

A person is holding a lit sparkler, with bright sparks emanating from the tip. The person is wearing a dark, textured sweater. The background is dark and out of focus.

Creative User-Centered Design and Validation of Visualizations

The Barcelona Supercomputing Center (BSC-CNS) is one of the most important scientific institutions based in Barcelona, specialises on **High Performance Computing (HPC)** and **Big Data**, offering infrastructure and supercomputing services to local and European scientists, as well as **generating knowledge and technology** for giving it back to society.



**Barcelona
Supercomputing
Center**

Centro Nacional de Supercomputación

MareNostrum

A man with a large nose and a red jacket is looking to the side. The background is a blurred indoor setting with green and grey tones.

Hello!!

I'm Luz Calvo

.

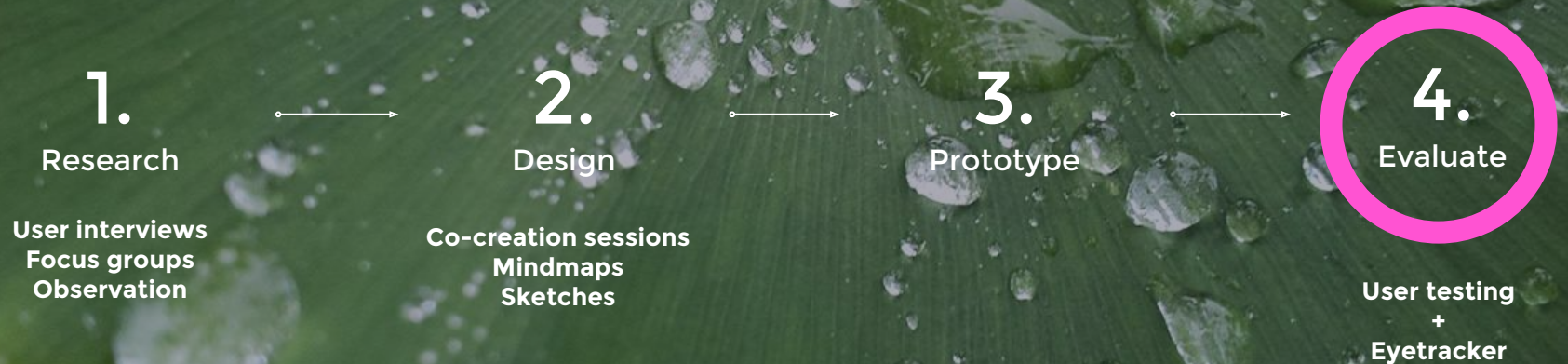
UX &
Information Experience

The only UX in the village

UCD-What is it?

User-Centered Design (UCD) is the process of designing a tool, such as a **website, application, user interface** or a **visualization** from the perspective of how it will be understood and used by a human user.

UCD-The process





**Things I've
learned while
not doing my
job**



Sónar + D

We know what you did

sónar[®]
2015

Around 118.000 visitors

The scientific visualization group of BSC-CNS deployed a **network of sensors** to detect and follow **wireless communication devices**, such as mobile phones, tablets... and make a real time analysis of how they move around the space of the festival.



SÓNAR 2015 by day

During the three days of Sónar by Day we turned the whole festival into a big collective experiment: we deployed a network of sensors to track all visitors' devices that had cell retransmission turned on. We made a real time analysis and a series of visualizations during the festival that are online in the site sonarbyday.com. People that attended the festival could see their own, real time footprint of what they did at Sónar 2015. The name of the project is this network of cell phones (or just cell).

This poster is an attempt to find, where we show and explain the posterior analysis that we performed on the collected data.

The most interesting things come from the public's behavior: where they are, how often do they move, for how long do they stay in a space. By applying software analysis techniques, those facts may tell us interesting stories, like which bands have the most loyal public, or the differences between the potential public of Vilagost and Compostela. This poster is intended to tell some or part of those stories, and allow you to discover your own.

The upper graph layout shows the real number of people on stage during the three days and their movements. Though it's a nice way to explore the relations between artists, stages, and days, the algorithm's goals is limited for a variety of reasons. For instance, the Village is the biggest space of the festival and a hub between the other stages, thus its occupation should be considered in the total Sónar efficiency per day of the festival's information. We applied corrective measures to make the other visualizations that are explained below.

