IT4010 – Research Project - 2023

Topic Assessment Form

Project ID : **TMP-23-381**

1. Topic (12 words max)

Cosmetic product suggestion system based facial features and skin features

2. Research group the project belongs to

Machine Learning and Soft Computing (MLSC)

3. Research area the project belongs to

Image Processing (IP)

4. If a continuation of a previous project:

Project ID	
Year	

5. Team member details

Student Name	Student ID	Specialization
Leader: Perera T.D.S	IT20228262	IT
Member 2: Karunanayake K.P.R.I	IT20164676	IT
Member 3: Karunanayake K.P.R.I	IT20242640	IT
Member 4: Sulakshana R.K.D.D	IT20247690	IT

6. Brief description of the research problem including references (200 – 500 words max) – references not included in word count

The research problem focuses on developing a cosmetic product recommendation system that combines the capabilities of machine learning and computer vision. The system is designed to analyze and interpret facial and skin features to make personalized cosmetic product recommendations. The aim is to provide consumers with customized product suggestions that are tailored to their individual skin and facial characteristics. The system would process facial images and skin data, utilizing advanced algorithms to extract relevant features and information. The output of the system would be personalized cosmetic product recommendations based on the individual's unique skin and facial features. With the rapid growth of technology in the cosmetic industry, the development of such a system has become an important area of research, as it has the potential to revolutionize the way consumers approach purchasing cosmetic products. The system would provide a more convenient, efficient and accurate method of product selection, ensuring that the consumer finds the right product for their specific needs.

References

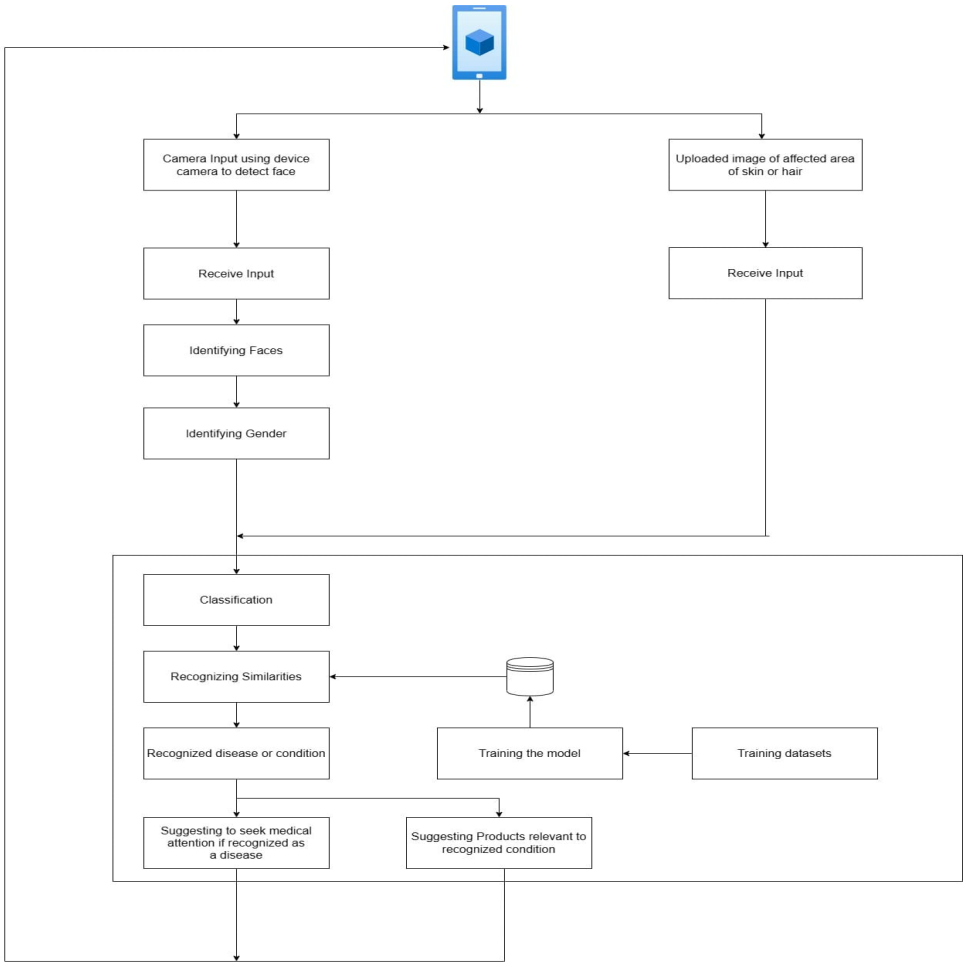
Kothari, D. Shah, T. Soni and S. Dhage, "Cosmetic Skin Type Classification Using CNN With Product Recommendation," *2021 12th International Conference on Computing Communication and Networking Technologies (ICCCNT)*, Kharagpur, India, 2021, pp. 1-6, doi: 10.1109/ICCCNT51525.2021.9580174.

