Pimpri Chinchwad Education Trust (PCET)

Pimpri Chinchwad College of Engineering

An ISO 9001:2015 Certified Institute, NBA Accredited, Accredited by NAAC with ‘A’ grade

Department of Information Technology

Skin disease classification

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Introduction

Skin Disease Classification:

- Skin diseases are commonly occurring and can have various harmful effects if not detected and treated early. Current diagnostic methods rely heavily on visual examination and clinical tests, which are prone to errors and can be time-consuming and expensive.
- It is essential to address this issue because early detection of skin diseases significantly improves the chances of successful treatment, with cure rates exceeding 95%. By enhancing diagnostic accuracy and efficiency, patients can receive timely intervention, preventing the spread and worsening of skin conditions.

Introduction

Skin Disease Classification:

- Our project proposes a solution that utilizes image processing and classification techniques to improve the accuracy and efficiency of skin disease diagnosis. By automating parts of the diagnostic process, such as image segmentation and feature extraction, our system aims to reduce human errors and streamline the diagnosis process.
- Patients: Receive early and accurate diagnosis, leading to timely treatment and improved outcomes.
- Dermatologists: Enhance diagnostic capabilities, reduce reliance on manual screening, and optimize resource utilization.
- Healthcare System: Decrease healthcare costs associated with prolonged treatment and improve overall patient care.

Motivation

- Provide accessible and efficient healthcare solutions
- Maintaining user privacy and data security.
- Aim: Develop a user-friendly web application for automated skin disease diagnosis.
- Goals:
  1. Implement a robust and accurate classification system using CNN algorithms.
  2. Create an intuitive user interface for seamless image uploading and result presentation.
  3. Ensure scalability and reliability of the application to accommodate a large user base.

Project Overview

- Data Collection: Gather a diverse dataset of skin disease images for training and testing.
- Preprocessing: Prepare the images by resizing and augmenting them for optimal model training.
- Model Development: Experiment with various CNN algorithms to develop a classification model.
- Evaluation: Assess the performance of the model using validation data and fine-tune parameters for optimal accuracy.
- Web Application Development: Design and implement the user interface and backend functionality for image upload and result display.

Literature Survey

Sr No.	Title Of the Paper	Methodology	Limitations	Conclusion
1	"Classification of skin disease using multi SVM classifier." *3rd International Conference on Electrical, Electronics, Engineering Trends, Communication, Optimization and Science*. 2016.	-C-means -Watershed -GLCM, IQA -MultiSVM classifier using Matlab	Higher time complexity	Consistently delivers high-quality results, proving effective even with smaller training datasets.

Literature Survey

Sr No.	Title Of the Paper	Methodology	Limitations	Conclusion
2	"Automatic detection and severity measurement of eczema using image processing." *2016 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). IEEE,* 2016.	-Region growing segmentation -Color based segmentation -Texture, color and border based feature extraction -SVM classification	The reliance on an image database may lower the accuracy level.	The proposed method offers a faster and simpler approach to detection with high accuracy; however,

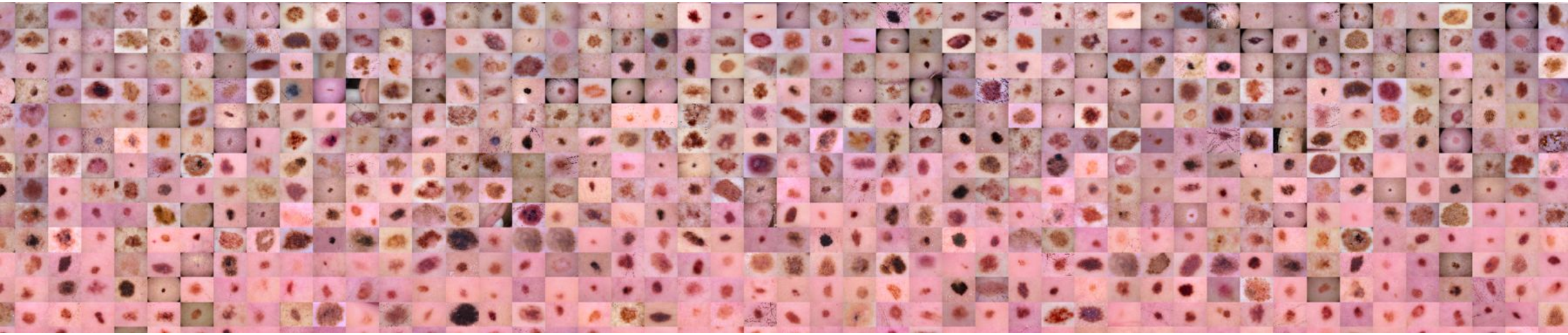
Literature Survey

Sr No.	Title Of the Paper	Methodology	Limitations	Conclusion
3	“Segmentation and classification of skin lesions for disease diagnosis." *Procedia Computer Science* 45 (2015): 76-85.	-Region growing segmentation -Color and texture based feature extraction -SVM and KNN classification	Potential performance reductions in certain classification classes, emphasizing the superiority of their fusion over individual methods.	Combining SVM and KNN methods yields better performance results
4	Automatic detection of melanoma skin cancer using texture analysis." *International Journal of Computer Applications* 42.20 (2012): 22-26.	-Fisher score ranking -Multi Layer Perceptron classifier method	Errors may arise if correct features are not selected diligently.	Skipping the segmentation method improves performance.

