CPSC 100

Computational Thinking

Data Visualization

Instructor: Firas Moosvi
Department of Computer Science
University of British Columbia

Agenda

- Project Reminders
- Topic switch (Data Visualization this week, Data provenance next week)
- Data Visualization!

Course Admin

Course Admin

- **Project Milestone 2 feedback released last week!**
  - Some of you needed to resubmit, TAs are looking at the resubmissions now **- do not wait for approval**, start working on Milestone 3!
  - Visit TA student hours for feedback

- **Project Milestone 3 is due Nov. 19th at 6 PM**
  - Note that in Labs this week there will be an activity where you can share your ideas and drafts with others and get feedback.
  - Please make sure you have ***something*** to share with others!

CPSC 100

Computational Thinking

Intro to Visualization

Instructor: Firas Moosvi
Department of Computer Science
University of British Columbia

Learning Goals

Learning Goals

After this **today's lecture**, you should be able to:

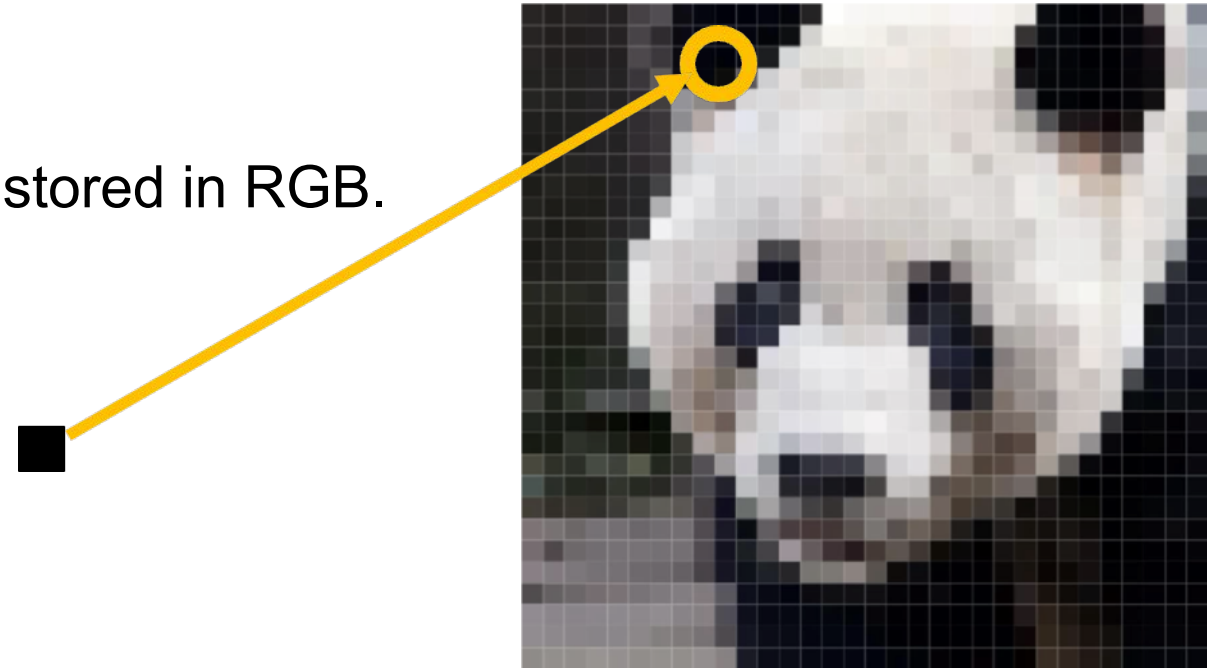
- Describe how images are stored in computers
- Explain the concept of bitmap images & how they are divided into pixels.
- Define visualization and explain its role in computational thinking.
  - Describe how visual data representation helps in understanding patterns, trends, and insights.
  - Differentiate between explanatory and exploratory visualization.
- Create different types of visual representations for a provided dataset.

Pixels & Computer

How are Images Stored?

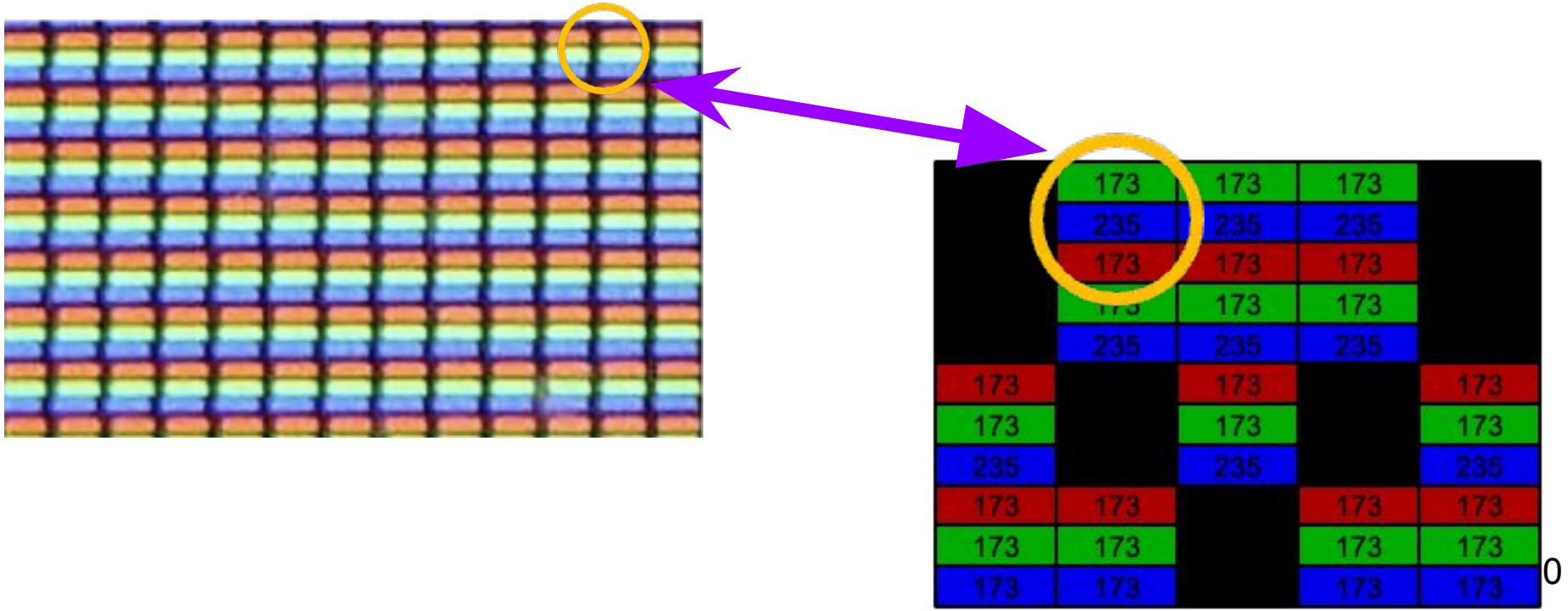
- There are two ways that computers commonly store images. The most common is a **bitmap** – the picture is chopped up into small little squares called **pixels**.

- Each pixel's colour is stored in RGB.



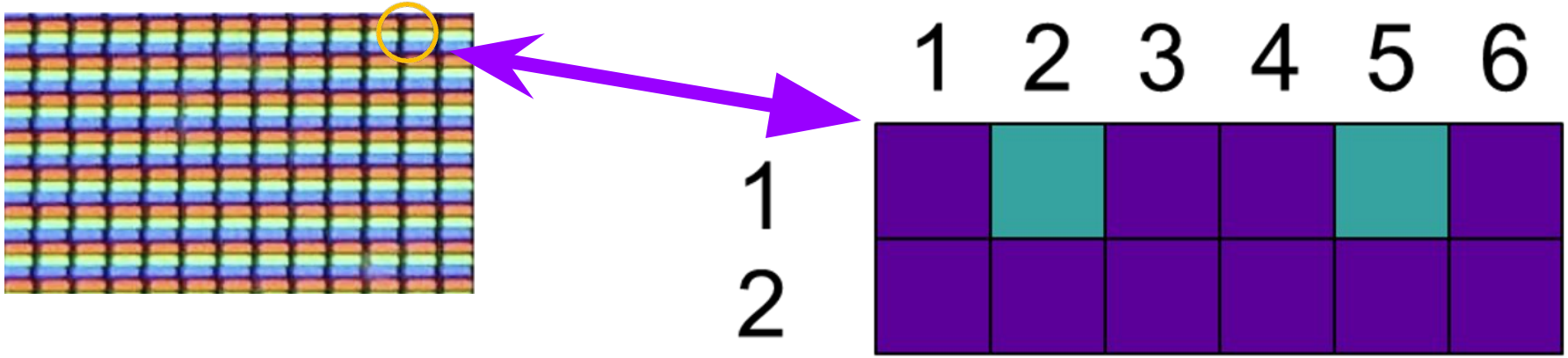
Bitmap Pixels

- The image is split into smaller **pixels**, each of which contain Red, Green and Blue



Bimap Pixels

- Bitmap image representation example

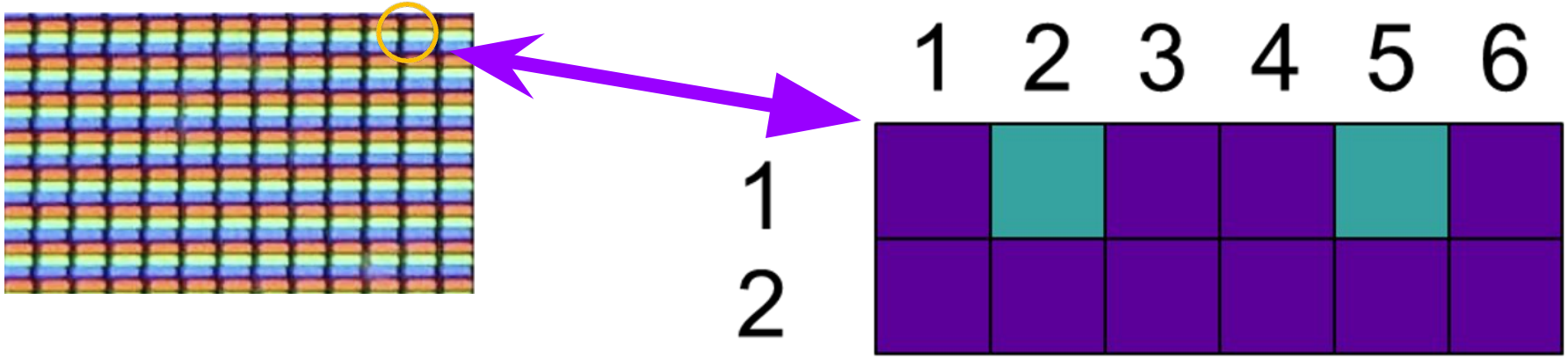


Note: the bitmap is ….

```
06 02
5C009A  35A4A0  5C009A 5C009A  35A4A0 5C009A
5C009A  5C009A  5C009A 5C009A 5C009A  5C009A
```

