Tecno-Emotional Cuisine and the Human Sense Case Study: Ecuadorian Food Heritage

Research Article

[1]Cristina Páez-Quinde,[2]Mayra I. Barrera G.,[3]Sonia Armas-Arias, [4]Xavier Sulca-Guale

Abstract

Techno-emotional cuisine is one of the recent gastronomic trends that is based on the elaboration of dishes in order to stimulate all the human senses. This type of cuisine makes traditionalist paradigms or pre-established rules disappear such as; sweet - salty; or either main or complementary ingredients. It involves the use of techniques and technological tools that lead to create a unique sensory and emotional experience to the diner in each plate, i.e. the holistic concept is really what matters to reach the climax of the consumer and the interaction of all the senses. Techno-emotional cuisine never goes against traditions or the essence of food, on the contrary, it values, respects, evolves and enhances food or traditional dishes that are part of the country's inherited heritage. Ecuadorian food's heritage has been identified through the application of the Methodological Manual for the Preparation of the Atlas "Food Heritage", classifying gastronomy by culinary regions of the country and the use of local products (potato, corn, guinea pig, shrimp) as well as imported products (platain, yucca, pork, beef). All these products contribute to the preparation of pre-Hispanic and local dishes. Gastronomic proposals were elaborated with the application of contemporary and avant-garde culinary techniques, so that they were reflected in the production of cookbooks based on products such as; potato, lupin beans, machica, medlar and local informative cuisine magazines like, Ambato and Mocha. The perception of these senses was identified with a 5-point Likert scale. Some encouraging results were obtained from the use of food heritage with avant-garde culinary techniques. The best perceptions were focused on the use of potatoes, medlar and machica, so that some preparations such as; breads, cookies, jams, sauces, drinks, among others were made from these products. Finally, emotional evaluations of food were applied; emotions such as joy, surprise, sadness, nostalgia, among others were identified in this research work

Keywords- Techo-Emotional Cuisine, Emotions, Food Heritage, Facial Recognition and Organoleptic.

[1,2,3,4]Facultad de Ciencias Humanas y de la Educación, Universidad Técnica de Ambato, Ecuador.
E-mail: [1]mc.paez@uta.edu.ec, [2]mayraibarrerag@uta.edu.ec

I. INTRODUCTION

This project TECHNO-EMOTIONAL CUISINE AND THE HUMAN SENSES LABORATORY CASE STUDY: ECUADORIAN FOOD HERITAGE has fulfilled the established purpose, which was research the Ecuadorian food heritage and therefore its classification by regions and origin of both primary and processed products throughout the two years. The beneficiary population has been classified through the dissemination of information

[1]Cristina Páez-Quinde,[2]Mayra I. Barrera G.,[3]Sonia Armas-Arias, [4]Xavier Sulca-Guale

that has been carried out throughout this time and it is detailed below: The direct beneficiaries are the amateur and expert community in gastronomy by having gastronomic innovation with the use of Ecuadorian heritage products, counteracting the homogenization of the current diet. In the educational field, this research will allow molecular and avant-garde cooking practices to be carried out by having the necessary equipment and chemicals to produce this type of cuisine. Educational Psychology and Psychopedagogy students will benefit from the psychopathology of emotions by differentiating that there is a direct association with emotions. It can be distinguished that there is a contrast between emotional and physiological eating. Students and teachers of the Tourism and Tourism and Hospitality major of Facultad de CienciasHumanas y de la Educacion will be able to develop better techniques

and technologies in food processing by using this laboratory. Psychopedagogy students will be able to study the emotions and feelings that the gastronomic field monopolizes. Students of Basic Education will be able to measure factors related to nutrition and the stimulation of learning. Professors of the Facultad de CienciasHumanas y de la Educación will have a full-time laboratory that complies with social roles through studies of the human senses and emotions.