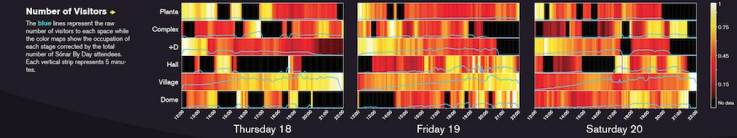
The graph of people's movements

Each circle represents a show, its color is the stage as indicated above, and its size reflects the number of attendees. The width of the line between the circles represent the number of people that were in both events.

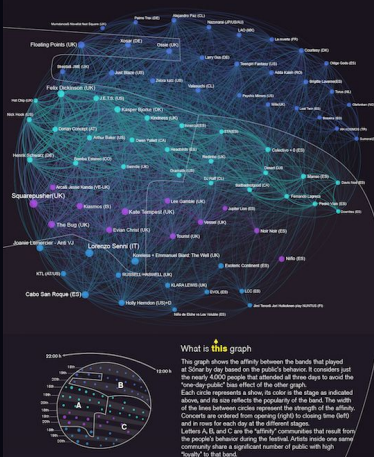
The three separated areas are the "corrections" that result from the people's behavior during the festival. Artists in the same community share more public between them than the others. We discovered, in our results for days of the most famous of the high percentage of people that attended the festival only one of the three days. This graph considers the nearly 10,000 people detected by our sensors.

Number of Visitors

The three lines represent the raw number of visitors to each space while the color maps show the occupation of each stage corrected by the total number of Sónar by Day attendees. Each vertical strip represents 5 minutes.



- Village
- Dome
- Complex
- Hall

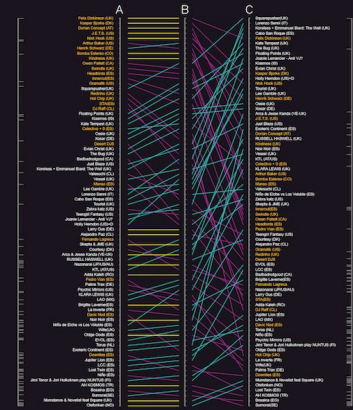


What is this graph

This graph shows the affinity between the bands that played at Sónar by Day based on the public's behavior. It considers just the nearly 10,000 people that attended all three days to avoid the "one-day public" bias effect of the other graph.

Each circle represents a show, its color is the stage as indicated above, and its size reflects the popularity of the band. The width of the line between circles represent the affinity of the affinity. Concerts are ordered from opening (right) to closing time (left) and its size for each day of the different stages. Concerts are ordered from opening (right) to closing time (left) and its size for each day of the different stages. Concerts are ordered from opening (right) to closing time (left) and its size for each day of the different stages.