Bimap Pixels

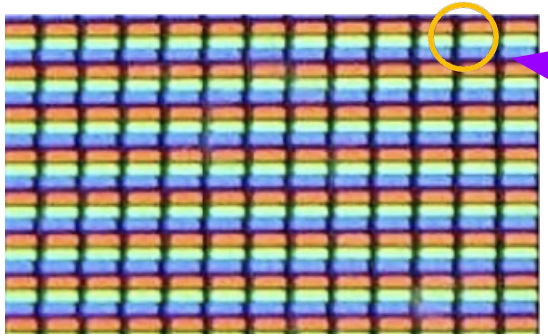
- Bitmap image representation example

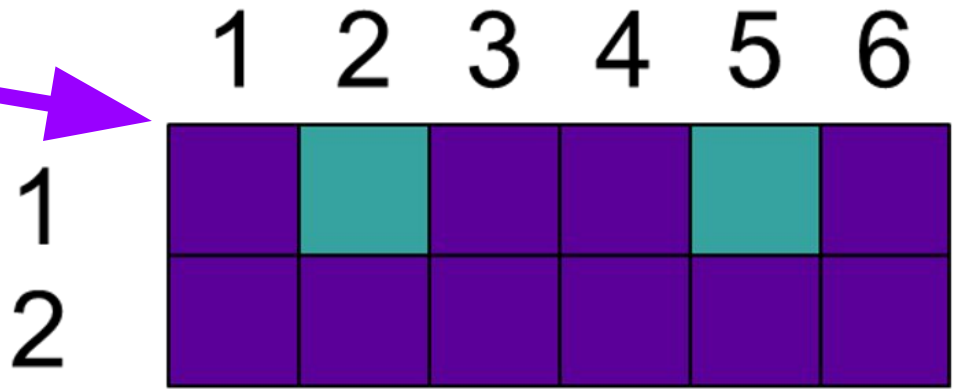



```
06 02
5C009A  35A4A0  5C009A 5C009A  35A4A0 5C009A
5C009A  5C009A  5C009A 5C009A 5C009A  5C009A
```

Bimap Pixels

- Bitmap image representation example





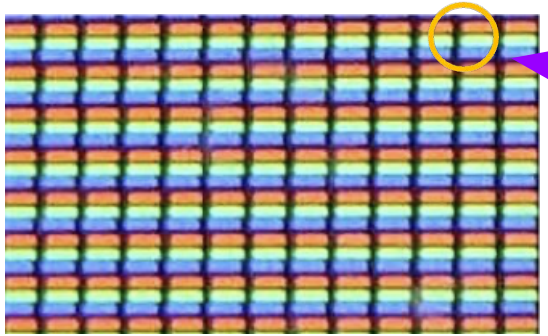
?

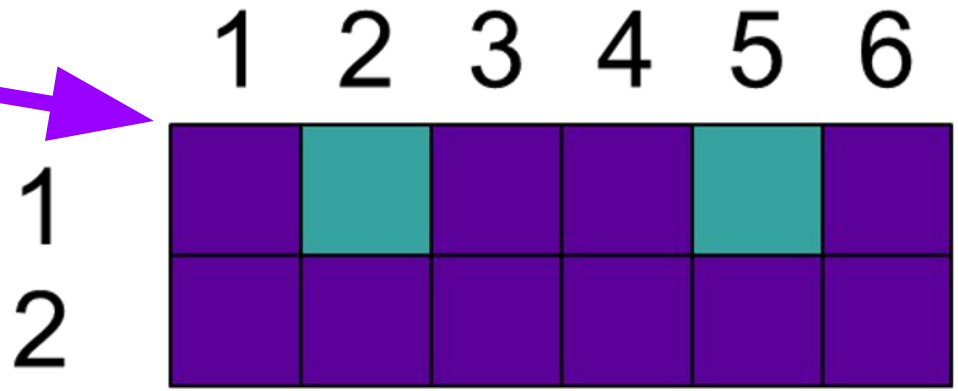
06 02

5C009A 35A4A0 5C009A 5C009A 35A4A0 5C009A
5C009A 5C009A 5C009A 5C009A 5C009A 5C009A

Bimap Pixels

- Bitmap image representation example





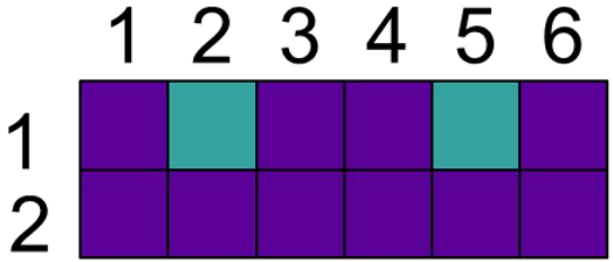
width & height

```
06 02
5C009A 35A4A0 5C009A 5C009A 35A4A0 5C009A
5C009A 5C009A 5C009A 5C009A 5C009A 5C009A
```

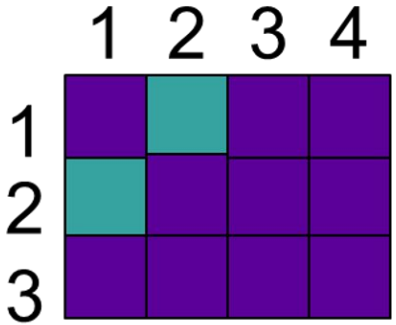
Q: Which image has the following bitmap?

iClicker

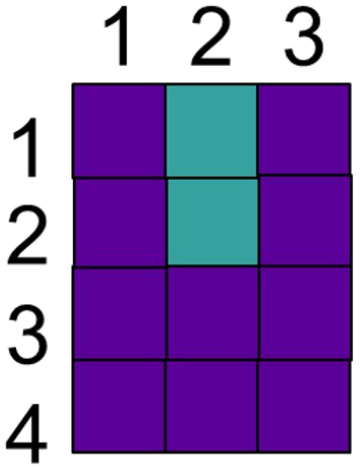
```
04 03
5C009A  35A4A0  5C009A 5C009A  35A4A0 5C009A
5C009A  5C009A  5C009A 5C009A  5C009A 5C009A
```



[A]



[B]

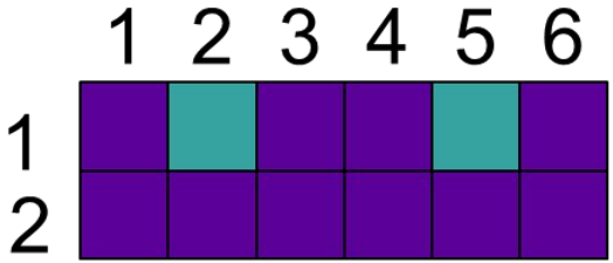


[C]

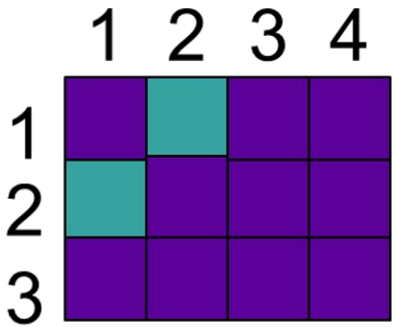
Q: Which image has the following bitmap?

iClicker

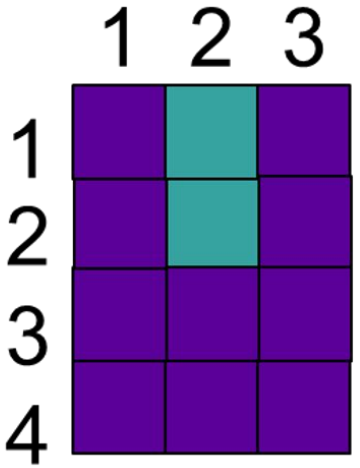
```
04 03
5C009A  35A4A0  5C009A 5C009A  35A4A0 5C009A
5C009A  5C009A  5C009A 5C009A  5C009A 5C009A
```



[A]



[B]



[C]

Data Visualization

What is Visualization?

- Also known as *visual data representation*
- The process of representing data graphically to make it easier to understand patterns, trends, and insights. Instead of raw numbers or complex tables, we use charts, graphs, and maps to communicate information effectively

What is Visualization?

- Also known as *visual data representation*
- The process of representing data graphically to make it easier to understand patterns, trends, and insights. Instead of raw numbers or complex tables, we use charts, graphs, and maps to communicate information effectively
- **Explanatory:** There is something in your data you would like to communicate to your audience
- **Exploratory**: You are trying to explore and understand patterns and trends within your data.

Why Visual Data Representation?

Why Visual Data Representation?

- Vision is our most dominant sense
- We are very good at recognizing visual patterns
- We need to see and understand in order to explain, reason, and make decisions:
  - Makes complex data easier to understand
  - Supports better decision-making
  - Improve communication

Why Visual Data Representation?

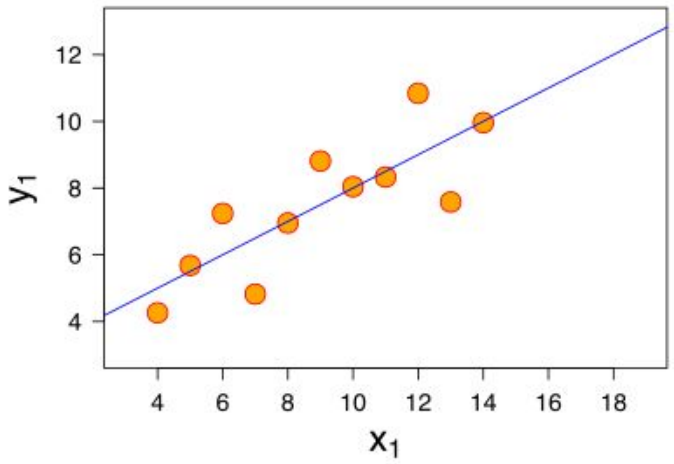
- Can you see any differences in the general trends of these four sets of numbers?

