Workshop di ricerca sociale

Introduzione all’analisi dei dati

Lorenzo Mattioli - una Regione per Restare

Cosa faremo oggi

Quando i dati sbagliano

- Errore di rappresentazione
- Errore di misura

Analisi dati

- Esempio di analisi esplorativa
- Comunicare i risultati

Quando i dati sbagliano

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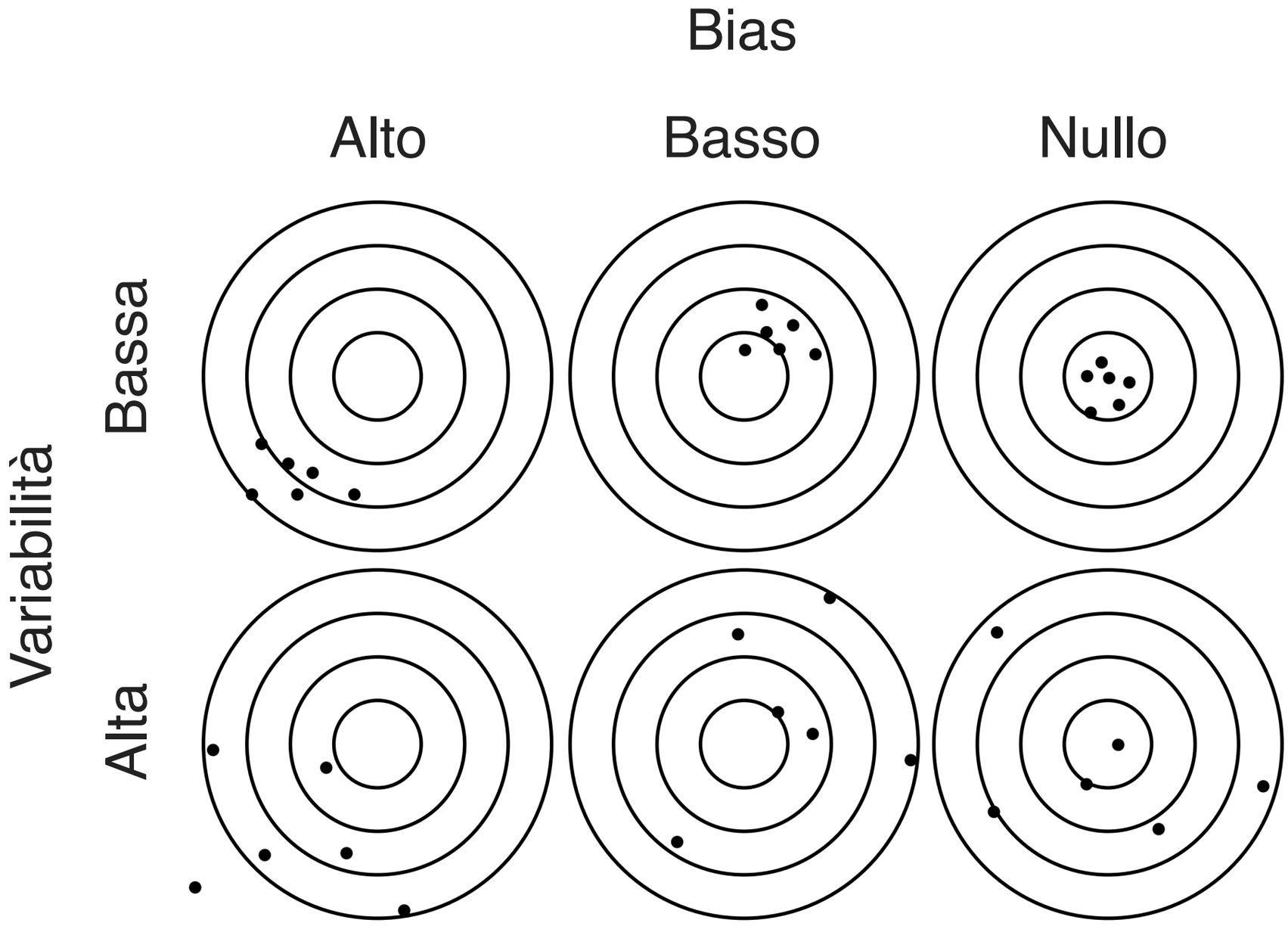
Cos’è l’errore

Bias e variabilità

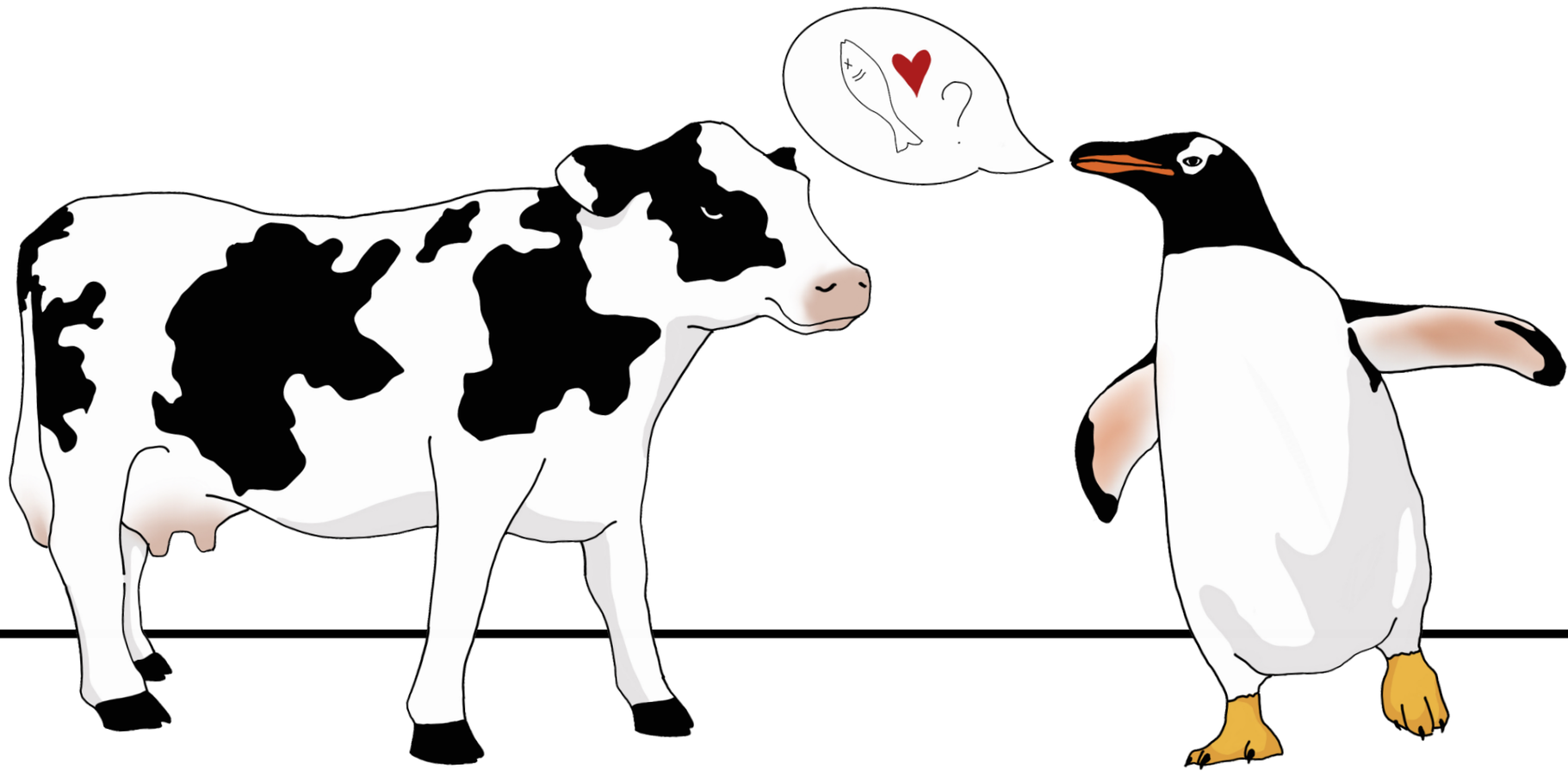


Total survey error framework

Di quale errore parliamo

Errore totale = Errore di **rappresentazione** + Errore di **misura**

Errore di rappresentazione



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Le elezioni USA del 1936

Roosevelt contro Landon

Partito democratico
Governatore di NY

Partito repubblicano
Governatore del Kansas

Il sondaggio del *Literary Digest*

Le dimensioni non contano

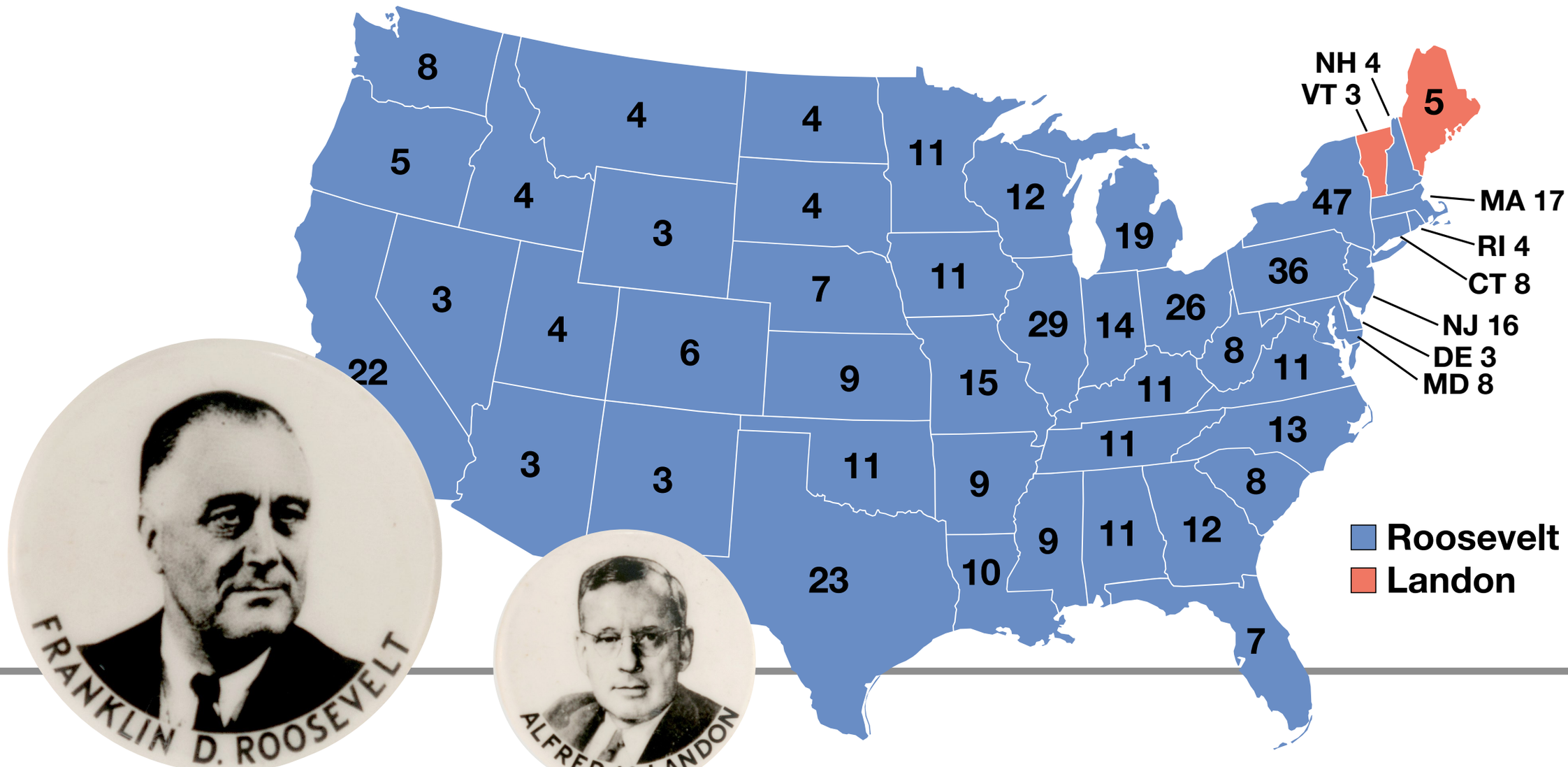
- 10 mln di questionari
- 2,4 mln di intervistati