Dataset

HAM10000 ("Human Against Machine with 10000 training images") dataset

- 10015 dermatoscopic images
- 7 different classes of skin diseases



	lesion_id	image_id	dx	dx_type	age	sex	localization	path	cell_type	cell_type_idx
0	HAM_0000118	ISIC_0027419	bkl	histo	80.0	male	scalp	../input/skin-cancer-mnist-ham10000/ham10000_i...	Benign keratosis-like lesions	2
1	HAM_0000118	ISIC_0025030	bkl	histo	80.0	male	scalp	../input/skin-cancer-mnist-ham10000/ham10000_i...	Benign keratosis-like lesions	2
2	HAM_0002730	ISIC_0026769	bkl	histo	80.0	male	scalp	../input/skin-cancer-mnist-ham10000/ham10000_i...	Benign keratosis-like lesions	2
3	HAM_0002730	ISIC_0025661	bkl	histo	80.0	male	scalp	../input/skin-cancer-mnist-ham10000/ham10000_i...	Benign keratosis-like lesions	2
4	HAM_0001466	ISIC_0031633	bkl	histo	75.0	male	ear	../input/skin-cancer-mnist-ham10000/ham10000_i...	Benign keratosis-like lesions	2

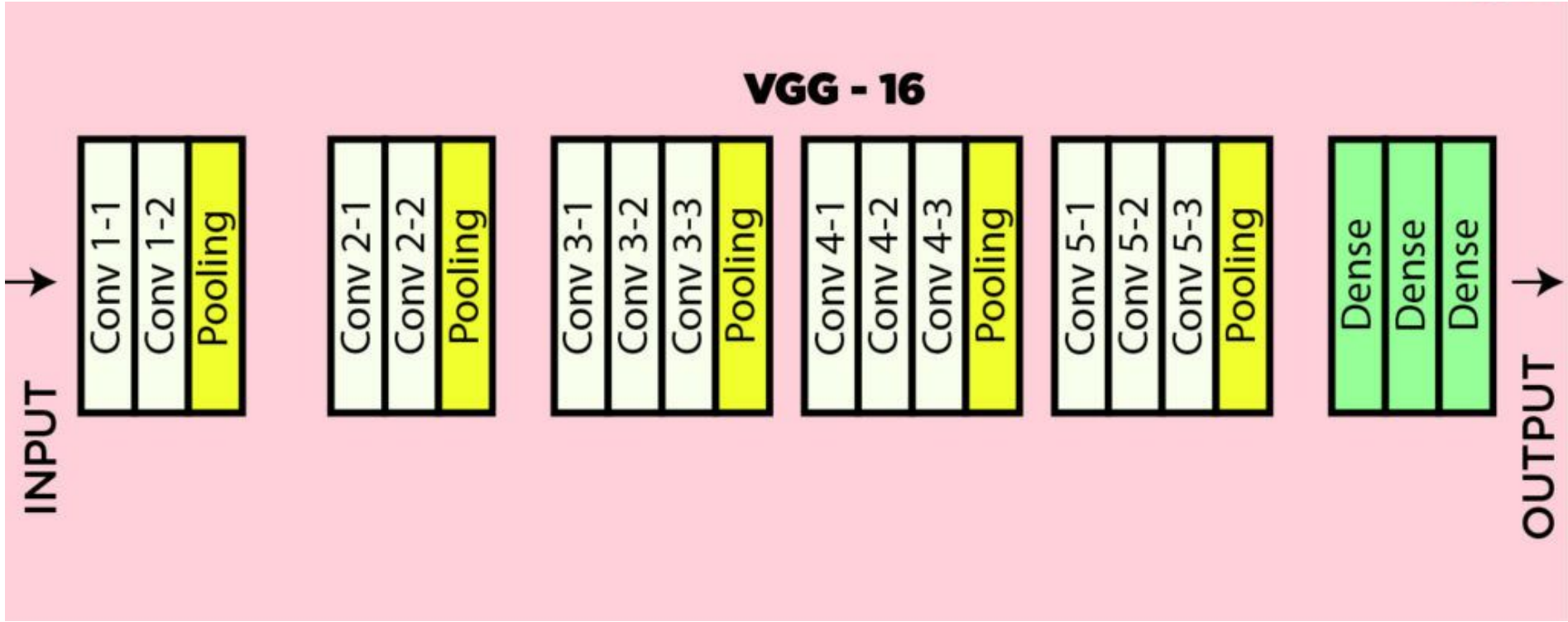
Objectives and Scope

- Objective:
  1. To Reduce User Efforts: Streamline the process of skin disease diagnosis by providing an automated platform where users can upload images and receive accurate results without the need for manual intervention.
  2. To Provide Full Satisfaction to Users: Ensure that users receive reliable and timely diagnosis results, leading to increased satisfaction and confidence in the application.

