BVRIT HYDERABAD

College of Engineering for Women

Department of CSE-AIML

SKIN LESIONS CLASSIFICATION FOR EARLY DISEASE DETECTION

Under the Guidance of :

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AGENDA

- Introduction and background
- Problem statement
- Literature Survey
- Existing System
- Proposed system
- Architecture
- Modules
- Partial Implementation Results
- Extension plan

INTRODUCTION

- Skin lesion classification is a crucial component of dermatology and healthcare.
- Early detection of malignant lesions, such as melanoma, is vital for successful treatment and improved patient outcomes.
- Machine Learning methods can automate medical analysis, creating a system that enhances contextual relevance, improves clinical reliability, facilitates objective communication among physicians, reduces errors due to human fatigue, lowers mortality rates, decreases medical costs, and facilitates easier disease identification.

INTRODUCTION

- AI, particularly deep learning, is revolutionizing dermatology by automating skin lesion classification. These automated models, combining medical expertise and computational capabilities, accurately distinguish between benign and malignant cases, promising improved efficiency and precision in diagnoses, ultimately enhancing healthcare outcomes and accessibility.

PROBLEM STATEMENT

- The manual interpretation of skin lesions poses significant challenges in terms of accuracy, timeliness, and accessibility to specialized care. Dermatologists, while possessing expertise, may face difficulties in differentiating between visually similar benign and malignant lesions. Furthermore, the subjectivity in visual assessments and the limitations in accessing dermatological expertise can lead to delayed diagnoses, impacting patient outcomes. Addressing these challenges requires an innovative approach that combines advanced technologies, such as deep learning, to enhance the efficiency and reliability of skin lesion classification

EXISTING SYSTEM

- Dermascopic lesion image classification is an area of active research in machine learning. One of the primary goals of such research is to create systems which can classify the skin lesion images and use them for early detection of skin diseases.
- The drawbacks that can occur are :
- Complexity
- Real-Time Performance
- Diversity

PROPOSED SYSTEM

- Utilize advanced data augmentation techniques to expand the dataset systematically, enabling comprehensive model training on a larger and more diverse set of examples.
- Integrate transfer learning methodologies by utilizing pre-trained weights from established models like MobileNet, and InceptionV3. This optimizes model performance by leveraging knowledge acquired during pre-training on large-scale datasets.
- Add interpretability to the model using CAM(Class Activation Maps)

PROPOSED SYSTEM

- Implement optimization techniques to enhance overall model accuracy. Optimization strategies fine-tune model parameters and improve convergence, ensuring optimal performance in disease detection tasks.
- Develop a user-friendly interface tailored for medical professionals and patients, prioritizing ease of use for a seamless experience. This user-centric approach enhances accessibility and facilitates efficient interaction with the disease detection system.

ARCHITECTURE

- MobileNet V3:
  - MobileNetV3, a lightweight neural network architecture tailored for mobile and edge devices, introduces efficiency-focused design elements. Employing inverted residual blocks with lightweight depthwise separable convolutions, it enhances computational efficiency while capturing complex patterns.
  - The integration of efficient Squeeze-and-Excitation (SE) blocks facilitates feature recalibration and adaptability through global average pooling and channel-wise excitation. Furthermore, MobileNetV3 leverages ideas from Neural Architecture Search (NAS) to optimize block configurations, fine-tuning the architecture for improved performance.

ARCHITECTURE

- Inception V3:
  - InceptionV3, a convolutional neural network architecture, incorporates distinctive features to optimize image processing tasks. The utilization of Inception modules involves parallel convolutional pathways (1x1, 3x3, 5x5), facilitating diverse feature extraction within the same layer.
  - To reduce computational complexity, the architecture employs factorization, breaking down large convolutions into smaller ones. Addressing the vanishing gradient problem, InceptionV3 incorporates auxiliary classifiers at intermediate layers during training.
  - Stabilizing and accelerating training is achieved through the application of batch normalization, enhancing convergence. Furthermore, the model adopts global average pooling in the final layers, replacing fully connected layers to reduce parameters and prevent overfitting.

MODULES

- Data Collection
- Data Preprocessing
- Deep learning model
- Performance Evaluation

Data Collection

- Data is collected from various challenges which were working on medical images.
- The data has been carefully curated, we plan on using HAM10000 dataset which has 10000 images
- HAM10000 dataset has images along with the labels and masks which tell about the lesion area and the classification used for training
- Link to the dataset : https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/DBW86T

Data preprocessing

- Train test split : A train test split is when you split your data into a training set and a testing set.
- Class Balancing : Balancing a dataset makes training a model easier because it helps prevent the model from becoming biased towards one class.
- Data augmentation : Data augmentation is the addition of new data artificially derived from existing training data.

Deep learning Model

- The primary goal is to design a deep learning model tailored to the specific requirements of image data processing
- Utilize transfer learning techniques to leverage pre-trained model ,and adapt them to the target image-related task.
- Fine-tune hyperparameters to optimize model performance for the given image dataset, ensuring it meets the desired objectives.
- Configure the neural network architecture by selecting and organizing layers suitable for image data, such as convolutional and pooling layers.

