

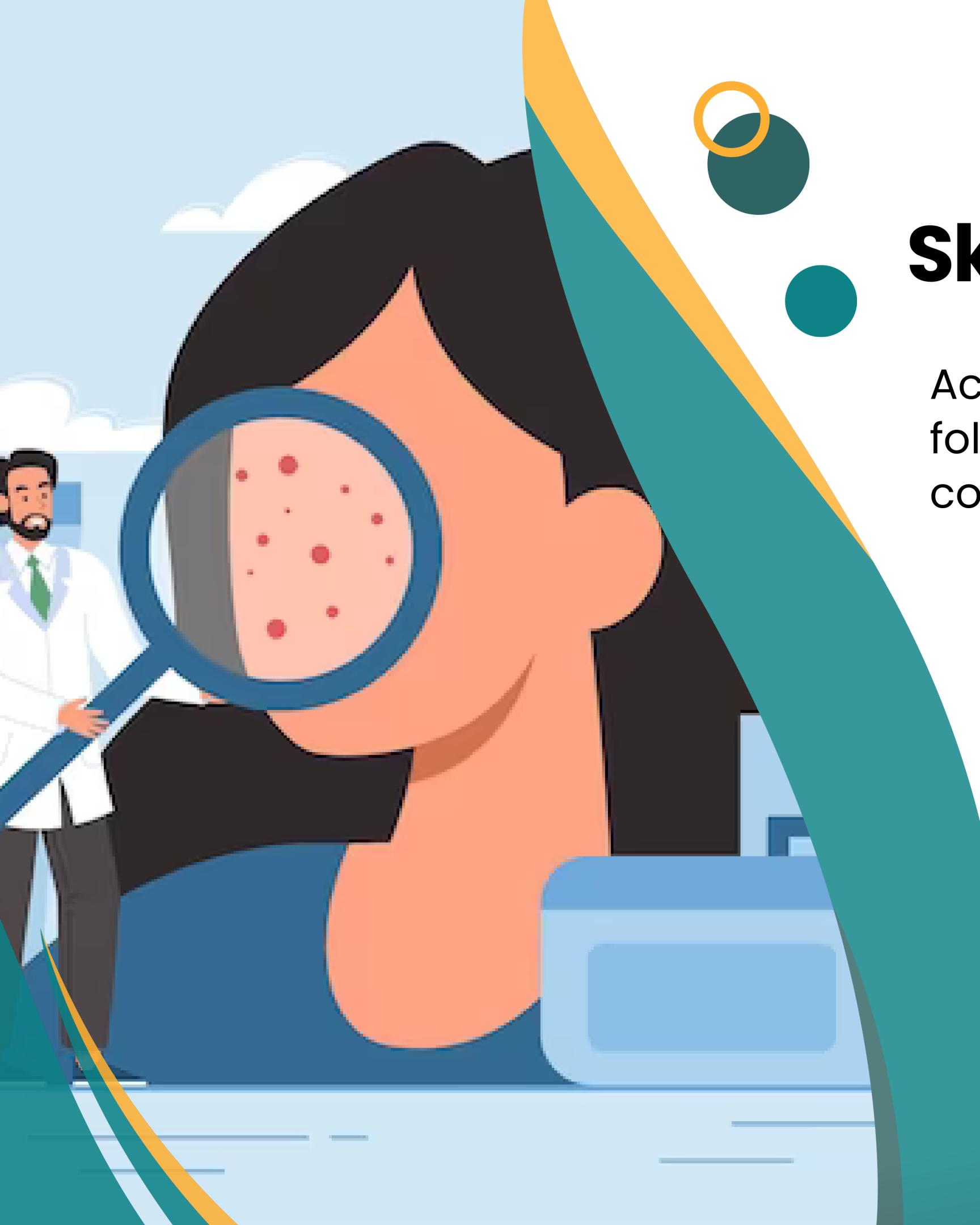
SKIN DISEASE DETECTION SYSTEM

Mentor
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Dept : CSE (Internet Of Things & Cyber Security
Including Block Chain Technology)

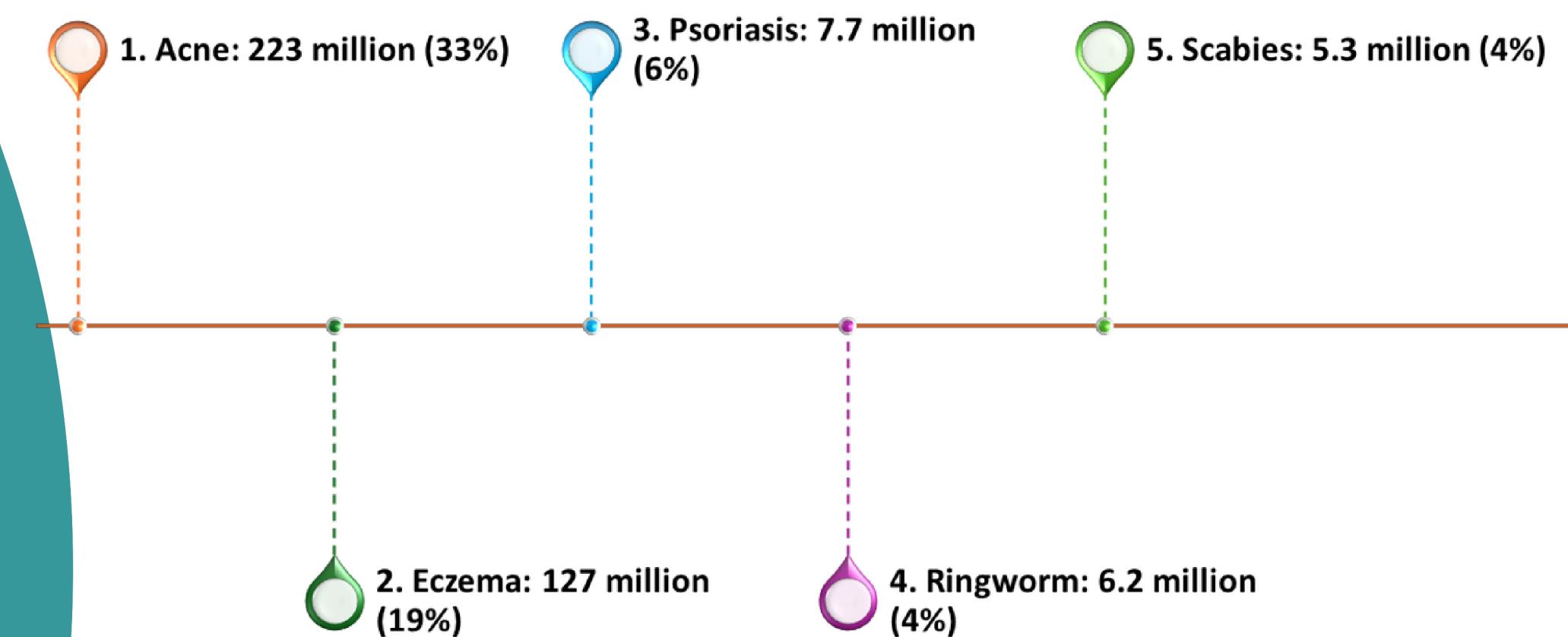
Presented by
Anika Parveen
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Skin Diseases Occurring In India

According to the Global Burden of Disease Study 2017, the following are the number of reported cases of the most common skin diseases in India.





Skin Diseases Occurring In India



Acne



Eczema



Psoriasis



Scabies



Ringworm

Types of Psoriasis



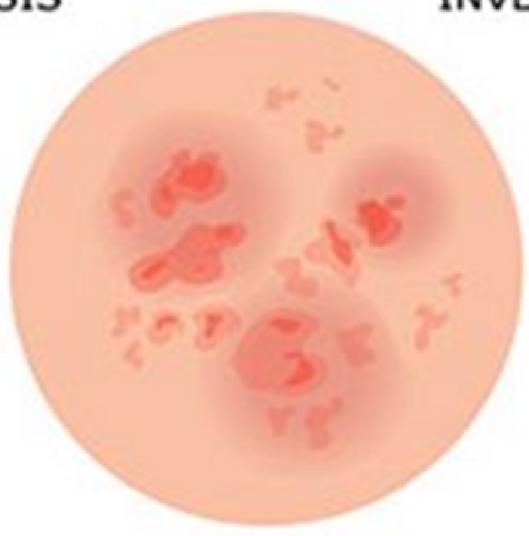
VULGAR PSORIASIS



INVERSE PSORIASIS



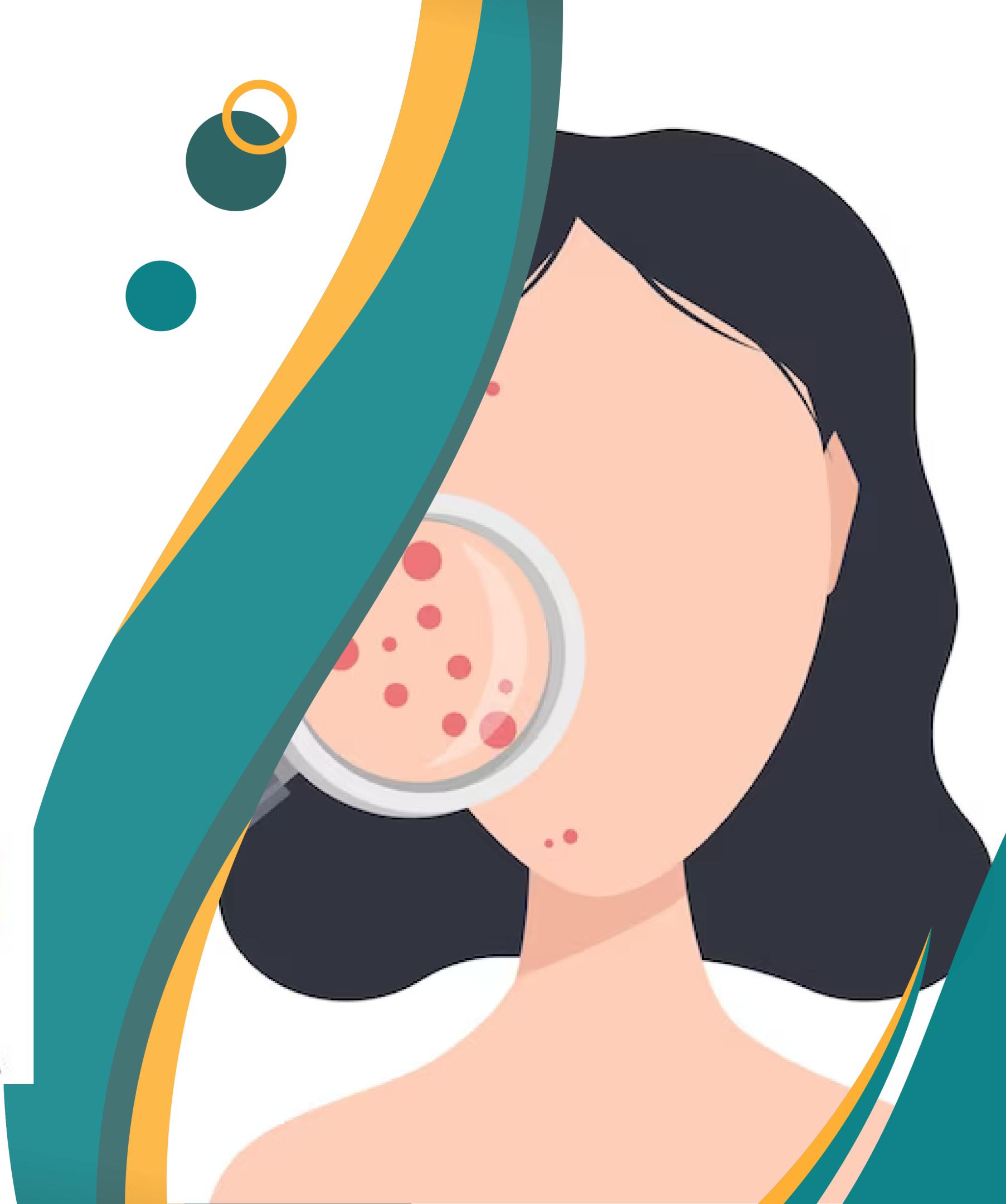
PUSTULAR PSORIASIS



GUTTATE PSORIASIS



PSORIATIC ERYthroDERMA



Need for Automated Detection System



Speed

Automated systems can provide quicker diagnosis compared to traditional methods.