1000 volte ca. un campione contemporaneo

<u>Predizione: Landon vincitore</u>

Le elezioni USA del 1936

Risultati

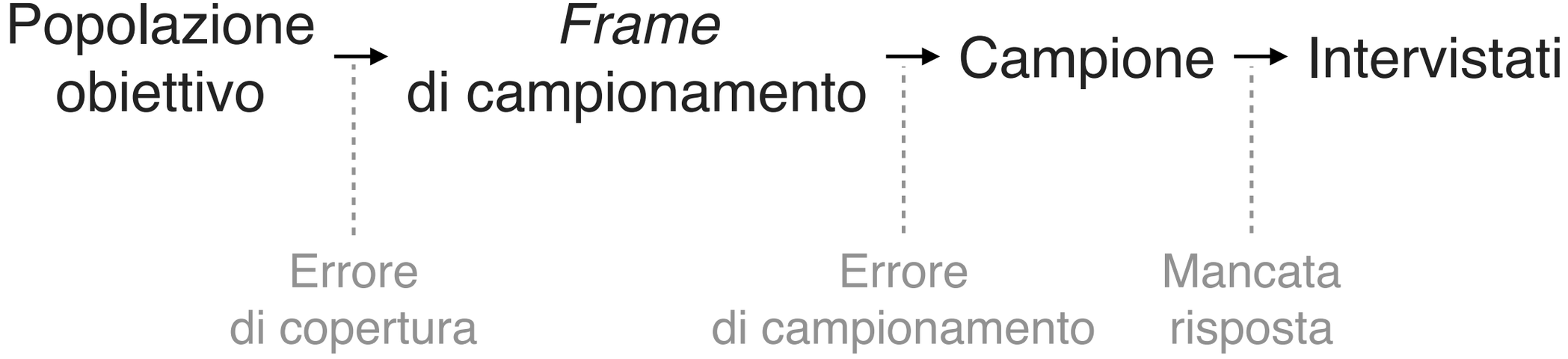


60,8%

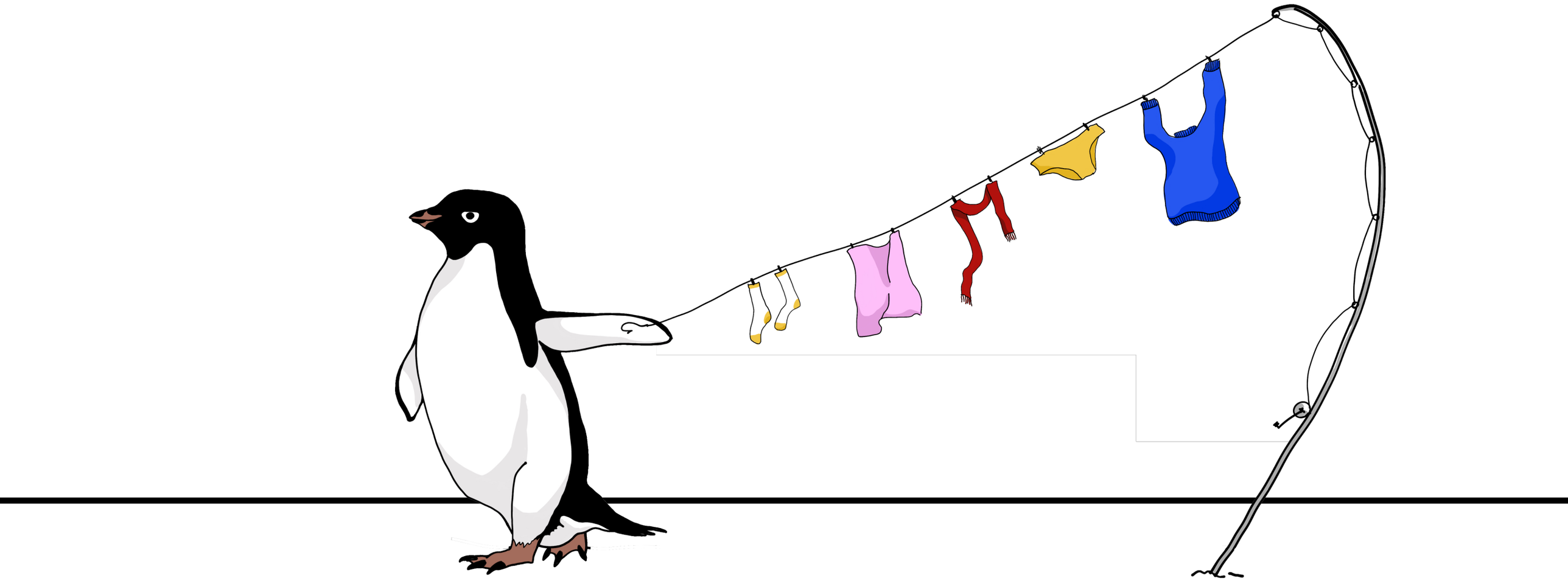
36.5%

Errori di rappresentazione

La parte per il tutto



Errore di misura



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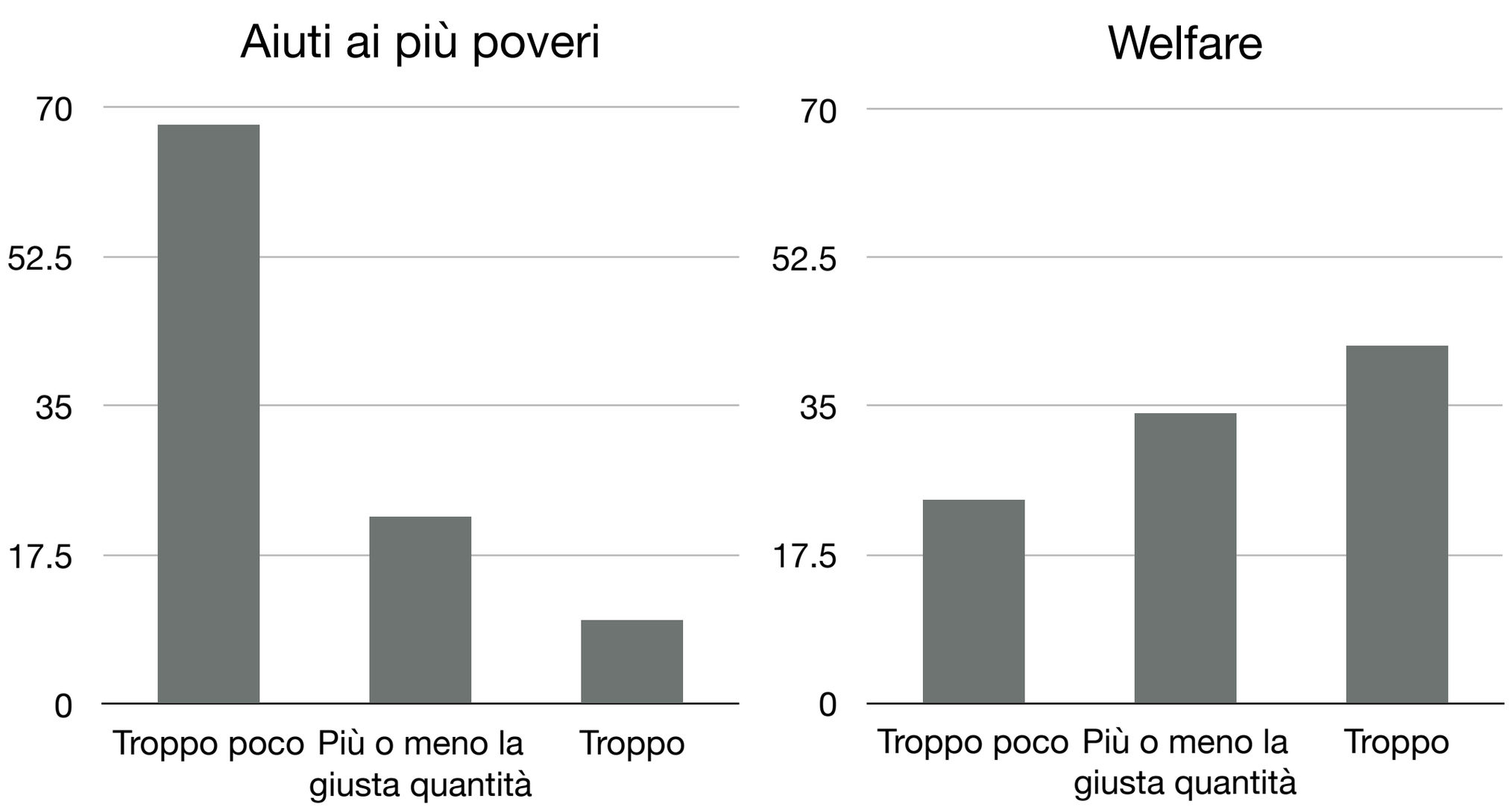
Spendiamo troppo o troppo poco?

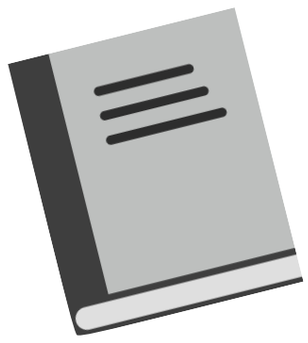
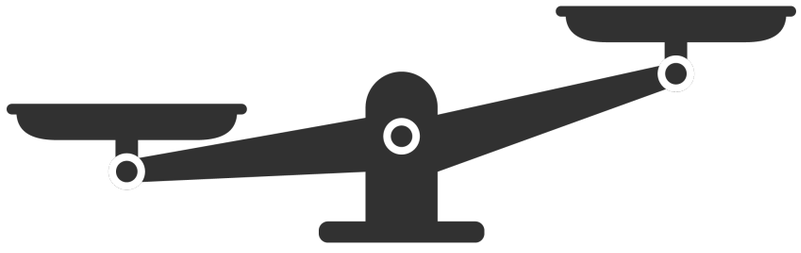
Le opinioni in un sondaggio americano



Adattamento dalla tabella A1 di:
HUBER, G. A., & PARIS, C. (2013). ASSESSING THE PROGRAMMATIC EQUIVALENCE ASSUMPTION IN QUESTION WORDING EXPERIMENTS: UNDERSTANDING WHY AMERICANS LIKE ASSISTANCE TO THE POOR MORE THAN WELFARE. *The Public Opinion Quarterly*, *77*(1), 385–397. http://www.jstor.org/stable/24545803

Operazionalizzazione

Dal concetto al valore

Concetto	Proprietà	Operazionalizzazione	Valore
Peso			0,6 Kg

Evitare gli errori

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Domande di ricerca

Porsi le giuste domande

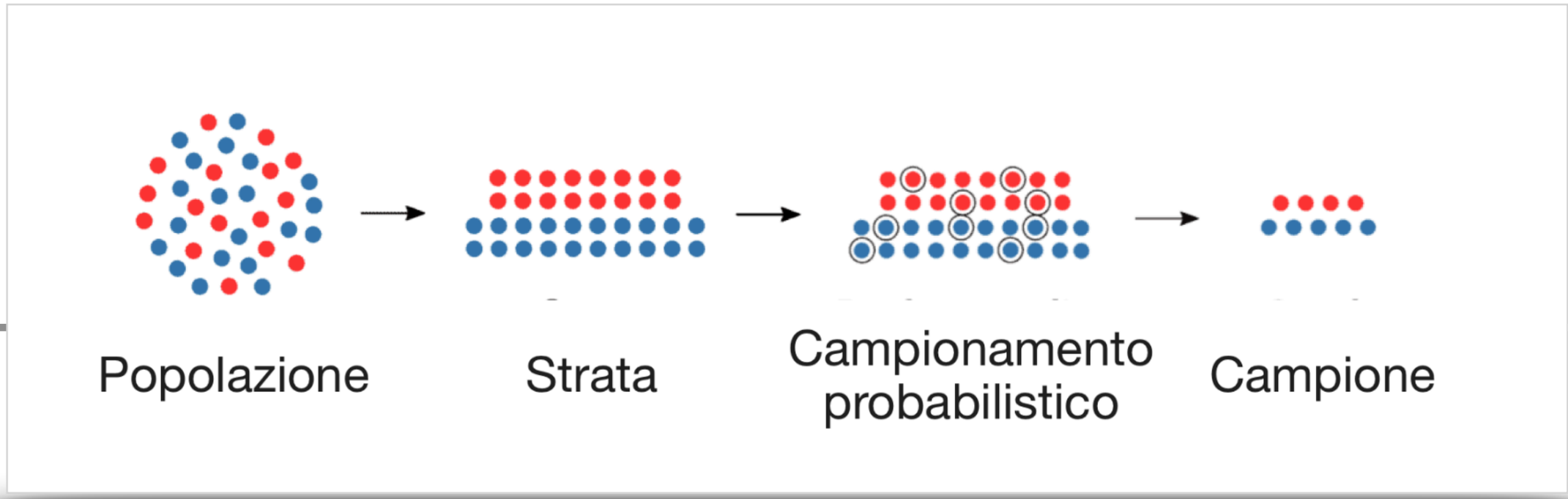
Una domanda di ricerca dovrebbe essere:

- Importante per la società
- Interessante per il ricercatore
- Fattibile ed eticamente difendibile

Errori di rappresentazione

A chi chiedere?

