

# Bayesian Model Algorithm for Selection and Classification of Product

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**Abstract.** The goal of this research is to determine the best model for trademark, nutrition, price, packaging design, product flavor, utility, convenience, marketing, and safety while making a purchase decision in Vietnam. Quantitative research was used to implement the method. Consumers in Ho Chi Minh City, Vietnam, eat soursop products regularly, according to the data. For statistical analysis, we used R 4.0.2. The findings of this study show that product flavor, safety, nutrition, and convenience had a significant and positive impact on purchasing decisions for soursop goods (39.2%). The purchasing decision is unaffected by trademark, price, packaging design, utility, or promotion. Implications included the need to develop soursop trees in Soc Trang, Vietnam, to enhance the economy. This study uses the optimal choice of Bayesian Model Selection.

**Keywords:** buying decision; products; Bayesian

## 1 Introduction

Vietnam is one of Asia's most important agronomic nations, ensuring thriving fruit manufacturing in the area. The sparkling fruit commercial enterprise is one of the first objectives in client calls because its revenue has elevated unexpectedly [1]. In the age of globalization, every buyer on the globe can enjoy domestic goods. Most clients would like and aspire to prioritize imported goods above domestic goods when selecting necessary items to suit their demands [2].

Economic integration is a topic that all governments must address. There are advantages to global integration besides the benefits it delivers. There are additional disadvantages, such as corporate rivalry. Vietnam is growing with many advantages [3], particularly in the fruit-growing enterprise. *Annona muricata* is the clinical call for soursop, and it has a high increase fee. They acclimatize to tropical climates but are less drought and cold-tolerant than soursop. Because this plant enjoys warmth, its miles are frequently used as a clean and powerful remedy in the South.

Agricultural merchandise includes necessary manufacturing products. We need to pay more consideration to the agronomic goods industry since agricultural goods have an immediate impact on our societal well-being. Choice in Agricultural Product Purchasing Decisions has the potential to increase agricultural product manufacturing and consumption [4].

Soursop has more or less 130 genera and 2300 species worldwide [5]. They are local to South and North America's tropics. Custard apple is presently considerable in tropical and subtropical places in the sector, along with India, Malaysia, and Nigeria [6]. Soursop is commonly grown in Vietnam's southern and vital provinces.

Soursop wood is prone to cold and grows in a humid area with about 1800 mm of rainfall. A pH range of 5.0 to 6.5 [7] is recommended. In some parts of our kingdom, people plant Soursop grafted on the bottom of the bowl in salty or salty soils and under the influence of the tides.

The Soursop tree is a fruit tree with thick, black leaves that remain glossy and green all year and grow to a height of 5-8 meters. The white area around the lengthy core of soursop fruit is the pulp [8]. Soursop fruits are heart-shaped and green, measuring 15-20cm in diameter and weighing up to 4kg. Soursop seeds are black and slick, and the number of seeds per fruit varies according to the growing climate [7]. Because the thorn custard apple is difficult to keep for long periods, it is normally selected when fully developed, with the fruit turning golden and sweet, slightly sour, and with a distinct aroma.

Soc Trang is a Vietnamese agricultural province characterized by persisting economic and production systems in each sector and region, modest and dispersed production scales, and improving production and business efficiency. Production expenses are still low, but they are significant. In the face of increasing global and regional competition, the province's global and regional economic integration of enterprises continues to fall short of expectations.

The disparity in development ranges amongst regions, in particular in remote regions populated by Khmer ethnic minorities; resources is a primary assignment for Soc Trang in the well-known integration manner; foremost, human resources for enforcing industrialization and modernization; the disparity in development ranges amongst regions, in particular in remote regions populated by Khmer ethnic minorities; the disparity in development ranges amongst regions, in particular in remote regions populated by Khmer ethnic minorities.