Eating

The act of eating is said that it is a priority to the biological need. People eat because they need to feed themselves. The senses participate in building a performative narrative form in which passions such as pleasant memories, special tastes, and exquisite aromas are exposed or either unpleasant tastes play a role in the act of eating [1]. Food is located in a constant relationship between the natural and social, between the ecological, the biological and the socio-cultural, between the individual and the collective, it is a highly complex fact that has the capacity to transform culture as an abstraction into something as concrete as food. It can probably mean that any culture is served on a plate. The nutritional importance of food has been prioritized in the new millennium because of its verification, measurement, control, and labeling (ecological aspects and useful life). This is one more effect of the rationalization process in modernity in a society where the explanatory myth of reality and its legitimation is occupied by science and the secular authority of the expert replaces the one given by any priest in ancient times [2]. In the kitchen, as in other branches of food research, sensory perception takes part in the upper vertex and in other disciplines converge from an anthropological concept. Two concepts are key and are needed between them i.e. the "Cook" and "diner". These two figures need sensory evaluation to relate to the foods they create and consume so that this action consolidates the classic definition of sensory evaluation "scientific discipline used to evoke, develop, analyze and interpret reactions on the characteristics of the products or materials as they are perceived by the senses of sight, smell, taste, touch, and hearing"[3].

Beginnings and traditional context

The study of emotions appears with Williams James and Carl Llange since 1884 as Psychological foundations of the understanding of human behavior. These foundations stated that the cerebral cortex receives responses and interprets the sensory stimuli that generate emotion, so they produce visceral and muscular changes in turn. If the necessary reinforcement of these stimuli is produced, a feeling behavior will be evidenced in front of the stimuli [4]. The study of emotions is carried out under the connotation of understanding human behavior through the initial contributions. Studies on emotions to understand their relationship to different stimuli

continue to advance based on common relationships made in the beginning. Many authors agree that emotions are the response to structures of meaning in different situations [5], [6], [7]. It can be noted that emotion has its epistemological origin from the Latin Emovere which means to move or disturb. Translated into everyday language, emotions transcend moving the brain to lead it to produce ideas, memories, feelings, or passions through stimuli that develop these behaviors. However, emotions are not all positive. They fall into a negative field when these stimulating actions involve the genesis of behavior.

The basic emotions can be fused into two to originate advanced emotions. These advanced emotions are love, submission, fright, disappointment, remorse, contempt, treachery, and optimism[8]. This theory supports subsequent studies of emotional intelligence as a key factor in the idealization of humans [9].

Techno-emotional kitchen

The term Techno-emotional Kitchen is a worldwide culinary movement of the early 21st century, whose main representative is Chef FerranAdrià. This movement is made up of chefs of different ages and traditions in which their dishes aim to create emotions in the diner through the use of new techniques and technologies. Also, they were the discoverers or interpreters who used other chefs systems and concepts previously developed. This does not pose any confrontation with tradition, because many of these dishes are an evolution in their preparation [10].

The impact of traditional cuisine within any place that intends to develop tourism is effective in the same proportion of the degree of perception that the visitor has of it. A first step for the correct management of traditional gastronomy, and which would become the main objective of this research is to be certain of the elements that make it up as well as identifying them from the customs of the people of Portoviejo, from their daily life activities and their ancestry as Manabitas. What in FerránAdrià's restaurant "El Bulli" [11]stands out is his innovative vision of gastronomy, in which there was no menu and it became an experience that could be tested by the five senses. It is the starting point in the development of countless techniques with the use of chemicals and cutting-edge equipment, which allowed chefs to obtain textures, flavors, and aromas[12].

Table 1. Technique creation table

Year of Creation	Technique	Equipment - Chemical Compound	Result product
1994	Foams	Siphon	Very aerial and light texture
1998	Hot gelatin	Agar-agar	Gelling in hot products
1999	Iced powder	Pacojet	Snow-like texture in juice poder, water or puree
2003	Airs	Soy lecithin - mixer	Light consistency
2003	Spherification	Sodium alginate and calcium chloride	Instant gelation of a fluid keeping liquid inside.
2004	Nitros	Nitrogen at -196ºC	Sorbets, shots, foams.
2005	Reverse spherification A	Dairy, calcium salt and alginate	Instant gelation of a fluid keeping liquid inside.

[1]Cristina Páez-Quinde,[2]Mayra I. Barrera G.,[3]Sonia Armas-Arias, [4]Xavier Sulca-Guale

2006	Reverse spherification B	Juice and puree - Calcium gluconolactate	Instant gelation of a fluid keeping liquid inside.
2008	Spherification Moldable (or m-spherification)	Calcium gluconolactate	Instant gelation of a fluid in triangular, square, etc. shapes, keeping liquid inside.

