The SensoBase Fairytale

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The SensoBase project (www.sensobase.fr) was sponsored by
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A database of descriptive sensory data

WHY ?

- To document the variety of practices in descriptive analysis
- To benchmark panel and panelist performances
- To compare sensometrics techniques on a large number of datasets

HOW ?

- By offering a free statistical analysis of each dataset provided
- Example of the statistical analysis offered :
  Wines from INRA Montpellier

To contribute to this project with your own data:

www.sensobase.fr

SENSOBASE Program - Microsoft Internet Explorer

Fichier Edition Affichage Favoris Outils ?

Précédente Rechercher Favoris

Adresse https://liris.cesg.cnrs.fr/English/index.html OK Liens

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SENSOBASE Program Ajouter un onglet

LABORATOIRE D'INTERFACE RECHERCHE INDUSTRIE SENSOMETRIE

SENSOBASE

Home

User Identification :

Login :

Password :

Enter

What is SENSOBASE ?

Methods of exchange

Extract of statistical results and their meaning (French)

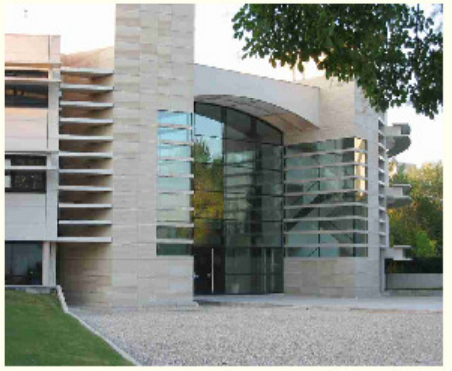
Register

Send us your suggestions

SENSOBASE

A sensory profiling database

At Centre Européen des Sciences du Goût, a project is conducted to build a database of sensory profiling datasets in which the data providers can exchange their sensory profiling data for statistical analyses.



New !

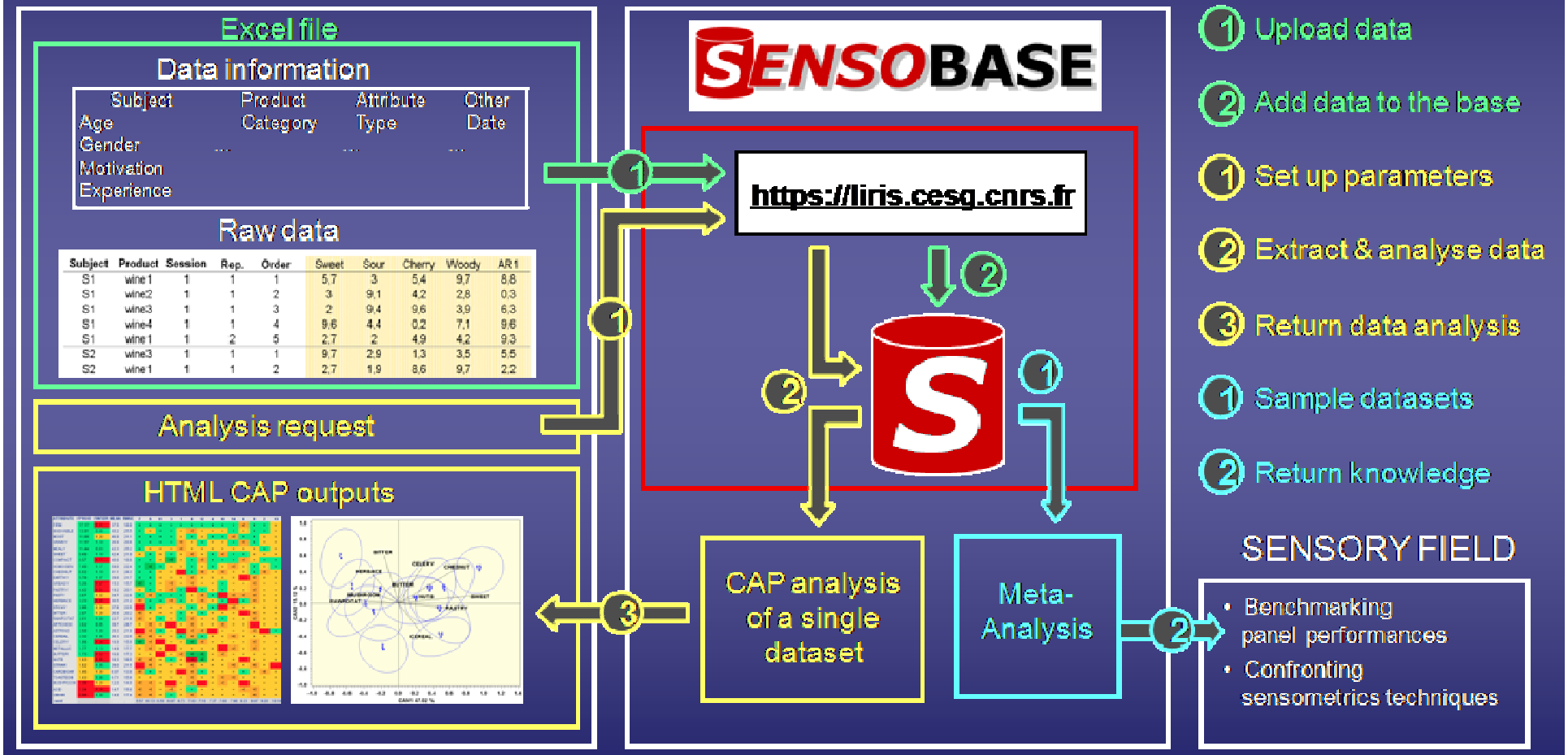
The SensoBase Excel files have been modified (precisions on the modifications).

