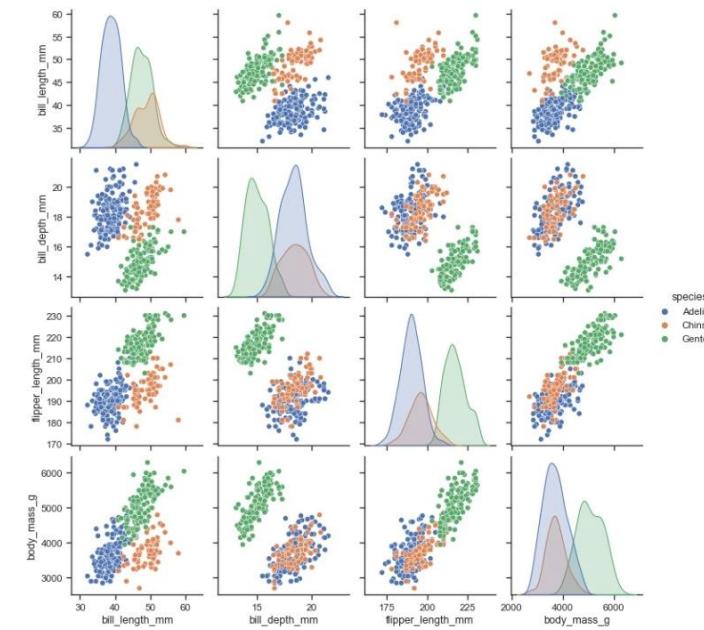
Seaborn

https://seaborn.pydata.org/examples/regression_marginals.html



Lots of pre-made complicated plots, but that means I need to remember lots of commands:

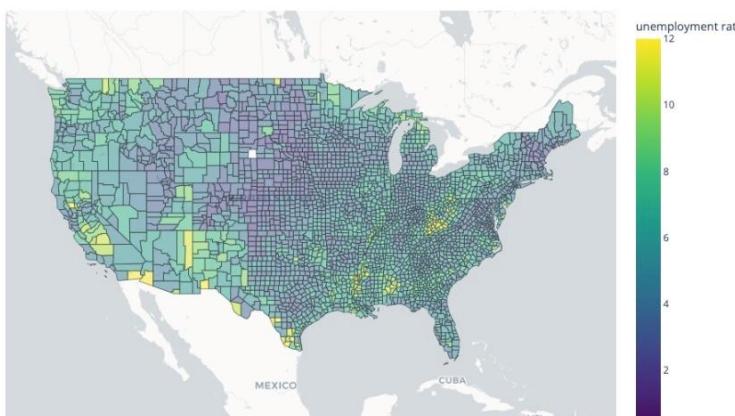
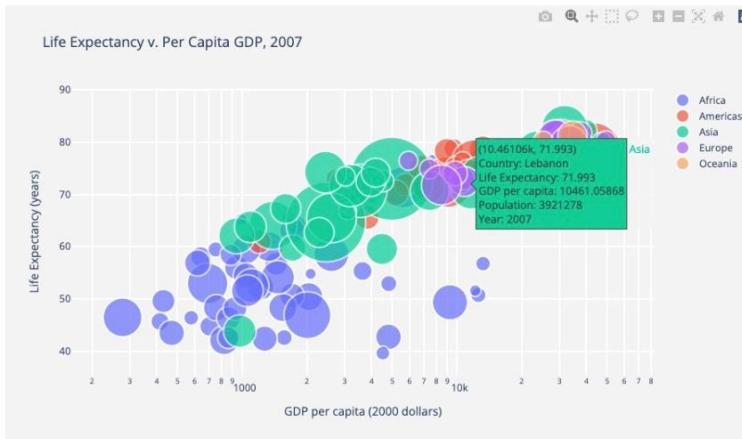
- Uses tidy data
- Hierarchically clustered heatmap
- Pairs grid
- Faceted plots
- Distributions



Steps in the process

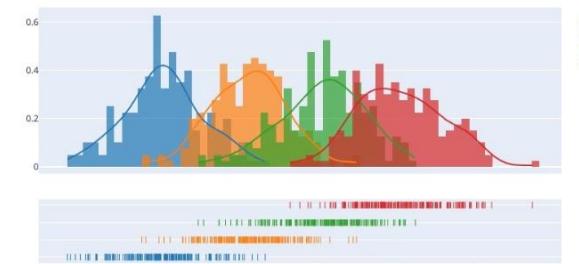
Plotly

<https://plotly.com/python/>

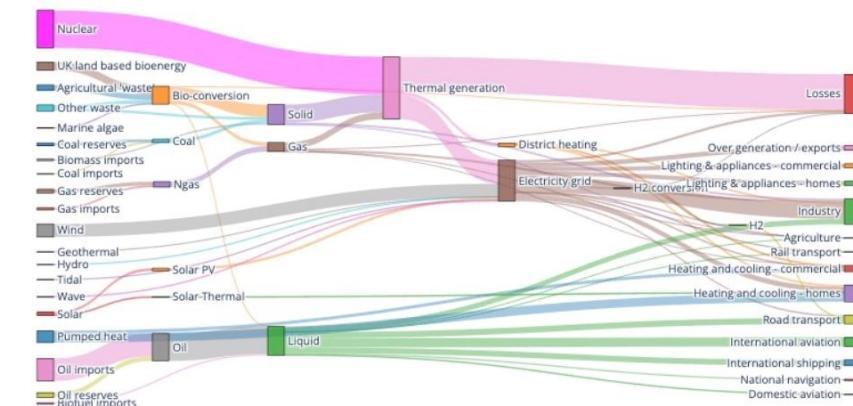


Lots of pre-made, complicated plots, but I forget the interface

- Plus interaction
- With Dash dashboards
- Some focus on machine learning
- Multi-language
- Have to install Jupyter plugin to work in notebooks



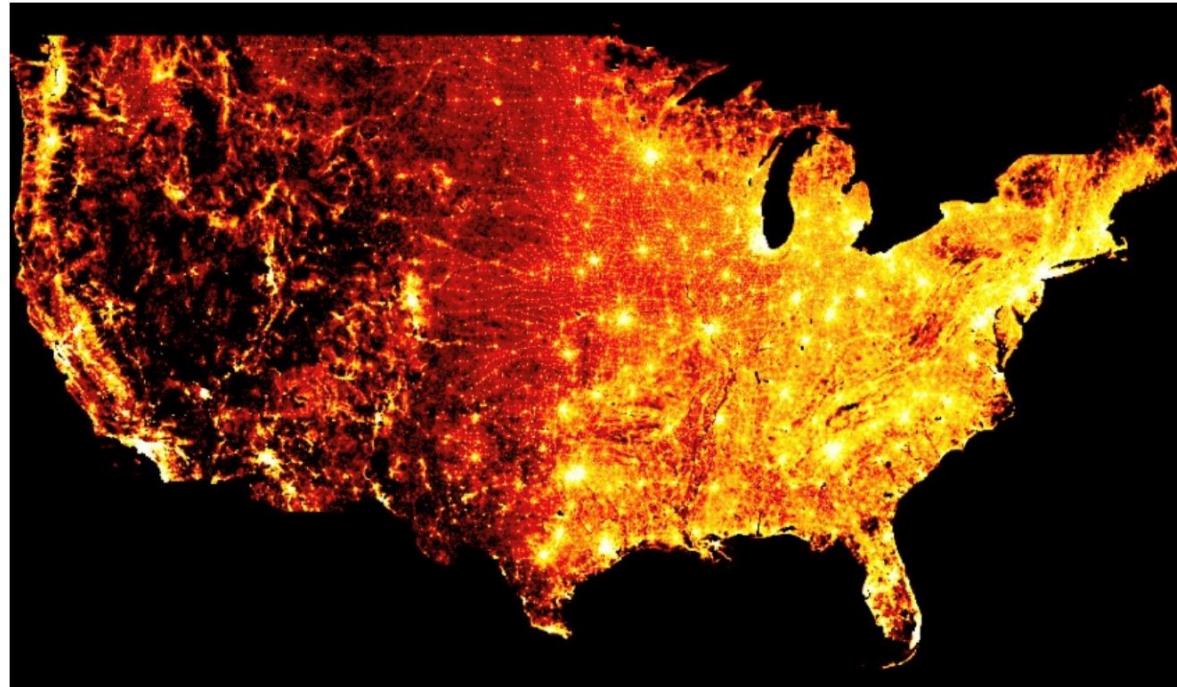
Energy forecast for 2050
Source: Department of Energy & Climate Change, Tom Counsel via [Mike Bostock](#)



Steps in the process

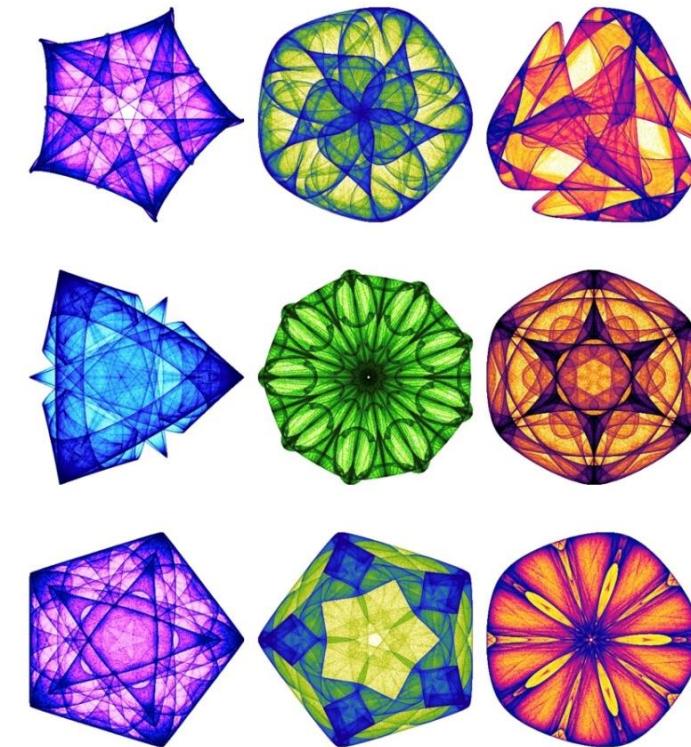
Datashader

<https://datashader.org/>

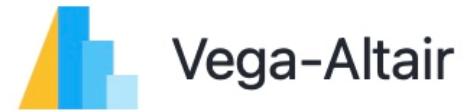


Graphics pipeline for rendering super large data

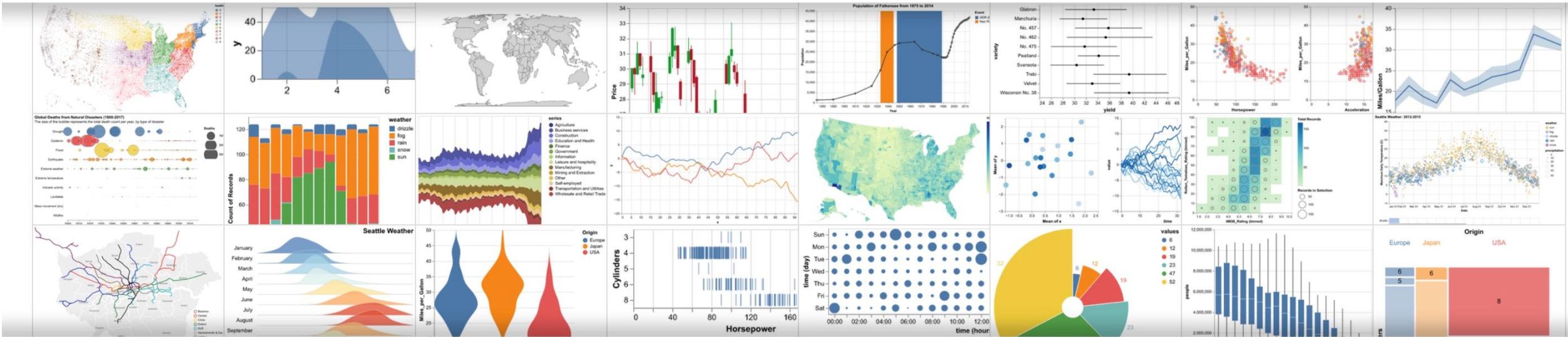
- Compiled to machine code using Numba
- CPU/GPU distribution
- Part of HoloViz – with HoloViews, hvPlot
- Part of the Bokeh world for high-performance



Steps in the process



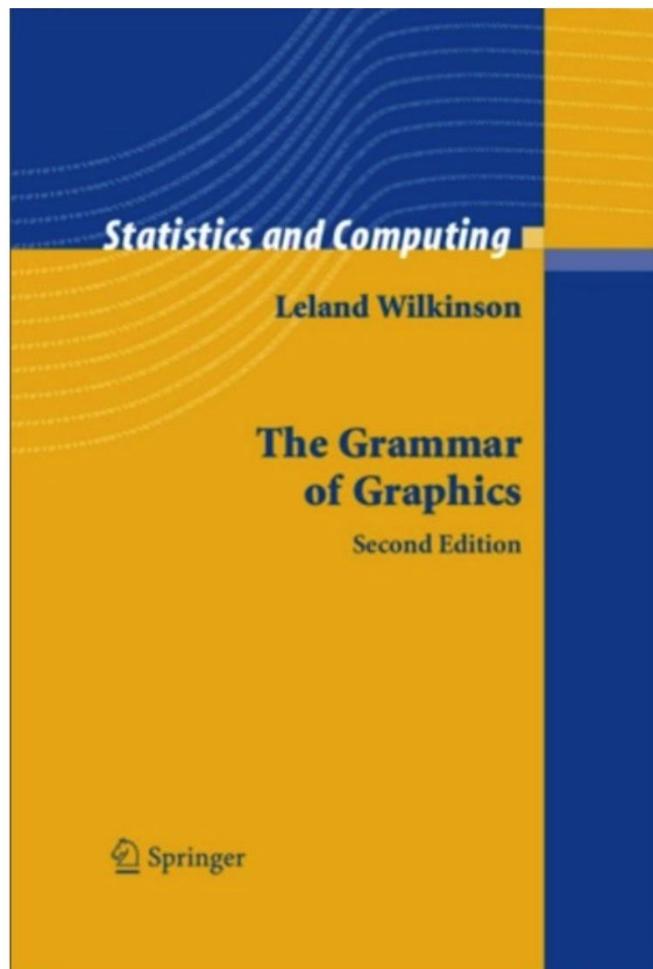
Vega-Altair: Declarative Visualization in Python



Vega-Altair is a declarative visualization library for Python. Its simple, friendly and consistent API, built on top of the powerful [Vega-Lite](#) grammar, empowers you to spend less time writing code and more time exploring your data.

<https://altair-viz.github.io/>

Steps in the process



“Just like a grammar helps us compose words into sentences in English, The Grammar of Graphics provides primitive building blocks to compose an expressive range of visualizations.”