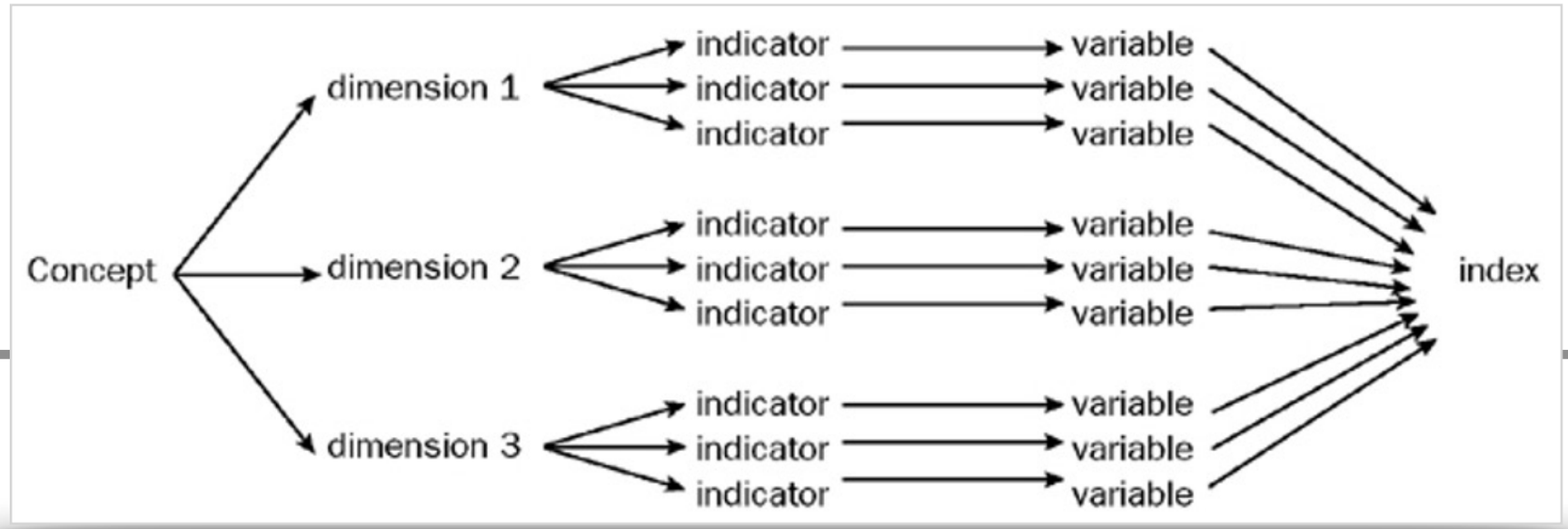
- Campionamento **probabilistico**
- **Post-stratificazione**



Errori di misura

Come chiedere?

- Ampia **preparazione** sulla letteratura di riferimento
- Costruire indici **multidimensionali**



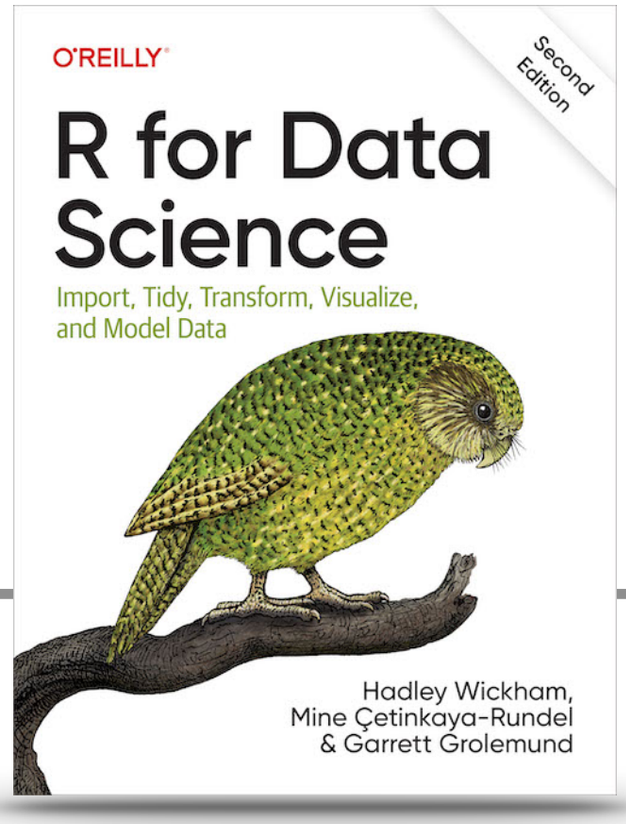
Analisi dati

Workshop di ricerca sociale

Approccio *tidy*

Un'osservazione per riga, una variabile per colonna

	y_1	y_2	y_3	…	y_k
x_1	v_{11}	v_{12}	v_{13}	…	v_{1k}
x_2	v_{21}	v_{22}	v_{23}	…	v_{2k}
x_3	v_{31}	v_{32}	v_{33}	…	v_{3k}
…	…	…	…	…	…
x_n	v_{n1}	v_{n2}	v_{n3}	…	v_{nk}



Il nostro dataset

Risultati esami californiani

Data literacy - RStudio Source Editor

CASchools

Filter

	district	school	county	grades	students	teachers	calworks	lunch	c
1	75119	Sunol Glen Unified	Alameda	KK-08	195	10.900	0.5102	2.0408	
2	61499	Manzanita Elementary	Butte	KK-08	240	11.150	15.4167	47.9167	
3	61549	Thermalito Union Elementary	Butte	KK-08	1550	82.900	55.0323	76.3226	
4	61457	Golden Feather Union Elementary	Butte	KK-08	243	14.000	36.4754	77.0492	
5	61523	Palermo Union Elementary	Butte	KK-08	1335	71.500	33.1086	78.4270	
6	62042	Burrel Union Elementary	Fresno	KK-08	137	6.400	12.3188	86.9565	
7	68536	Holt Union Elementary	San Joaquin	KK-08	195	10.000	12.9032	94.6237	
8	63834	Vineland Elementary	Kern	KK-08	888	42.500	18.8063	100.0000	
9	62331	Orange Center Elementary	Fresno	KK-08	379	19.000	32.1900	93.1398	
10	67306	Del Paso Heights Elementary	Sacramento	KK-06	2247	108.000	78.9942	87.3164	
11	65722	Le Grand Union Elementary	Merced	KK-08	446	21.000	18.6099	85.8744	
12	62174	West Fresno Elementary	Fresno	KK-08	987	47.000	71.7131	98.6056	
13	71795	Allensworth Elementary	Tulare	KK-08	103	5.000	22.4299	98.1308	
14	72181	Sunnyside Union Elementary	Tulare	KK-08	487	24.340	24.6094	77.1484	
15	72298	Woodville Elementary	Tulare	KK-08	649	36.000	14.6379	76.2712	
16	72041	Pixley Union Elementary	Tulare	KK-08	852	42.070	24.2142	94.2957	
17	63594	Lost Hills Union Elementary	Kern	KK-08	491	28.920	11.2016	97.7597	
18	63370	Buttonwillow Union Elementary	Kern	KK-08	421	25.500	8.5511	77.9097	
19	64709	Lennox Elementary	Los Angeles	KK-08	6880	303.030	21.2824	94.9712	
20	63560	Lamont Elementary	Kern	KK-08	2688	135.000	23.4375	93.2292	

Showing 1 to 20 of 420 entries, 14 total columns

Il nostro dataset

Risultati esami californiani

A data frame containing 420 observations on 14 variables.

district character. District code.

school character. School name.

county factor indicating county.

grades factor indicating grade span of district.

students Total enrollment.

teachers Number of teachers.

calworks Percent qualifying for CalWorks (income assistance).

lunch Percent qualifying for reduced-price lunch.

computer Number of computers.

expenditure Expenditure per student.

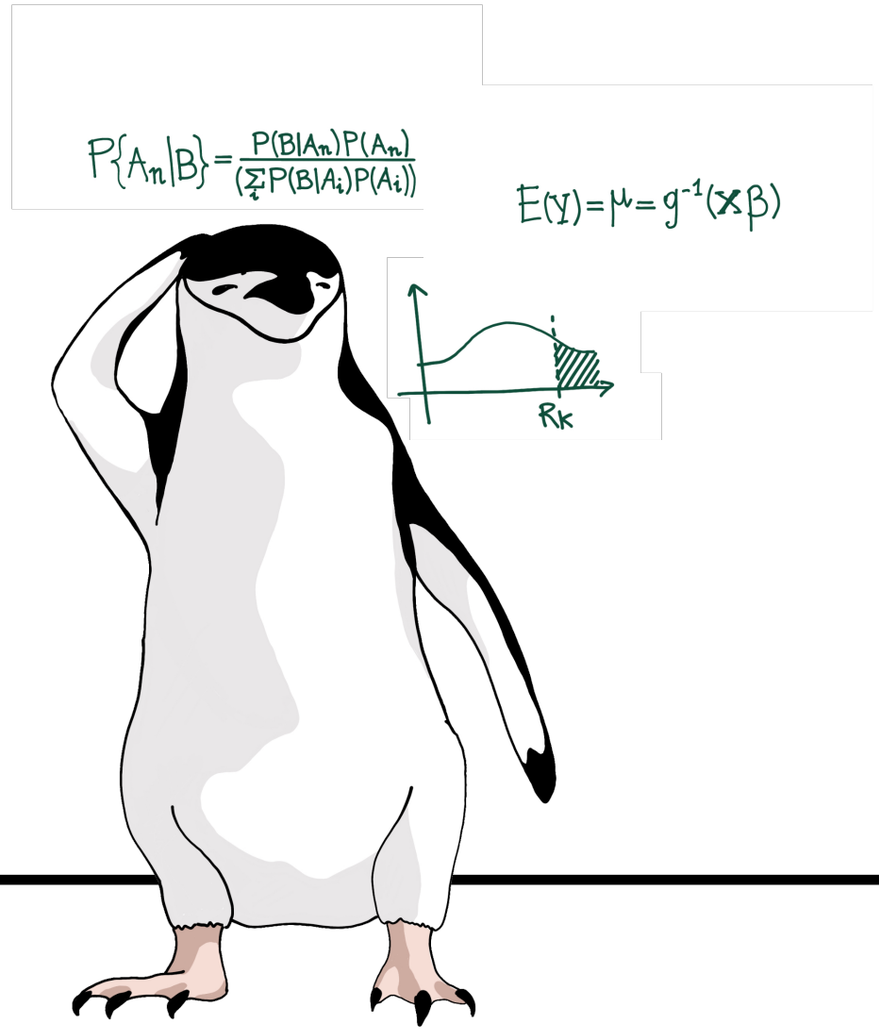
income District average income (in USD 1,000).

english Percent of English learners.

read Average reading score.

math Average math score.

