[EVOP]

# Visual Data Analysis - Design

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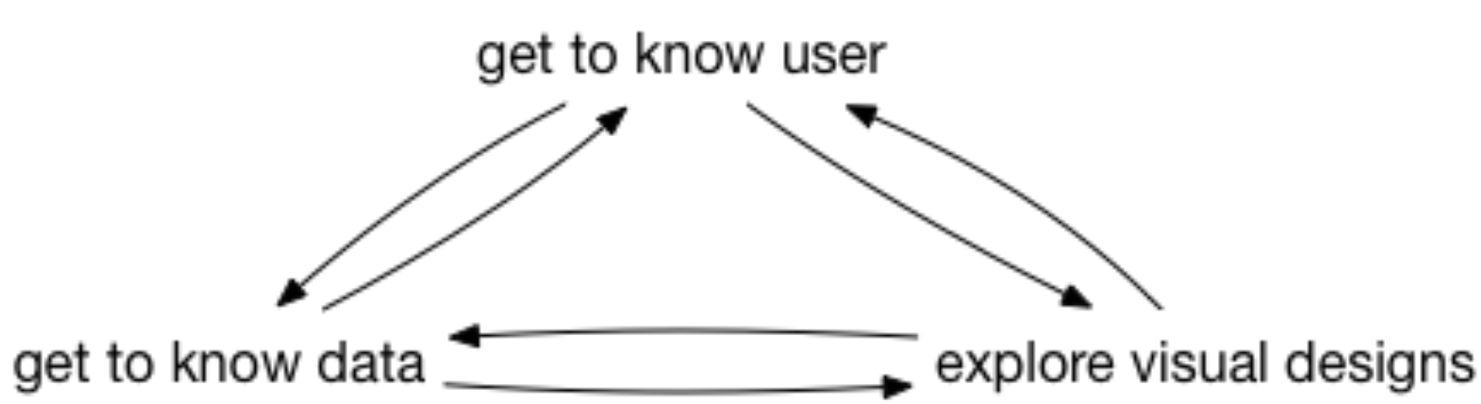
(several parts as described by Francis Rowland, EBI)

# The design process



The user

# Find the why

- what they *want* != what the *need* => need to find **underlying goals**
- e.g. let them **imagine** what they could do if some technologies were available that are (still) science-fiction (e.g. nanobots in blood; Gaviscon commercial http://m.youtube.com/watch?v=_skKmcLdyVQ) => helps to identify underlying **assumptions**
- additional methods, e.g. **card sorting**
- if possible: tape the discussion (w/ agreement)
- ask “why?” 3 times

**Nanobot Specification Sheet** (version 2253)

Requested by: Jan

Nanobot name: JAN-001

Nanobot type: ☒ sensor (measure/monitor/detect)
☐ execute

Type of information to be gathered (general description; 1 sentence):

virus entered cell

Sensor type: ☐ continuous; polling frequency: _____
☒ triggered; what trigger? virus entered
☐ once

To be administered: ☒ at birth
☐ ad hoc; when: _____

Sketch of dummy data format:

- 3D position cell
- tissue
- which virus

**Nanobot Specification Sheet** (version 2253)

Requested by: Jan

Nanobot name: JAN-002

Nanobot type: ☒ sensor (measure/monitor/detect)
☐ execute

Type of information to be gathered (general description; 1 sentence):

expression level of p53
(actual copies of protein)

Sensor type: ☒ continuous; polling frequency: 5 min
☐ triggered; what trigger? _____
☐ once

To be administered: ☒ at birth
☐ ad hoc; when: _____

Sketch of dummy data format:

| timestamp | tissue | expression level |
|---|---|---|
| 2253111120932 | liver | 5,372,923 |
| 2253111120932 | heart | 2,793,529 |
| ⋮ | | |

