



OP&P Product Research

Where **consumer** and **product** meet.

How reliable are the consumers? Comparison of sensory profiles from consumers and experts

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introduction

- in the sensory theory:
 - experts panels are used for the products' description
 - consumers should only be used for the hedonic task
 - they lack two essentials qualities for profiling (consensus and reproducibility)
 - there are strong halo effects (Earthy, MacFie & Hedderley, 1997)
- in the sensory practice:
 - consumers are sometimes used for both tasks
 - it has been proven that consumers' description show the required qualities (consensus and reproducibility) (Husson, Le Dien, Pagès, 2001)

problematic

How reliable are the consumers?

presentation of the studies

- products:
 - twelve luxurious women perfumes
(Gazano, Ballay, Eladan & Sieffermann, 2005)



Angel (Eau de Parfum)	L'Instant (Eau de Parfum)
Cinéma (Eau de Parfum)	J'Adore (Eau de Toilette)
Pleasures (Eau de Parfum)	J'Adore (Eau de Parfum)
Aromatics Elixir (Eau de Parfum)	Pure Poison (Eau de Parfum)
Lolita Lempicka (Eau de Parfum)	Shalimar (Eau de Toilette)
Chanel N°5 (Eau de Parfum)	Coco Mademoiselle (Eau de Parfum)

presentation of the studies

- expert panel (Agrocampus Rennes)
 - twelve persons (11 students and 1 teacher) from the Chantal Le Cozic school (esthetics and cosmetic school)
 - focus group per group of six, with two animators
 - generation of a list of twelve attributes
 - “Vanille”, “Notes Florales”, “Agrume”, “Boisé”, “Vert”, “Epicé”, “Capiteux”, “Fruité”, “Fraîcheur Marine”, “Gourmand”, “Oriental”, “Enveloppant”
 - training session for the most difficult ones
 - the twelve products were tested two times in two one-hour sessions

presentation of the studies

- consumer panel (OP&P Product Research, Utrecht)
 - 103 naïve Dutch consumers living in the Utrecht area
 - the same twelve perfumes were rated on 21 attributes
 - “odour intensity”, “freshness”, “jasmine”, “rose”, “camomile”, “fresh lemon”, “vanilla”, “mandarin/orange”, “anis”, “sweet fruit/melon”, “honey”, “caramel”, “spicy”, “woody”, “leather”, “nutty/almond”, “musk”, “animal”, “earthy”, “incense”, “green”
 - two products (Shalimar and Pure Poison) were duplicated
 - the fourteen (12+2) products were tasted in two one-hour sessions (seven products in each session, presentation order was balanced)

presentation route map

- the consumer and expert data are compared in three different ways
 1. Univariate analysis
 - analyses of variance
 - correlations
 2. Multivariate comparison
 - construction of the two products' spaces (PCA)
 - comparison of the products' spaces through GPA and MFA
 3. Confidence ellipses
 - graphical confidence intervals around the products averaged over the two panels
 - graphical confidence intervals around the products defined by the different panels

Performance of the two panels (univariate analysis)

performance of the panels

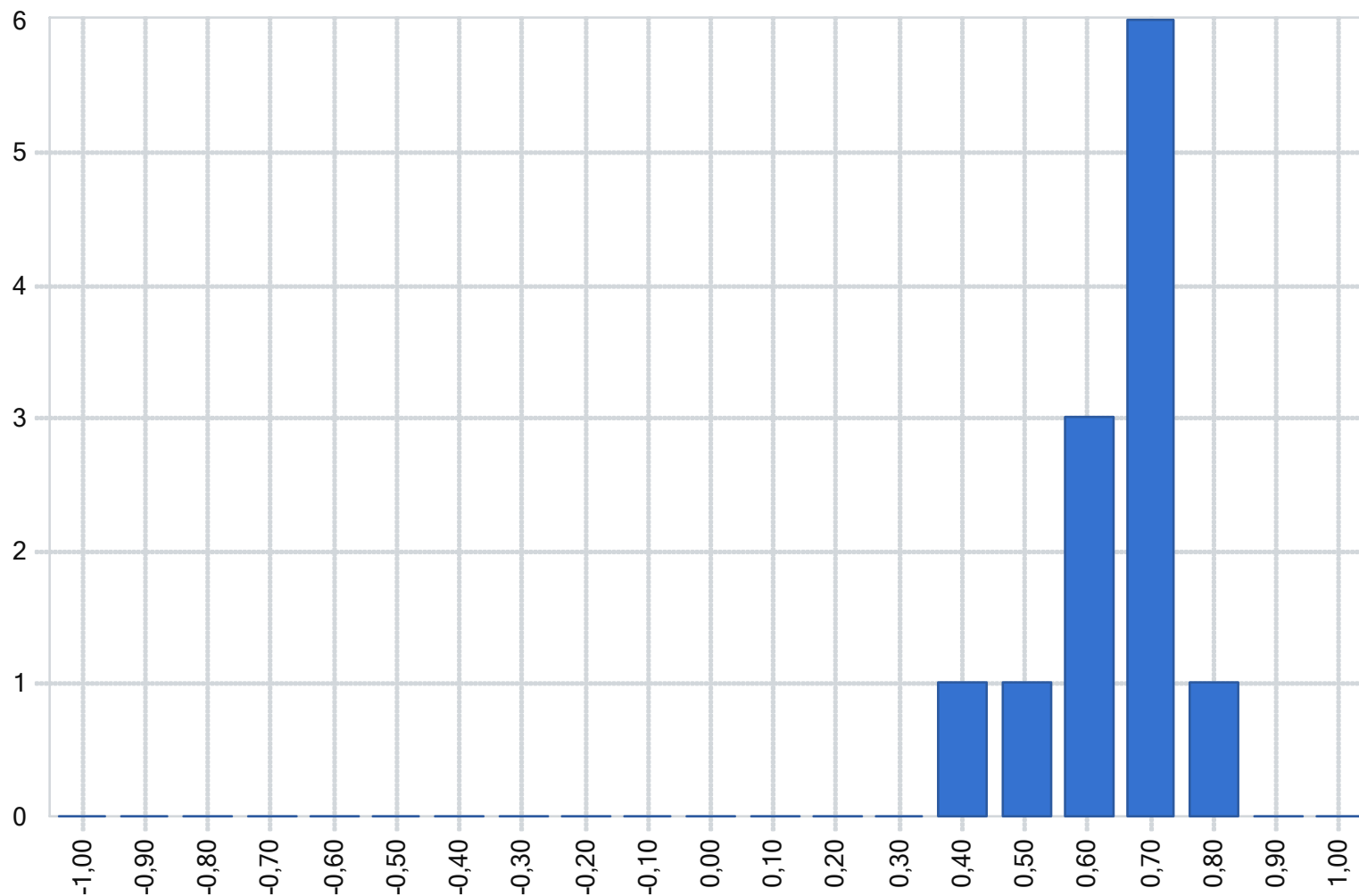
- usually, the expert panels should have many qualities:
 - discrimination: panelists should be able to detect and describe the differences existing between the products
 - reproducibility: panelists should describe the products in the same way, when they are repeated
 - agreement: panelists should give the same description of the products as the rest of the panel
 - it can be measured with the correlations (usually, one panelist is compared to the mean over the rest of the panel)

expert panel

- panel performance
 - discriminate on 11 out of 12 attributes (“Agrume”, pvalue=0.08)
 - reproducible for 11 out of 12 attributes (“Notes Florales”)
- panellist performance (discrimination, reproducibility)
 - panellists 1, 3 and 12 are very good
 - panellists 8, 9 and 10 are not good in discrimination (discriminate the products on less than 6 out of 12 attributes)
 - panellist 9 is also not good in reproducibility (reproducible on only 3 out of 12 attributes. “Notes Florales”, “Agrume” and “Enveloppant”)

expert panel (correlations)