Accuracy

Machine learning models, especially deep learning, have shown high accuracy in diagnosing various skin conditions.



Non-invasiveness

Image-based analysis avoids the need for invasive procedures like biopsies.



Accessibility

Such systems can be deployed in remote or underserved areas, increasing access to healthcare.

Skin Disease Images Collected From Doctor's Chamber

Date	No of Images	No of Patient	No of Disease	Disease Names
14-4-23	12	7	3	Lupus, Herpes , Fungus
20-4-23	14	8	7	Hairfall, PPS , fungal infection , Mole ,Corn ,Acne
26-4-23	10	5	5	Tinea, vitiligo , Melanoma , Hairfall , Psoriasis
1-5-23	15	4	3	Melanoma, Hairfall ,PPS
9-5-23	10	5	2	Tinea, vitiligo
10-5-23	12	5	4	Warts, Hives , Keratoses , Herpes
17-5-23	11	6	5	Oiaqonal (LPH), Hair fall , Corn , Tinea , PPS
24-5-23	10	8	6	Herpes, psoriasis , Eczema , Tinea , vitiligo , Corn
26-5-23	8	8	3	psoriasis, Corn , Acne
30-5-23	9	5	5	Acne, Lupus, Herpes , Fungus , PPS
7-8-23	2	1	1	Exanthems
14-8-23	3	2	2	Moles, Corn
20-8-23	6	3	3	Vitilago, Lichen Planus, Tinea
28-8-23	12	6	4	Oiaqonal (LPH), Hair fall , Corn , Tinea
7-7-23	8	7	6	Ringworm , LPS , Milinial Bucuraus , PPS ,acne
14-7-23	4	5	4	Warts, Hives , Keratoses , Herpes

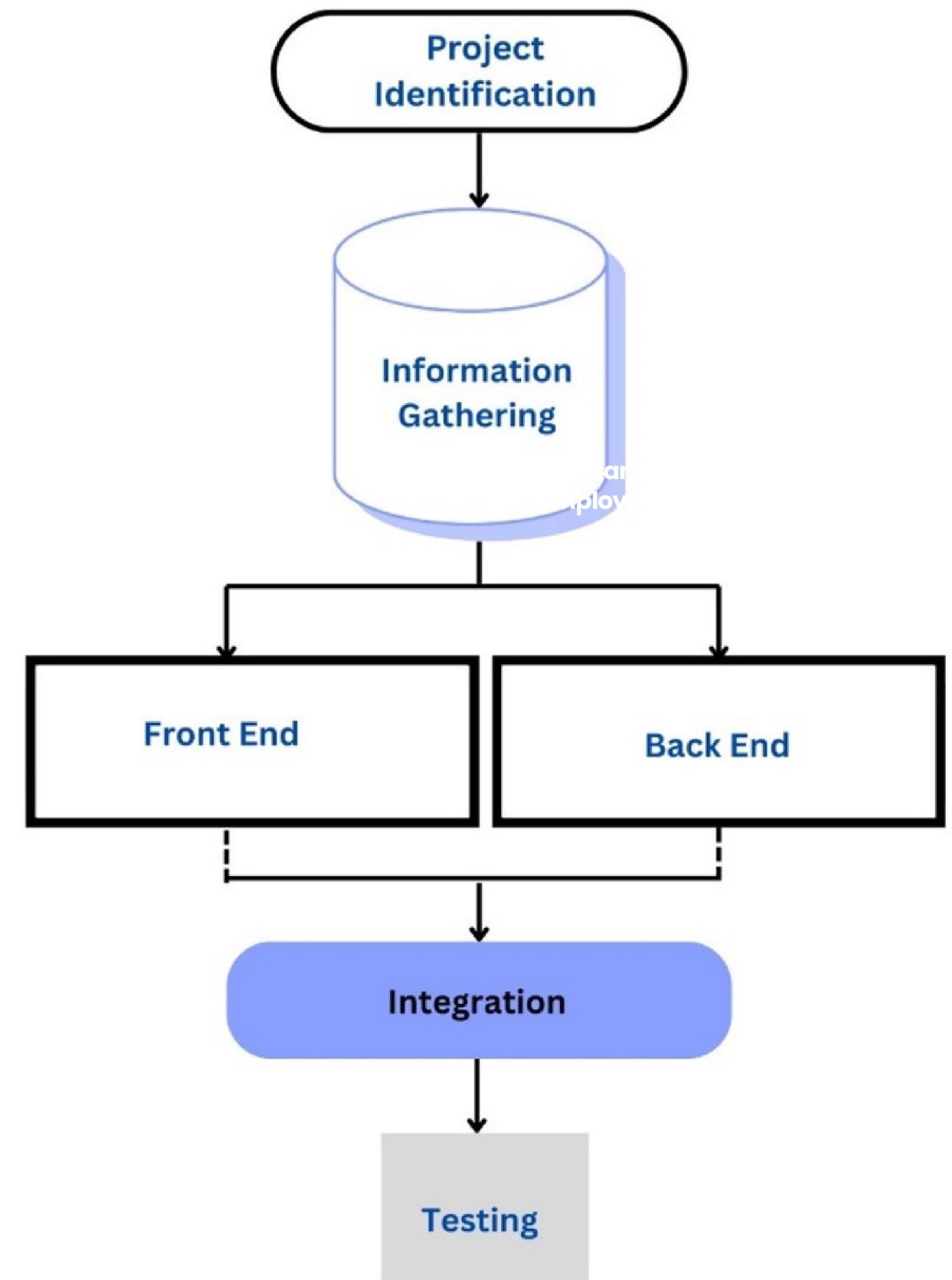
20-7-23	6	4	7	Acne, Lupus, Herpes , Exanthems ,Corn
6-8-23	7	3	5	Tinea, vitiligo , Melanoma , Hairfall , PPS
13-8-23	9	3	4	psoriasis, Corn , Acne , Fungus
20-8-23	7	2	3	Herpes, psoriasis , Eczema
27-8-23	10	3	5	Hairfall, PPS , fungal infection , Mole ,Corn
3-9-23	5	2	3	Eczema, Tinea , vitiligo
10-9-23	6	3	4	Eczema, Tinea , vitiligo , melanoma
17-9-23	10	5	6	psoriasis, Corn , Acne , Fungus , PPS , Herpes
24-9-23	11	2	2	Keratosis pilaris, Millennial Bureaus
1-10-23	9	6	5	Herpes, psoriasis , Eczema , Tinea , vitiligo
8-10-23	6	8	4	Warts, Hives , Keratoses , Herpes
15-10-23	5	4	7	Acne, Lupus, Herpes , Exanthems ,Corn
22-10-23	7	5	5	Tinea, vitiligo , Melanoma , Hairfall , PPS
5-11-23	6	6	5	Hairfall, PPS , fungal infection , Mole ,Corn
12-11-23	8	3	3	Eczema, Tinea , vitiligo
19-11-23	10	6	6	Herpes, psoriasis , Eczema , Tinea , vitiligo , Corn