ALKolifi ALEnezi, Nawal Soliman. “A Method of Skin Disease Detection Using Image Processing and Machine Learning.” *Procedia Computer Science*, vol. 163, no. 1, 1 Jan. 2019, pp. 85–92, www.sciencedirect.com/science/article/pii/S1877050919321295, https://doi.org/10.1016/j.procs.2019.12.090.

Wang, J., Li, Y., & Wang, Y. (2021). Personalized cosmetic product recommendation using facial features and deep learning. Information Processing & Management, 58(1), 102184.

Roy, Mrinmoy & Protity, Anica. (2022). Hair and Scalp Disease Detection using Machine Learning and Image Processing. 10.48550/arXiv.2301.00122.

7. Brief description of the nature of the solution including a conceptual diagram (250 words max)



The nature of the solution to this research problem is a cosmetic product recommendation system that uses machine learning and computer vision techniques to analyze and interpret facial and skin features. The system is designed to provide personalized product recommendations based on the individual's unique skin and facial characteristics. The solution leverages advanced algorithms to process facial images and skin data, extract relevant features and information, and generate customized product suggestions. The solution aims to address the challenges faced by consumers in selecting the right cosmetic product, by providing a more accurate, efficient, and convenient method of product selection. The solution also offers a unique opportunity to leverage cutting-edge technologies to revolutionize the cosmetic industry and provide consumers with personalized product recommendations that cater to their specific needs.

8. Brief description of specialized domain expertise, knowledge, and data requirements (300 words max)

1. Machine learning and computer vision: In-depth knowledge of machine learning algorithms such as deep learning, convolutional neural networks, and image processing techniques is required to develop and implement the cosmetic product suggestion system.

2. Cosmetics and skin care: A strong understanding of the cosmetics industry and the properties of different cosmetic products is necessary to make informed product recommendations.

3. Image processing and analysis: Expertise in image processing techniques, such as feature extraction, image segmentation, and data augmentation, is crucial for analyzing facial images and skin data.

4. Data management and storage: Large amounts of facial images and skin data need to be stored and managed efficiently to ensure the system is scalable and able to handle increasing demand.

5. Human-centered design and user experience: An understanding of human-centered design principles and user experience is necessary to ensure the system is user-friendly and provides a positive experience for users.

The availability of high-quality facial images and skin data is crucial for the success of the system. The data should be collected from a diverse range of individuals and should include both demographic and skin/facial feature information. The data should also be labeled accurately and be representative of the target population. The quality and availability of data will impact the accuracy of the system's cosmetic product recommendations.

9. Objectives and Novelty

Main Objective The solution aims to address the challenges faced by consumers in selecting the right cosmetic product, by providing a more accurate, efficient, and convenient method of product selection.			
Member Name	Sub Objective	Tasks	Novelty
Perera T.D.S	The objective is to develop machine learning model to analyze facial images and detect gender and skin conditions. This involves training a neural network on a large dataset of facial images and skin disease annotations. The model will be designed to identify the presence of specific facial skin conditions such as acne, dark spots, blackheads, and others by analyzing the features of the face and skin. The ultimate goal is to develop a highly accurate and efficient method for diagnosing facial skin conditions using facial images.	• Identify the face from camera video input stream using OpenCV. • Identify the gender using detected face. • Segmentation of facial skin. • Classifying abnormal facial skin areas. • Detecting facial skin conditions in abnormal facial skin areas using CNNs.	• Mobile application. • Using live video input stream instead of using images. • Using different models for each gender separately for detecting facial skin conditions instead of one for both genders .