The Popularity chart of Sónar's public

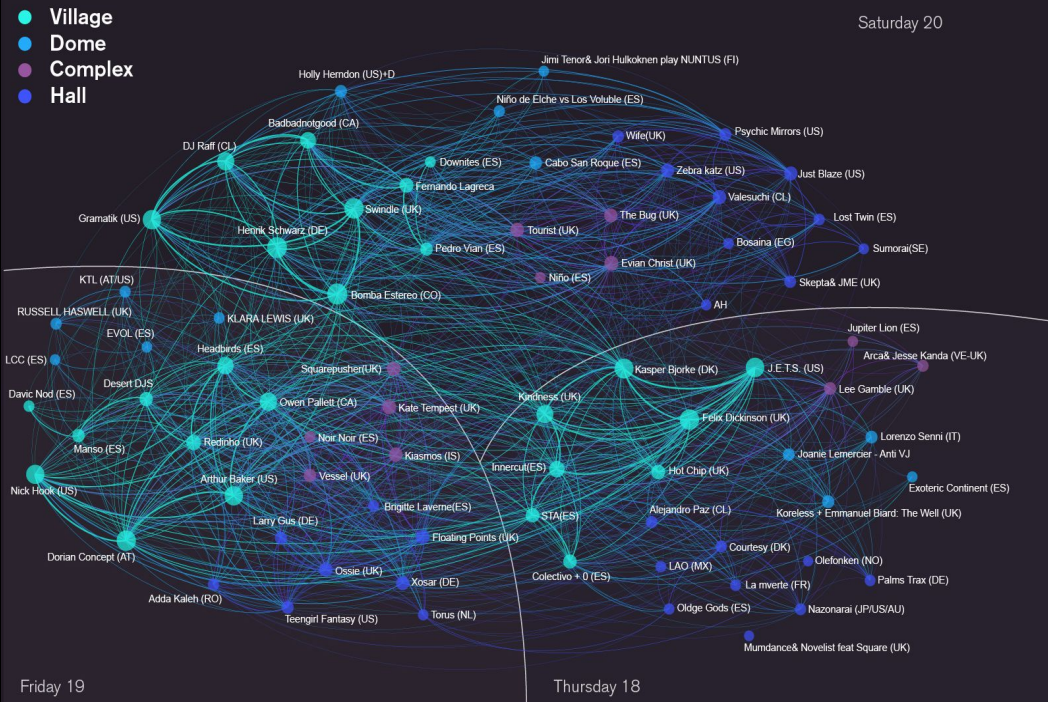


A This ranking considers only the number of people at each concert.
B Here, popularity results from the number of visitors plus the importance of each band and mobility of each person.
C Our last ranking considers all items in B plus venue size, allocated time, and the number of public per show.
The names of the artists that played at the Village stage are in light orange. You can see how they descended from the top positions in list A as we consider more variables than just the raw number of public to calculate the popularity.
The lines more going down in the ranking cover going up and yellow keeping the same position.

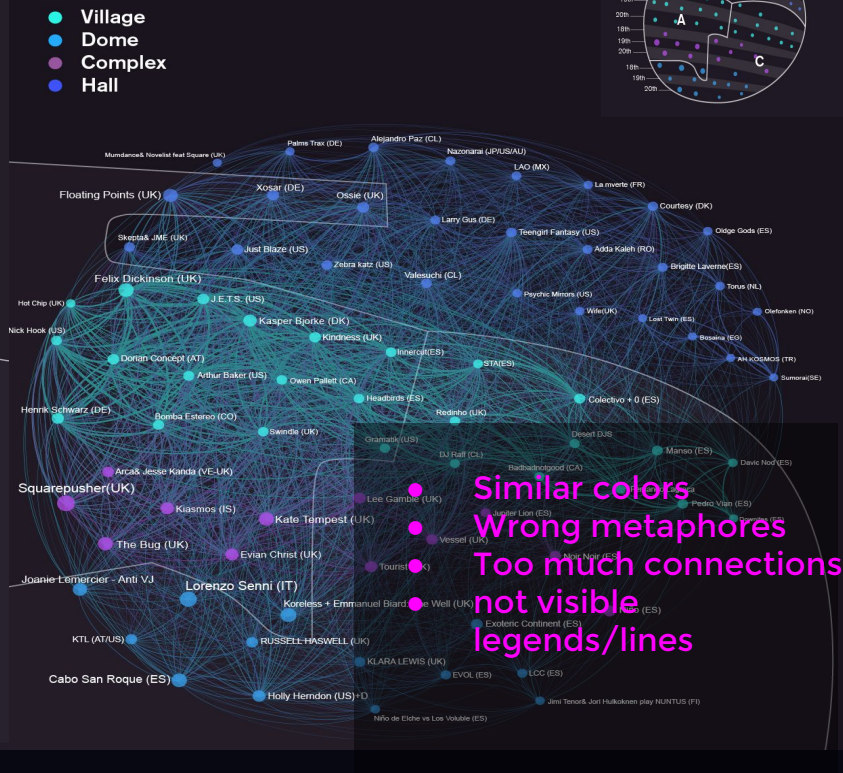
An aerial photograph of a dark, rugged landscape, possibly a volcanic field or a desert. The terrain is covered in dark, textured material, with a winding path or road visible in the upper right. A small, dark pond or crater is visible in the lower center. The overall tone is dark and moody, with a mix of deep blues, purples, and blacks.

