POSITIONING

In the analysis of positioning, we consider the relative position of the product of a company compared to those of the competitors, this position can be identified in terms of distances.

Multidimensional Scaling (MDS)

MULTIDIMENSIONAL SCALING are included within the perceptive positioning techniques

MDS allows to build the perceptive synthetic space (map) of the relevant target basing on simple proximity evaluations between n products/ brands

To facilitate the map interpretation without changes, you can overlay any quantitative and preference evaluations of some pre-specified attributes. Compared to other techniques (correspondence analysis and discriminant analysis) it tries to identify, within the perceptive map, the existence of latent attributes.

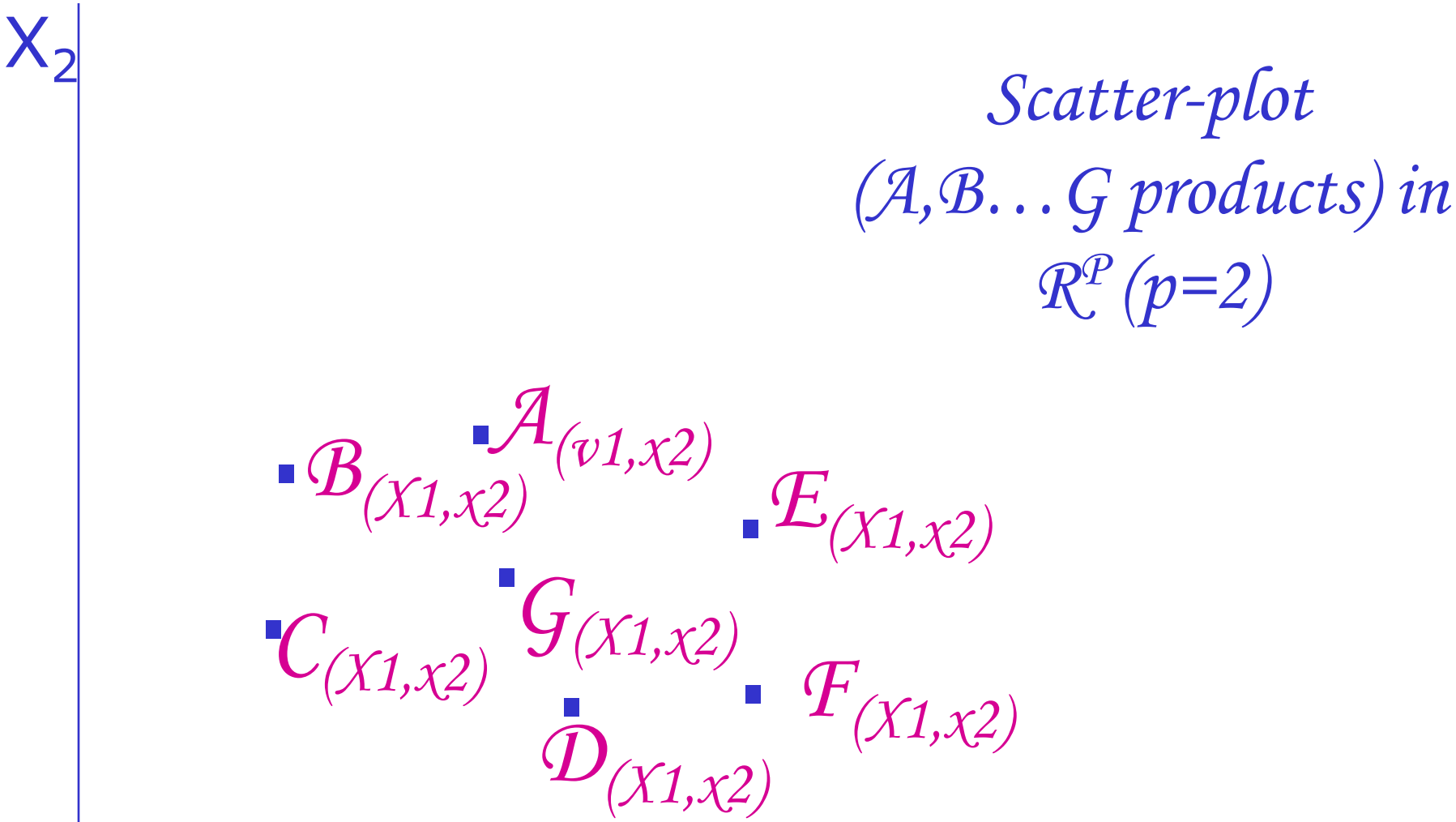
Multidimensional Scaling (MDS)

MDS defines a graphical representation of the objects (products or brands) in a space of reduced dimensions, in such a way that the initial judgments are faithfully represented by the distances between the points of the configuration obtained.

Multidimensional Scaling (MDS)

The information in a set of data is graphically represented by a cloud of points (scatter-plot)

The points are placed in such a way that the geometric relationships (distances) between them reflect the empirical relationships among the original data.