Karunanayake K.P.R.I	The objective is to create a machine learning algorithm that can analyze hair samples and identify common hair disorders such as dandruff, hair loss, and alopecia. This will involve developing a method for extracting meaningful features from hair samples and using this information to train a machine learning model for disease diagnosis. The algorithm will be designed to accurately diagnose hair disorders and provide personalized recommendations for treatment.	• Identifying areas with hair from provided image. • Segmentation of areas with hair. • Classifying abnormal areas. • Detecting hair conditions in classified areas using CNNs.	• Mobile application. • Using different models for each gender separately for detecting facial skin conditions instead of one for both genders.
Karunanayake K.P.R.I	The objective is to develop a personalized recommendation system that uses the information obtained from other objectives to make accurate and personalized cosmetic product suggestions. This will involve combining the results of the machine learning models for skin disease diagnosis, hair conditions diagnosis and facial skin data analysis. The recommendation system will take into account the individual's specific skin type and facial characteristics, as well as the diagnosed skin and hair conditions, to generate customized product suggestions.	• Gathering result data from other objectives. • Detecting skin type from provided images for other objectives using CNNs. • Finding relevant cosmetic products based on detected hair/facial skin condition and detected skin type using gathered datasets.	• Mobile application. • Give recommendations based on not only the detected facial skin/hair condition but also based on detected skin type. • Sort the recommended cosmetic products based on user reviews for that particular product.

		• Sort recommended products by ratings. • Display the skin disease name if skin disease was detected.	
Sulakshana R.K.D.D	The objective is to use machine learning techniques to identify patterns in skin data and accurately diagnose skin diseases and analyze how far that the disease has spread or how far the disease has cured. The goal is to develop a highly accurate and efficient method for diagnosing skin diseases based on skin images.	• Identifying skin on provided image. • Segmentation of skin areas. • Detecting abnormal areas in the skin. • Analyzing abnormal areas for possible skin diseases. • Analyzing detected areas for skin diseases with timely separated datasets using CNNs.	• Mobile application. • This system can not only detect skin diseases but also can detect how far that the disease has spread or how far the disease has cured.

SLIIT UNI
THE KNOWLEDGE UNIVERSITY

IT4010 – Research Project - 2023

Topic Assessment Form

10. Supervisor checklist (supervisors should fill sections 10 and 11)

a) Is this research problem valid?

Yes	✓	No	

b) Is the proposed research group correct?

Yes	✓	No	

c) Is the proposed research area correct?

Yes	✓	No	

d) Do the proposed sub-objectives match the students' specialization?

Yes	✓	No	

e) Is the required domain expertise, knowledge and the data available?

Yes	✓	No	

f) Is the scope of the solution practical?

Yes	✓	No	

g) Do all sub-objectives have sufficient novelty?

Yes	✓	No	

11. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor		Geethanjali	Wimalaratne	
Co-Supervisor		Sathira	Hettiarachchi	
External Supervisor				
Summary of external supervisor's (if any) experience and expertise				

IT4010 – Research Project - 2023

Topic Assessment Form

Summary Sheet

The topic evaluation panel will use the summary sheet to evaluate the suitability of the project

1. Brief description of research problem including references (200 – 300 words max)

The research problem focuses on developing a cosmetic product recommendation system that combines the capabilities of machine learning and computer vision. The system is designed to analyze and interpret facial and skin features to make personalized cosmetic product recommendations. The aim is to provide consumers with customized product suggestions that are tailored to their individual skin and facial characteristics. The system would process facial images and skin data, utilizing advanced algorithms to extract relevant features and information. The output of the system would be personalized cosmetic product recommendations based on the individual's unique skin and facial features. With the rapid growth of technology in the cosmetic industry, the development of such a system has become an important area of research, as it has the potential to revolutionize the way consumers approach purchasing cosmetic products. The system would provide a more convenient, efficient and accurate method of product selection, ensuring that the consumer finds the right product for their specific needs.

References

Kothari, D. Shah, T. Soni and S. Dhage, "Cosmetic Skin Type Classification Using CNN With Product Recommendation," *2021 12th International Conference on Computing Communication and Networking Technologies (ICCCNT)*, Kharagpur, India, 2021, pp. 1-6, doi: 10.1109/ICCCNT51525.2021.9580174.

ALKolifi ALEnezi, Nawal Soliman. "A Method of Skin Disease Detection Using Image Processing and Machine Learning." *Procedia Computer Science*, vol. 163, no. 1, 1 Jan. 2019, pp. 85–92, www.sciencedirect.com/science/article/pii/S1877050919321295, https://doi.org/10.1016/j.procs.2019.12.090.

Wang, J., Li, Y., & Wang, Y. (2021). Personalized cosmetic product recommendation using facial features and deep learning. Information Processing & Management, 58(1), 102184.

Roy, Mrinmoy & Protity, Anica. (2022). Hair and Scalp Disease Detection using Machine Learning and Image Processing. 10.48550/arXiv.2301.00122.