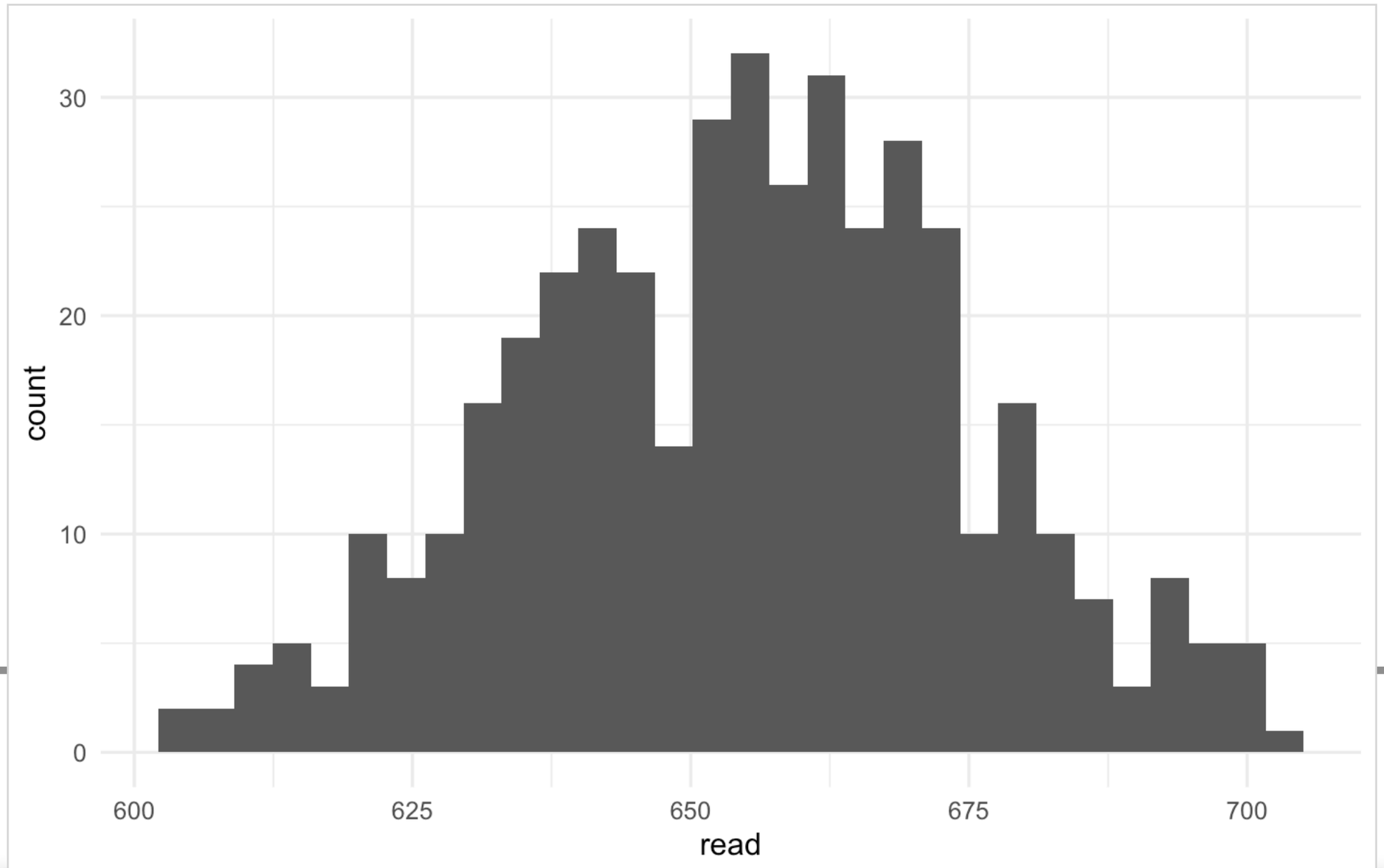
Analisi esplorativa



Workshop di ricerca sociale

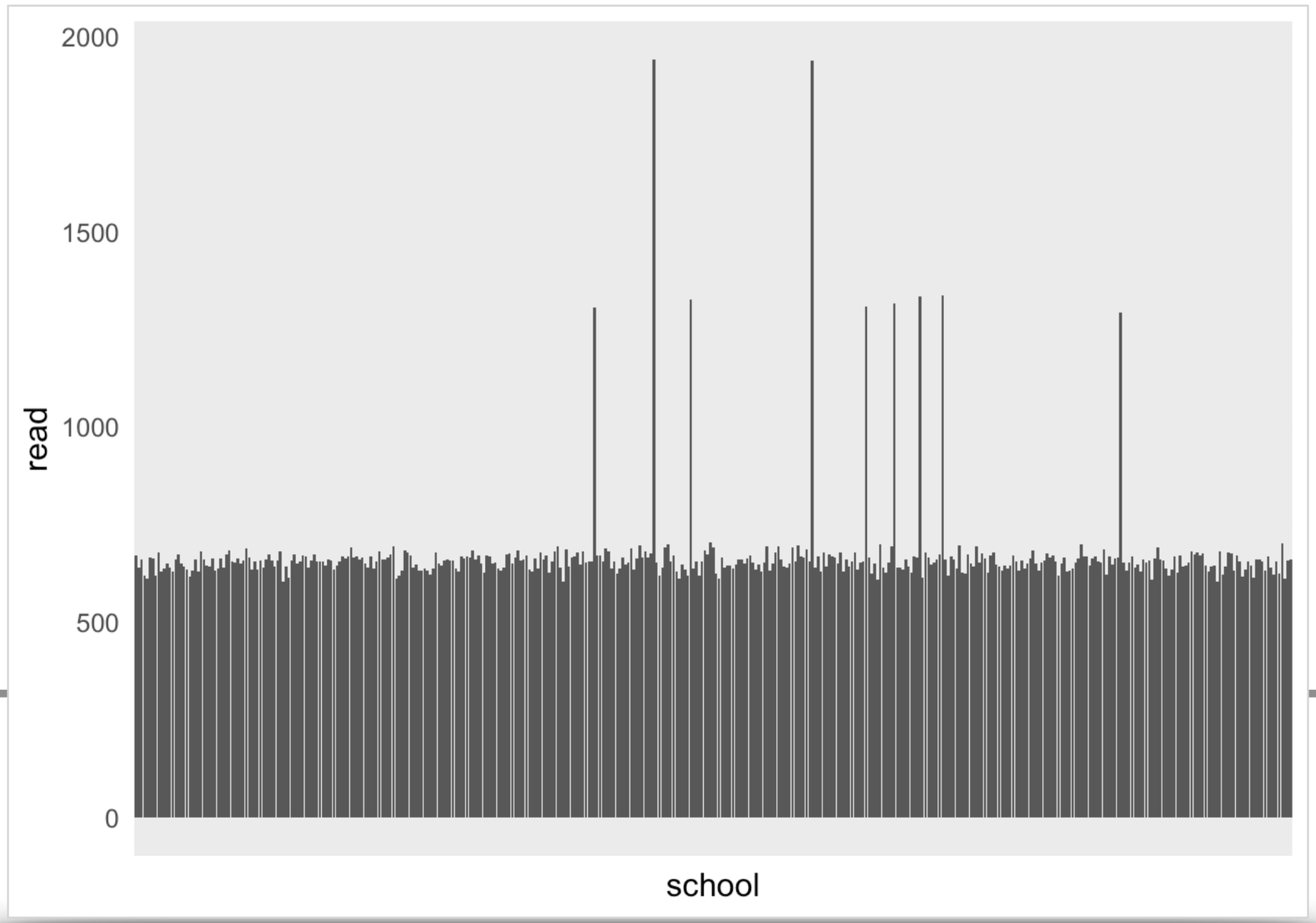
Analisi esplorativa

Istogramma della variabile obiettivo



Analisi esplorativa

Plot delle differenze fra scuole



RQ: Cosa spiega le differenze tra i voti conseguiti da studenti di scuole diverse?

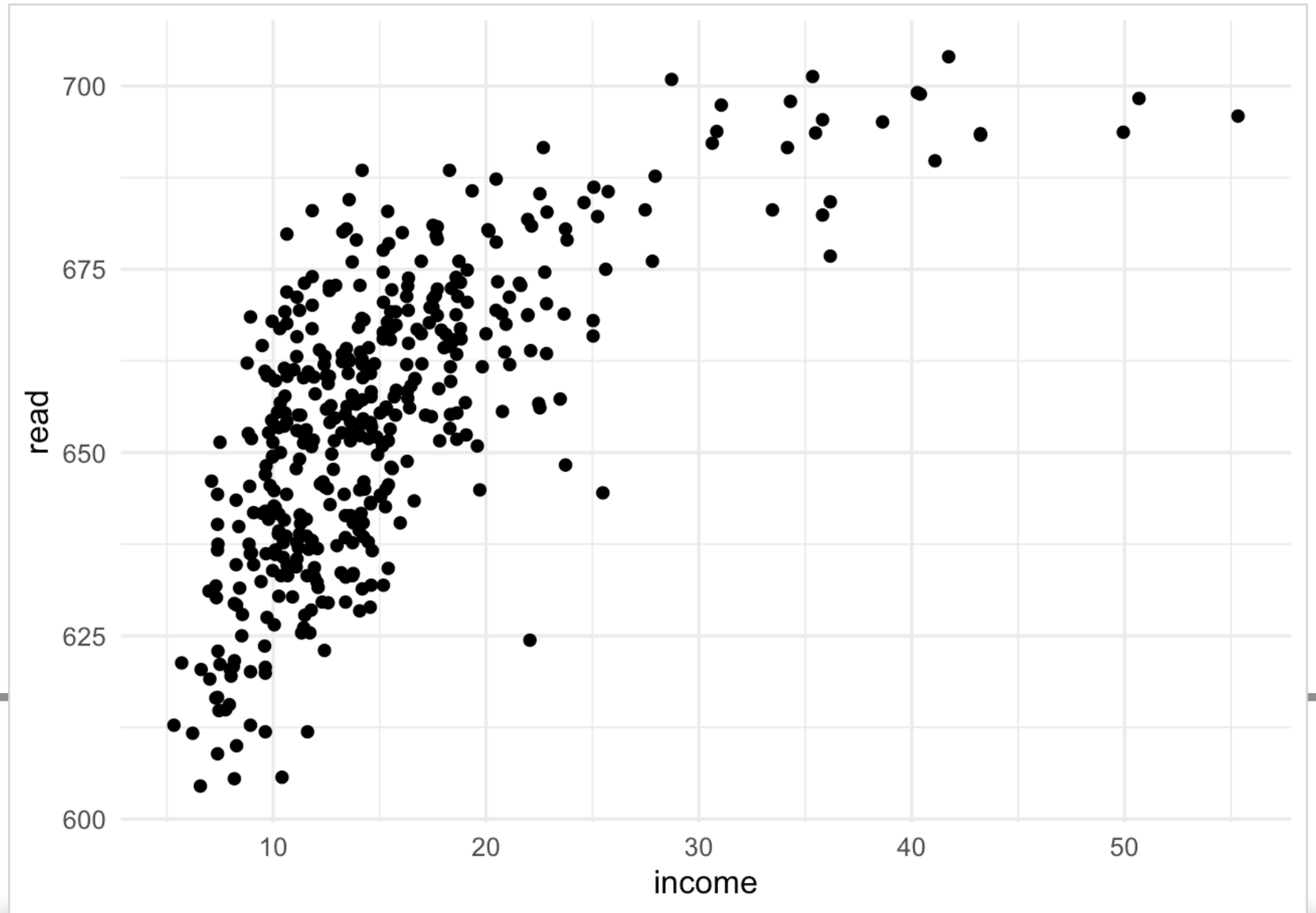
Esempi di ipotesi possibili

Avete consigli?

H1: Le scuole con reddito medio più alto sono avvantaggiate
H2: Le scuole con meno studenti non americani sono avvantaggiate

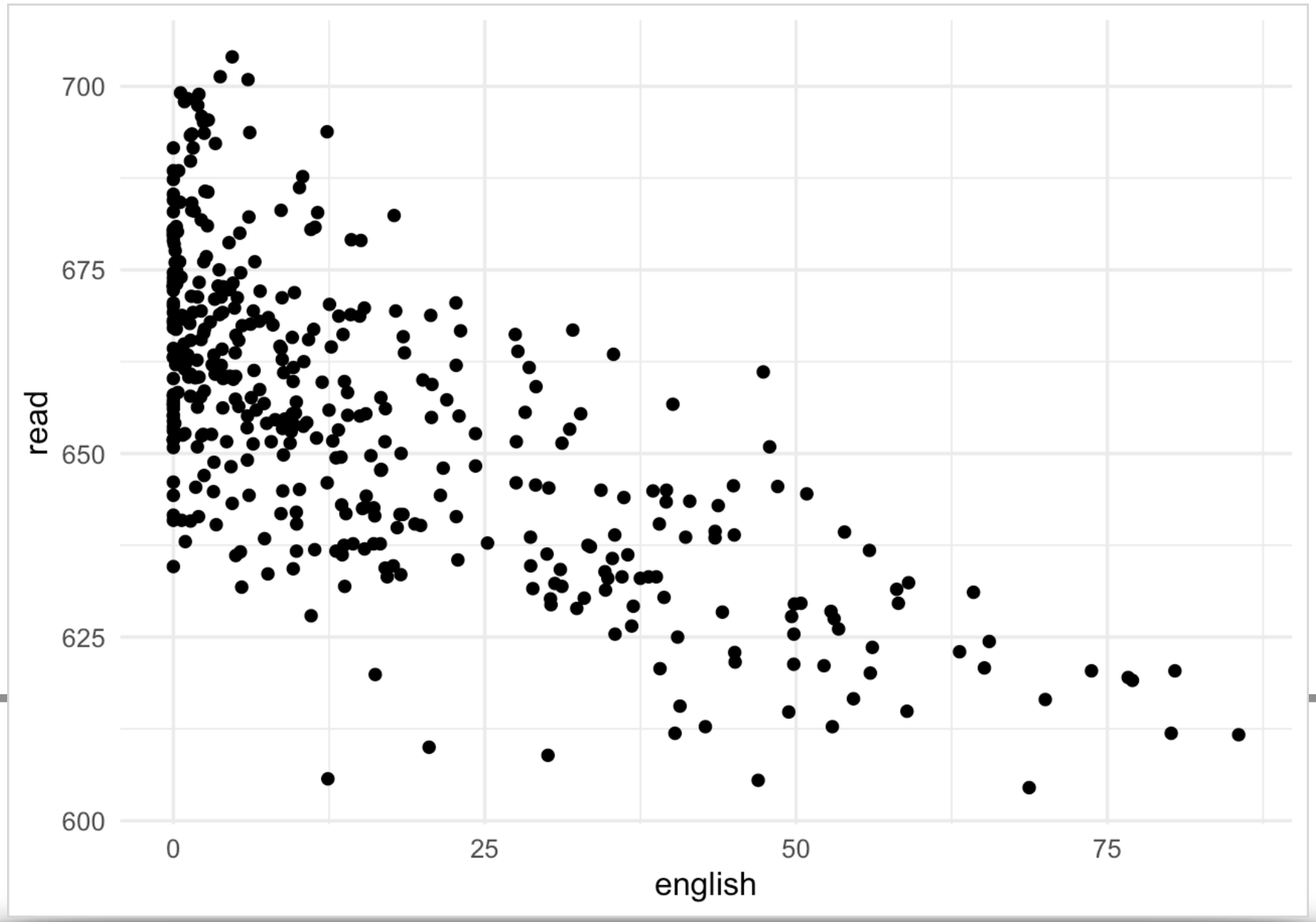
Reddito e rendimento

Ipotesi 1



Quanto è alta la barriera linguistica

Ipotesi 2



Modellizzazione statistica

Quantificare la disuguaglianza

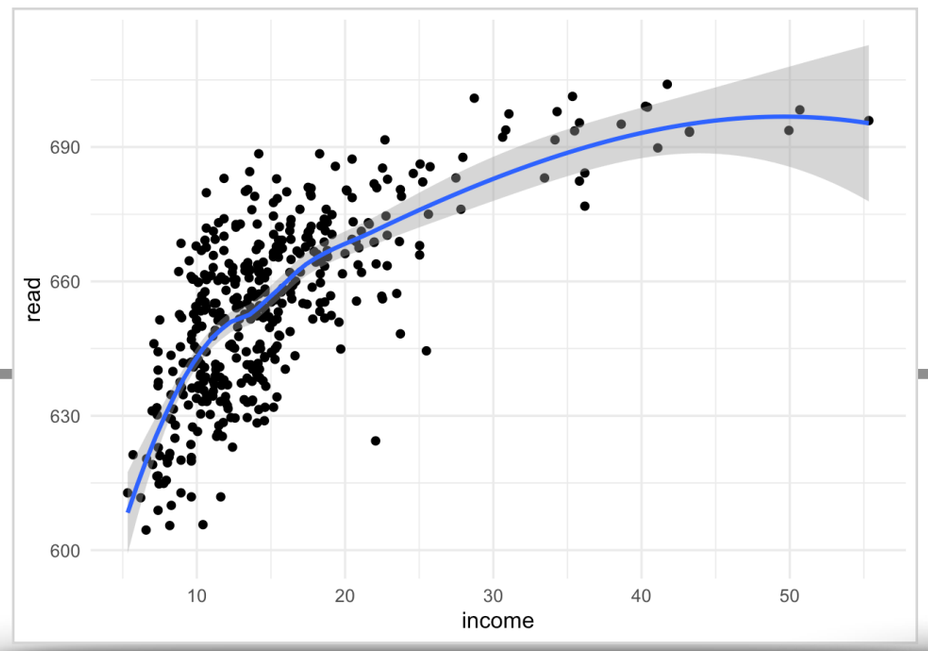
$$y = \alpha + \beta_1 x_1 + \beta_2 x_2^2 + \epsilon$$

