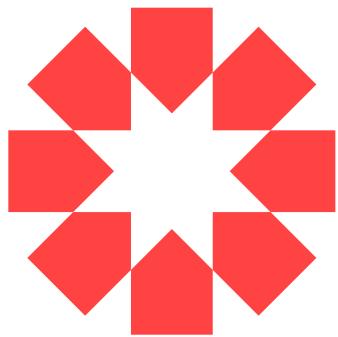


An intro to Data Visualisation

Data Visualisation · Gyan Lakhwani · January 2025



About me



Co-founder

Public Knowledge Design Studio



Product Designer

Microsoft

IDC

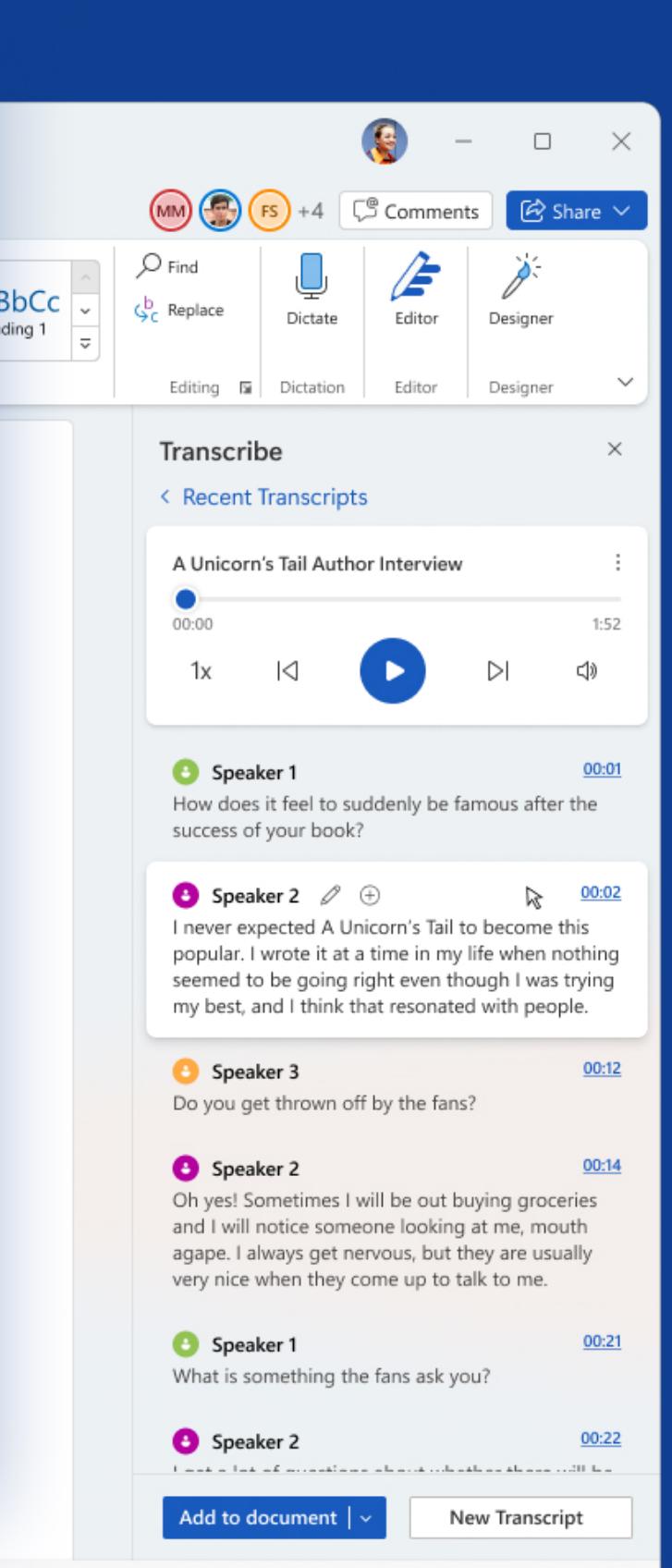
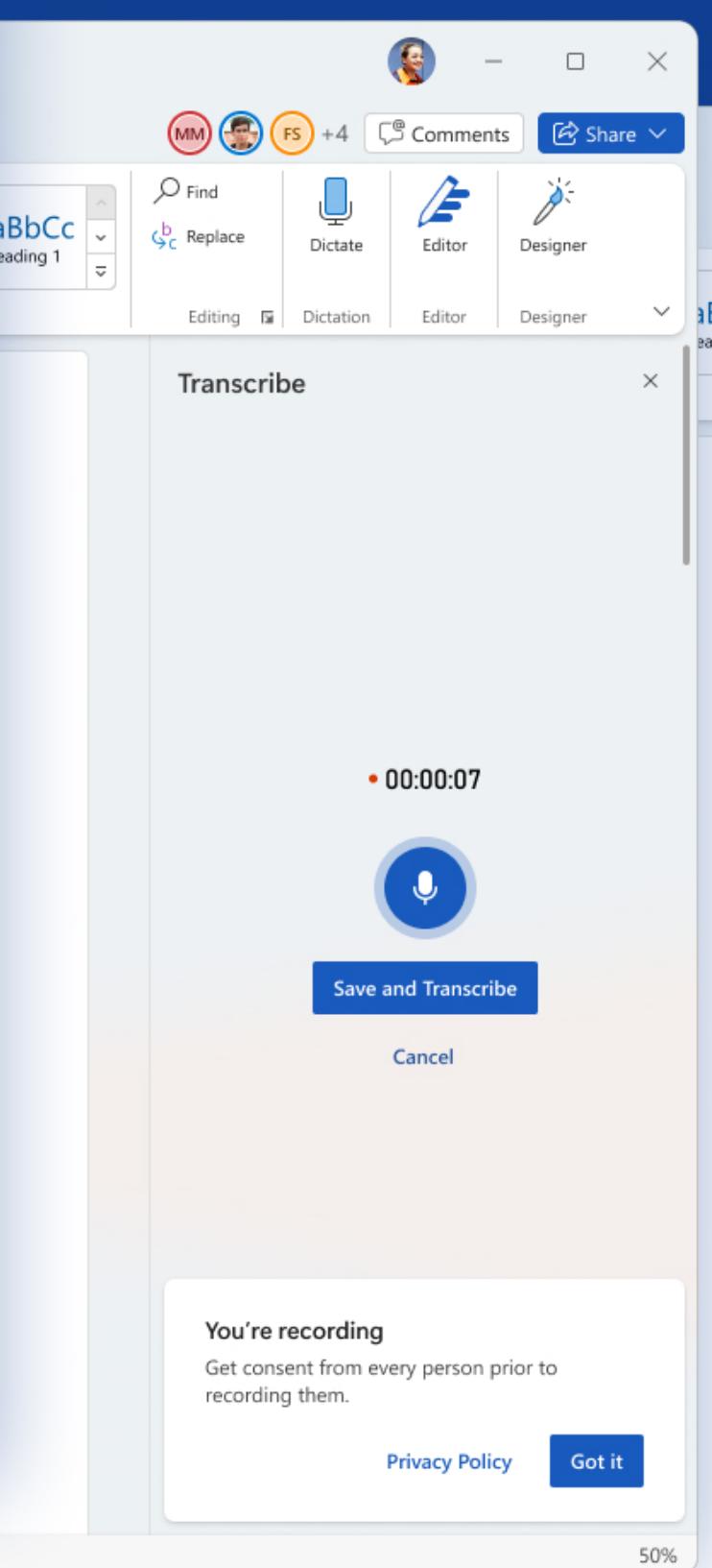
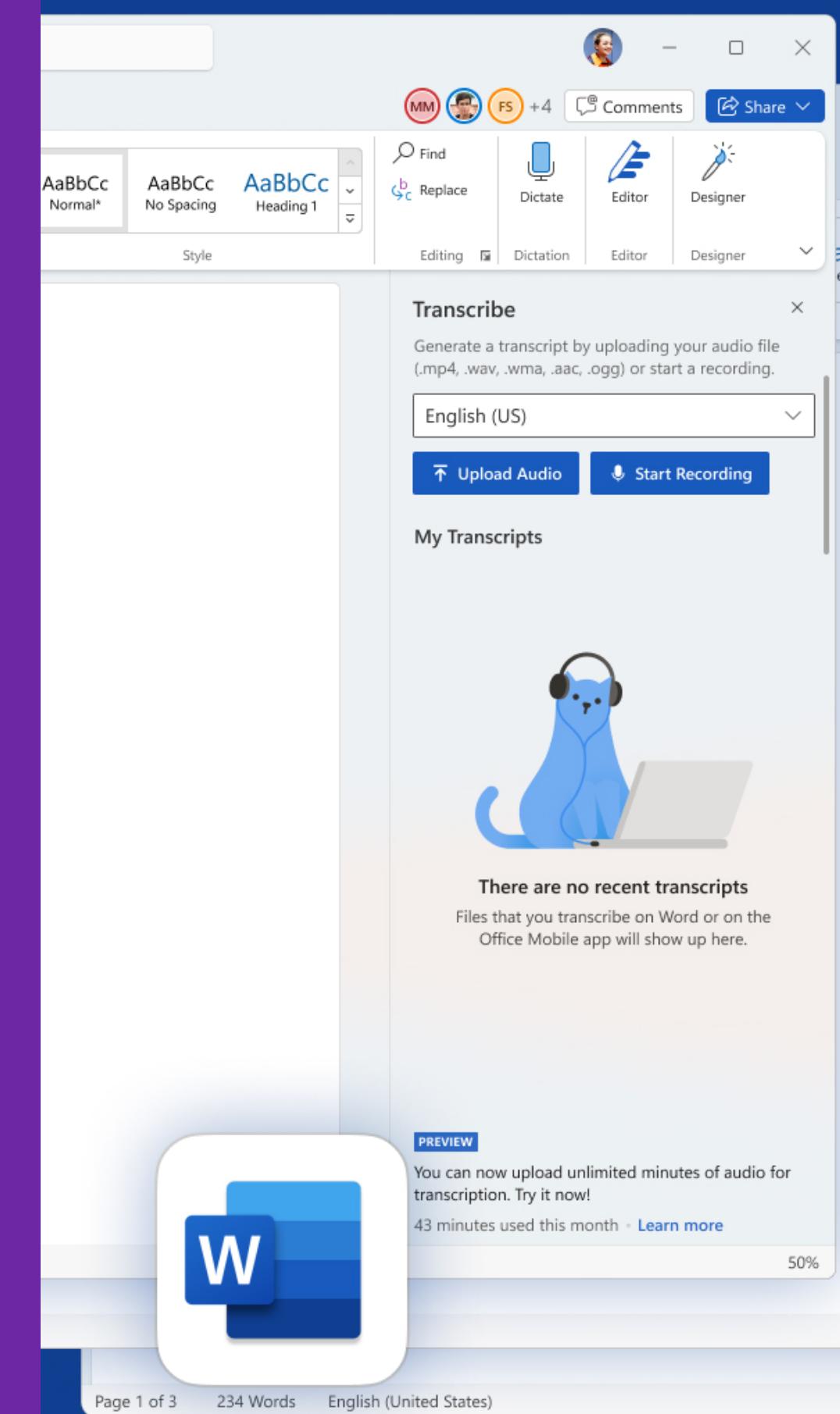
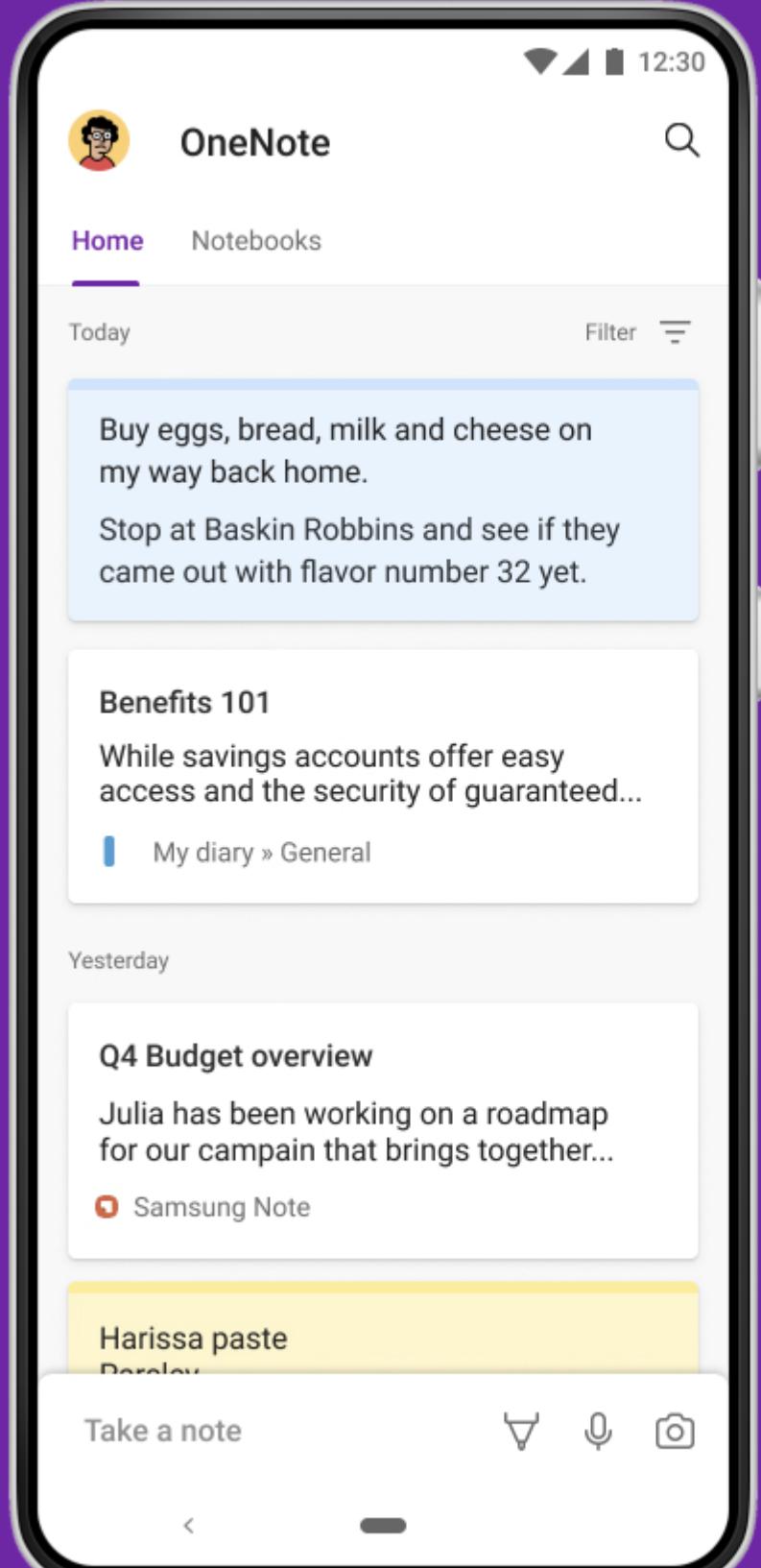
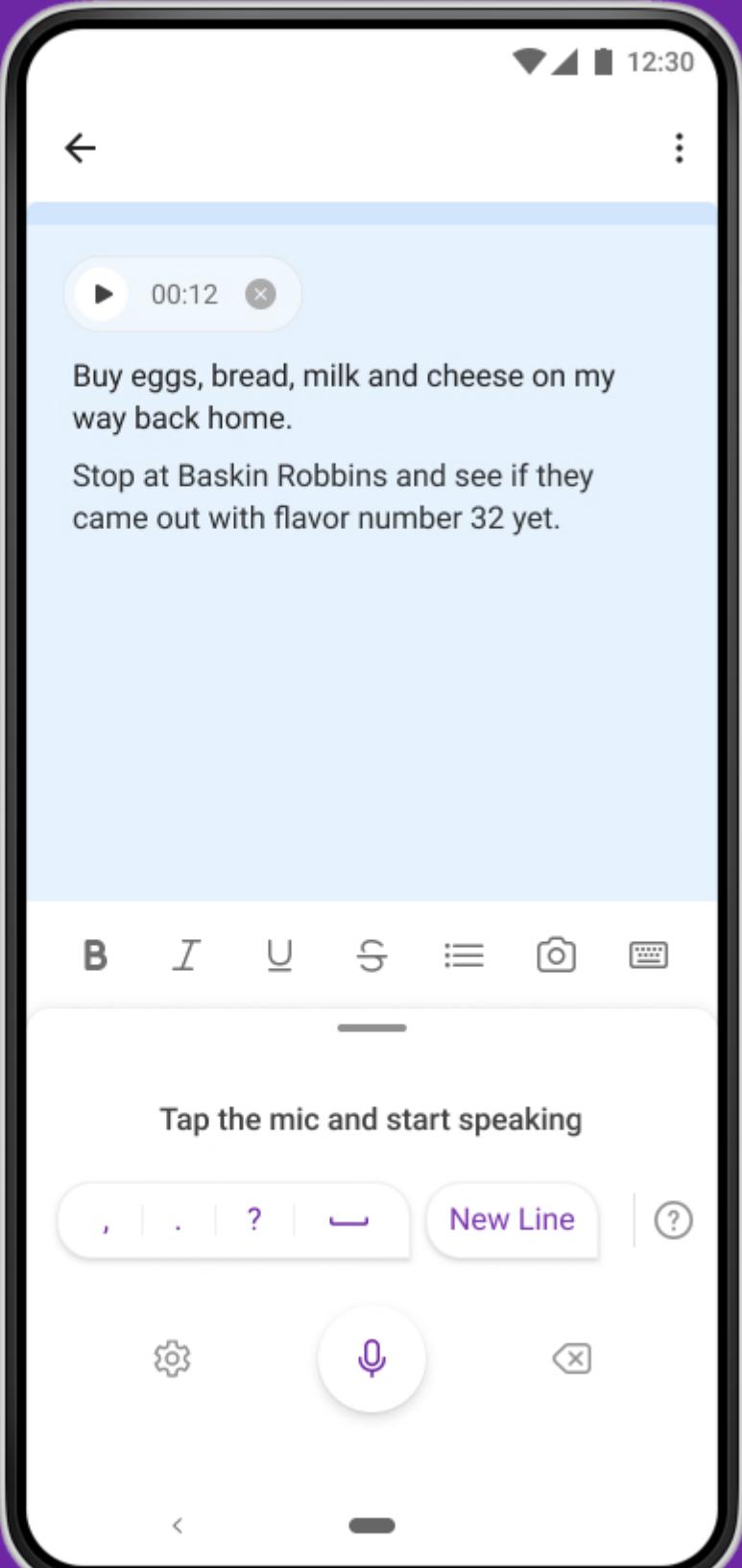
M.Des. (Interaction Design)