Along with the challenges of an agricultural province with a shaky start, the infrastructure must fulfill the criteria of the socioeconomic boom, and the province must deal with problems regularly. Weather and natural disasters have their advantages. The wide variety of negative families continues to upward push. Due to the soursop tree's remarkable monetary performance in drought and saline terrain, several farmers in Soc Trang, Vietnam, have built a soursop garden area. We designed an empirical study on buying soursop merchandise in Vietnam to evaluate the factors that have an impact on the development of soursop farming in Soc Trang Province, Vietnam.

## **2 Factors influence Buying Decision of Products**

Prediction of conduct based on decision-making behavior and the use of expectations. One of the primary considerations is maximizing one's improvements [9]. Buyer food decisions are based on quality expectations before purchase and subsequent quality experience [10]. Buyers select a product with a trademark (TM) that guarantees a considerable quality, according to numerous sorts of studies. They also demonstrate that the factor of nutrition (NU) has a significant impact on food purchasing [11].

The first is the utility (UT) of food quality aspects, which are separated into three categories: search, experience, and credence. Color, price (PE), and size are search variables that are measured before the products are purchased, whereas experience points are those that buyers interpret after they have purchased and used the object [10]. Second, packaging design is important because it gives to the development of long-term consumer loyalty and the formation of a positive image associated with the company manufacturer's trademark owner [11]. Third, product flavor (PF) is the sensual impress formed by flavor and smell buds, and it

is a crucial predictor of a consumer's purchasing decision and the consistency of a product [12]. Fourth, convenience (CO) is mentioned as a motive on occasion, and a shopping list has been developed. This is something White and Manning has thought about. There are also other price and item subcategories. The most often mentioned variables impacting buying decisions were convenience difficulties. Fifth, with Promotion (PM), buyers want to try these items out, and current consumers are supposed to be motivated to purchase more regularly so that a company's products can be repurchased and sales volume can improve. Promotional programs can promote short-term sales by increasing customer interest in purchasing items, ensuring a consistent reaction from buyers, emphasizing product discounts, and emphasizing product discounts. If the campaign is repeated and improved, it should have an impact on purchasing decisions, encouraging buyers to buy more items and increasing the number of products they buy. Discounts can be used to attract new customers, encourage customers to spend more, and encourage people to try new things [14]. Finally, customers, the food sector, and the government are all concerned about food safety. Consumers' approach to food safety is dependent in part on faith in the food supply chain because they are unable to detect food safety issues. The study's purpose is to investigate the elements that influence customer trust, food safety, and, as a result, their willingness to purchase cattle [15].

According to various writers in Vietnam, product (PF), pricing (PE), location (PL), and promotion (PM) have proved their superior impact on accelerating sales [1], developing business, and competing successfully in the marketplace [16]. This shows that businesses are becoming more eager to devote themselves to marketing efforts [17]. As a result, the beneficial benefits of the product (PF), price (PE), location (PL), and promotion (PM) on customer purchasing decisions have been extensively studied [1, 18].

### **3 Method**

According to Tabachnick and Fidell [19] for the best regression analysis, it is necessary to ensure the sample size: is  $N \geq 8m + 50$ . Participants answered survey questions, which was the primary method of data gathering. The survey inquired about the current situation of the factors that influence purchase decisions. Respondents were picked using traditional approaches, and there were 194 customers in Ho Chi Minh City, Vietnam. There were 70 men (36.1%) and 124 women in our research population (63.9 percent).

The best model for R software was chosen to use BIC (Bayesian Information Criteria). In the theoretical environment, BIC has been used to choose models. BIC can be used in a regression model to estimate one or more dependent variables from one or more independent variables [20]. The BIC is a crucial and useful indicator for identifying a complete and simple model. A model with a lower BIC is chosen based on the BIC information standard. When the minimal BIC value is reached, the best model will end [20-22].

## 4 Results

### Bayesian Model Selection

Every stage of the search for the best model is detailed in the R report. BIC selects the best 5 models in table 1.