- distribution of the correlations (correlation between expert i and the mean over the (n-1) others)



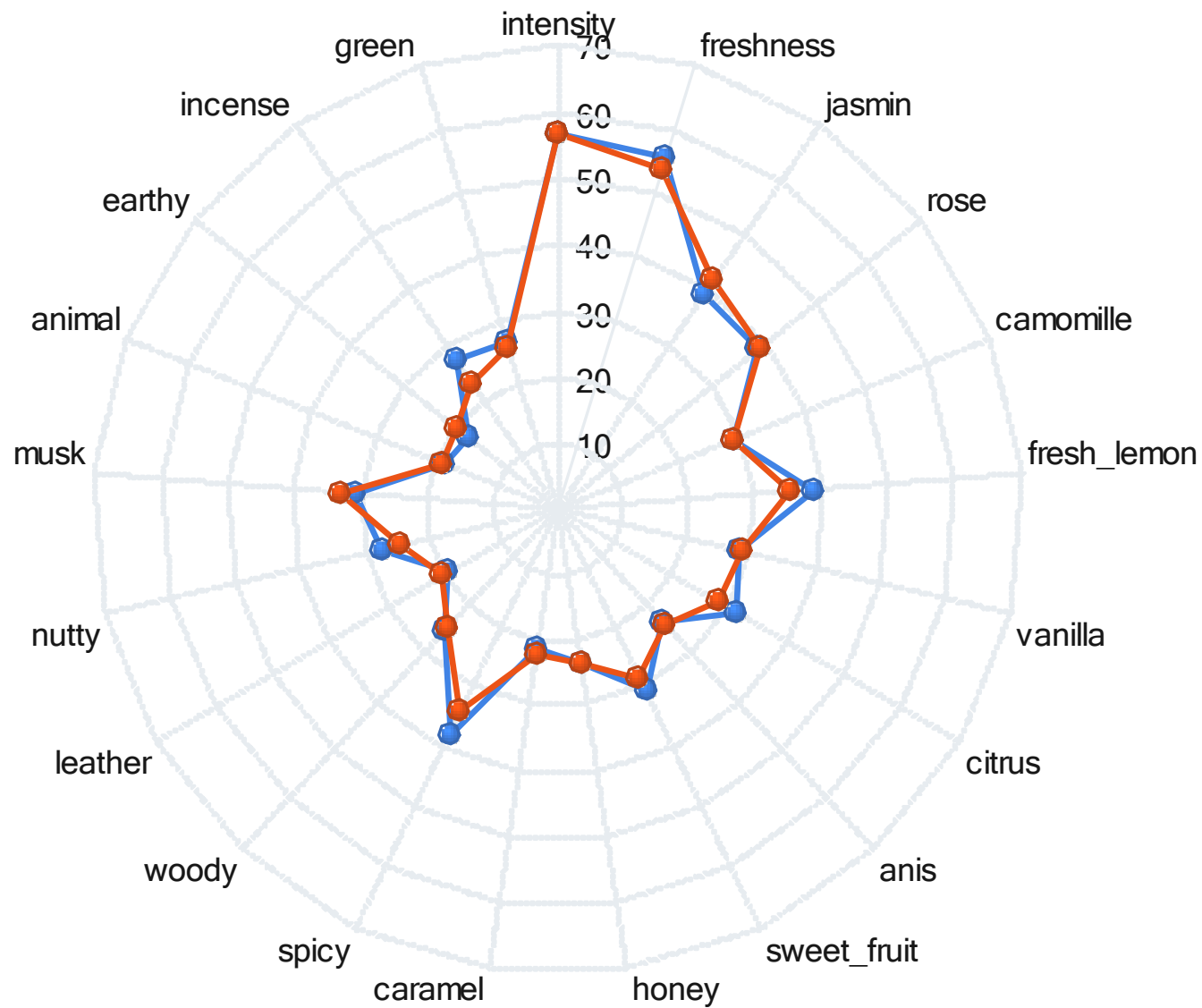
consumer panel

- discrimination (on the twelve original products)
 - the consumers discriminate the products on all attributes except “camomile” (pvalue = 0.62)
 - NB: the consumers discriminate on “Citrus” (pvalue < 0.001)
- reproducibility (on the two duplicated products only)
 - consumers are reproducible on all attributes except one (“woody”)

consumer panel (reproducibility)