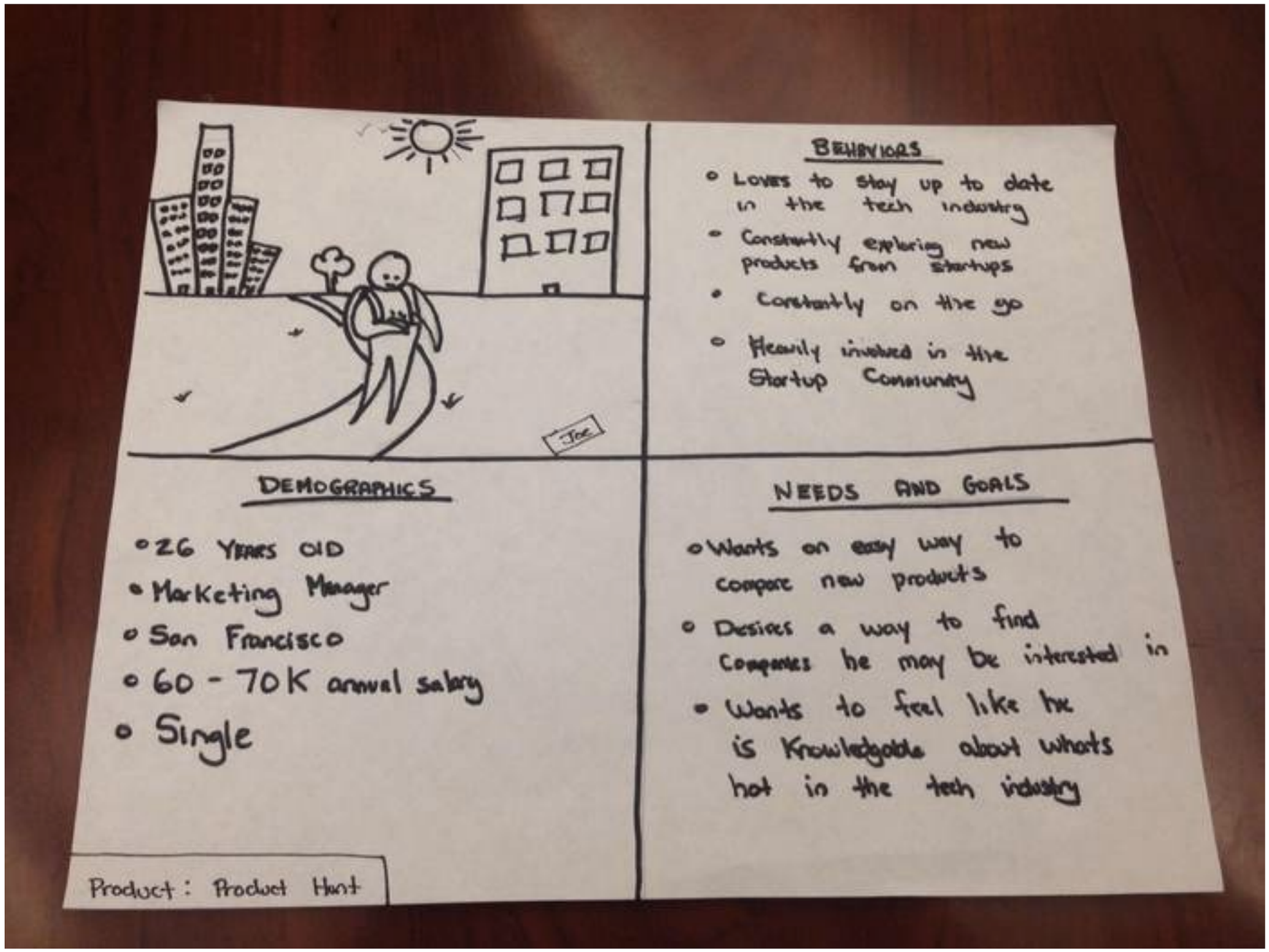
# Statement of goals

- Based on this discussion, state the specific goals of the user (= task abstraction as described by T. Munzner), e.g.
    - “Show the relationship between A, B and C across X and Y from m to n”.
    - “Identify instances of A that have a value larger than x”.
    - …

# Proto-persona

- Based on this task analysis, create one or (probably) more porto-personae, describing their name, behaviours and characteristics, needs or pain points, and what would help them. Who would be the actual users, and why do the need it?

| **Yun, clinical researcher**<br> <br>www.edmonton.ca | **Behaviour and characteristics**<br>Yun spends about half of her time in the lab but uses bioinformatics tools and software to analyse and process disease-related data.<br>Often stays late (experiments!) |
|---|---|
| **Needs & pain points**<br>Often doesn't have time to remember how to use certain software<br>Feels overwhelmed by latest huge datasets<br>Finds some visualisations overly-complex | **Would be served by…**<br>Summary reports of data with highlights<br>Focus on certain genes by default<br>Add and mix data, perhaps in layers |




http://www.anthonycreyes.com/persona-to-prototype-product-hunt/

# [Activity] Proto-persona & problem statements (in group)

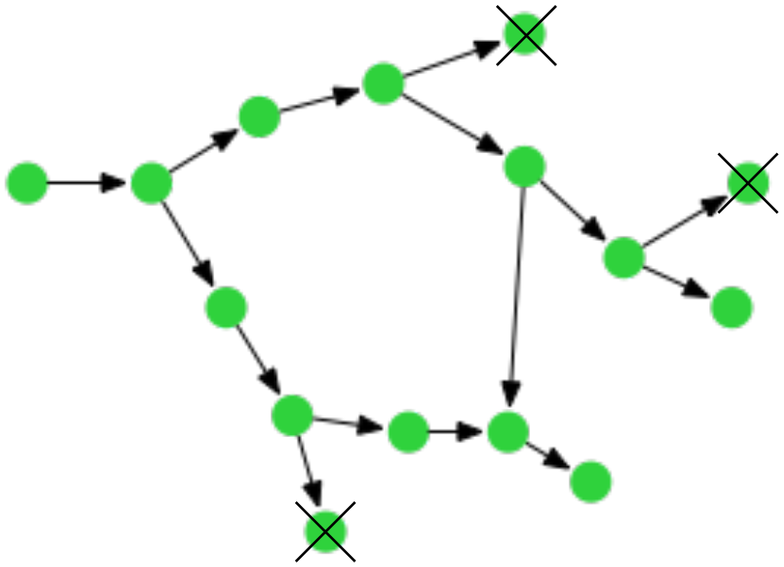
- dataset = flight data

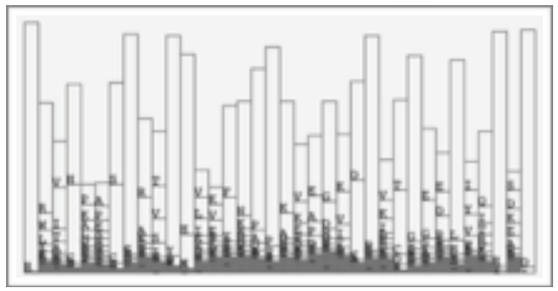
```
from_airport,from_city,from_country,from_long,from_lat,to_airport,to_city,to_country,to_long,to_lat,airline,airline_country,dist
ance
Balandino,Chelyabinsk,Russia,61.838,55.509,Domododevo,Moscow,Russia,38.51,55.681,Aerocondor,Portugal,1458
Balandino,Chelyabinsk,Russia,61.838,55.509,Kazan,Kazan,Russia,49.464,56.01,Aerocondor,Portugal,775
Balandino,Chelyabinsk,Russia,61.838,55.509,Tolmachevo,Novosibirsk,Russia,83.084,55.021,Aerocondor,Portugal,1341
...
```

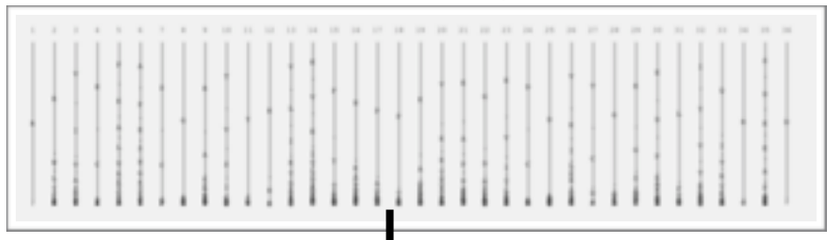
- describe 3 proto-personae

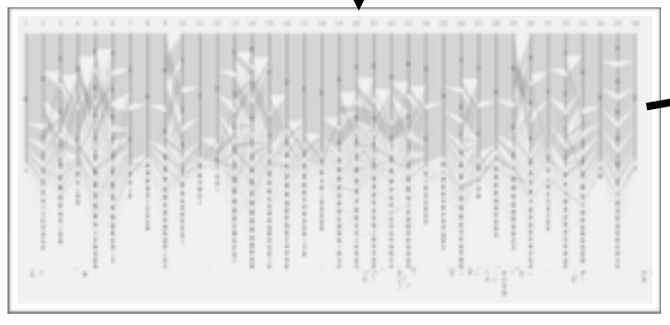
- think of at least 4 goals, and write down goal statements