Source: [2]

Food sovereignty

The **CONSTITUTION OF ECUADOR** in its Third Chapter Food Sovereignty:

Art. 281.- Food sovereignty constitutes a strategic objective and an obligation of the State to guarantee that individuals, communities, people, and nationalities achieve self-sufficiency in healthy and culturally appropriate food on a permanent basis.

13. Prevent and protect the population from the consumption of foods that are contaminated or that endanger their health or that science has uncertainty about its effects.

14. Acquire food and raw materials for social and nutritional programs, primarily from associative networks of small producers.

According to the (Organic Law of the Food Sovereignty Regime., 2010) in its Article 27. The incentive to the consumption of nutritious foods. - In order to reduce and eradicate malnutrition, the State will encourage the consumption of nutritious foods, preferably of agroecological and organic origin by supporting their marketing, carrying out nutritional promotion and education programs for healthy consumption, identification and labeling of the nutritional content of foods, and the coordination of public policies.

Facial recognition through technological application tools

Facial recognition is defined as the identification of a person through the analysis of biometric characteristics specifically of the face. The extraction of this type of information is related to the characteristics of mathematical processes and coincidence algorithms, thus allowing this to expand various fields, not only in the technological part. Currently, Tourism has become a world power activity and therefore the creation of a project is proposed. This project articulates web 2.0 and 3.0 tools linked to the field of Tourism[14] in all its classifications, thus allowing Ecuador and its regions to be promoted as a Tourist Destination.

Artificial vision is used in several areas, one of them is the fight against terrorism and insecurity due to crime. All of them are used through efficient systems capable of recognizing strange or different situations from a routine, as well as the scenarios of the gastronomy and tourism[15]. This research work demonstrates the detection of emotions through the tasting of foods from the Ecuadorian food heritage. The detection and consequently the monitoring of people and their body parts is of utmost importance in understanding human tasks. The most used mechanism is video surveillance, different from the traditional, this one is automated and intelligent. This sort of surveillance allows us to become an active area of research to the great demand of these systems in large areas of massive concurrence of people such as airports, educational institutions at all levels, train and bus stations as well as Massive events[16].

In conclusion, artificial vision is a great support within surveillance networks, because they are monitored by specific personnel. This personnel is in charge of large amounts of monitoring that are fed by cameras, therefore, the use of the artificial vision optimizes and makes the process of

detecting daily routines effective at the same time[17]. The Table 1 depicts that the overview of techniques for food.

II. MATERIALS AND METHODS

The methodology used in this research project is based on experimentation, because most of the dishes made by the undergraduates in process of their graduation were tasted by students of Facultad de Ciencias de la Educacion. A random sample of 300 students was taken. Students were grouped into 20 participants per group. These groups tasted the dishes and two research instruments were applied, both for the sensory organoleptic analysis and the recognition of emotions. As the final results, there is the validation of the data obtained by the aforementioned instruments. Different statistical methods were applied for the correlation of the variables. The data was processed through the support of the SPSS statistical software so that the following results were obtained:

Organoleptic analysis - emotional gastronomy Fiesta de las Flores y las Frutas
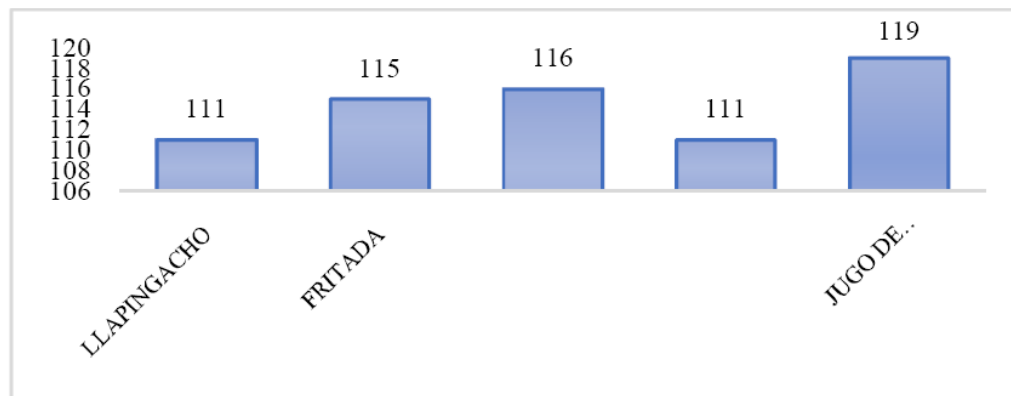**Sensory**
Parameter :Color

Figure 1. Organoleptic analysis - color

According to the parameter of color from all tasted dishes (Figure 1), it is evident that the highest percentage of people corresponds to the color of blackberry juice with coconut, while the lowest percentage

corresponds to the color of Colada Morada with Empanada de Viento because there is lack of colors, so that more decoration is needed with the fruits that these dishes are made of.