Pure Poison

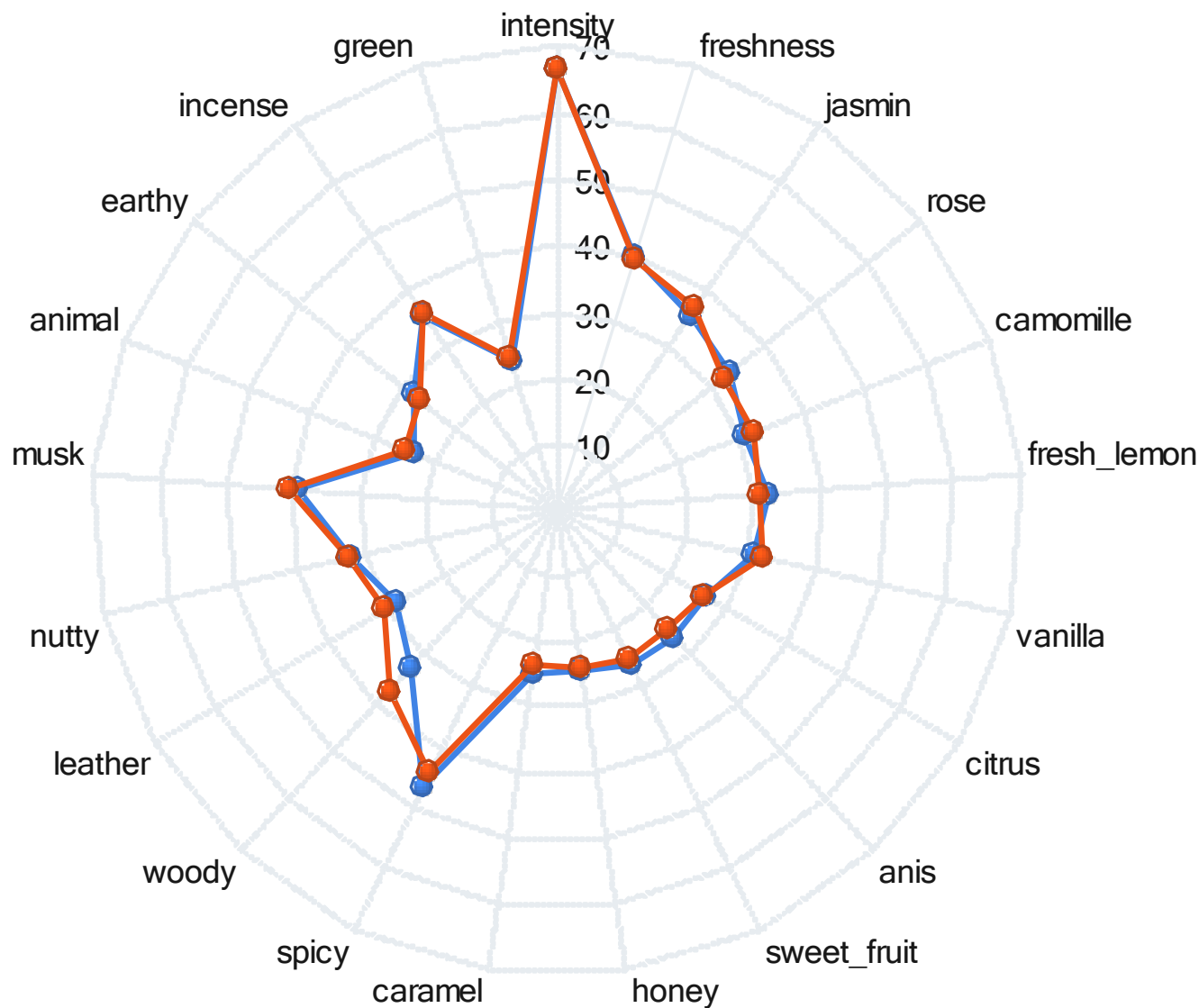
Pure Poison 2



consumer panel (reproducibility)

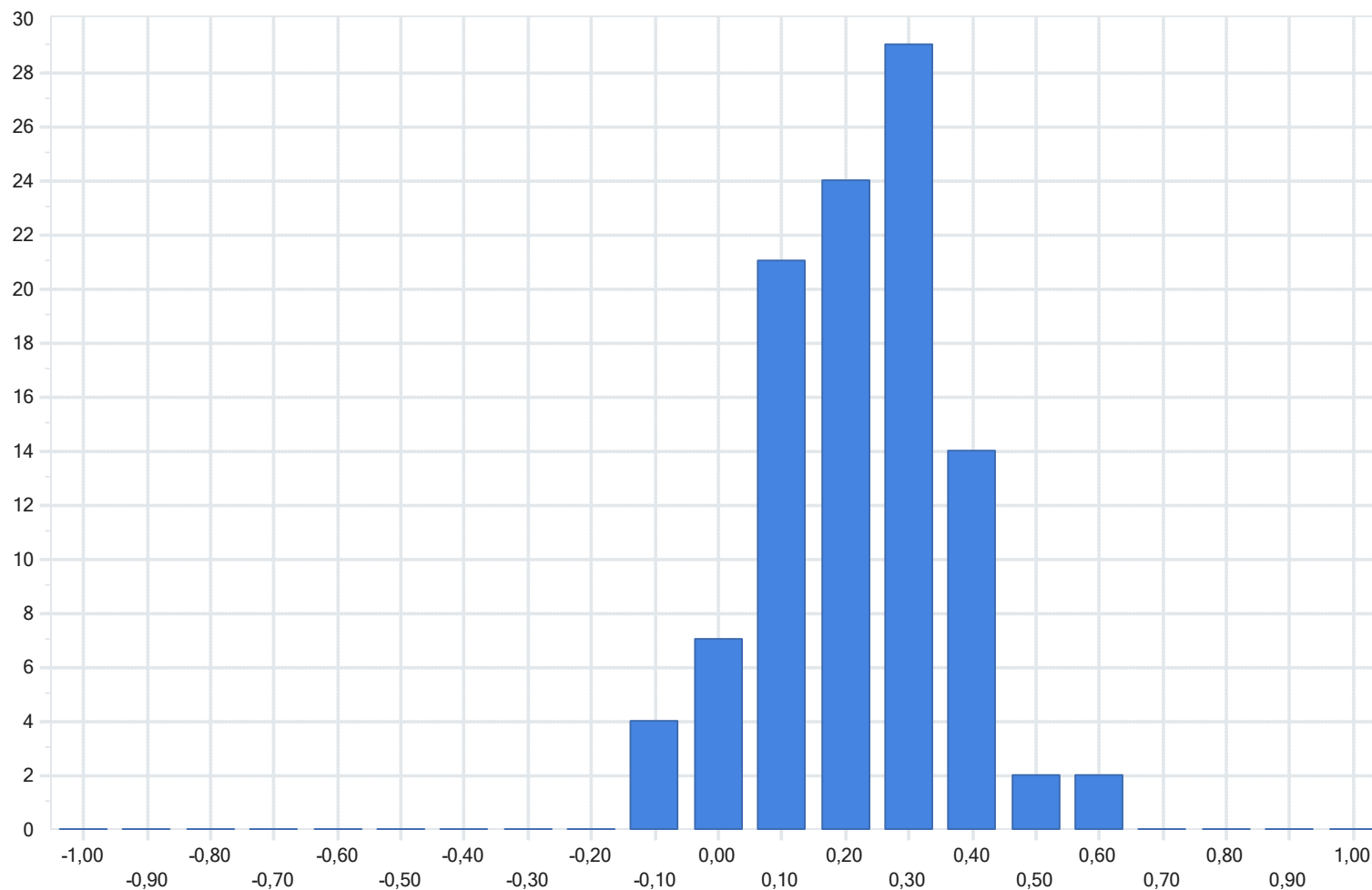
Shalimar

Shalimar 2



consumer panel (correlations)

- distribution of the correlations (correlation between a consumer i and the mean over the $(n-1)$ others)



conclusions on the panel performance

- expert panel
 - discriminates between the products
 - are reproducible
 - high correlations

- consumer panel
 - discriminates between the products
 - shows reproducibility's qualities
 - lower but still positive correlations (consumers are untrained)