**The results:
The ugly truth**

Number of movements between music groups



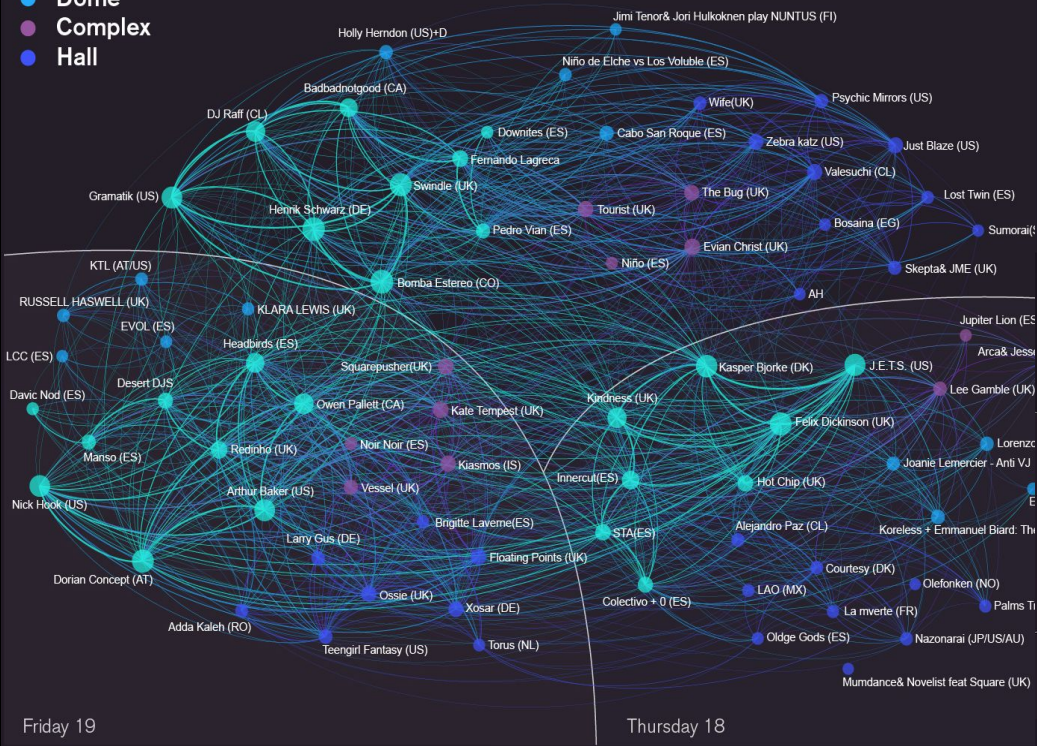
Music affinity between groups





User's opinions

- Village
- Dome
- Complex
- Hall



SÓNAR2015

by day

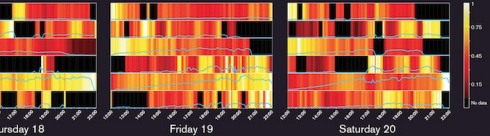
During the three days of Sonar by Day we turned the whale festival into a big collective experiment: we deployed a network of sensors to track all motion detected that had not been information based on. We made a real time analysis and a series of visualizations during the festival that are still visible in the online network. Insights that attended the festival could see their own, real time footprint of what they did at Sonar 2015. The name of the project is this network of what they did at Sonar.

This poster is an extension to that, where we show and explain the posterior analysis that we performed on the collected data. The most interesting things come from the public's behavior: where they are, how often do they move, for how long they stay in a space. By applying network analysis techniques, those facts may tell us interesting stories, like which bands have the most loyal public or the differences between the privileged public of Village and Complex. This network is intended to tell some or part of those stories, and allow you to discover your own.

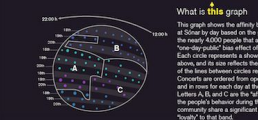
The upper graph (right) shows the true number of people per stage during the three days and their movements. Though it's a nice way to explore the relations between artists, alone, and then, the attendance's graph is limited for a variety of reasons. For example, the Village is the largest space of the festival and a hub between the other stages, thus its occupation should be corrected to the total Dome efficiency per day to get an interesting information. We applied corrective measures to make the other visualizations that are explained below.