<https://www.dmoritz.de/talks/VegaLite-OpenVisConf-2017.pdf>

Steps in the process

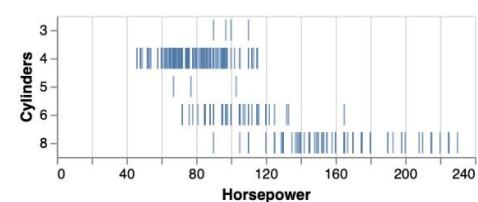
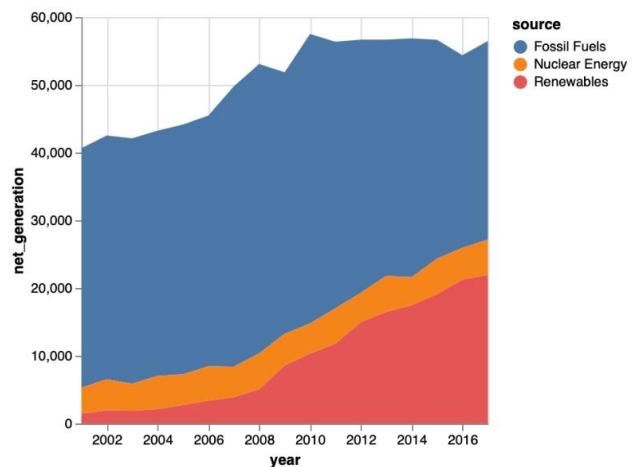
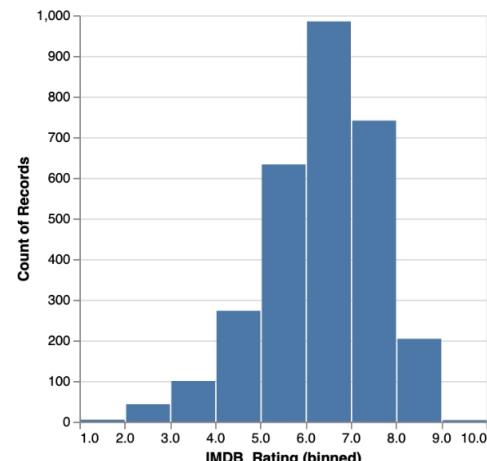
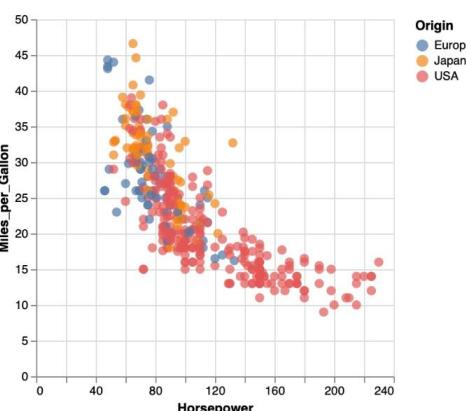
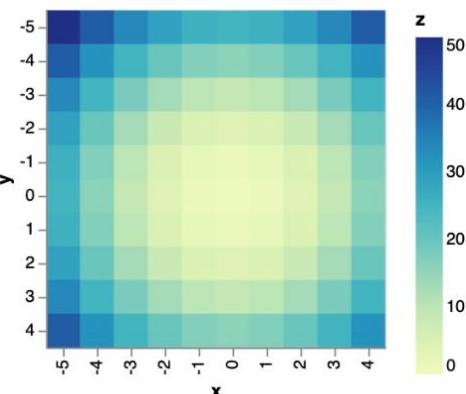
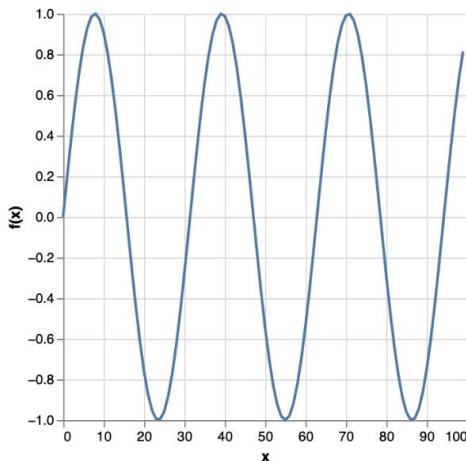
Grammar of Graphics: building blocks for visual encodings

Data	Input data source to visualize
Transform	Filter, aggregation, binning, etc
Mark	Data-representative graphics
Encoding	Mapping between data and mark properties
Scale	Functions that map data values to visual values
Guides	Axes & legends that visualize scales

Steps in the process

Marks

Mark	Method	Description
Arc	<code>mark_arc()</code>	A pie chart.
Area	<code>mark_area()</code>	A filled area plot.
Bar	<code>mark_bar()</code>	A bar plot.
Circle	<code>mark_circle()</code>	A scatter plot with filled circles.
Geoshape	<code>mark_geoshape()</code>	Visualization containing spatial data
Image	<code>mark_image()</code>	A scatter plot with image markers.
Line	<code>mark_line()</code>	A line plot.
Point	<code>mark_point()</code>	A scatter plot with configurable point shapes.
Rect	<code>mark_rect()</code>	A filled rectangle, used for heatmaps
Rule	<code>mark_rule()</code>	A vertical or horizontal line spanning the axis.
Square	<code>mark_square()</code>	A scatter plot with filled squares.
Text	<code>mark_text()</code>	A scatter plot with points represented by text.
Tick	<code>mark_tick()</code>	A vertical or horizontal tick mark.
Trail	<code>mark_trail()</code>	A line with variable widths.



https://altair-viz.github.io/user_guide/marks/index.html

Steps in the process

Transformations

Transform	Method	Description
Aggregate	<code>transform_aggregate()</code>	Create a new data column by aggregating an existing column.
Bin	<code>transform_bin()</code>	Create a new data column by binning an existing column.
Calculate	<code>transform_calculate()</code>	Create a new data column using an arithmetic calculation on an existing column.
Density	<code>transform_density()</code>	Create a new data column with the kernel density estimate of the input.
Extent	<code>transform_extent()</code>	Find the extent of a field and store the result in a parameter.
Filter	<code>transform_filter()</code>	Select a subset of data based on a condition.
Flatten	<code>transform_flatten()</code>	Flatten array data into columns.
Fold	<code>transform_fold()</code>	Convert wide-form data into long-form data (opposite of pivot).
Impute	<code>transform_impute()</code>	Impute missing data.
Join	<code>transform_joinaggregate()</code>	Aggregate transform joined to original data.
Aggregate		
LOESS	<code>transform_loess()</code>	Create a new column with LOESS smoothing of data.
Lookup	<code>transform_lookup()</code>	One-sided join of two datasets based on a lookup key.
Pivot	<code>transform_pivot()</code>	Convert long-form data into wide-form data (opposite of fold).
Quantile	<code>transform_quantile()</code>	Compute empirical quantiles of a dataset.
Regression	<code>transform_regression()</code>	Fit a regression model to a dataset.
Sample	<code>transform_sample()</code>	Random sub-sample of the rows in the dataset.
Stack	<code>transform_stack()</code>	Compute stacked version of values.
TimeUnit	<code>transform_timeunit()</code>	Discretize/group a date by a time unit (day, month, year, etc.)
Window	<code>transform_window()</code>	Compute a windowed aggregation

Data Transformations

It is often necessary to transform or filter data in the process of visualizing it.
In Altair you can do this one of two ways:

1. Before the chart definition, using standard pandas data transformations.
2. Within the chart definition, using Vega-Lite's data transformation tools.

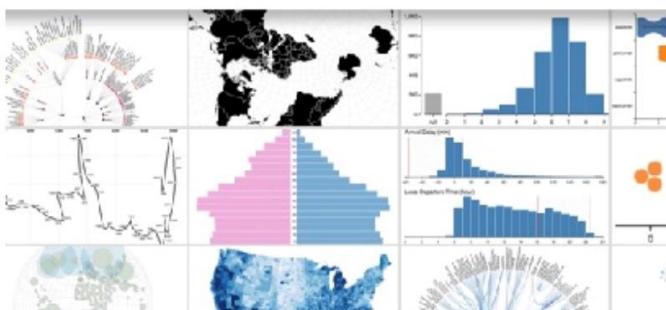
https://altair-viz.github.io/user_guide/transform/index.html

Steps in the process

Grammar of Graphics for Customized Designs



Vega – A Visualization Grammar



Offer **fine-grained control** for composing interactive graphics.

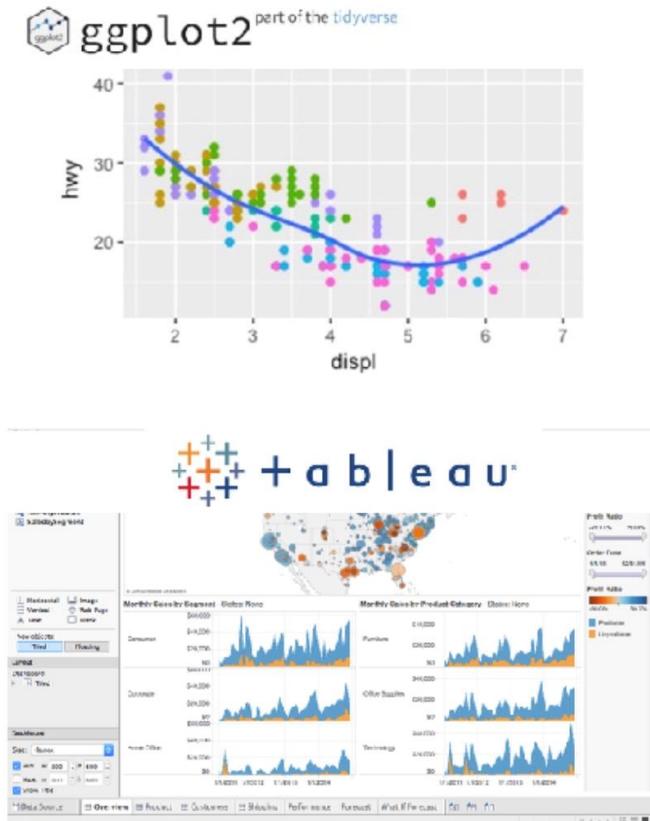
But require **verbose** specifications and technical expertise.

For example, creating a bar chart in D3 requires a few dozen lines of code and some knowledge of JavaScript and SVG.

<https://www.domoritz.de/talks/VegaLite-OpenVisConf-2017.pdf>

Steps in the process

Grammar of Graphics for Exploration



Facilitate **rapid exploration** with **concise specifications** by omitting low-level details.

Infer **sensible defaults** and allow customization by overriding defaults.

But **not creating a general specification** and **limited support for interactions**.

<https://www.domoritz.de/talks/VegaLite-OpenVisConf-2017.pdf>

Steps in the process

Vega-Lite's Mission

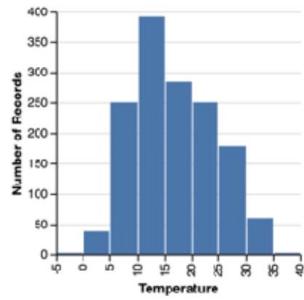
Facilitate *exploratory data analysis*
with an *expressive* yet *concise* language to
specify *interactive multi-view graphics*