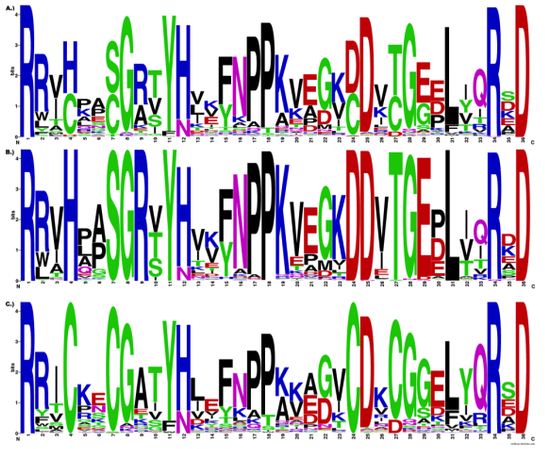
# The design

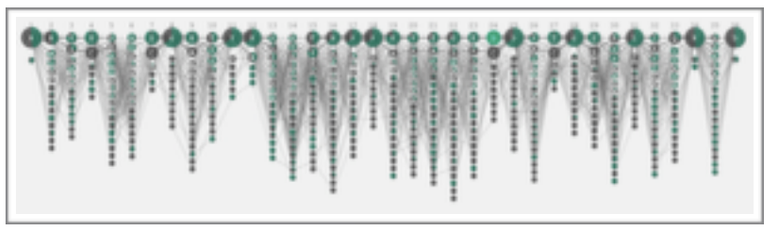


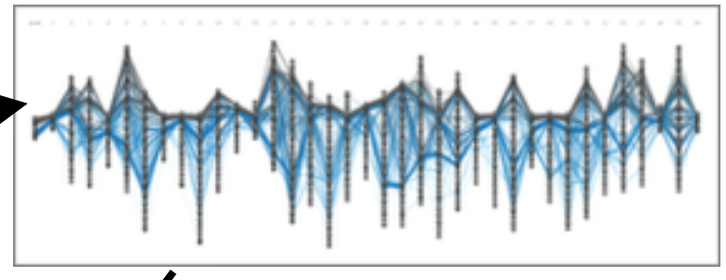


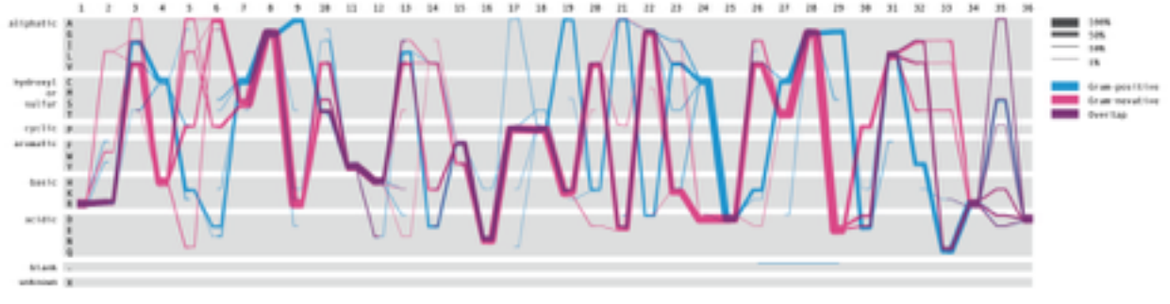


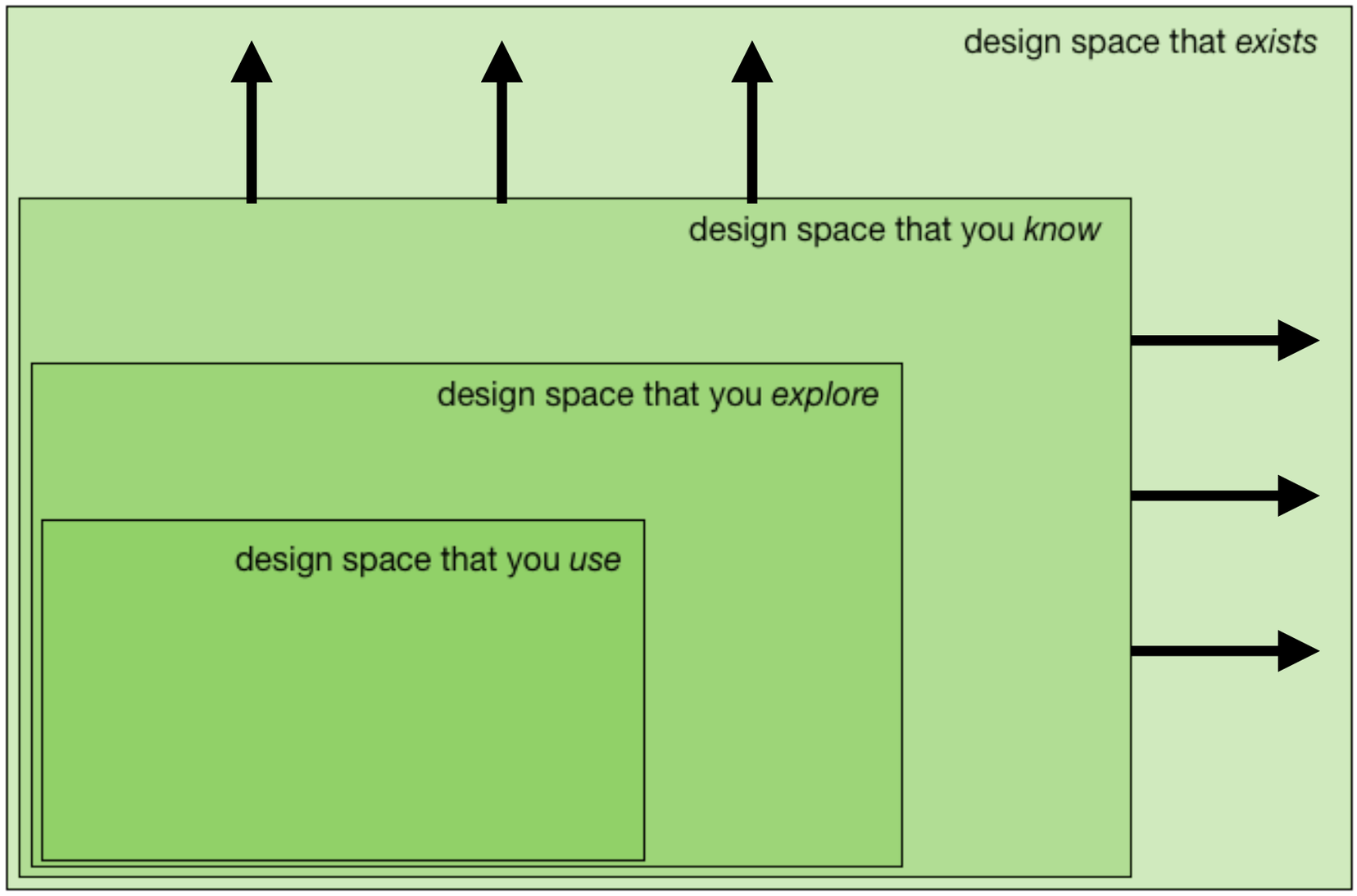









aliphatic
hydroxyl or sulfur
cyclic
aromatic
basic
acidic
blank
unknown
Gram-positive
Gram-negative
Overlap




problem: initial design space that you know is small => how to expand?