IDC School of Design, IIT Bombay

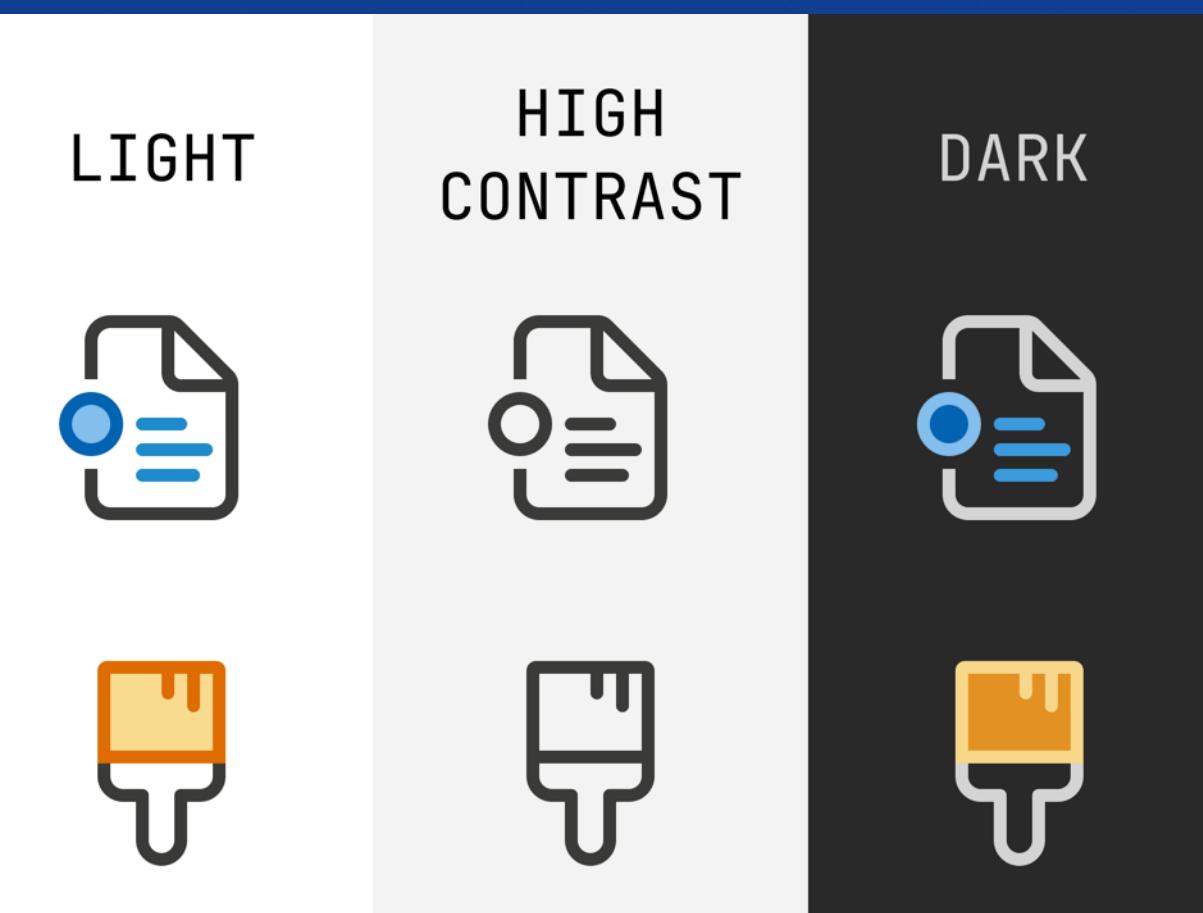
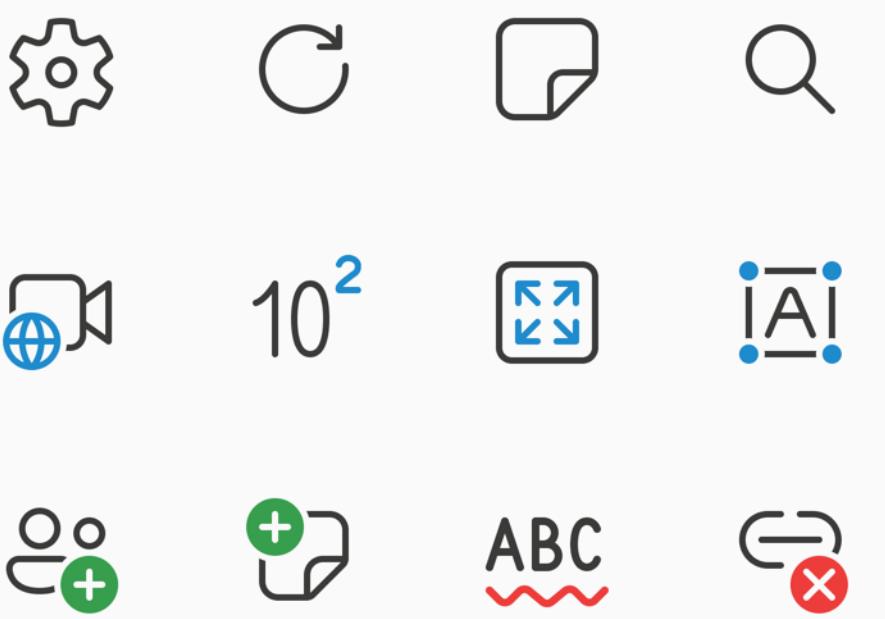


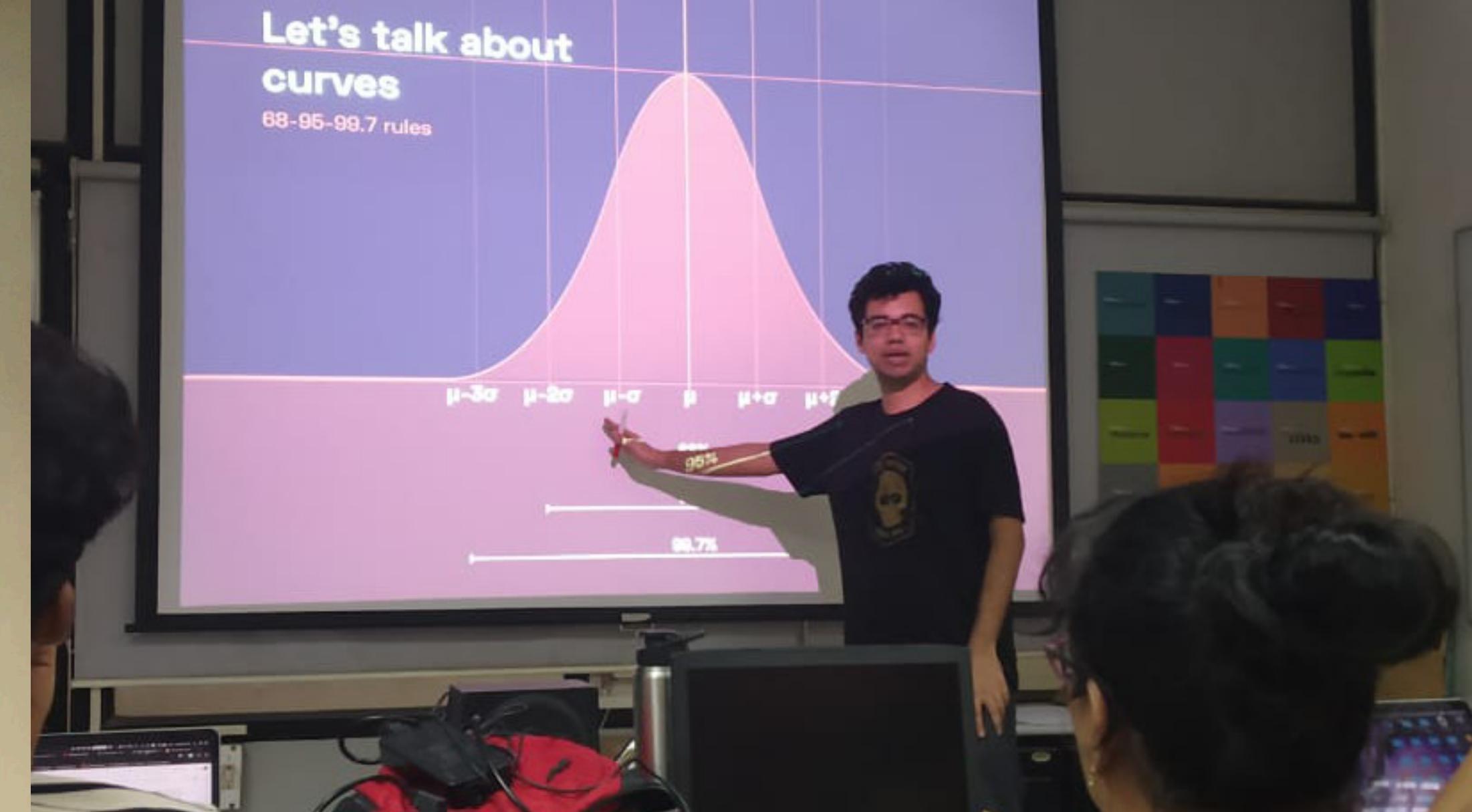
B.Tech. (Information Technology)

MAIT, IP University



A screenshot of the Microsoft Word desktop app. The ribbon menu is visible with tabs like File, Arc, Home, Insert, Layout, References, and Review. The Home tab is selected. Below the ribbon is a toolbar with icons for Undo, Paste, and Clipboard. The main area shows a document titled "Document 32".







Gyan Lakhwani (@gyanl) • Instagram

gyanl Edit profile

373 posts 1,174 followers

Gyan Lakhwani

@gyanl Designer, illustrator, nerd | UX @ www.gyanl.com

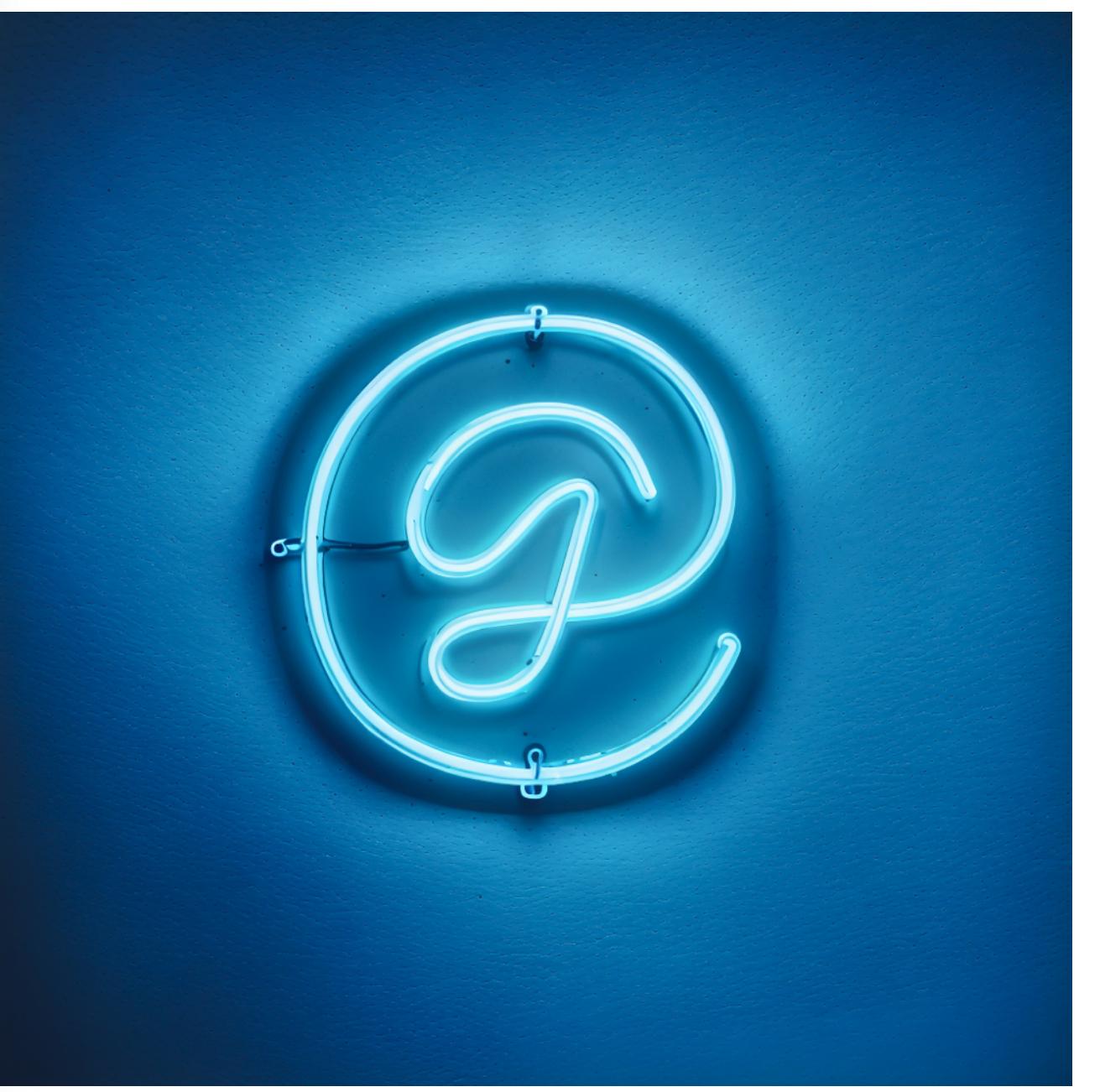
Instagram

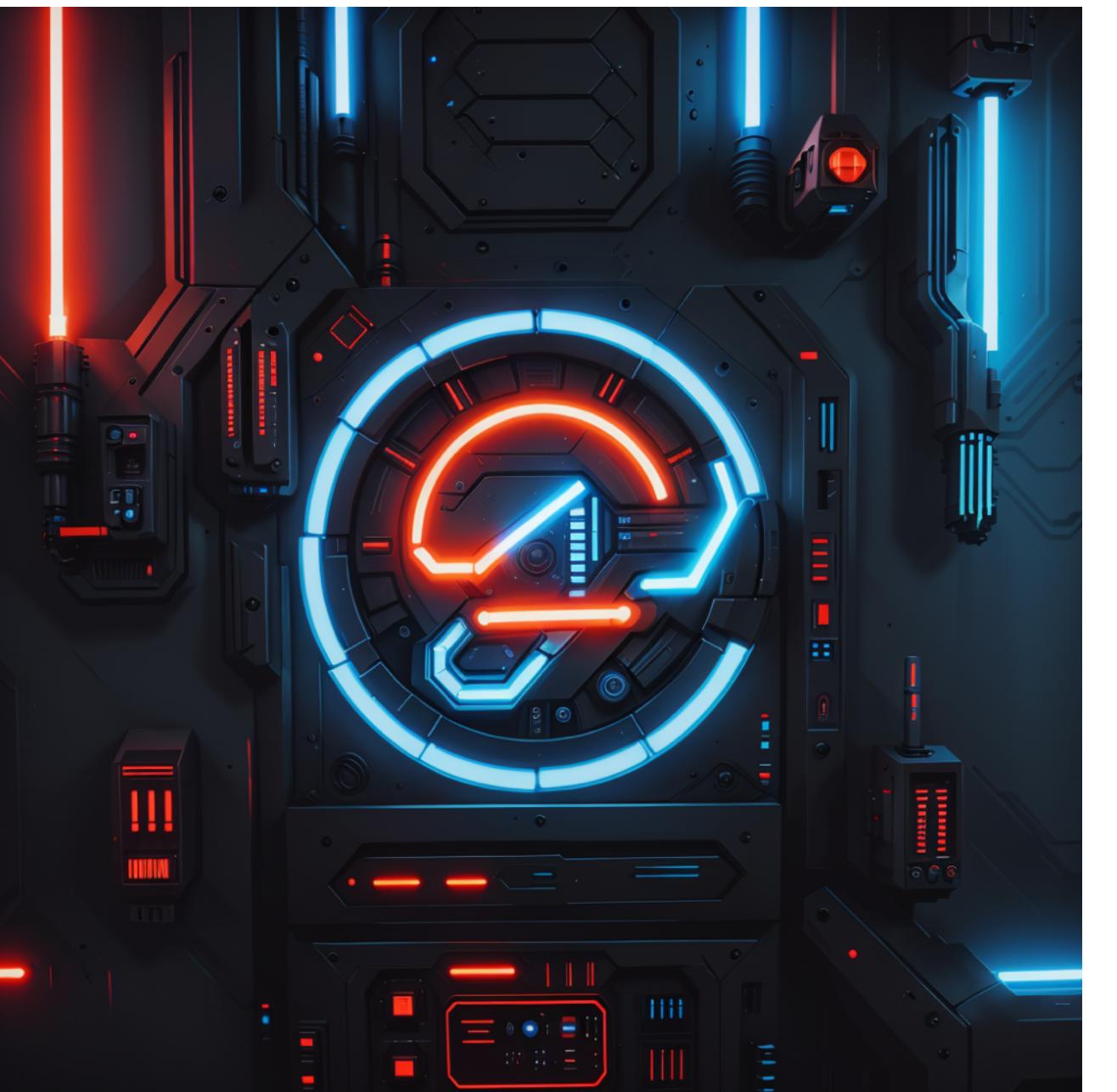
- Home
- Search
- Explore
- Reels
- Messages (3)
- Notifications
- Create
- Profile
- Threads (9+)
- More

