Unsupervised Learning

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The need to group data

Everything should be made as simple as possible, but not simpler

Albert Einstein

The need to group data

- The world is **complex** and **multidimensional**
- **Univariate** analysis focuses on **only one** dimension
- Sometimes, world issues are best understood as **multivariate**. E.g.

The need to group data

- The world is **complex** and **multidimensional**
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- Sometimes, world issues are best understood as **multivariate**. E.g.
  - Percentage of foreign-born Vs. *What is a neighborhood?*
  - Years of schooling Vs. *Human development*
  - Monthly income Vs. *Deprivation*

Grouping **as** *simplifying*

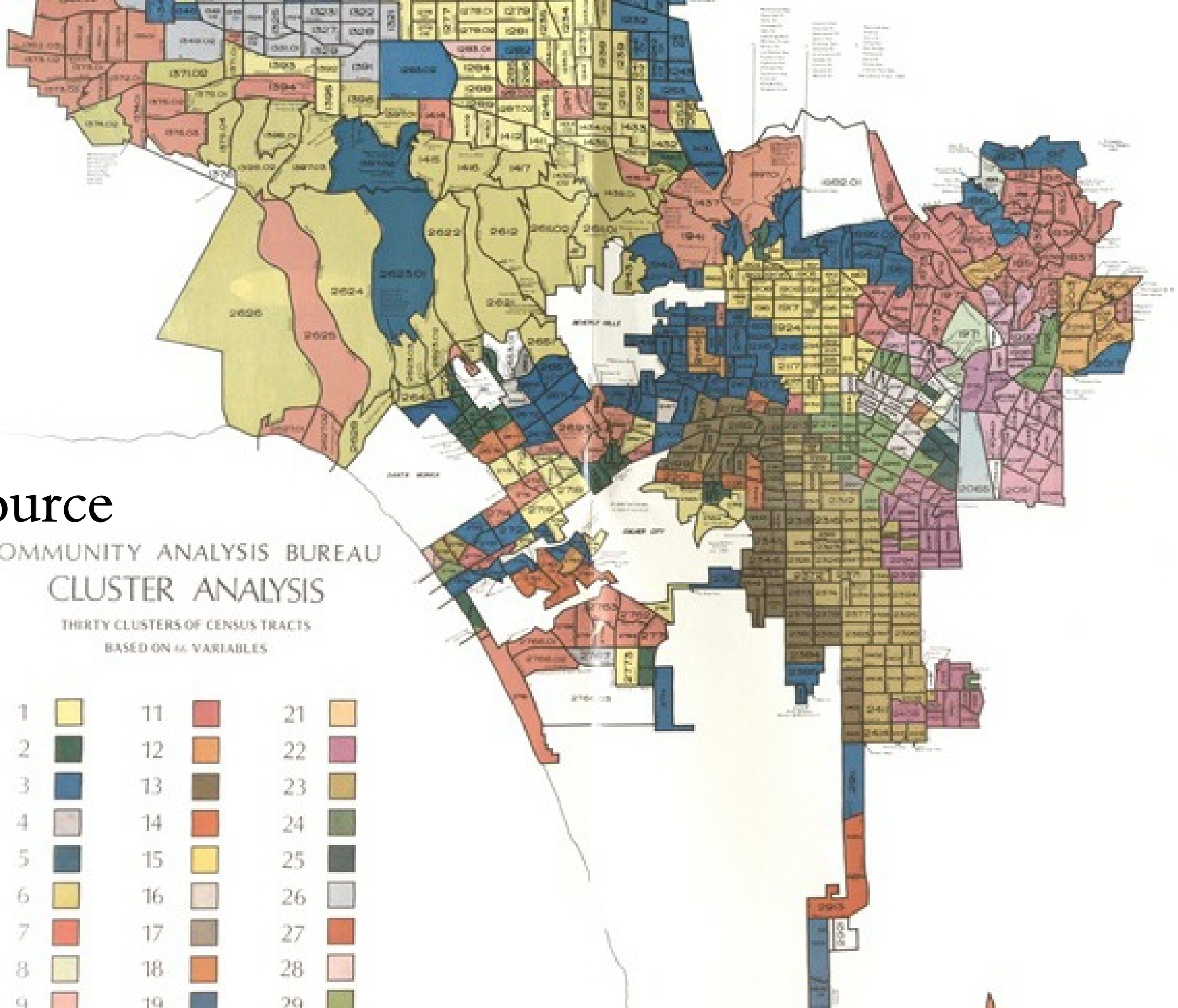
- Define a given number of categories based on **many characteristics** (multi-dimensional)
- Find the **category** where each observation *fits best*
- **Reduce complexity**, keep all the **relevant information**
- Produce easier-to-understand outputs