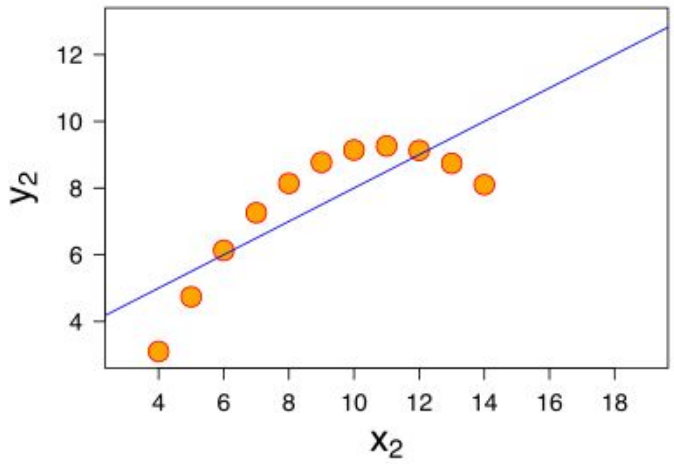
I		II		III		IV	
10	8.04	10	9.14	10	7.46	8	6.58
8	6.95	8	8.14	8	6.77	8	5.76
13	7.58	13	8.74	13	12.74	8	7.71
9	8.81	9	8.77	9	7.11	8	8.84
11	8.33	11	9.26	11	7.81	8	8.47
14	9.96	14	8.1	14	8.84	8	7.04
6	7.24	6	6.13	6	6.08	8	5.25
4	4.26	4	3.1	4	5.39	19	12.5
12	10.84	12	9.13	12	8.15	8	5.56
7	4.82	7	7.26	7	6.42	8	7.91
5	5.68	5	4.74	5	5.73	8	6.89

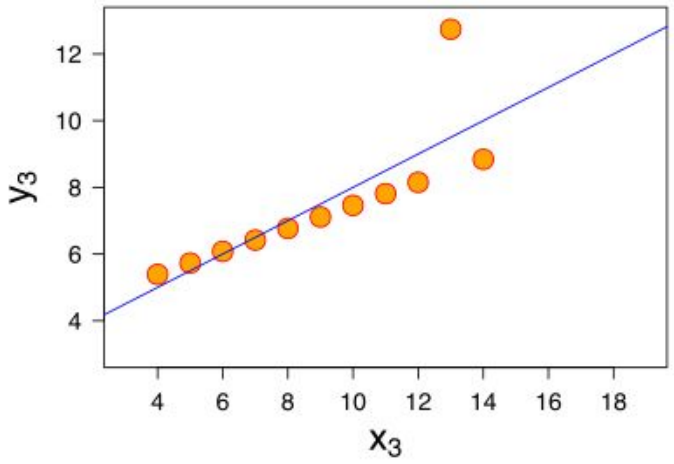
Anscombe's Quartet

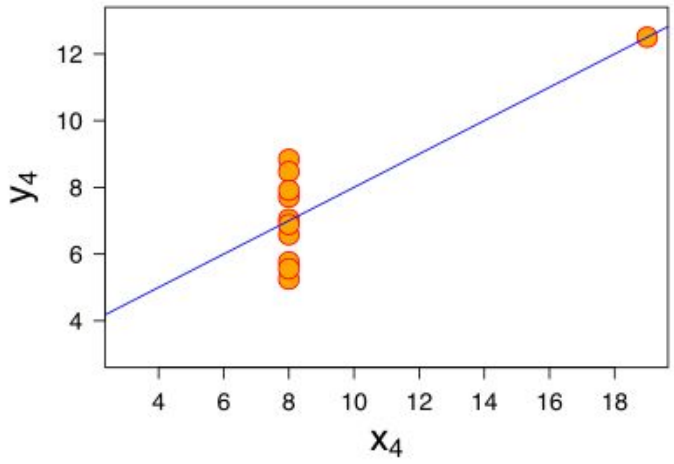
Four datasets that share the same descriptive statistics, including mean, variance, and correlation.

I		II		III		IV	
10	8.04	10	9.14	10	7.46	8	6.58
8	6.95	8	8.14	8	6.77	8	5.76
13	7.58	13	8.74	13	12.74	8	7.71
9	8.81	9	8.77	9	7.11	8	8.84
11	8.33	11	9.26	11	7.81	8	8.47
14	9.96	14	8.1	14	8.84	8	7.04
6	7.24	6	6.13	6	6.08	8	5.25
4	4.26	4	3.1	4	5.39	19	12.5
12	10.84	12	9.13	12	8.15	8	5.56
7	4.82	7	7.26	7	6.42	8	7.91
5	5.68	5	4.74	5	5.73	8	6.89

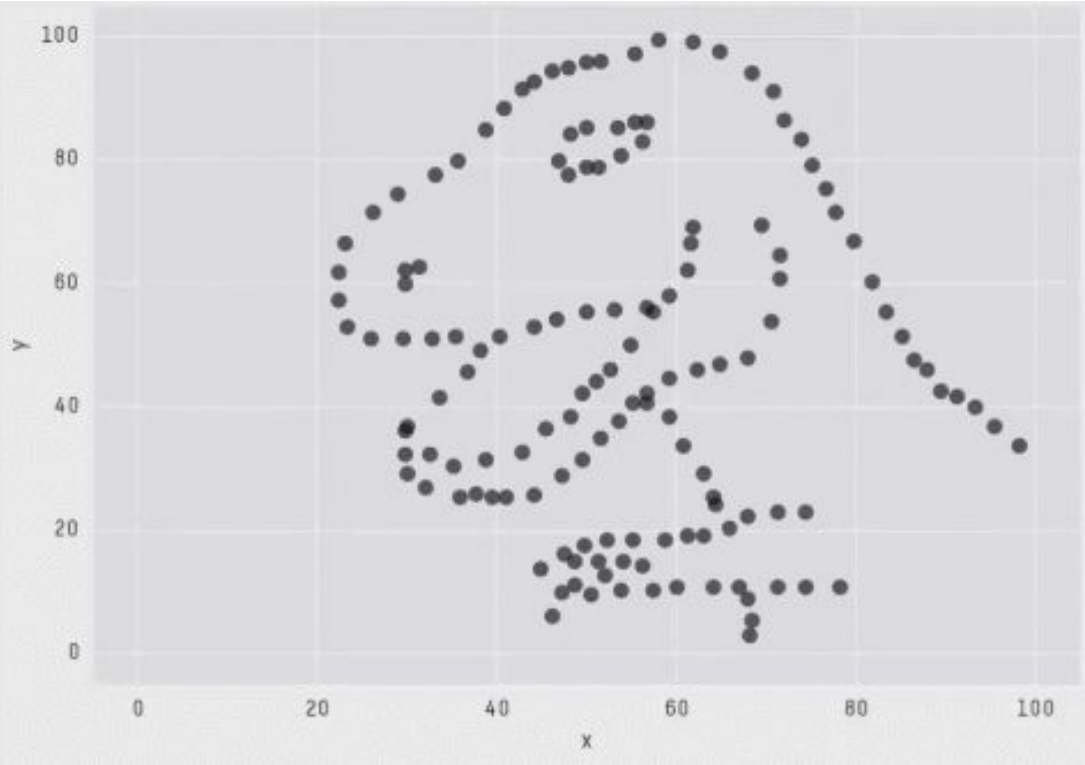

y1
x1
4
6
8
10
12
14
16
18


y2
x2
4
6
8
10
12
14
16
18


y3
x3
4
6
8
10
12
14
16
18


y4
x4
4
6
8
10
12
14
16
18

Other Example: Datasaurus dataset [Link]



X Mean: 54.2659224
Y Mean: 47.8313999
X SD : 16.7649829
Y SD : 26.9342120
Corr. : -0.0642526

Activity

Activity

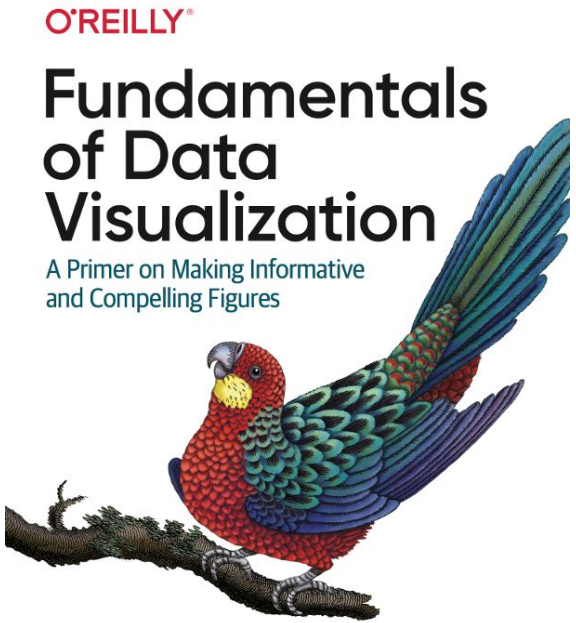
- Visualize the dataset below in at least 5 different ways.
- Sketch on paper
  OR use a tool (e.g.Excel)

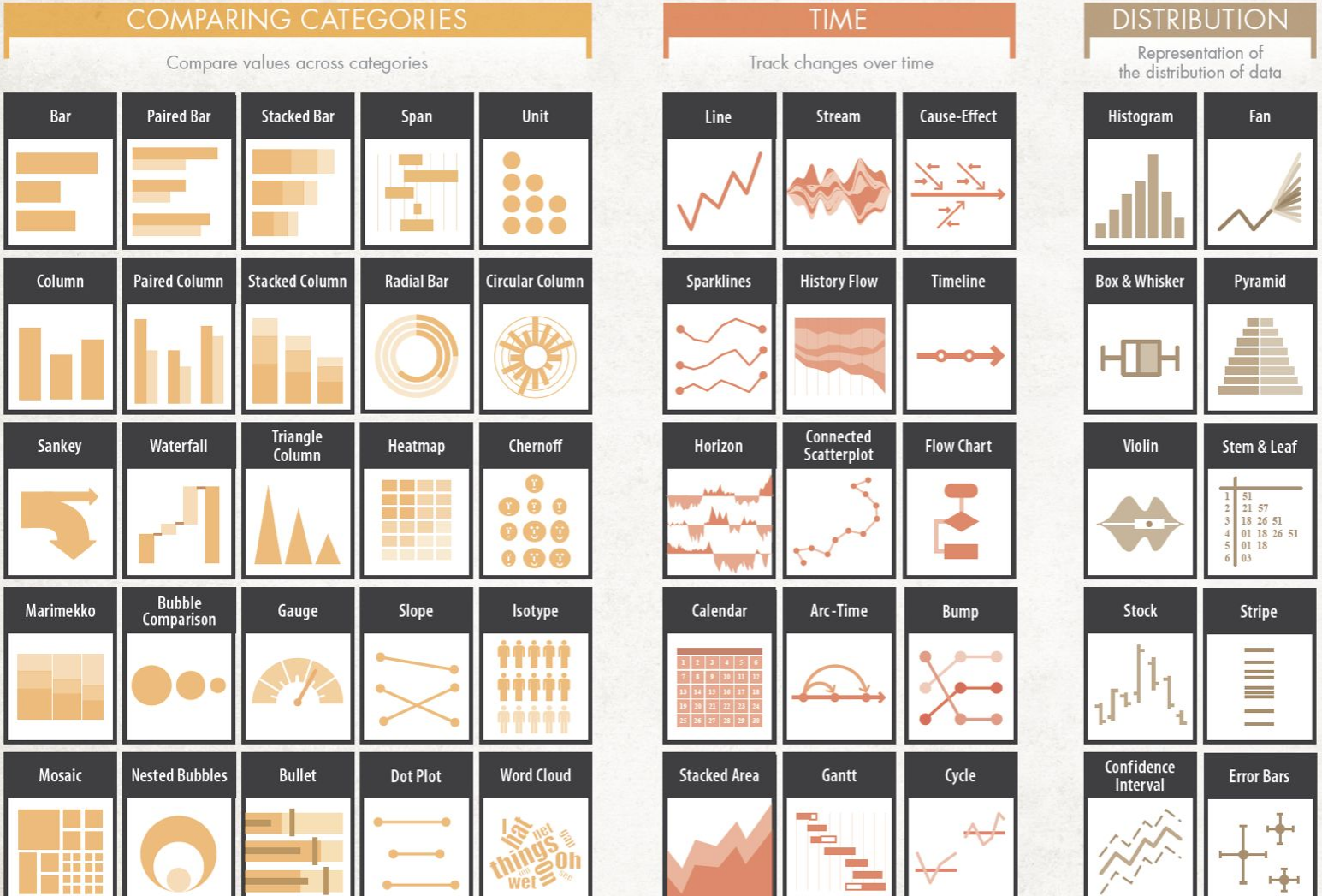
Ice Cream Flavour	Count
Chocolate	50
Vanilla	43
Mint	31
Strawberry	35
Matcha	12
Blueberry	43
Coffee	66

Debrief

Welcome to the wonderful world of Data Visualization!