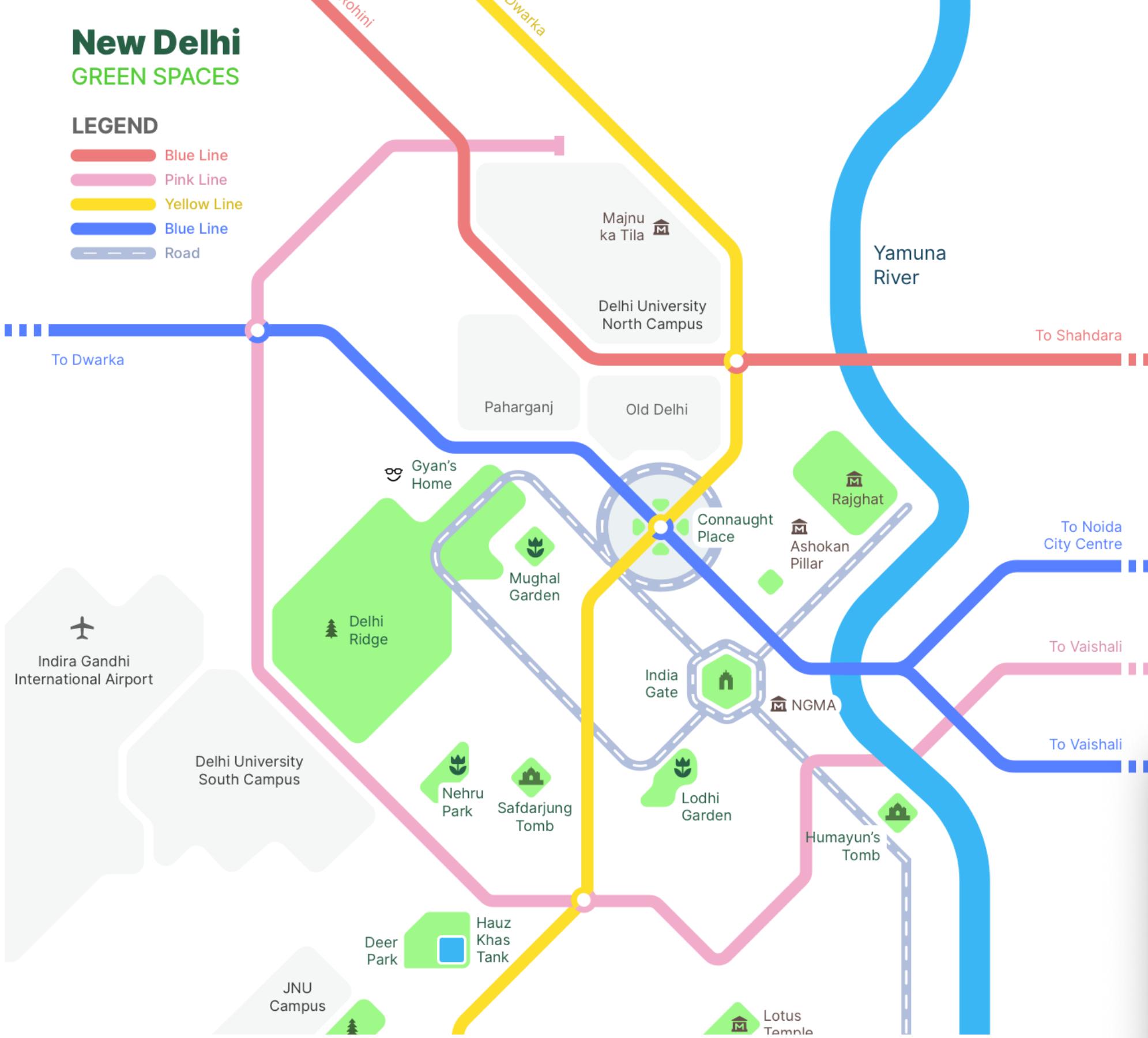
Draw Reqs Summer Flo... Screenshots Typoday Talks

POSTS REELS SA

A screenshot of a digital drawing application interface. At the top, there's a toolbar with icons for selection, eraser, text, shapes, and other drawing tools. Below the toolbar, a header bar shows the text "View archive" and a circular profile icon. The main workspace displays some user statistics: "4 followers" and "2,017 following". A bio section reads "ard | UX @microsoft". Below the stats, there are several circular thumbnails representing different doodles or projects, including one for "V-day" featuring a yellow star, one for "XStressX" showing a person, and one for "Doodle Req...". At the bottom of the screen, there are two buttons: "SAVED" and "TAGGED".







Mapping your contributions

It is possible to use Leaflet to map your contributions on an embeddable map. As an example, I mapped my classmate Gauri's contributions here:

GauriT's contributions



Exemplar Based Experience Transfer
Paridhi Maheshwari

INDIA HCI 2019

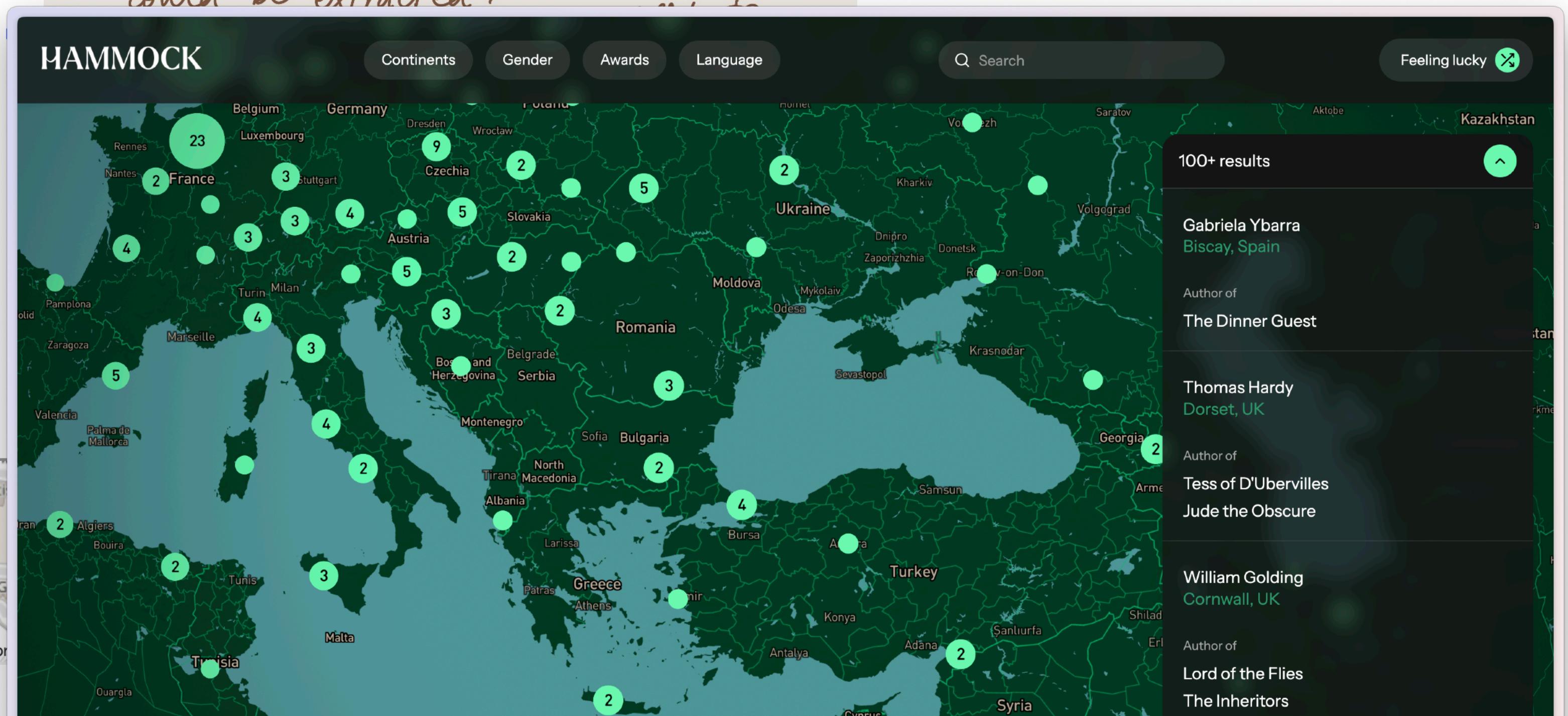
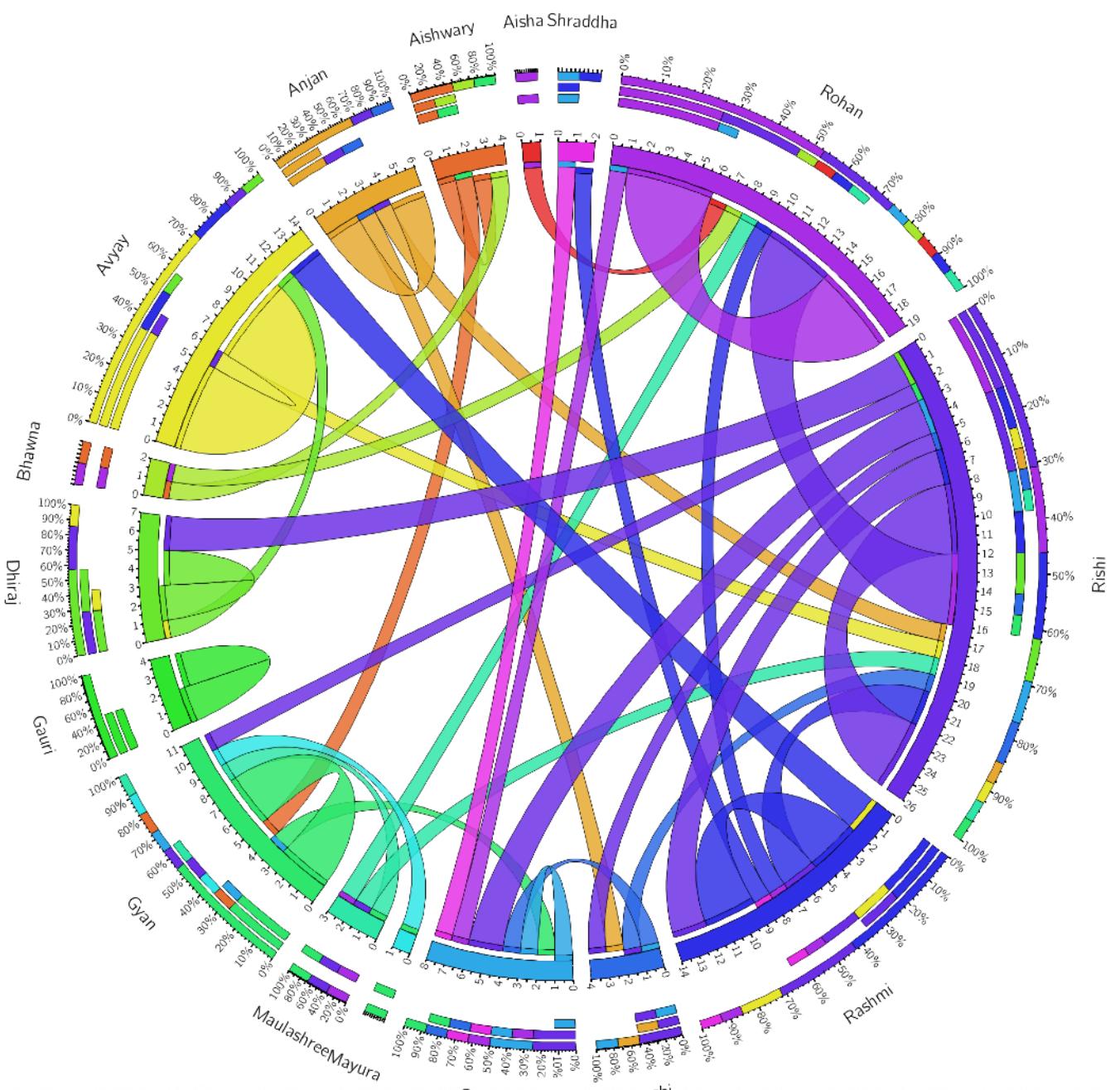
Banners are everywhere