X2
Scatter-plot
(A,B…G products) in
$\mathcal{R}^p$ (p=2)
A(v1,x2)
B(X1,x2)
E(X1,x2)
G(X1,x2)
C(X1,x2)
F(X1,x2)
D(X1,x2)
X1

Multidimensional Scaling (MDS)

The analysis is performed on proximity matrices

Each statistical unit is represented as a point of the scatter-plot, whose coordinates are the evaluations of some attributes (not known*) of a particular product / brand.

The distances between points reflect the evaluations of similarity / dissimilarity provided by consumers for each pair of product.

* The attributes are not known … MDS discovers them (this is the difference with discriminant analysis and the correspondence)!

EXAMPLE OF AVERAGE DISSIMILARITY MATRIX (9 =max; 1=min)

STILIST	COVERI	MISSONI	GIGLI	MOSCHINO	MILA SCHON	VALENTINO	KRIZIA	VERSACE	FERRE'	ARMANI
COVERI	0									
MISSONI	7	0								
GIGLI	8.11	8.22	0							
MOSCHINO	6.33	8.33	6.3	0						
MILA SCHON	8.67	7.89	8.1	8.78	0					
VALENTINO	8.56	8.22	8.6	8.67	4.11	0				
KRIZIA	7.56	7	8.4	7.89	4.33	3.56	0			
VERSACE	7.33	8.22	6	8	8	6	7.11	0		
FERRE'	7.67	8.33	8.2	8.33	8.56	7	7.22	6.56	0	
ARMANI	7.89	8.56	7.9	8.56	7.56	6.56	3.78	7.78	6	0

AIM OF MDS

Having similarity judgments expressed by consumers, according to their perceptions between all pairs of elements (products/brands) belonging to a given set of size n

The algorithm can identify a configuration of n elements, in a geometric space of dimension p (2 or 3), such that the distances calculated between the points-elements reproduce as much as possible the initial similarity evaluations.

Multidimensional Scaling (MDS)

GENERALLY... note the coordinates you can calculate the Euclidean distances between pairs of points ...

... With the MDS the problem is the opposite!!!

Note the proximity between pairs of n points (identifiable geometrically as distances in a geometric space) it is possible to derive the coordinates of the n points

The greater the proximity (similarity) between pairs of judgments the smaller is the distance between pairs of points!

How to obtain proximity measures?

1. Direct proximity measures: values of similarity received from a sample of consumers on two or more products/ brands
2. Proximity measures calculated according to the type of character, qualitative or quantitative.

MDS generally involves direct proximity measures, asking an opinion on "psychological" diversity between objects (brands / products).

How to obtain proximity measures?

You must have a square MATRIX of proximity measures (nxn) between all possible pairs of elements equal to

$$n! / 2 / (n-2)! = N (n-1) / 2$$

The judgment of proximity is measured on scale:

- ☐ Nominal
- ☐ Ordinal
- ☐ Interval
- ☐ Ratio

How to obtain proximity measures?

Nominal: subjective grouping ⟶ asking to k subjects to group n objects (products) in s groups according to their degree of similarity (k=3 subjects, n=6 products and s=3 groups)

	A	B	C
G ruppo1	2-4-6	2-4	1-4
G ruppo2	1	3-5	2
G ruppo3	3-5	1-6	3-5-6

A similarity index s between i and j objects is calculated by counting how many times they fall into the same group for each of the k subjects:

$$s_{ij} = \sum_{k=1}^{s} {}_k x_{ij}$$

⟶ x_{ij}=1 when k put i and j in the same group

How to obtain proximity measures?

Ordinal: pairwise comparison with anchor points

comparing an object (product) to the remaining, providing a ranking of similarities; asking to sort all possible pairs from the most similar to the very dissimilar

... often too complex, it is better to sort with an interval scale!

Interval: asking to assign a score (1 to 5 or 7) to all possible pairs based on the degree of similarity.

Anchor points	Comparison	Rank order
A	B	4
	C	1
	D	3
	E	5
	F	6
	G	2
B	A	4
	C	2
	D	6
	E	3
	F	1
	G	5
.....	.....	.....

Interval rating

	Very Similar			Dissimilar
A B	1	2	.....	7
A C	1	2	.....	7
...				
...				
A G	1	2	.....	7
...				
F G	1	2	.....	7
	.....			.....

PROXIMITY INDEX

Square matrix (n x n) of proximity indices among n statistical units:

$$\Delta = [\delta_{ij}] \qquad (i, j = 1,2,\ldots n)$$

where δ_{ij} = proximity measure between i and j

MDS : OBJECTIVE

STARTING WITH EUCLIDEAN DISTANCES

$$d_{ij} = \left\{ \sum_{s=1}^{k} (x_{is} - x_{js})^2 \right\}^{1/2} \quad \forall\, i \, e \, j$$

PROXIMITIES ARE INTERPRETATED AS FUNCTION OF DISTANCES:

$$\delta_{ij} = f(d_{ij})$$

MDS TYPE

1. METRIC (proximity measures expressed by interval and ratio scales)
2. NON METRIC (proximity measures expressed by ordinal scales) iterative procedure
3. FOR IDIVIDUAL DIFFERENCES (a matrix for each respondent)
4. AGGREGATE (a matrix for all respondents)