Objectives and Scope

- Scope:
  1. Integration of CNN Algorithms: Incorporate convolutional neural network algorithms to accurately classify skin diseases based on uploaded images.
  2. User-Friendly Interface: Design an intuitive and user-friendly interface that facilitates easy image uploading, result viewing, and navigation.
  3. Scalability: Develop the application with scalability in mind to accommodate potential growth in user base and data volume over time.

System Architecture



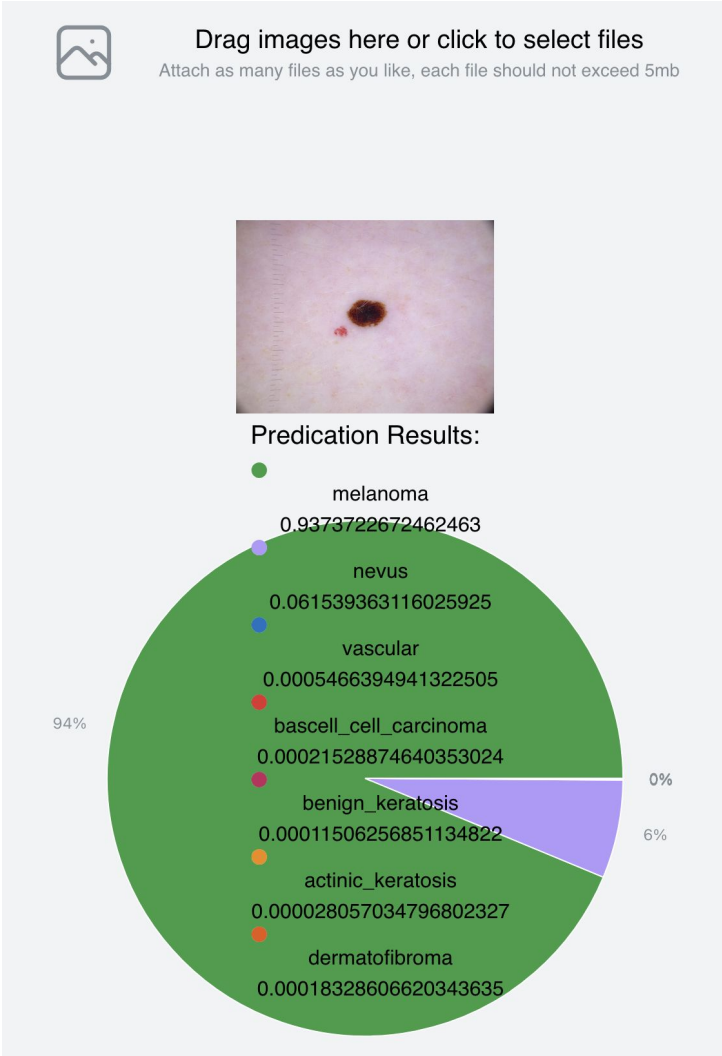
Methodology

- System Flow:
  1. Input: Affected skin region image.
  2. Pre-processing: Rescaling
  3. Classification: The image is classified using CNN with VGG16 architecture
  4. Result Representation: Result of classification is shown to user as a pie chart

Technology Stack

- Programming Language: Python3
- Image Processing Libraries: PIL
- Machine Learning Libraries: TensorFlow, Keras
- Development Environment: Jupyter Notebook or any Python IDE (e.g., PyCharm, VS Code)
- Data Handling and Manipulation: NumPy, Pandas
- Frontend: React, Tailwind, Vite, MantineJs

Result


Drag images here or click to select files
Attach as many files as you like, each file should not exceed 5mb
Predication Results:
melanoma
0.9373722672462463
nevus
0.061539363116025925
vascular
0.0005466394941322505
bascell_cell_carcinoma
0.00021528874640353024
benign_keratosis
0.00011506256851134822
actinic_keratosis
0.00002805703479680232 7
dermatofibroma
0.00018328606620343635
94%
0%
6%

Advantages & Applications

- **Early Detection**:
  - Enables early intervention and treatment, improving patient outcomes.
- **Non-invasive**:
  - Provides non-invasive screening, reducing patient discomfort.
- **Accessibility**:
  - Increases access to healthcare, especially in remote areas.
- **Efficiency**:
  - Enhances diagnostic speed and accuracy, optimizing healthcare delivery.
- **Cost-effectiveness**:
  - Reduces healthcare costs by streamlining the diagnostic process.
- **Scalability**:
  - Adaptable to various healthcare settings for seamless integration.
- **Objective Evaluation**:
  - Provides objective assessments, minimizing human error.

Conclusion

The project is expected to yield significant outcomes with far-reaching contributions across various sectors:

- Enhanced public health and hygiene through early detection of skin diseases.
- Reduction in healthcare costs and burden on medical facilities.
- Facilitation of remote diagnosis and communication in healthcare, coupled with strengthened data privacy and security measures.

References

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Thank You!