Sample Images Collected From Chamber

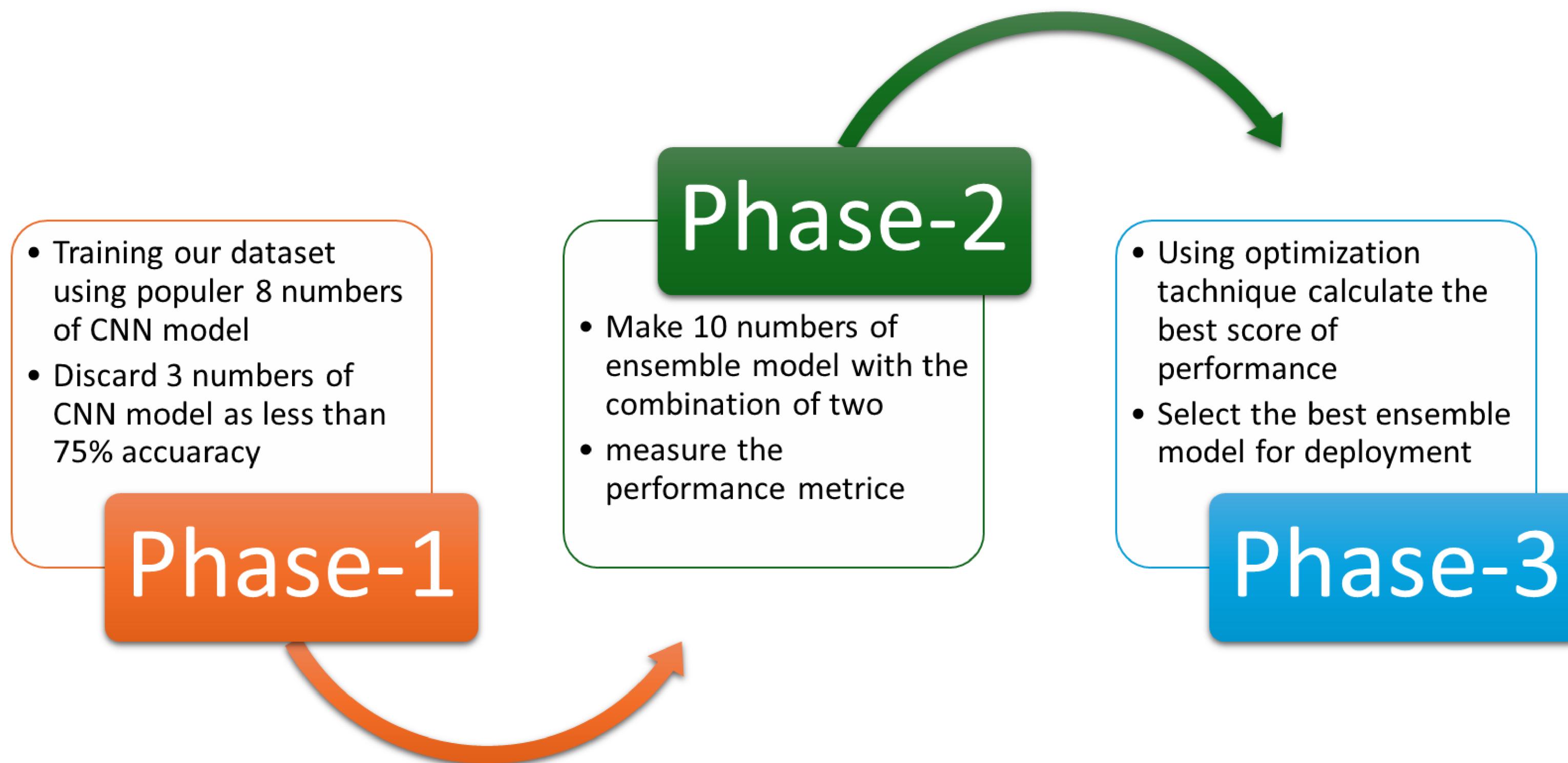


System Design

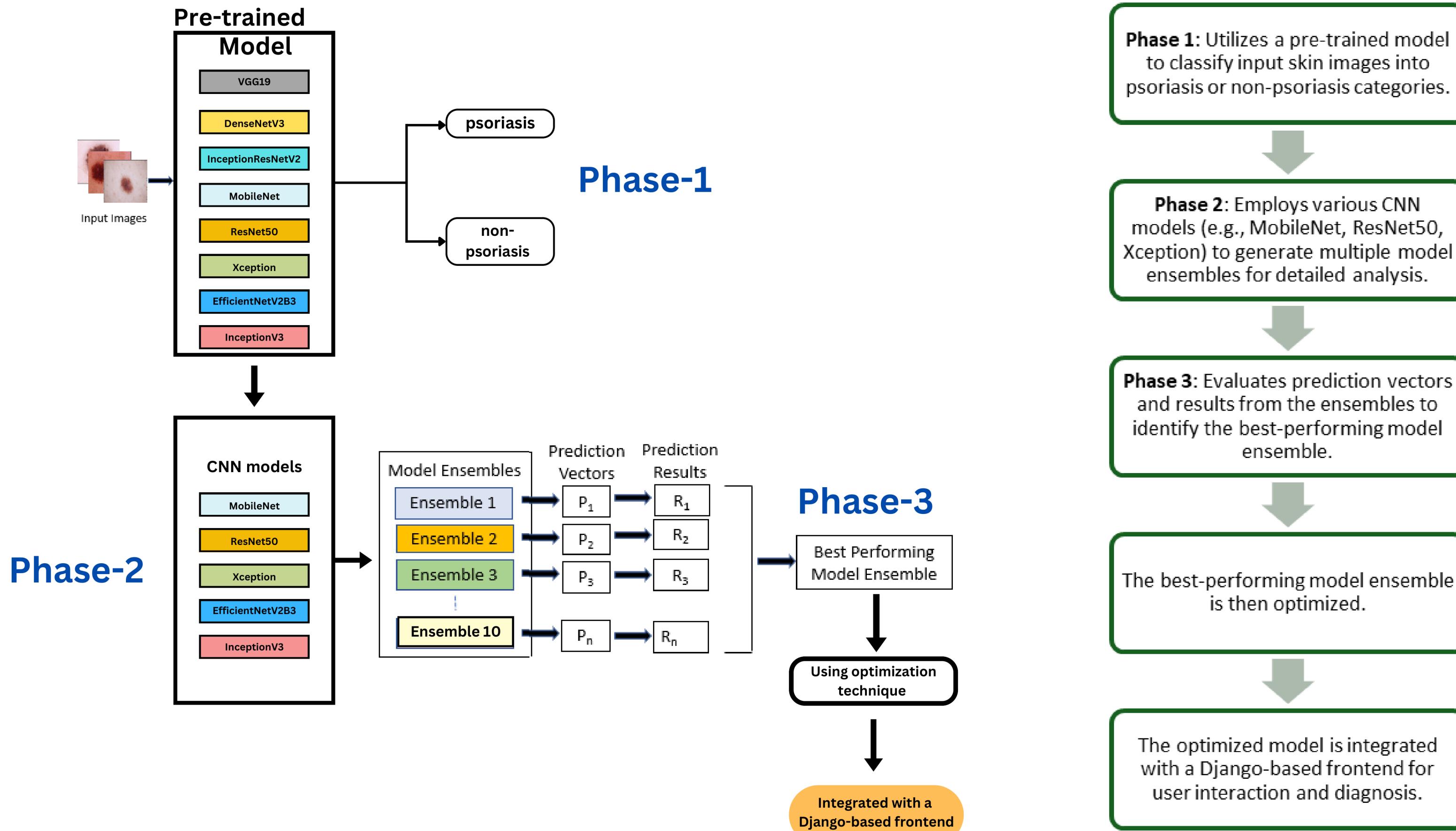
- System design involves a structured approach to developing software. The process begins with Project Identification, where objectives and feasibility are determined.
- This is followed by Information Gathering, which collects detailed requirements.
- The design is then divided into Front End (user interface) and Back End (server-side logic) development.
- These components are subsequently integrated, ensuring seamless interaction, and the final step is Testing to identify and fix any issues, ensuring the system meets all specified requirements.



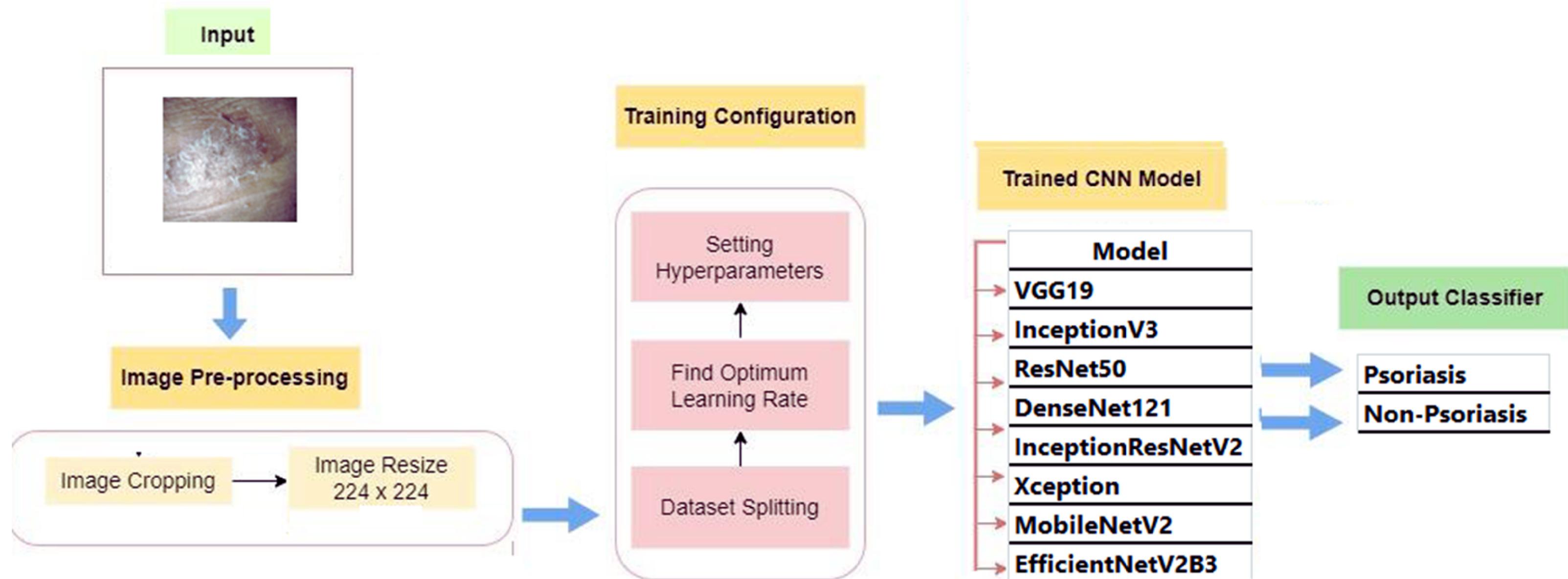
Phases of Designing the backend



Back-End Phases



Phase - 1



Comparative Study of Network Models

Pretrained Network Models that are available to be used for the skin disease analysis :