<https://www.domoritz.de/talks/VegaLite-OpenVisConf-2017.pdf>

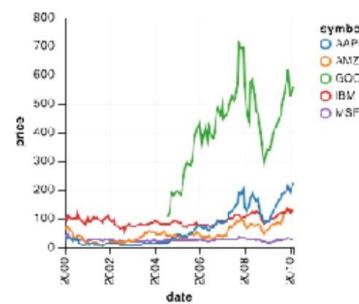
Steps in the process

Vega-Lite: a Grammar of Graphics

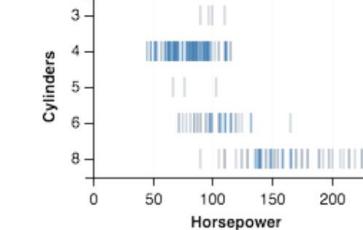
Histogram



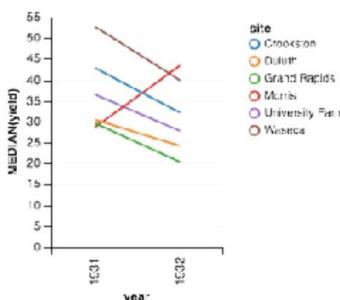
Multi-series Line Chart



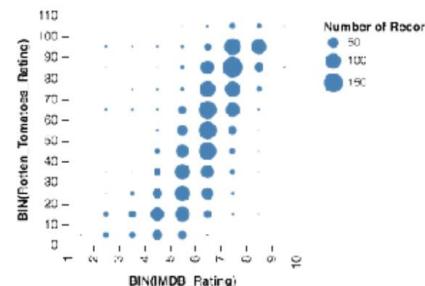
Stripplot



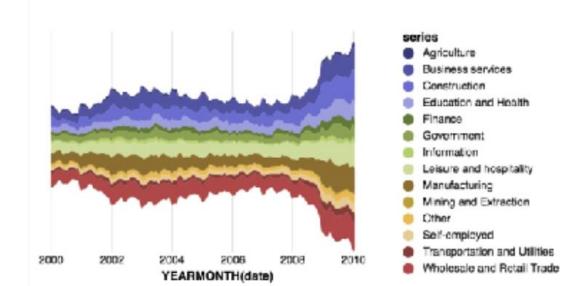
Slope Graph



Binned Scatterplot



Area Chart

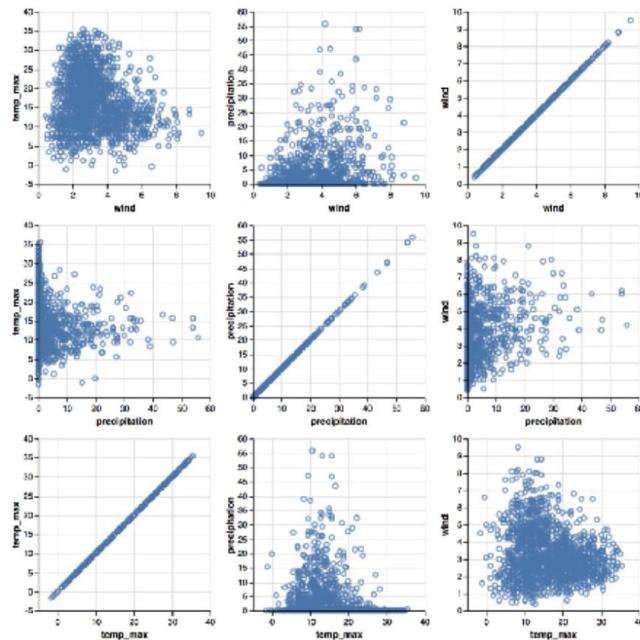


<https://www.domoritz.de/talks/VegaLite-OpenVisConf-2017.pdf>

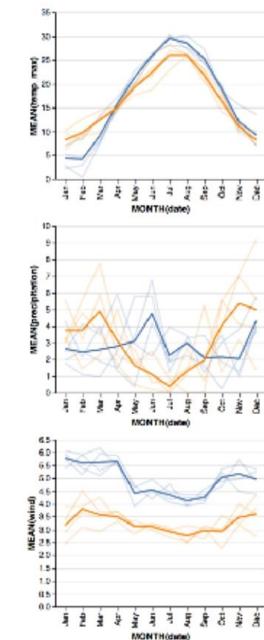
Steps in the process

Vega-Lite: a Grammar of Multi-View Graphics

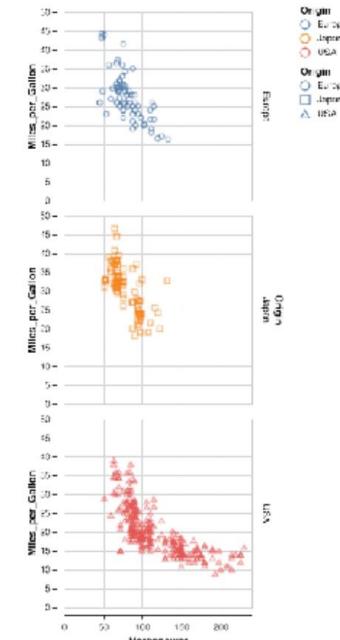
Scatterplot Matrix



Concatenated & Layered View



Faceted View

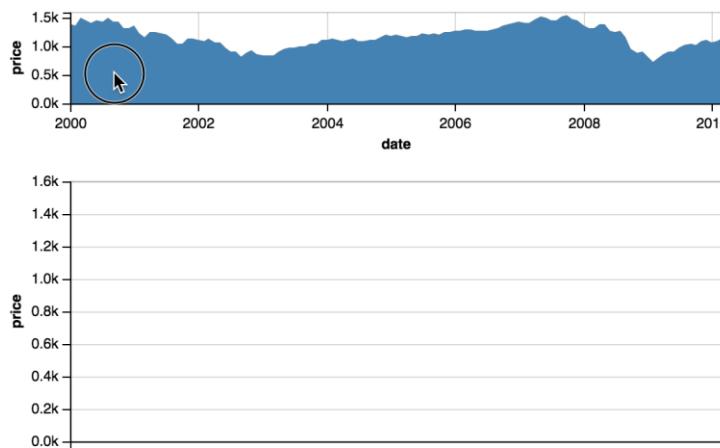


<https://www.domoritz.de/talks/VegaLite-OpenVisConf-2017.pdf>

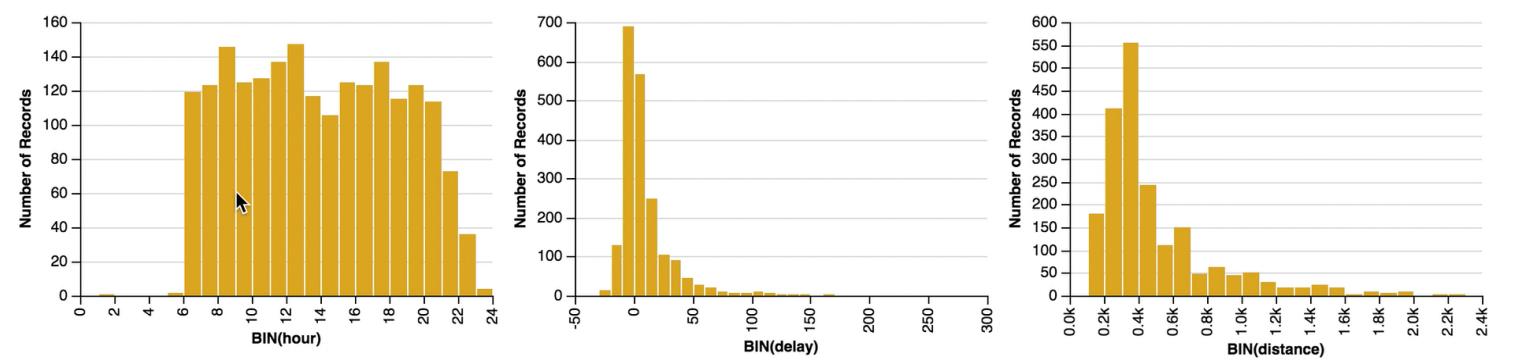
Steps in the process

Vega-Lite: a Grammar of Interactive Multi-View Graphics

Overview + Detail



Crossfilter

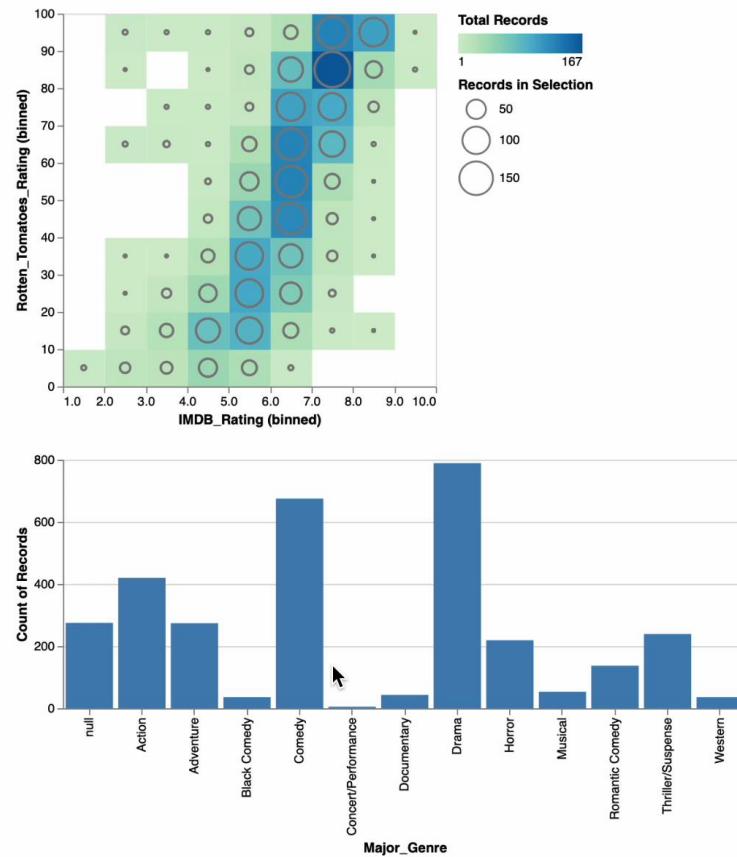


<https://www.domoritz.de/talks/VegaLite-OpenVisConf-2017.pdf>

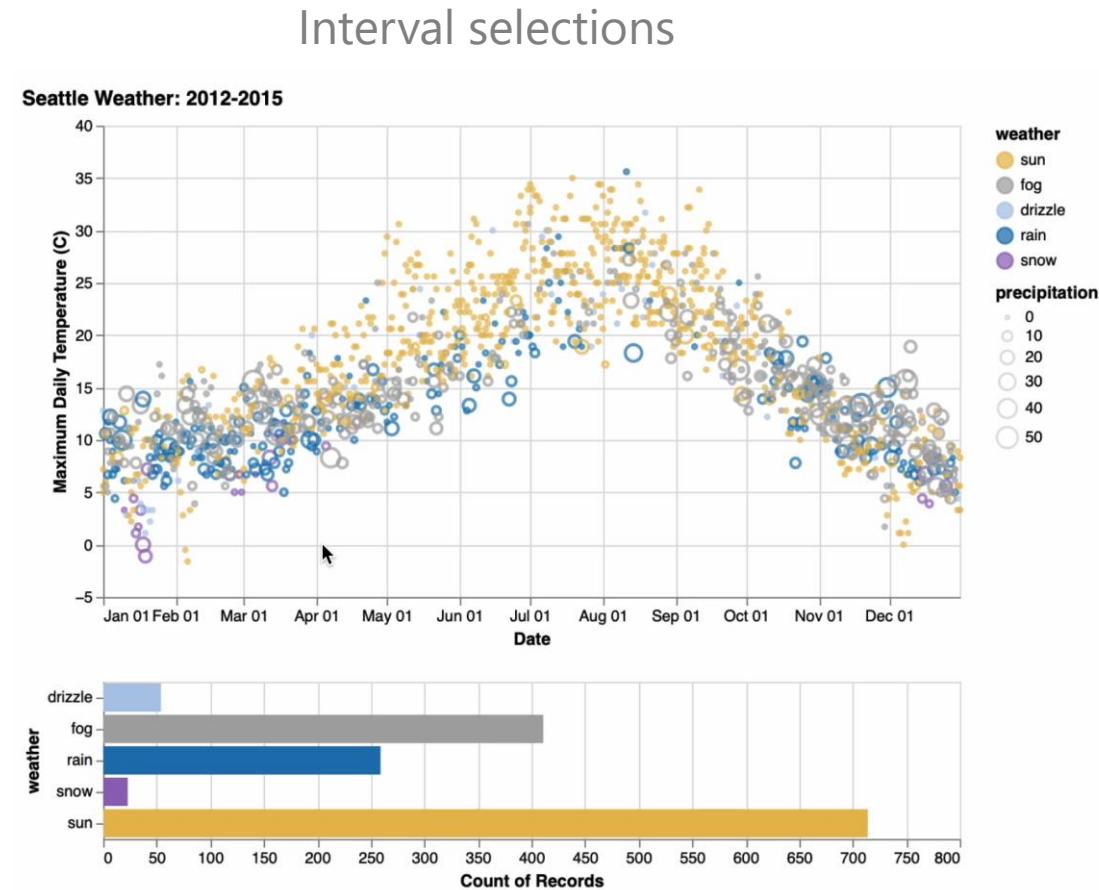
Steps in the process

Vega-Lite: a Grammar of Interactive Multi-View Graphics

Single selections



Interval selections



<https://www.domoritz.de/talks/VegaLite-OpenVisConf-2017.pdf>

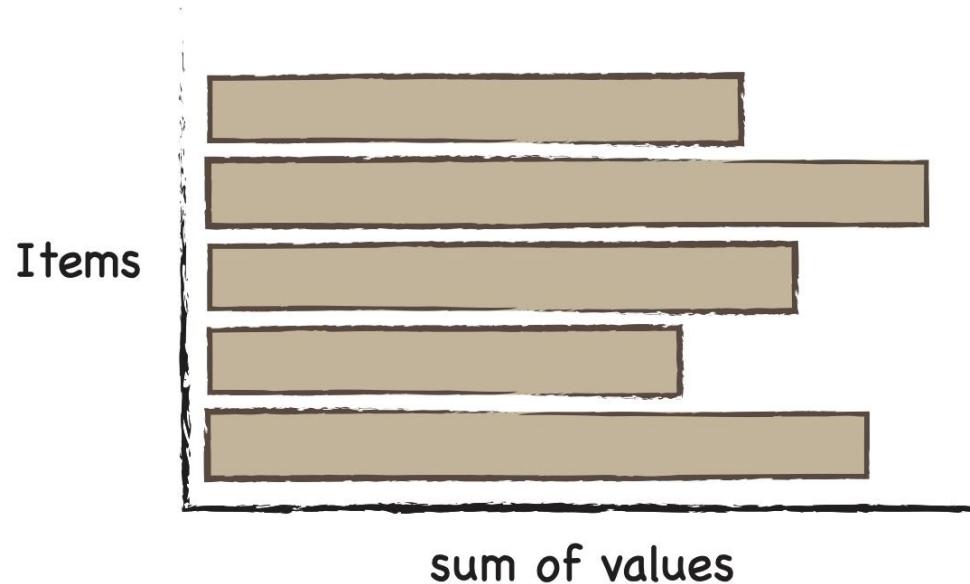
Steps in the process

Declare the chart you want to see



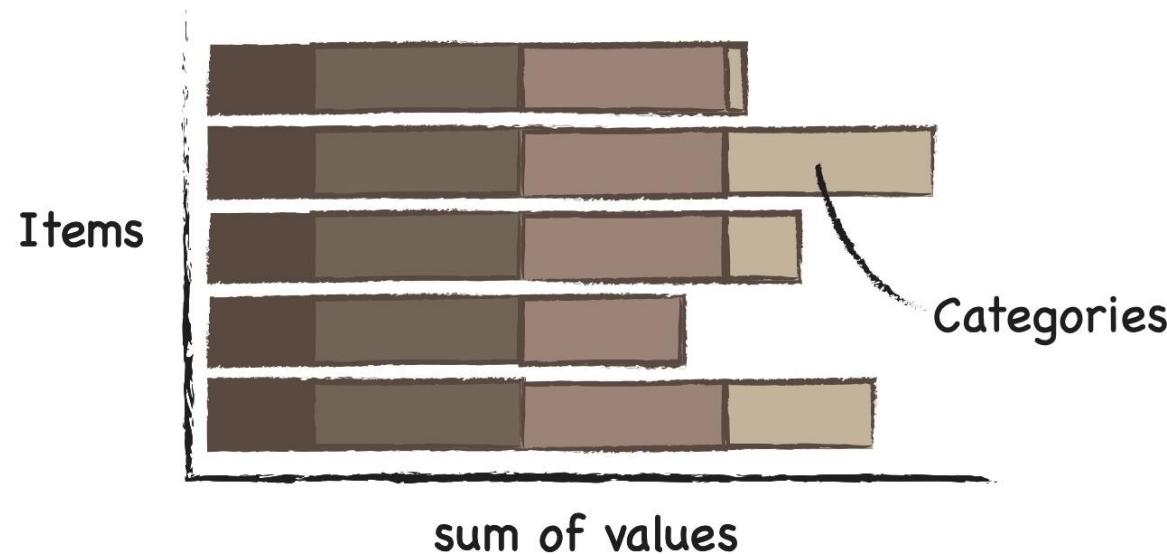
Steps in the process

Declare the chart you want to see



Steps in the process

Declare the chart you want to see



Steps in the process

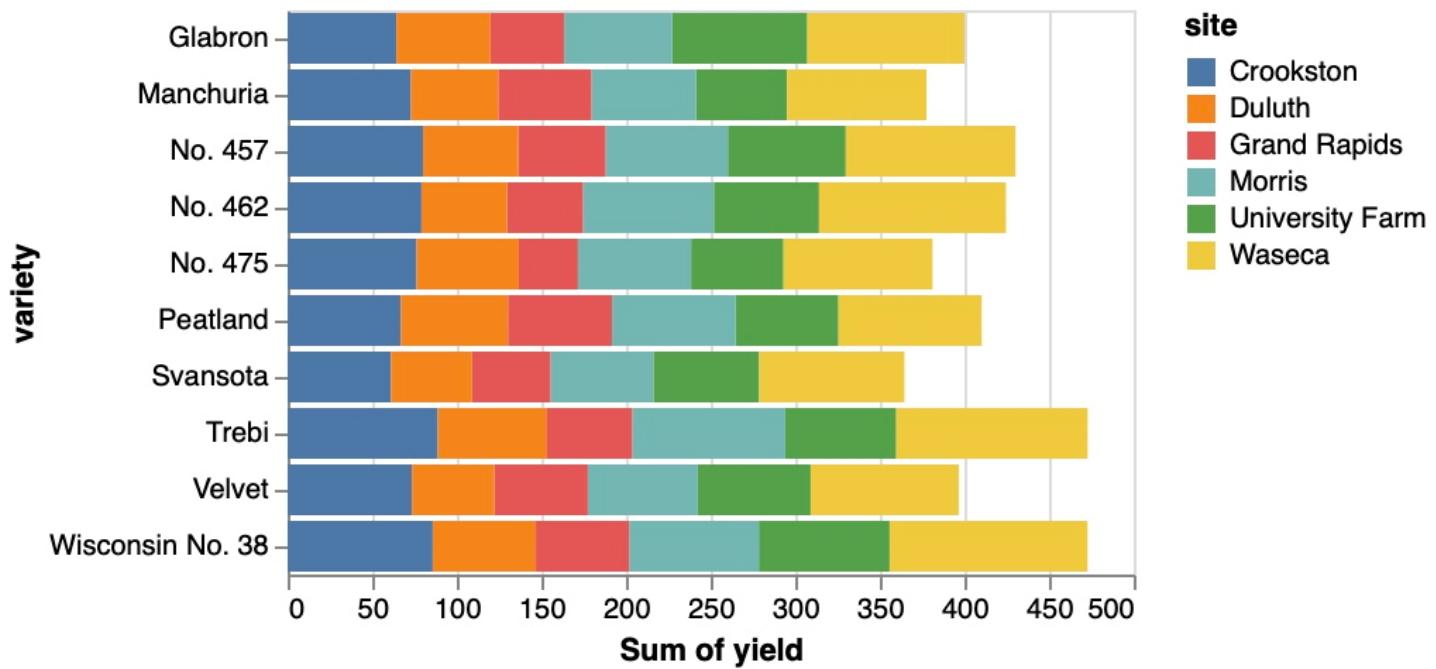
```
import altair as alt
from vega_datasets import data

source = data.barley()
source.head()
```

	yield	variety	year	site
0	27.00000	Manchuria	1931	University Farm
1	48.86667	Manchuria	1931	Waseca
2	27.43334	Manchuria	1931	Morris
3	39.93333	Manchuria	1931	Crookston
4	32.96667	Manchuria	1931	Grand Rapids