- Highly recommend this free online book as a reference!




COMPARING CATEGORIES
Compare values across categories
Bar
Paired Bar
Stacked Bar
Span
Unit
Column
Paired Column
Stacked Column
Radial Bar
Circular Column
Sankey
Waterfall
Triangle Column
Heatmap
Chernoff
Marimekko
Bubble Comparison
Gauge
Slope
Isotype
Mosaic
Nested Bubbles
Bullet
Dot Plot
Word Cloud
TIME
Track changes over time
Line
Stream
Cause-Effect
Sparklines
History Flow
Timeline
Horizon
Connected Scatterplot
Flow Chart
Calendar
Arc-Time
Bump
Stacked Area
Gantt
Cycle
DISTRIBUTION
Representation of the distribution of data
Histogram
Fan
Box & Whisker
Pyramid
Violin
Stem & Leaf
Stock
Stripe
Confidence Interval
Error Bars

GEOSPATIAL

Relates data to its geography

- Map
- Flow Map
- Icon Map
- Choropleth
- Map with Columns
- Isopleth
- Cartogram
- Map with Pie Charts
- Contour
- Non-Contiguous Cartogram
- Bubble Map
- Dorling Map
- Connection Map
- Point Map
- Subway Map

PART-TO-WHOLE

Relates the part of a variable to its total

- Pie
- Treemap
- Donut
- Square Cloud
- Arc
- Voronoi
- Nightingale
- Triangle Treemap
- Sunburst
- Waffle

RELATIONSHIP

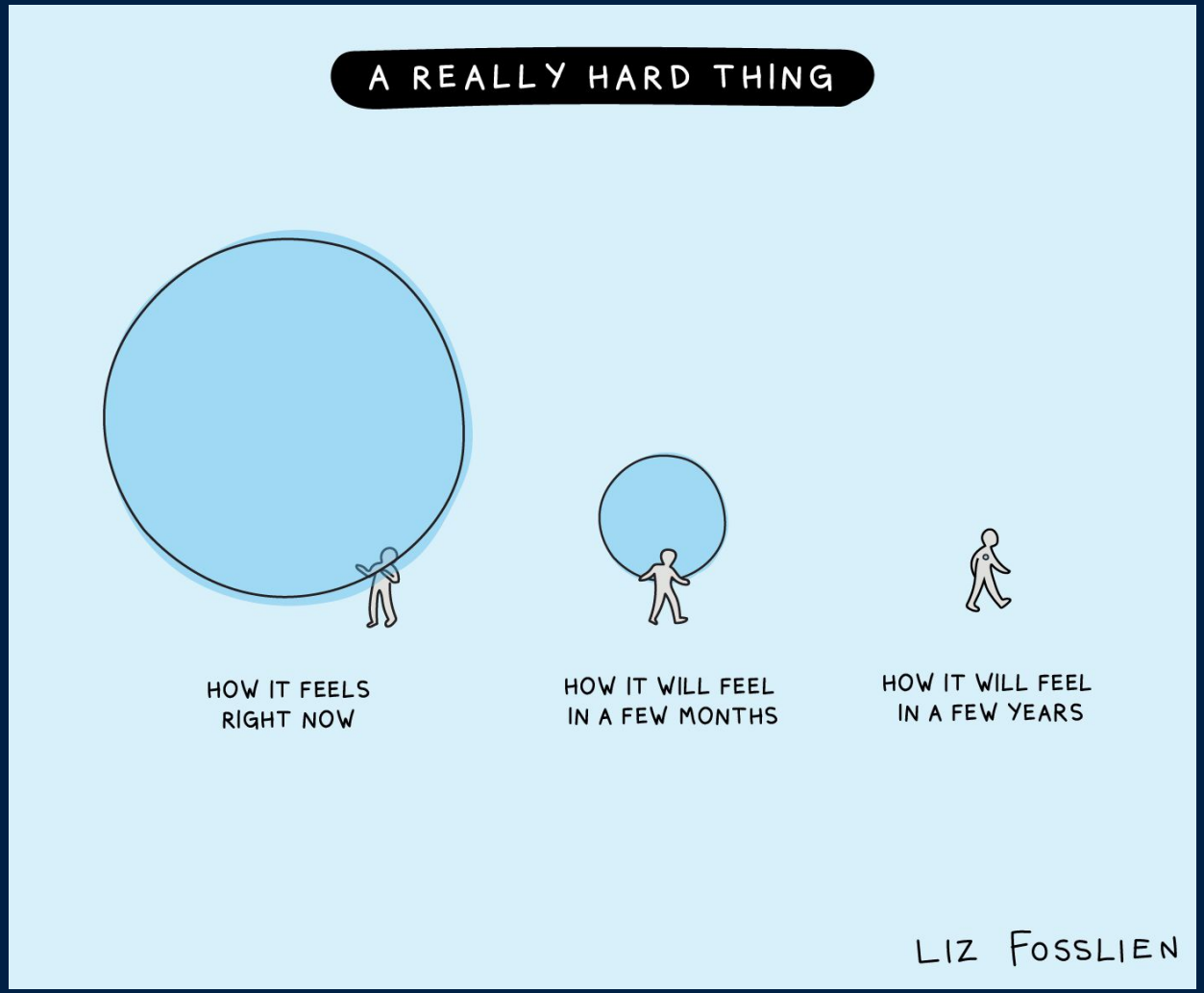
Illustrates correlations or relationships between variables

- Scatterplot
- Arc-Connection
- Dendrogram
- Word Tree
- Circle Packing
- Chord
- Tree
- Correlation Matrix
- Bubble
- Hive
- Double Tree
- Radar
- Parallel Coordinates
- Force-Directed
- Network
- Venn Diagram

@jschwabish @SR_Visual_Info

Principles of Effective Visualizations

Principle	Definition	Examples
• Proportional Ink	The amount of ink used to indicate a value should be proportional to the value itself.	Truncating the y-axis on a bar chart to exaggerate the difference between bars violates the principle of proportional ink.
• Data:ink ratio	Remove distracting visual elements to focus attention on the data	Lighten line weights, remove backgrounds, never use 3D or special effects, ~~remove~~ avoid unnecessary/redundant labels.
• Labels & legends	Use axes labels and titles to highlight/ communicate data	Never leave your data column names as axes labels! Generally good to add a title.
• Overplotting	With large datasets, points overlap, resulting in large clouds of data	To fix overplotting, could plot just a sample subset of the data, use alpha, and use smaller points. Or, jitter - but check if appropriate!
• Visualization choice	Must be informed by the **data** you have, the **research question** being asked and the **audience** that cares.	Pick the simplest plot that best shows most/all of the data needed to answer the research question. If you only have summary statistics, cannot show distributions. Tailor the visualization to your audience (within reason) but don't dumb it down.
• Colour & Accessibility	Colour can be used to encode information or for aesthetics/style/ design. However, colour can also be distracting if used inappropriately or poorly.	Choose a perceptually uniform colour palette; can be sequential or diverging for quantitative data. Opt for colour-blind friendly palettes. Categorical data can use qualitative colour schemes.


A REALLY HARD THING
HOW IT FEELS RIGHT NOW
HOW IT WILL FEEL IN A FEW MONTHS
HOW IT WILL FEEL IN A FEW YEARS
LIZ FOSSLIEN

Preview for next class...

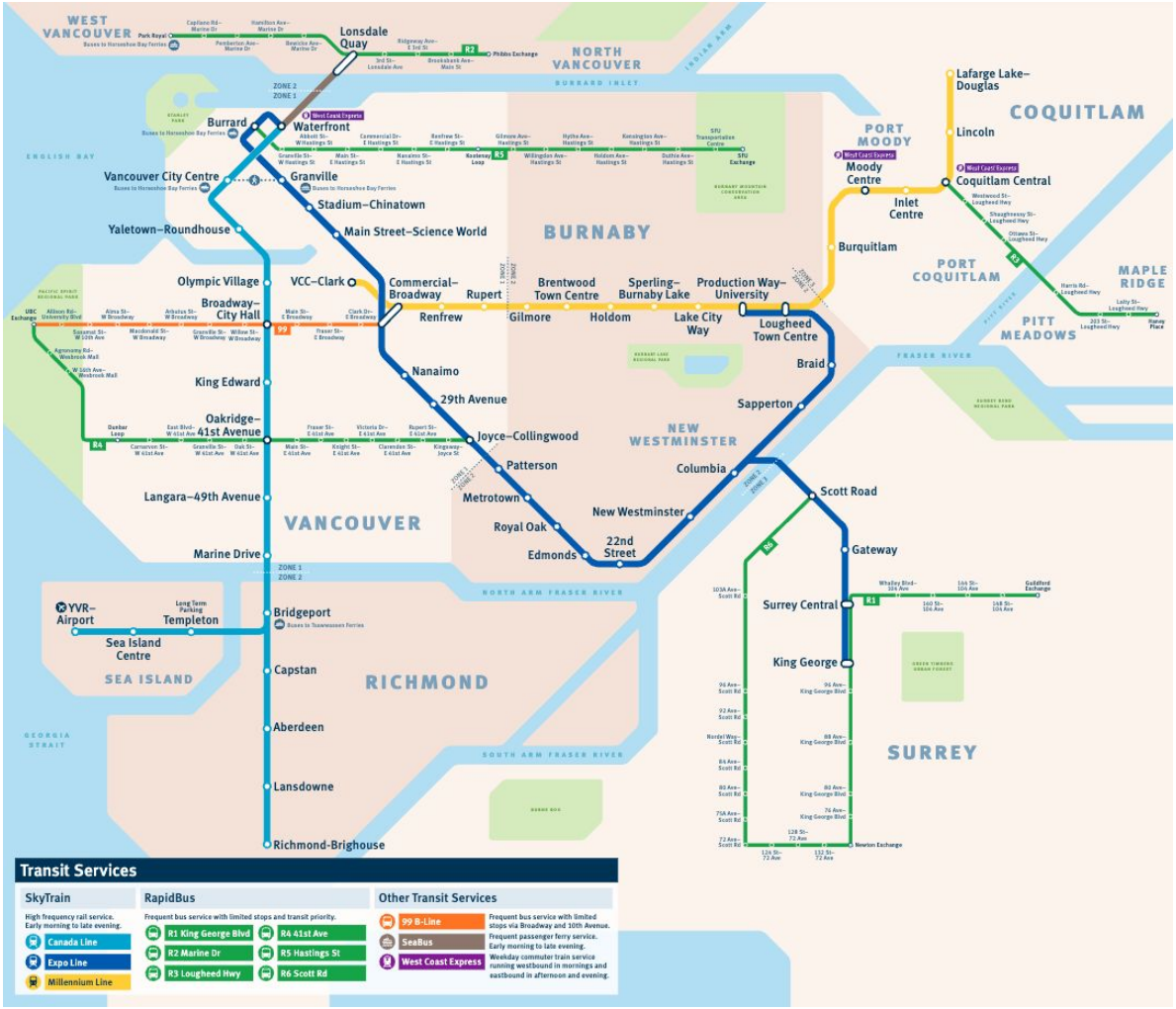
Learning Goals

After this **today's lecture**, you should be able to:

- Define infographics and their role in conveying information effectively.
  - Understand the difference between infographic vs. visualization
- Recognize, define and apply high-level principles of infographic design
- Identify strengths and weaknesses in infographic designs based on high-level principles.

