

Hair and Beard style Recommendation System based on the Face Shape and Gender

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Agenda

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Problem Background

Fashion Industry

- In 2021, the total industry value is \$759.5 billion (GLOBAL GARMENT AND TEXTILE INDUSTRIES).
- According to one estimate, it will increase by \$1 trillion by 2025 (Liu et al., 2019).
- providing numerous employment opportunities.

Hairstyle & Beard style

- The market size of the industry has reached USD 20.61 billion (Wang et al., 2022).
- The industry will increase by 30.80 billion by 2030 (Wang et al., 2022).
- can use ML to enhance customer experiences and improve business operations

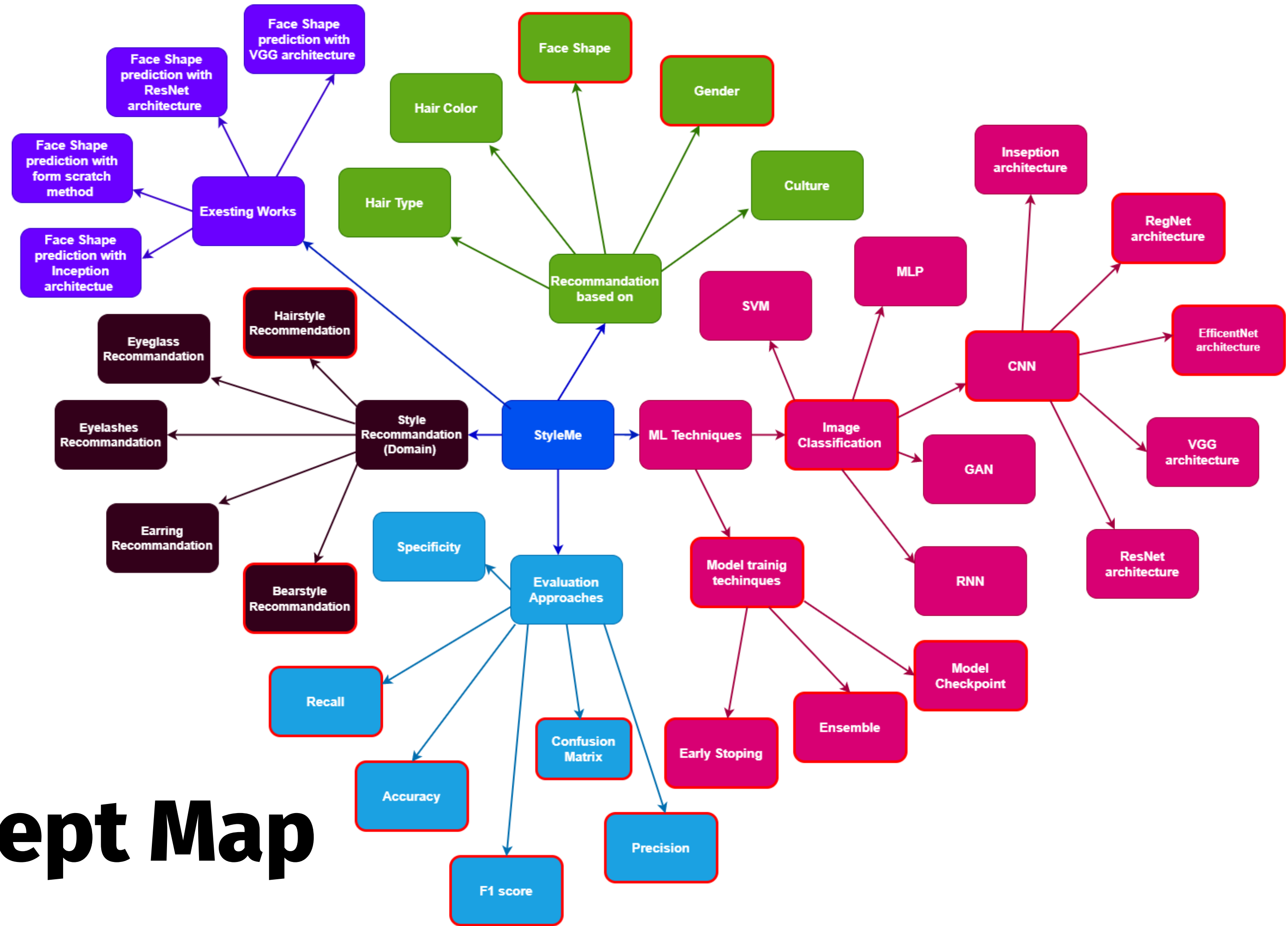
Problem Definition

It is difficult to decide on a suitable hair or beard style without the help of a stylist, but if a person wants to find a stylist, it's more expensive and time-consuming.

Research Gap

- There is currently no system available for suggesting hair and beard style combinations based on face shape and gender.
- In the past, none of the researchers utilized CNN architectures such as EfficientNet and RegNet for face shape prediction. Additionally, employing the Ensemble method yields better performance.
- In the past, researchers did not employ CNN architectures like EfficientNet for gender identification. However, these method have been found to offer improved performance.