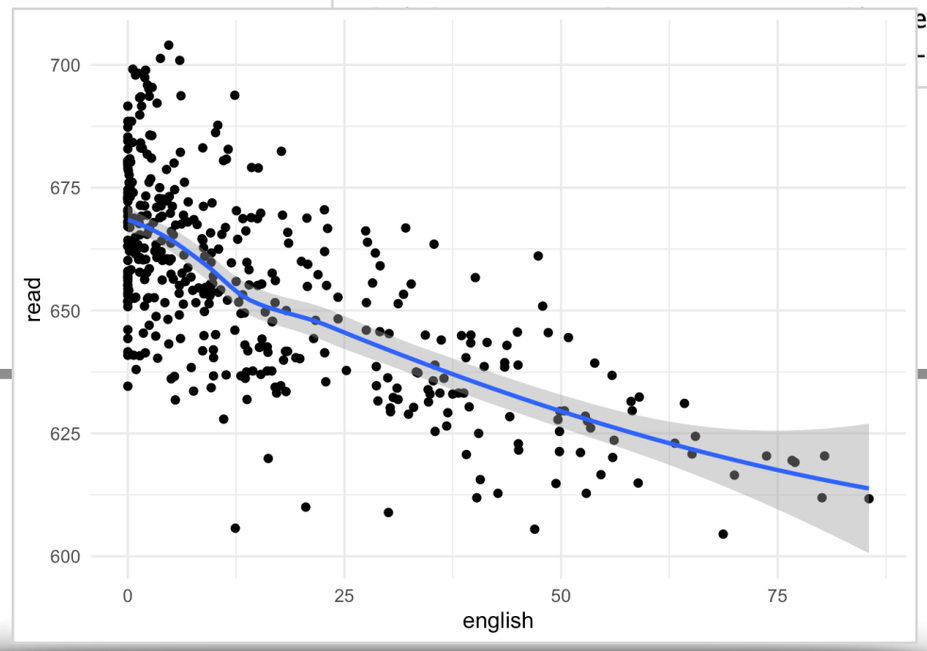
```
Call:
lm(formula = read ~ english + income2, data = df)

Residuals:
    Min      1Q  Median      3Q     Max
-46.676  -7.205   0.774   7.518  31.511

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 657.424772   0.937128  701.53   <2e-16 ***
english      -0.639549   0.031292  -20.44   <2e-16 ***
income2       0.026615   0.001629   16.34   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 11.39 on 417 degrees of freedom
ed R-squared:  0.6792
-value: < 2.2e-16
```



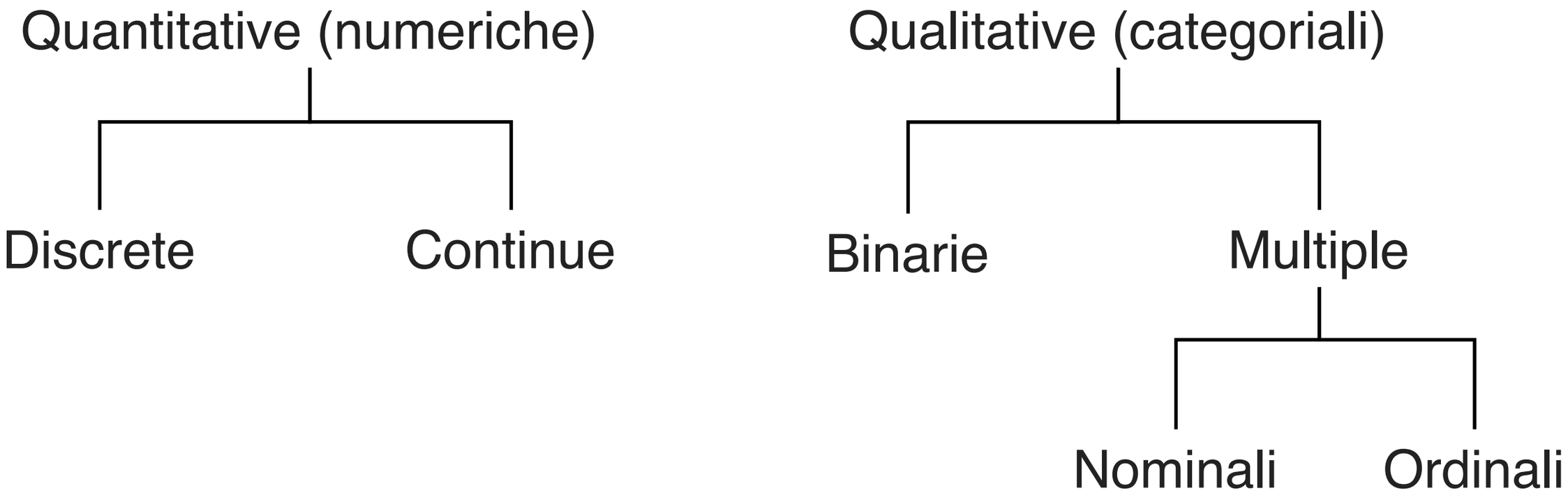


Comunicare i risultati

Workshop di ricerca sociale

Scegliere il grafico giusto

Classificazione delle variabili



from Data to Viz

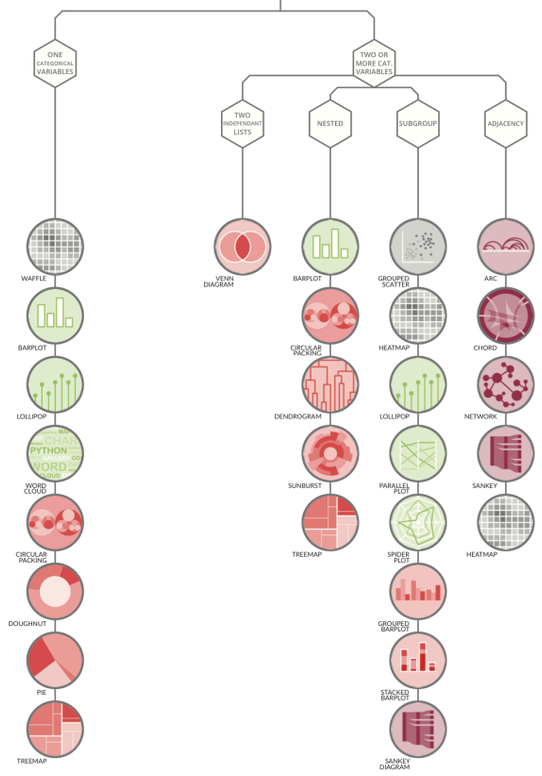
'From Data to Viz' is a classification of chart types based on input data format. It will help you find the perfect chart in three simple steps :

1. Identify what type of data you have.
2. Go to the corresponding decision tree and follow it down to a set of possible charts.
3. Choose the chart from the set that will suit your data and your needs best.

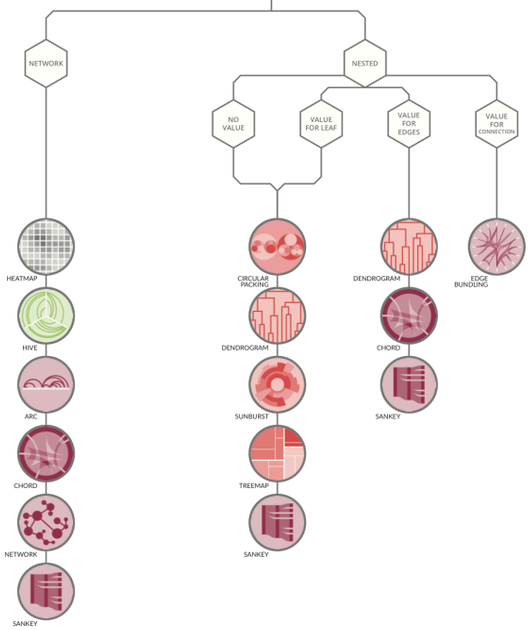
Dataviz is a world with endless possibilities and this project does not claim to be exhaustive. However it should provide you with a good starting point. For an interactive version and much more, visit:

data-to-viz.com

CATEGORIC

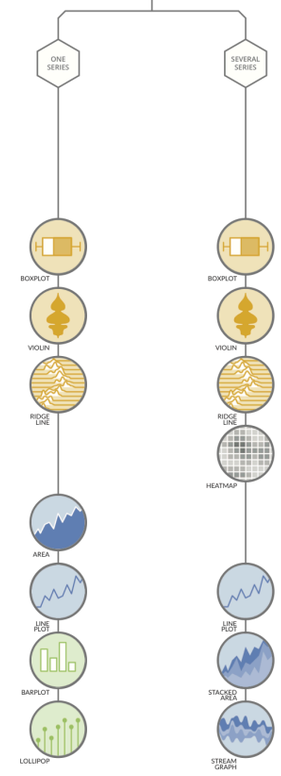


RELATIONAL



MAP

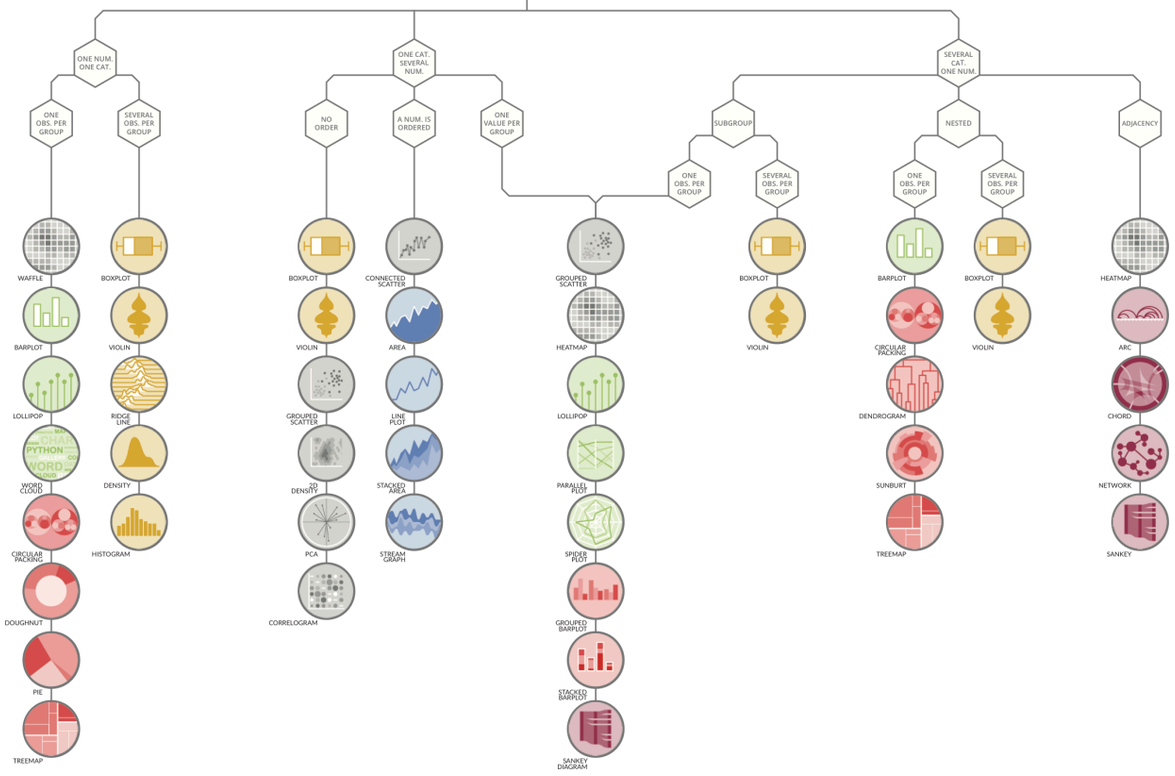
TIME SERIES



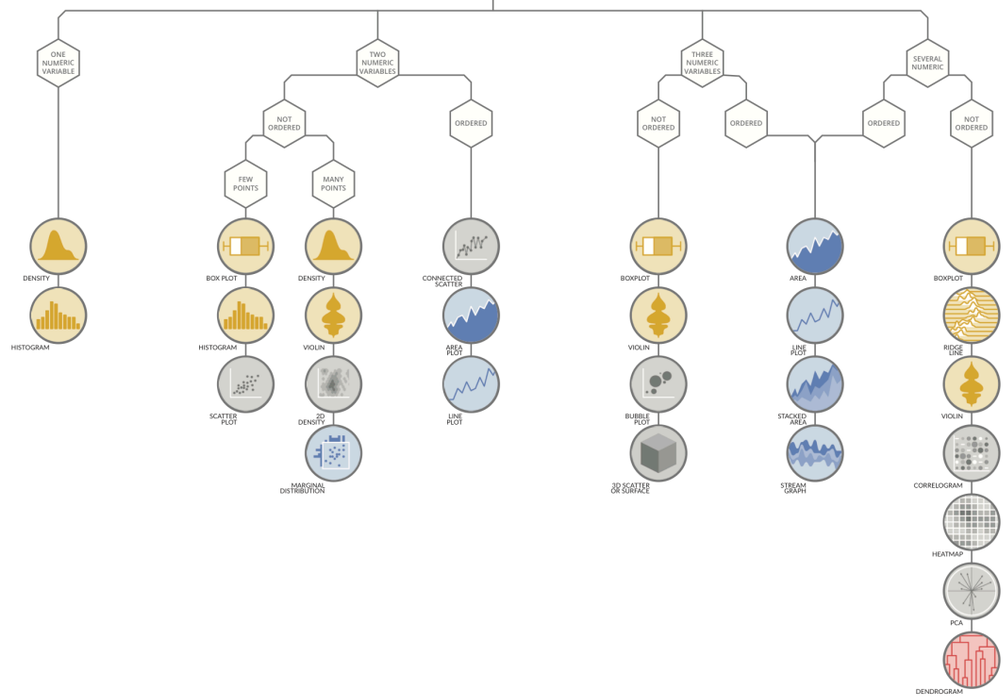
WHAT DO YOU WANT TO SHOW ?