Infographics

Vancouver


WEST VANCOUVER
NORTH VANCOUVER
BURNABY
COQUITLAM
PORT MOODY
PORT COQUITLAM
MAPLE RIDGE
PITT MEADOWS
NEW WESTMINSTER
VANCOUVER
RICHMOND
SEA ISLAND
SURREY
Lonsdale Quay
Burrard
Waterfront
Granville
Vancouver City Centre
Stadium–Chinatown
Main Street–Science World
Yaletown–Roundhouse
Olympic Village
VCC–Clark
Broadway–City Hall
Commercial–Broadway
Rupert
Renfrew
Brentwood Town Centre
Gilmore
Holdom
Sperling–Burnaby Lake
Lake City Way
Production Way–University
Lougheed Town Centre
Lafarge Lake–Douglas
Lincoln
Coquitlam Central
Moody Centre
Inlet Centre
Burquitlam
Braid
Sapperton
King Edward
Oakridge–41st Avenue
Nanaimo
29th Avenue
Joyce–Collingwood
Patterson
Metrotown
Royal Oak
Edmonds
22nd Street
New Westminster
Columbia
Scott Road
Gateway
Surrey Central
King George
Langara–49th Avenue
Marine Drive
Bridgeport
YVR–Airport
Templeton
Sea Island Centre
Capstan
Aberdeen
Lansdowne
Richmond-Brighouse
Transit Services
SkyTrain
Canada Line
Expo Line
Millennium Line
RapidBus
R1 King George Blvd
R2 Marine Dr
R3 Lougheed Hwy
R4 41st Ave
R5 Hastings St
R6 Scott Rd
Other Transit Services
99 B-Line
SeaBus
West Coast Express

What are Infographics?

"Information graphics or infographics are **visual representations of data**, information, or knowledge intended to **present the idea quickly succinctly, and clearly."** (Wikipedia)

- Static representation that conveys a specific message
- Typically includes graphics and stats (but it doesn't have to)
- Images used do not necessarily have to encode data

Infographics vs. Visualization

- An infographic is a **static representation** that conveys a specific message. It typically includes graphics and stats but doesn't have to.

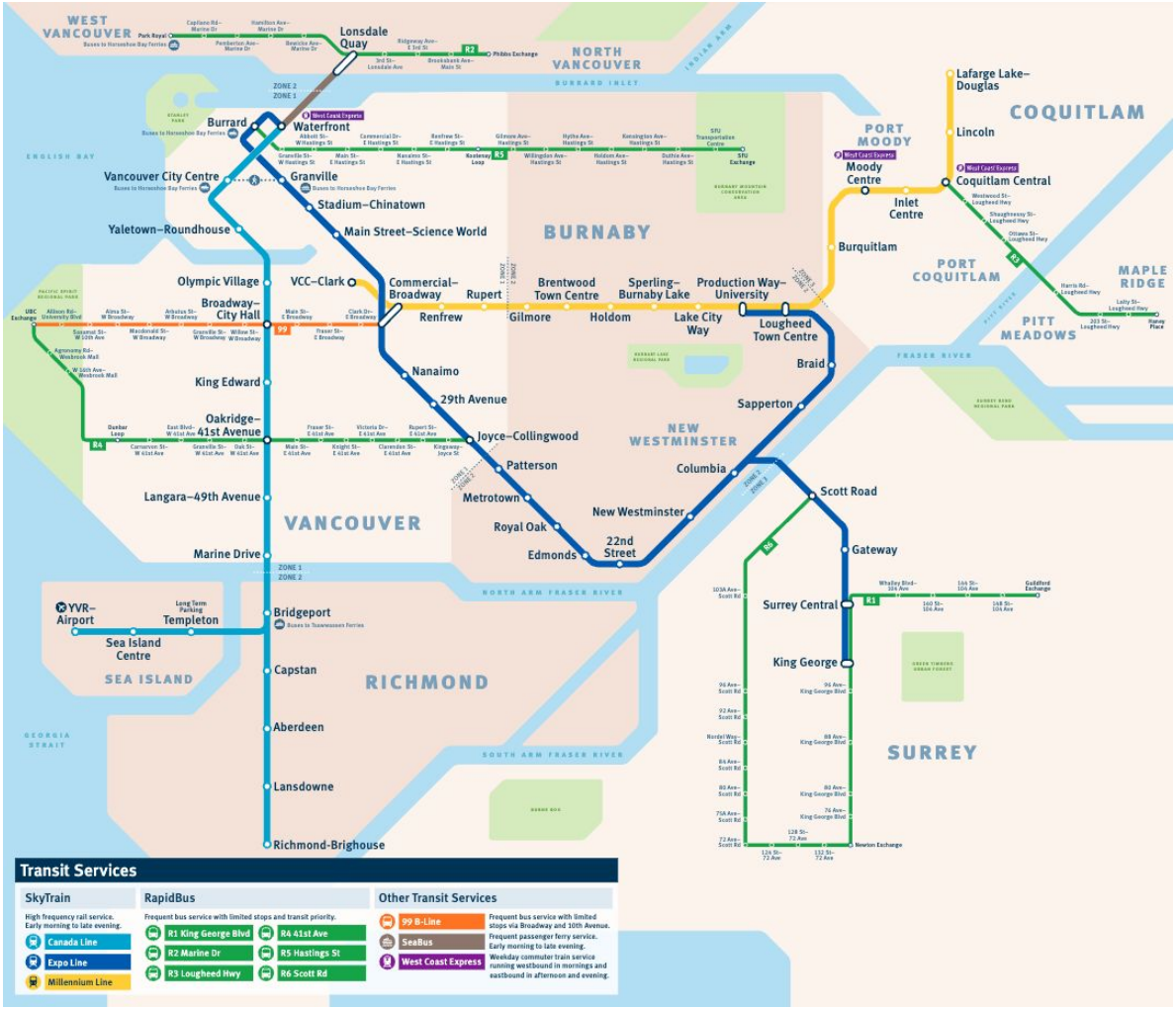
- Visualization can be an **interactive or static representation** that primarily uses visual marks to encode data.

Why Infographics?

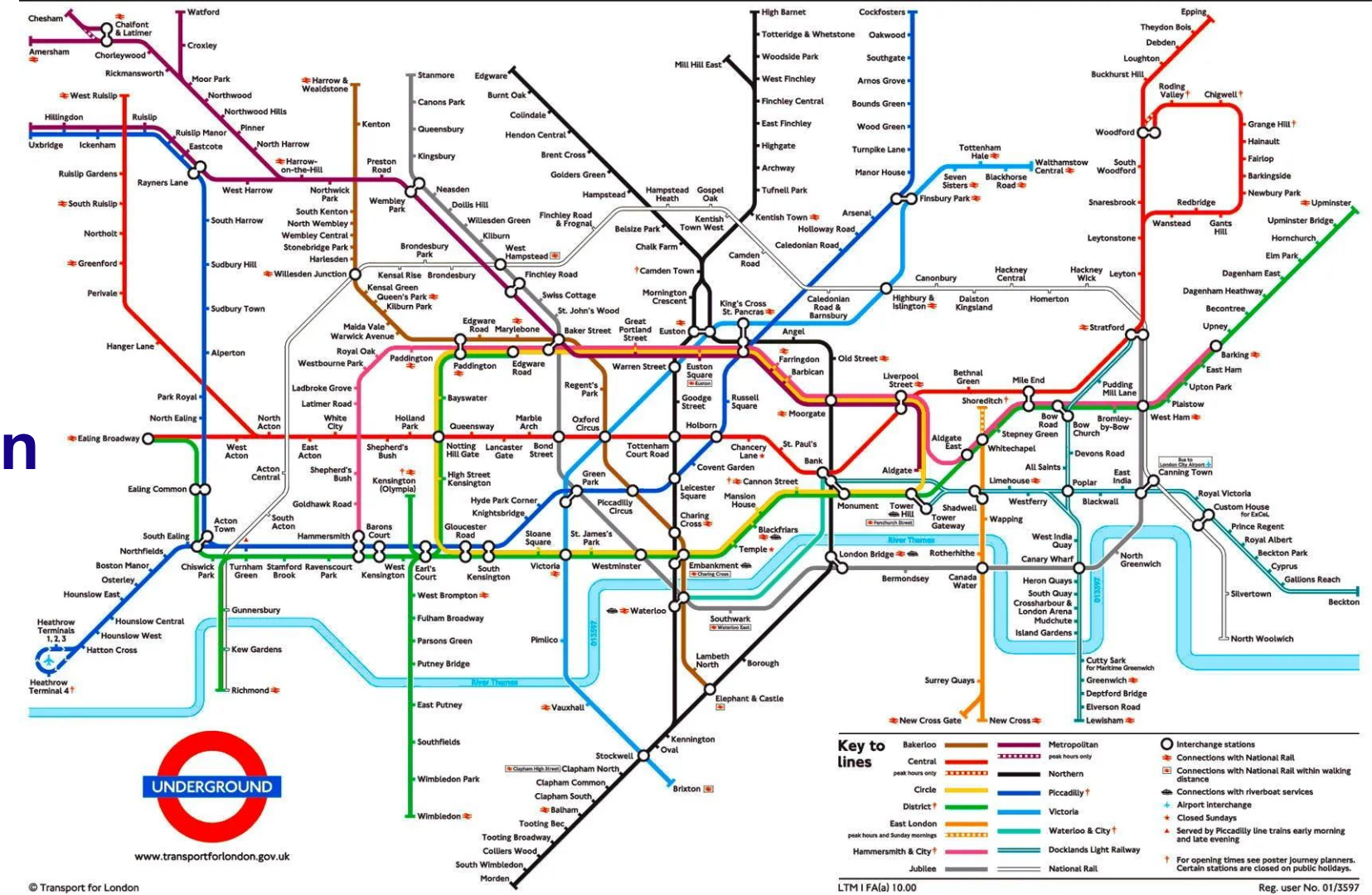
- Improve Comprehension and Retention
  - mix of text, visuals, and icons to break down complex ideas
- Enhance Engagement
  - attracts more attention than plain text
- Simplify Data and Statistics
  - make numbers more understandable*
    - * = simplification should not compromise the accuracy of the data
- Increase Information Accessibility
  - bridge language and literacy gaps by using icons, symbols, and structured layouts