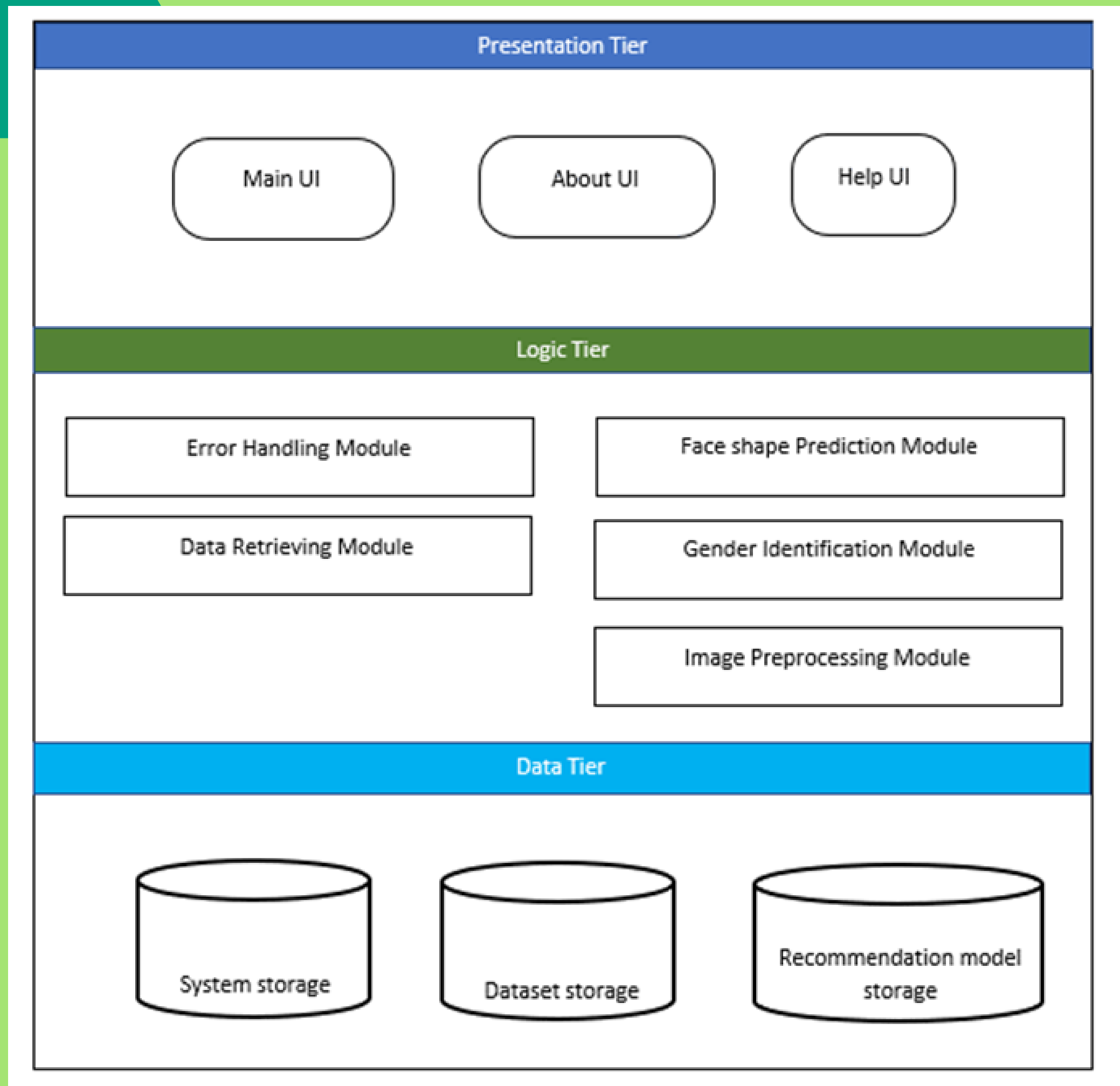
Concept Map



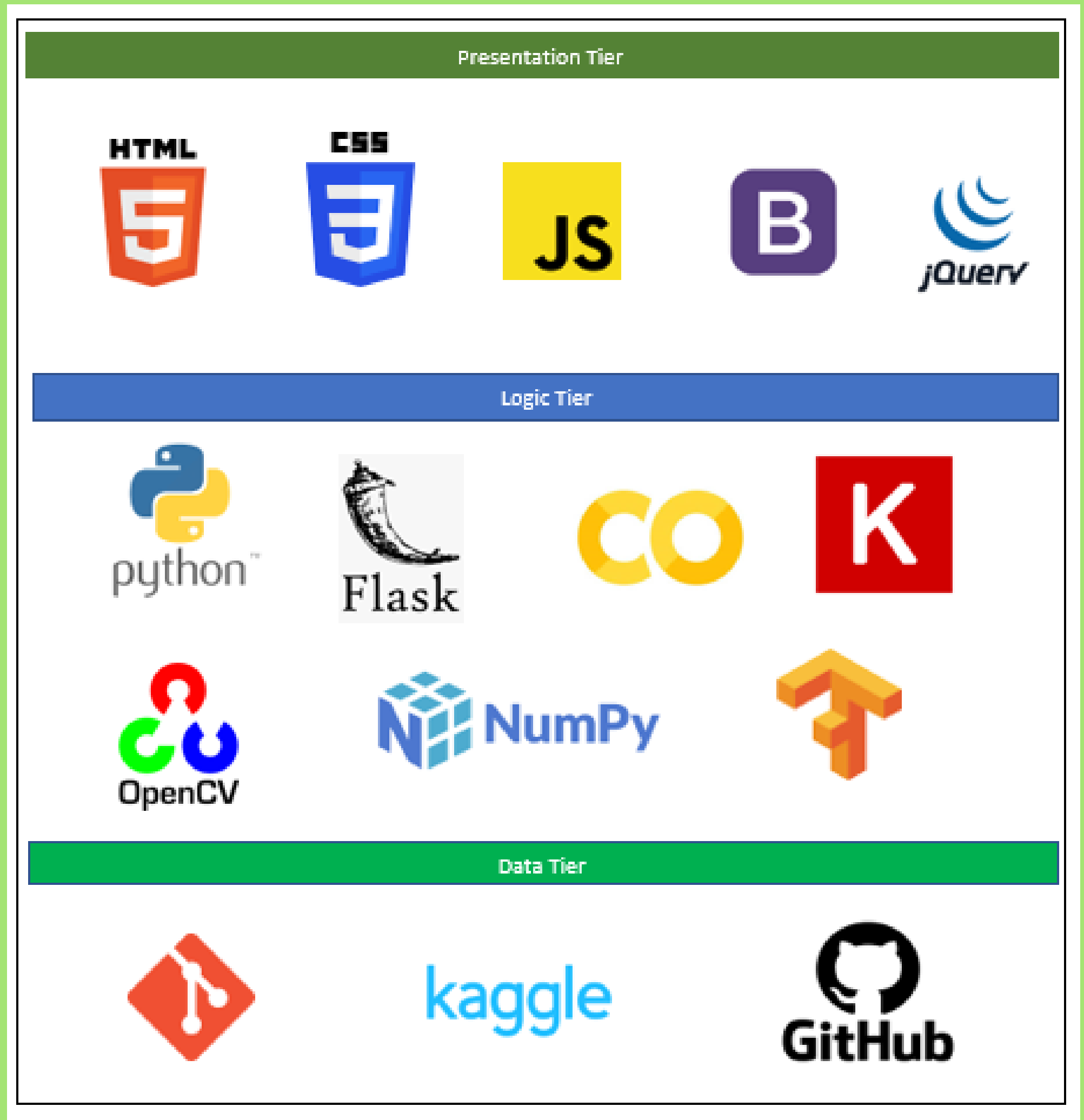
Aim

The aim of this research is to design, develop, and evaluate a recommendation system that can analyze the face of a user and predict the face shape and gender of the user. Then, according to the face shape and gender, it will recommend the hair or beard style for the users.