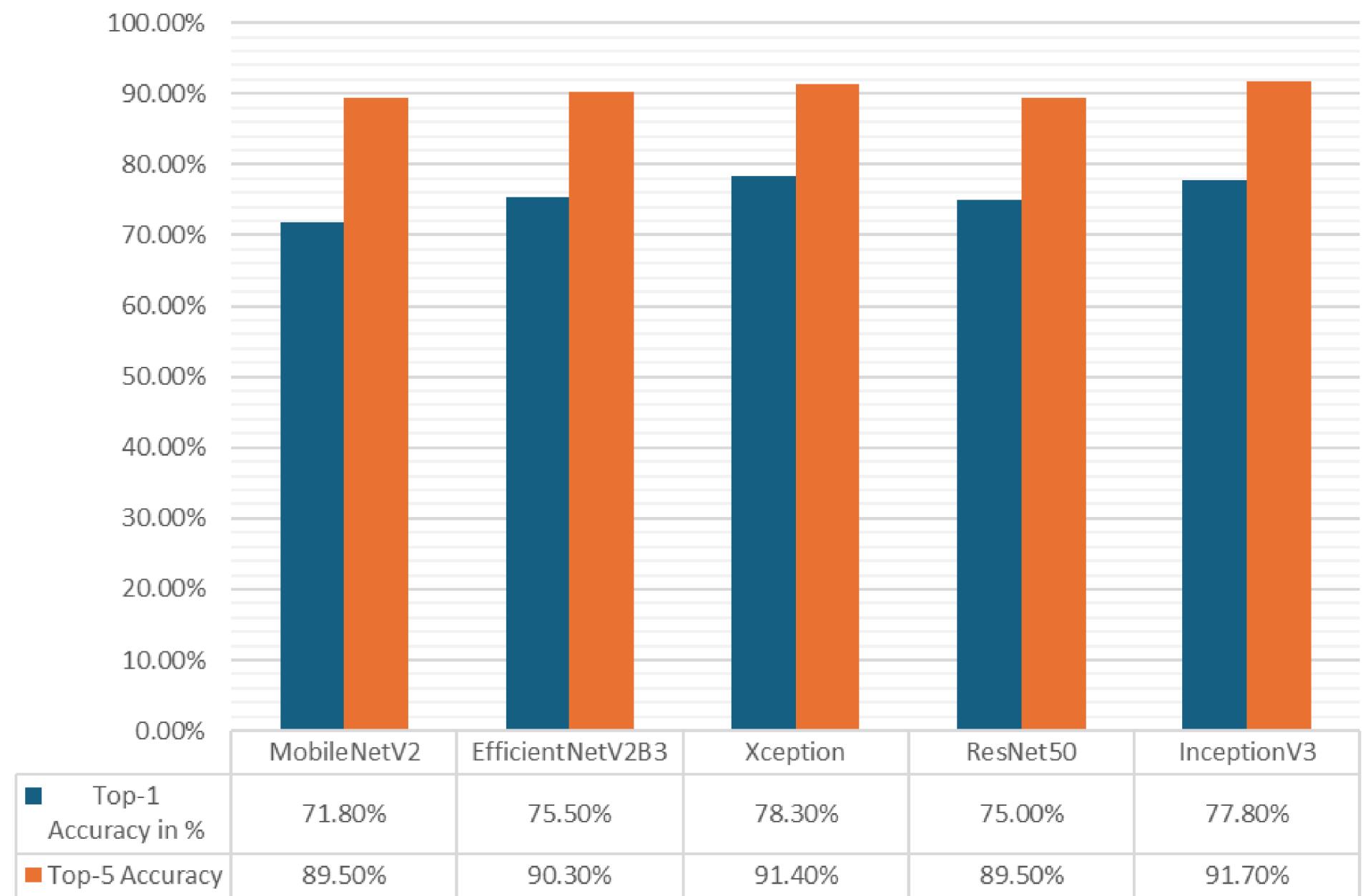
1. MobileNet

2. EfficientNet V2B3

3 .Xception

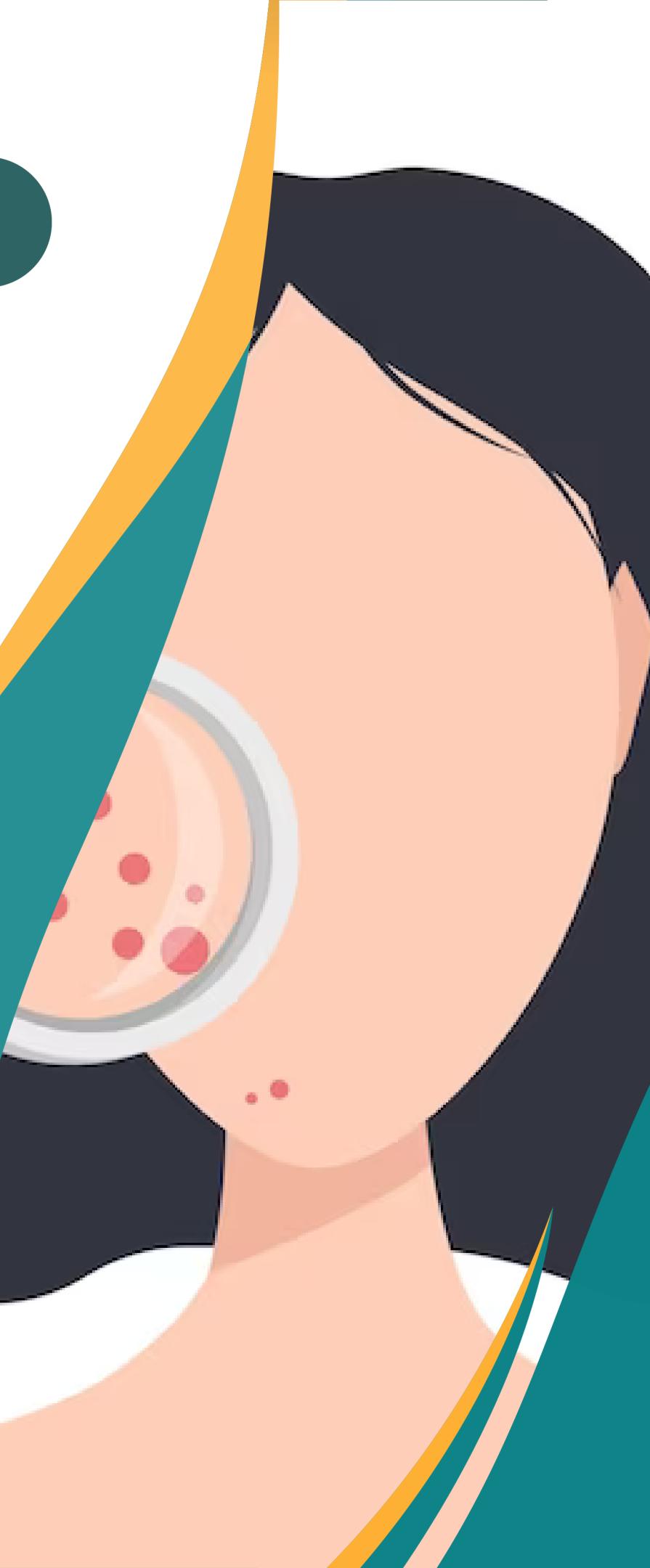
4. Inception V2

5. ResNet-50

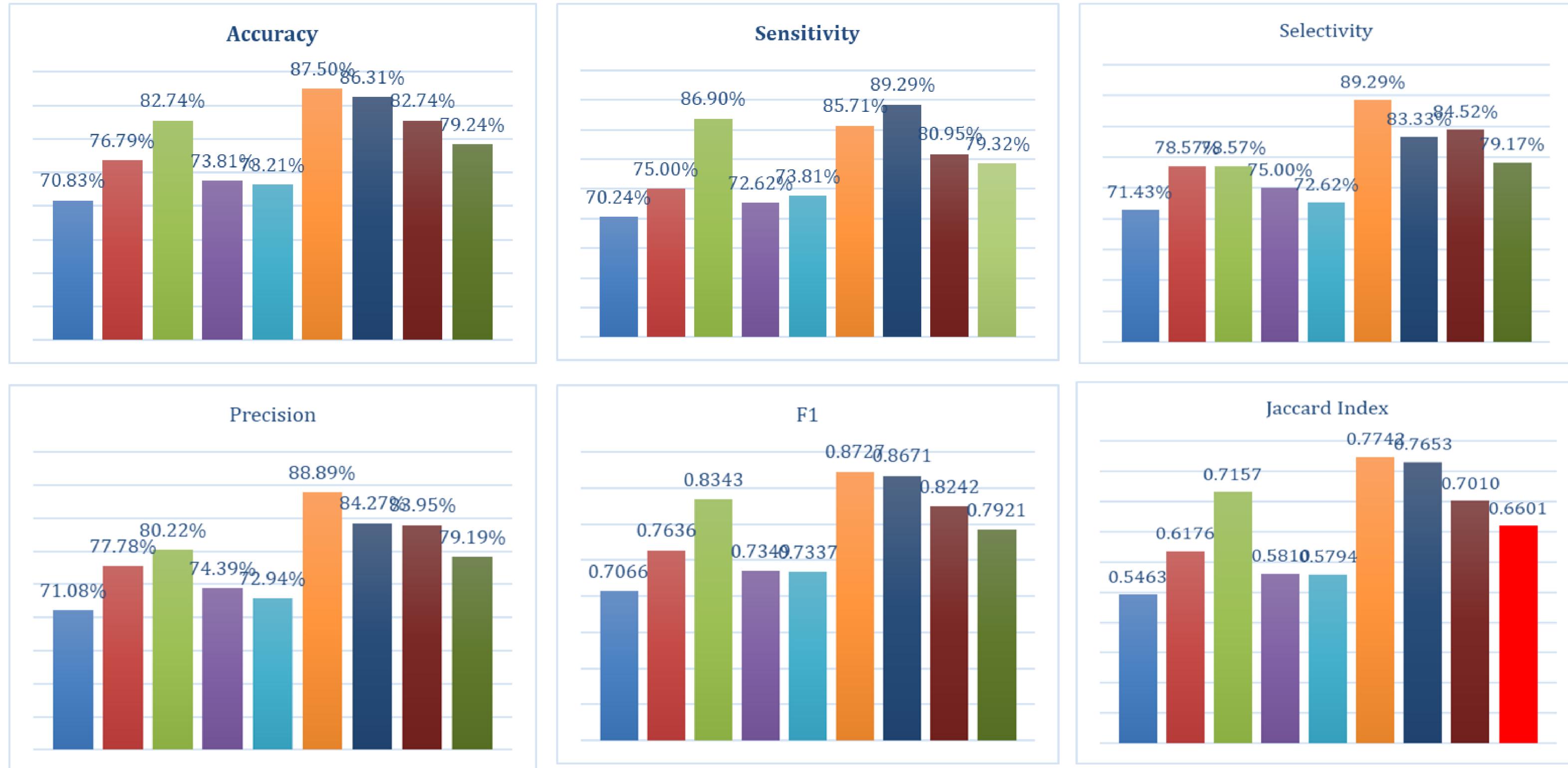


Model Specification

Model	Size (MB)	Top-1 Accuracy	Top-5 Accuracy	Parameters (M)	Depth	Time(ms) /inference step (CPU)	Time(ms) /inference step (GPU)
VGG19	549	71.30%	90.00%	143.7	19	84.8	4.4
InceptionV3	92	77.90%	93.70%	23.9	189	42.2	6.9
ResNet50	98	74.90%	92.10%	25.6	107	58.2	4.6
InceptionResNetV2	215	80.30%	95.30%	55.9	449	130.2	10
DenseNet121	33	75.00%	92.30%	8.1	242	77.1	5.4
Xception	88	79.00%	94.50%	22.9	81	109.4	8.1
MobileNet	14	71.30%	90.10%	3.5	105	25.9	3.8

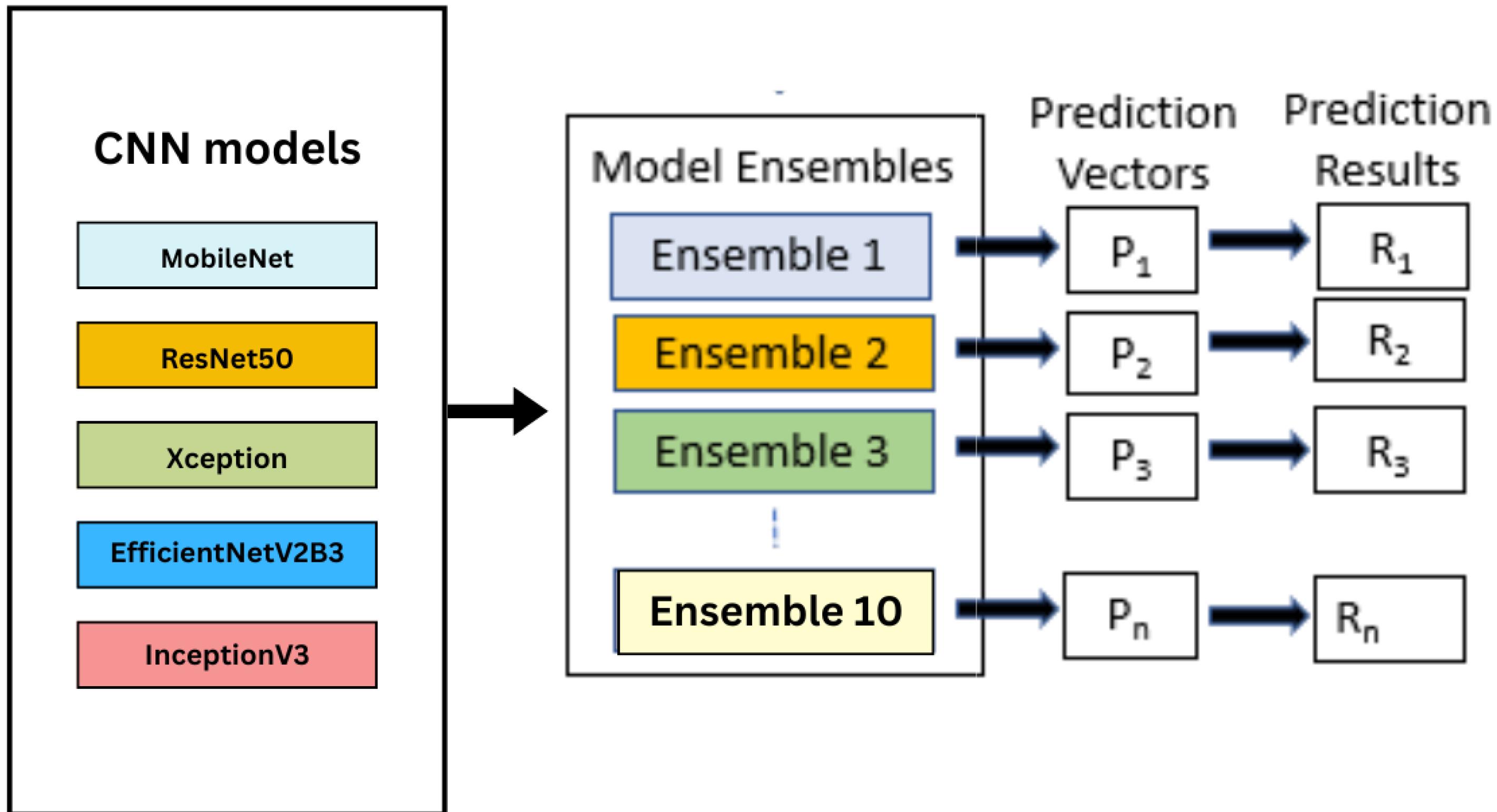


Result of 1st phase

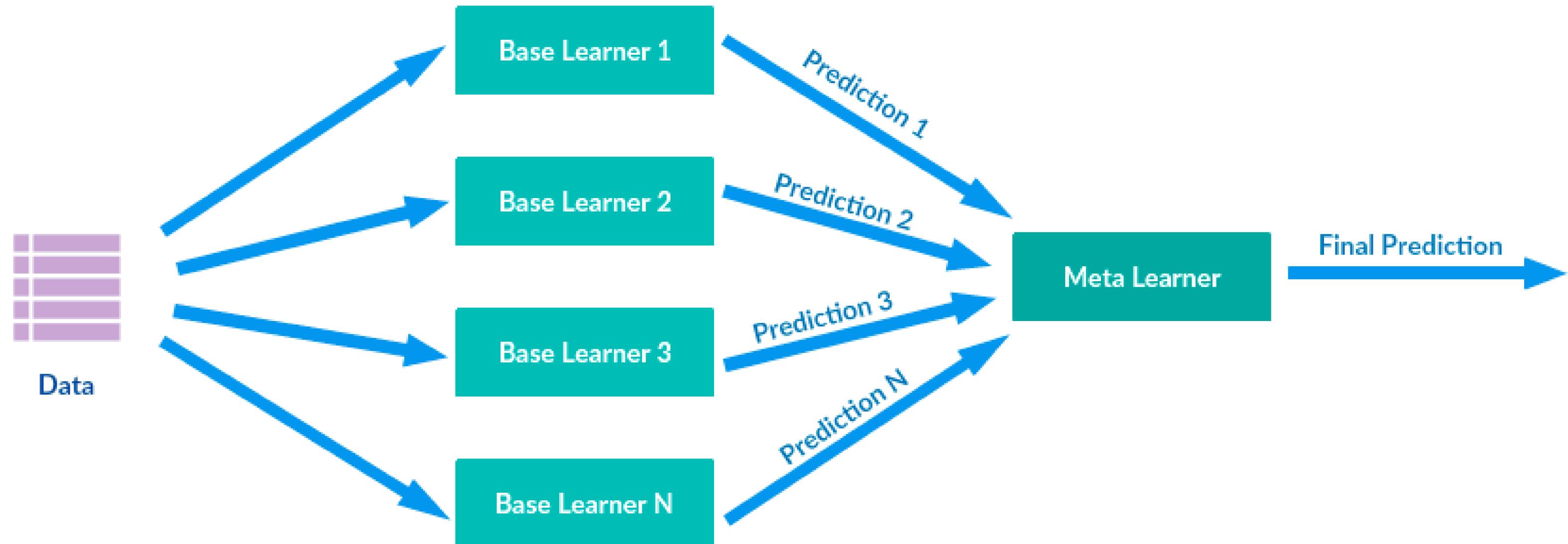


■ VGG19 ■ InceptionV3 ■ ResNet50 ■ DenseNet121 ■ InceptionResNetV2 ■ Xception ■ MobileNetV2 ■ EfficientNetV2B3 ■ Avg

Phase - 2



Ensemble Learning





Advantages of Ensemble Learning

Improved Accuracy

- Ensemble methods typically achieve higher predictive accuracy than individual models by combining their outputs. Aggregating the results of multiple models reduces the likelihood of errors that any single model might make.