2. Brief description of the nature of the solution (150 words max)

The nature of the solution to this research problem is a cosmetic product recommendation system that uses machine learning and computer vision techniques to analyze and interpret facial and skin features. The system is designed to provide personalized product recommendations based on the individual's unique skin and facial characteristics. The solution leverages advanced algorithms to process facial images and skin data, extract relevant features and information, and generate customized product suggestions. The solution aims to address the challenges faced by consumers in selecting the right cosmetic product, by providing a more accurate, efficient, and convenient method of product selection. The solution also offers a unique opportunity to leverage cutting-edge technologies to revolutionize the cosmetic industry and provide consumers with personalized product recommendations that cater to their specific needs.

3. Objectives and novelty

Main Objective The solution aims to address the challenges faced by consumers in selecting the right cosmetic product, by providing a more accurate, efficient, and convenient method of product selection.			
Member Name	Sub Objective	Tasks	Novelty
Perera T.D.S	The objective is to develop machine learning model to analyze facial images and detect gender and skin conditions. This involves training a neural network on a large dataset of facial images and skin disease annotations. The model will be designed to identify the presence of specific facial skin conditions such as acne, dark spots, blackheads, and others by analyzing the features of the face and skin. The ultimate goal is to develop a highly accurate and efficient method for diagnosing facial skin conditions using facial images.	• Identify the face from camera video input stream using OpenCV. • Identify the gender using detected face. • Segmentation of facial skin. • Classifying abnormal facial skin areas. • Detecting facial skin conditions in abnormal facial skin areas using CNNs.	• Mobile application. • Using live video input stream instead of using images. • Using different models for each gender separately for detecting facial skin conditions instead of one for both genders .

Karunanayake K.P.R.I	The objective is to create a machine learning algorithm that can analyze hair samples and identify common hair disorders such as dandruff, hair loss, and alopecia. This will involve developing a method for extracting meaningful features from hair samples and using this information to train a machine learning model for disease diagnosis. The algorithm will be designed to accurately diagnose hair disorders and provide personalized recommendations for treatment.	• Identifying areas with hair from provided image. • Segmentation of areas with hair. • Classifying abnormal areas. • Detecting hair conditions in classified areas using CNNs.	• Mobile application. • Using different models for each gender separately for detecting facial skin conditions instead of one for both genders.
Karunanayake K.P.R.I	The objective is to develop a personalized recommendation system that uses the information obtained from other objectives to make accurate and personalized cosmetic product suggestions. This will involve combining the results of the machine learning models for skin disease diagnosis, hair conditions diagnosis and facial skin data analysis. The recommendation system will take into account the individual's specific skin type and facial characteristics, as well as the diagnosed skin and hair conditions, to generate customized product suggestions.	• Gathering result data from other objectives. • Detecting skin type from provided images for other objectives using CNNs. • Finding relevant cosmetic products based on detected hair/facial skin condition and detected skin type using gathered datasets.	• Mobile application. • Give recommendations based on not only the detected facial skin/hair condition but also based on detected skin type. • Sort the recommended cosmetic products based on user reviews for that particular product.

		• Sort recommended products by ratings. • Display the skin disease name if skin disease was detected.	
Sulakshana R.K.D.D	The objective is to use machine learning techniques to identify patterns in skin data and accurately diagnose skin diseases and analyze how far that the disease has spread or how far the disease has cured. The goal is to develop a highly accurate and efficient method for diagnosing skin diseases based on skin images.	• Identifying skin on provided image. • Segmentation of skin areas. • Detecting abnormal areas in the skin. • Analyzing abnormal areas for possible skin diseases. • Analyzing detected areas for skin diseases with timely separated datasets using CNNs.	• Mobile application. • This system can not only detect skin diseases but also can detect how far that the disease has spread or how far the disease has cured.

IT4010 – Research Project - 2023

Topic Assessment Form

<u>This part to be filled by the Topic Screening Panel members</u>

Acceptable: Mark/Select as necessary

Topic Assessment Accepted	
Topic Assessment Accepted with minor changes (should be followed up by the supervisor)*	
Topic Assessment to be Resubmitted with major changes*	
Topic Assessment Rejected. Topic must be changed	

* Detailed comments given below

Comments

The Review Panel Details

Member's Name	Signature

Important:

1. According to the comments given by the panel, do the necessary modifications and get the approval by the **Supervisor** or the **Same Panel**.
2. If the project topic is rejected, identify a new topic, and request the RP Team for a new topic assessment.
3. The form approved by the panel must be attached to the **Project Charter Form**.