Examples: Transit Maps

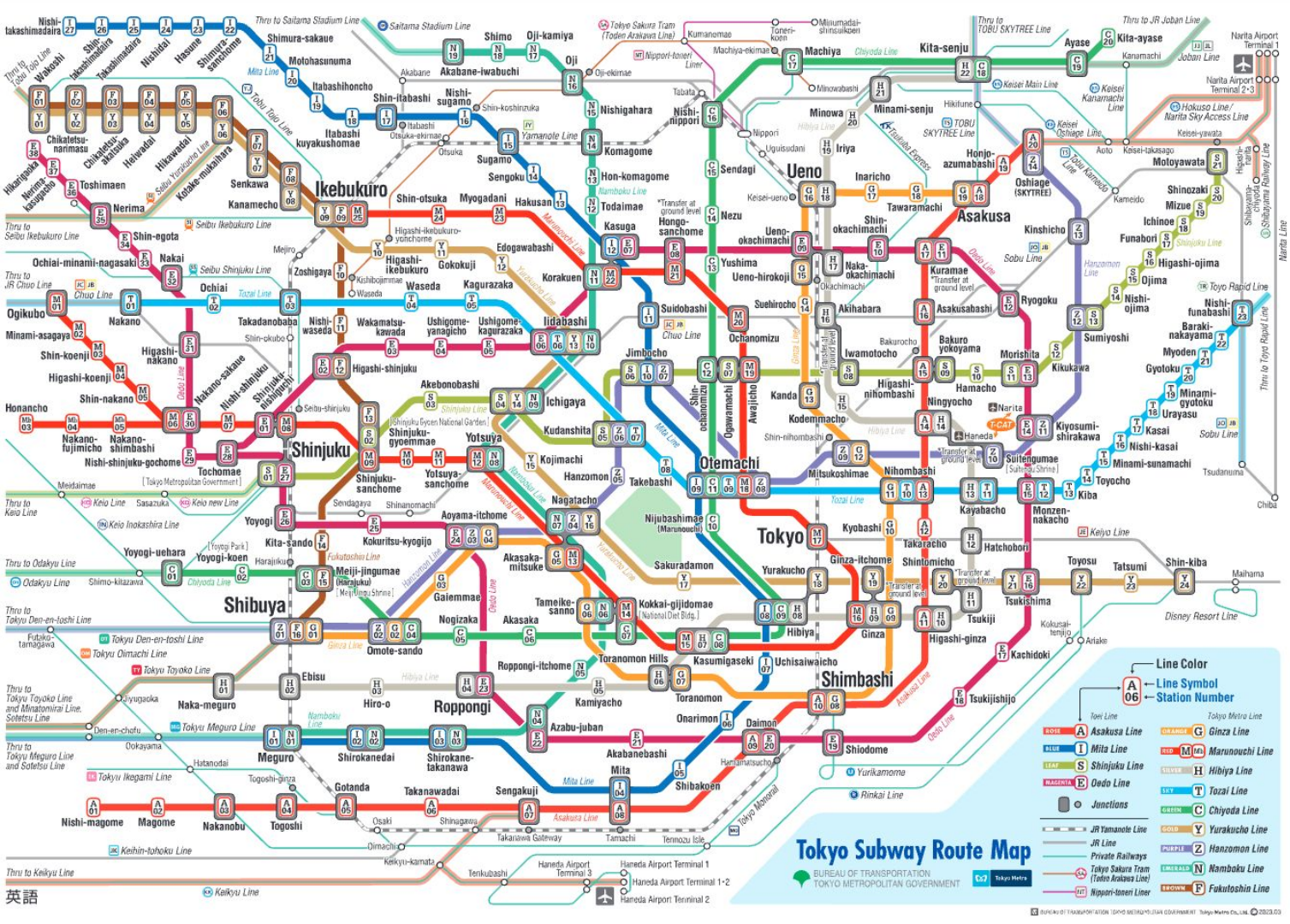
Vancouver


WEST VANCOUVER
NORTH VANCOUVER
BURNABY
COQUITLAM
PORT MOODY
PORT COQUITLAM
MAPLE RIDGE
PITT MEADOWS
NEW WESTMINSTER
VANCOUVER
RICHMOND
SEA ISLAND
SURREY
Lonsdale Quay
Burrard
Waterfront
Granville
Vancouver City Centre
Stadium–Chinatown
Main Street–Science World
Yaletown–Roundhouse
Olympic Village
VCC–Clark
Broadway–City Hall
Commercial–Broadway
Rupert
Renfrew
Brentwood Town Centre
Gilmore
Holdom
Sperling–Burnaby Lake
Production Way–University
Lake City Way
Lougheed Town Centre
Lafarge Lake–Douglas
Lincoln
Coquitlam Central
Moody Centre
Inlet Centre
Burquitlam
Braid
Sapperton
King Edward
Oakridge–41st Avenue
Nanaimo
29th Avenue
Joyce–Collingwood
Patterson
Metrotown
Royal Oak
Edmonds
22nd Street
New Westminster
Columbia
Scott Road
Gateway
Surrey Central
King George
Langara–49th Avenue
Marine Drive
Bridgeport
YVR–Airport
Templeton
Sea Island Centre
Capstan
Aberdeen
Lansdowne
Richmond-Brighouse
Transit Services
SkyTrain
High frequency rail service. Early morning to late evening.
Canada Line
Expo Line
Millennium Line
RapidBus
Frequent bus service with limited stops and transit priority.
R1 King George Blvd
R2 Marine Dr
R3 Lougheed Hwy
R4 41st Ave
R5 Hastings St
R6 Scott Rd
Other Transit Services
99 B-Line
Frequent bus service with limited stops via Broadway and 10th Avenue.
SeaBus
Frequent passenger ferry service. Early morning to late evening.
West Coast Express
Weekday commuter train service running westbound in mornings and eastbound in afternoon and evening.

London


UNDERGROUND
www.transportforlondon.gov.uk
© Transport for London
Key to lines
Bakerloo
Central
peak hours only
Circle
District†
East London
peak hours and Sunday mornings
Hammersmith & City†
Jubilee
Metropolitan
peak hours only
Northern
Piccadilly†
Victoria
Waterloo & City†
Docklands Light Railway
National Rail
Interchange stations
Connections with National Rail
Connections with National Rail within walking distance
Connections with riverboat services
Airport interchange
Closed Sundays
Served by Piccadilly line trains early morning and late evening
† For opening times see poster journey planners. Certain stations are closed on public holidays.
LTM I FA(a) 10.00
Reg. user No. 01/3597