Reduced Overfitting

- By combining multiple models, ensemble methods can help mitigate the risk of overfitting to the training data. Techniques like bagging reduce variance, which can prevent models from becoming too tailored to the specificities of the training dataset.

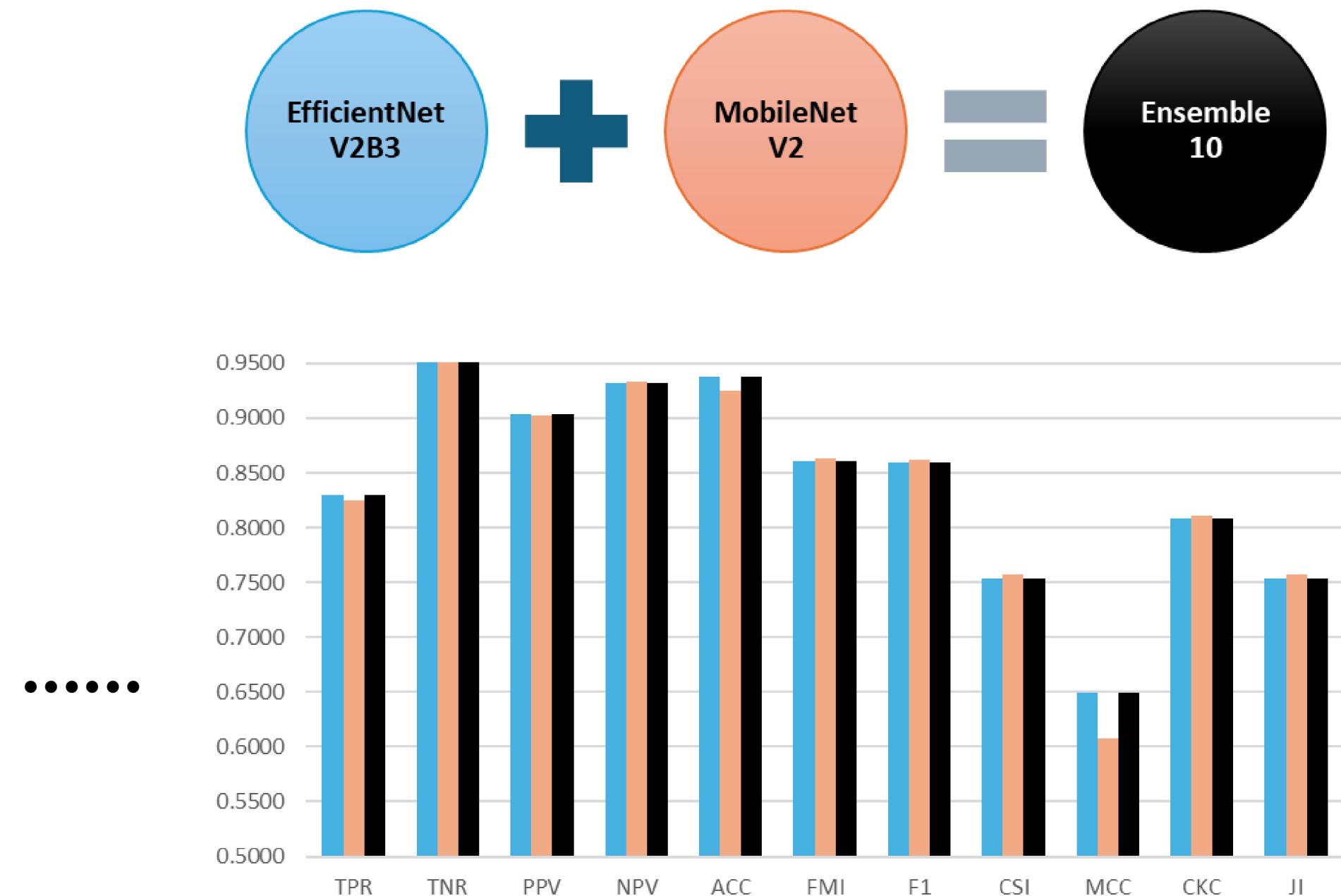
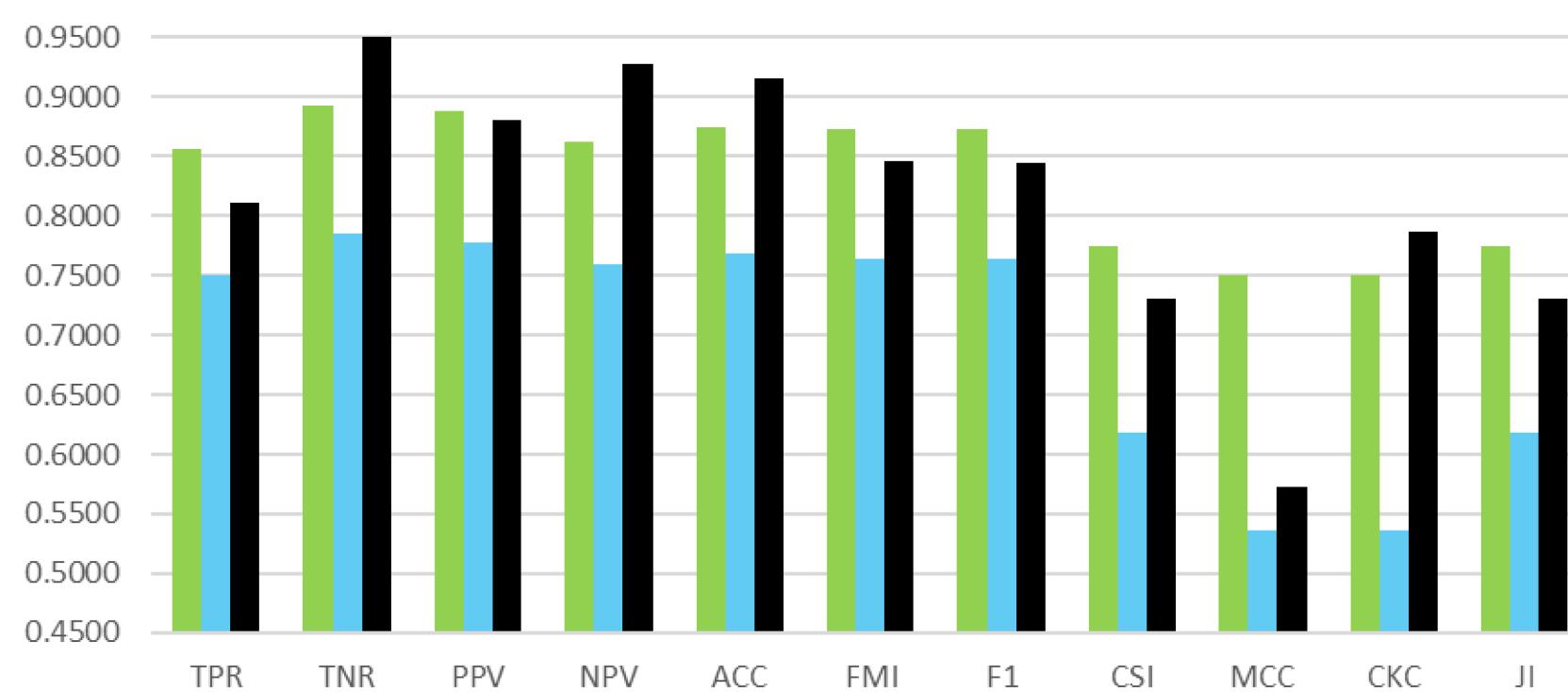
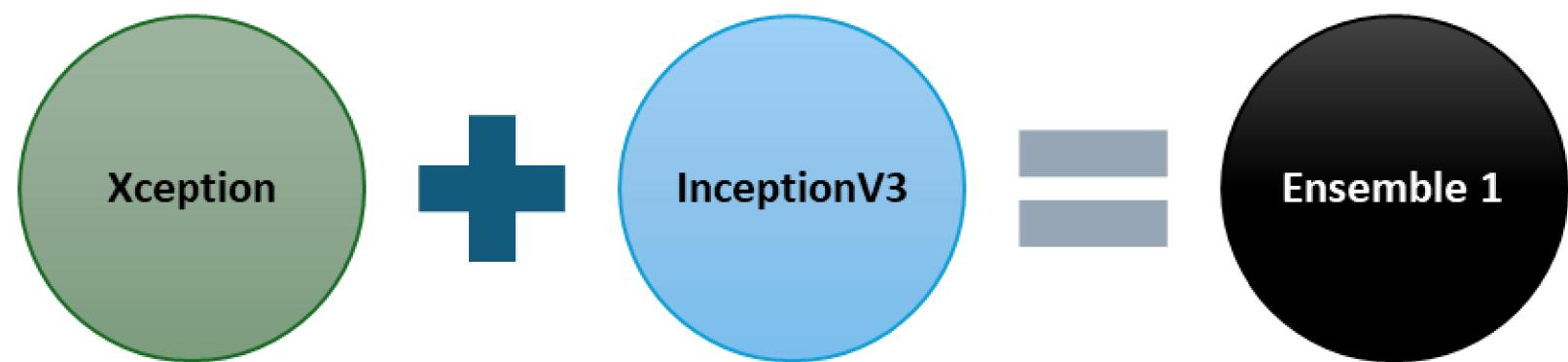
Increased Robustness

- Ensemble models are generally more robust to noisy data and outliers, as the impact of anomalies is averaged out across multiple models. This robustness makes ensemble models more reliable in real-world applications.