Parameter : Smell

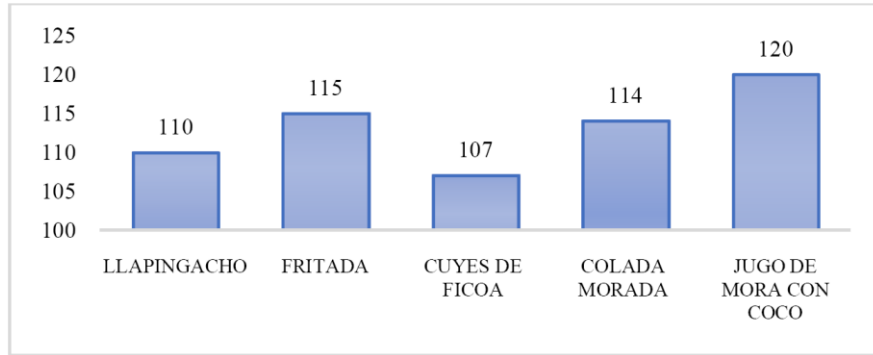[1]Cristina Páez-Quinde,[2]Mayra I. Barrera G.,[3]Sonia Armas-Arias, [4]Xavier Sulca-Guale

Figure 2. Organoleptic analysis – smell

According to the parameter of smell from all tasted dishes (Figure 2), it is evident that the highest percentage of people corresponds to the smell of blackberry juice with coconut, while the lowest percentage corresponds to the color of fritada because a good smell did not give off from the fried pork.
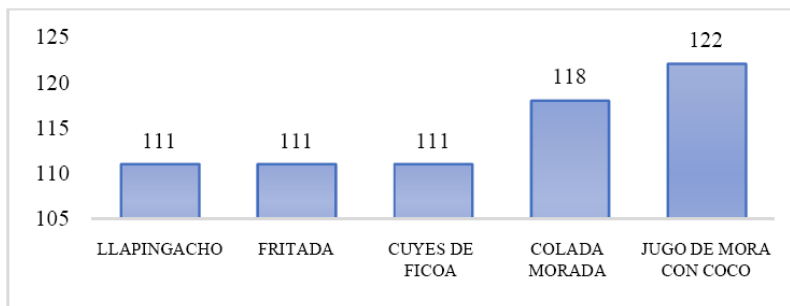
Parameter :Flavor

Figure 3. Organoleptic analysis – flavor

According to the parameter of flavor from all tasted dishes (Figure 3), it is evident that the highest percentage of people corresponds to the taste of blackberry juice with coconut and colada morada, while the lowest percentage corresponds to the taste of fritada and Ficoa roasted guinea pig because the guinea pig was not roasted enough and its blood had not yet dried well.
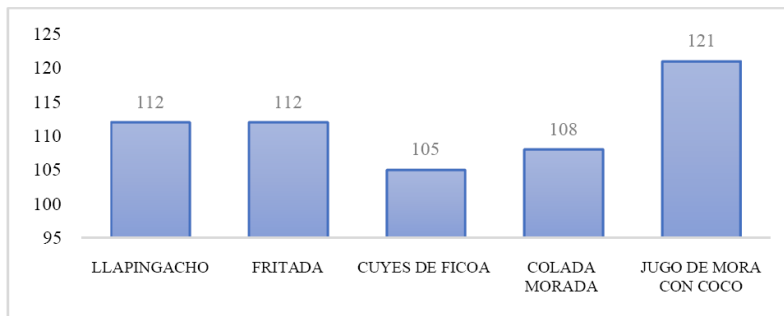
Parameter : Texture