Steps in the process

```
alt.Chart(source).mark_bar().encode(  
    x='sum(yield)',  
    y='variety',  
    color='site'  
)
```



https://altair-viz.github.io/gallery/horizontal_stacked_bar_chart.html

Steps in the process

Add-ons

Large datafiles &
database
connections



Save as png/svg/pdf/
offline-html & more



Tile-layers Open
Street Map
basemaps

Vega-Altair

Python Dashboarding Landscape

PyGWalker

Solara

Shiny for
python

Streamlit

Dash

Quarto

Steps in the process

From code to story

- Objective
- Audience
- Data exploration
- **Key insights**
- Storyline
- Visualization
- Testing and iterating
- Presenting



<https://img.oastatic.com/img2/54455918/max/variant.jpg?revbust=e02e7349>

Steps in the process

Key insights

- Demo Notebook on Rotterdam Weather

The screenshot shows a web browser window with the URL <https://daggegevens.knmi.nl/klimatologie/uurgegevens>. The page is titled "Uurwaarden van weerstations". At the top, there are tabs for "Weerstations" and "Regenstations", with "Weerstations" being active. Below the tabs are buttons for "Dagwaarnemingen", "Uurwaarnemingen", and "Weer op je geboortedag". The main content area is titled "Selecteer parameters" and contains sections for "Periode" and "Velden". Under "Periode", there are input fields for "van" (20170101) and "tot" (20221231), and a checkbox for "Inseason". Under "Velden", there are checkboxes for "Alle velden" and "DD: Windrichting (in graden) gemiddeld over de laatste 10 minuten van het afgelopen uur (360=noord, 90=oost, 180=zuid,".

<https://daggegevens.knmi.nl/klimatologie/uurgegevens9>

Steps in the process

Key insights

```
# Opmerking: door stationsverplaatsingen en veranderingen in waarnemmethodieken zijn deze t#
# SOURCE: ROYAL NETHERLANDS METEOROLOGICAL INSTITUTE (KNMI)
# Comment: These time series are inhomogeneous because of station relocations and changes in
#
# STN      LON(east)    LAT(north)   ALT(m)      NAME
# 344      4.447        51.962       -4.30       Rotterdam
# FF       : Windsnelheid (in 0.1 m/s) gemiddeld over de laatste 10 minuten van het afgelopen
# T        : Temperatuur (in 0.1 graden Celsius) op 1.50 m hoogte tijdens de waarneming / T
# RH      : Uursom van de neerslag (in 0.1 mm) (-1 voor <0.05 mm) / Hourly precipitation a
# M        : Mist 0=niet voorgekomen; 1=wel voorgekomen in het voorgaande uur en/of tijdens
# R        : Regen 0=niet voorgekomen; 1=wel voorgekomen in het voorgaande uur en/of tijdens
# S        : Sneeuw 0=niet voorgekomen; 1=wel voorgekomen in het voorgaande uur en/of tijdens
# O        : Onweer 0=niet voorgekomen; 1=wel voorgekomen in het voorgaande uur en/of tijdens
# Y        : IJsvorming 0=niet voorgekomen; 1=wel voorgekomen in het voorgaande uur en/of t
# STN,YYYYMMDD,H,    FF,      T,     RH,      M,      R,      S,      O,      Y
344,20170101,      1,      40,      20,      -1,      1,      1,      0,      0,      0
344,20170101,      2,      40,      19,      0,      1,      0,      0,      0,      0
344,20170101,      3,      40,      16,      0,      0,      0,      0,      0,      0
344,20170101,      4,      50,      18,      0,      0,      0,      0,      0,      0
344,20170101,      5,      50,      11,      0,      0,      0,      0,      0,      0
```

- Demo Notebook on Rotterdam Weather

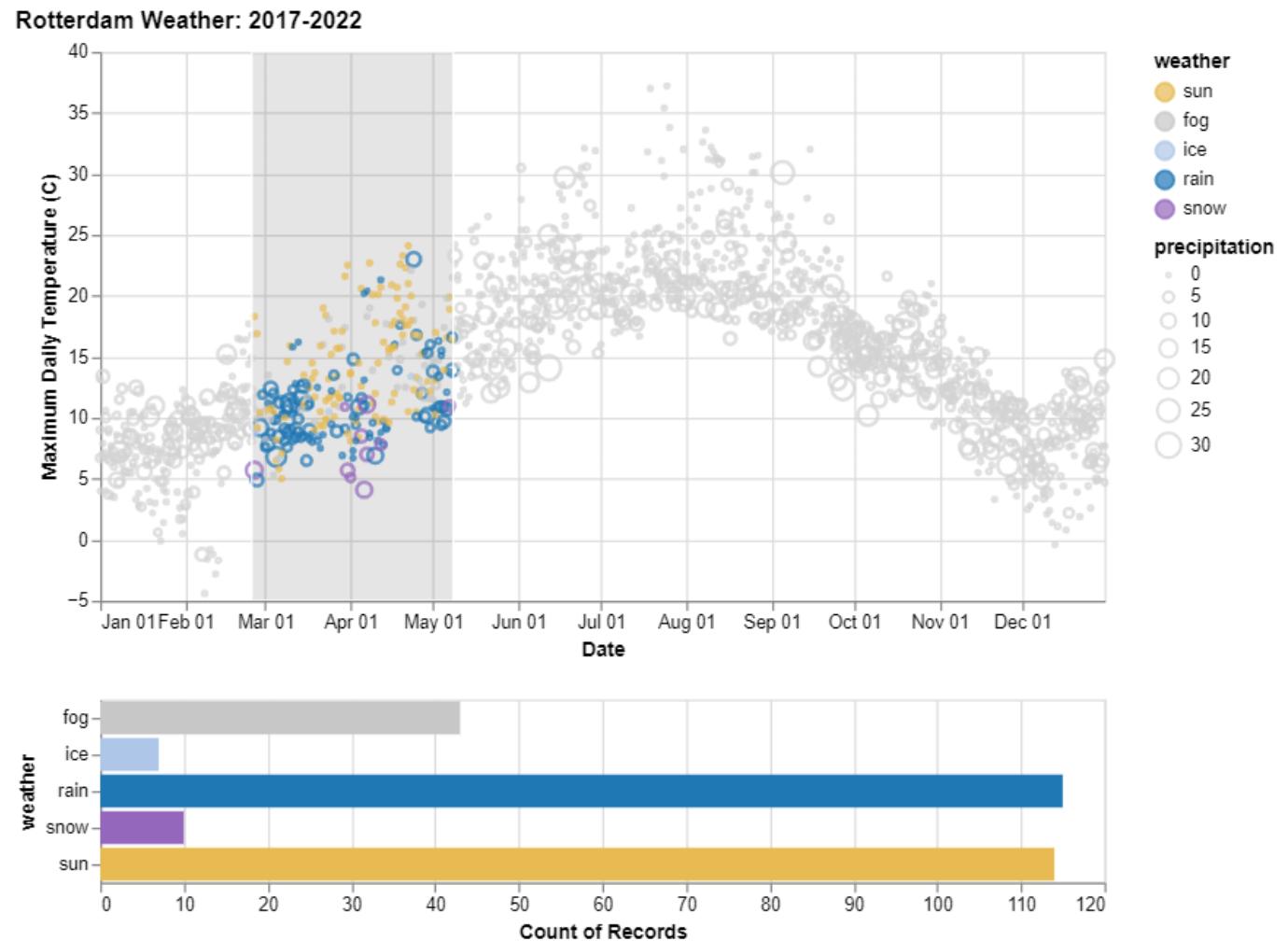
Priority	Weather Type
1	Ice
2	Lightning
3	Snow
4	Fog
5	Rain
6	Sun

<https://daggegevens.knmi.nl/klimatologie/uurgegevens9>

Steps in the process

Key insights

- Demo Notebook on Rotterdam Weather

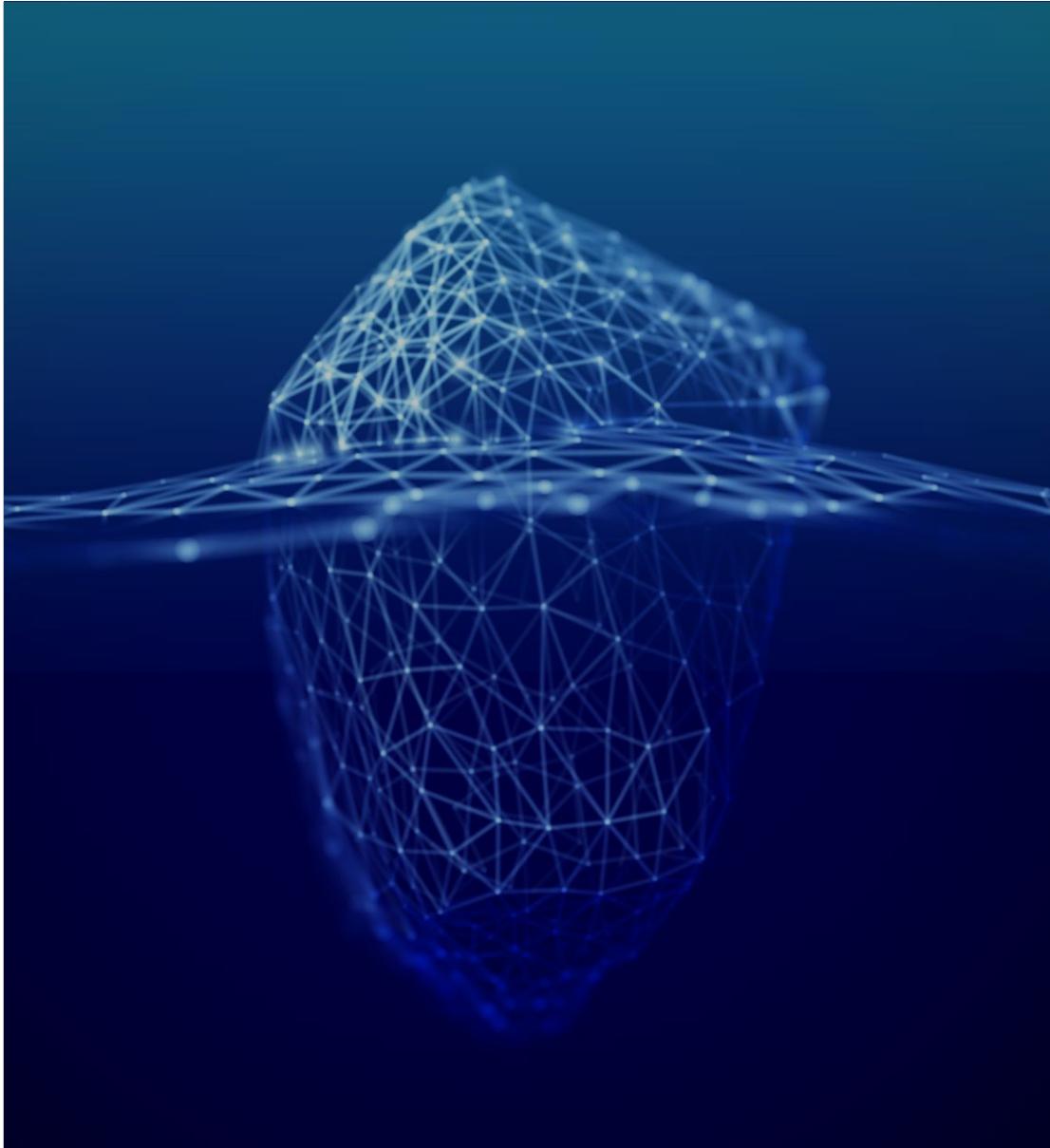


https://nbviewer.org/github/mattijn/dataset_hoogwater21/blob/main/2023-12-15%20rotterdam%20weather%20visz.ipynb

Steps in the process

Key insights

- At some point extracted meaningful patterns, trends, correlations, or anomalies.
- Identify the most critical insights that align with your objective



BREAK 😊

Steps in the process

From code to story

- Objective
- Audience
- Data exploration
- Key insights
- **Storyline**
- Visualization
- Testing and iterating
- Presenting



<https://img.oastatic.com/img2/54455918/max/variant.jpg?revbust=e02e7349>

Steps in the process

Storyline - Objective and audience



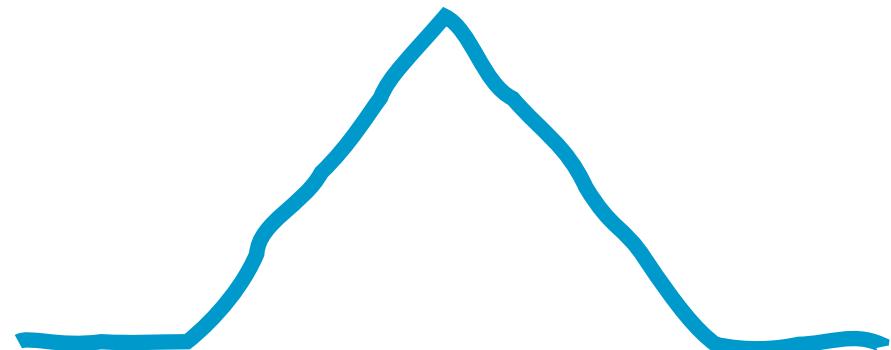
Image by wirestock on Freepik

Steps in the process

Storyline – What is a story?

A story is a description, either true or imagined, of a connected series of events, typically with a rise and fall.