You should download and use the new versions of the Excel files for the next studies ! (Files are available on your personal account)

Datasets sent with an older version of an Excel file will be rejected.

Send your sensory profiling data...

Working flow chart of the SensoBase



Current contents of the SensoBase

About 3-4 years after having started the project, SensoBase is composed of :

- 683 datasets (sensory studies)
- 83 sensory labs from 17 countries (48 data providers)
- 2 731 panellists
- 4 367 products
- 12 558 sensory attributes
- 4 044 923 scores

Meta-analysis for establishing repeatability benchmarks

Mean of standard deviations of replicates (0-10 scale)

PRODUCT	Tastes	Aromas	Flavors	Visual	Texture	Mean	n	Std
Meat-Fish	0.87	1.80	0.96	1.41	1.28	**1.19** ^{D}	1123	0.57
Beverages	1.18	1.24	1.26	1.10	1.06	**1.20** ^{D}	1828	0.65
Dairy	1.10	0.98	1.47	0.93	1.48	**1.26** ^{C}	1195	0.67
Ready-cooked dishes	1.16	1.17	1.33	1.38	1.70	**1.35** ^{B}	996	0.49
Bread	1.25	1.40	1.26	1.47	1.90	**1.46** ^{A}	468	0.54
Fruit-Veg	1.47	1.34	1.44	1.40	1.63	**1.48** ^{A}	1422	0.59
Mean	**1.17** ^{D}	**1.23** ^{C}	**1.28** ^{BC}	**1.28** ^{B}	**1.44** ^{A}	1.28	.	.
n	1874	1294	1731	983	1481	.	7375	.
Std	0.59	0.63	0.61	0.53	0.67	.	.	0.62

Means with the same letter are not significantly different (p=0.05)

Table based on 207 datasets

Meta-analysis for understanding factors of panelist performances

Indexes of performance

Agreement = Pearson correlation coefficient (panelist versus others)

Discrimination = $MS_{product}/ (MS_{product} + MS_{residual})$ (from indivudal one-way ANOVA)

Repeatability = Root $MS_{residual}$ (from a 0-10 scale)