Geodemographic analysis

Geodemographic analysis

- Technique developed in 1970's attributed to Richard Webber
- **Identify similar neighborhoods** → Target urban deprivation funding
- Originated in the **Public** Sector (policy) and spread to the **Private** sector (marketing and business intelligence)

Source


COMMUNITY ANALYSIS BUREAU
CLUSTER ANALYSIS
THIRTY CLUSTERS OF CENSUS TRACTS
BASED ON 66 VARIABLES
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CDRC Maps

DATA CHOOSER

Classifications | Retail

Select a map:

2011 Area Classif/n of OAs

Download this data

MAP OPTIONS

Layers: Land | Labels

Toggle: Retail Centres

Download: retail centre locations

Postcode: l19dw Go

Geodemographics derived from the UK's 2011 Census.

- Rural Residents
- Cosmopolitans
- Ethnicity Central
- Multicultural Metropolitans
- Urbanites
- Suburbanites
- Constrained City Dwellers
- Hard-Pressed Living

AREA INFORMATION

Ethnicity Central

Ethnic Family Life

Established Renting Families

Liverpool, North West

Area	Classification Code
E00176718	3a1

Don't agree with the classification for your area? Let us know by choosing a better one at Open Geodemographics.

Source

Clustering

Split a dataset into **groups** of observations that are **similar within** the group and **dissimilar between** groups, based on a series of **attributes**

Machine learning

Unsupervised

Machine learning

The computer *learns* some of the properties of the dataset without the human specifying them