- Distribution
- Correlation
- Ranking
- Part of a whole
- Evolution
- Maps
- Flow

CATEGORIC AND NUMERIC

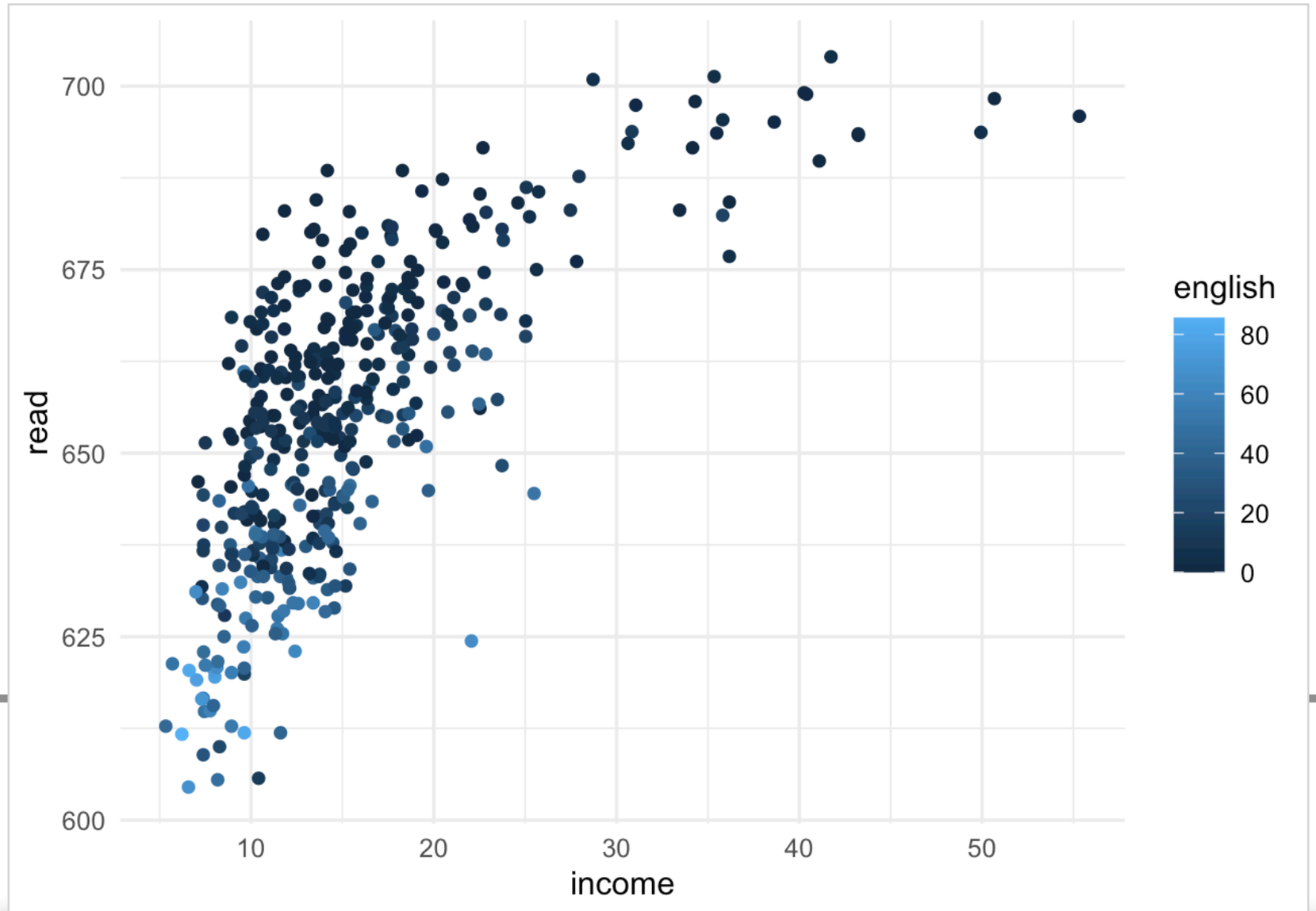


NUMERIC



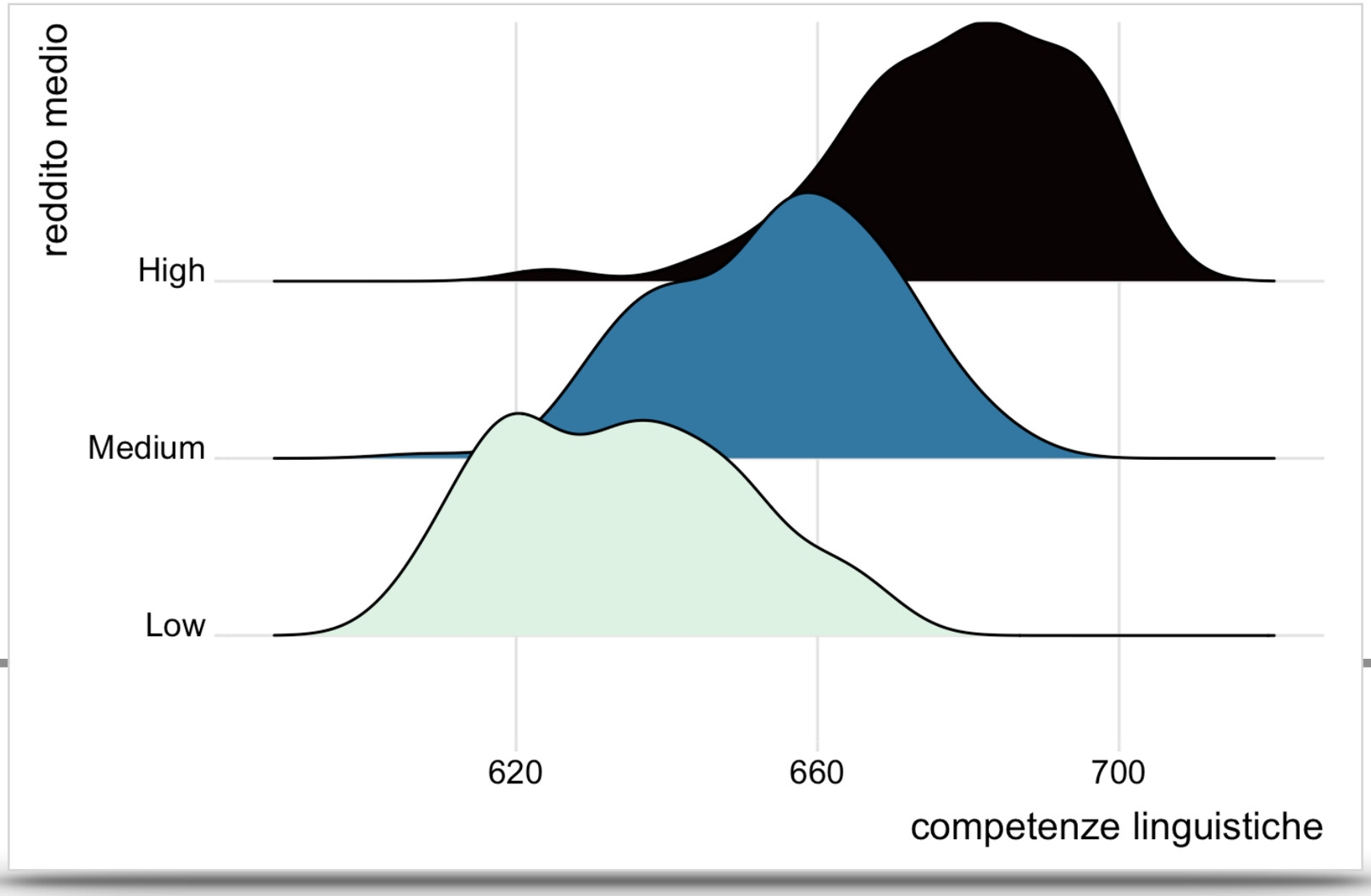
Uscire dalla bidimensionalità

Colore a conferma della covarianza



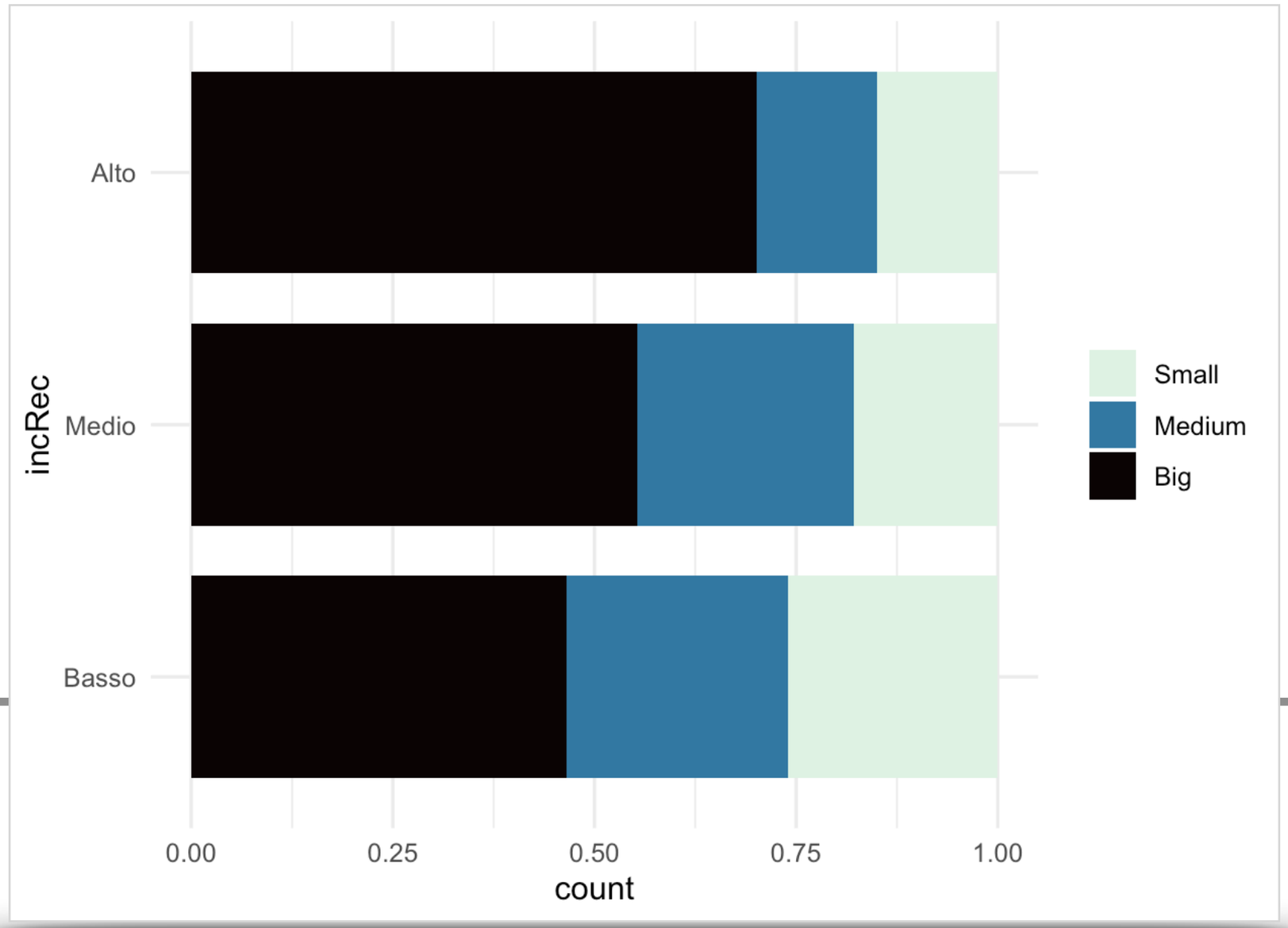
Non solo numeri

Interazioni fra variabili numeriche e categoriali



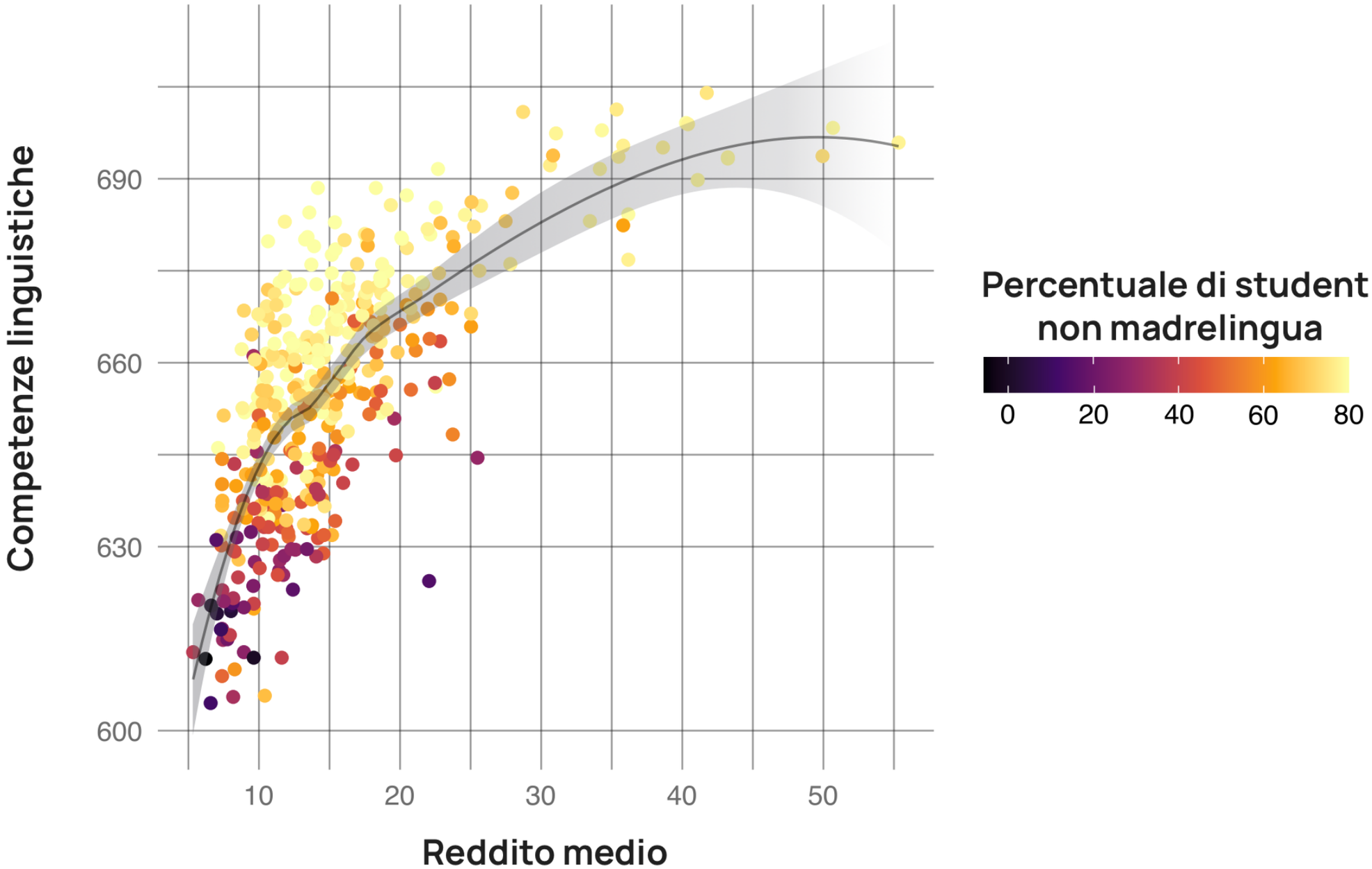
Dare un nome alle cose

Variabili qualitative

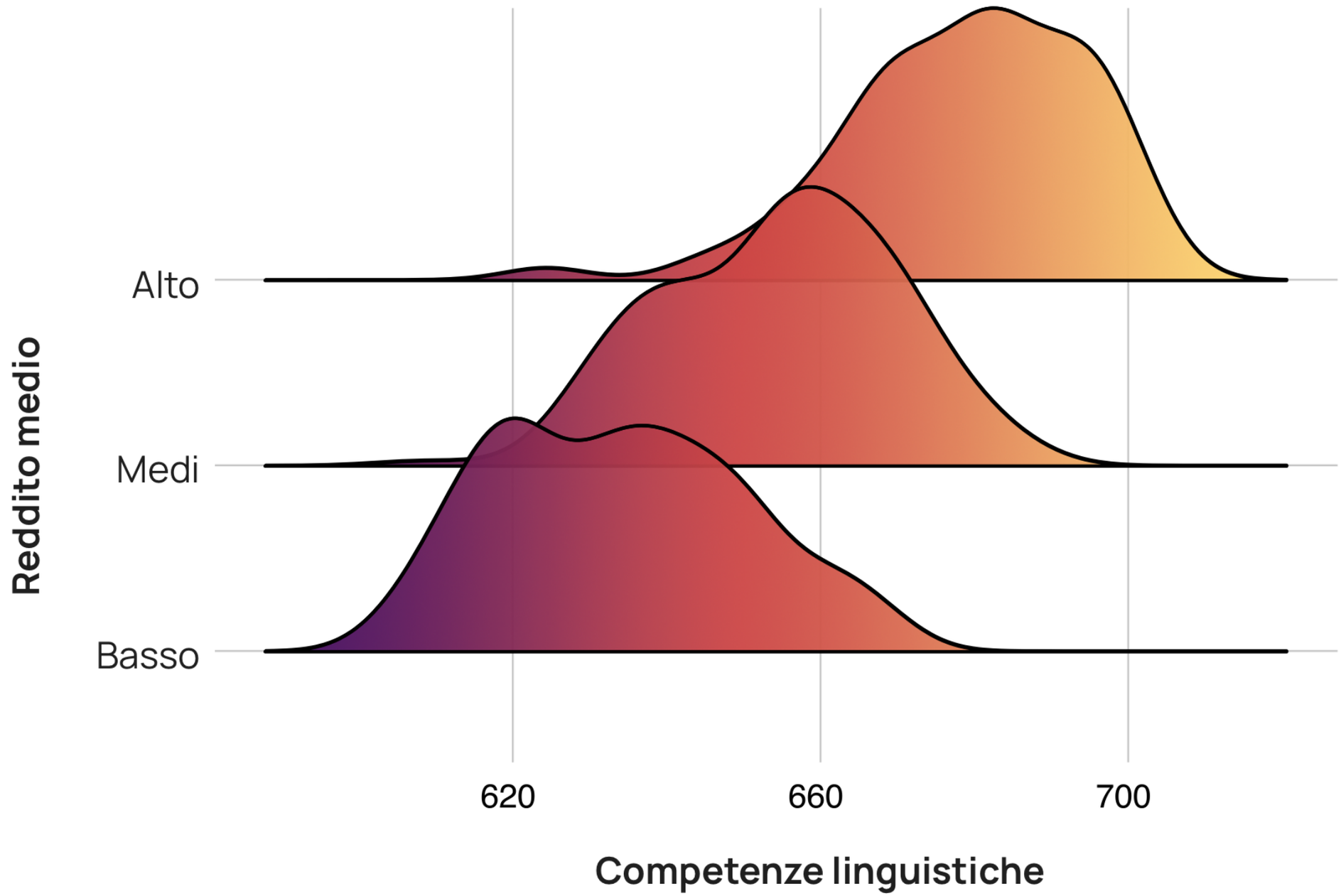


Possiamo fare di **meglio**

Reddito medio e prima lingua degli studenti spiegano la variabilità di competenze linguistiche fra scuole

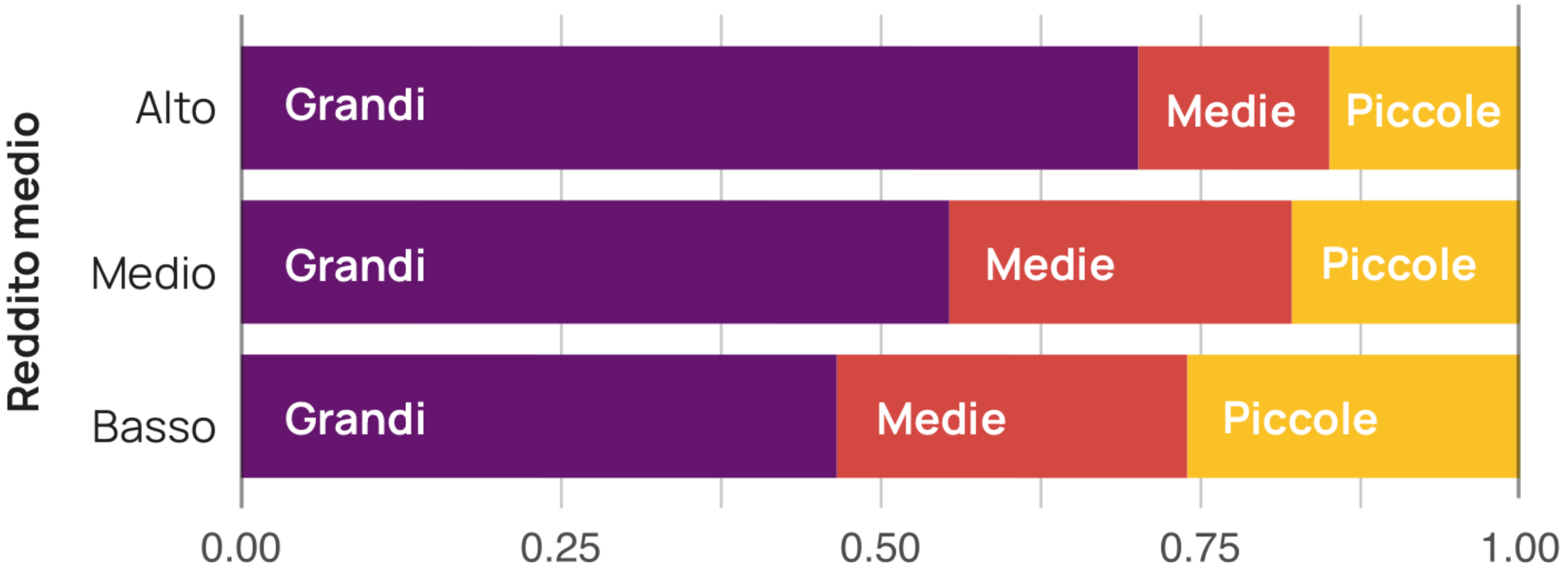