EXTRACT

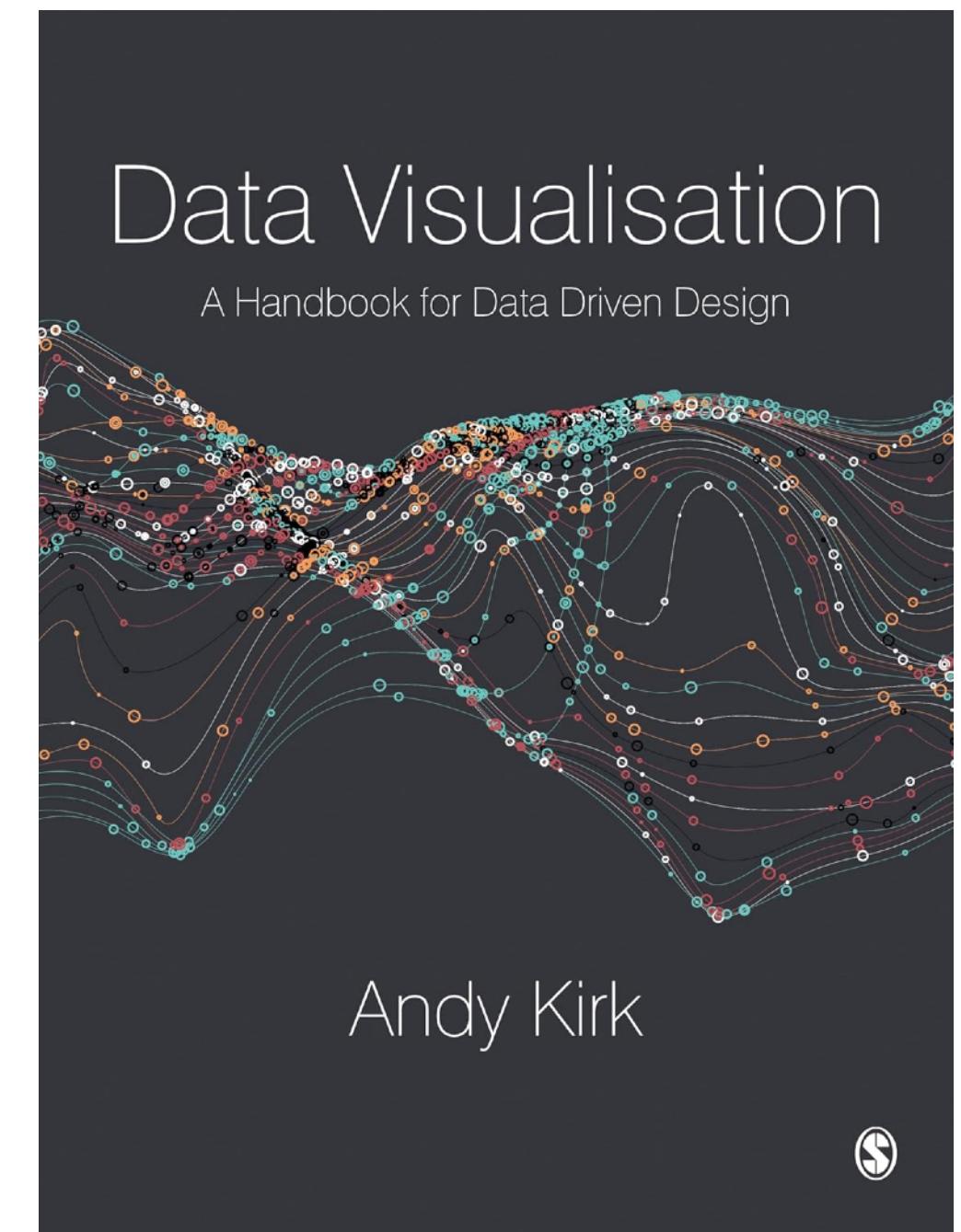
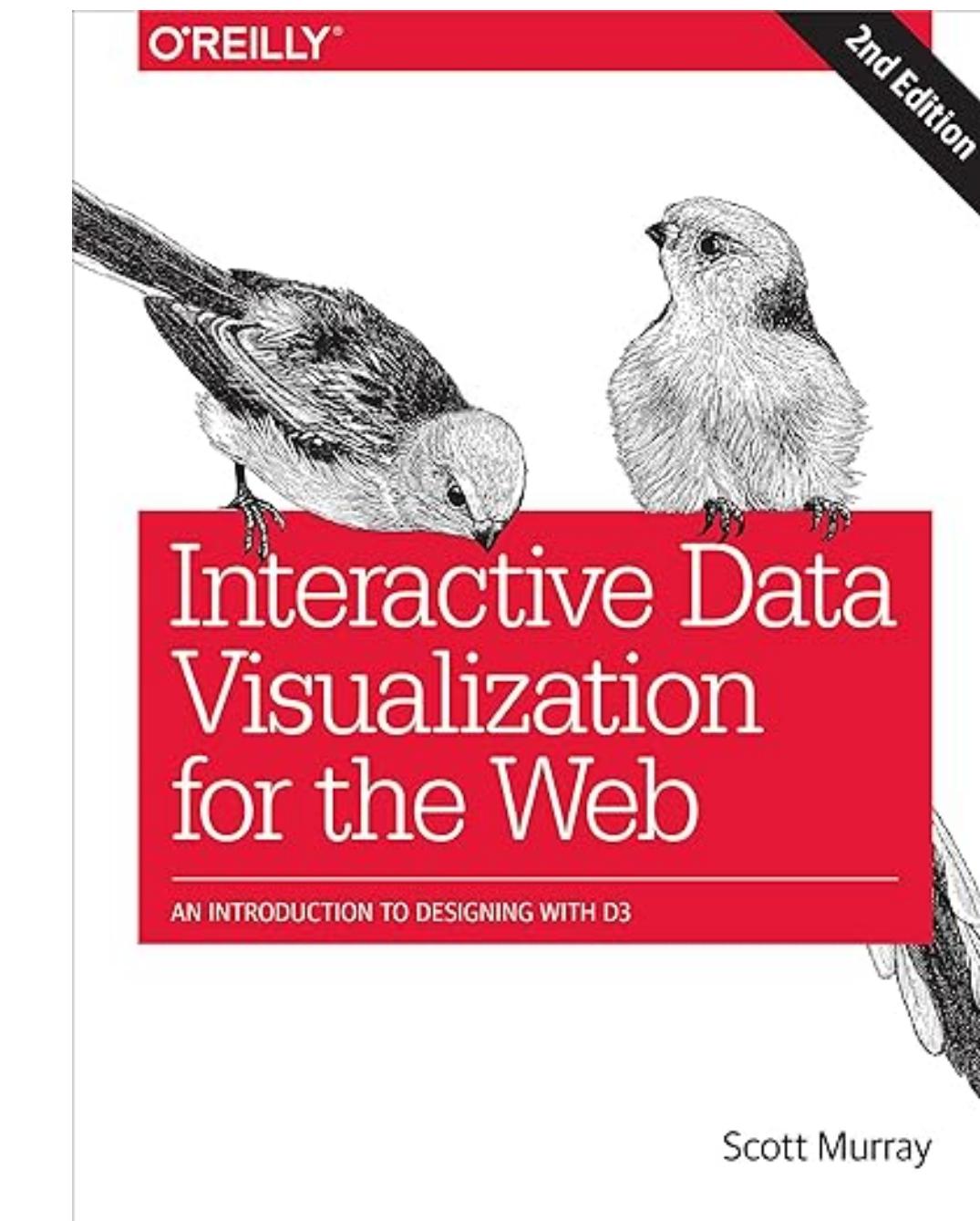
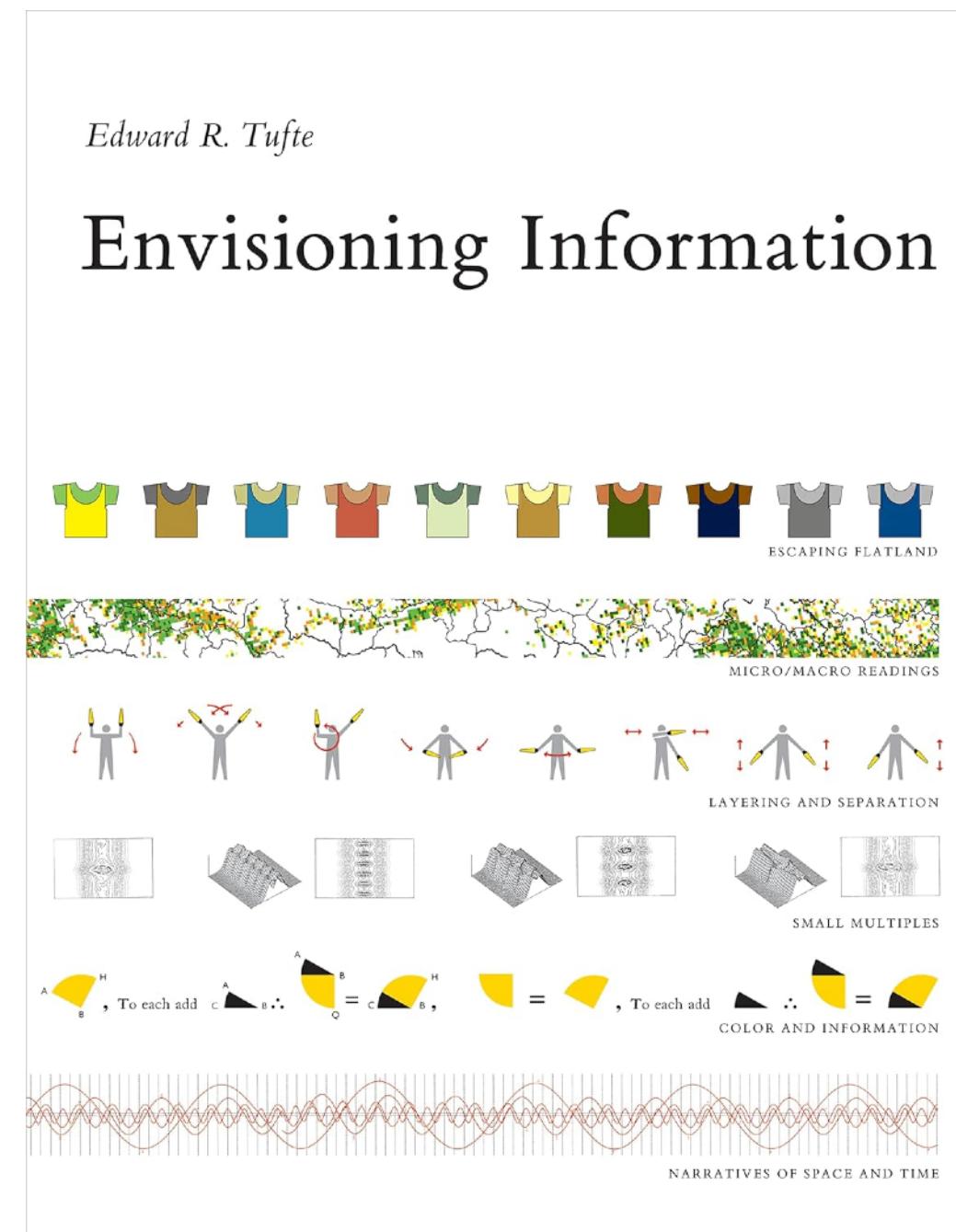
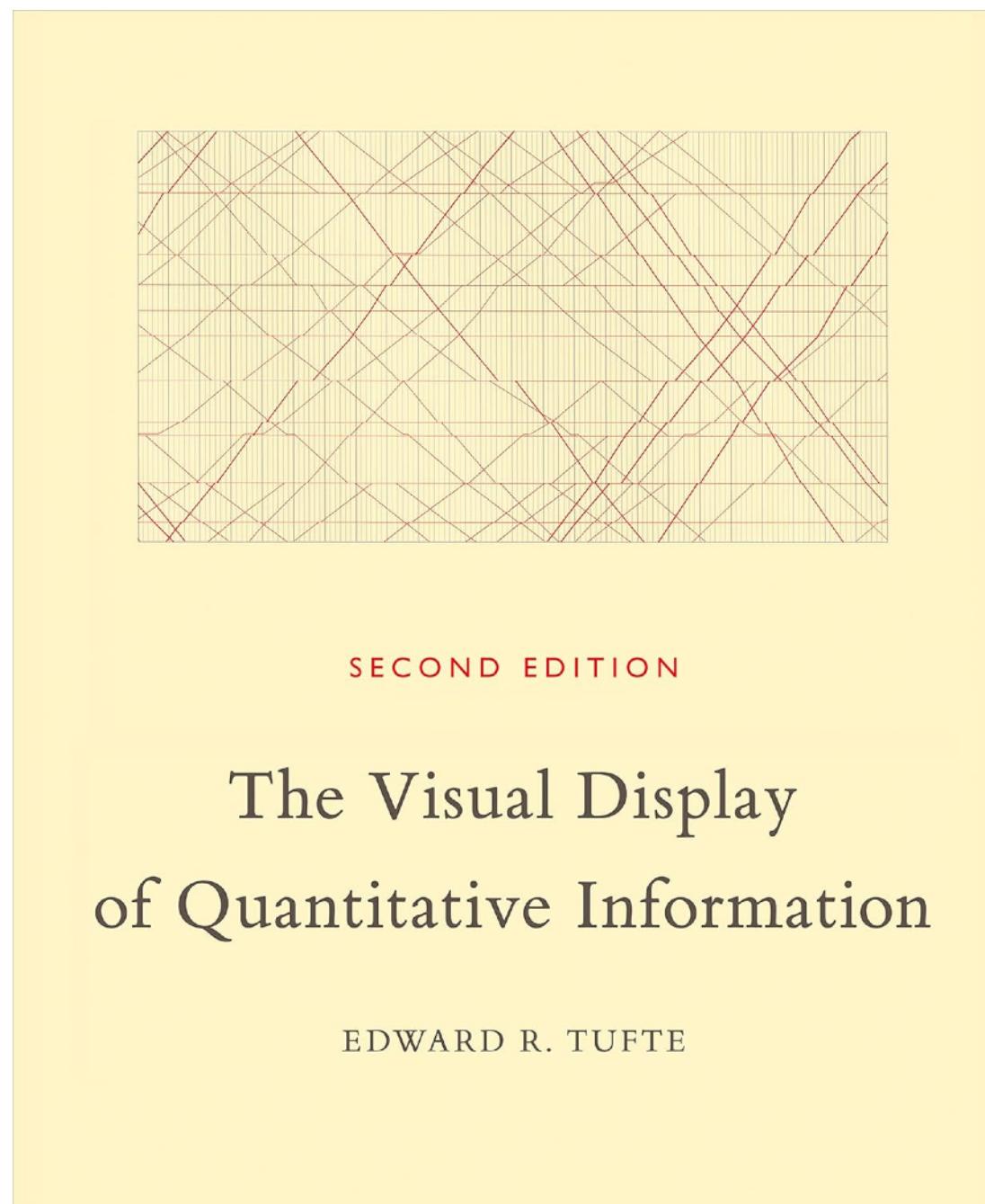
Text
Image
Shape
single page graphics

at a pixel level.

What if the template could be extracted?



Recommended Reading



Introductions

Tell us a little bit about yourself



- What's your name?
- What did you have for breakfast today?
- What's your date of birth?
- Where do you live currently? (Area)
- Which city/town were you born in?
- What's your favourite film?

“You can’t improve what you don’t measure.”

— Peter Drucker, Austrian American management consultant

Data

Data

[23, 60, 44, 28, 11]

“25°C”

33 cm

Orange, Red, Purple

Gyan

Data

Raw, unorganized data is a collection of numbers, symbols, or text. Data can lack context when viewed individually.

Data

Raw, unorganized data is a collection of numbers, symbols, or text. Data can lack context when viewed individually.

- Unstructured
- Represents reality but without explanation
- May be quantitative or qualitative

Data

Raw, unorganized data is a collection of numbers, symbols, or text. Data can lack context when viewed individually.

Information

Information

“The current temperature in Delhi
is 10°C.”

“Total sales for last month were
500 units.”

Information

- Structured and contextualized
- Provides meaning to data
- Useful for decision-making at a basic level

“The current temperature in Delhi is 10°C.”

“Total sales for last month were 500 units.”

Data

Raw, unorganized data is a collection of numbers, symbols, or text. Data can lack context when viewed individually.

Information

Processed data that has been organized, structured, or refined to provide meaning and context. Useful for decision-making, analysis, and communication.

How?

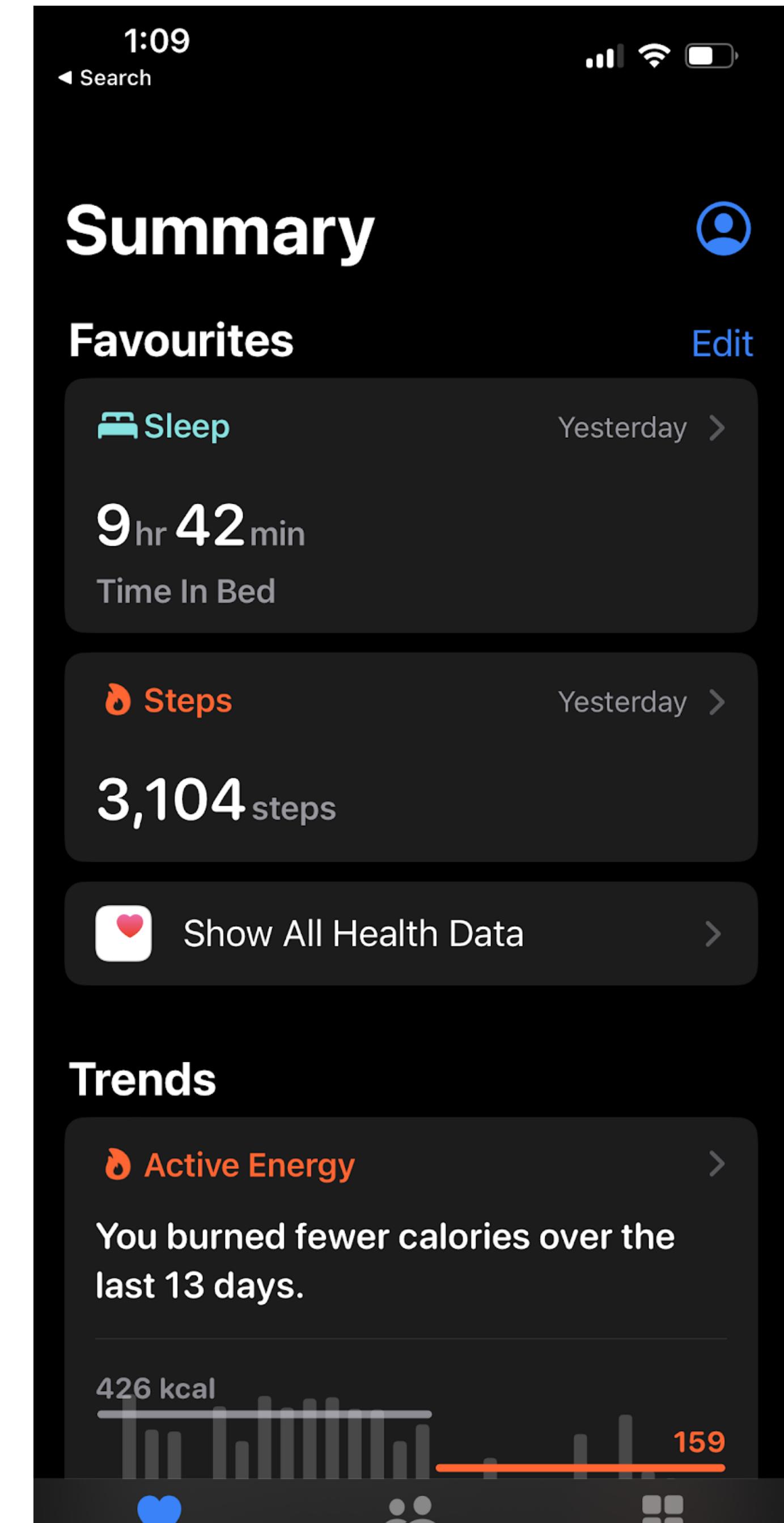
Data → Information

Activity 1

Data selfie

We are all producing data all the time!

Phone calls
Emails/Whatsapp messages
Health/fitness data
Instagram likes
Screen time/App usage
Attendance marking
Location sharing/history
Browser history
Payment/Splitwise data on UPI



Create a pen and paper visualisation of your personal data

- Collect some personal data, around 15-20 observations should be enough.
- Write or list your data points in a simple format (e.g., date/time, category, count).
- Identify any patterns or categories (like “morning vs. evening” or “work vs. personal”). Brainstorm a rough idea of how to visually represent each data point. You can experiment with shapes, lines, colors, or symbols that connect to your theme (e.g., hearts for likes, footprints for steps).

Things to keep in mind

- You will share your visualisation with the class, only use data points you are okay with sharing. Consider categorising or anonymising details you don't want to share. E.g. Categorise into hours of the day instead of exact time.
- Think about how you might visualise the information. You can encode with position, size, shape, colour, etc. Try sketching bar charts, radial diagrams, or more abstract/artistic representations.
- Use labels, legends, and a short caption explaining what each part represents.
- Try using thicker pens, colored pencils, etc. to have more options with encoding.