Model Stability

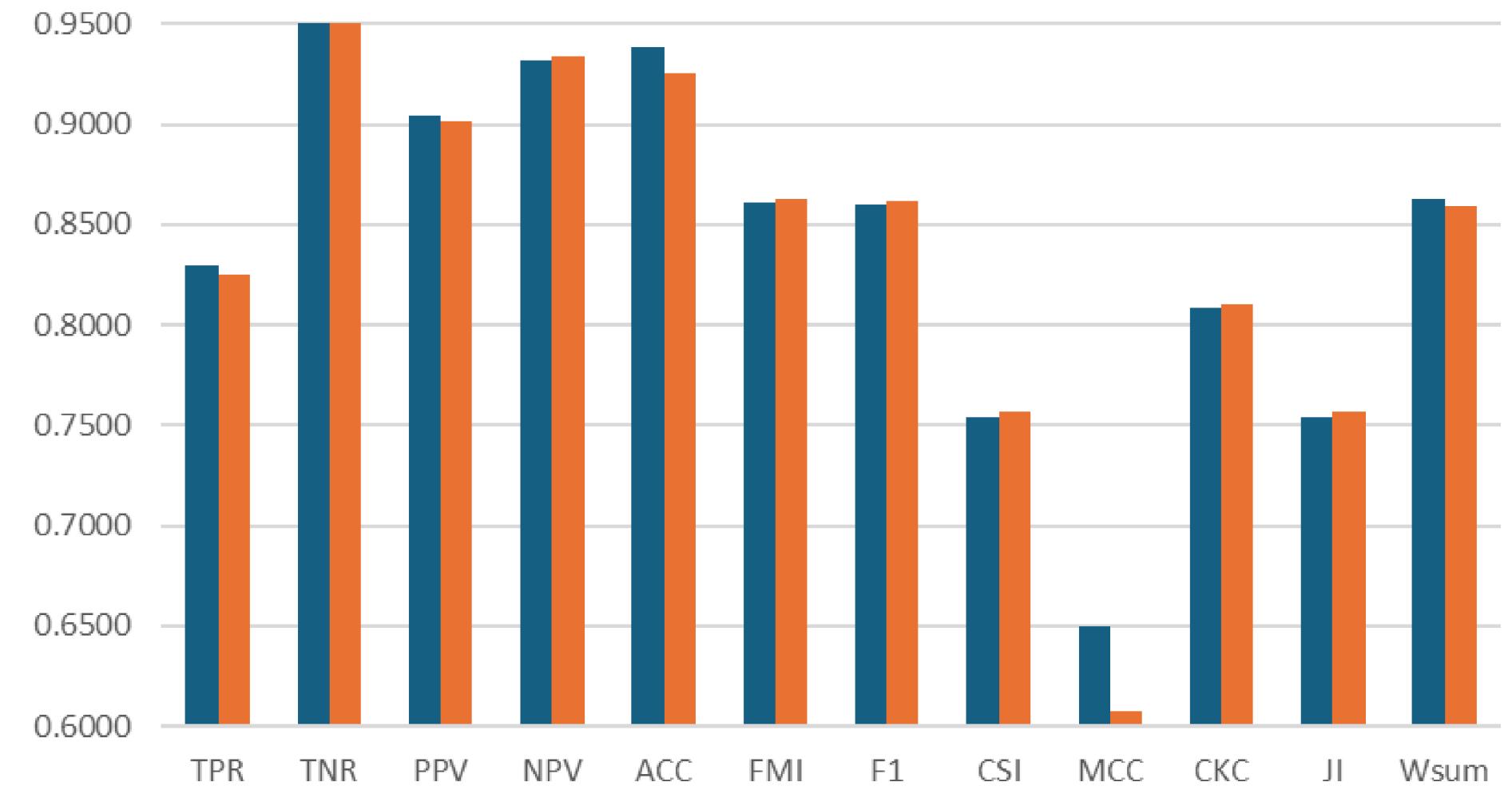
- Single models can be highly sensitive to variations in the training data, leading to instability. Ensemble methods smooth out these variations, resulting in more stable predictions.

Result of 2nd phase



Comparison of best two Ensemble models

Features	Xception+mobilenet	Xception+efficientnet
TPR	0.8293	0.8247
TNR	0.9658	0.9648
PPV	0.9040	0.9019
NPV	0.9315	0.9334
ACC	0.9384	0.9253
FMI	0.8606	0.8625
F1	0.8596	0.8616
FNR	0.1707	0.1753
FPR	0.0342	0.0352
FDR	0.0960	0.0981
FOR	0.0685	0.0666
CSI	0.7537	0.7568
MCC	0.6495	0.6072
CKC	0.8080	0.8105
JI	0.7537	0.7568
Wsum	0.8628	0.8591

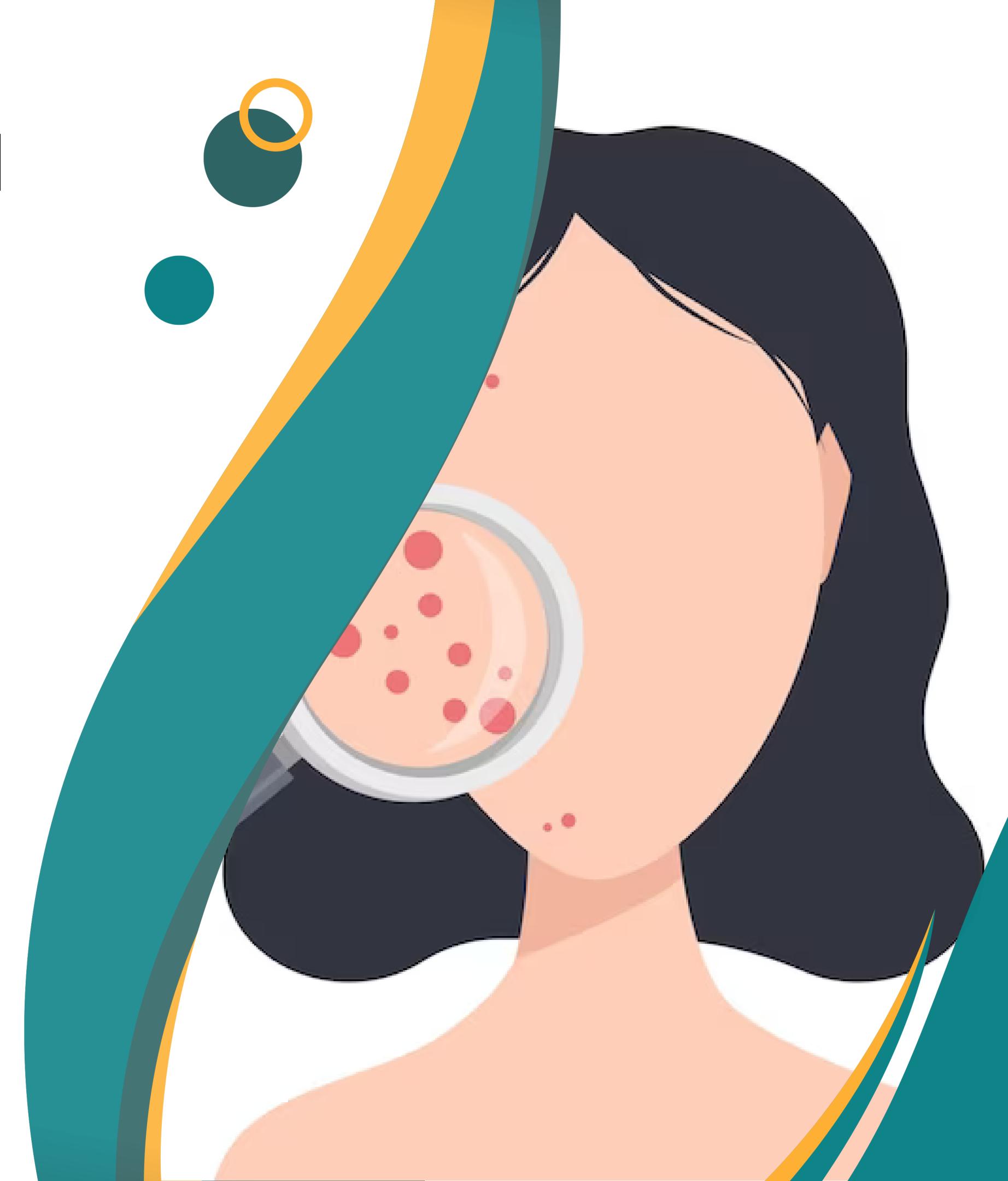


Ensemble of Xception and MobileNet models

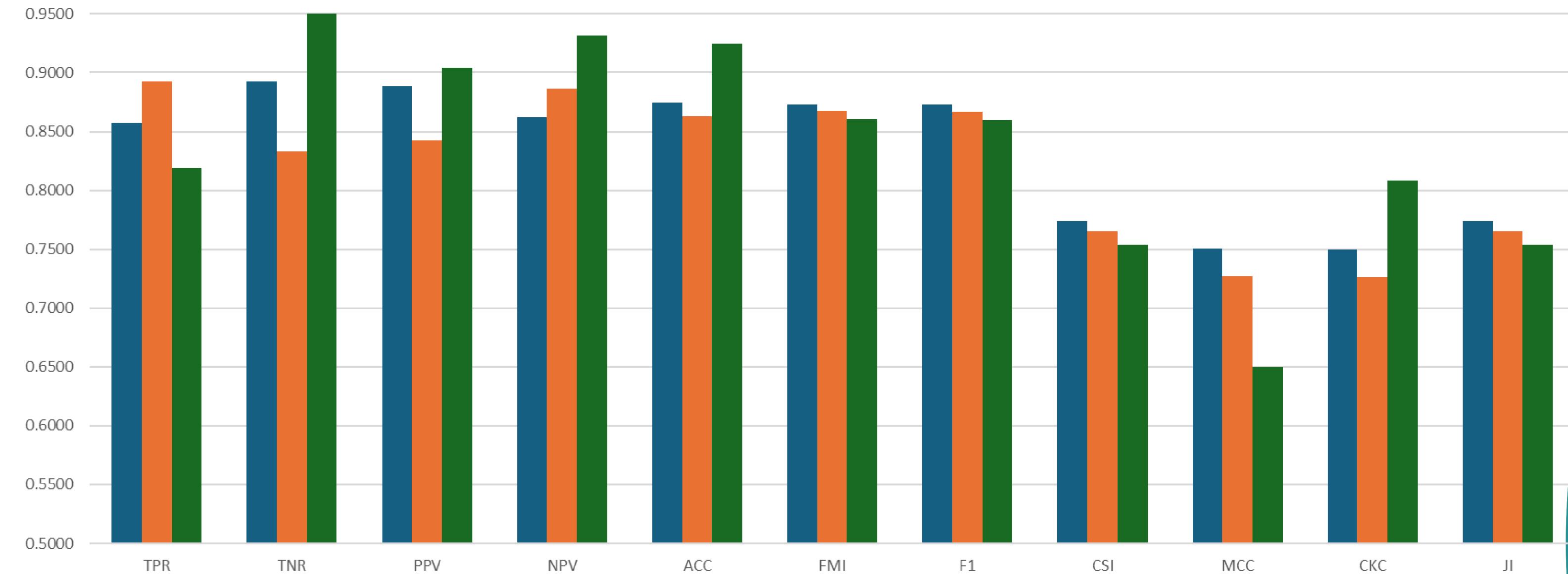
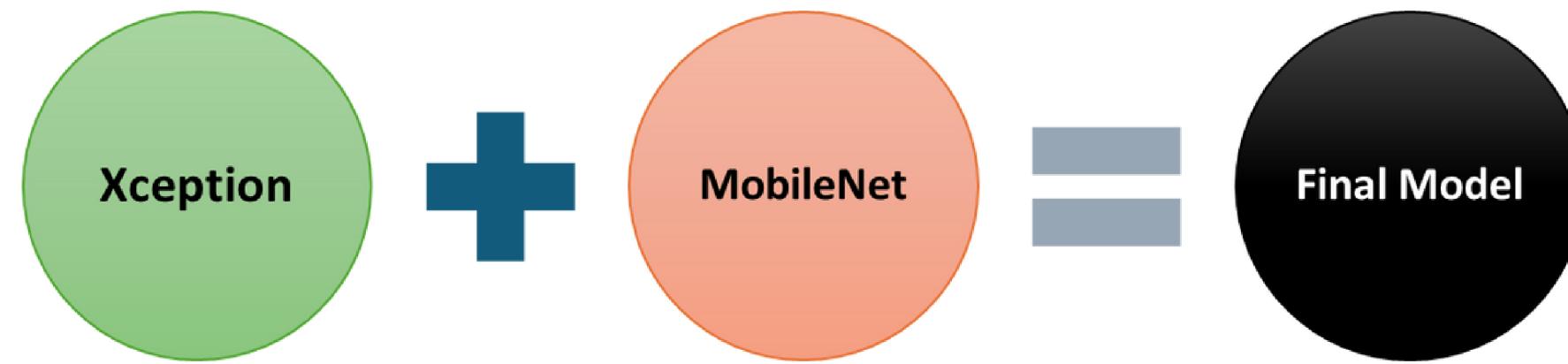
The optimization process revealed that the combination of Xception and MobileNet models yielded the best results.