Figure 4. Organoleptic analysis – texture

According to the parameter of texture from all tasted dishes (Figure 4), it is evident that the highest percentage of people corresponds to the texture of blackberry juice with coconut, while

the lowest percentage corresponds to the taste of Ficoa roasted guinea pig because guinea pig's skin was not very crunchy because it was not roasted enough.
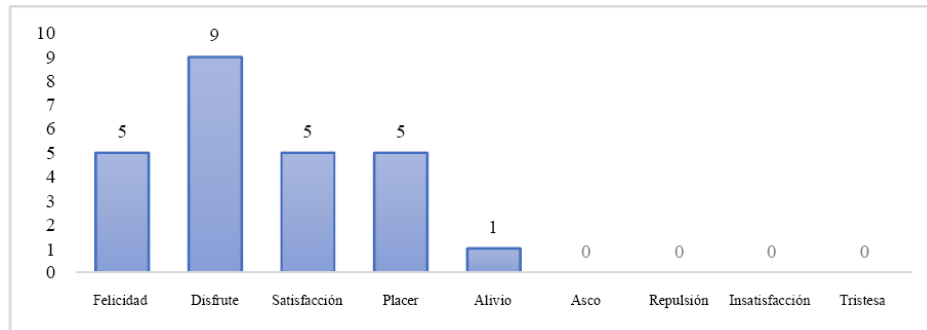

Figure 5. Emotional result of Llapingacho

According to the emotions caused by tasting Llapingacho (Figure 5), it is evident that the highest percentage of the people surveyed enjoyed tasting this dish, while the lowest percentage was relieved because they had a craving to try this dish.

Statistical calculation of experimentation

The Friedman test is considered for the development of the correlation of the variables. It can be shown (Figure 6) that having a p (value) less than 0.005, the null hypothesis is rejected and the alternative is accepted i.e. emotions are directly related to the sensory-organoleptic analysis of the dishes.

Se muestran las significancias asintóticas. El nivel de significancia es ,05.
Figure 5. Friedman analysis (emotions)
Source: SPSS Program

III. RESULTS AND DISCUSSION

For the identification of the Ecuadorian food heritage, the gathering of information is considered by means of the Atlas of the Food Heritage of Ecuador. These files were adapted according to the needs of the research. Based on the Methodological Manual for the elaboration of the Food Heritage Atlas which is an initiative (Ministry of Culture and Heritage, 2020);

based on the emblematic project "Heritage Cities of Ecuador" with the component "Food Heritage". This is how the Techno-emotional Kitchen Laboratory project and the Ecuadorian

[1]Cristina Páez-Quinde,[2]Mayra I. Barrera G.,[3]Sonia Armas-Arias, [4]Xavier Sulca-Guale

Food Heritage case study proposed the revaluation of gastronomic wealth at the national level based on cutting-edge techniques and technologies within the kitchen. The information gathering takes place prior to the academic tours of the students of the Tourism and Tourism and Hospitality majors of Facultad de CienciasHumanas y de la Educacion to different locations in the regions of Ecuador. These files include the creation of a letterhead for the techno-emotional kitchen and the senses laboratory and the adaptation of the information required for this research project. The evaluation of emotions in the fulfillment of this objective is carried out through the application of a validated instrument. Obviously, the execution of an emotional analysis file is based on studies already carried out by researchers. In short, it is the interpretation of emotional situations such as happiness, surprise, fear, sadness, disgust, angry, to have a response to reactions according to the tasting and establishing results with food elaborations. The list of emotions in The Geneva Emotion Wheel (GEW) model. Emotions are alphabetically arranged in this wheel as follows: joy, relief, love, longing, regret, disgust, amazement, jealousy, compassion, guilt, disappointment, despair, contempt, enjoyment, fun, anger, envy, happiness, interest, irritation, elation, pity, wonder, fear, nostalgia, pride, pleasure, worry, remorse, revulsion, laughter, surprise, tenderness, sadness, shame.