Quantified Self

quantifiedself.com/

QUANTIFIED SELF
SELF KNOWLEDGE THROUGH NUMBERS

QS

SEARCH

≡

2023-02-20	122	98	96	88	82	86	90	105	108	104	96	100	100	100	100	107	84	99	86	86	87	86	113	135	112	113		
2023-02-21	122	98	96	88	82	86	90	105	108	104	96	100	100	100	100	100	162	137	102	118	94	89	87	119	109	89		
2023-02-22	96	96	94	91	93	95	96	102	101	107	101	97	97	97	100	116	114	124	97	84	84	92	107	114				
2023-02-23	119	109	104	98	98	88	89	101	113	100	93	95	99	104	110	88	105	108	95	90	93	98	120	118				
2023-02-24	114	117	118	106	101	96	91	100	97	100	109	106	107	102	120	99	94	95	101	94	88	89	94	116				
2023-02-25	127	115	94	96	86	97	84	89	99	111	103	92	101	107	116	97	94	103					95	95				
2023-02-26	97	96	99	96	89	93	95	95	97	98	94	93	98	92	96	98	116	124	143	140	143	133						
2023-02-27	157	138	122	135	130	120	116	127	123	121	120	120	136	150	121	120	129	131	137	138	131	128	120	135				
2023-02-28	144	151	133	134	123	111	117	120	118	131	134	148	136	148	122	125	129	106	122	106	105	114	118	105				
2023-03-01	100	104	98	95	95	97	100	111	117	130	129	120	106	99	139	123	117	116	122	133	158	148	148	131				
2023-03-02	129	130	128	118	116	111	119	124	129	121	119	115	134	134	114	96	125	156	146	146	136	121	121	123				
2023-03-03	113	101	100	98	97	109	127	134	128	124	134	134	120	112	103	105	127	127	91	113	119	131	129	105				
2023-03-04	98	96	93	95	95	94	110	106	112	111	116	107	123	110	102	106	112	98	105	133	141	117	125	111				
2023-03-05	93	88	94	83	84	89	101	102	109	111	111	112	113	98	91	84	93	81	85	138	97	114	106	91				
2023-03-06	99	99	87	81	87	86	96	103	91	94	102	107	123	93	92	124	138											
2023-03-13																							114	106				
2023-03-14	66	70	67	64	67	79	85	87	90	94	96	122	111	108	100	97	90	102	85	90	84	112	118	129				
2023-03-15							83	82	74	76	80	94	89	98	106	93	97	103	110	118	103	90	85	95	93	100	107	98
2023-03-16	111	117	119	100	84	88	84	89	95	94	92	89	136	86	96	96	92	110	85	87	81	98	98	112				
2023-03-17	100	103	109	97	85	95	84	92	94	87	87	85	98	93	94	91	102	84	87	101	88	97						
2023-03-18							92	91	81	92	88	95	93	87	92	90	94	85	78	100	88	87	89	79				
2023-03-19	106	99	94	80	79	81	84	82	86	85	87	99	84	80	81	80	72	85	110	91	76	83	77	88				
2023-03-20							63	63	62	75	76	88	79	100	73	79	88	92	75	79	90	75	62	70	115	116		
2023-03-21	112	89	76	70	70	71	81	98	93	88	88	92	92	94	92	104	105	110	107	104					108			
2023-03-22	116	113	100	95	90	86	81	95	87	93	84	92	82	98	97	90	89	92	98	91	82	85	82	101				
2023-03-23	103	117	113	93	86	89	81	92	87	95	85	106	102	94	101	84	81	79	85	94	94	85	84	90				

New Show&Tell Event: Tracking Blood Glucose

Please join us for an hour of short "QS Show&Tell" talks about diet and exercise series using personal science. This session will focus on

Open <https://quantifiedself.com/> in a new tab and focus it



THE KEATING MEMORIAL SELF RESEARCH GROUP

Would you like to get help with your self-research project from an active, experienced group of peers? You're invited to join the Keating Memorial Self Research group. We meet every Thursday at 10am Pacific time. You can find the agenda, notes & links in the full post.



Dear Data

dear-data.com

Dear Data

[the book](#) [the project](#) [press](#) [the authors](#) [get in touch](#) [news!](#)

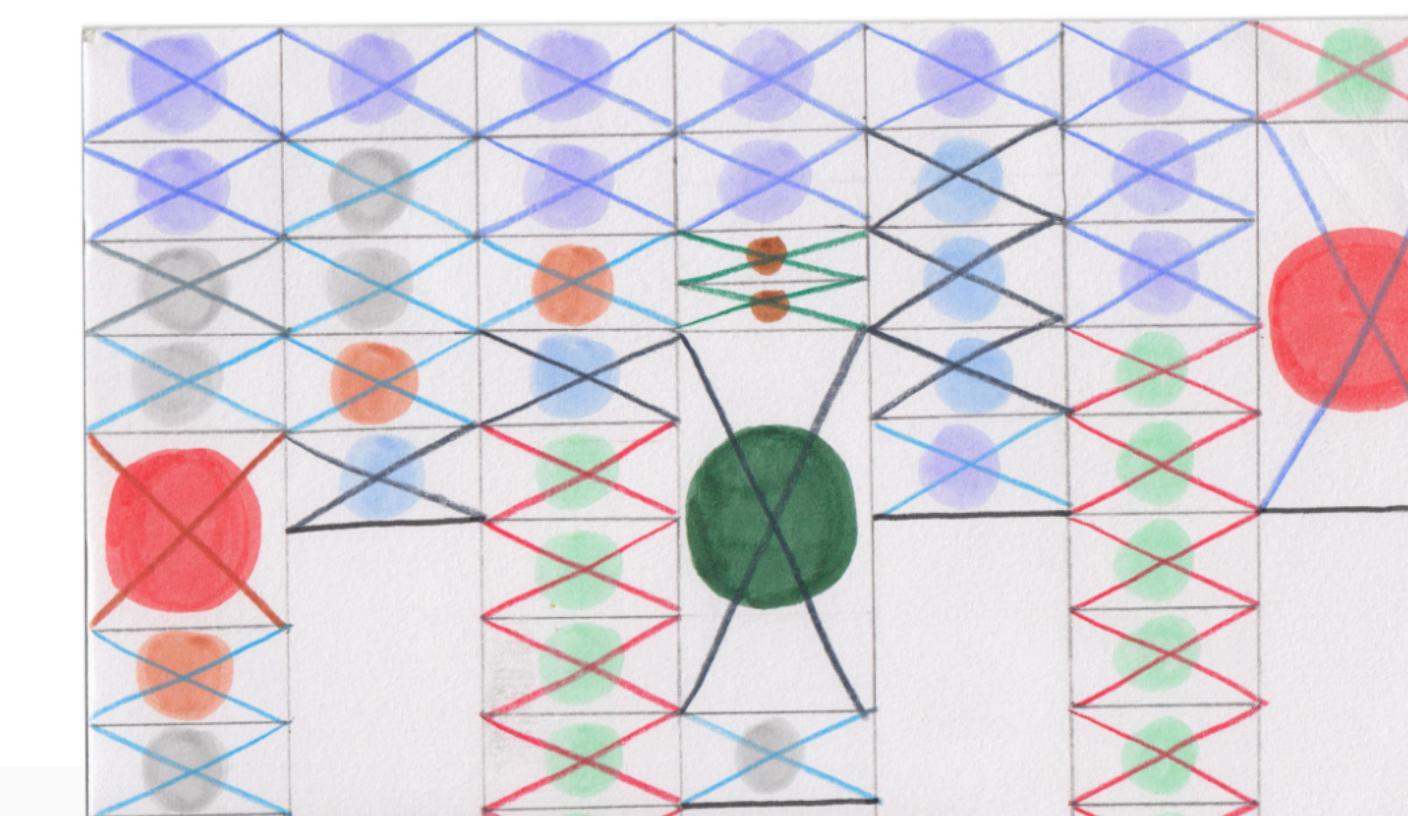
Dear Data is a year-long, analog data drawing project
by [Giorgia Lippi](#) and [Stefanie Posavec](#).

We did it! We reached **52 weeks of drawing our data!**

Week 52

A week of goodbyes

Giorgia Stefanie



Activity 1

Data selfie

Lets analyse

Why did you choose this data point?

How did you decide on the visual style?

Did you discover something interesting about yourself?



How?

Data → Information → Knowledge → Wisdom

Knowledge

A deeper understanding derived from combining multiple pieces of information and experience.

“When temperatures rise above 30°C, demand for cold beverages increases.”

“Sales typically increase by 10% in December due to holiday promotions.”

Wisdom

The ability to make sound judgments and decisions based on knowledge, values, and long-term vision.

“Given rising temperatures, we should diversify our cold beverage offerings to maintain competitive advantage.”

“Invest in sustainable supply chains to prepare for long-term growth and environmental impacts.”

Data as design material

What can we do with data?

Exhibit

Show raw data

List, Table, Infographic

Explain

Answer Questions

Data journalism, report

Explore

Finding what to ask

Dashboards, simulations

Experience

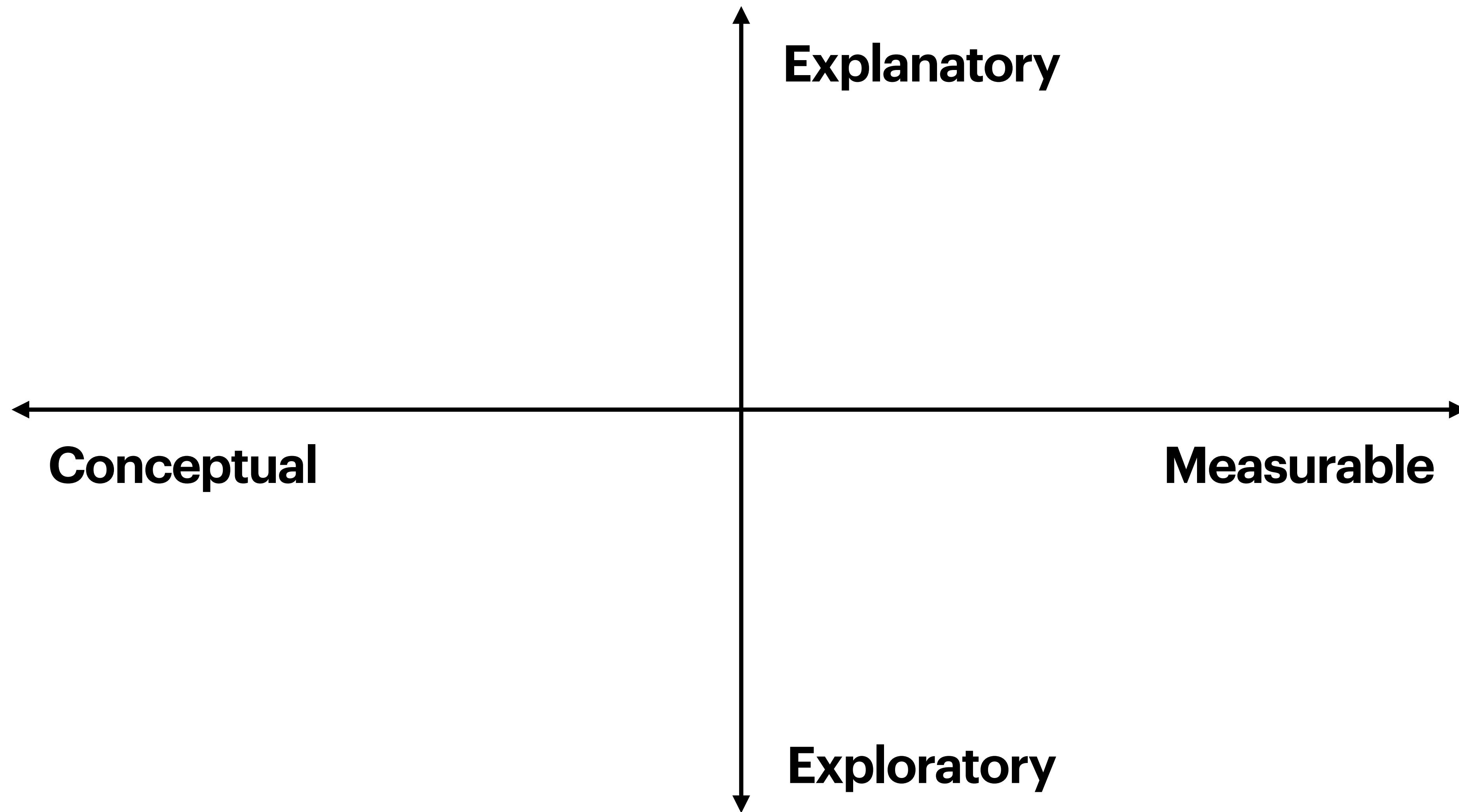
Finding meaning in data

Data art piece, New media
installation

Enable

Building tools to visualise
specific use cases

Software for data viz



Datasets

data.gov.in

The screenshot shows the homepage of the data.gov.in platform. At the top, there's a blue header bar with the text "A Digital India Initiative" on the left and "Choose your theme" with icons for theme selection on the right. Below the header is the data.gov.in logo with the tagline "Open Government Data (OGD) Platform India". The main navigation menu includes links for HOME, CATALOG, APIs, SECTOR, CHIEF DATA OFFICER, METRICS, LOGIN | REGISTER, and a central navigation dot.

The main content area features a large green banner for "Kisan Call Centre (KCC)" with the subtitle "Transcripts Of Farmers Queries & Answers Data". To the right of the banner are two illustrations: one of a person working at a computer and another of a farmer using a tractor. Below the banner is a purple section containing a search bar labeled "Search Catalog/Resources/API" and a yellow "Search" button. This section also displays various data metrics:

Trending Data	Crime	Rainfall	Pincode	Population	Market
505,060 RESOURCES	12,462 CATALOG	10.56 M TIMES DOWNLOADED	583 CHIEF DATA OFFICERS		
3,321 VISUALIZATIONS	181 SOURCED WEBSERVICES/APIs	36.89 M TIMES VIEWED	262,052 APIs		

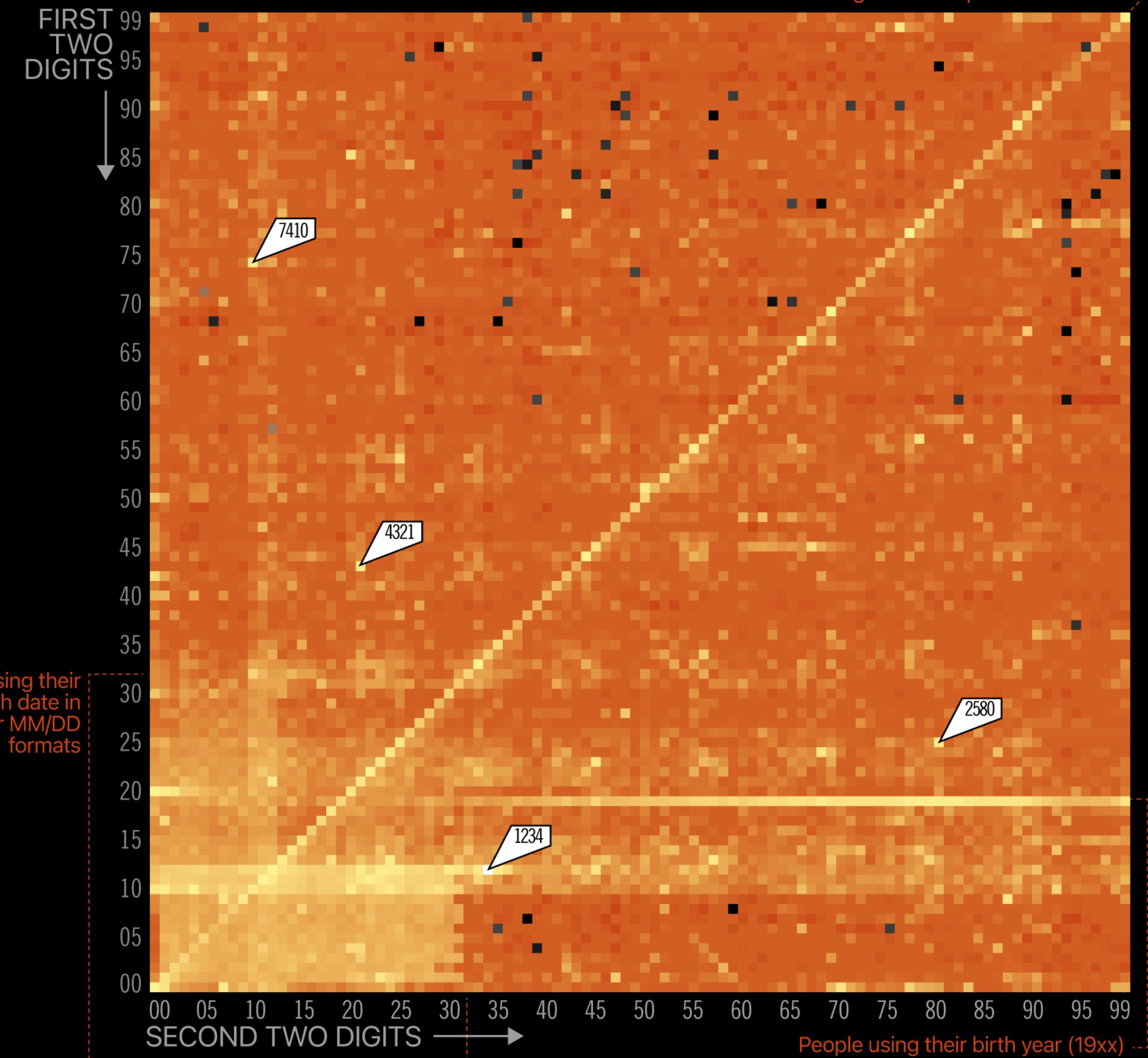
On the right side of the purple section, there's a "Suggest Dataset" button and a "NEED HELP? ASK NICCI" button. Below the purple section, there's a "Discover Datasets By" section with categories like "Sector" (highlighted in yellow), "Economy", "Environment", "Healthcare", and "Education". A small circular profile picture of a woman is also visible in the bottom right corner.