By leveraging the strengths of both models, the ensemble achieved superior accuracy and overall performance in detecting skin diseases.

This optimized approach ensures a robust and reliable diagnostic tool, capable of providing precise and consistent results

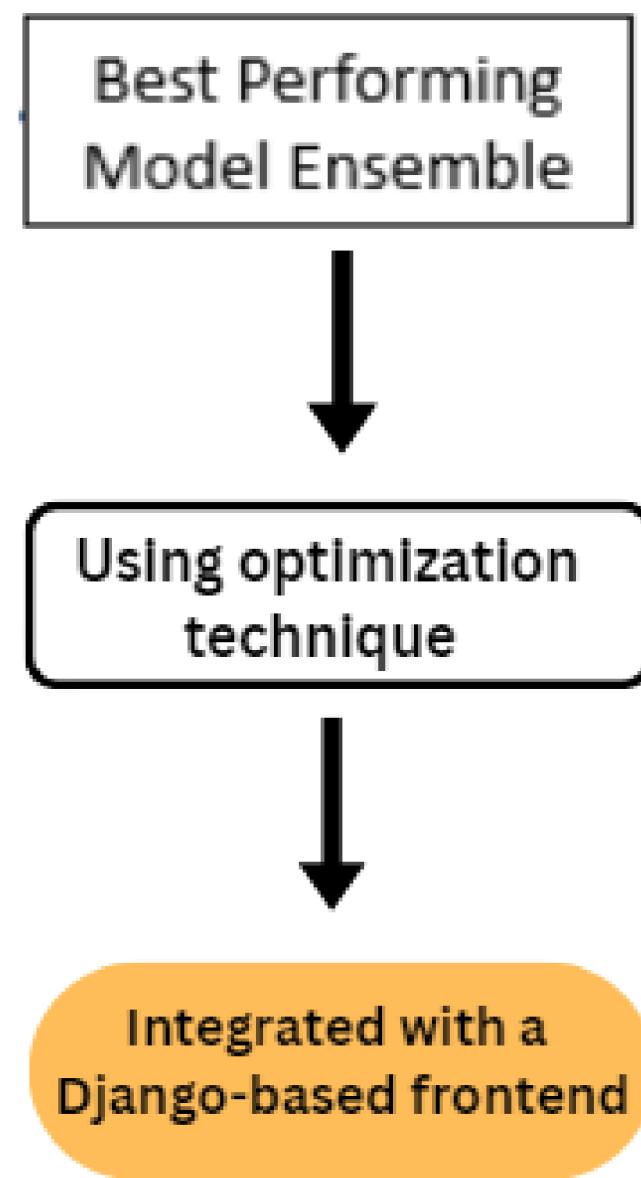


Results of Ensemble of Xception and MobileNet models



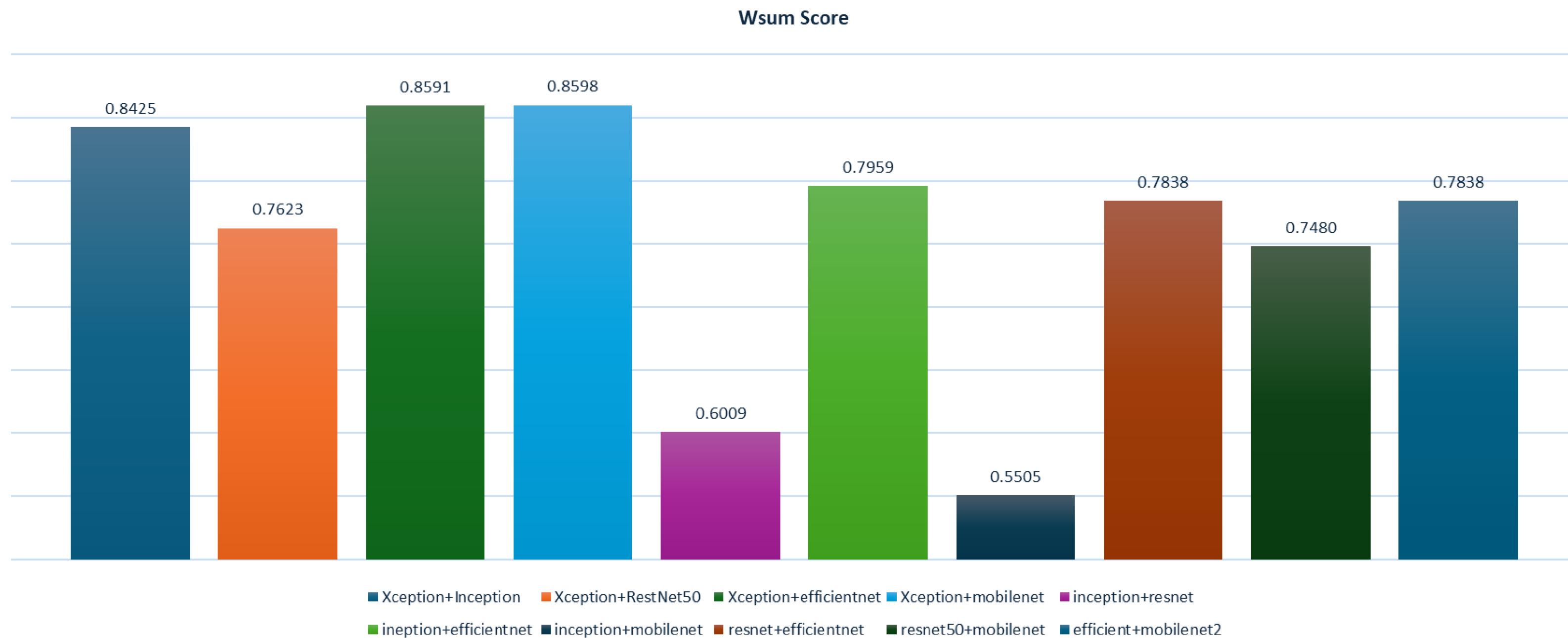
Phase - 3

Phase-3



- The optimization technique used in the third phase involved a weighted sum approach. This method assigns different weights to the performance metrics of each model based on their relative importance.
- By calculating Weighted sum optimization assigns weights to performance metrics based on importance, calculating a weighted average to evaluate models comprehensively.
- This approach ensures balanced performance across multiple metrics, optimizing accuracy and other crucial parameters, and enabling selection of the best overall performing model.

Result of 3rd phase



Front-End Interface

Responsive Design:

- The platform features a user-friendly, responsive design that works seamlessly across various devices.

Ease of Use:

- Simplified navigation and intuitive controls allow users to easily upload images and view results.

Real-time Feedback:

- Provides immediate feedback and diagnosis upon image submission.

Educational Resources:

- Offers information on various skin conditions to help users understand their diagnosis.

Back-End Infrastructure



Web Framework:

- Built using robust web technologies to ensure stability and scalability. Likely technologies include Django, Flask, or similar frameworks for backend development.

Database Management:

- Secure storage of user data and images, with a focus on privacy and compliance with data protection regulations.

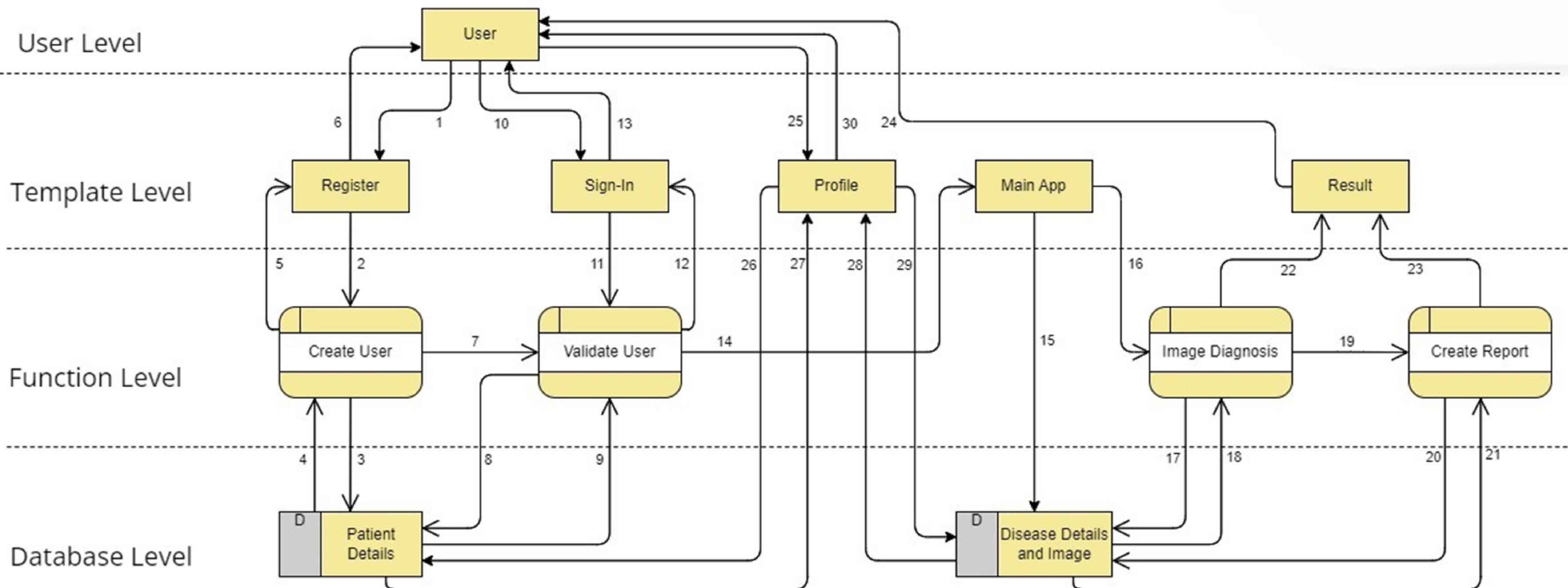
API Services:

- Integrates with AI model serving platforms to facilitate seamless model inference and data processing.

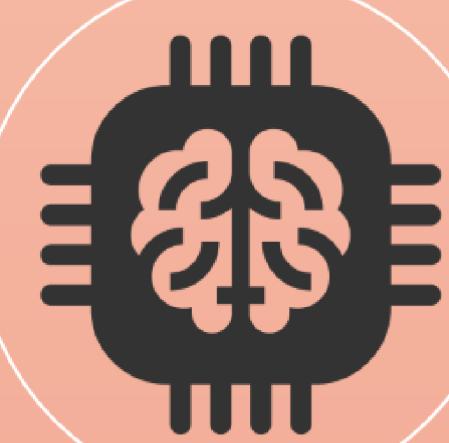
Scalability:

- Designed to handle a large number of concurrent users and image uploads, ensuring smooth operation under high demand.

Data Flow Diagram



System Goals



Smart:

- DermDetect has been designed using modern technologies like machine learning to automate the process of detection of psoriasis, a very common skin disease in India. With the help of today's medical science knowledge and advanced technologies, our app has the ability to provide high accuracy results, as good as a professional dermatologist.



Simple:

- Place your phone's camera near the formation on the skin and click a clear photo, upload it to our system, and within 15 seconds you will find out if there is cause for concern.