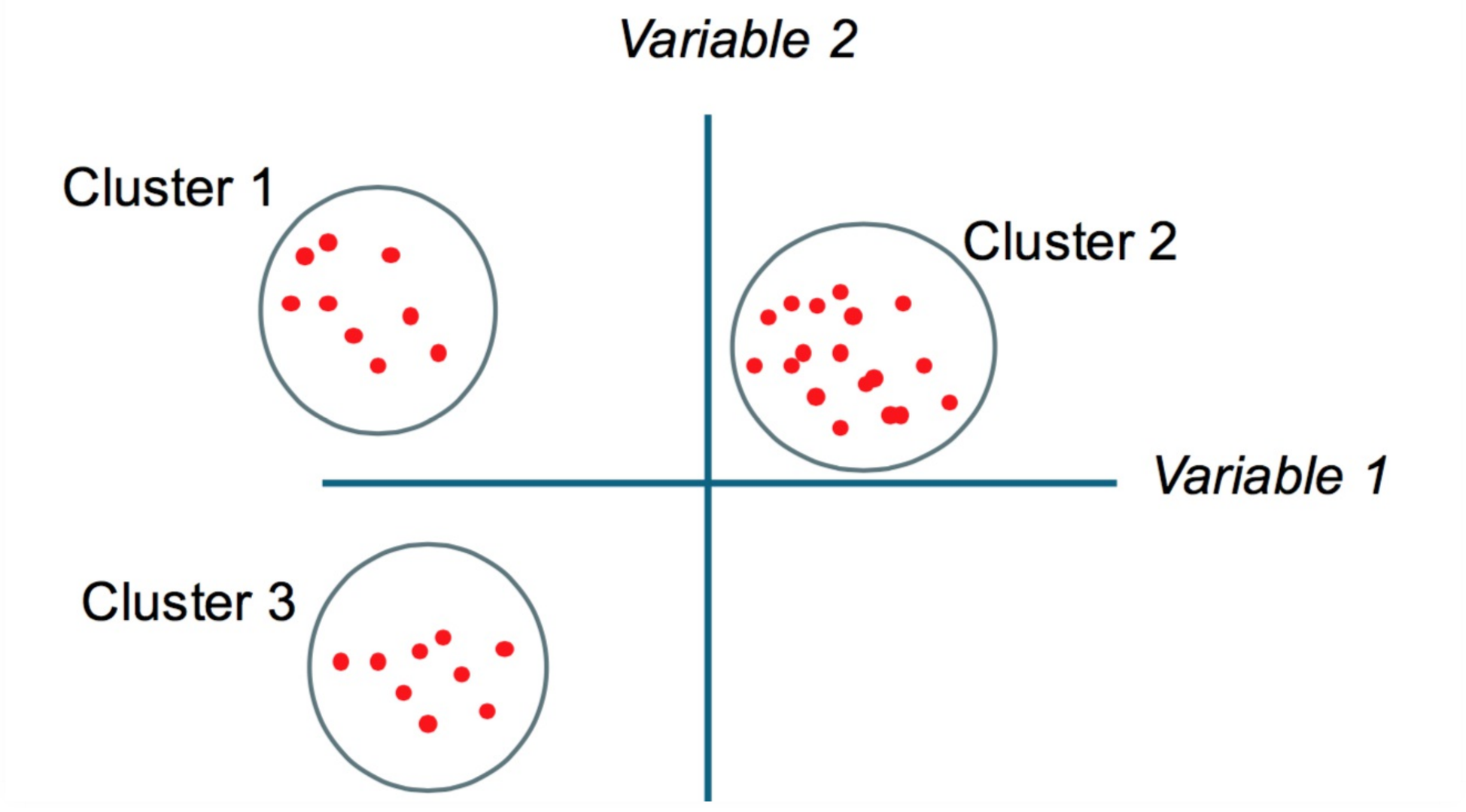
Unsupervised

Machine learning

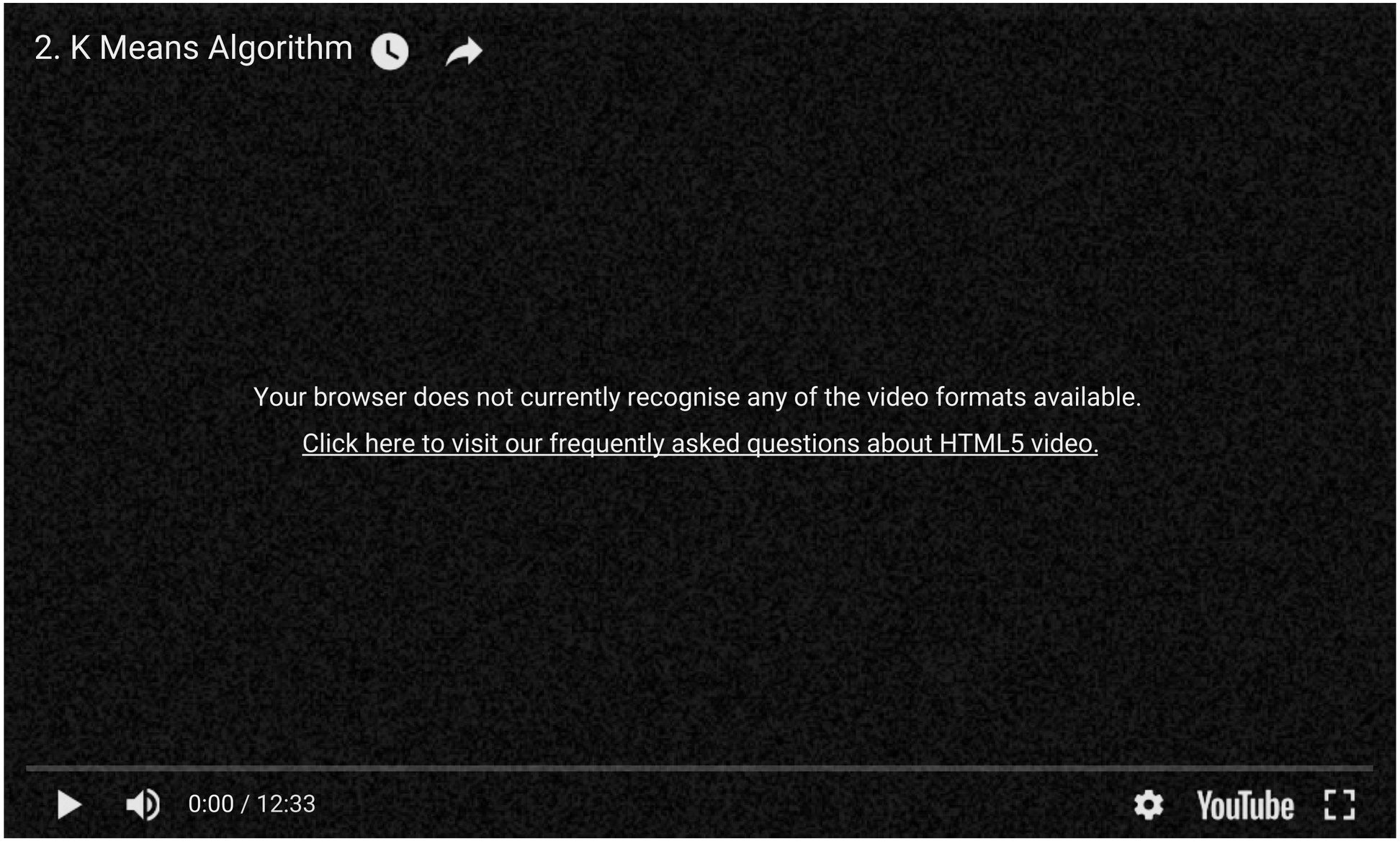
Unsupervised

There is no a-priori structure imposed on the classification → before the analysis, no observations is in a category