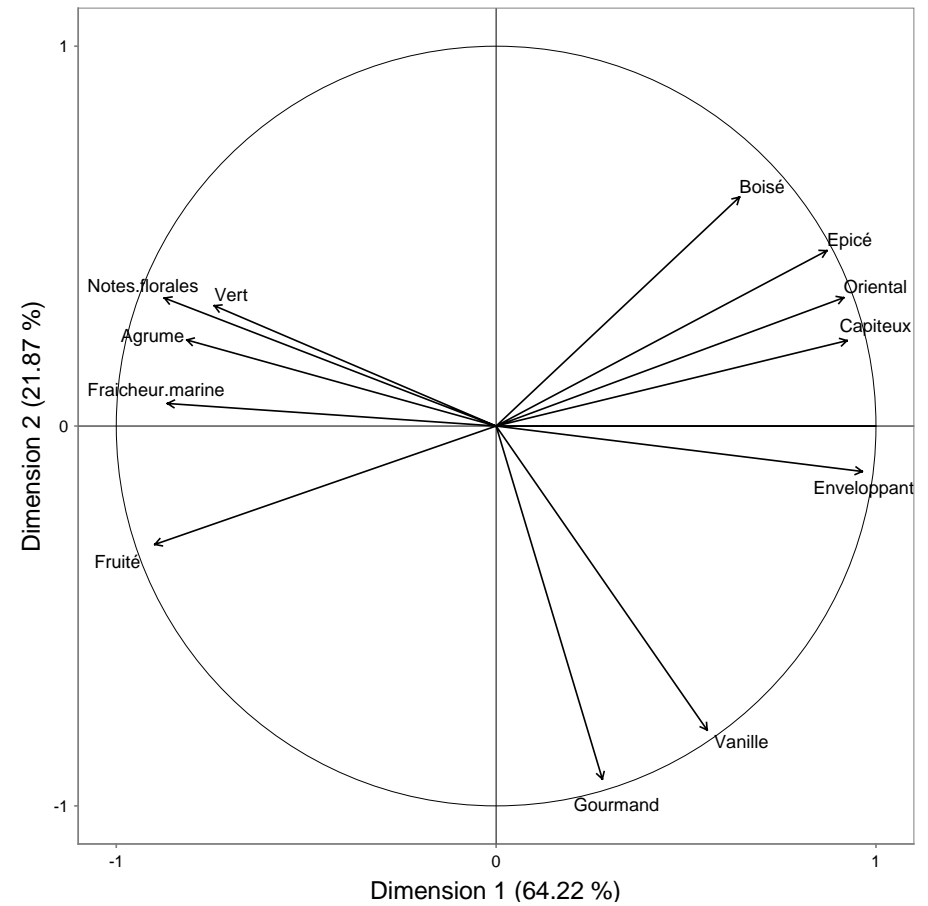
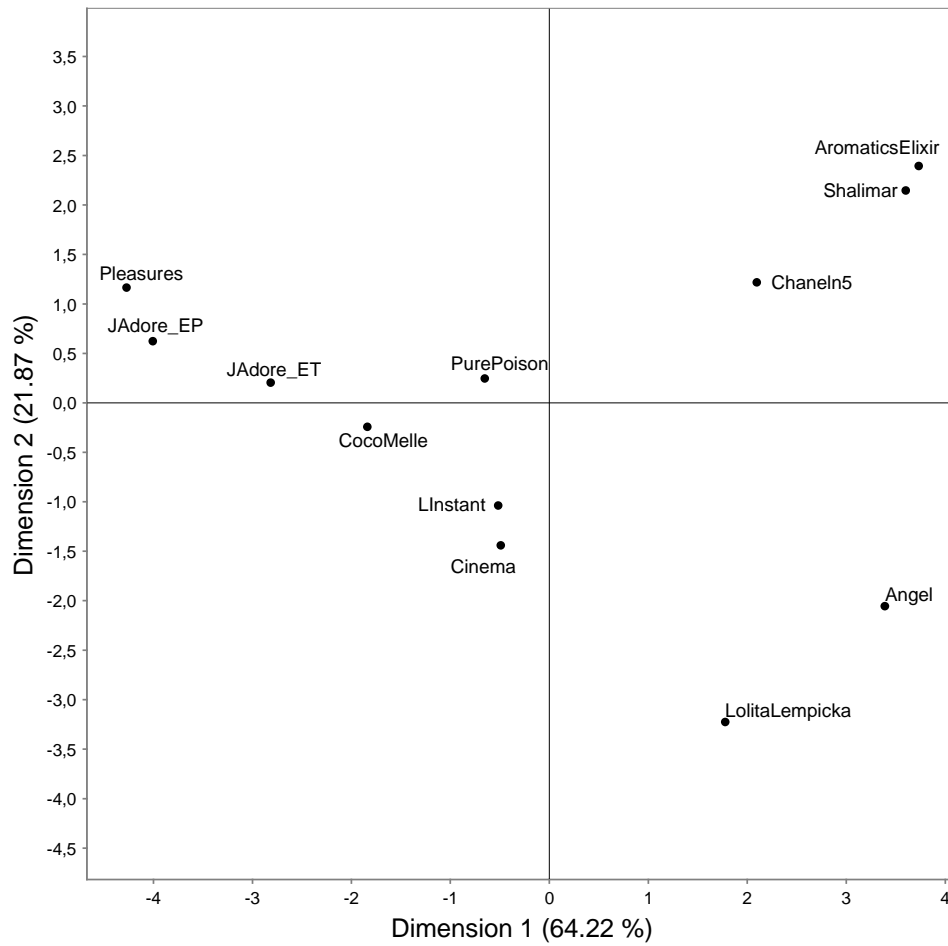
Both panels show the same qualities

Products' spaces (multivariate analysis)

methodology

- products' spaces
 - the products profiles (averaged over the panellists or consumers) are computed.
 - Principal Components Analysis is then run on these product x attribute matrices
- comparison of the two products' spaces (expert and consumer) is a “multi-table problem”
 - comparison through the Procrustean analysis
 - comparison through Multiple Factor Analysis (MFA)
 - comparison through the confidence ellipses technique