# Generating ideas - exploring design space

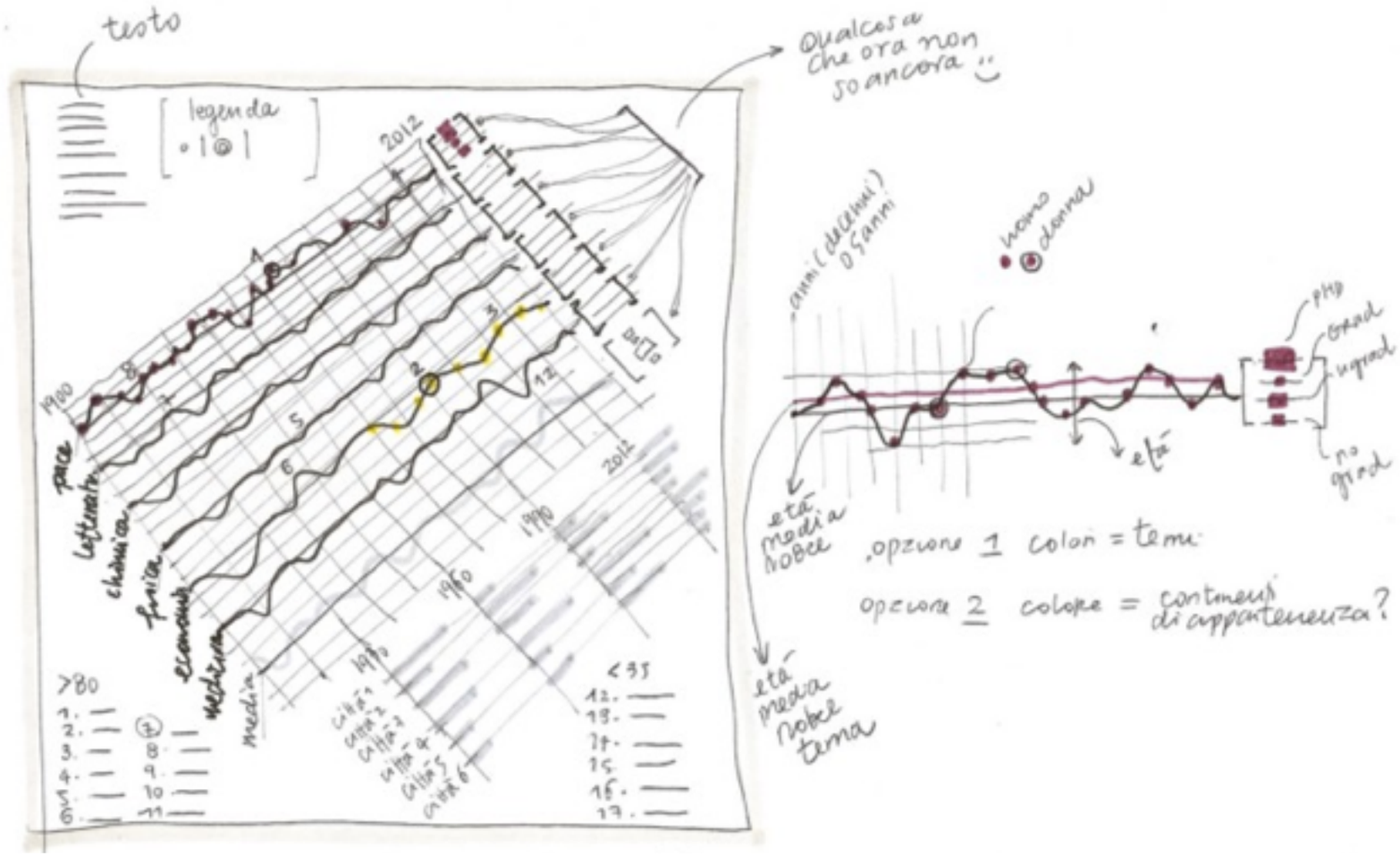
= “ideation”

- use pen & paper!
- approaches:
  - expand your visual library
  - anti-solutions
  - five-design sheets
  - …