Accessible:

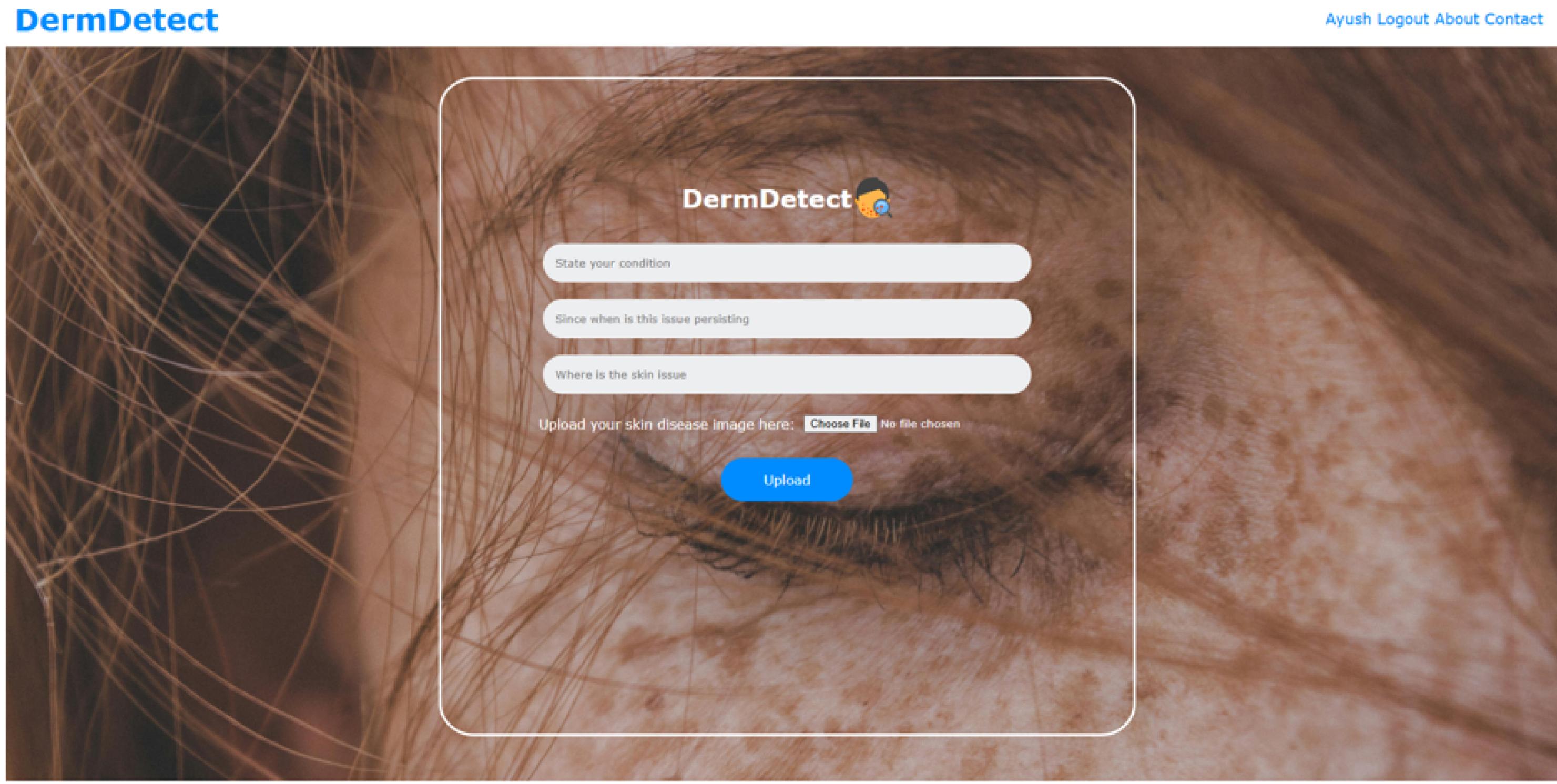
- DermDetect is available anytime, anywhere. Keep your health in check at your fingertips even when you are on the go.



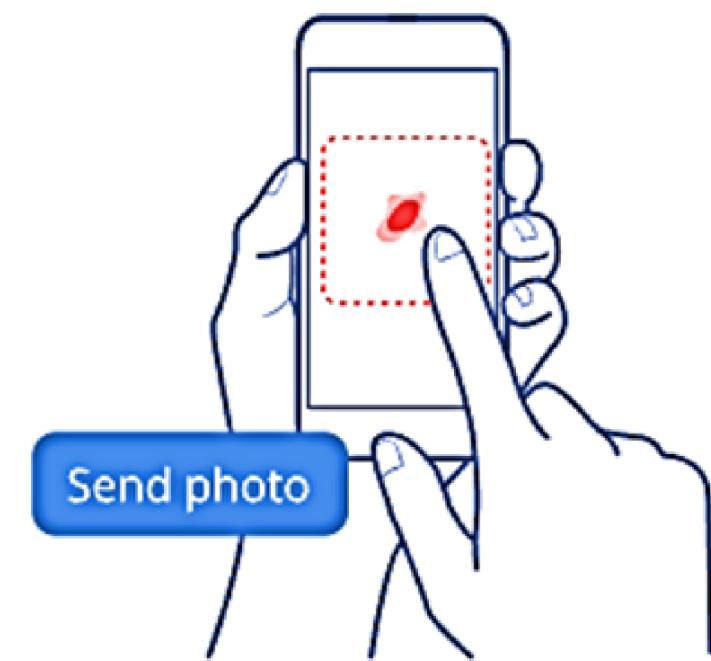
Affordable:

- DermDetect's leading image analytics features are absolutely free to use. The main objective behind building the system is to provide a seamless and easy user experience to our users so that they can verify their doubts about their skin irritations and get confirming results.

Front-End User View: DermDetect



How to use the DermDetect



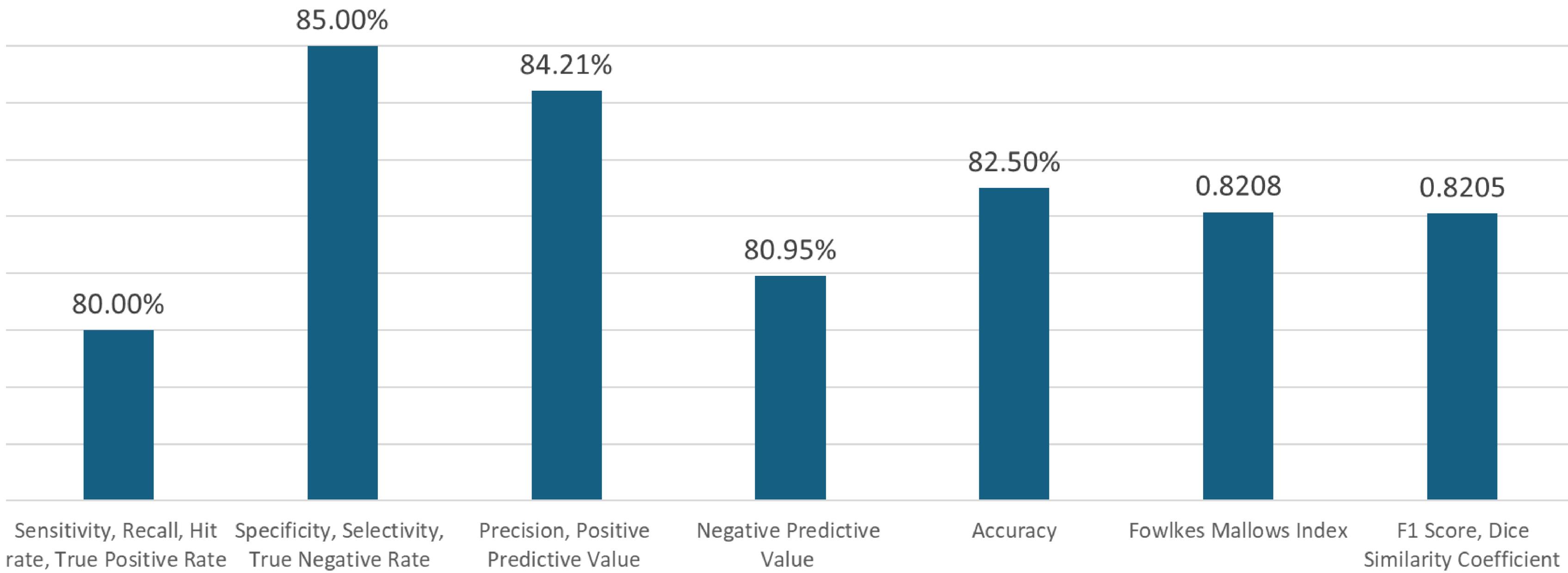
Results

		Training Set	
		Psoriasis	Non-Psoriasis
TARGET OUTPUT	Psoriasis	16 40.00%	3 7.50%
	Non-Psoriasis	4 10.00%	17 42.50%

Confusion Matrix

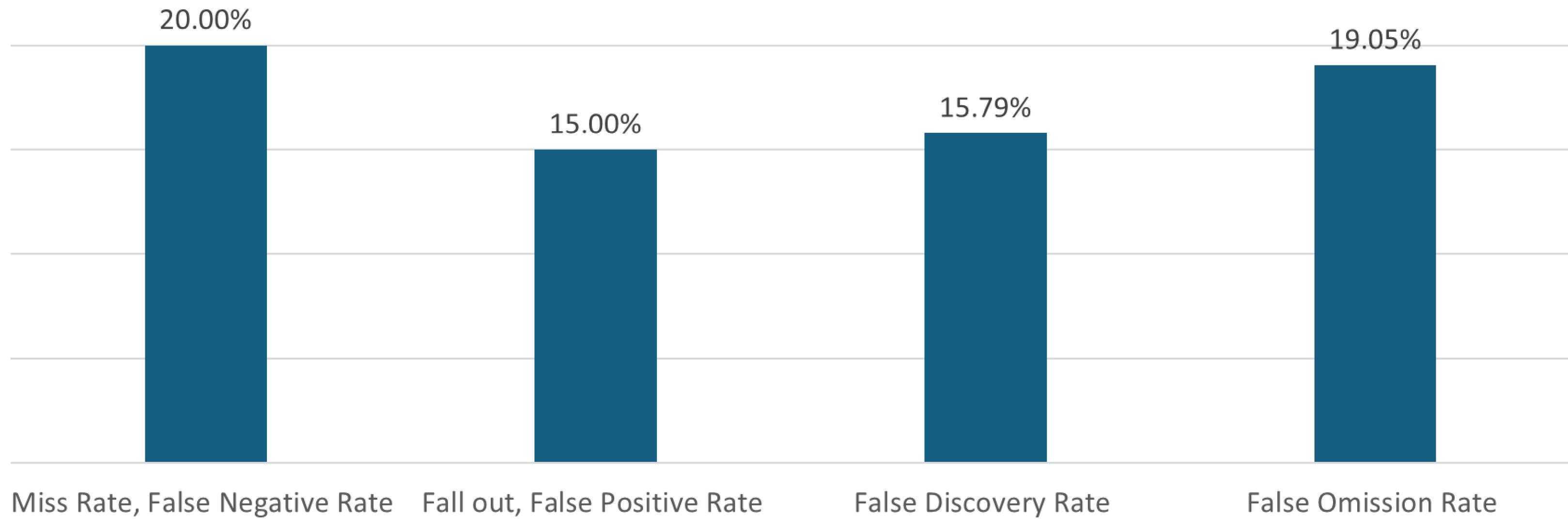
Results

Final Result:1



Results

Final Result:2



Results

Final Result:3



Threat Score, Critical Success
Index



Cohen's Kappa Coefficient (κ)



Jaccard Index



Phi coefficient (ϕ), Matthews
Correlation Coefficient

Conclusion

- There are several challenges associated with skin disease detection in India. One of the biggest challenges is the lack of awareness and education about skin diseases among the general public, which can result in delayed diagnosis and treatment. Additionally, there is a shortage of dermatologists in India, particularly in rural areas, which can limit access to specialized care.
- Another challenge is the variability in skin types and conditions across different regions of India, which can make it difficult to develop algorithms that are accurate for all populations. Finally, the quality of images used for analysis can be a challenge, particularly in areas where there is limited access to high-quality imaging equipment.
- Despite these challenges, we are trying to improve the accessibility and accuracy of dermatological care in the country using our research work.

Thank You