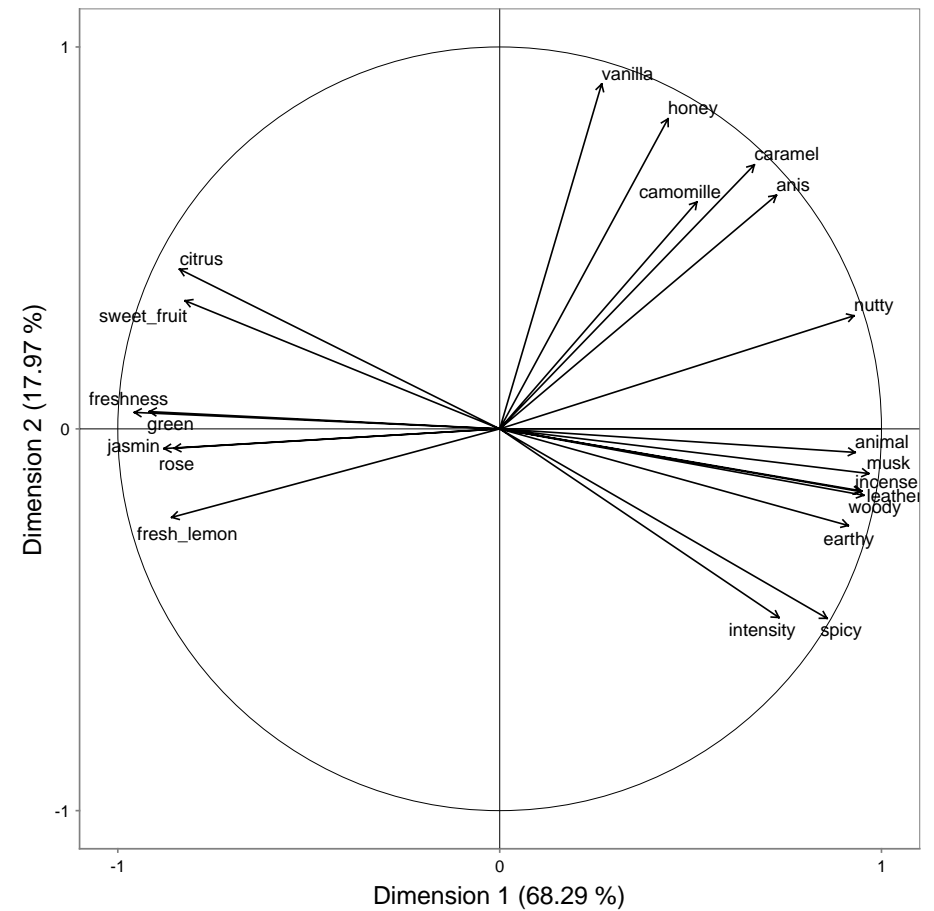
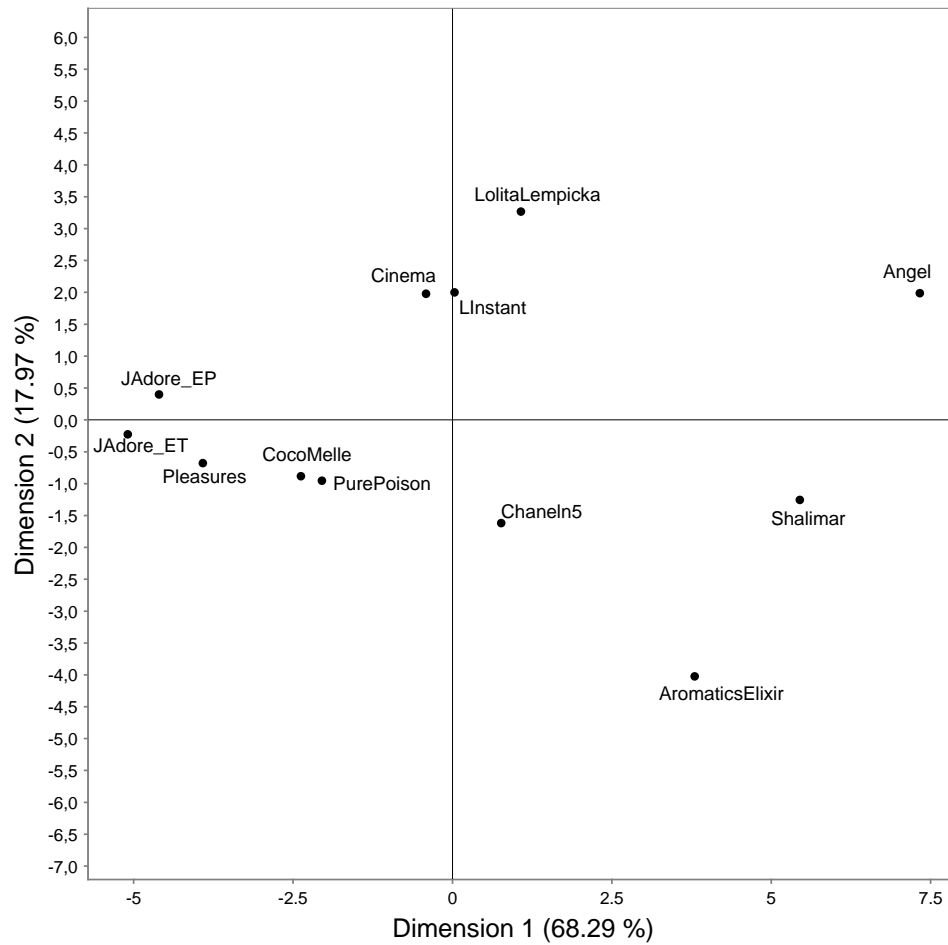
expert panel



expert panel (conclusions)

- first dimension (64% of the total inertia) shows two clusters:
 - Aromatics Elixir, Shalimar, Angel, Chanel n5 and Lolita Lempicka (characterized by Epice, Oriental, Capiteux, Enveloppant)
 - versus
 - Pleasures, J'Adore (EP and ET) (characterized by Fraicheur Marine, Agrume, Notes Florales, Vert, Fruité)
- second dimension (22% of the total inertia) discriminates between
 - Aromatics Elixir, Shalimar (characterized by Boisé)
 - versus
 - Lolita Lempicka (characterized by Gourmand, Vanille)