# Pen & paper

https://t.co/Rvoc8sUOOP

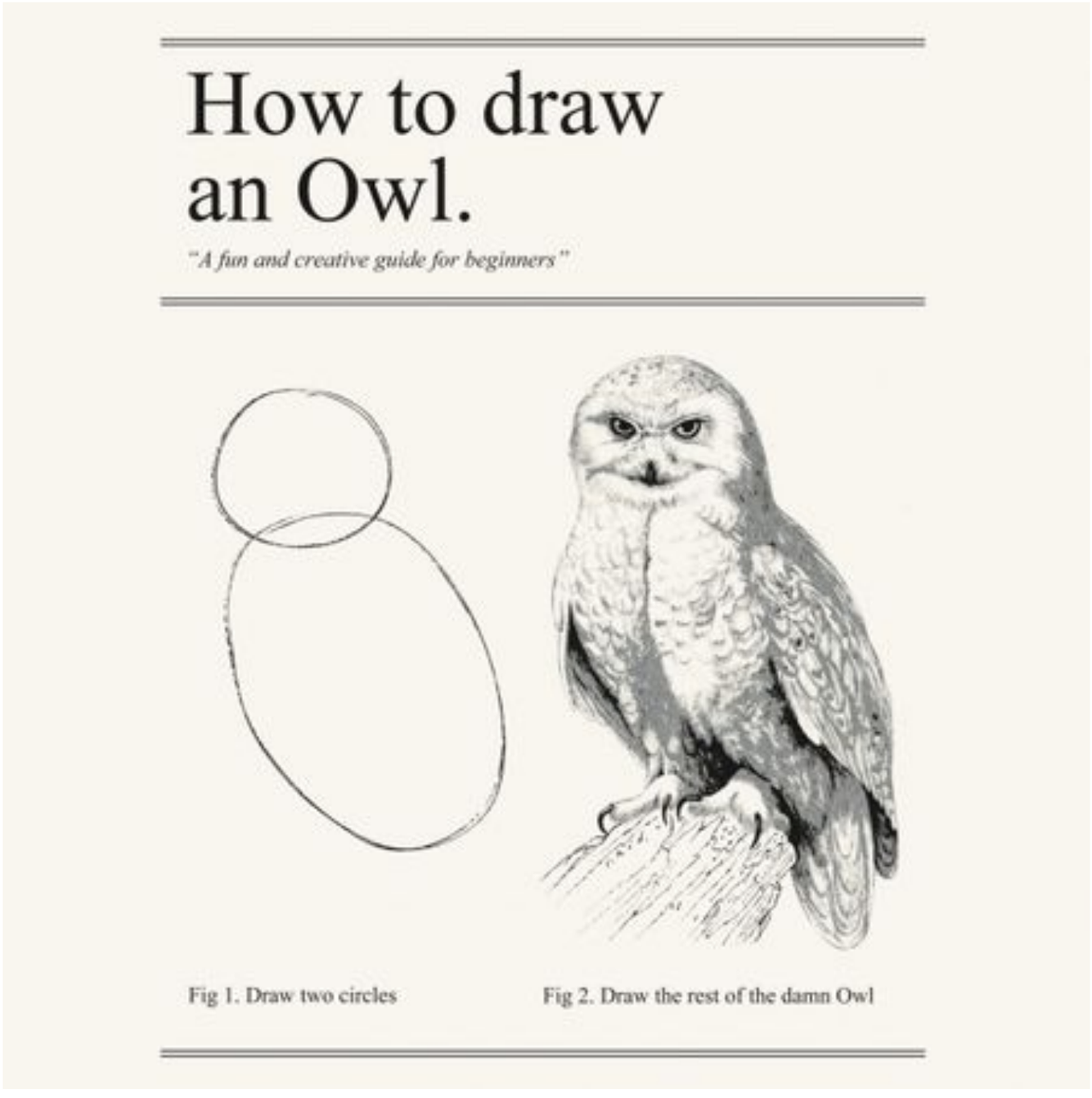
Read this




“Get the big things right during low-fidelity, and the little things will follow in future iterations” (Marc Rettig)

=> biggest benefit of sketching with pen: **sketches are cheap**. (meaning: they are easy and quick to make, so that you won’t cling to them and feel uncomfortable when you discard them)

# Intermezzo - “But I can’t draw…”



How to draw an Owl.

*“A fun and creative guide for beginners”*

Fig 1. Draw two circles

Fig 2. Draw the rest of the damn Owl

# [Activity]

- Take a line for a walk
- Draw 8 objects & concepts (10 sec each)

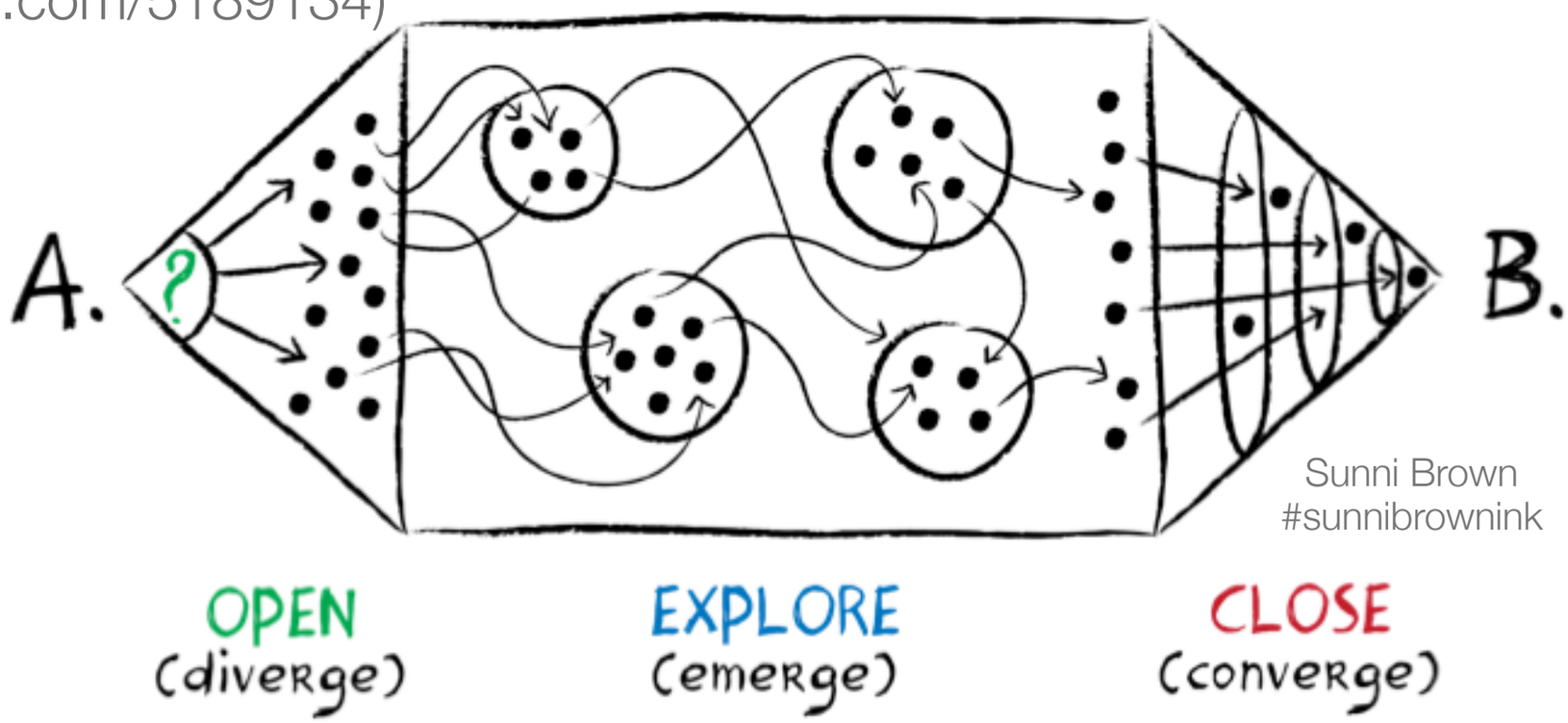
# Diverge - emerge - converge

"The best way to have a good idea is to have many" (Linus Pauling)

- Don't arrive with just one idea => if someone critiques that idea, it feels like they critique you

- Arrive with many ideas and *don't commit yourself* to any of them => you can have open discussions