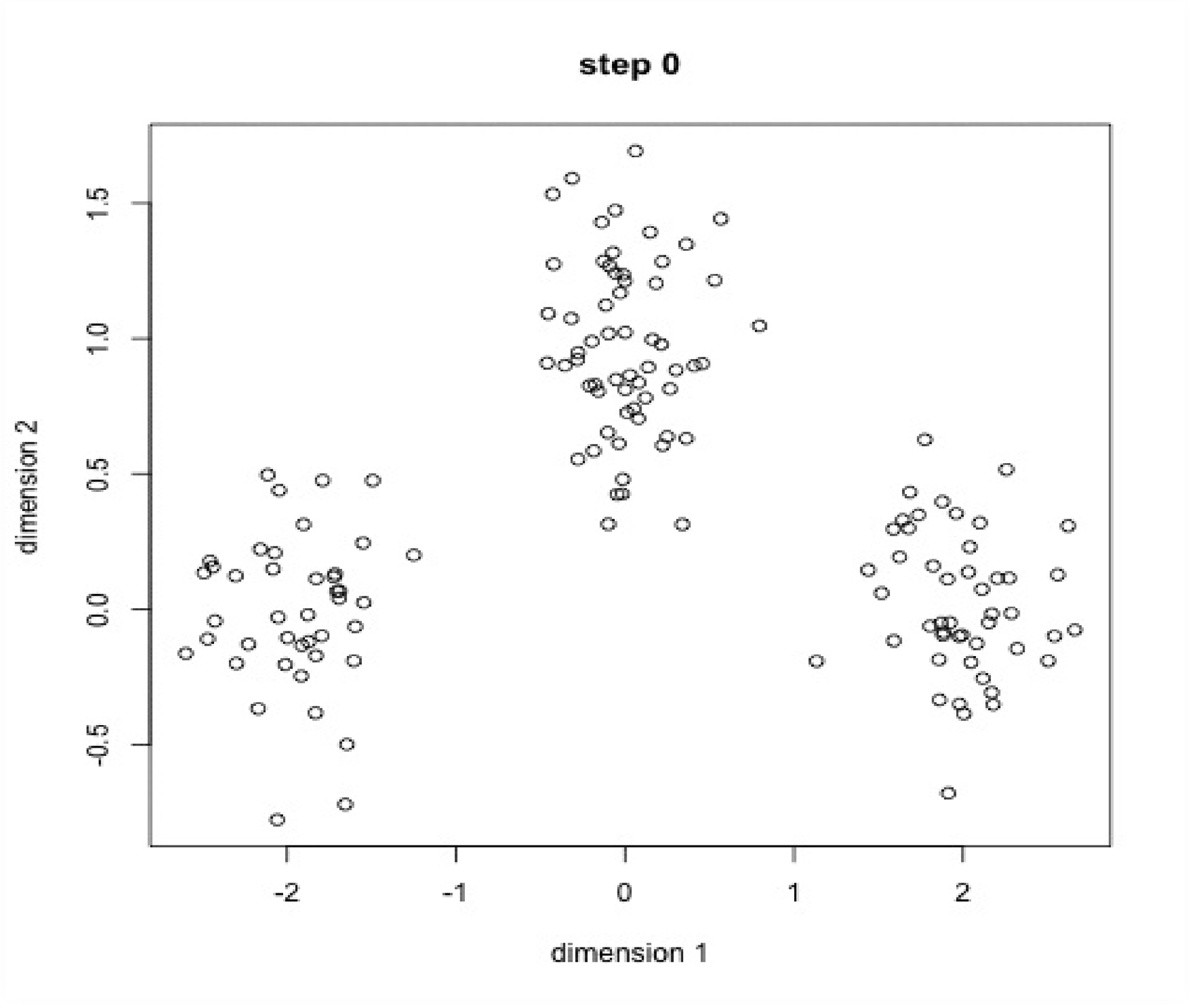
Intuition



K-means [Source]



K-means [Source]



More clustering...

- Hierarchical clustering
- Agglomerative clustering
- Spectral clustering
- Neural networks (e.g. Self-Organizing Maps)
- DBScan
- Topological Data Analysis
- ...

