



« **Bayesian Networks:**  
an alternative method to understand  
the link between fragrances and emotions »



- On a study on fine fragrances, **Sense'n Feel™ method** is used to measure **emotions and personality features**. Traditional statistical analyses give **perceptive information** on the products.
- **Bayesian Networks** method is recently used in the sensory domain:
  - What would be the **benefit** of applying Bayesian Networks?
  - Could it be an **alternative method** to understand the link between fragrances and emotions?

◆ Case study

- Description of the fieldwork
- Use of Sense'n Feel boards

◆ Method

- Bayesian Networks: principle, use and advantages

◆ Results

- Interpretation of the network
- Drivers of liking

**Bayesian Networks: an alternative method to understand the link between fragrances and emotions**

Dominic BREMMUD, Lailitha L. ERICHE, Sylvie DAN 2.0  
© 2017 & licensed to Silliker  
 ADRIANT® - SILLIKER, rue Pierre-Abelje 68biers, 44300 NANTES

1. Context & Objectives	2. Case study	4. Results
<p>Emotions are not rational: so is the act of purchase. Consumers and market researchers often try to understand the hidden part of the choice process.</p> <p>Having access to the emotions aroused by a product, would give more information to make from the consumer's expectations and then to adapt the communication. This is particularly the case of fine fragrances: they drive a lot of emotions, since they are directly related to sensory and personal references.</p> <p>Sense'n Feel<sup>®</sup> is a non-intrusive (developed by Adiant) to measure emotions and personality features. Classical statistical treatments applied to these data would provide descriptive information about fragrances.</p> <p><b>Bayesian Networks</b> method is a modeling tool recently used in the sensory domain.</p> <p>Are Bayesian Networks a statistical alternative method to understand the link between fragrances and emotions?</p> <p>Combining Sense'n Feel<sup>®</sup> results with Bayesian Networks output may better describe fragrances through emotions felt by consumers. It would allow to:</p> <ul style="list-style-type: none"> <li>• create a network connecting smelling fragrance personalities and sensory items,</li> <li>• highlight unexpected links between items,</li> <li>• create a model explaining the liking,</li> <li>• identify the drivers of liking</li> </ul>	<p>A blind test led on 254 consumers was carried out in France. Five fragrances from the market were assessed via a monadic sequential order according to a full balanced design (Fiel for 1M): Eau de Parfum, 150ml; 1) Anichon/Noelensme and Black Orchid.</p> <p>9 point-scales were used to assess the fragrances. The data set includes 30 variables:</p> <ul style="list-style-type: none"> <li>- overall liking,</li> <li>- 9 socio-demographic variables from the survey,</li> <li>- Sensory items (S),</li> <li>- 11 traits to measure emotions (E) - #6 Jokes example of "Jeune/Jeune",</li> <li>- 11 traits to measure personality features (P) - #6 Jokes example of "Jeune/Jeune".</li> </ul> <p>Each board is composed of pictures and should be considered as a whole to illustrate one emotion or personality.</p>	<p>11 Factors are coded as new latent variables to summarize all items. For example, the variables Jeune, Jeune and Eau de Parfum are summarized in a factor named "Jeune".</p> <p>Amongst them two factors composed of all socio-demographic variables are discriminated from the main network.</p> <p>Sensory terms are grouped together as well as emotions and personality features, except for the factor "Jeune". It contains all kinds of terms: Jeune, Eau de Parfum, Eau de Parfum, Eau de Parfum and Eau de Parfum.</p> <p>Probabilistic Structural Equation highlights the emotions and personality features terms have more impact on overall liking than sensory terms.</p> <p>Figure 1 - Probabilistic Structural Equation</p> <p>Four factors impact directly the overall liking:</p> <ul style="list-style-type: none"> <li>- "Jeune",</li> <li>- "Jeune/Jeune",</li> <li>- "Jeune/Jeune",</li> <li>- "Jeune/Jeune".</li> </ul> <p>Figure 2 - Impact of the four factors on overall liking</p>
<p>Classical statistical methods applied on Sense'n Feel<sup>®</sup> data provide descriptive information about fragrances:</p> <ul style="list-style-type: none"> <li>- Principal Component Analysis (PCA) allows to explore links between smelling personality features, sensory terms, and highlights similarities / differences between fragrances.</li> <li>- Analysis of Variance (ANOVA) gives significant differences between products on their sensory profiles.</li> </ul> <p>Bayesian Networks, based on conditional probabilities and Bayes theorem, use both graphs and probability theories. It aims at setting up links between terms (variables) and at creating a model explaining a target item (eg overall liking).</p> <p>The method can highlight:</p> <ul style="list-style-type: none"> <li>• the links between items with the Kullback-Leibler Divergence,</li> <li>• a classification of the items and an identification of factors (summary of several terms),</li> <li>• a model which can explain the overall liking or another term,</li> <li>• a hierarchy of the terms following their impact on the overall liking</li> <li>• an analysis probably prokaryotic definition of a new prototype.</li> </ul> <p>The advantages of this method are:</p> <ul style="list-style-type: none"> <li>• to take into account non-linear links between terms</li> <li>• to avoid issues due to missing data,</li> <li>• to analyze all the items of a questionnaire at the same time.</li> </ul> <p>All continuous data must be described as following: 1-3; 4-5-6; 7-9-0              All analyses were done with BayesLab Software developed by Beatis.</p>	<p>3. Method</p> <p>5. Conclusions &amp; Perspectives</p> <p>Combining Sense'n Feel and Bayesian Networks helps to cross the line of traditional analysis. More than an alternative, Bayesian Networks are a complementary method. Using all questionnaire items: it gives access to new product information allowing to link consumer's emotions and sensory terms (perception). It also highlights drivers of liking.</p> <p>In this study, statistics show that overall liking is more influenced by emotions than by sensory terms. This conclusion is not expected since the connection between emotions and overall liking is not direct. Indeed, when a product is assessed, the opinion of the consumers is based on its sensory perceptions, which afterwards drive emotions. Do the 6 sensory terms enough to describe products? Are the naive consumers able to answer it? Do the boards of pictures allow more direct connections without consumers' bias?</p>	<p>6. References</p> <ul style="list-style-type: none"> <li>• Baillié L. (2015), <i>Qualité de l'air et santé</i> (pp.105-120). Météo France. (Météo France, France).</li> <li>• Corio E. S. Engel M. (2019), <i>Perception of fragrance</i> (and personality). <i>Sense'n Feel</i>. <a href="http://www.adiant.com/fr/ressources/developpement">http://www.adiant.com/fr/ressources/developpement</a>.</li> <li>• Drouot P.M.A. (2016), <i>Méthodes de statistiques</i>. Dunod.</li> <li>• Drouot P.M.A. (2016), <i>Méthodes de statistiques</i>. Dunod.</li> <li>• Drouot P.M.A. (2016), <i>Méthodes de statistiques</i>. Dunod.</li> </ul>

- More than being an alternative, Bayesian Networks give **complementary** results:
  - Link between all variables,
  - Relative importance of the factors on overall liking,
  - Balance of emotions, personality features, sensory items on the overall liking
- Results of **influence** of **emotions** and **sensory items** were not expected:
  - How to explain it?
  - Which Perspectives?



Thank you  
for your attention!