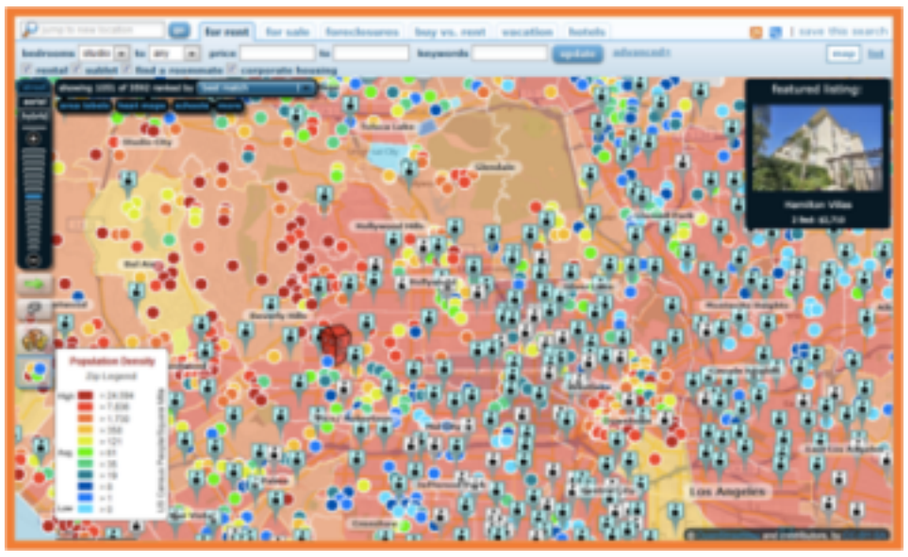
(see Bill Buxton https://vimeo.com/5189134)

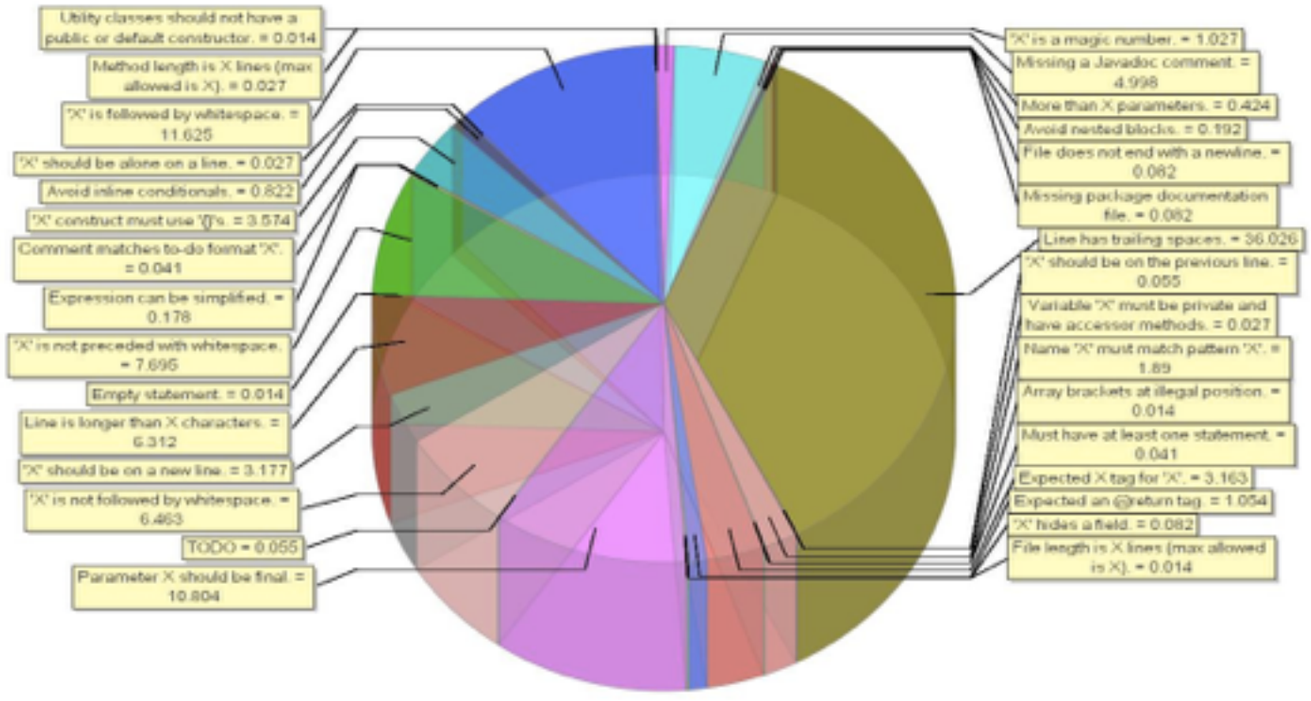


# Anti-solution

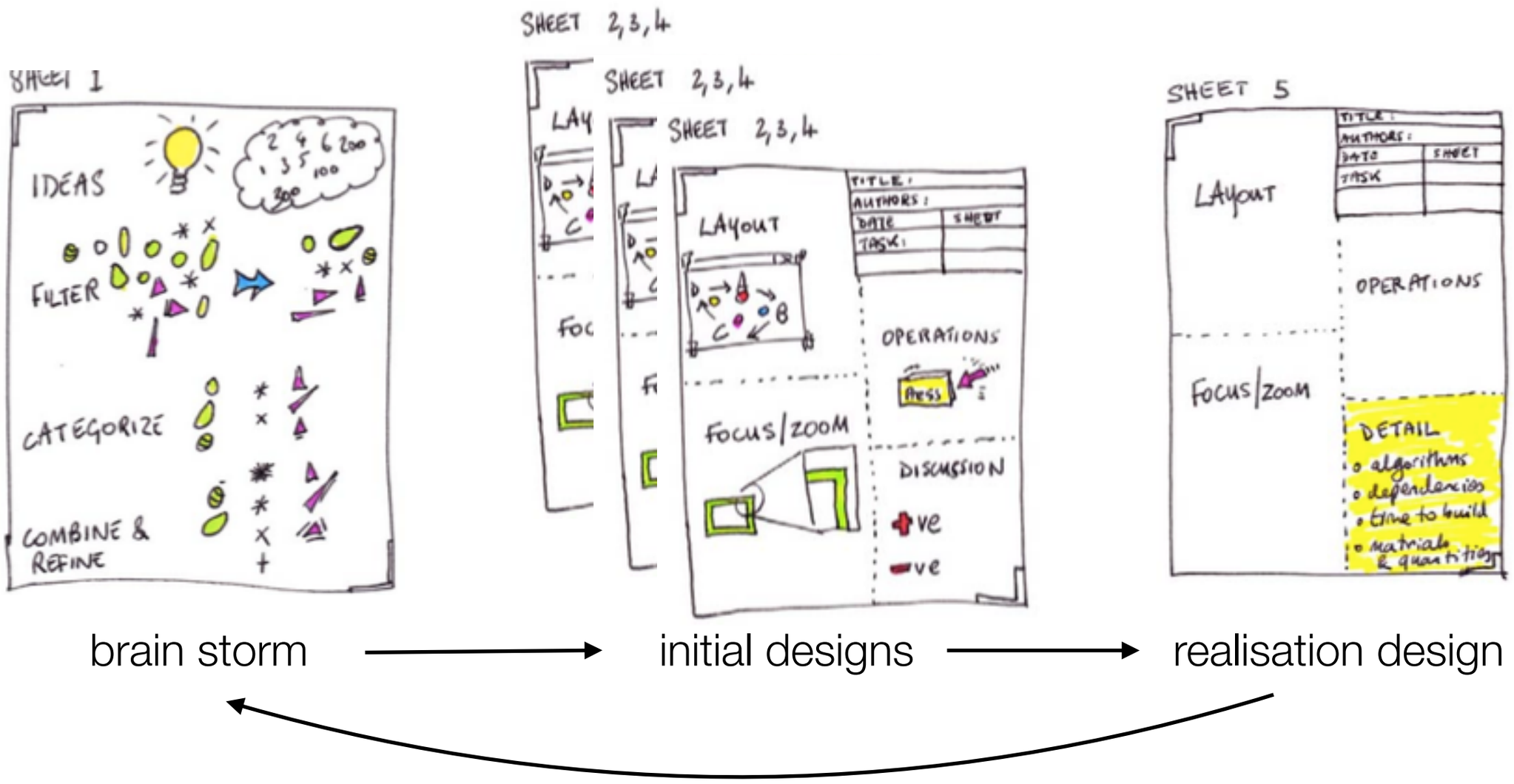
Sketch a collection of designs that are particularly bad at supporting the goals of the (proto-)users (e.g. using “bad” selection of encoding; see Mackinlay)