Weighted ANOVA of a performance index

- Index first averaged over attributes to get a single value per panelist
- Model: Index = Factor + Dataset + Factor*Dataset (for instance: Factor=AGE)
- Dataset is considered as a random effect
- Experimental unit: the panelist (n from 267 to 3,202 depending on the factor analyzed)
- Each dataset has a weight proportional to the balance of the factor level frequencies and to the total number of panelists in this dataset

Level of performances by age, gender, panelist education and sensory experience

AGE (n=3,202)	F-tests in ANOVA			AGE Level	Mean
	AGE	Dataset	AGE*Dataset		
Agreement	2.35	**14.10**	1.12	All	0.387
Discrimination	**9.52**	**8.80**	1.09	30-	**0.615 b**
				30-45	**0.627 a**
				45+	**0.612 b**
Repeatability	2.31	**13.22**	0.99	All	1.207

EDUCATION (n=267)	F-tests in ANOVA			EDU Level	Mean
	EDU	Dataset	EDU*Dataset		
Agreement	1.72	**5.27**	1.01	All	0.363
Discrimination	**4.02**	**2.76**	**1.99**	Secondary	**0.582 b**
				Higher	**0.619 a**
Repeatability	0.05	**6.60**	0.60	All	1.353

GENDER (n=2,381)	F-tests in ANOVA			GEN Level	Mean
	GEN	Dataset	GEN*Dataset		
Agreement	0.24	**14.86**	1.16	All	0.385
Discrimination	0.10	**8.39**	1.22	All	0.616
Repeatability	0.01	**12.96**	0.84	All	1.185

EXPERIENCE (n=486)	F-tests in ANOVA			EXP Level	Mean
	EXP	Dataset	EXP*Dataset		
Agreement	**3.13**	**13.65**	0.99	none	**0.372 b**
				1-3 years	**0.402 a**
				>3 years	**0.424 a**
Discrimination	**4.11**	**13.70**	0.87	none	**0.616 b**
				1-3 years	**0.620 b**
				>3 years	**0.645 a**
Repeatability	1.60	**11.76**	0.97	All	1.361

When significant (p=0.05), the F statistic is in yellow and the levels of the factor are compared. Otherwise, just the grand mean (All) is given.

Summary of the findings related to panelist performances

- Ability to discriminate products increase:
  - with level of education,
  - with level of expertise in sensory analysis,
  - in 30-45 years old subjects.
- However, these effects do not extend to repeatability
- Regarding types of descriptors:
  - appearance has got the best performances,
  - individual repeatability and discrimination are better on taste, flavor and odor compared to texture.
- Women are not better tasters than men !
- A huge variability of the levels of performances was observed across the sensory labs

Meta-analysis for assessing panel heterogenity in terms of repeatability and scaling

Usual ANOVA Model

$$Y_{jir} = a_j + b_i + c_{ji} + \varepsilon_{jir}$$

a_j : judge effect. b_i : product effect
c_{ij} : judge by product interaction

Brockhoff's Assessor Model

$$Y_{jir} = \alpha_j + \beta_j \nu_i + \varepsilon'_{jir}$$

α_j : judge effect. ν_i : product effect
β_j : scaling coefficient of judge j

Covariance Assessor Model (CAM)

$$Y_{jir} = a_j + \beta_j \nu_i + b_i + c_{ji} + \varepsilon''_{jir}$$

A mixture of both models allowing for a product effect adjusted to the scaling effect

- Usual ANOVA assumes panel homogeneity towards both repeatability and scaling
- Based on hundreds of datasets sampled from the Sensobase :
  - The tests of panel homogeneity provided by the Assessor model were significant in 73 and 76 % of the attributes for repeatability and scaling, questioning strongly the validity of ANOVA with sensory data
  - The use of a data transformation removing scaling did not result in more product effect significance
  - The use of CAM resulted in an increase of the percentage of attributes with a significant product effect from 59 % in classical ANOVA to 68 % with CAM

How many panelists are necessary ?