consumer panel



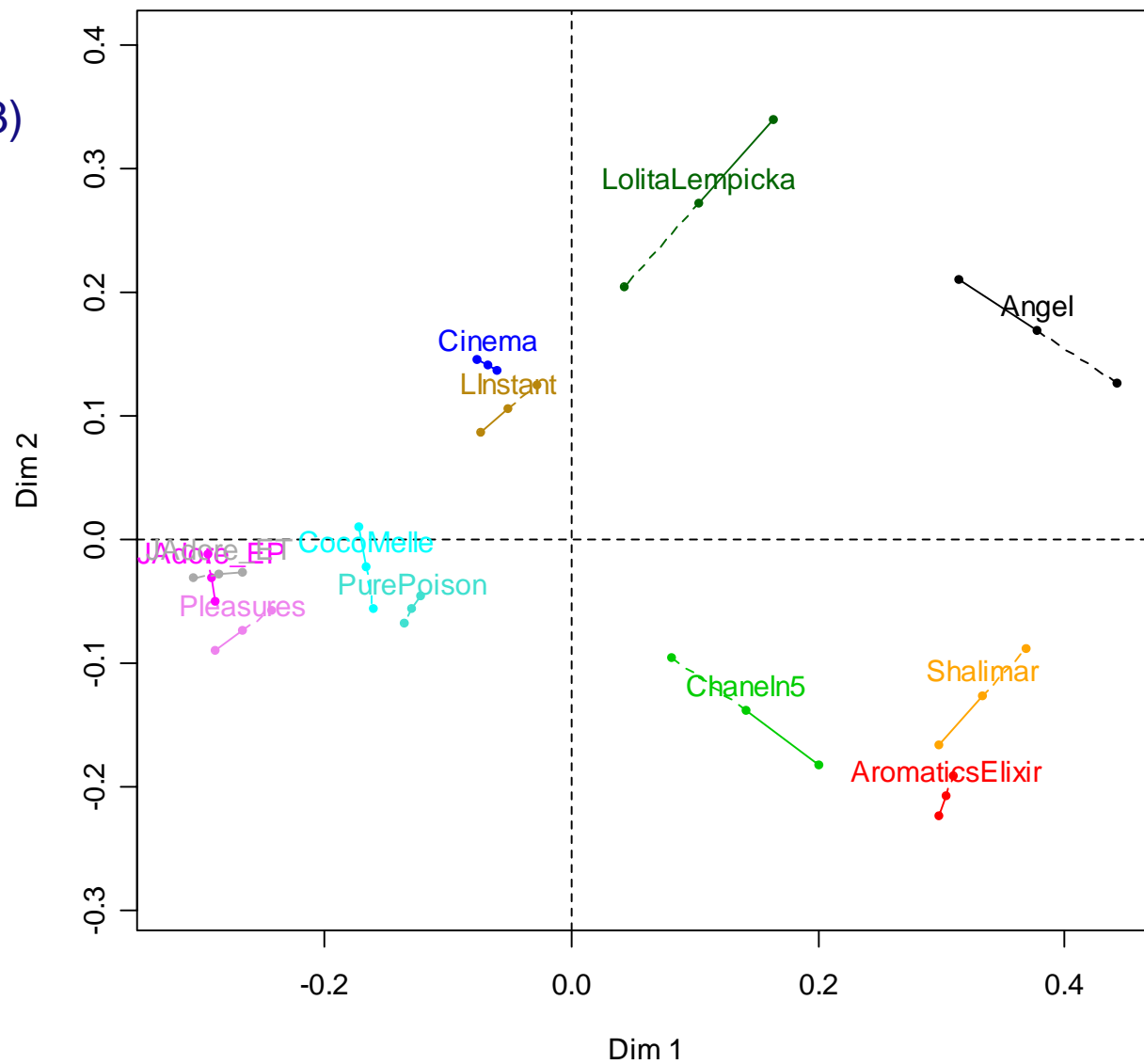
consumer panel (conclusions)

- first dimension (68% of the total inertia) shows two clusters
 - Angel, Shalimar, Aromatics Elixir (characterized by nutty, animal, musk, incense, leather, woody earthy, spicy)
 - versus
 - J'Adore (EP and ET), Pleasures (characterized by citrus, sweet fruit, freshness, green, jasmin, rose, fresh lemon)
- second dimension (18% of the total inertia) discriminates between
 - Lolita Lempicka (characterized by vanilla, honey, camomile, caramel)
 - versus
 - Aromatics Elixir, Shalimar (characterized by intense, spicy)

Multivariate comparison of the two panels (GPA and MFA)

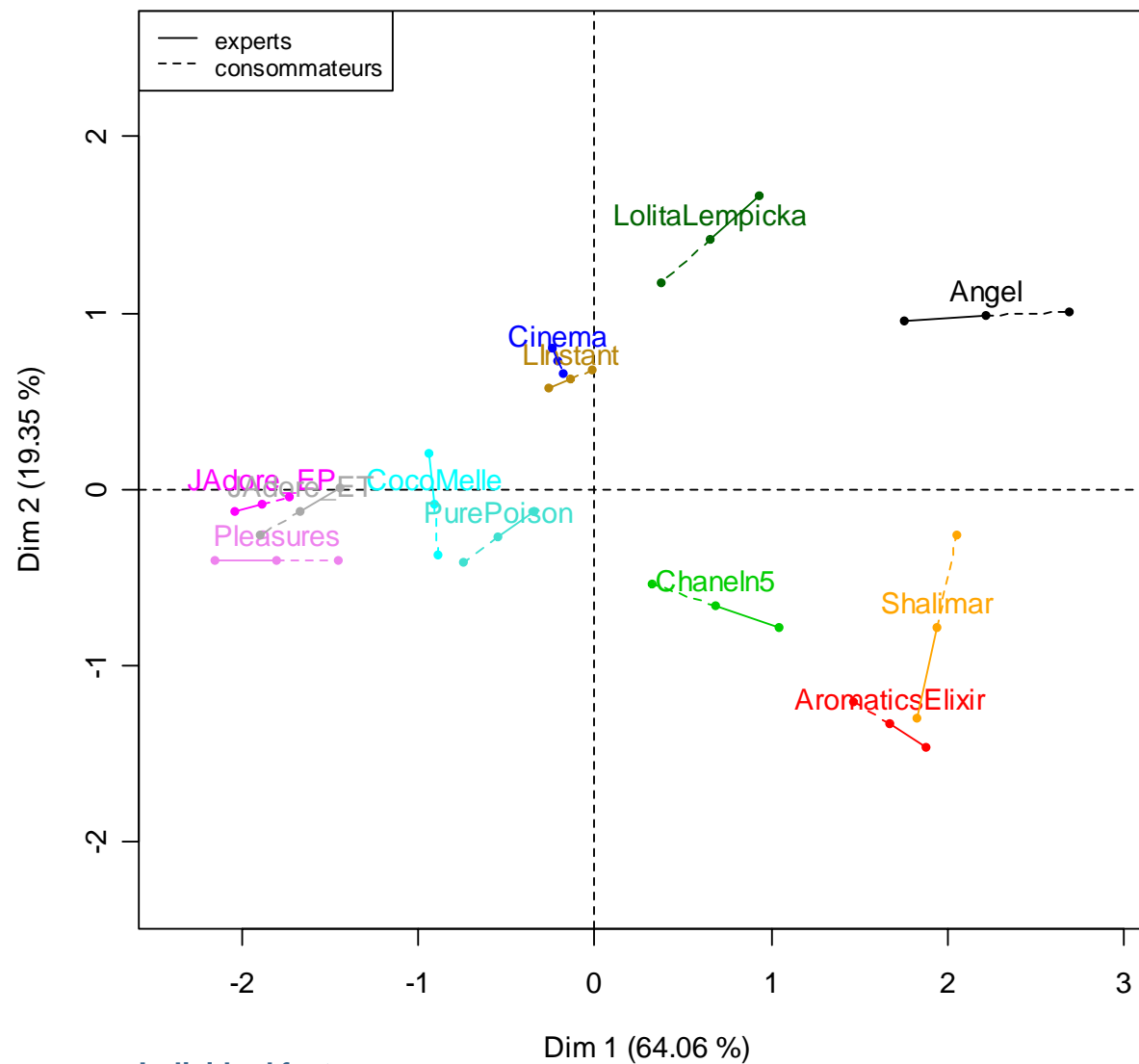
expert vs consumer: Procrustes analysis

GPA consensus space
 (coefficient of similarity: 0.93)