Different properties, different best usecases

See interesting comparison table

Examples

Frequently Bought Together

Total price: £32.97

Add all three to Basket

i These items are dispatched from and sold by different sellers. Show details

- **This item:** Green and Black's Organic Dark Chocolate 85 Percent Cocoa 100 g (Pack of 5) £11.62 (£2.32 / 100 g)
- Green and Black's Organic Ginger Dark 100 g (Pack of 5) £10.40 (£2.08 / 100 g)
- Green and Black's Organic Dark Chocolate Maya Gold 100 g (Pack of 5) £10.95 (£2.19 / 100 g)

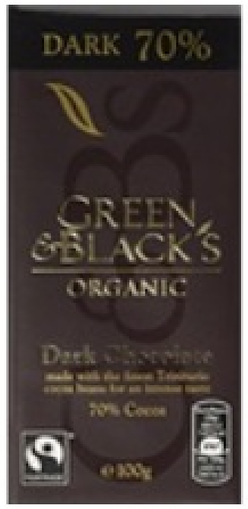
Customers Who Bought This Item Also Bought

Green and Black's Organic Ginger Dark 100 g (Pack of 5)

15

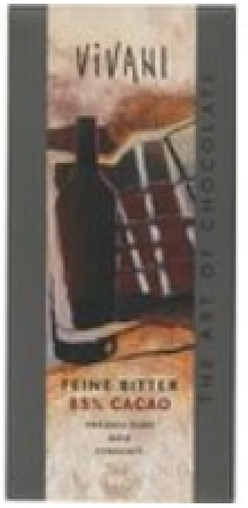
Green and Black's Organic Dark Chocolate Maya Gold 100 g (Pack of 5)

5



Green and Black's Organic Dark Chocolate 100 g (Pack of 5)

22



Vivani Organic Dark Chocolate with 85% Coco 100 g (Pack of 5)

25

potify

Search

dreamessence

Your Daily Mixes

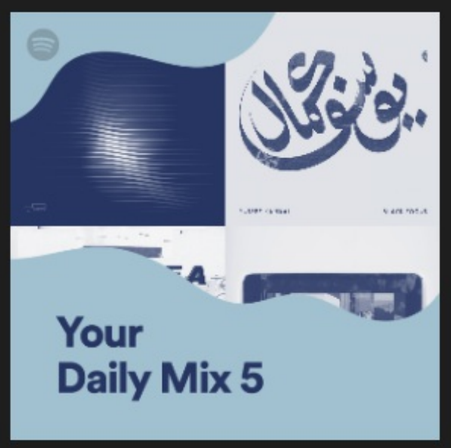
Play the music you love, without the effort. Packed with your favorites and new discoveries.

Daily Mix 1
Gata Cattana, DELLAFUENTE, ToteKing and more
MADE FOR DREAMESSENCE

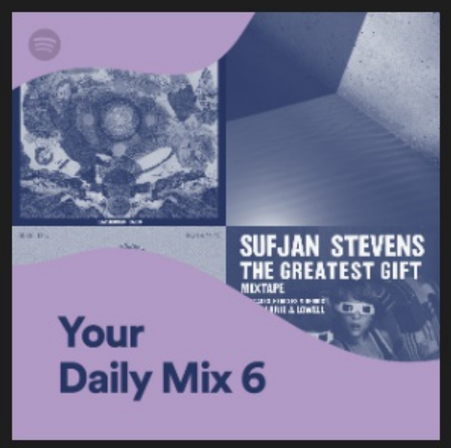
Daily Mix 2
Aphex Twin, George FitzGerald, Nosaj Thing and more
MADE FOR DREAMESSENCE

Daily Mix 3
Dedekind Cut, Helena Hauff, Taylor Deupree and more
MADE FOR DREAMESSENCE

Daily Mix 4
Berliner Philharmoniker, Alexandre Tharaud, Sir Colin Davis and more
MADE FOR DREAMESSENCE



Daily Mix 5
GoGo Penguin, Yussef Kamaal, Blue Lab Beats and more
MADE FOR DREAMESSENCE



Daily Mix 6
Fleet Foxes, Andrew Bird, Iron & Wine and more
MADE FOR DREAMESSENCE

Friend activity

townhallsym
Step Out
José González
The Secret

1236163056
Divine Hamme
The Breeders
Last Splash

_maxi
Sensationz of
Mentol Nomad
Subterrane

FIND FRIEN

Data-driven campaigns

Let's talk

We find your voters and move them to action.

CA Political has redefined the relationship between data and campaigns. By knowing your electorate better, you can achieve greater influence while lowering overall costs.

“There are no longer any experts except Cambridge Analytica.”

- Frank Luntz, Political Pollster

Recapitulation

- Some problems are truly **highly dimensional** and univariate representations are not appropriate
- **Clustering** can help reduce complexity by creating **categories** that retain statistical information but are easier to understand