System Design



Implementation

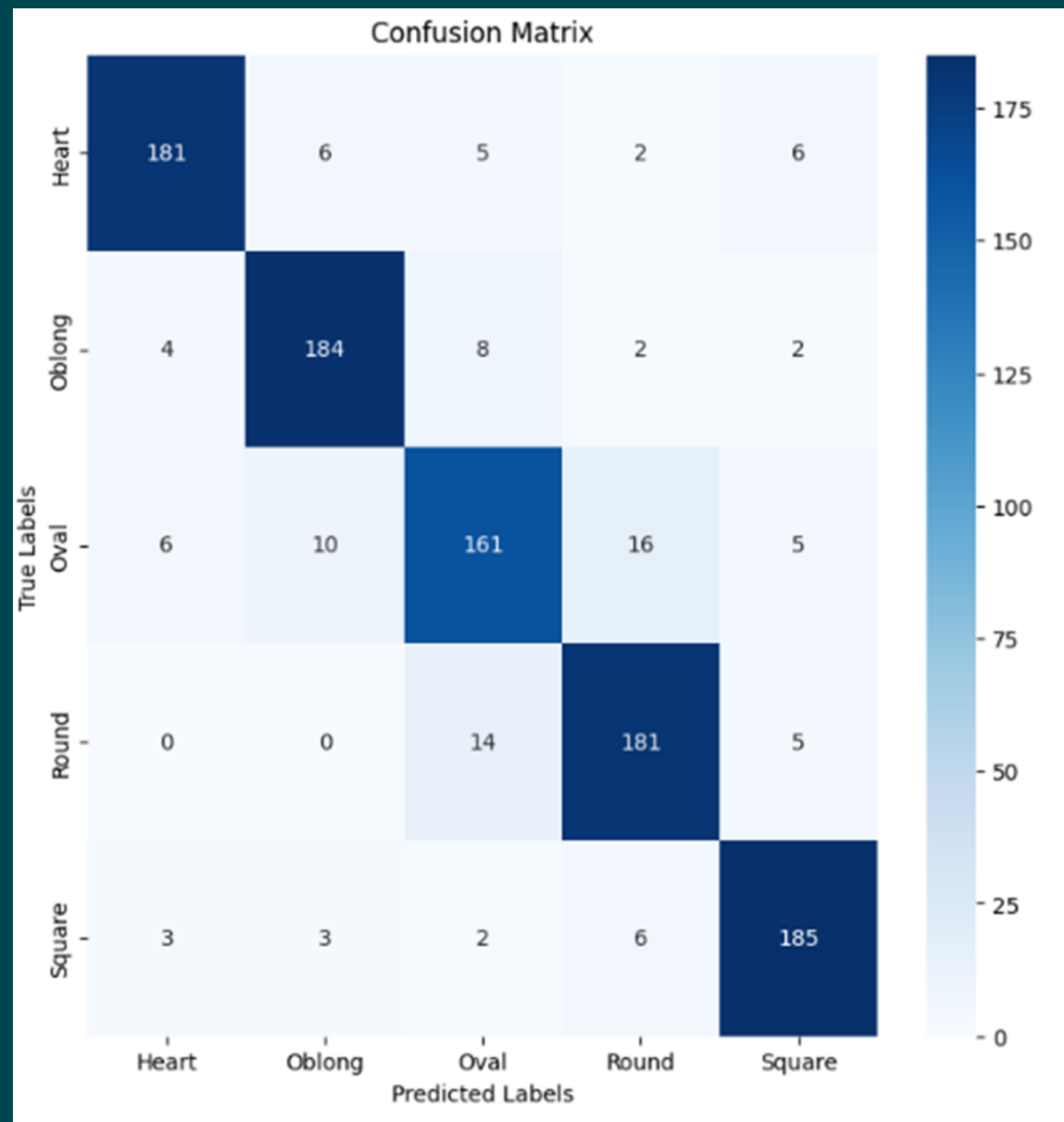


Demo

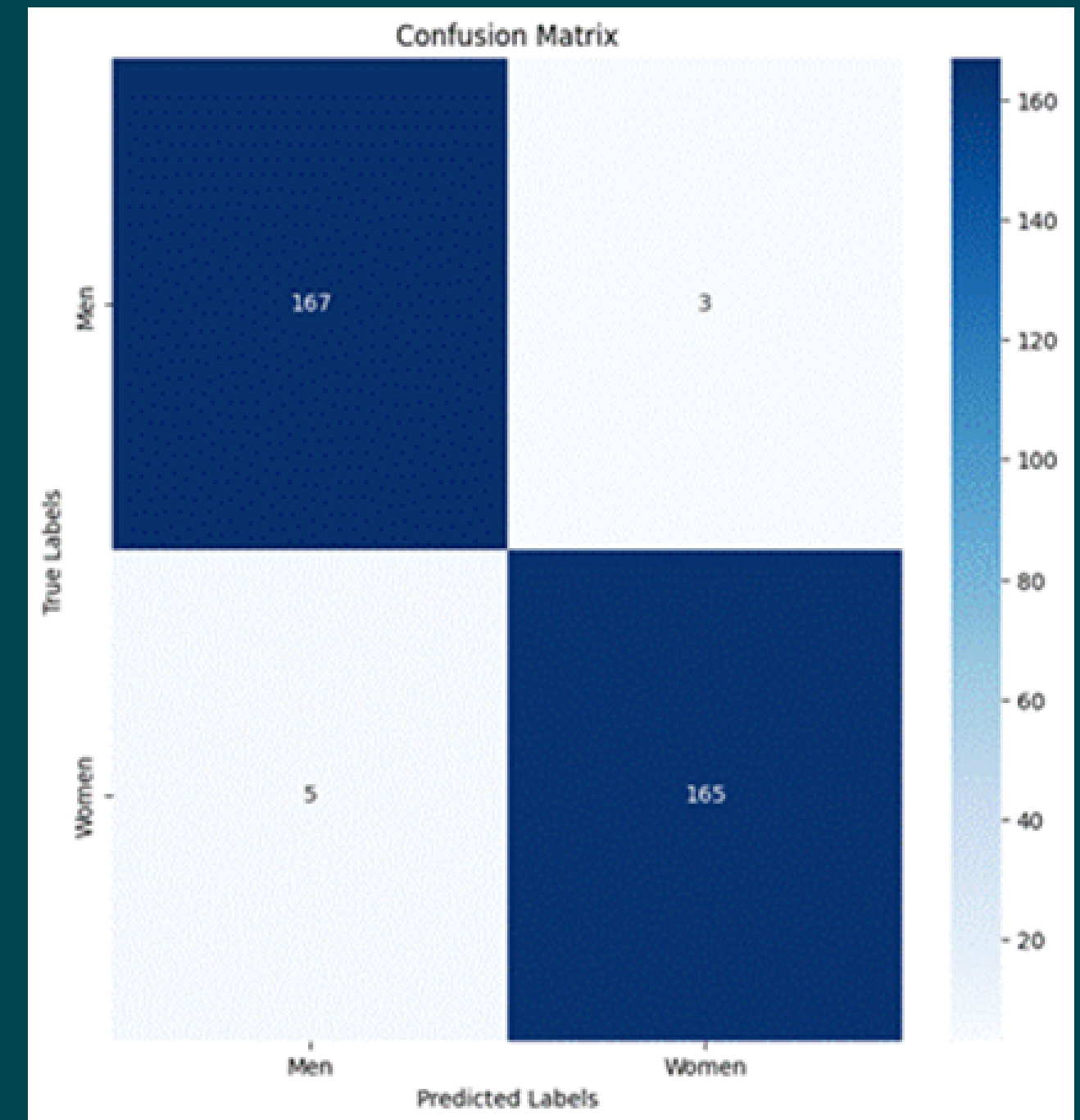


Testing and evaluation

Face shape prediction model



gender identification model



Testing and evaluation

Face shape prediction model

	precision	recall	f1-score	support
Heart	0.94	0.91	0.92	200
Oblong	0.91	0.92	0.91	200
Oval	0.84	0.81	0.83	198
Round	0.87	0.90	0.88	200
Square	0.91	0.93	0.92	199
accuracy			0.89	997
macro avg	0.89	0.89	0.89	997
weighted avg	0.89	0.89	0.89	997

gender identification model

	precision	recall	f1-score	support
Men	0.97	0.98	0.98	170
Women	0.98	0.97	0.98	170
accuracy			0.98	340
macro avg	0.98	0.98	0.98	340
weighted avg	0.98	0.98	0.98	340

Benchmarking

Method	Description	Accuracy
(Abdullah et al., 2022)	Ensemble with VGG16	86.5%
(IEEE Computational Intelligence Society)	ANN	60%
(Rahmat et al., 2018)	Used PNN (Probabilistic neural network)	80%
(Emmanuel and Tio, 2019)	Used inception v3	84.4%
(Hossam et al., 2021)	Used SVM algorithm	82%
Proposed Model	Using RegNetY160, EfficientNetV2-S and model trained from scratch using Sequential and used the ensemble technology and trained a model	89.5%