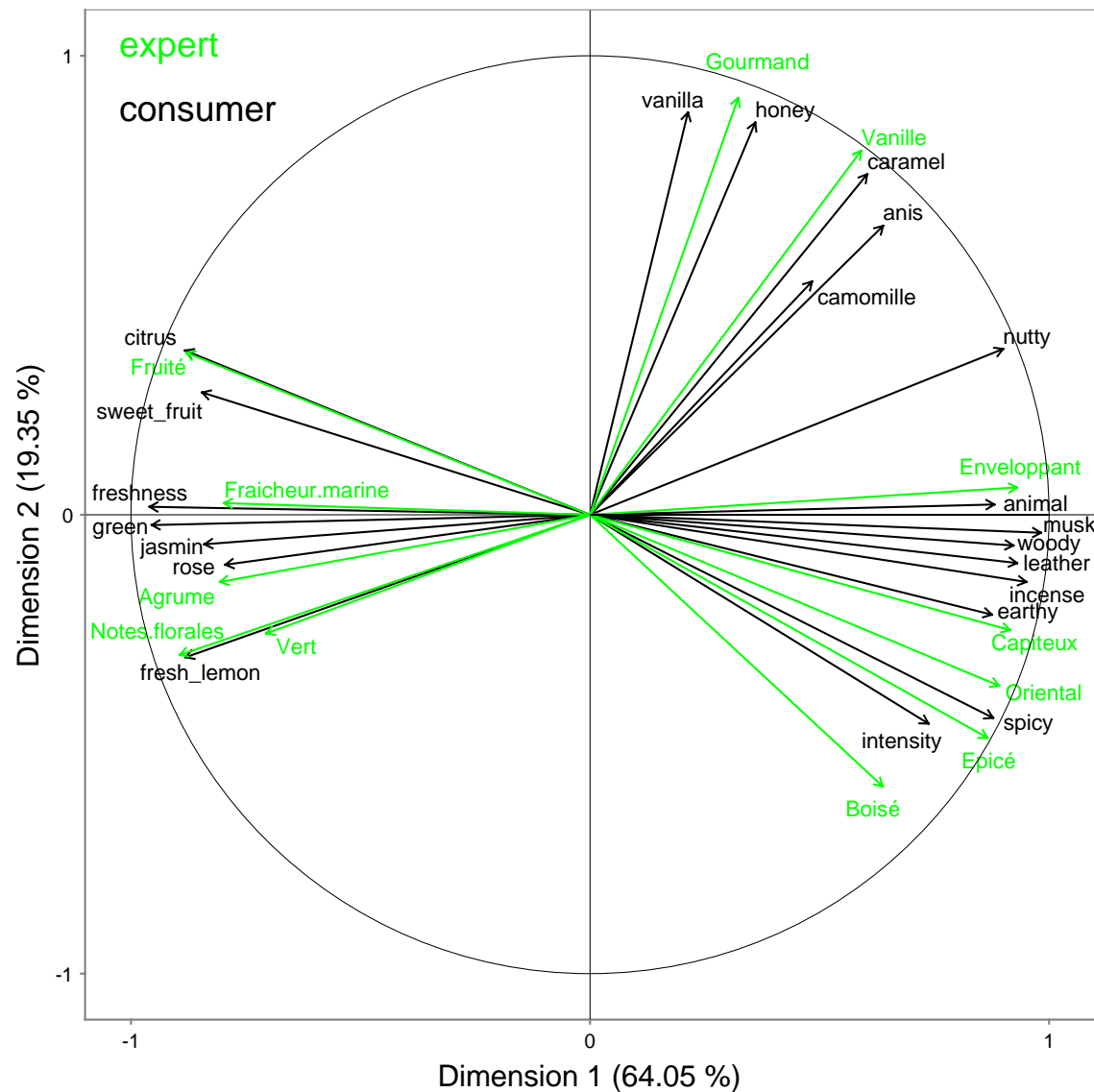
expert vs consumer: Multiple Factor Analysis

MFA partial points' representation
(RV coefficient: 0.87)



expert vs consumer: Multiple Factor Analysis

MFA variables' representation
(RV coefficient: 0.87)



Comparison through the confidence ellipses technique

(Husson, Lê & Pagès, 2005)

(Lê, Pagès & Husson, 2008)

confidence ellipses

methodology

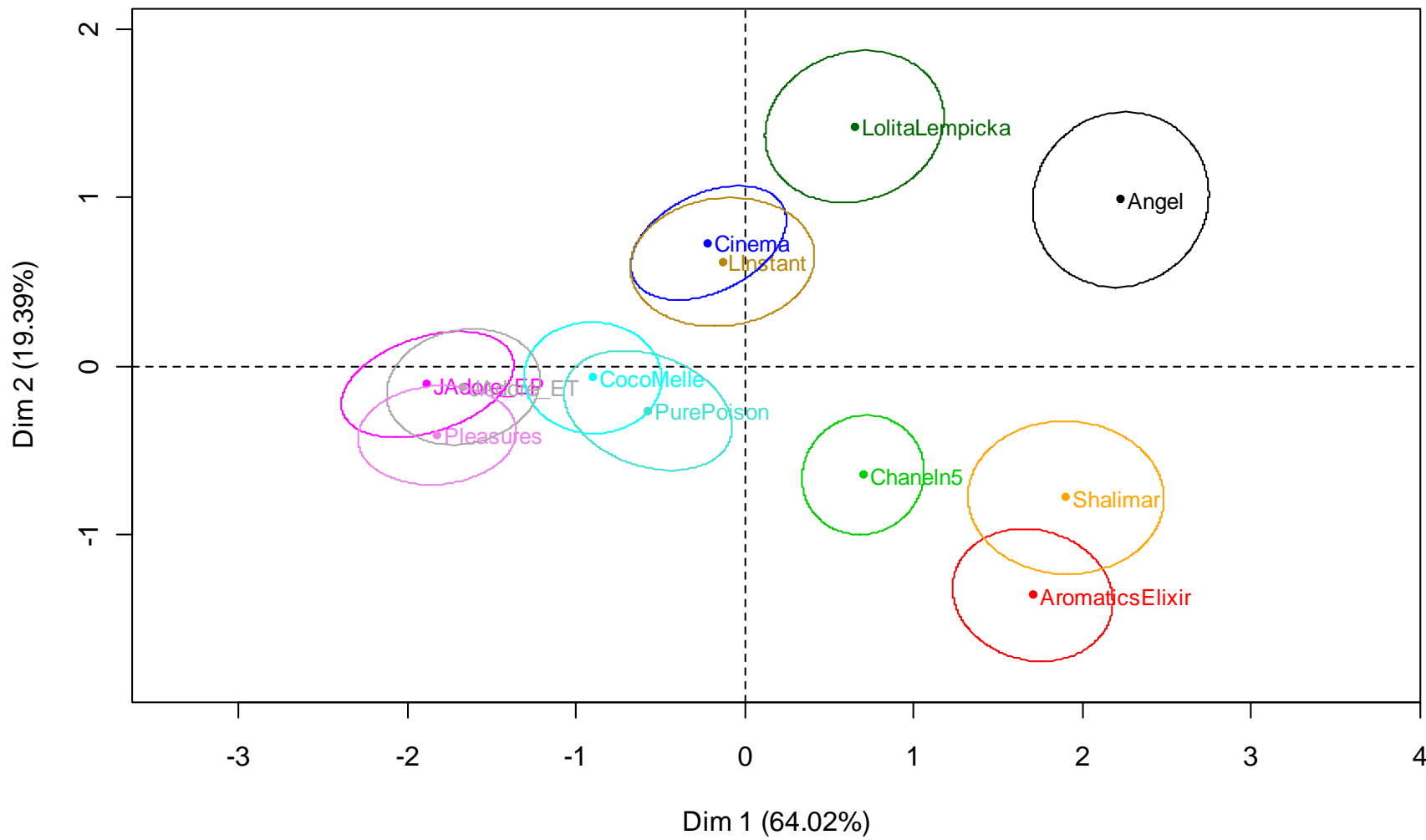
1. Compute the product profiles (averaged by product over the judges)
2. Create the products' space
3. Re-sample by bootstrapping new panels
4. For each new panel, compute new products' profiles
5. Project as illustrative the products on the original product space
6. Steps 3 to 5 are repeated many times (i.e. 500 times)
7. Confidence ellipses around the products containing 95% of the data are constructed