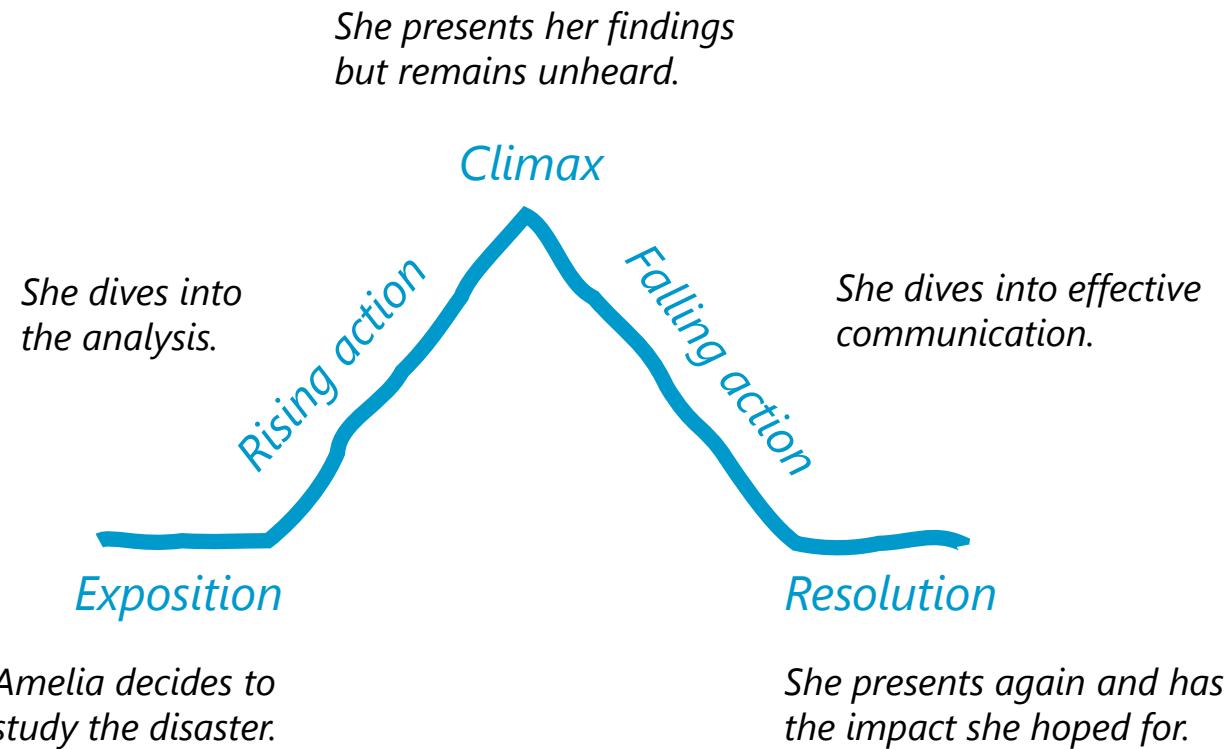
- Characters
- Setting
- Plot
- Conflict
- Resolution



<https://dictionary.cambridge.org/dictionary/english/story>
<https://authority.pub/parts-story/>

Steps in the process

Storyline – Example for a story arc



Steps in the process

Storyline – Facts vs. story

"The king died. Then the queen died."

vs.

"The king died. Then the queen died of grief."



<https://writing.upenn.edu/wh/archival/documents/karlan/mccullough.php>; Image by freepic.diller on Freepik

Steps in the process

Storyline – Common plots

1. Crime scene investigation

- Problem and search for its solution
- Example: How did the dam breach?



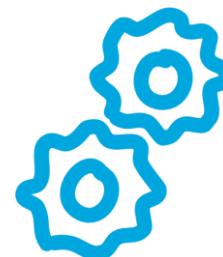
2. Eureka - "I've found it!"

- Many different attempts to solve a problem until the solution is found
- Example: Various simulations in a lab on how to make dams more stable



3. Relationships

- Tells about cause-effect/ correlation relationships
- Example: How are dam maintenance and dam failure related?



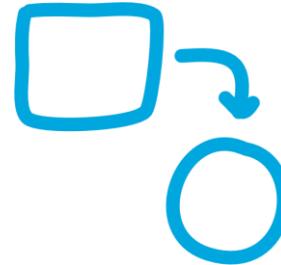
Pyczak 2017: Tell me! Wie Sie mit Storytelling überzeugen.

Steps in the process

Storyline – Common plots

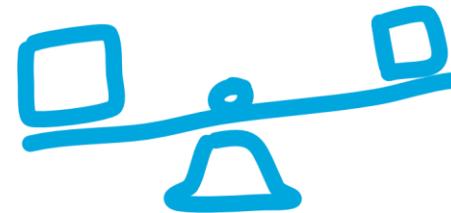
4. Transformation

- Development on a time axis, often including predictions
- Example: Fatalities around the world in the past 50 years due to dam failures and predictions for the future



5. Contrasts

- Different possibilities are compared with a focus on the differences
- Example: Different ideas for how to build back better after the disaster and their different effects



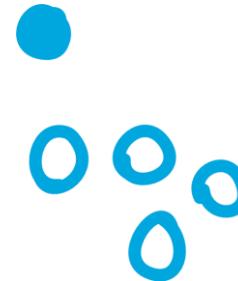
Pyczak 2017: Tell me! Wie Sie mit Storytelling überzeugen.

Steps in the process

Storyline – Common plots

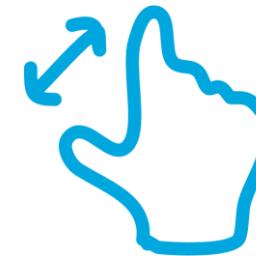
6. Outliers

- Focuses on those data points that seemingly don't fit
- Example: Minor cracks in the dam that were overlooked during monitoring checks before the disaster



7. Zoom in or out

- From the bigger picture to the details or from the details to the bigger picture
- Example: Storm conditions during the incident zooming into the filling of the reservoir and the breaching of the dam / The dam that breached, zooming out to the state of dams around the world

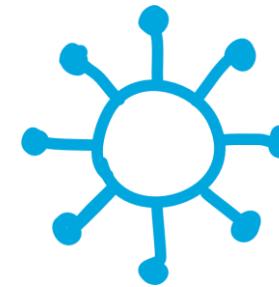


Steps in the process

Storyline – Common plots

8. Factors

- The effect of different factors on something
- Example: Starting with the dam failure and telling the story of the factors that contributed to it



9. Intersections

- Different trends that intersect
- Example: The reservoir inflow and outflow over time and a critical water level that is exceeded



Steps in the process

From code to story

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<https://img.oastatic.com/img2/54455918/max/variant.jpg?revbust=e02e7349>

Steps in the process

Visualization – Design tips

1. Simplicity
2. Consistency
3. Hierarchy
4. Alignment
5. White space
6. Colors
7. Typography
8. Imagery



Image by frimufilms on Freepik

Steps in the process

Visualization – 1. Simplicity

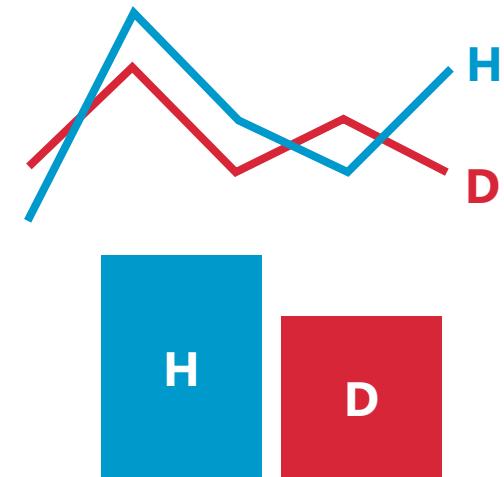
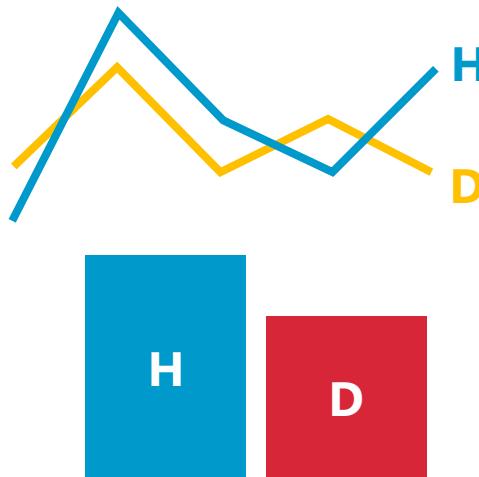
- Focus on your objective and only add what contributes to it, remove the rest
 - Just enough information and visualization
- Consciously steer the focus
 - Guiding the eye by means of colors, contrast, enlarging elements, etc.



Steps in the process

Visualization – 2. Consistency

- Repeat fonts, colors, and style for the same type of information
 - Same size and font for all headers in the same place
 - Same visual feeling for photos and icons
 - Same margin
- Variation is possible, but do this consciously to place focus



Steps in the process

Visualization – 3. Hierarchy

- Create a logical order and thereby an intuitive flow
 - Limited number of levels (e.g. headings, subheadings, and two text types)
- Visually support this order
 - By means of a strong composition, colors, contrast, the size of elements, etc.

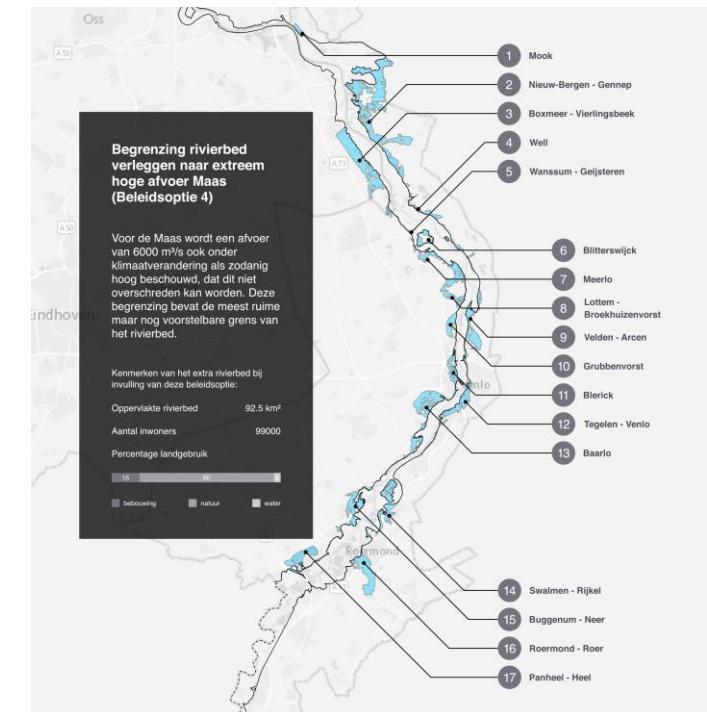
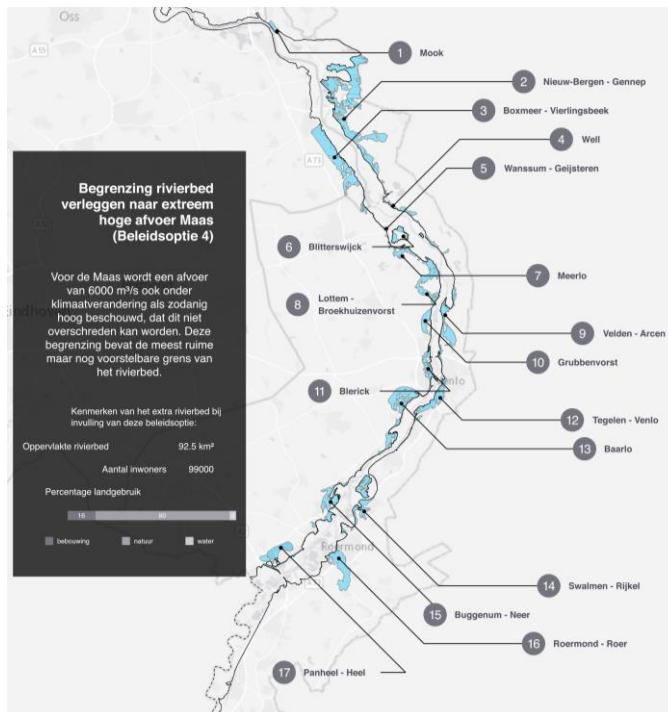
The magic ingredients

context “The surrounding parts that determine meaning background.” (How does this relate to what I already know ?)	relevance “Implying close relationship or importance.” (How does this relate to what is important to me?)
-----------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------

Steps in the process

Visualization – 4. Alignment

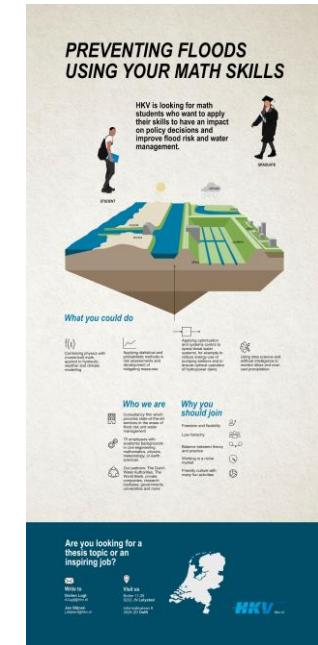
- Make sure there is an order and balance
 - Avoid placing elements randomly
 - No ‘floating’ elements
 - Everything ‘on the grid’
 - Everything e.g. left-aligned
 - Photos evenly distributed
- Deviation is possible, but do this consciously to place focus



Steps in the process

Visualization – 5. White space

- Make sure you leave space without any content in it, your design needs to "breathe"
 - Space around elements
- Trust your message
 - Minimalist content requires trusting in your message



<https://imgur.com/1R2R4>

Steps in the process

Visualization – 6. Colors

- Choose a color palette and use the colors consistently
 - Limited number of colors
 - If everything has emphasis, then nothing has emphasis
- Make sure there is sufficient contrast and be aware of visual impairment ("Design for all")



Steps in the process

Visualization – 7. Typography

- Choose typography that is clear, readable, and consistent
 - Sufficient font size and contrast
 - Leave space between texts (see "White space")
 - Mostly sans serif
- Pay attention to the optimal length of lines (max. 60 letters)



<https://about.easil.com/serif-vs-sans-serif/>

Steps in the process

Visualization – 8. Imagery

- Avoid distraction
 - Less is more, one good image instead of several
- Use images with a good quality, an appropriate visual feeling and images that are socially responsible
 - Be careful with the licenses and that you don't reinforce stereotypes



Images by Freepik; https://www.torontomu.ca/content/dam/news-events/news/2021/04/web_Student_Diversity.jpg

Steps in the process

From code to story

- Objective
- Audience
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- Presenting



<https://img.oastatic.com/img2/54455918/max/variant.jpg?revbust=e02e7349>

Steps in the process

Testing and iterating

"The first draft of anything is shit."