Gli studenti di scuole ad alto reddito sono avvantaggiati nelle competenze linguistiche



Le scuole a reddito alto sono mediamente più grandi

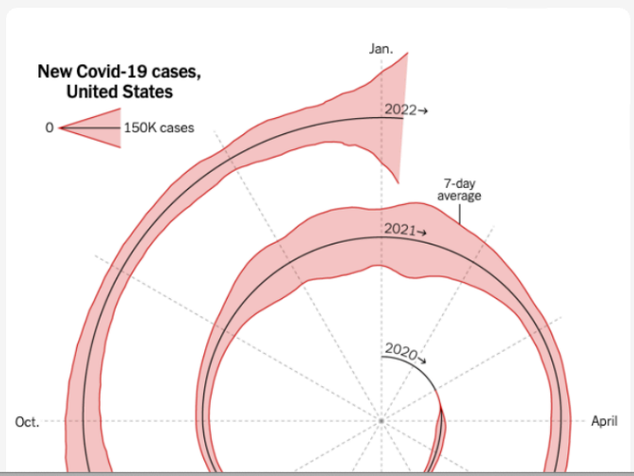
Valori percentuali sul totale per categoria di reddito

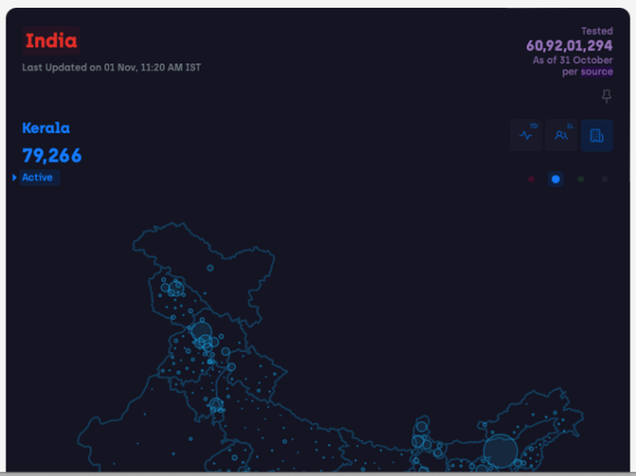


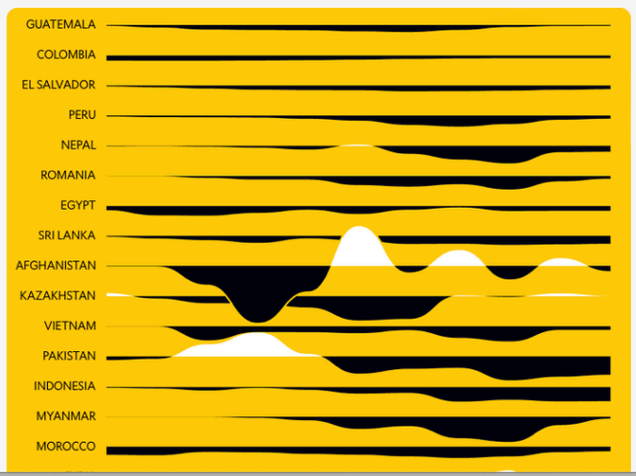
Dataviz Inspiration

Dataviz-inspiration.com aims at being the biggest list of chart examples available on the web. It showcases 195 of the most beautiful and impactful dataviz projects I know. The collection is a good place to visit when you're designing a new graph, together with data-to-viz.com that shares dataviz best practices.