Tokyo


Tokyo Subway Route Map
BUREAU OF TRANSPORTATION
TOKYO METROPOLITAN GOVERNMENT
Line Color
Line Symbol
Station Number
Toei Line
Asakusa Line
Mita Line
Shinjuku Line
Oedo Line
Tokyo Metro Line
Ginza Line
Marunouchi Line
Hibiya Line
Tozai Line
Chiyoda Line
Yurakucho Line
Hanzomon Line
Namboku Line
Fukutoshin Line
Junctions
JR Yamanote Line
JR Line
Private Railways
Tokyo Sakura Tram (Toden Arakawa Line)
Nippori-toneri Liner
Ikebukuro
Shinjuku
Shibuya
Ueno
Asakusa
Tokyo
Otemachi
Shimbashi
Roppongi
Meguro
Shirokanedai
Shirokane-takanawa
Gotanda
Takanawadai
Sengakuji
Mita
Shibakoen
Akabanebashi
Shiodome
Daimon
Onarimon
Kamiyacho
Toranomon
Toranomon Hills
Kasumigaseki
Uchisaiwaicho
Hibiya
Ginza
Higashi-ginza
Tsukiji
Shintomicho
Ginza-itchome
Yurakucho
Hatchobori
Kyobashi
Nihombashi
Mitsukoshimae
Kodemmacho
Kayabacho
Takaracho
Monzen-nakacho
Kiyosumi-shirakawa
Kikukawa
Morishita
Higashi-nihombashi
Ningyocho
Hamacho
Kinshicho
Oshiage (SKYTREE)
Honjo-azumabashi
Inaricho
Tawaramachi
Asakusabashi
Kuramae
Ryogoku
Bakuro-yokoyama
Iwamotocho
Akihabara
Suehirocho
Ueno-okachimachi
Naka-okachimachi
Shin-okachimachi
Yushima
Ueno-hirokoji
Okachimachi
Nezu
Sendagi
Nishi-nippori
Nippori
Minowa
Minami-senju
Machiya
Kita-senju
Ayase
Kita-ayase
Hikifune
Aoto
Kameido
Kinshicho
Oshiage (SKYTREE)
Motoyawata
Shinozaki
Mizue
Ichinoe
Funabori
Higashi-ojima
Ojima
Nishi-ojima
Nishi-funabashi
Baraki-nakayama
Myoden
Gyotoku
Minami-gyotoku
Urayasu
Kasai
Nishi-kasai
Minami-sunamachi
Toyocho
Kiba
Tsunadumma
Chiba
Maihama
Disney Resort Line
Shin-kiba
Toyosu
Tatsumi
Tsukishima
Kachidoki
Tsukijishijo
Shiodome
Hamamatsucho
Yurikamome
Rinkai Line
Tokyo Monorail
Haneda Airport Terminal 1
Haneda Airport Terminal 1·2
Haneda Airport Terminal 2
Haneda Airport Terminal 3
Keikyu Line
Keikyu-kamata
Keihin-tohoku Line
Oimachi
Takanawa Gateway
Tamachi
Tennozu Isle
Osaki
Shinagawa
Nishi-magome
Magome
Nakanobu
Togoshi
Togoshi-ginza
Hatanodai
Ookayama
Den-en-chofu
Naka-meguro
Ebisu
Hiro-o
Futako-tamagawa
Jiyugaoka
Yoyogi-uehara
Yoyogi-koen
Yoyogi Park
Yoyogi
Kita-sando
Kokuritsu-kyogijo
Meiji-jingumae (Harajuku)
Meiji-Jingu Shrine
Harajuku
Omote-sando
Gaiemmae
Aoyama-itchome
Nogizaka
Akasaka
Akasaka-mitsuke
Tameike-sanno
Kokkai-gijidomae
National Diet Bldg.
Nagatacho
Sakuradamon
Hanzomon
Kojimachi
Takebashi
Nijubashimae (Matsunouchi)
Kudanshita
Ichigaya
Yotsuya
Yotsuya-sanchome
Shinjuku-gyoemmae
Shinjuku Gyoen National Garden
Shinjuku-sanchome
Shinjuku-nishiguchi
Nishi-shinjuku
Nishi-shinjuku-gochome
Tochomae
Tokyo Metropolitan Government
Seibu-shinjuku
Higashi-shinjuku
Shin-okubo
Okubo Line
Nishi-waseda
Waseda
Kagurazaka
Iidabashi
Ushigome-kagurazaka
Ushigome-yanagicho
Wakamatsu-kawada
Takadanobaba
Higashi-nakano
Shin-koenji
Higashi-koenji
Shin-nakano
Nakano-sakaue
Nakano
Ogikubo
Minami-asagaya
Ochiai
Ochiai-minami-nagasaki
Nakai
Shin-egota
Nerima
Toshimaen
Hikarigaoka
Nerima-kasuyacho
Chikatetsu-narimasu
Chikatetsu-akatsuka
Heiwadai
Hikawadai
Kotake-mukaihara
Senkawa
Kanamecho
Zoshigaya
Mejiro
Higashi-ikebukuro
Higashi-ikebukuro-yonchome
Gokokuji
Edogawabashi
Myogadani
Shin-otsuka
Otsuka
Sugamo
Shin-sugamo
Nishigahara
Komagome
Hon-komagome
Todaimae
Hakusan
Sengoku
Yamanote Line
Shin-koshinzuka
Itabashi
Shin-itabashi
Itabashihoncho
Motohasunuma
Shimura-sakaue
Shimura-sanchome
Nishidai
Hasune
Akabane
Akabane-iwabuchi
Shimo
Oji-kamiya
Oji
Oji-ekimae
Kumanomae
Machiya-ekimae
Machiya
Toneri-koen
Minowabashi
Hikifune
Aoto
Kameido
Kinshicho
Oshiage (SKYTREE)
Motoyawata
Keisei-takasago
Keisei-yawata
Keisei-Oshiage Line
Keisei Main Line
Keisei Kanamachi Line
Hokuso Line / Narita Sky Access Line
Joban Line
Narita Airport Terminal 1
Narita Airport Terminal 2·3
Thru to JR Joban Line
Thru to TOBU SKYTREE Line
Thru to Saitama Stadium Line
Saitama Stadium Line
Thru to Seibu Ikebukuro Line
Seibu Ikebukuro Line
Seibu Shinjuku Line
Seibu Yurakucho Line
Thru to JR Chuo Line
Chuo Line
Tozai Line
Thru to Keio Line
Keio Line
Keio new Line
Keio Inokashira Line
Sasazuka
Meidaimae
Thru to Odakyu Line
Odakyu Line
Shimo-kitazawa
Thru to Tokyu Den-en-toshi Line
Tokyu Den-en-toshi Line
Tokyu Oimachi Line
Tokyu Toyoko Line
Thru to Tokyu Toyoko Line and Minatomirai Line, Sotetsu Line
Tokyu Meguro Line
Thru to Tokyu Meguro Line and Sotetsu Line
Tokyu Ikegami Line
Thru to Keikyu Line
Haneda Airport Terminal 1·2
Haneda Airport Terminal 2
Haneda Airport Terminal 3
Tenkubashi
Thru to Saitama Stadium Line
Thru to Tokyu Toyoko Line
Thru to Seibu Ikebukuro Line
Thru to JR Chuo Line
Thru to Keio Line
Thru to Odakyu Line
Thru to Tokyu Den-en-toshi Line
Thru to Keikyu Line
Thru to Toyo Rapid Line
Toyo Rapid Line
Tobu Tojo Line
Tobu Kameido Line
Tobu Isesaki Line
Tobu Skytree Line
Tobu Nikko Line
Tobu Koizumi Line
Tobu Urban Park Line
Tobu Daishi Line
Tobu Sky Tree Line
Tobu Kameido Line
Tobu Isesaki Line
Tobu Nikko Line
Tobu Koizumi Line
Tobu Urban Park Line
Tobu Daishi Line
Tobu Sky Tree Line
Tokyu Toyoko Line
Tokyu Meguro Line
Tokyu Oimachi Line
Tokyu Ikegami Line
Tokyu Den-en-toshi Line
Tokyu Sakura Tram (Toden Arakawa Line)
Nippori-toneri Liner
Tokyo Metro Line
Toei Line
Tokyo Metro Line
Ginza Line
Marunouchi Line
Hibiya Line
Tozai Line
Chiyoda Line
Yurakucho Line
Hanzomon Line
Namboku Line
Fukutoshin Line
Asakusa Line
Mita Line
Shinjuku Line
Oedo Line
Junctions
JR Yamanote Line
JR Line
Private Railways
Tokyo Sakura Tram (Toden Arakawa Line)
Nippori-toneri Liner
英語

Other Examples

UBC Library Snapshot

UBC Library advances research, learning and teaching excellence by connecting communities within and beyond UBC to the world's knowledge. The Library, a high-ranking member of the Association of Research Libraries (ARL), is the largest library in British Columbia and provides access to expanding digital resources and houses an on-site digitization centre. For more information, visit library.ubc.ca.

15 branches across 2 campuses

315 full-time staff
- 88 librarians
- 184 management & support staff
- 43 student employees

Rankings
- **14 out of 115** university libraries in the Association of Research Libraries (ARL)
- **2nd** among Canadian academic libraries (ARL)
- cIRcle, UBC's information repository, **ranks 2nd in Canada** and 44th globally among 1,650 repositories.

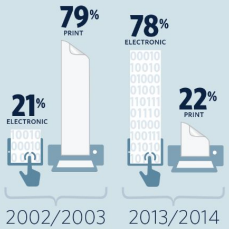
COLLECTIONS

- More than **7.4m** volumes
- More than **1.8m** e-books
- **330,000+** e-journals
- **500,000+** items in locally produced **digital collections**

More than
5 million e-book downloads
8 million e-journal downloads

LIBRARY RESOURCES

Expenditures shifting from **print** to **electronic**



on-campus 3.8M+ visits (JAN–DEC 2013)
library.ubc.ca 11.1M+

UBC Library on SOCIAL MEDIA

Twitter 4,8K
Facebook 9,9K
16 accounts

Librarians provided 1,768 instructionals to more than **41,427 participants** and answered reference questions
- 54,648 in-person
- 10,756 online

UBC Library Snapshot

UBC Library advances research, learning and teaching excellence by connecting communities within and beyond UBC to the world's knowledge. The Library, a high-ranking member of the Association of Research Libraries (ARL), is the largest library in British Columbia and provides access to expanding digital resources and houses an on-site digitization centre. For more information, visit library.ubc.ca.

15 branches across 2 campuses

315 full-time staff
- 88 librarians
- 184 management & support staff
- 43 student employees

Rankings
- **14 out of 115** university libraries in the Association of Research Libraries (ARL)
- **2nd** among Canadian academic libraries (ARL)
- cIRcle, UBC's information repository, **ranks 2nd in Canada** and 44th globally among 1,650 repositories.

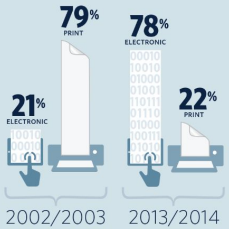
COLLECTIONS

- More than **7.4m** volumes
- More than **1.8m** e-books
- **330,000+** e-journals
- **500,000+** items in locally produced **digital collections**

More than
5 million e-book downloads
8 million e-journal downloads

LIBRARY RESOURCES

Expenditures shifting from **print** to **electronic**



on-campus 3.8M+ visits (JAN–DEC 2013)
library.ubc.ca 11.1M+

UBC Library on SOCIAL MEDIA

Twitter 4,8K
Facebook 9,9K
16 accounts

Librarians provided 1,768 instructionals to more than **41,427 participants** and answered reference questions
- 54,648 in-person
- 10,756 online

Company: Benevity

Principles for Infographics

Principles for Infographics

- **Simplicity**
- **Consistency**

- **Visibility**
- **Navigability** (structure)

- **Suitability**

Principles for Infographics

- **Simplicity** – minimal text, clear message, avoid clutter
- **Consistency**

- **Visibility**
- **Navigability** (structure)

- **Suitability**

Principles for Infographics

- **Simplicity** – minimal text, clear message, avoid clutter
- **Consistency** – layout and design elements should be consistent.
  - 2 to 3 font sizes, colour scheme
- **Visibility**
- **Navigability** (structure)

- **Suitability**

Principles for Infographics

- **Simplicity** – minimal text, clear message, avoid clutter
- **Consistency** – layout and design elements should be consistent.
  - 2 to 3 font sizes, colour scheme
- **Visibility** – appropriate font sizes, colors that contrast
- **Navigability** (structure)

- **Suitability**

Principles for Infographics

- **Simplicity** – minimal text, clear message, avoid clutter
- **Consistency** – layout and design elements should be consistent.
  - 2 to 3 font sizes, colour scheme
- **Visibility** – appropriate font sizes, colors that contrast
- **Navigability** (structure) – clear order to follow, use scale/proportion to emphasize key points/headings
- **Suitability**

Principles for Infographics

- **Simplicity** – minimal text, clear message, avoid clutter
- **Consistency** – layout and design elements should be consistent.
  - 2 to 3 font sizes, colour scheme
- **Visibility** – appropriate font sizes, colors that contrast
- **Navigability** (structure) – clear order to follow, use scale/proportion to emphasize key points/headings
- **Suitability** – right data for message, right graphic for the message, right metaphors for the audience

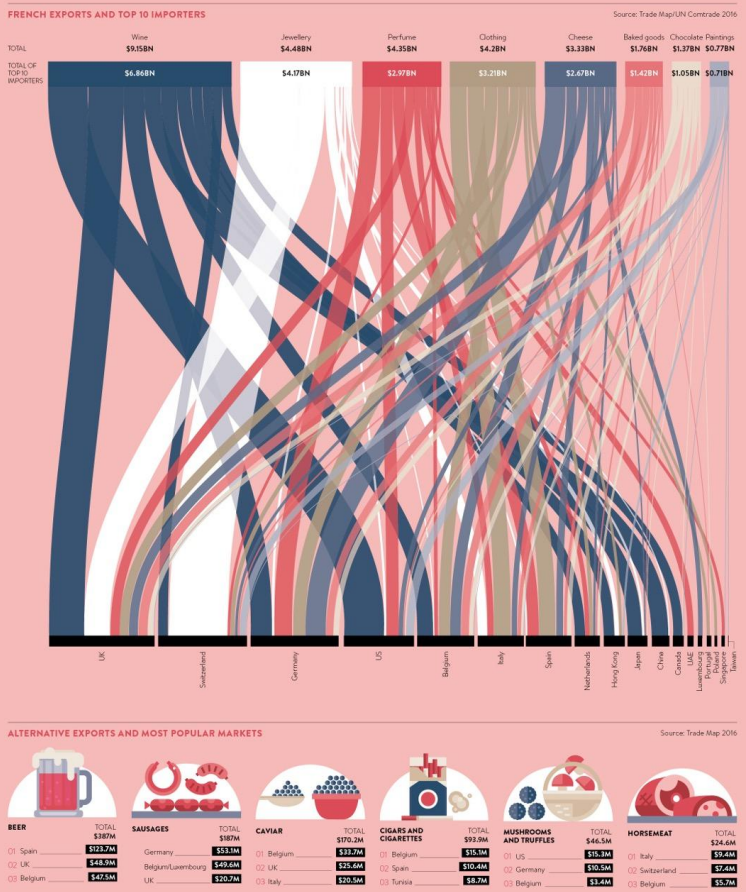
Principles for Infographics

- **Simplicity** – minimal text, clear message, avoid clutter
- **Consistency** – layout and design elements should be consistent.
  - 2 to 3 font sizes, colour scheme
- **Visibility** – appropriate font sizes, colors that contrast
- **Navigability** (structure) – clear order to follow, use scale/proportion to emphasize key points/headings
- **Suitability** – right data for message, right graphic for the message, right metaphors for the audience