Ernest Hemingway

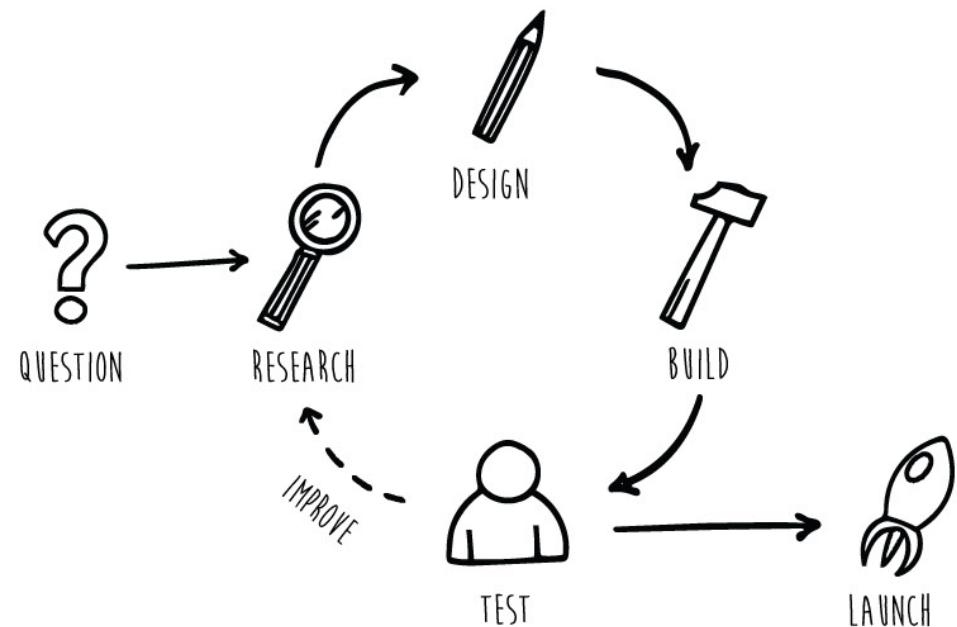


Image by Freepik

Steps in the process

From code to story

- Objective
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- **Presenting**



<https://img.oastatic.com/img2/54455918/max/variant.jpg?revbust=e02e7349>

Steps in the process

Presenting – Preparation for oral presentations

- Objective
 - What is your objective for presenting and how can you measure if you reached it?
- Audience
 - Who is listening and how can you pick them up?
- Story
 - Today: What is?
 - Tomorrow: What should be?
 - Call to action: How can we get there?



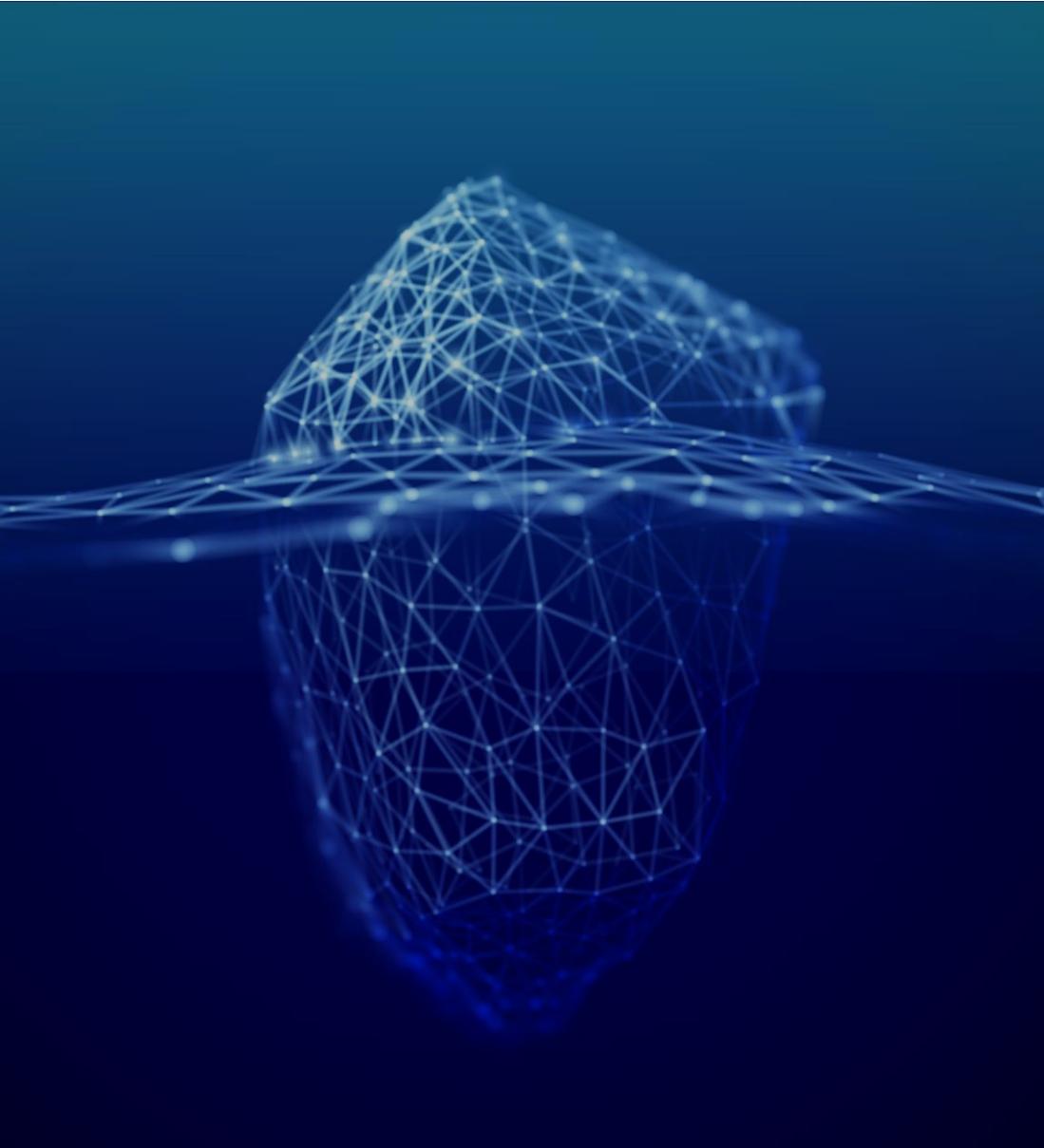
www.strategisches-storytelling.de; Image by jcomp on Freepik,,

Steps in the process

From code to story



Image by jcomp on Freepik



Agenda

- **Point of departure**
- **Steps in the process**
- **Application**
- **Closing**



https://images.ctfassets.net/njaj3vyo48vj/3ZfwWSRkUhBFwAQcshSvvw/58982700ae485bcfd66512a92ff216/Valkenburg_Panorama_View.jpg?f=center&w=1899&fm=webp&q=80&fit=fill



Image by wirestock on Freepik



Image by Freepik



<https://i2-prod.mirror.co.uk/incoming/article9394933.ece/ALTERNATES/s615b/Flooding-in-Islington.jpg>



<https://gray-kfvs12-prod.cdn.arcpublishing.com/resizer/v2/7FZDR2OFTNFKLGAL2D5ZQFJ6AE.jpg?auth=5bcf535e01c4c8bef1d3e4f30d3768f4f55ba8d5ec35149953b46a44c47b1288&width=1600&height=900&smart=true>



https://img.hbvl.be/0QYC2xrJZlujl_g-ILDIDN6W9nk=/0x0:2425x1618/960x640/smart/https%3A%2F%2Fstatic.hbvl.be%2FAssets%2FImages_Upload%2F2021%2F07%2F21%2F7b4119fa-78fc-4934-a729-262a4a7dbaee.jpg

Application Limburg Floods 2021



High water Limburg summer 2021 more drastic than river floods in 1993 and 1995

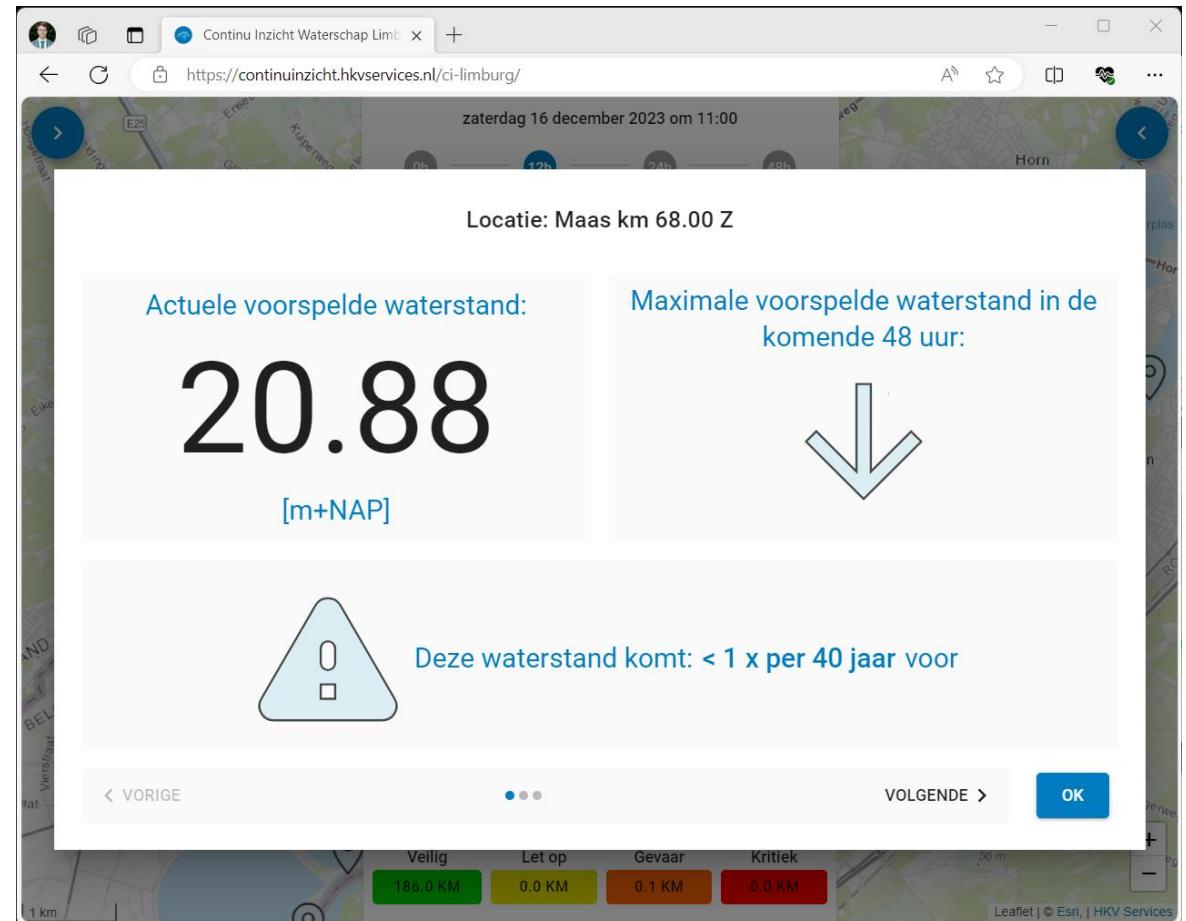
NEWS - 09 SEPTEMBER 2021 - WEBREDACTIE

The heavy precipitation along with the high water of July 2021 in the Netherlands and surrounding countries was an extreme and exceptional event with major social consequences in Limburg. Commissioned by the Expertise

<https://www.tudelft.nl/en/2021/citg/high-water-limburg-summer-2021-more-draastic-than-river-floods-in-1993-and-1995>

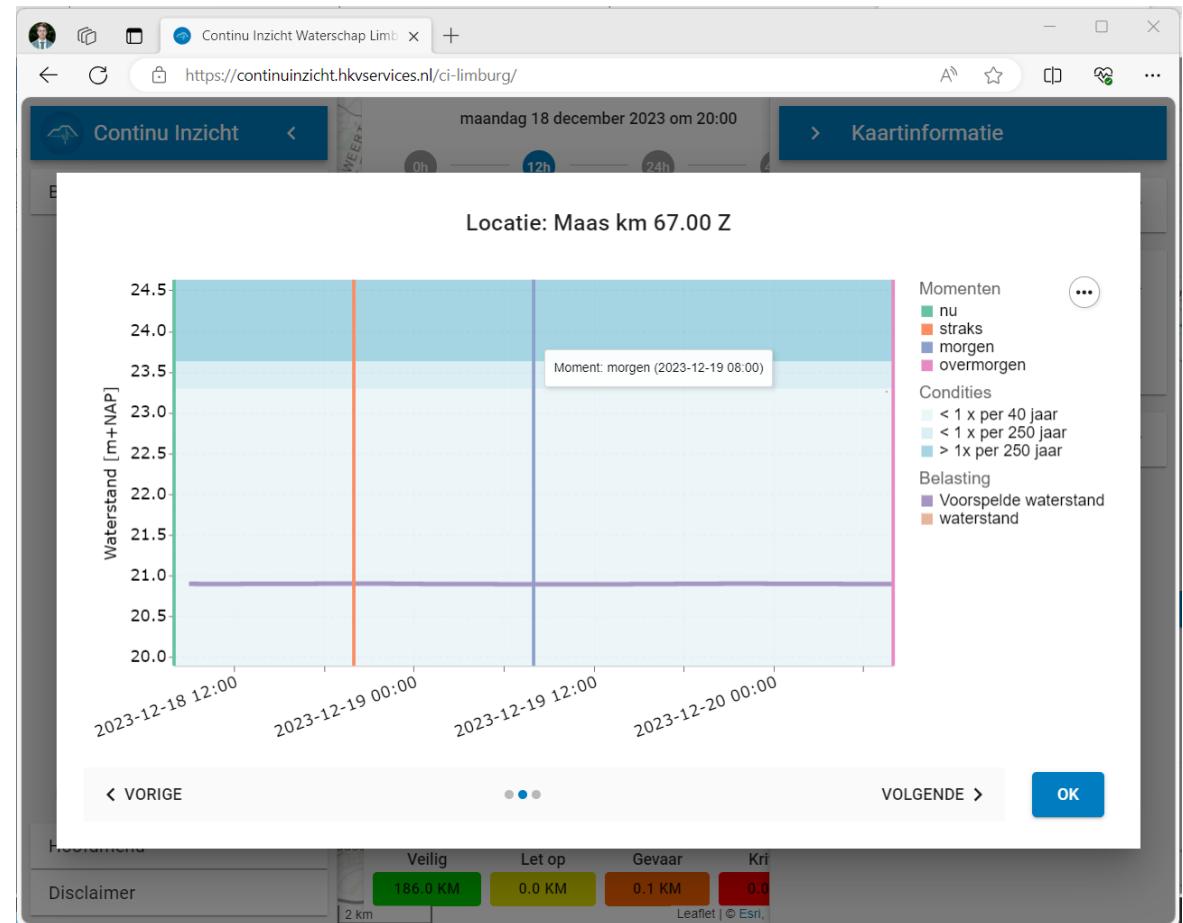
Application Limburg Floods 2021

- Computes status of each dike segment
 - Based on fragility curves or failure classes
 - For each failure mechanism
 - Overtopping
 - Piping
 - Stability
- Using measured and forecasted waterlevels
- Every 15 minutes, 24/7