1. Take a dataset from the ***Sensobase*** composed of ***n*** subjects
2. Draw a sub-panel of size ***n-k*** (***k*** = 1 to ***n***-2)
3. Analyze sub-panel data and decide whether the results are in accordance with those obtained from the analysis of the whole panel data
4. Redo steps 2 and 3 for 100 sub-panels
5. Redo steps 1 to 4 for a large number of datasets

Example of step 3 (analysis):

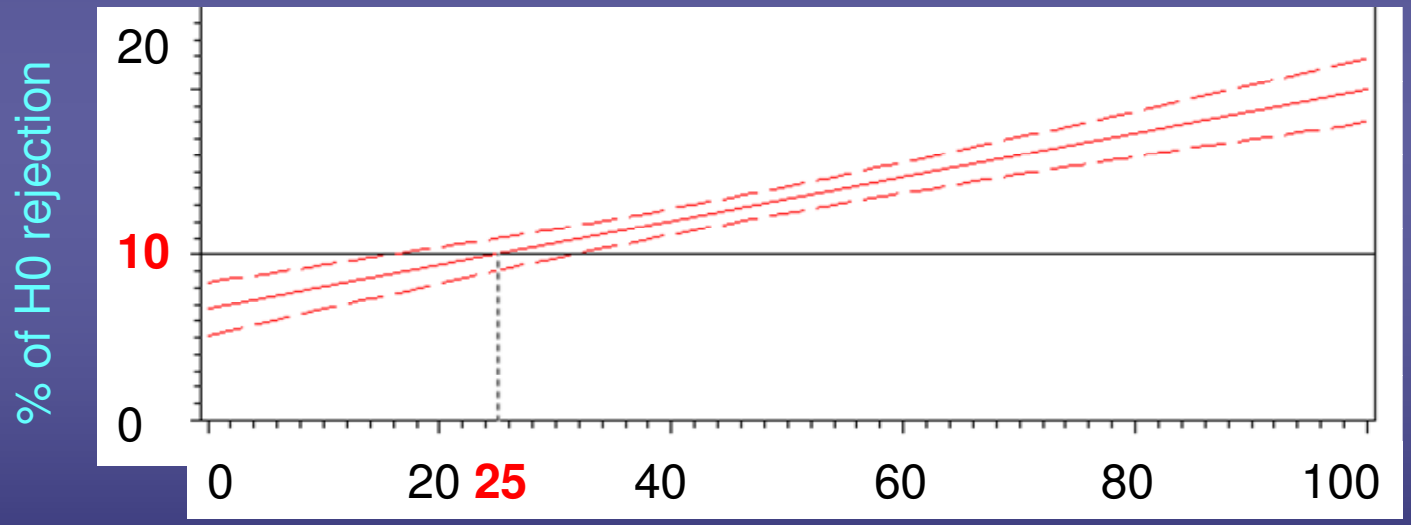
- Correlation coefficient between the vectors of product mean scores
- Discrimination power of the panel: MS_{prod} / Ms_{prod} + $MS_{prod*subj}$
- Extension of both aspects to multivariate analysis

This research is ongoing, first results expected in 2009 …

To what extent panel size can be reduced with no alteration of product mean scores ?

- Compute **r** the correlation coefficient between the vectors of product mean scores from the whole and the sub-panel
- Test H0 : " Good correlation, **r** = 0.9 " against H1: " Lack of correlation, **r** < 0.9 "

Mean and confidence interval of % of lack of correlation



From 89 datasets and 100 sub-panels per dataset and sub-panel size

In average, size of sensory panels could be reduced by 25%

Conclusion

Improving Sensobase :

- To increase result robustness by getting more data providers
- To compare multivariate statistical techniques
- To simplify data transfer (a Fizz® option is under discussion)
- To enrich method documentation

Developing a Prefbase :

- To collect datasets of hedonic scales from consumer trials
- The database was set up a couple of months ago
- Data collection has just begun within INRA, CESG and members of ACTIA (technical centers for the food industries)
- Opening it to external partners is under discussion …