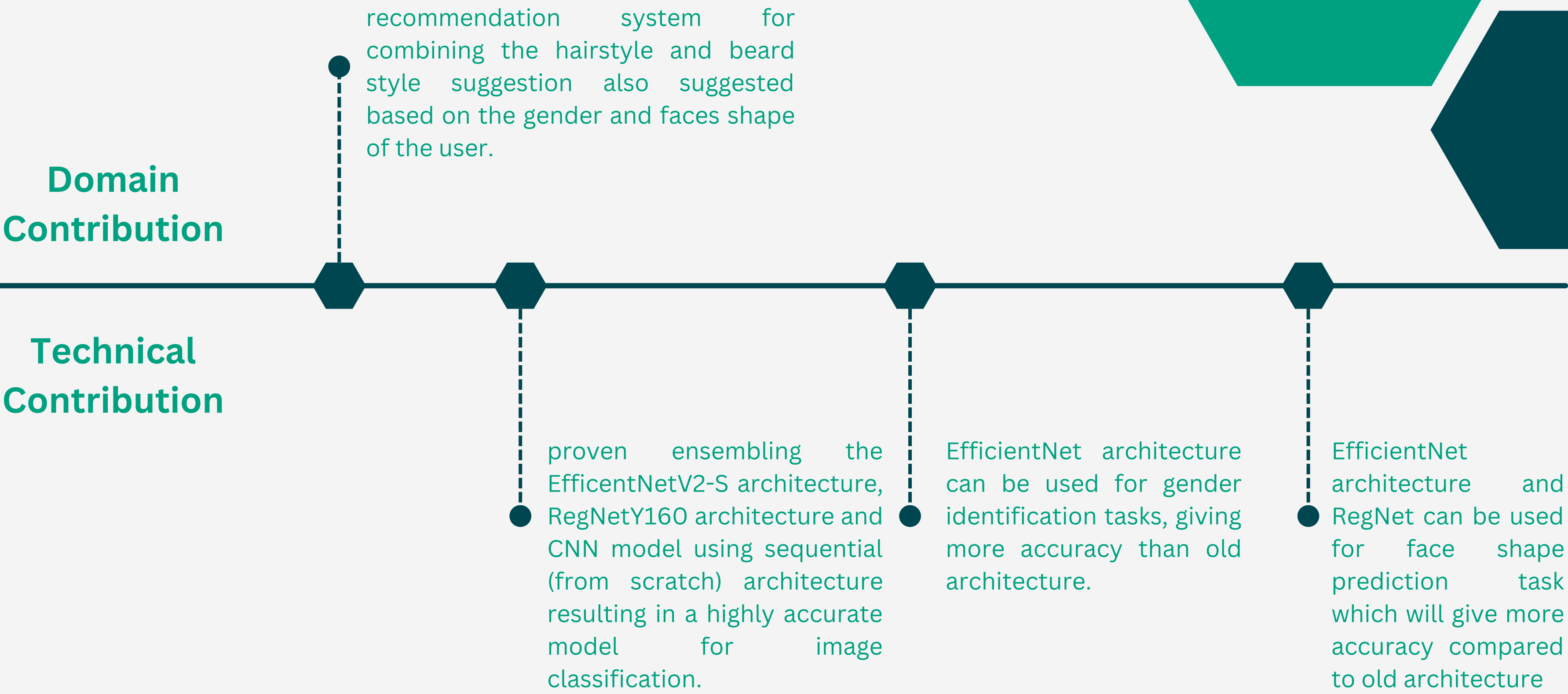
Compare with existing models

Architecture	Accuracy
Sequential	71%
InceptionV3	75.5%
GAN	77%
VGG16	71%
VGG19	80.4%
EfficientNetV2-M	86%
EfficientNetV2-S	88%
RegNetX160	86%
RegNetY160	87.2%
Ensemble Vgg19, Inception and MobileNet	87.6%
Ensemble RegNetY160, EfficientNetV2-S and model trained from scratch using Sequential	89.5%

Limitations & Future Enhancements

- The system only considers the face shape and gender of the user to suggest the hair and beard style. In the future, we can also suggest styles based on hair type, face colour, race, and many more factors.
- A limited dataset was used for training the face shape prediction model. The dataset contains only 800 images for each of the five face shape classes, with 200 images for validation and 200 images for testing. In fact, if we can increase the dataset, we can increase the performance of the model.
- The system was initially built as a website because of limited time and knowledge, but in the future we can also do a mobile app, which can increase its usability.
- Try new architects and new ML techniques to increase performance. The use of more advanced hardware, such as GPUs or TPUs, can also improve the efficiency and speed of the training process.
- We can suggest other things, such as eyeglasses, earrings, or other accessories, based on the face shape and gender. This way, in the future, we can expand the system with additional style choices, thereby providing a more comprehensive and personalized fashion experience.

Conclusion - Contributions



Conclusion - Skills

Existing Skills

HTML

CSS

JavaScript

Flask

Python

Academic Writing

Acquired Skills

Deep Learning

CNN

Data pre-processing

Machine Learning

References

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**Thank you for
listening !**