The graph of people's movements
Each circle represents a show, its color is indicated above, and its size reflects the number of alterations. The width of the line between the circles represents the number of people that were in both. The three separated areas in the graph represent the number of people that moved from the Village during the festival. Artists in the same community share more public between them than the others. All movements, the same result for the day of the festival because of the high percentage of people that attended the festival only one of the three days. This graph considers the nearly 10,000 people detected by our sensors.

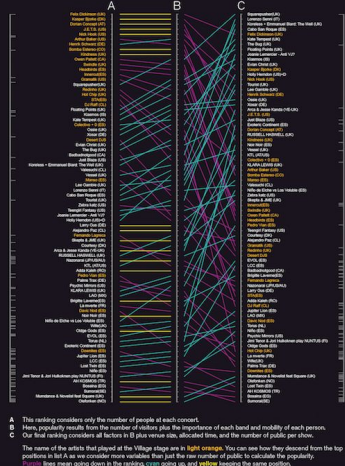
Number of Visitors
The line below represents the raw number of visitors to each space while the color inside shows the occupation of each stage corrected by the total number of Sonar by Day attendees. Each vertical strip represents 5 minutes.



- Village
- Dome
- Complex
- Hall



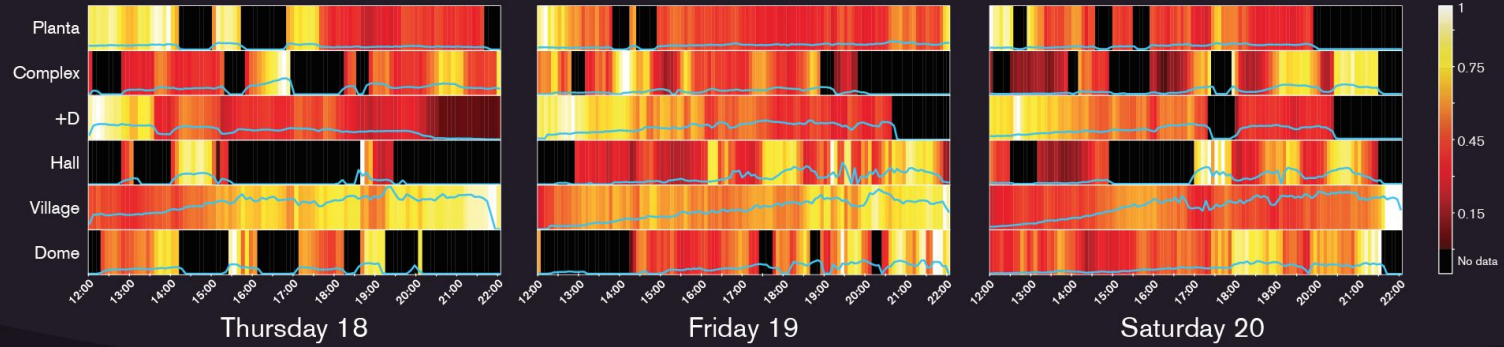
The Popularity chart of Sonar's public



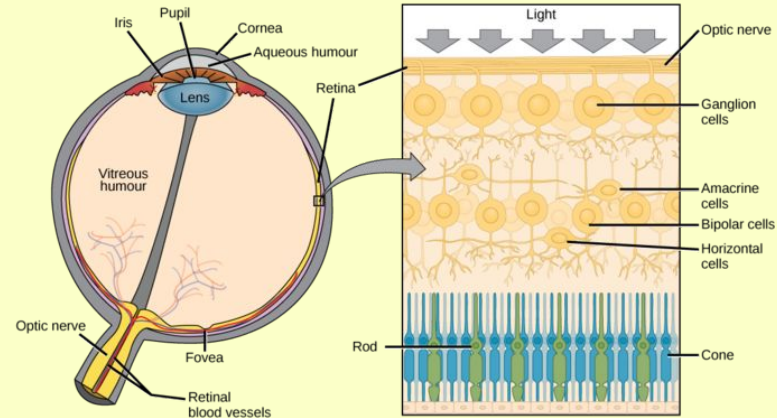
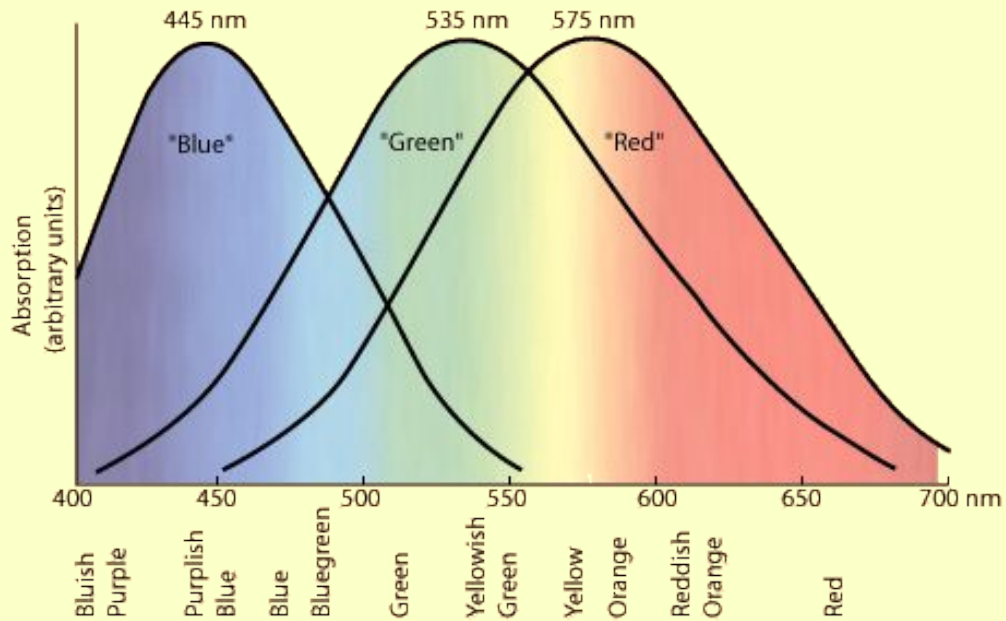
- Yellow vs. red
- Black & white

Number of Visitors ➡

The **blue** lines represent the raw number of visitors to each space while the color maps show the occupation of each stage corrected by the total number of Sónar By Day attendees. Each vertical strip represents 5 minutes.



Heatmap



**Social conventions
vs.
Anatomy lessons**



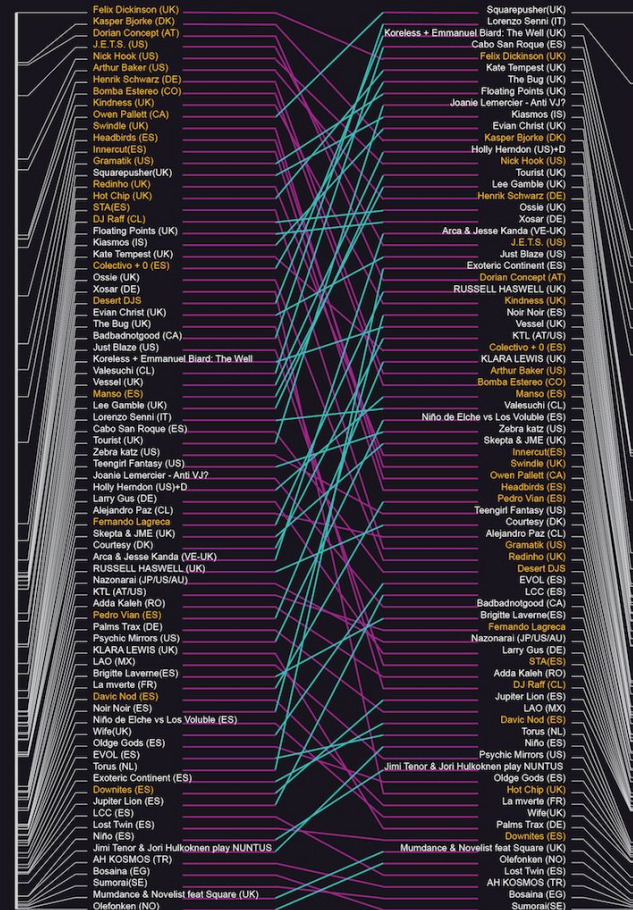
participant: wait a minute, the lighter color means the more traffic

User's opinions

The Popularity chart of Sonar's public

Number of visitors

Visitors and loyalty



- Redundant / superfluous elements
- ? vs ?