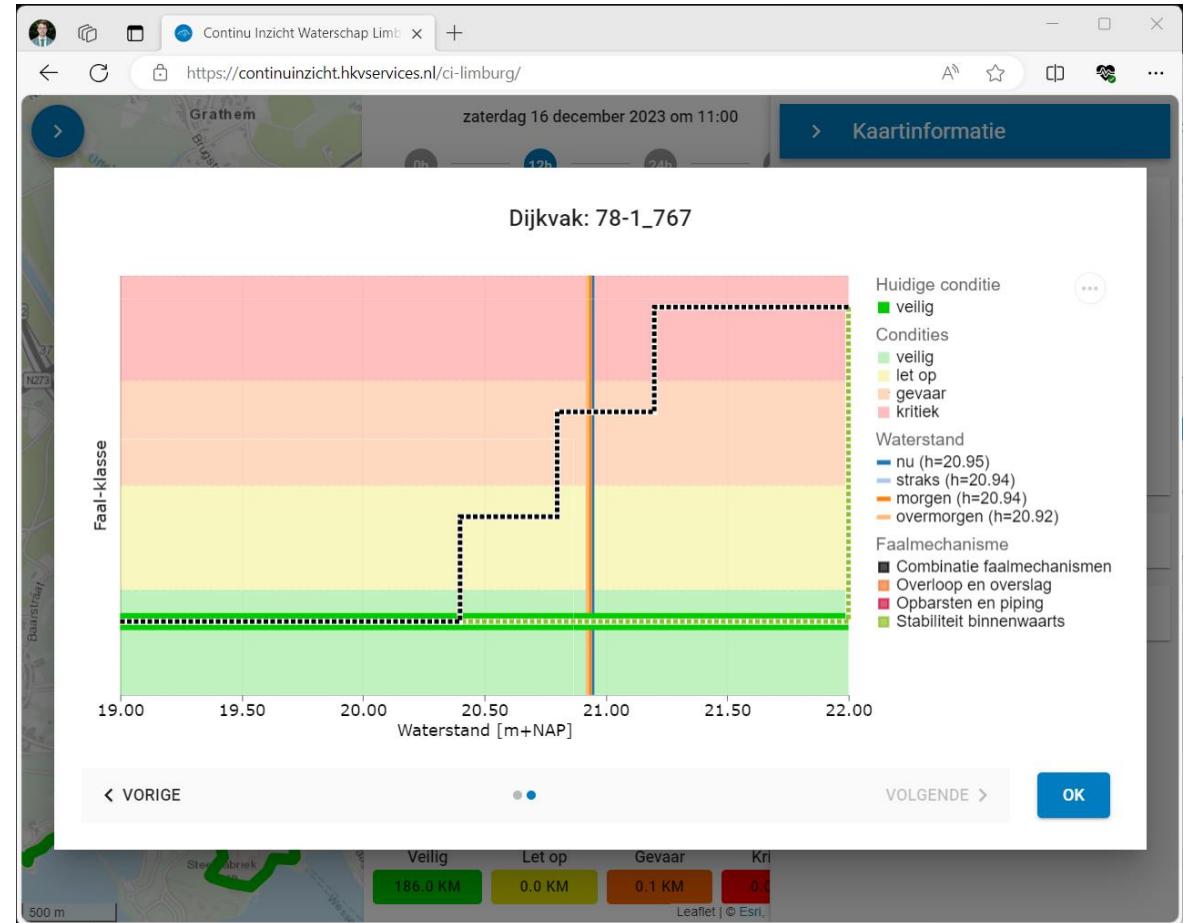
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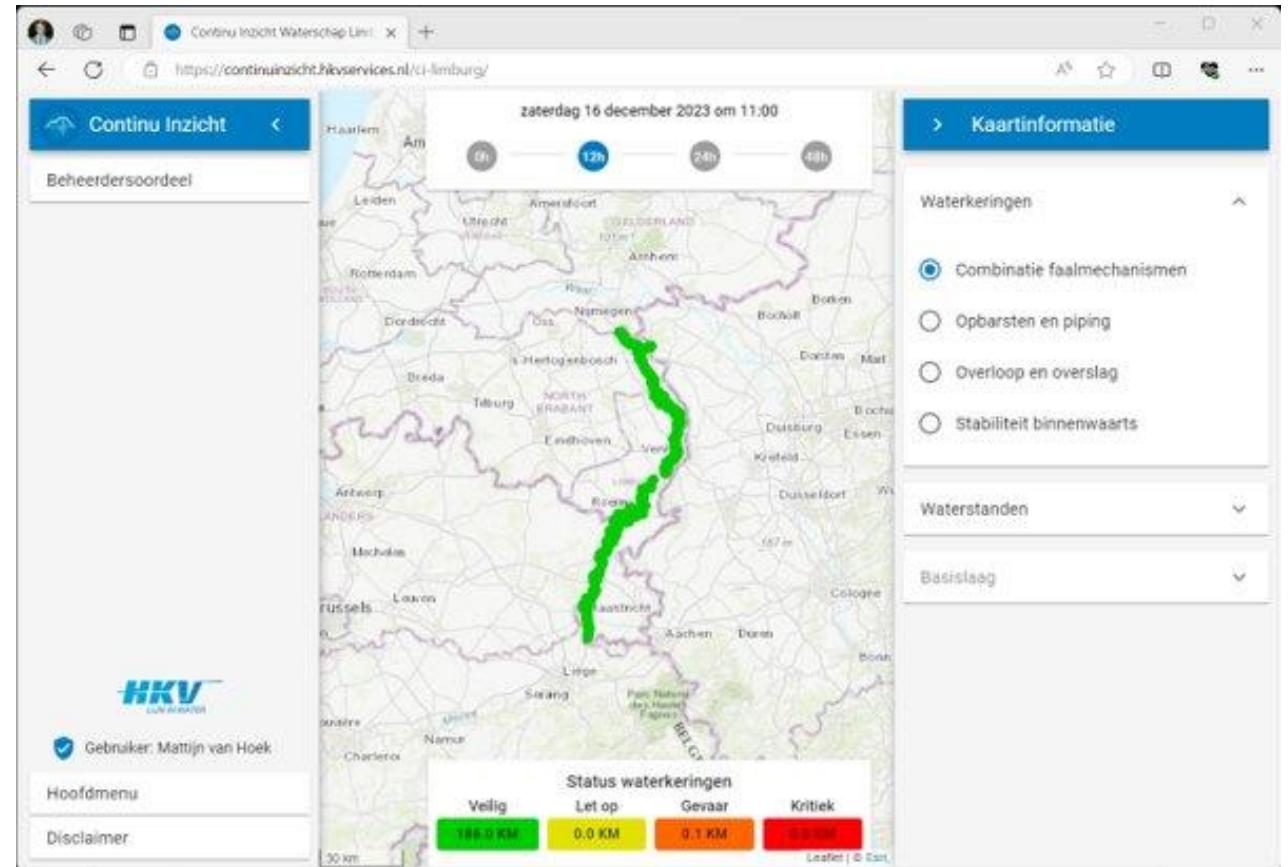
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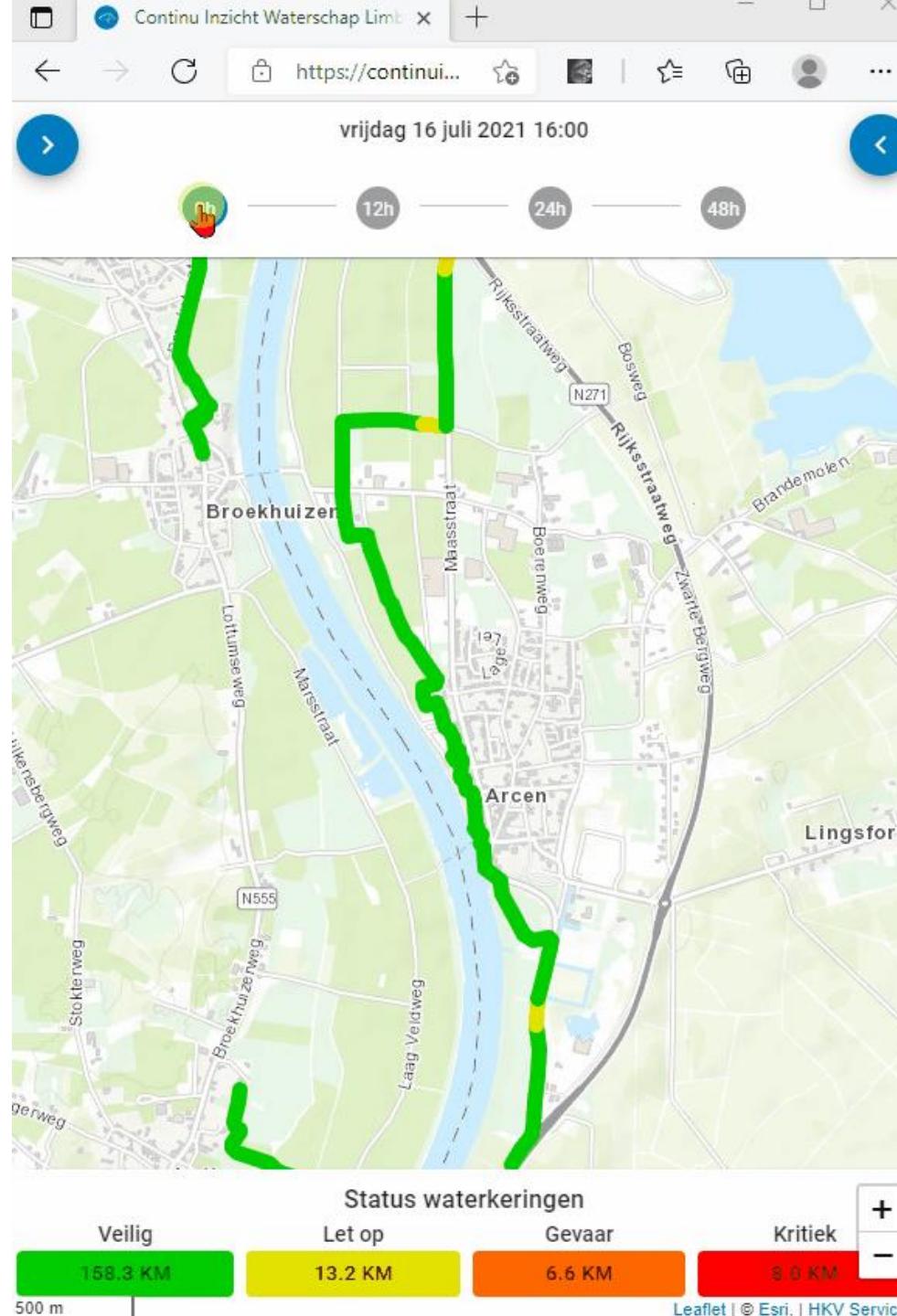


Application Limburg Floods 2021

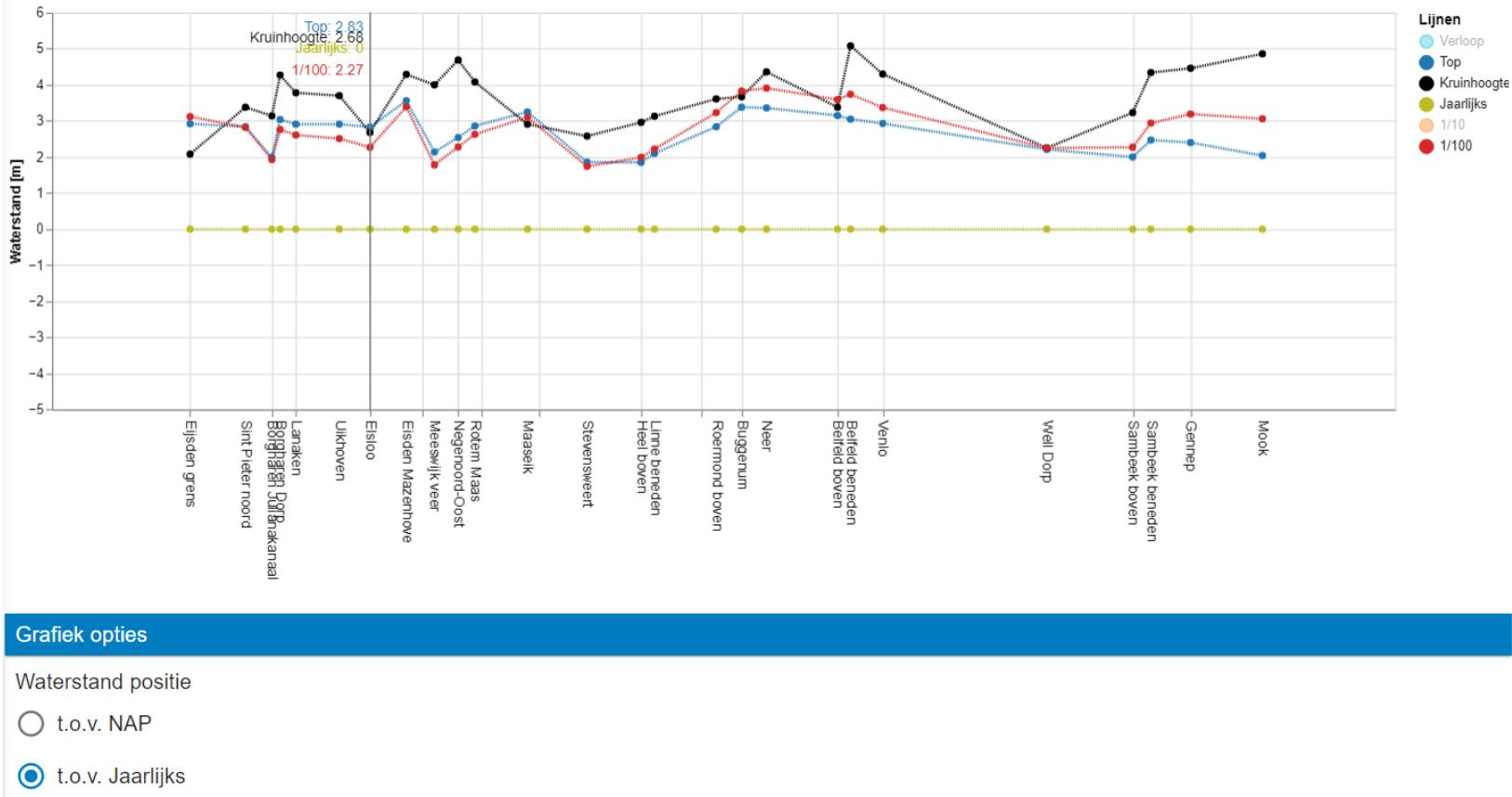
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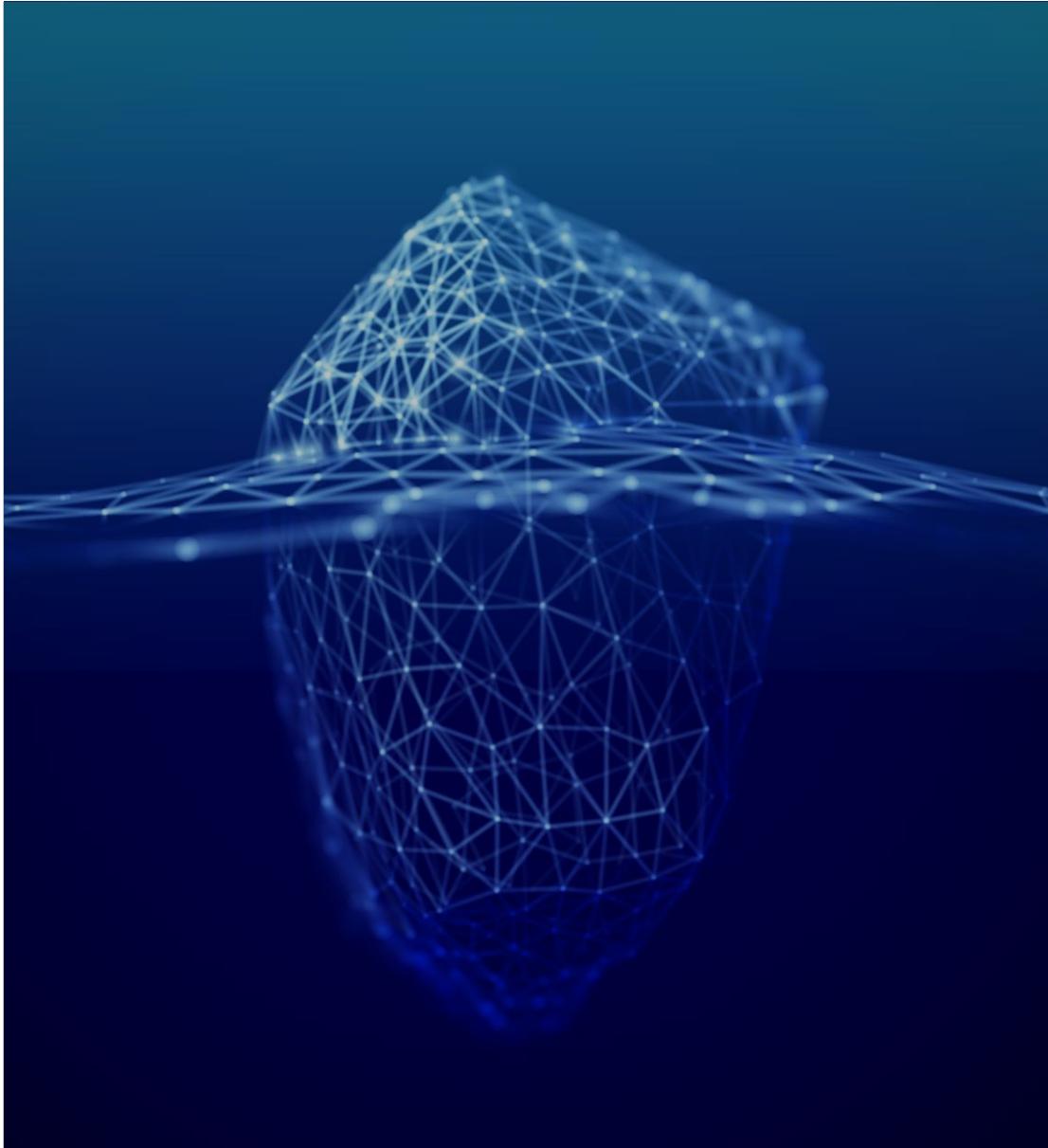
Application Limburg Floods 2021