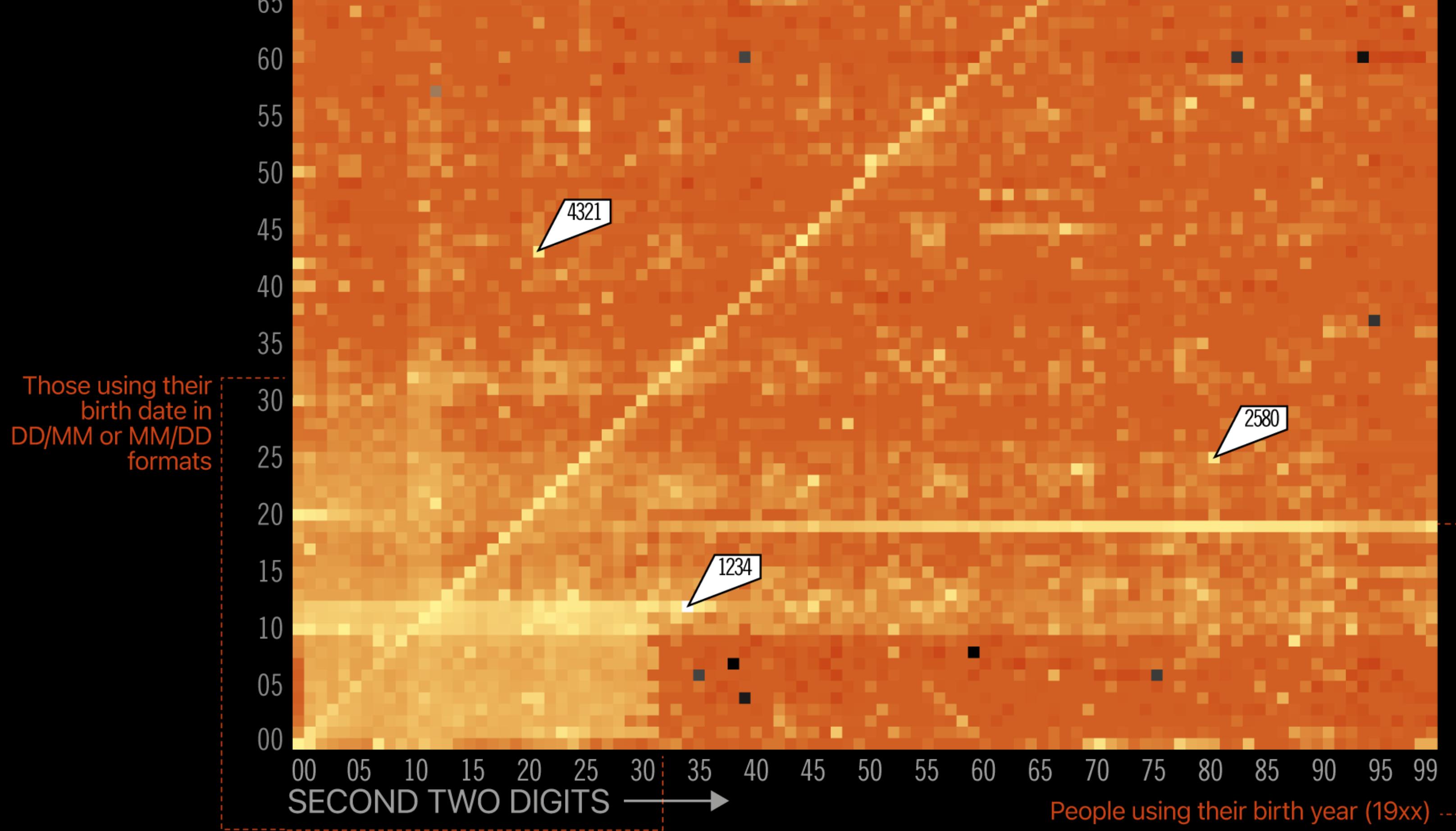
Pin Point

The most common
4-digit PIN numbers



Those using their
birth date in
DD/MM or MM/DD
formats





most common

1234	0000	7777	2000	2222	9999	5555	1122	8888	2001	□	27% of all PIN numbers
1111	1212	1004	4444	6969	3333	6666	1313	4321	1010	□	

least common

8557	8438	9539	7063	6827	0859	6793	0738	6835	8093	
9047	0439	8196	6093	7394	9480	8398	7637	9629	8068	

Cyber fraud in banking transactions surges in FY24: Data

Maharashtra accounts for more than one-fourth of the amount lost due to cyber fraud in India

Updated - November 13, 2024 04:43 pm IST

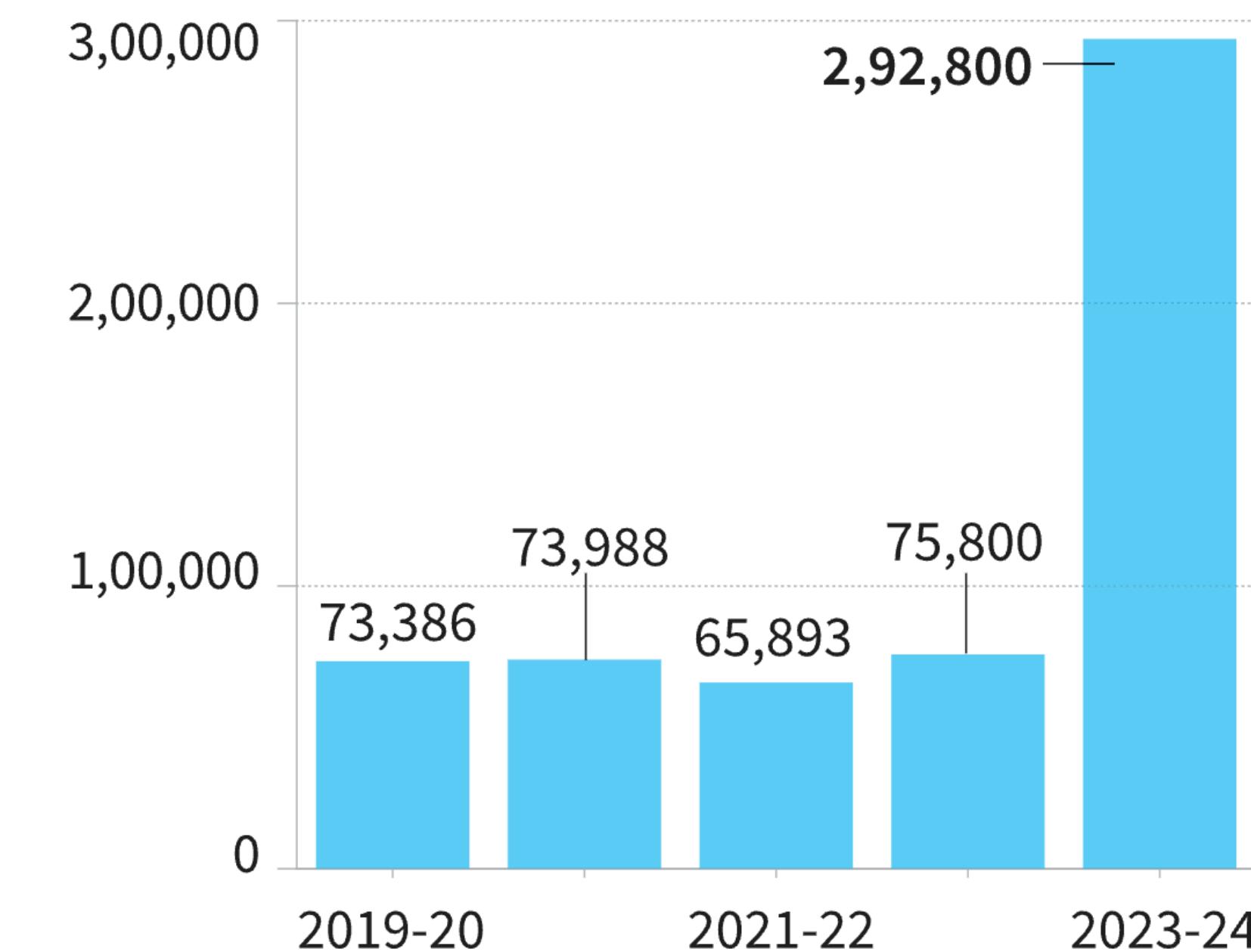
MD ZAKARIA SIDDIQUI, SABIR AHAMED



READ LATER

PRINT

Chart 1(a) | The chart shows the number cyberfrauds across the years in banking transactions



Why are tomato prices rising in October: Data

The average retail prices shot up to ₹65-70 per kilo in the north and the eastern regions in October

Updated - October 19, 2024 11:12 am IST

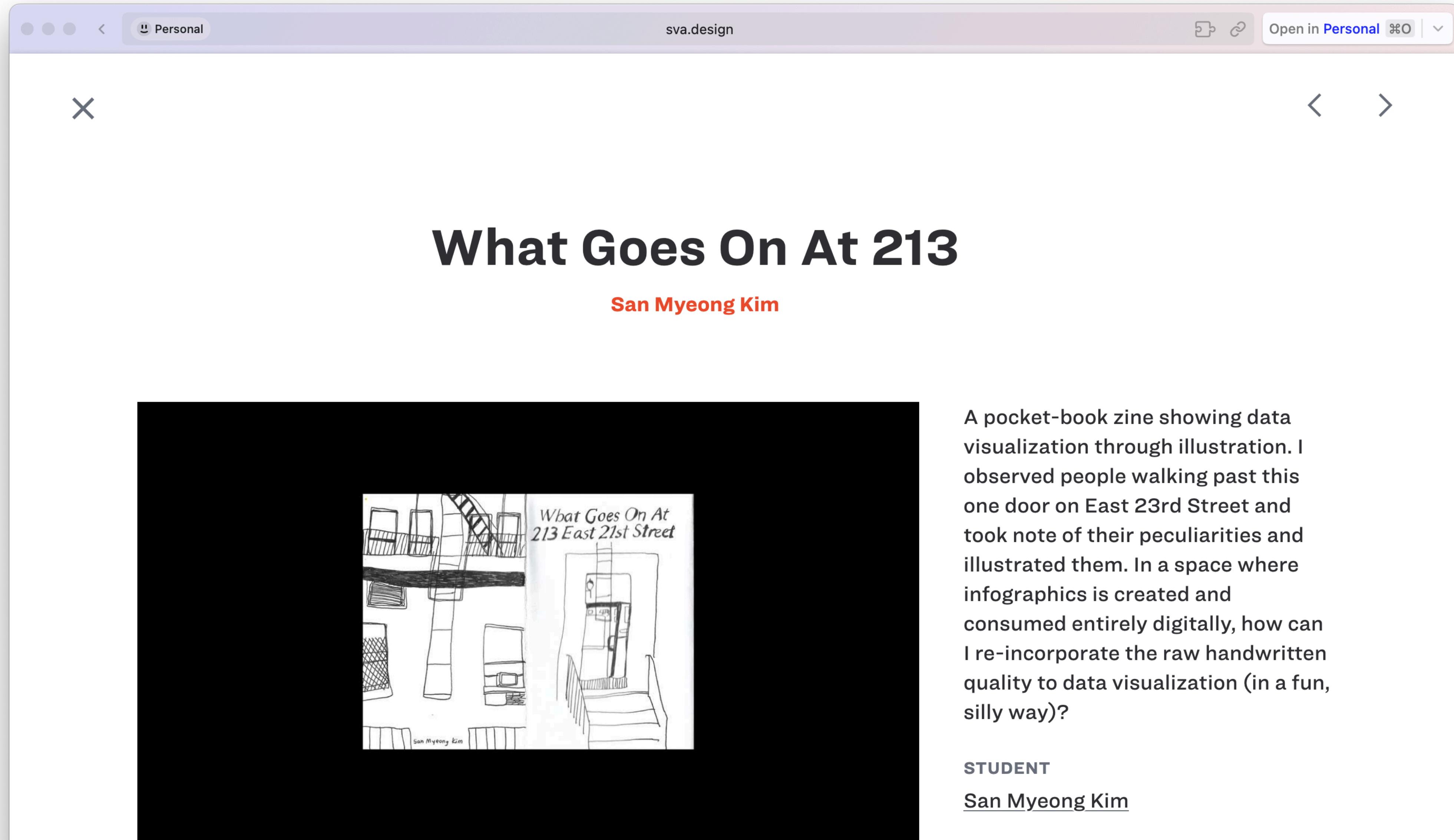
Divisons in tomato belt	June 1-5					July 3-9					August 7-13					September 4-10				
Rayalaseema	LE	LE	LE	D	D	N	N	N	LD	E	E	LE	LD	LE	D	LE	N	D		
S.I. Karnataka*	E	LE	D	D	N	N	LE	LE	LE	N	N	LE	D	N	D	LD	D	D		
West M.P.	N	D	D	E	N	E	N	N	E	E	N	D	LE	N	LE	LE	D	LE		
Odisha	LE	LD	LD	D	E	D	D	LE	N	E	D	D	N	N	E	N	N	LE		
Gujarat Region	LD	D	LD	N	E	D	N	E	E	N	D	LD	LE	LE	LE	D	D	LE		
Madhya Maharashtra	D	LE	D	N	N	E	E	LE	LE	E	D	E	LE	N	N	LD	N	LE		

In the graph, LE: Large excess rainfall; E: Excess, N: Normal, D: Deficient, LD: Large deficient. In the last week of September, large excess rainfall in four of the six major tomato production belts destroyed tomatoes ready for sale



Data Art/Storytelling

sva.design

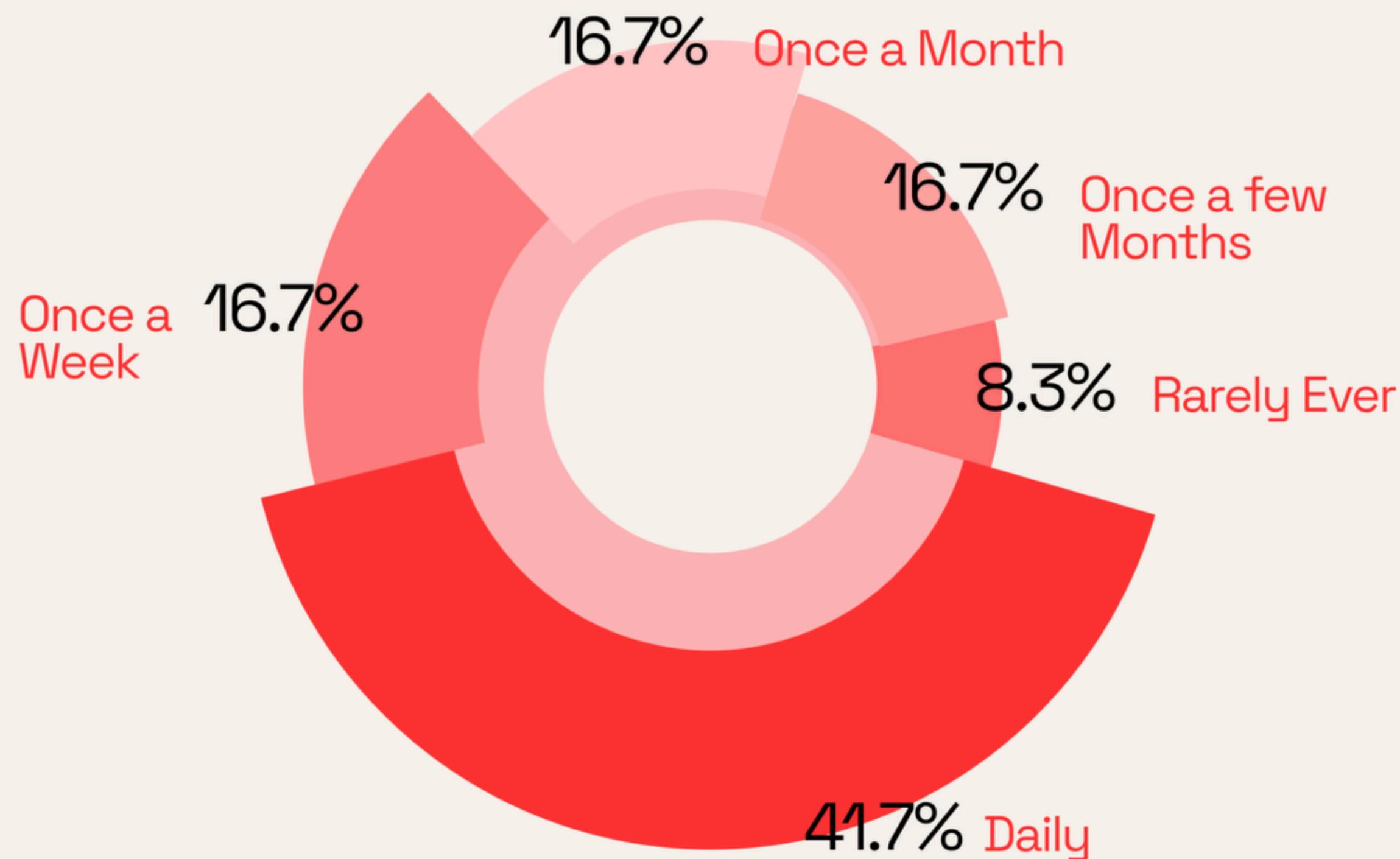


The screenshot shows a web browser window with a light purple header bar. The address bar displays "sva.design". Below the header, there are standard browser controls: a close button (X), a back button (<), a forward button (>), and a refresh/copy link icon. The main content area features a large, bold, black title "What Goes On At 213" centered at the top. Below the title is the author's name, "San Myeong Kim", in a smaller, red font. To the left of the title is a small "X" icon, and to the right are navigation arrows. The central part of the page contains a thumbnail image of a zine cover. The zine is titled "What Goes On At 213 East 21st Street" and is attributed to "San Myeong Kim". The illustration on the cover depicts a building facade with various windows and architectural details. To the right of the zine thumbnail is a descriptive text block.

A pocket-book zine showing data visualization through illustration. I observed people walking past this one door on East 23rd Street and took note of their peculiarities and illustrated them. In a space where infographics is created and consumed entirely digitally, how can I re-incorporate the raw handwritten quality to data visualization (in a fun, silly way)?