principle

- if ellipses are superimposed, the products are not significantly different
- the size of the ellipses is related to the variability existing around the products

confidence ellipses

Confidence ellipses around the products



confidence ellipses

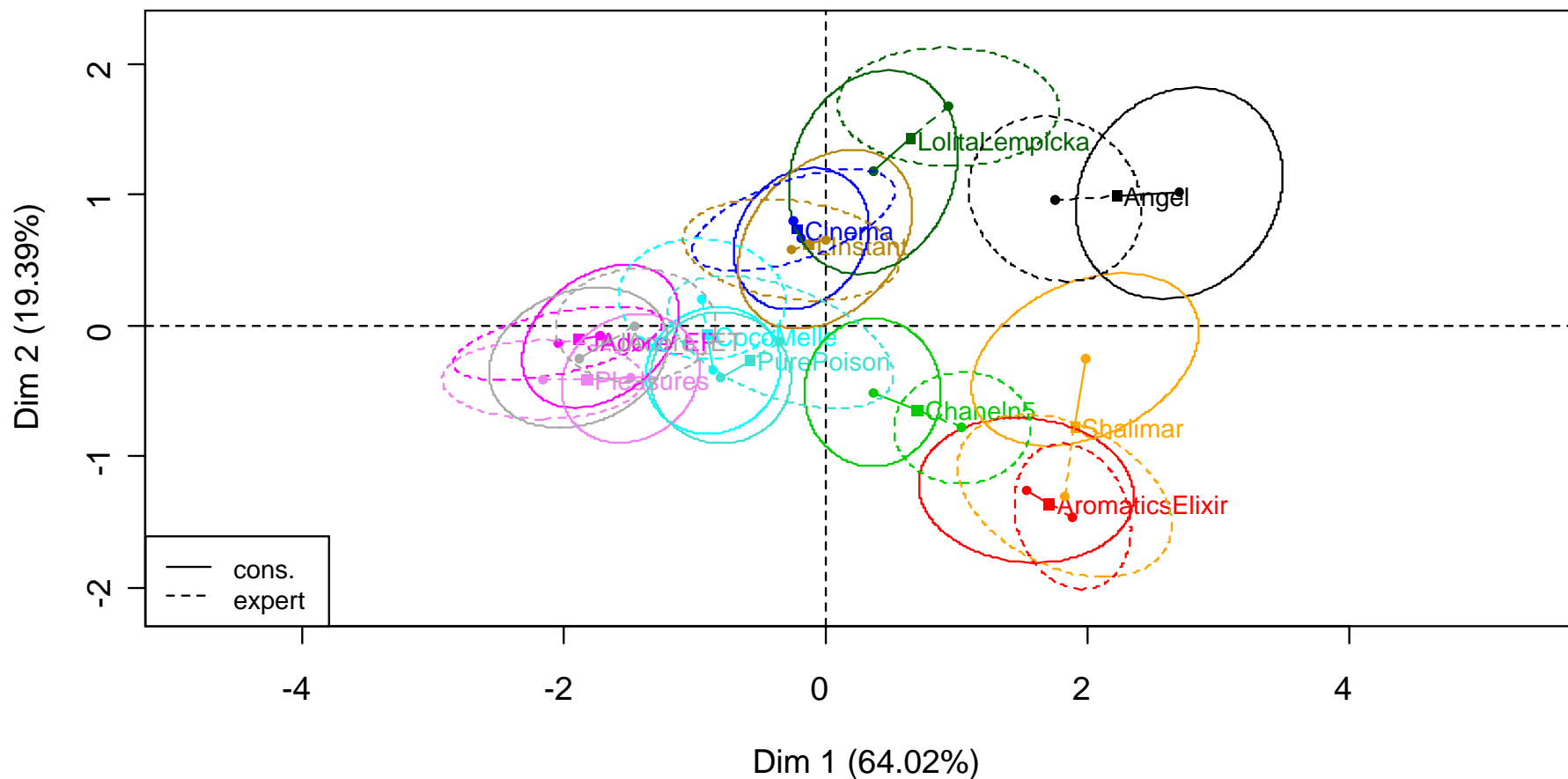
- mean points
 - some products are not significantly different
 - J'Adore ET, J'Adore EP and Pleasures
 - Cinema and L'Instant
 - some products are clearly significantly different
 - Angel and J'Adore (ET or EP)
 - Chanel n°5 and Shalimar

confidence ellipses

- as we have two different panels, we can apply this methodology to both
 - creation of confidence ellipses around each product seen by each panel (24 ellipses are created here)
 - comparison of a given product through the two panels (same colour)
 - comparison of the different products within a panel (same type of line)

confidence ellipses

Confidence ellipses for the partial points



confidence ellipses

- partial points
 - within a product, the ellipses related to the two panels are always superimposed (no differences between the panels)
- the sizes of the ellipses are equal
 - the higher amount of consumers compensate the higher variability due to the lack of training for consumers

conclusions

- although consumers don't have the habit to describe perfumes (difficult task), they give the same information as the expert panel (and it's identical to the standard description of the perfumes)
- they also have the same qualities (discrimination and reproducibility)
- a difference between consumers and experts panel exists in the variability of the results (more variability for consumers), but this is compensated by the larger size of the panel (here 103 vs 12)
- with consumers, not only intensity, but also ideal and hedonic questions can be asked in the same time

references

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thank you

- special thanks to
 - Melanie COUSIN
 - Maëlle PENVEN
 - Mathilde PHILIPPE
 - Marie TOULARHOAT

students from AgroCampus-Rennes, who took care of the whole expert panel data.





Thank you for your attention!