Application Limburg Floods 2021



[hoogwater2021 \(hkvservices.nl\)](http://hoogwater2021.hkvservices.nl)



BREAK 😊

Application Limburg Floods 2021

An opportunity to practice

- Define your objective
- Decide who is your target audience
- Analyze the data
- Prepare a 3-minutes presentation
(time for 5 groups to present)
- Start of the presentations at **3:20 pm**



Application

Limburg Floods 2021 – Ideas for target audiences



Image by teksomolika and pressfoto on Freepik and by Freepik

Application Presentations

For those who present:

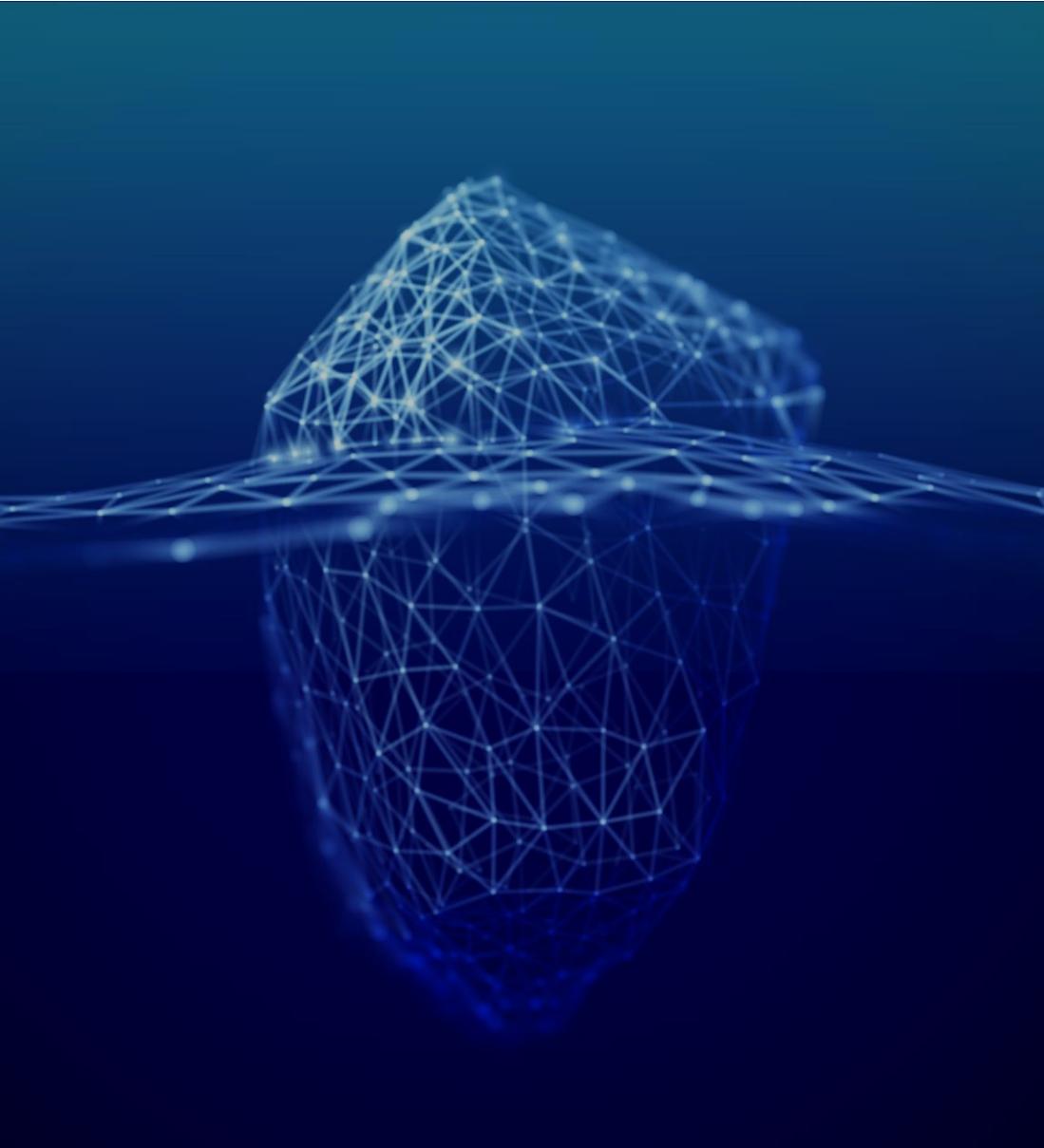
- Tell us before you start your presentation what is your objective and who are we as the audience
- Present within 3 minutes

For the audience:

- Take note how the presentation is given
- Provide constructive feedback



Image by jcomp on Freepik



Agenda

- **Point of departure**
- **Steps in the process**
- **Application**
- **Closing**

Closing Looking back - KnowWonder

What do you **know** already?

and

What do you **wonder** about?



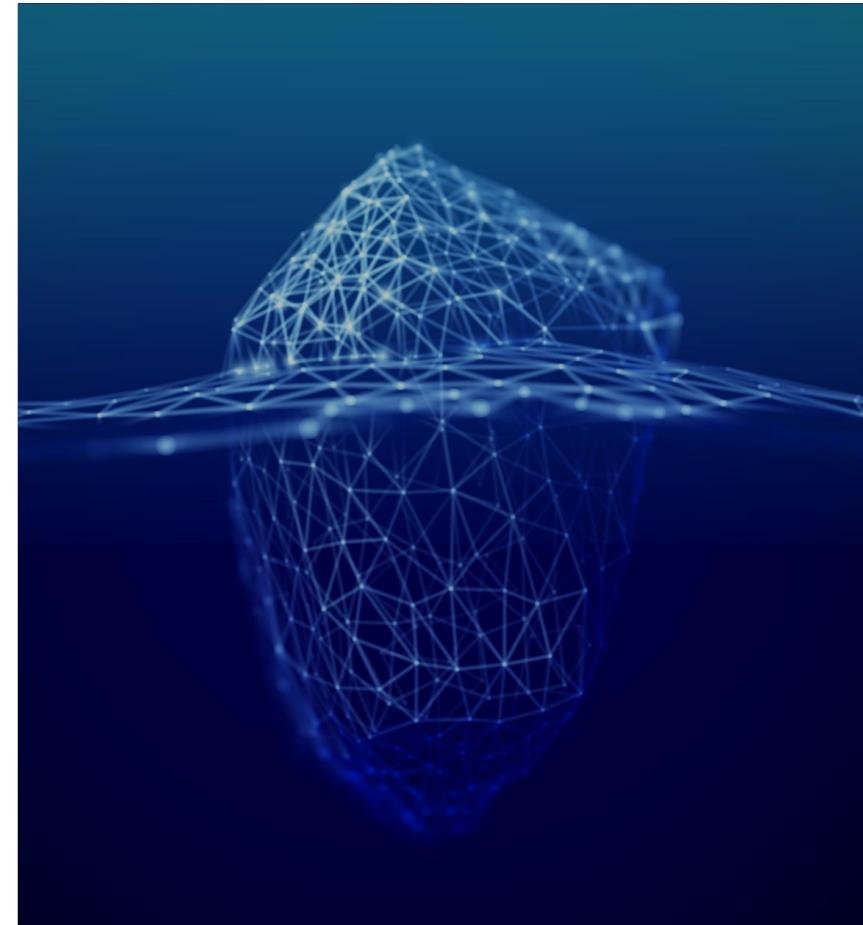
Closing Looking back - Our objectives

It is the end of the session, we hope you have

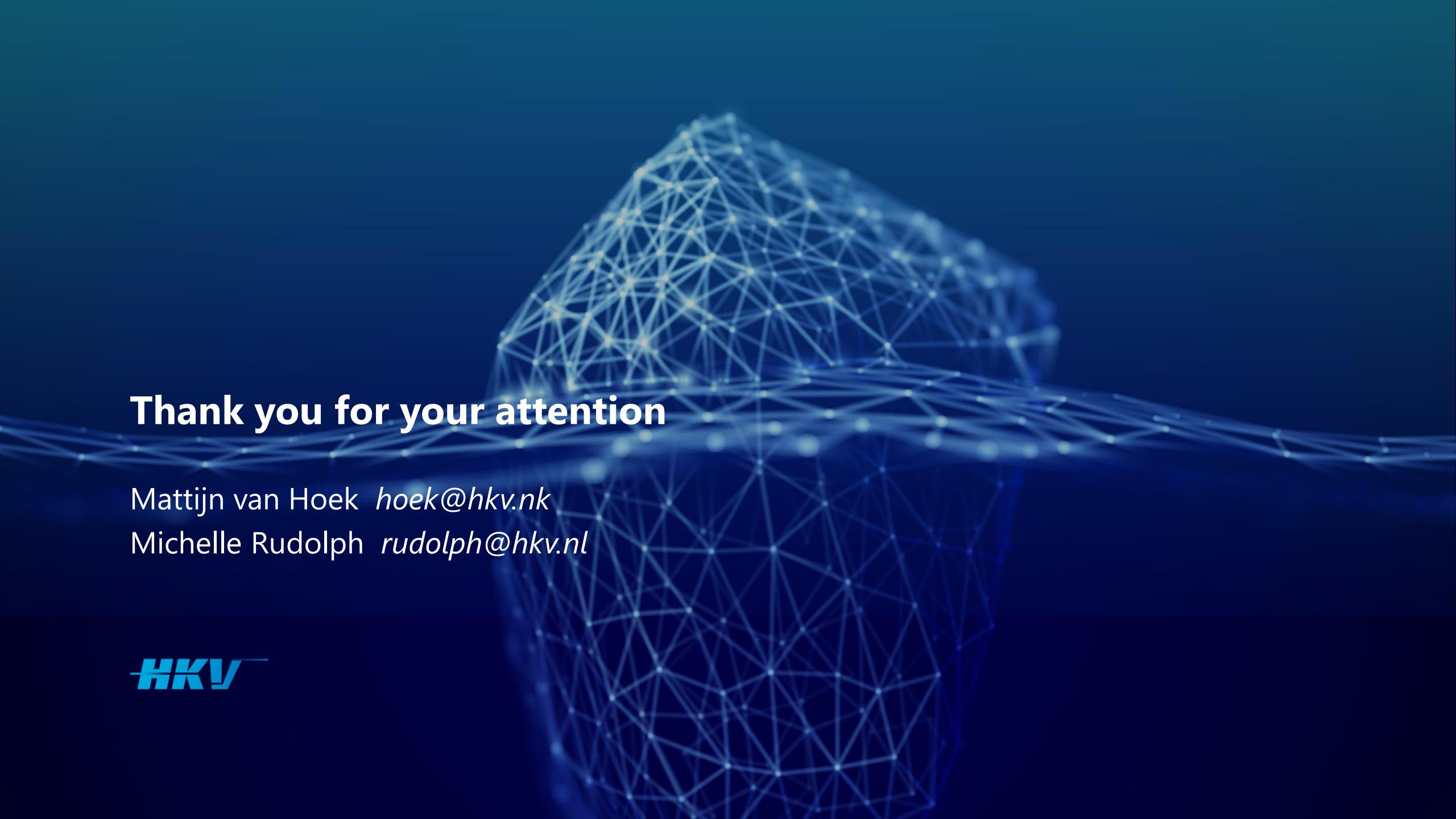
- learned and applied the basics of effective (visual) communication
- written your own Vega-Altair code
- used storytelling to convey your message
- had fun ☺

Bonus

- gotten enthusiastic about the topic and want to learn more





A large, abstract geometric shape composed of numerous small, glowing blue dots connected by thin lines, forming a complex network or mesh. It is set against a dark blue background and occupies the right half of the slide.

Thank you for your attention

Mattijn van Hoek *hoek@hkv.nk*

Michelle Rudolph *rudolph@hkv.nl*