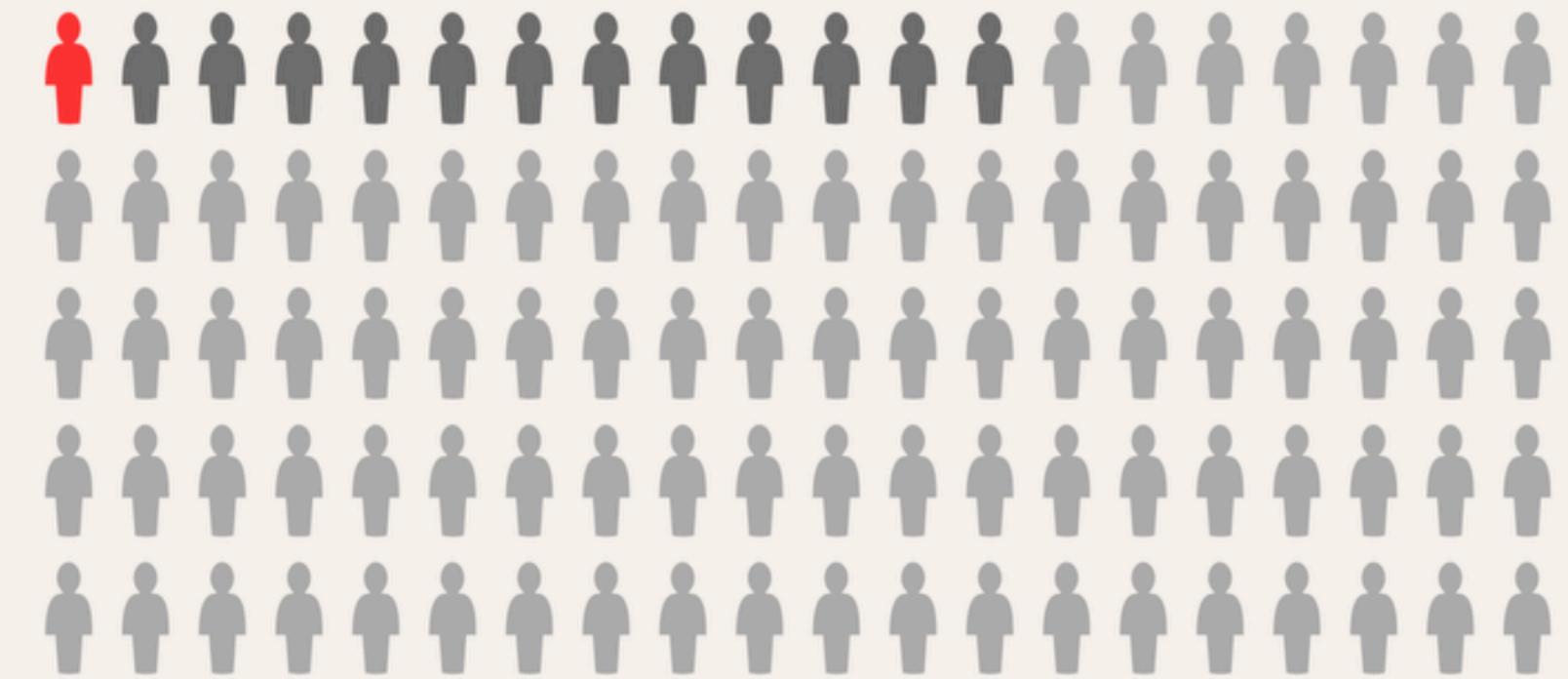
STUDENT
San Myeong Kim

Infographics



Harshwardhan Somwanshey

13 people per
100 person own
a vehicle in India



2.2 million injuries in
India that warranted
hospital admission,
and 18 million
injuries warranted
an emergency room
visit

(Bhalla et al. 2014).

The number of
cars registered
in 2020 was
43.73 M

(Official RTI Statistics).

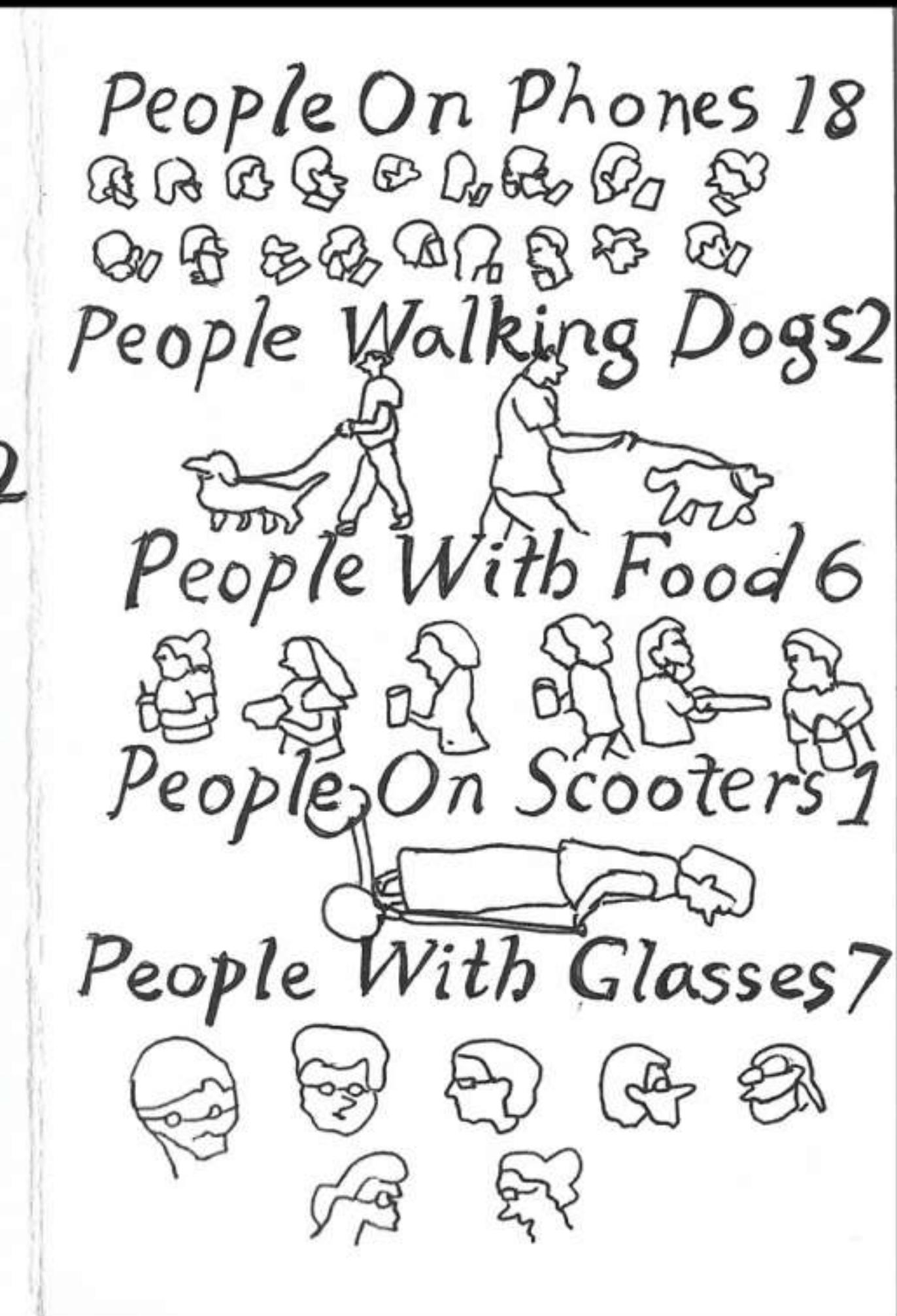
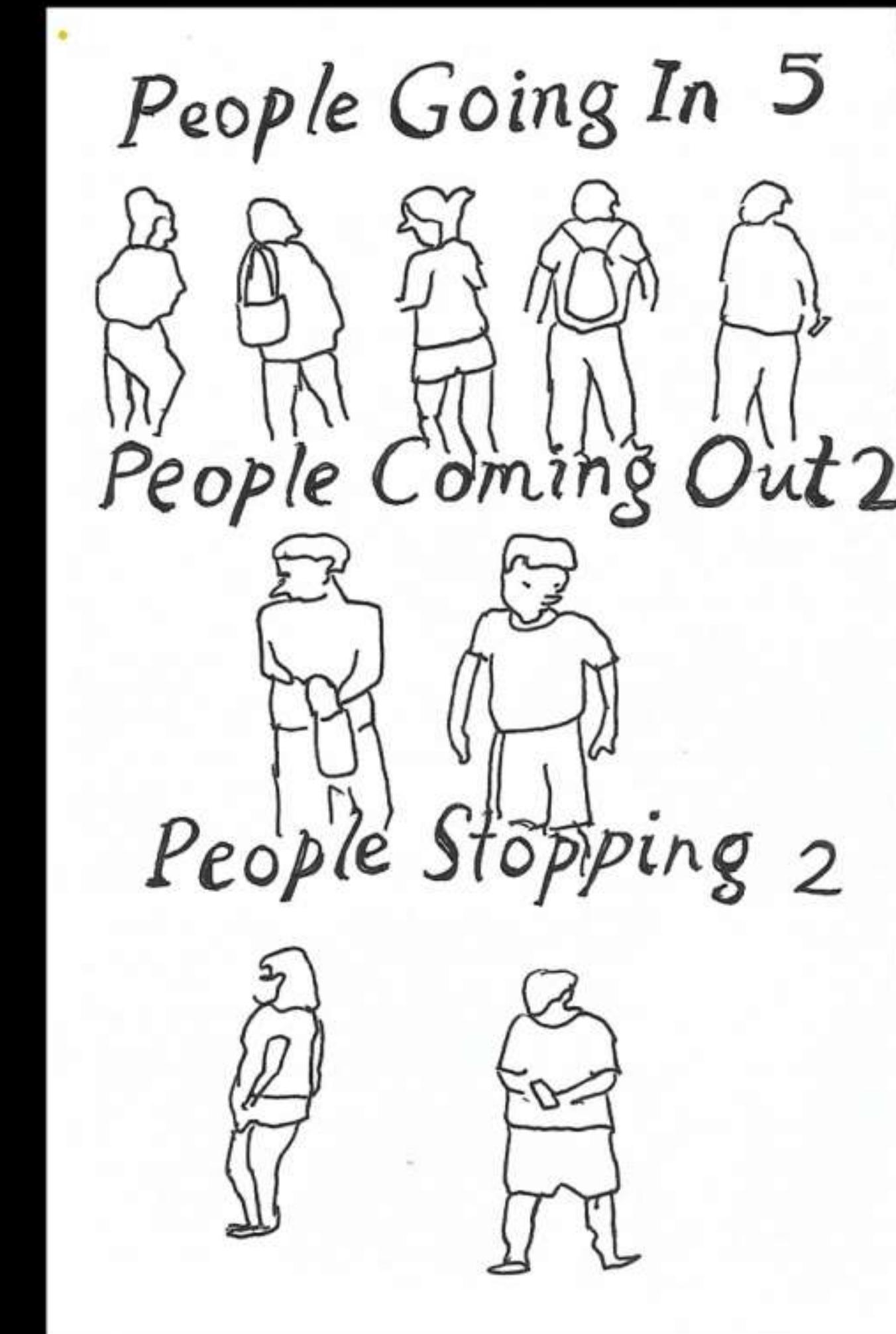
155,622 persons were killed
in road traffic crashes in
India in 2021

(Official RTI Statistics).



Data Art/Storytelling

sva.design

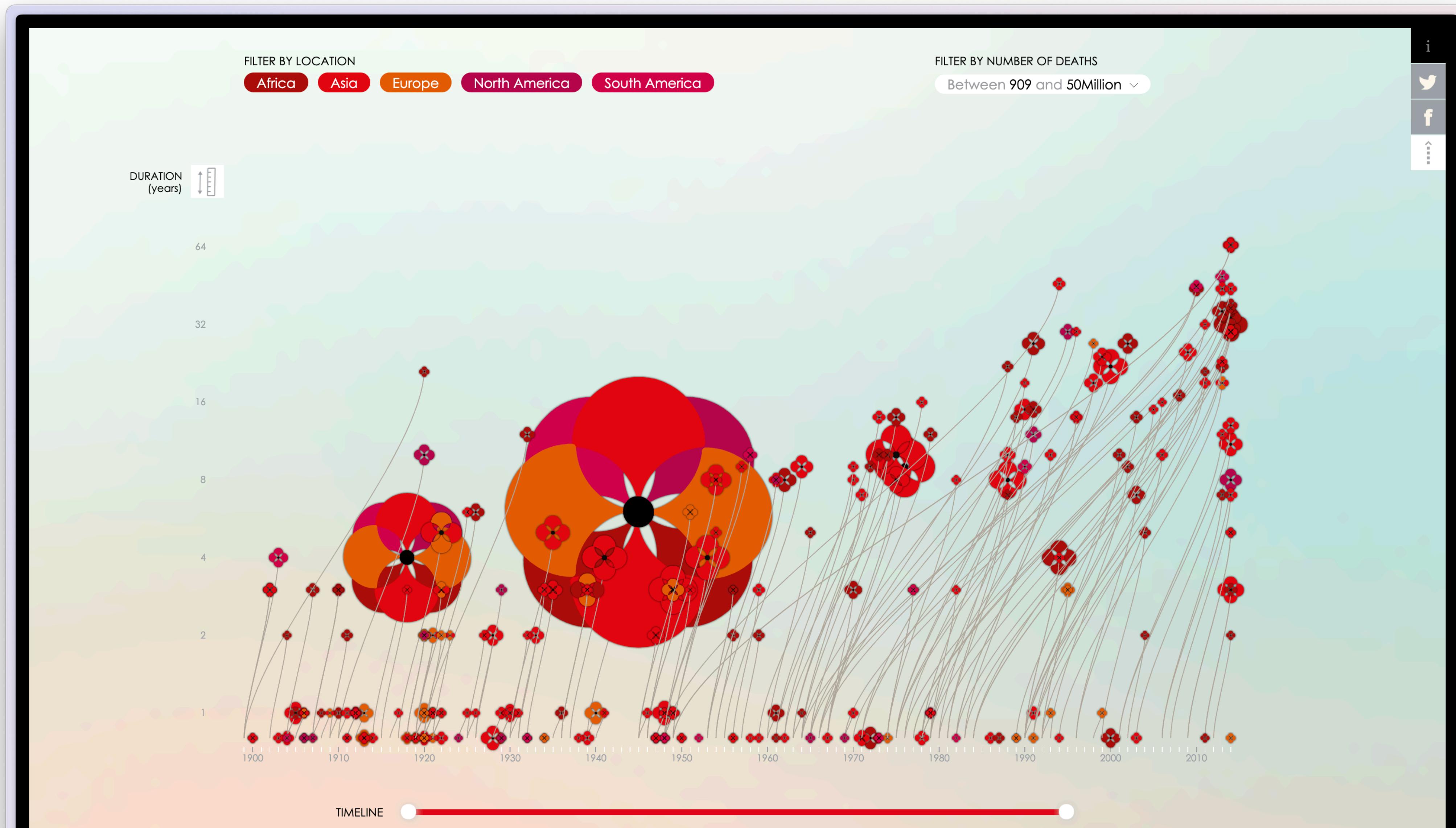




What's for dinner? · Gyan Lakhwani

Data Art

poppyfield.org



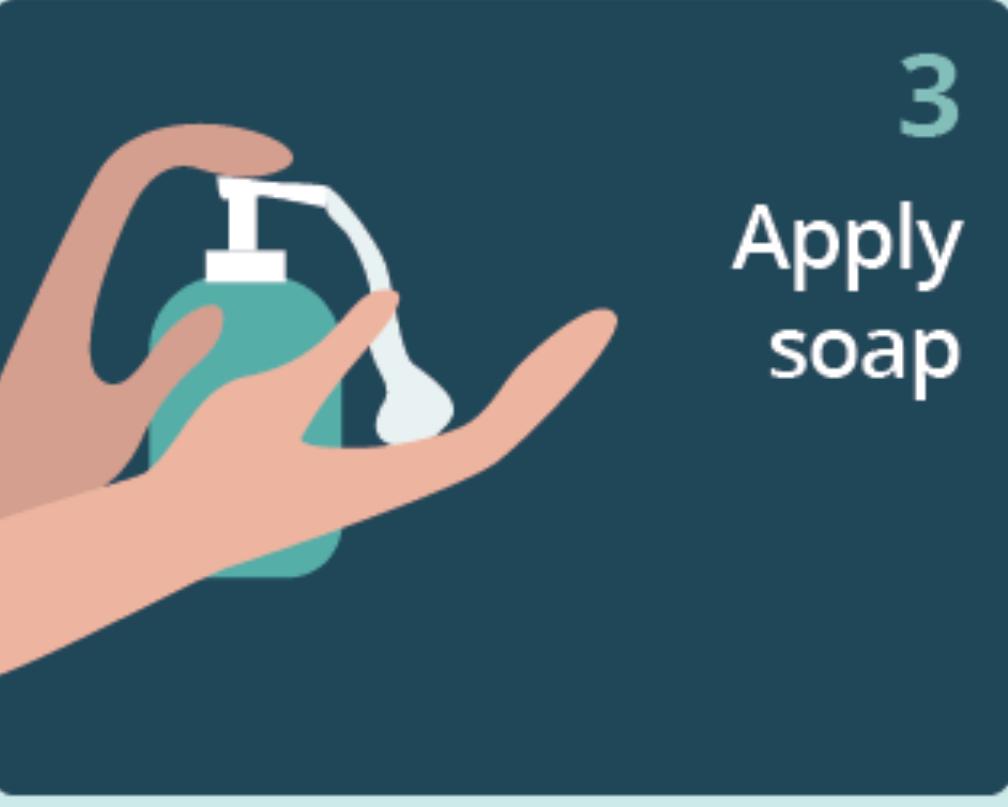
Infographic

[healthdirect.gov.au](https://www.healthdirect.gov.au)

Hand washing tips

- 

1 Remove any jewellery
- 

2 Wet hands with running water
- 

3 Apply soap
- 

4 Rub hands together for at least 20 seconds
- 

5 Wash all areas, including in between fingers
- 

6 Rinse hands and turn off tap
- 

7 Dry hands thoroughly with a paper towel

Data Storytelling

dear-data.com

Dear Data

[the book](#) [the project](#) [press](#) [the authors](#) [get in touch](#) [news!](#)