Parallel coordinates



participant: I don't know . I didn't understand anything of this graph.

User's opinions

An aerial photograph of a vast, arid desert landscape. The terrain is characterized by rolling sand dunes and ridges, with a winding dirt path visible in the upper right. The lighting is dramatic, with deep shadows and bright highlights, suggesting a low sun position. The overall color palette is dominated by warm, earthy tones of brown, tan, and orange, with some darker, shadowed areas in the foreground and background.

How to deal with...

The data scientist's view



“The interface is not important, what is important is the mechanism of retrieving and processing data.”

Solution /argument: If you have some information you want to show, but nobody is going to understand it, it has no (value) reason to exist. (you have no information)

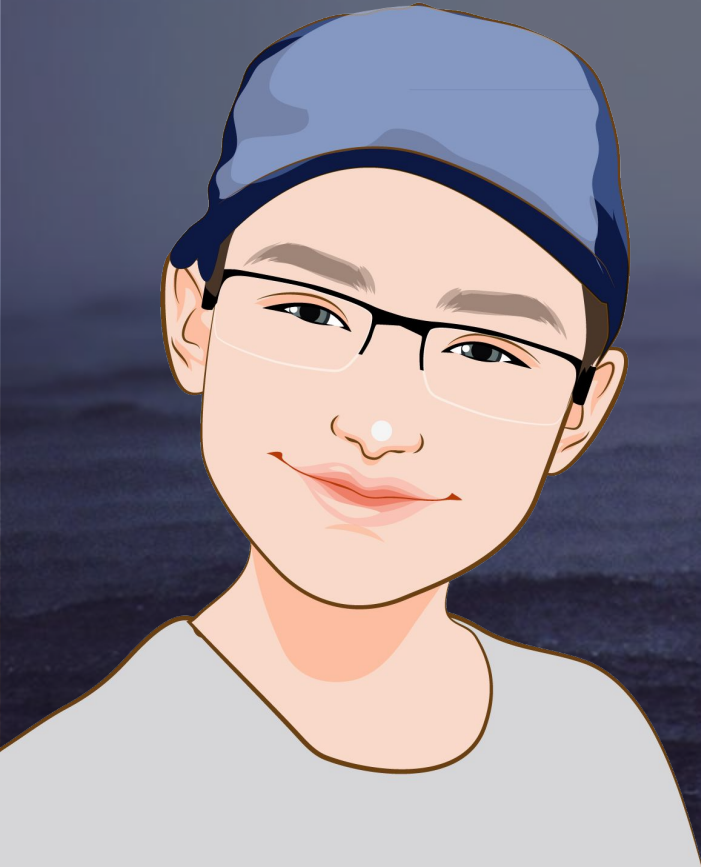
The visualization expert's view

“The more variables I put in a graph, the better the visualization.”

Solution /argument: Too much information is overwhelming. Use **interaction** to show data in a gradual fashion: The user can decide when to access.



The technologist's view



“The user? What’s a user? What is important is that it works. Right?”

Solution /argument: Invite them to a user-testing session.

The graphic designer view



“ If something is easy to understand or not is not the question, only the graphical beauty is important.”

Solution /argument: Kill'em all.

Just kidding. Invite them to a user-testing session too...

An aerial photograph of a vast, arid landscape. The terrain is characterized by rolling sand dunes and ridges, with a winding path or dry riverbed visible in the distance. The lighting is dramatic, with deep shadows and bright highlights, suggesting a low sun position. The overall color palette is dominated by warm, earthy tones like browns, oranges, and yellows, with some darker areas in the shadows.

Some thoughts

We are still learning...

Thanks!

Any questions?

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Luz Calvo