Principles in Action

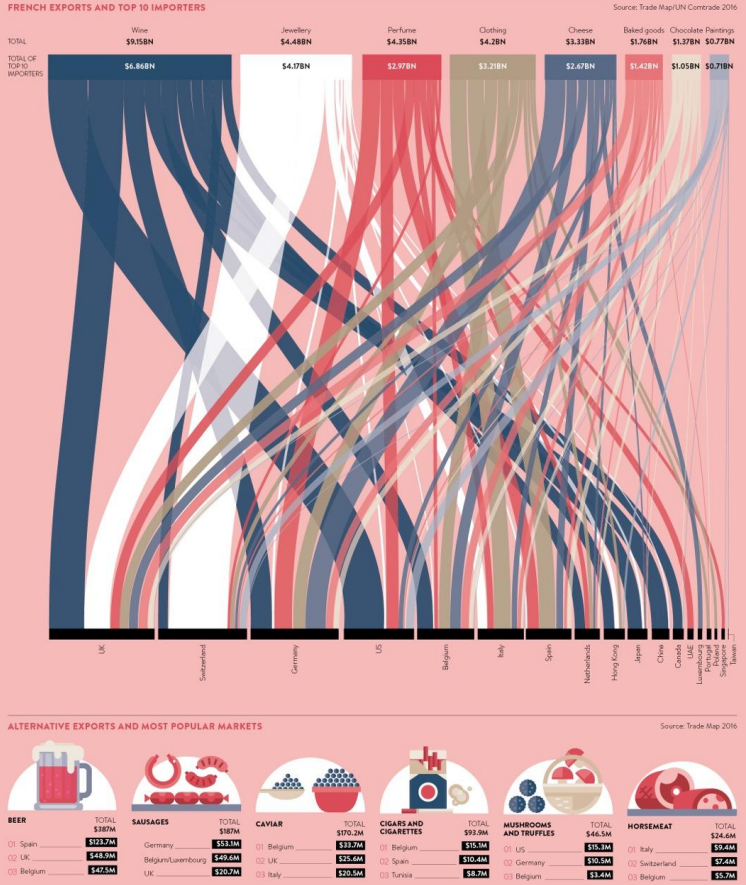
Made in France

France exported $572 billion of goods in 2015, making it the sixth largest exporter in the world. While aircraft, cars and medicines are the country's highest-valued goods, there are many other exports to varied markets

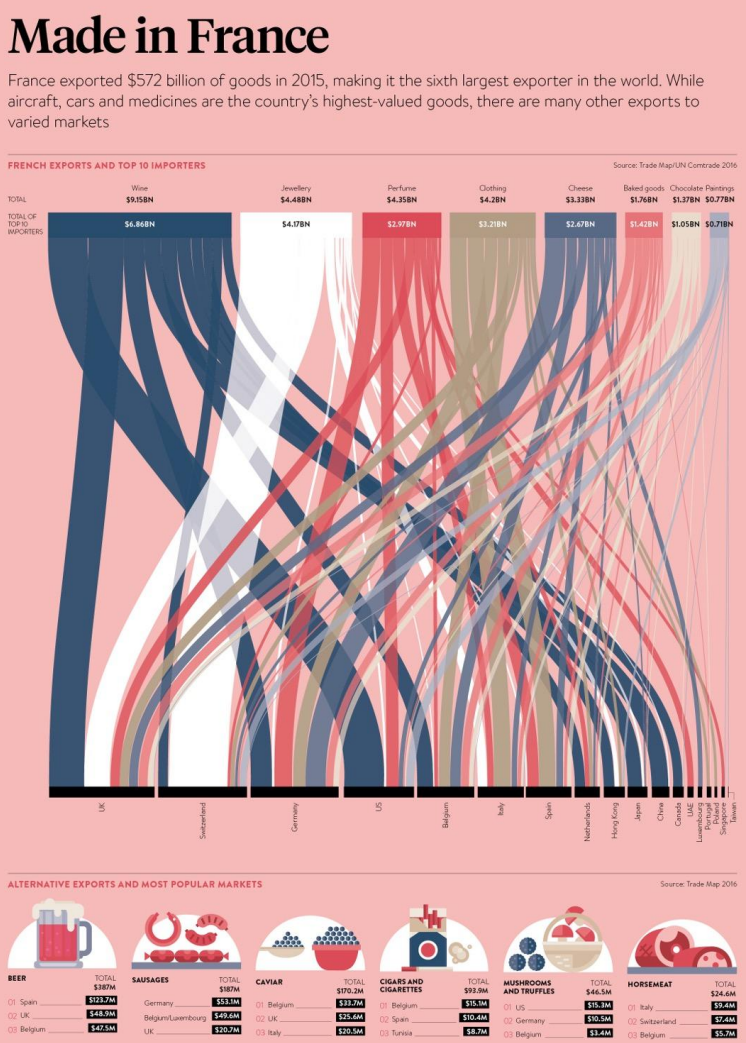


Made in France

France exported $572 billion of goods in 2015, making it the sixth largest exporter in the world. While aircraft, cars and medicines are the country's highest-valued goods, there are many other exports to varied markets



FRENCH EXPORTS AND TOP 10 IMPORTERS
Source: Trade Map/UN Comtrade 2016
TOTAL
TOTAL OF TOP 10 IMPORTERS
Wine $9.15BN
Jewellery $4.48BN
Perfume $4.35BN
Clothing $4.2BN
Cheese $3.33BN
Baked goods $1.76BN
Chocolate $1.37BN
Paintings $0.77BN
$6.86BN
$4.17BN
$2.97BN
$3.21BN
$2.67BN
$1.42BN
$1.05BN
$0.71BN
UK
Switzerland
Germany
US
Belgium
Italy
Spain
Netherlands
Hong Kong
Japan
China
Canada
UAE
Luxembourg
Portugal
Poland
Singapore
Taiwan
ALTERNATIVE EXPORTS AND MOST POPULAR MARKETS
Source: Trade Map 2016
BEER TOTAL $387M
01 Spain $123.7M
02 UK $48.9M
03 Belgium $47.5M
SAUSAGES TOTAL $187M
Germany $53.1M
Belgium/Luxembourg $49.6M
UK $20.7M
CAVIAR TOTAL $170.2M
01 Belgium $33.7M
02 UK $25.6M
03 Italy $20.5M
CIGARS AND CIGARETTES TOTAL $93.9M
01 Belgium $15.1M
02 Spain $10.4M
03 Tunisia $8.7M
MUSHROOMS AND TRUFFLES TOTAL $46.5M
01 US $15.3M
02 Germany $10.5M
03 Belgium $3.4M
HORSEMEAT TOTAL $24.6M
01 Italy $9.4M
02 Switzerland $7.4M
03 Belgium $5.7M



✗ Simplicity

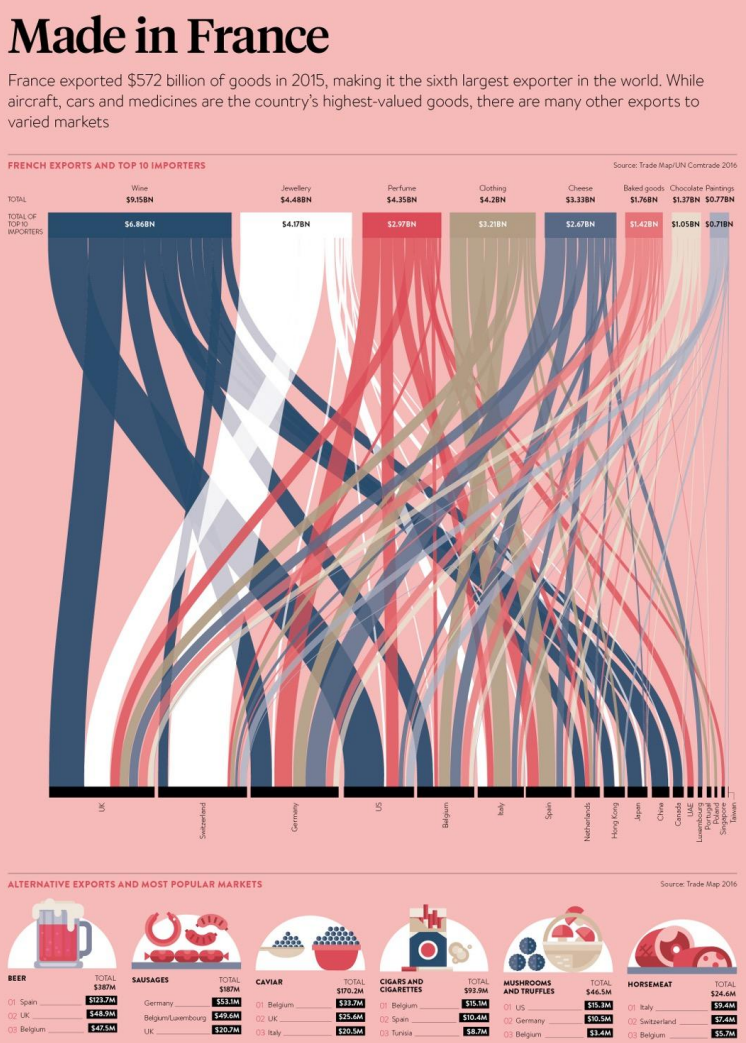
use of a sankey diagram does not help

✗ Visibility

text at the bottom is very hard to read

✗ Suitability

what is the focus of the infographic?



❌ Simplicity

use of a sankey diagram does not help

❌ Visibility

text at the bottom is very hard to read

❌ Suitability

what is the focus of the infographic?

✅ Navigability

top to bottom

✅ Consistency

colour theme

Infographics vs. Visualization

- An infographic is not a type of visualization, as it could just be made up of words and images. (e.g., 70% of children like chocolate ice cream with a picture of an ice cream cone).
- The images in an infographic do not necessarily have to encode data. So you can have infographic that has an emoji, an image of an animal, food, but not encode quantitative data with the images (e.g. no bar charts).