Facial recognition - emotions
For the facial recognition, it is required to locate focal points i.e. human features such as mouth, nose, eyes and ears. They were located through photographs or in real time through the use of a camera. The objective of this type of facial recognition systems is to identify a set of images which are unknown, so that these images can be recognized simultaneously through data training (real time).The python code for the Emotion recognition is shown in Figure 7.

```python
import cv2
import os
import numpy as np

def emotionImage(emotion):
        # Emociones
        if emotion == 'Felicidad': image = cv2.imread('emociones/felicidad.jpeg')
        if emotion == 'Enojo': image = cv2.imread('emociones/enojo.jpeg')
        if emotion == 'Sorpresa': image = cv2.imread('emociones/sorpresa.jpeg')
        if emotion == 'Tristeza': image = cv2.imread('emociones/tristeza.jpeg')
        return image

# ----------- Métodos usados para el entrenamiento y lectura del modelo ----------
#method = 'EigenFaces'
#method = 'FisherFaces'
method = 'LBPH'

if method == 'EigenFaces': emotion_recognizer = cv2.face.EigenFaceRecognizer_create()
if method == 'FisherFaces': emotion_recognizer = cv2.face.FisherFaceRecognizer_create()
if method == 'LBPH': emotion_recognizer = cv2.face.LBPHFaceRecognizer_create()

emotion_recognizer.read('modelo'+method+'.xml')
# -------------------------------------------------------------------------------

dataPath = '.../Reconocimiento Emociones/Data' #Cambia a la ruta donde hayas almacenado Data
imagePaths = os.listdir(dataPath)
print('imagePaths=',imagePaths)

cap = cv2.VideoCapture(0,cv2.CAP_DSHOW)

faceClassif = cv2.CascadeClassifier(cv2.data.haarcascades+'haarcascade_frontalface_default.xml')

while True:

        ret,frame = cap.read()
        if ret == False: break
        gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
        auxFrame = gray.copy()

        nFrame = cv2.hconcat([frame, np.zeros((480,300,3),dtype=np.uint8)])
```

Figure 6. Emotion recognition - Python software

CONCLUSIONS

This research project has met the proposed objectives, allowing the students of the majors of Facultad de CienciasHumanas y de la Educación to be the direct beneficiaries of the articulation of this project with their graduation research work, thereby promoting that the research field is significantly expanded, i.e. both Professors and students form research work teams that allow the social, economic and innovative contribution that research requires.

Innovative proposals have been developed both in the gastronomic, psychological, and technological part. They allow the dissemination of updated, modern information and above all the use of new techniques and technologies without leaving aside the part of ancestrality as a focal point in the research. This is the case of new recipes based on Ecuadorian food heritage. The dissemination of information played a fundamental role, which allowed Ambato's community to learn about new gastronomic routes, the development of mobile applications to promote tourism both in its small towns as well as in the whole province. The development of innovative products such as the recognition of emotions based on the tasting of products made using cutting-edge gastronomic techniques, automating processes, and consequently generating new technologies.

REFERENCES

[1]Cristina Páez-Quinde,[2]Mayra I. Barrera G.,[3]Sonia Armas-Arias, [4]Xavier Sulca-Guale

[1] T.-O. F., V. M.F., I.-P. R., D.-M. S., T.-S. R. and N.-E. M., "Heritage Cooking as Tourist Motivation: Ambato Case Study," *Springer,* pp. 109-114, 2019.

[2] H. Masoud, M. Mortazavi and N. Torabi Farsani, "A study on tourists' tendency towards intangible cultural heritage as an attraction (case study: Isfahan, Iran)," *City, Culture and Society,* vol. 54, no. 60, pp. 54-60, 2019.

[3] F. Farrelly, F. Kock and A. Josiassen, "Cultural heritage authenticity: A producer view," *Annals of Tourism Research,* vol. 79, p. 102770, 2019.

[4] X. Yi, X. Fu, L. Yu and L. Jiang, "Authenticity and loyalty at heritage sites: The moderation effect of postmodern authenticity," *Tourism Management,* vol. 67, pp. 411-424, 2018.

[5] A.-M. Brouwer, M. Hogervorst, J. B.F. van Erp, M. Grootjen, E. van Dam and E. H.Zandstra, "Measuring cooking experience implicitly and explicitly: Physiology, facial expression and subjective ratings," *Food Quality and Preference,* vol. 78, p. 103726, 2019.

[6] K. Janhonen, K. Torkkeli and M. J., "Informal learning and food sense in home cooking," *Appetite,* vol. 130, pp. 190-198, 2018.

[7] K. Altuwairqi, S. Kammoun-Jarraya, A. Allinjawi and M. Hammami, "A new emotion–based affective model to detect student's engagement," *Journal of King Saud University - Computer and Information Sciences,* pp. In Press, Corrected Proof, 2018.