**Table 1.** Bayesian Model Selection

DE	Probability (%)	SD	model 1	2	3	4	5
Intercept	100.0	0.190471	1.11148	1.29953	1.19178	1.09596	1.21932
TM	4.6	0.008270	.	.	.	.	.
NU	88.6	0.053819	0.12007	0.13789	0.12602	0.10122	.
PE	7.6	0.015439	.	.	0.04342	.	.
PD	3.9	0.007013	.	.	.	.	.
PF	100.0	0.045029	0.18339	0.19697	0.18780	0.17971	0.20003
UT	11.6	0.025952	.	.	.	0.04277	.
CO	91.0	0.046642	0.10644	.	0.11102	0.10279	0.12369
PM	4.5	0.007866	.	.	.	.	.
SA	100.0	0.049730	0.17834	0.18662	0.18047	0.16687	0.22852

There are nine independent variables and one dependent variable in this study. With a probability of 100 percent, product flavor (PF) and safety (SA) influence the relevance levels of the aspects that lead to the decision to gain the soursop product (color, flavor, smell, design, and pylorus), while convenience (CO) and nutrition (NU) influence buying decision (DE) with an average probability of 91 percent and 88.6 percent, respectively. Price (PE), trademark (TM), marketing (PM), and packaging design (PD) all have a low chance of influencing buying decisions (DE): 7.6, 4.6, 4.5, and 3.9%, separately.

### Model Evaluation

**Table 2.** Model Test

Model	nVar	R <sup>2</sup>	BIC	post prob
1	4	0.392	-75.55172	0.526
2	3	0.364	-72.02293	0.090
3	5	0.397	-71.69359	0.076
4	5	0.395	-71.28243	0.062
5	3	0.361	-71.22831	0.061

**BIC = -2 \* LL + log(N) \* k**

According to the results from table 2, BIC shows model 1 is the optimal selection because BIC (-75.55172) is the minimum. Nutrition (NU), product flavor (PF), convenience (CO), and safety (SA) impact buying decision (DE) is 39.2% (R<sup>2</sup>) in table 4. BIC finds model 1 is the optimal choice and three variables have a probability of 52.6% (post prob). The regression equation below is statistically significant, according to the analysis above.

$$DE = 1.11148 + 0.12007NU + 0.18339PF + 0.10644CO + 0.17834SA$$

## Discussion

More than half of those asked claimed they ate soursop for health reasons, while nearly 20% said it was a personal favorite. TM, PE, PD, UT, and PM are not the major criteria for guiding the purchasing decision (DE) of items from the soursop (PM). As a result, product flavor (0.18339) is an important factor in this group of customers' decision to buy soursop items. The second most important factor in survey respondents' purchasing decisions is safety (0.17834). Nutrition is the third important component (0.12007N). Convenience is the last crucial component (0.10644). These four characteristics are important to customers when selecting whether or not to utilize soursop products, although they are not comparable to the five factors described above that were rejected. These four characteristics are important to customers when selecting whether or not to utilize soursop products, although they are not comparable to the five factors described above that were rejected. This conclusion emphasizes the importance of taking product flavor (PF) and safety (SA) into account while developing soursop-based products. Furthermore, safeguarding nutrition (NU) and convenience (CO) will contribute to the commercial success of the product. To summarize, the province of Soc Trang needs the growth of soursop trees to increase its budget. It is commonly used in ice creams, sweets, and a variety of other meals and beverages due to its sweet flavor. Aside from its culinary uses, the soursop contains many useful chemicals with therapeutic qualities. Aside from its use as a food, the soursop has several beneficial compounds that have therapeutic properties.

## 4 Conclusions

The hypothetical framework of measurable models and the outcomes of applying for the buying decision (DE) to construct the consuming marketplace for a variety of soursop products are the subject of this paper. According to the experiments, product taste (PF), safety (SA), nutrition (NU), and convenience (CO) are the aspects that influence purchasing decisions (DE) in order of priority (DE).

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