=> helps to identify what does not work => adds limits to your design space



# 5-design sheet methodology



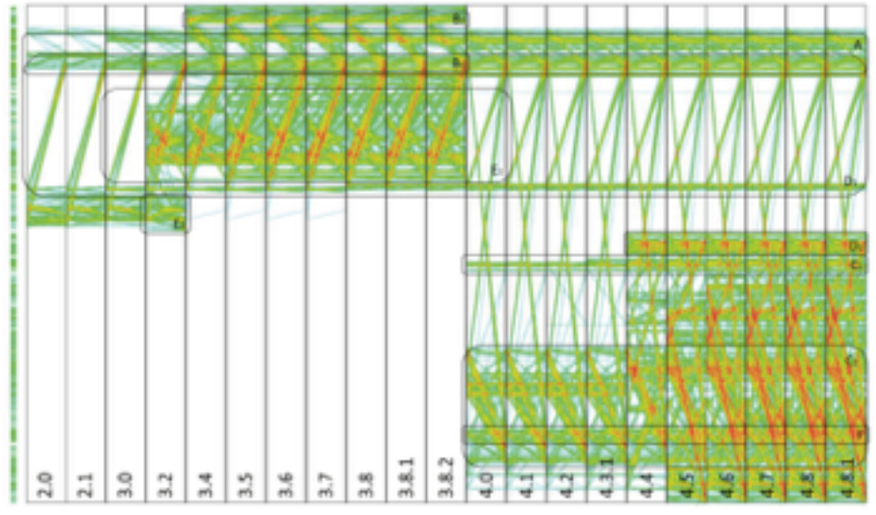

Read the paper! (http://fds.design)

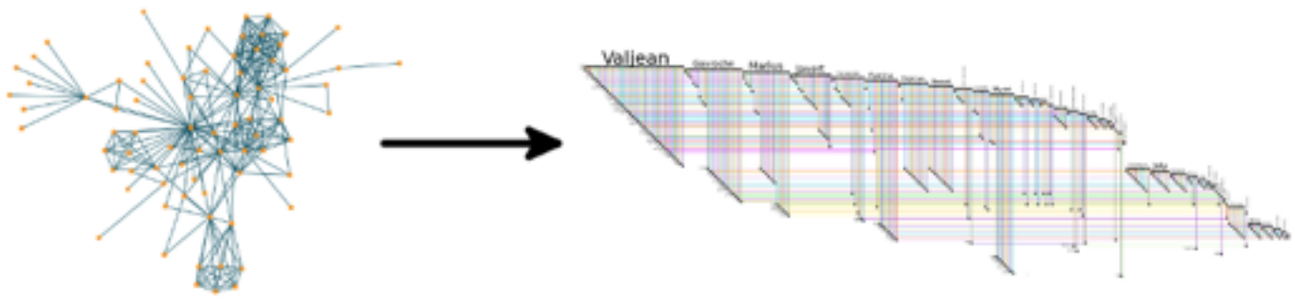
# 5dS: sheet 1 - ideation

only part that may be >1 sheet

approaches:

- **relax**: “slow hunch” - good ideas take time
- **re-work** existing visuals
- **provoke**: think of impossible solutions
- glue **dissimilar ideas** together (e.g. use a network to visualize geo-spatial data, or parallel coordinates to visualise networks)
- **reverse/flip/invert** an idea (e.g. biofabric: nodes as links, links as nodes)



- **<u>iterate & refine</u>**: evaluate and revisit assumptions
- **collaborate**: work with different people
- **transferency**: look at other fields for inspiration (e.g. biomimicry)
- **research**: discover every idea and solution so far
- **metaphors**: use analogies
- **<u>make mistakes</u>**: good ideas come from serendipity (e.g. sticky note and penicillin)

# 5dS: sheet 1 - ideation

- parts of the sheet:

1. **ideate** - sketch as many ideas as possible (half-baked, throw a wide net => don’t critique)

2. **filter** - remove duplicate and irrelevant ideas by annotating the existing ideas

3. **categorize** - can these ideas be clustered in some way?

4. **combine & refine** - which visualisations can complement each other?