Deep learning Model

- Deep Learning Model with CAM with Class Activation Maps (CAM):
    - Class Activation Maps (CAM) reveal where a neural network focuses during predictions.
    - They improve model interpretability by highlighting influential image regions, aiding in object localization, and enhancing transparency into the network’s decision process in image classification tasks.

Performance Evaluation

- The comprehensive evaluation of our proposed model involves subjecting it to diverse and challenging scenarios.
- Scenarios designed to mimic real-world conditions deviating from ideal training situations
- This aimed to gauge the model's resilience to practical image degradation.
- Evaluation metrics, including accuracy, precision, recall were employed for quantitative analysis. Qualitative analysis involved visually inspecting model predictions on challenging images, providing insights into its behavior and identifying potential areas for improvement in handling specific challenges.

EXTENSION PLAN

- Model Selection: Choosing an appropriate model that caters to the needs of the problem in hand the different models which are prospects are RESNET, MobileNet,Inception.
- Integration of CAM Once the model is created the class activation maps(CAM) are to be integrated in the architecture of the model.
- Performance Optimization Apply optimization techniques to yield better results all while not compromising on the user experience.
- User interface Create a user interface which is handy and easy to use.It has to provide the explanation to the output.

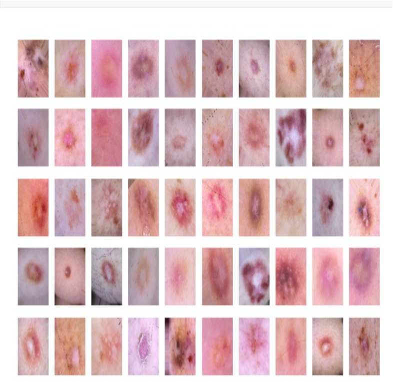
Major Project Stage - 2

AGENDA

- Data Collection
- Data Augmentation
- Data Preprocessing
- Visualization
- Integration
- Testing
- Evaluation

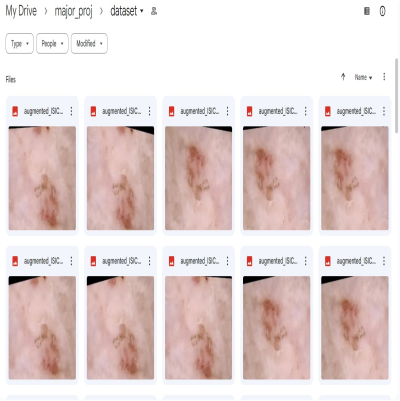
Progress so Far

- Module Name: Data Collection
- Status: 100
- Result:



Progress so Far

- Module Name: Data Preprocessing
- Status: 100
- Result:

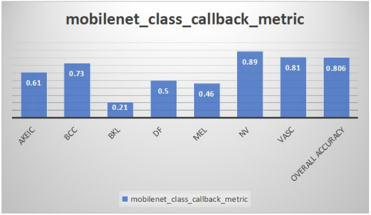


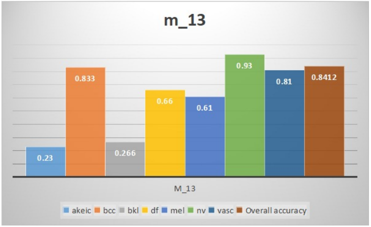
Progress so Far

- Module Name: Model Selection
- Status: 70
- Result:

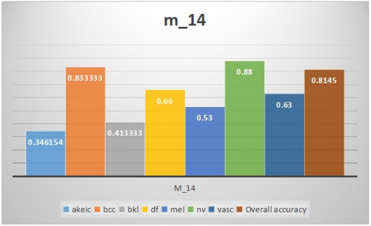
Model	akeic	bcc	bkl	df	mel	nv	vasc	Overall accuracy
mobile_net_100_epochs	0.615	0.7	0.2	0.5	0.46	0.9	0.81	0.812
mobilenet_class_callback_metric	0.61	0.73	0.21	0.5	0.46	0.89	0.81	0.806
m_13	0.23	0.833	0.266	0.66	0.61	0.93	0.81	0.8412
m_14	0.346154	0.833333	0.41333	0.66	0.53	0.88	0.63	0.8145

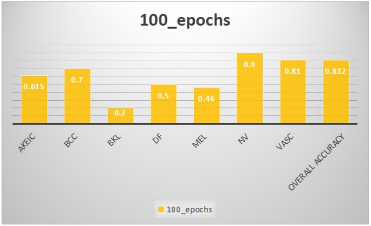
Model Wise Graph



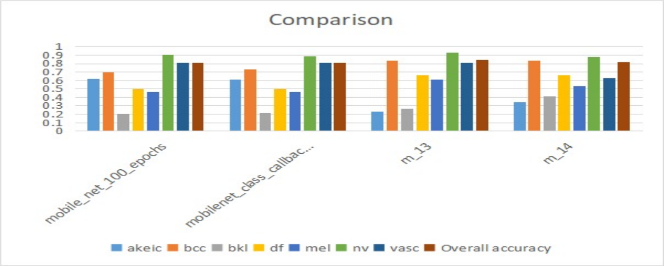


Model Wise Graph





Model Comparison



Stage - 2 Plan

- Creating User Interface

THANK YOU