select chart types select tools







Cosa abbiamo fatto oggi

Quando i dati sbagliano

- Errore di rappresentazione
- Errore di misura

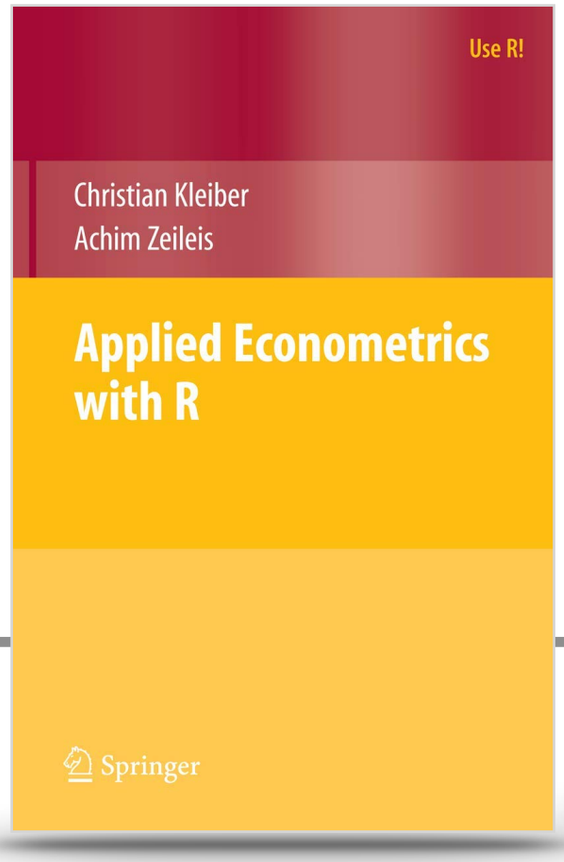
Analisi dati

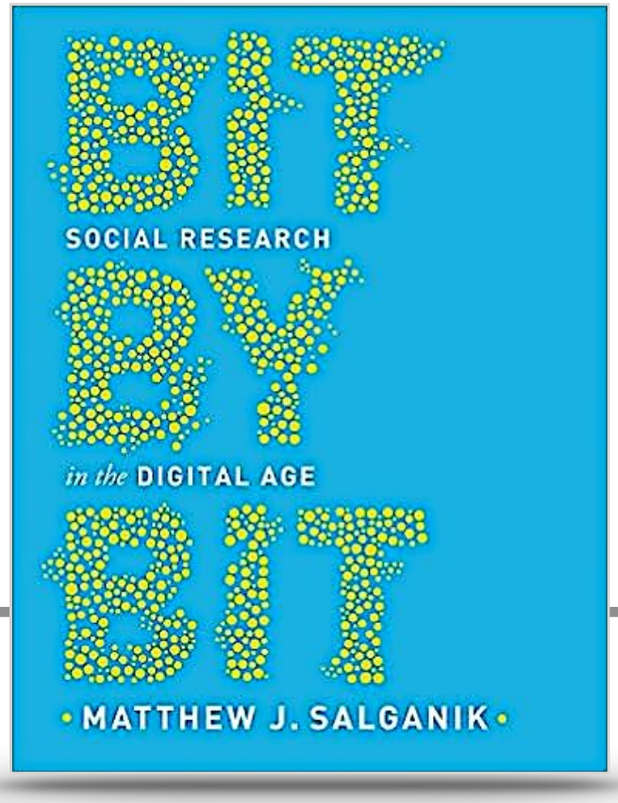
- Esempio di analisi esplorativa
- Comunicare i risultati

Cosa leggere

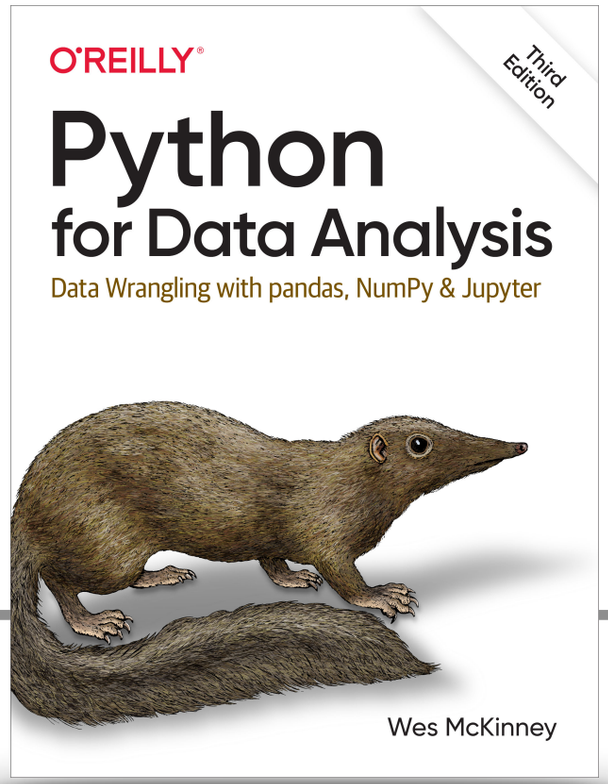
Workshop di ricerca sociale

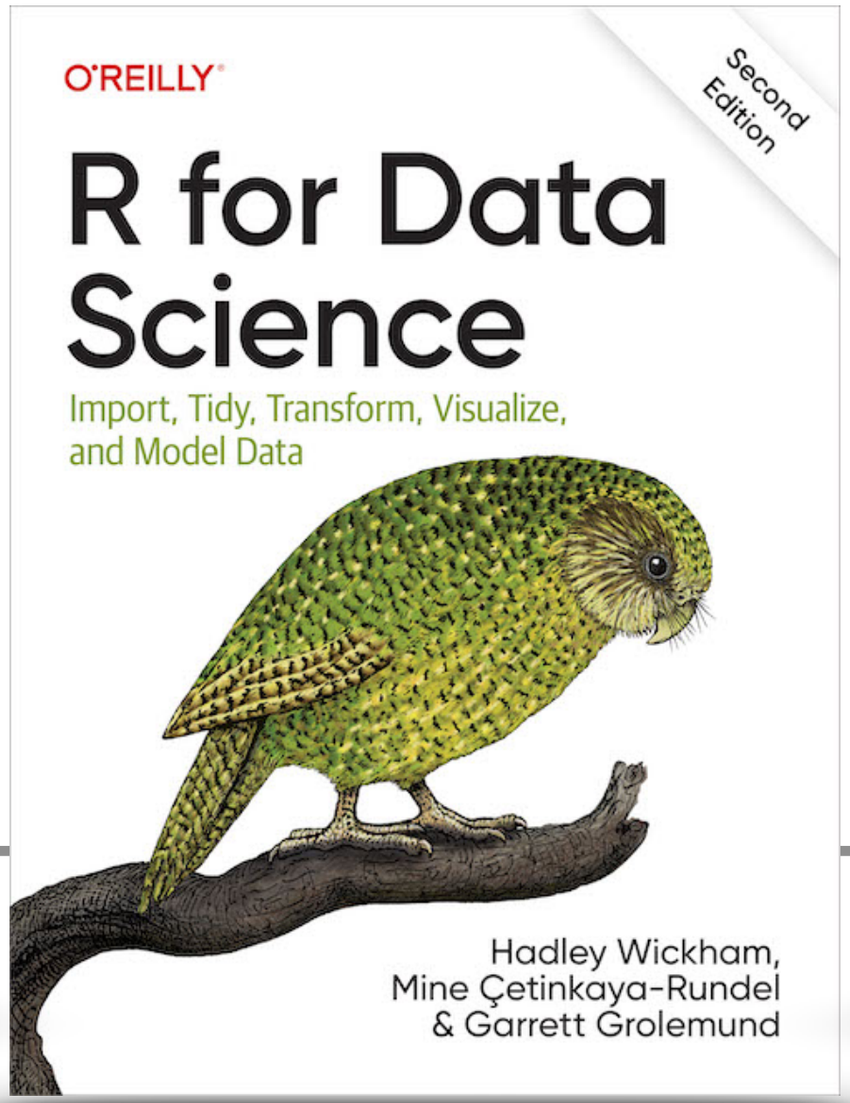
Ricerca sociale

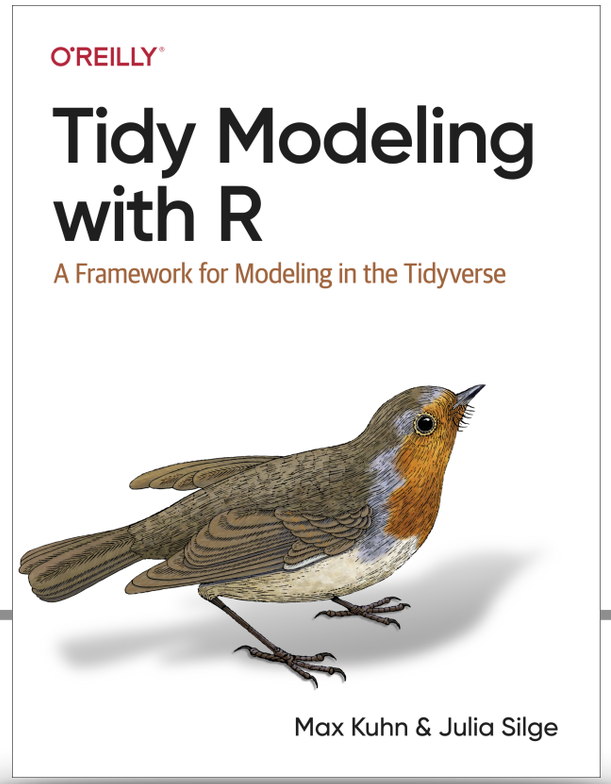




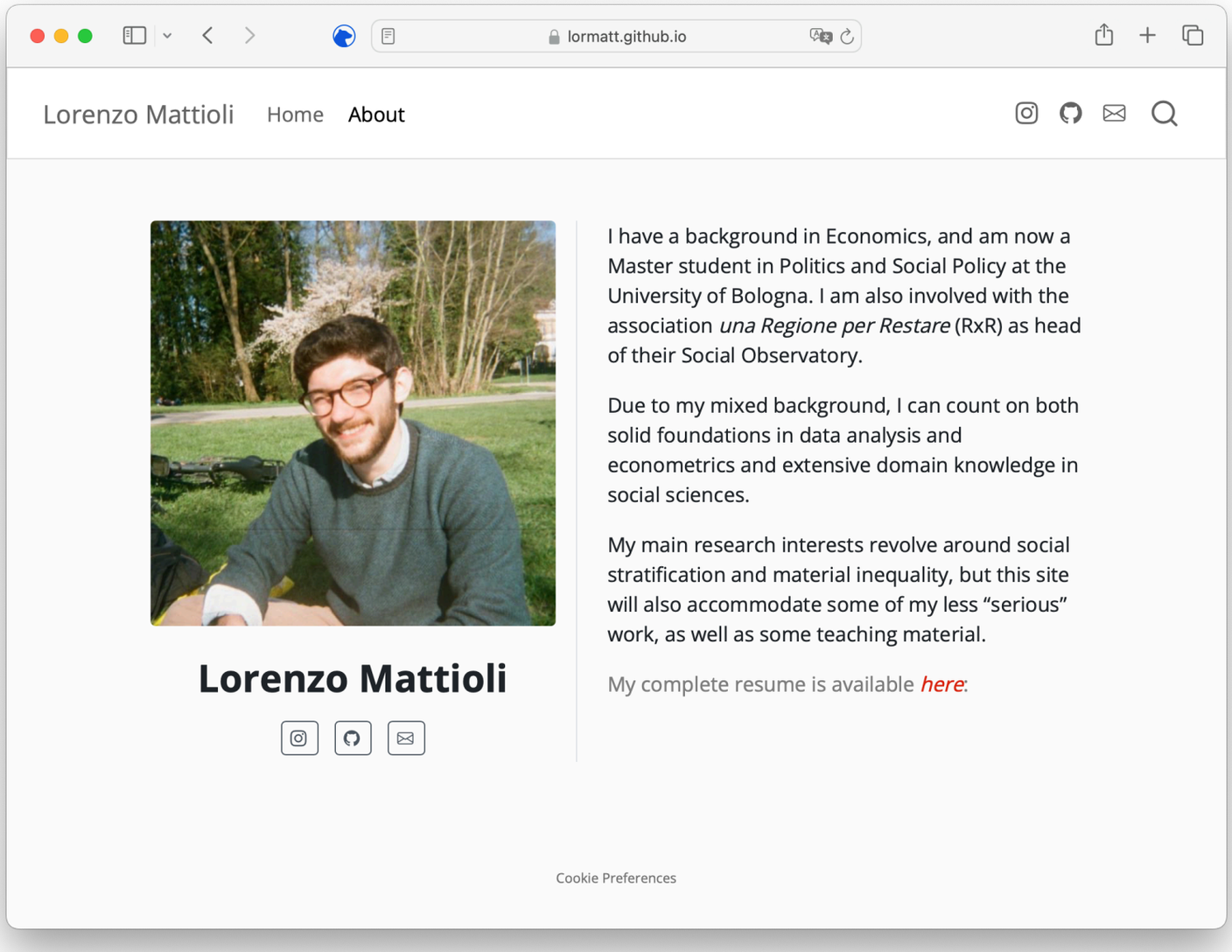
Analisi dei dati







Contatti



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