5. **question** - reflect on what has been created

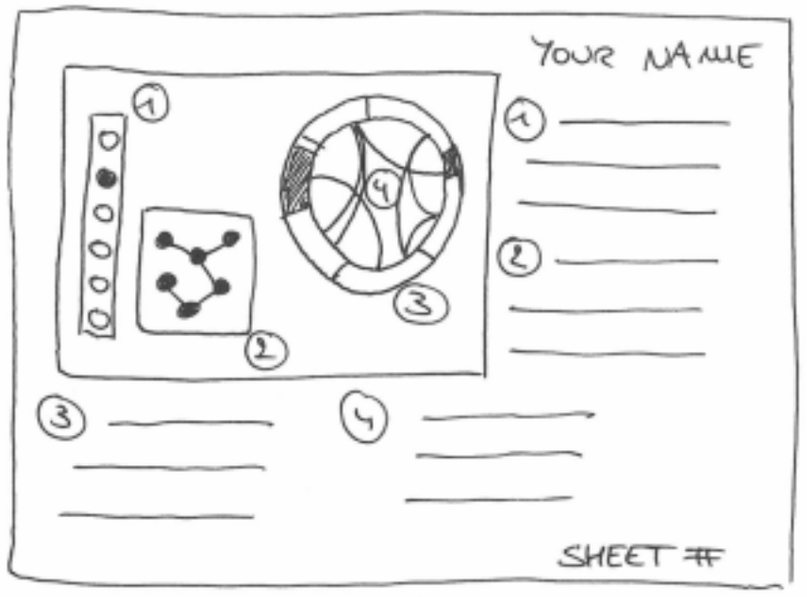
# [Activity] 8+8 sketch (individually)

- Fold A3 paper 3 times in half => 8 sections
- Assign goal statements to students:
    - Generate 8 different designs as creative and diverse as possible; *meaningfully* distinct, not just cosmetically (max 20 min total)
    - Choose 2 or 3
    - Generate 8 detailed versions or variations (max 20 min total)
    - Present

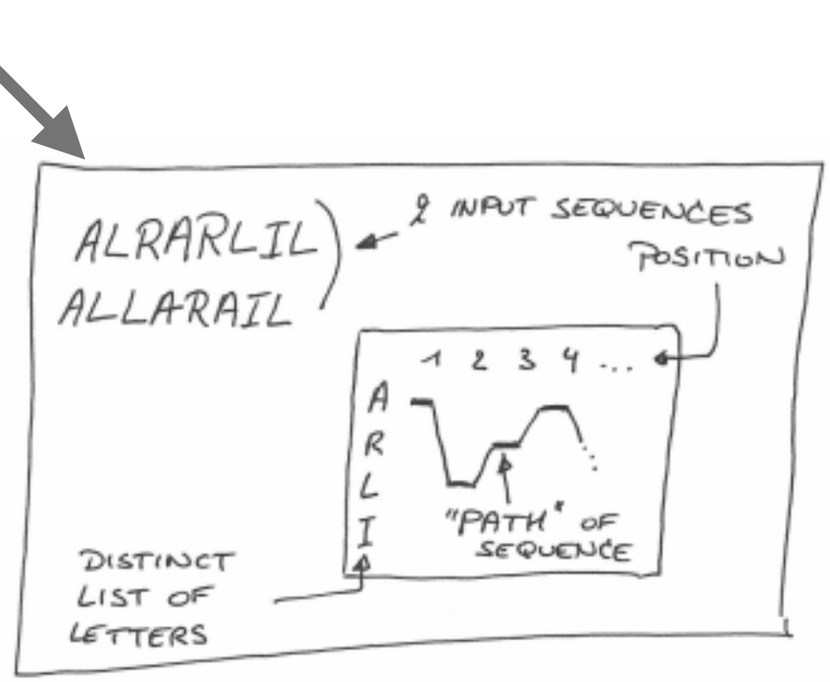
# [Activity] Create 5dS sheet 1

- individually; assign statements a-b-c-d-a-b-c-d-a-b-c-d
- use what you already did in 8+8 exercise
- max 15 min

# 5dS: sheets 2-4




1. **meta-information** - title, name, date, number, …
2. **layout** - overview, =~ sketch of a screenshot
3. **operations** - what interactions are possible? (maybe defer to storyboard; see later)
4. **focus/parti** - explain the central idea; e.g. zoomed into a single component, or a flow diagram
5. **discussion** - advantages and disadvantages



# [Activity] Create 5dS sheets 2-4

- max 20 min

# 5dS: sheet 5

similar to sheets 2-4:

1. **meta-information**

2. **layout**

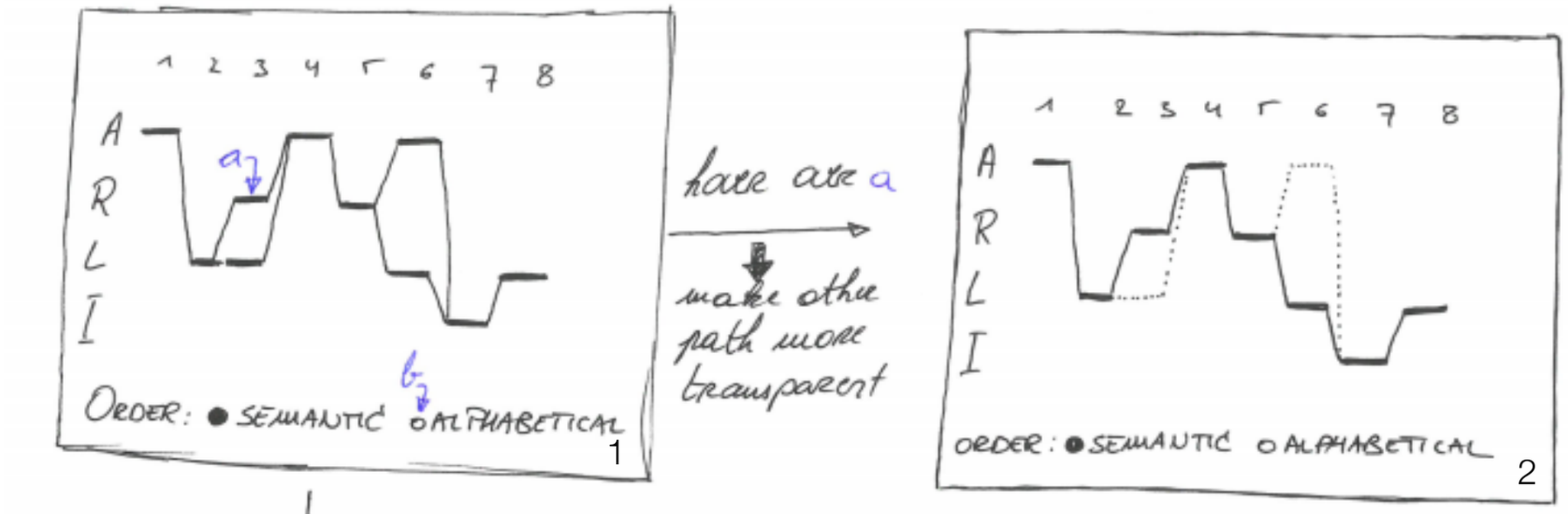
3. **operations**

4. **focus/parti**

5. **details** - algorithms, design patterns, data structures

# [Activity] Create 5dS sheet 5

# Have interaction? => draw a storyboard




- sketch sequences of interactions
- think about each step and about the transitions
- number each “slide” => refer to detail slides

# Critique

- critique != criticism
- method: 2+2
    - what are 2 things to definitely keep
    - what are 2 things that should be changed