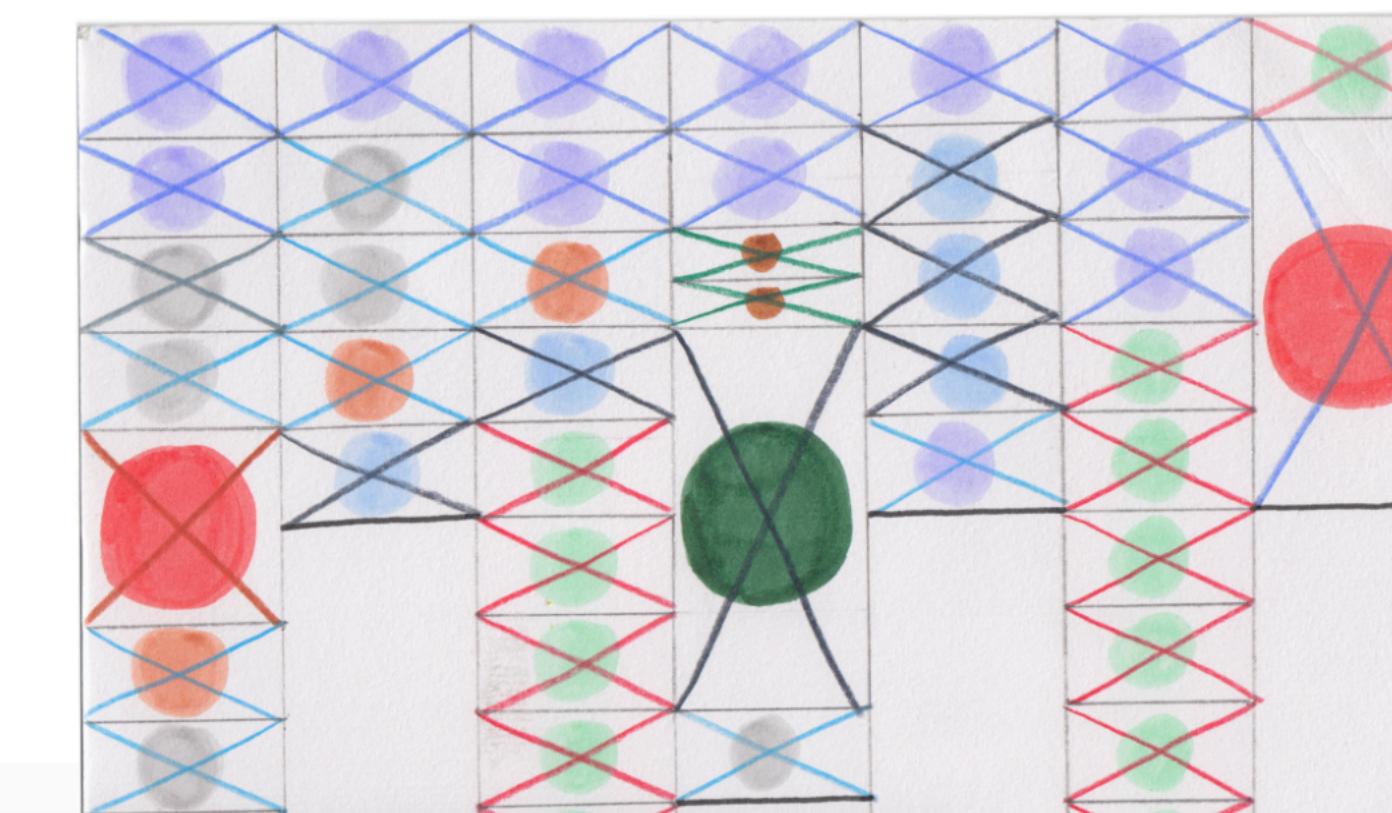
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A week of goodbyes

Giorgia Stefanie

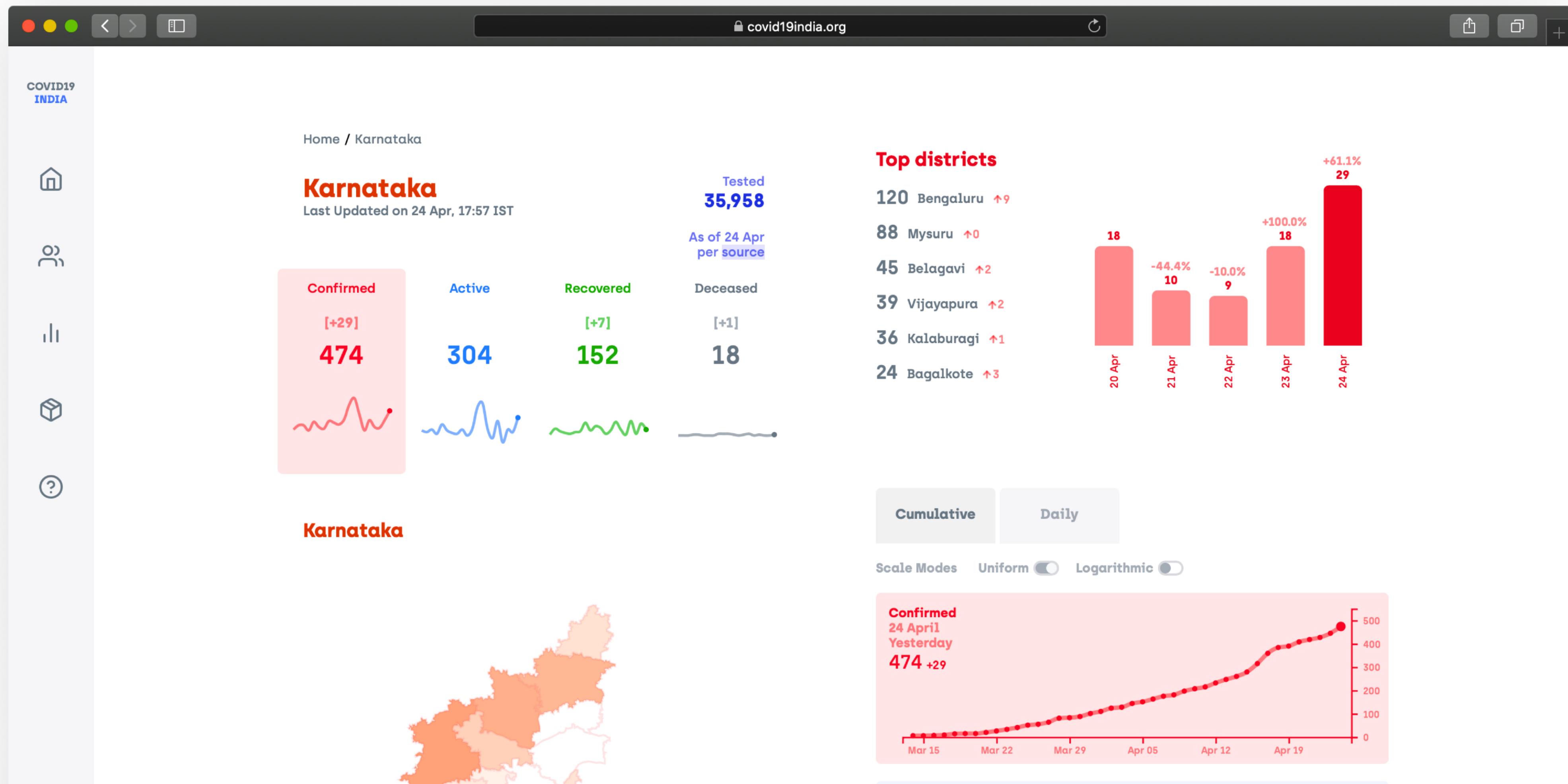


Dashboards

covid19india



COVID19INDIA



TYPOLOGY OF INFORMATION GRAPHICS

Type of information →

Conceptual

Purely conceptual information cannot be visualized, only illustrated.

Purpose of the graphic ↓

Infographics

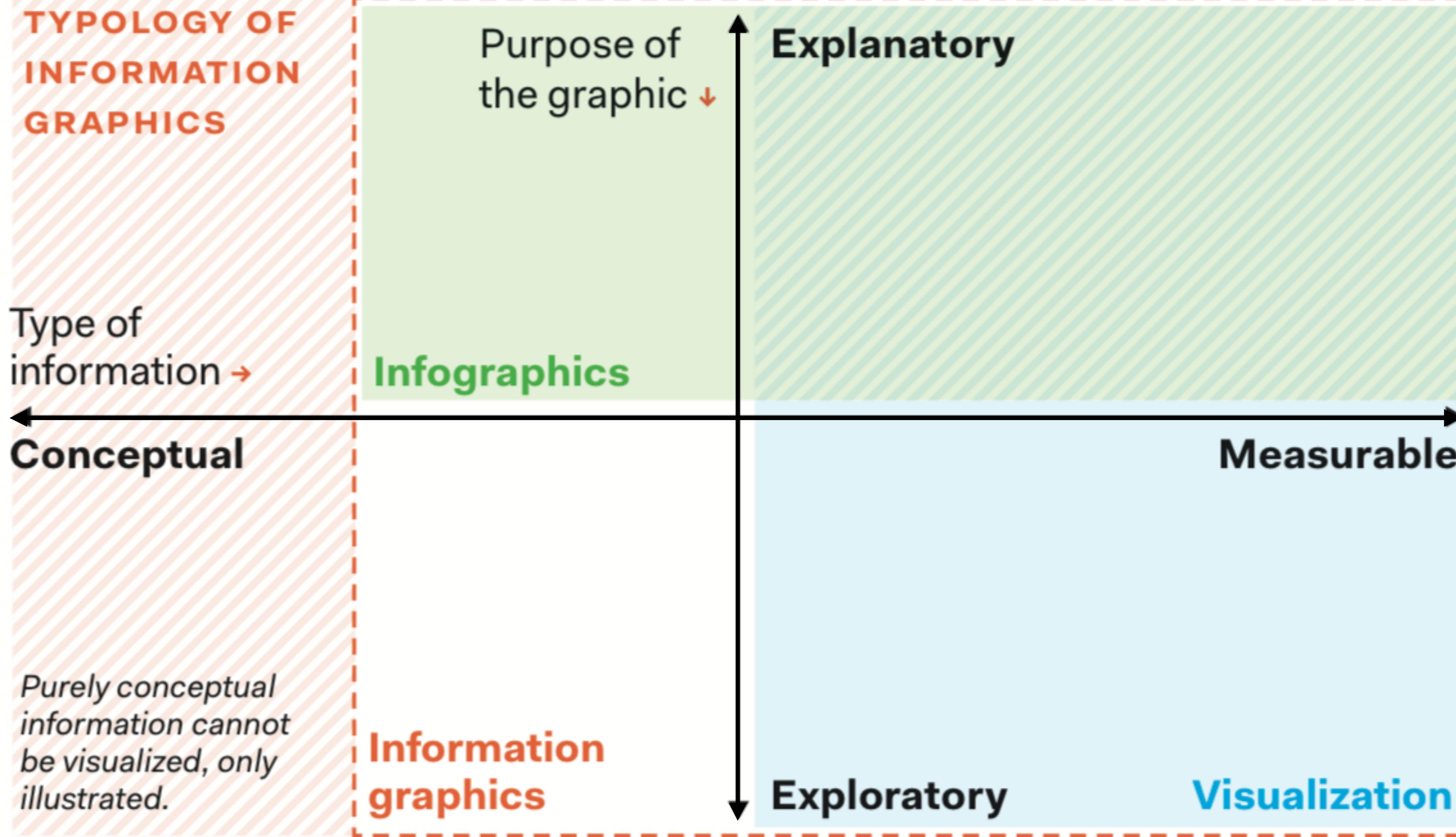
Information graphics

Explanatory

Exploratory

Measurable

Visualization



Levels of measurement

- **Nominal:** the data can only be categorized
- **Ordinal:** the data can be categorized and ranked
- **Interval:** the data can be categorized, ranked, and evenly spaced
- **Ratio:** the data can be categorized, ranked, evenly spaced, and has a natural zero

Ratio

Categories, Rankable, Equally Spaced, True Zero

- Height (If I have 0cm of cloth, how much cloth do I have?)
- Age
- Weight (10kg is half of 20kg)
- Temperature in Kelvin

Best Encodings

Length / Height

Bar charts are highly effective because starting at zero is meaningful.

Position on a Common Axis

Plots (scatter plots, line graphs) that begin at zero can show proportional differences accurately.

Area or Volume

For special cases (e.g., bubble charts), ratio data can be encoded in areas or volumes, but clarity and scaling must be carefully managed.

Tips

Including a zero baseline is crucial to reflect accurate proportions. If the axis doesn't start at zero, it can misrepresent the magnitude of differences.

Interval

Categories, Rankable, Equally Spaced

- Temperature in Fahrenheit or Celsius
- Calendar Years (e.g. 5 years ago it was 2020, 10 years ago it was 2015)
- Time of the day (1pm to 2pm is the same interval as 3pm to 4pm. However, 4pm is not half the time as 2pm. 00:00 hrs is not the absence of time, it's just the start point for the daily cycle)

Best Encodings

Position on a Common Scale

For continuous variables, a line graph or horizontal axis that shows the numeric scale works well.

Color Gradients

Continuous gradients can indicate intervals, but be mindful of how you handle zero or the “origin.”

Length / Height

Bar charts can work, but labeling is key to remind viewers that zero isn’t absolute in interval scales.

Tips

Because interval scales can go below zero (e.g., -5°C), color ramps or dual-axis encodings (positive vs. negative) can help clarify where zero is relative to the data.

Ordinal Categories, Rankable

- Language ability
(e.g., beginner < intermediate < fluent)
- Spiciness Levels on a Menu
(e.g. Mild < Medium < Hot < Extra Hot)
- Medal placements in competitions
(e.g. Gold > Silver > Bronze)

Best Encodings

1. **Ordered Color Gradients (Saturation or Lightness)**
 - Use a consistent light-to-dark gradient or a single hue varying in saturation to reflect an inherent ranking (e.g., from less to more).
2. **Position Along a Single Axis**
 - Placing items on a vertical or horizontal axis in order, from smallest rank to largest rank.
3. **Size (with caution)**
 - Increasing size (such as the length of bars) can show a progression, but remember ordinal data doesn't ensure precise numerical intervals.
4. **Shape Variation that Suggests Progression**
 - For instance, incremental shapes (thin bar → thicker bar → thickest bar) but only if differences are clearly incremental.

Tips

- Avoid using too many color hues for ordinal data, because changing hue can undermine the sense of order. A single hue in varying saturation is more intuitive.

Nominal Categories

- City of birth
(Delhi, Ranchi, Kolkata, Mysore)
 - Best Encodings
Color Hue

Different hues (e.g., red, green, blue) help distinguish categories without implying any hierarchy.
- Gender
(Male, Female)
 - Shape**

Vary the shape (circle, triangle, square) to denote distinct categories.
- Car brands
(Hyundai, Toyota, Mercedes)
 - Spatial Grouping**

Group items by category in different regions of a chart, map, or diagram.
- Marital status
(Unmarried, married, divorced)
 - Tip**

Avoid using size, saturation, or brightness for nominal variables, since they can accidentally imply magnitude or importance that isn't intended.

Pop Quiz!

A researcher collects demographic data from her participants.

She asks participants for their city of birth.

Which level of measurement is this?

A researcher collects demographic data from her participants.
She asks participants for their city of birth.
Which level of measurement is this?

[A] Nominal

[B] Ordinal

[C] Interval

[D] Ratio

A Likert scale is a rating system that measures attitudes, opinions, or behaviors by asking respondents to choose from a range of answer options.

What type of measurement is a Likert scale?

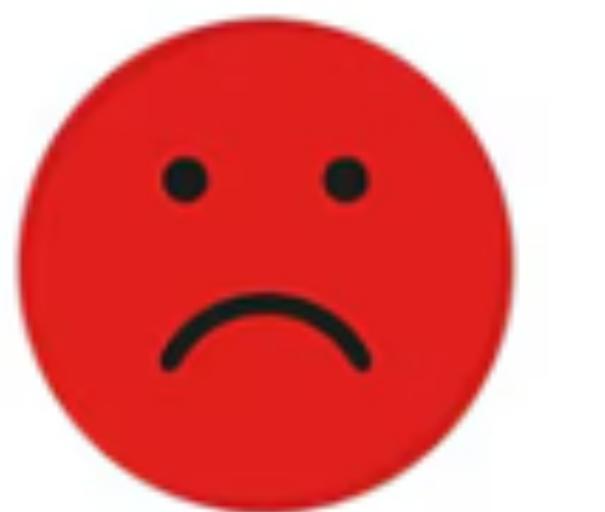
[A] Nominal

[B] Ordinal

[C] Interval

[D] Ratio

How satisfied are you with our service?



Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied
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Level of measurement	Description	Examples
Nominal	Data can only be categorized	Gender, eye color, hair color
Ordinal	Data can be categorized and ranked, but intervals between categories are not necessarily equal	Education level, Likert scale responses, income
Interval	Data can be categorized, ranked, and evenly spaced	Temperature measurements in Celsius or Fahrenheit
Ratio	Data can be categorized, ranked, evenly spaced, and has a natural zero	Height, weight

Data Encoding

Mapping

data variables → visual channels

Nominal

Ordinal

Interval

Ratio

Lines

Bars

Shapes

Colors

Positions

Certain types of variables map better to certain ways of visualising information

Data visualisation tools

Or, homework #1!

Group Activity: Look into these Data visualisation tools. Create a presentation on how they work and present them to the class in the next session (14 jan?)

- Flourish
- Tableau
- Infogram
- ChartBlocks
- Datawrapper
- Google Charts
- D3.js
- Carto
- Mapbox
- Power BI
- Charticulator
- RAWGraphs
- Visme
- Venngage
- Piktochart
- RAW Graphs
- Orange
- P5.js
- chart.js
- Leaflet.js
- dygraphs
- Timeline.js
- Gephi
- Candela
- Rshiny
- Google Data Studio
- Datawrapper
- Palladio
- OpenRefine
- Circos
- Plotly
- Observable
- Tangle