[8] M. Iosifyan and O. Korolkova, "Emotions associated with different textures during touch," *Consciousness and Cognition,* vol. 71, pp. 79-85, 2019.

[9] S. Chakravarthula, B. R.W. Baucom, S. Narrayanari and P. Georgiou, "An analysis of observation length requirements for machine understanding of human behaviors from spoken language," *Computer Speech & Language,* vol. 66, p. 101162, 2021.

[10] S. Coman and M. Opazo, "A canon of one's own: A comparative analysis of cultural production in gastronomy and the visual arts," *Poetics,* Vols. In Press, Corrected Proof, p. 101474, 2020.

[11] A. Jimenez-Mavillard and J. Suarez, "Diffusion of elBulli's innovation: Rate of adoption in Allrecipes and Epicurious," *International Journal of Gastronomy and Food Science,* vol. 22, p. 100243, 2020.

[12] L. Marcuta, A. Marcuta and B. Marza, "Modern Tendencies in Changing the Consumers' Preferences," *Procedia Economics and Finance,* vol. 16, pp. 535-539, 2014.

[13] A. Jimenez-Mavillard, "Bullipedia: un caso de construcción social de conocimiento gastronómico.," *Electronic Thesis and Dissertation Repository,* pp. 10-14, 2016.

[14] E. Rojas-Rivas, A. Rendón-Domínguez, A. Felipe-Salinas and F. Cuffia, "What is gastronomy? An exploratory study of social representation of gastronomy and Mexican cuisine among experts and consumers using a qualitative approach," *Food Quality and Preference,* vol. 83, p. 103930, 2020.

[15] D. Weerdenburg, S. Scheider, B. Adams, B. Spierings and E. van der Zee, "Where to go and what to do: Extracting leisure activity potentials from Web data on urban space," *Computers, Environment and Urban Systems,* vol. 73, pp. 143-156, 2019.

[16] Z. Li, C. Wang, X. Liu and Y. Wang, "Facial expression description and recognition based on fuzzy semantic concepts," *Future Generation Computer Systems,* vol. 114, pp. 619-628, 2021.

[17] L. Zhang, M. Jiang, D. Farid and M. Hossain, "Intelligent facial emotion recognition and semantic-based topic detection for a humanoid robot," *Expert Systems with Applications,* vol. 40, no. 13, pp. 5160-5168, 2013.

AUTHORS' INFORMATION FORM

First Author – Information
Name   : Cristina Páez Quinde
Designation   :Researcher teacher
Department   : Facultad de Ciencias Humanas y de la Educación
University   : Universidad Técnica de Ambato
Mail ID.   : mc.paez@uta.edu.ec
Contact No.   : 593995301659
Course   : Magister
ResidentialAddress   :Letamendi y San Cristóbal, Ambato-Ecuador

Second Author – Information
Name   : Mayra I. Barrera G.
Current Designation   :Researcher teacher
CurrentDepartment   : Facultad de Ciencias Humanas y de la Educación
University   : Universidad Técnica de Ambato
Mail ID.   : mayraibarrerag@uta.edu.ec
Contact No.   : 593995903532
Course   : Magister
ResidentialAddress   :Izamba, Ambato-Ecuador

Note: Should indicate corresponding author as CA

	Cristina Páez-Quinde obtained her Bachelor's degree in Computer Science from Catholic University of Ambato. Then she obtained her Master's degree in Tools for university teaching management and practice, Research professor at the Facultad de CienciasHumanas y de la Educación of the Universidad Técnica de Ambato. Currently, she is the main coordinator of the research Techno-Emotional Cuisine And The Human Senses Laboratory Case Study: Ecuadorian Food Heritage. Her specializations include Tourism and semantic web, Education and technology, Big Data, artificial intelligence.
	Lcda. Mayra I. Barrera G., Mg.(**Mayra Barrera**) received the Mg. degree from the Technical University of Ambato, Ecuador, in 2010, then she obtained her Master's degree in Management and Mediation of Children's Educational Centers, she is a researcher teacher at the Faculty of Humans Science and Education, Technical University of Ambato worked as a teacher in Initial Education. Her specializations include initial education, children development, and early stimulation. Her research interests are in children education and everything relation with that.

*Date of Birth: 11/Feb/1984
*Year of Registration: 2020