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Detection of Signs of Ageing in Face and Demanding Situations to the Body and Skin Diseases after COVID -19 using Machine Learning

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ABSTRACT

The primary goal of this thesis is to simulate the causes of human face ageing and to detect skin illnesses. This project combines the capabilities of a Deep Learning model, notably EfficientDet, with the capabilities of a machine learning model and Advanced Computer Vision to identify and locate aging and skin disease. In an uploaded photo there are irregularities which can be detected. The appearance of age-related face changes is determined by a variety of factors. Wrinkles, dark patches, and swollen eyes are all variables to consider. The TensorFlow Objection Detection API is used to investigate the factors. TensorFlow Zoo's EfficientDet model is pre-trained. The proposed models are found to be effective based on the outcomes. Very effective in predicting the indications of ageing in people of all ages. Python was used to implement this project.

Keywords : Skin Disease, Advanced Computer Vision, Convolutional Neural Networks (CNN), Google Net Architecture, Tensorflow, Ageing Detection, Object Detection API.

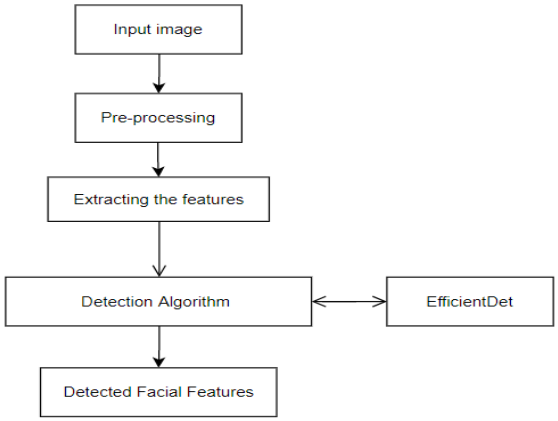
I. INTRODUCTION

The project's prototype involves applying machine learning to detect signs of ageing in the human face. Our goal is to develop a machine learning system that will allow users to upload a photo of an affected part of their skin and receive a diagnosis. We usually do not give priority to skin diseases so this software provides us an easy way to detect any problems with skin. Estimating the burden of skin disease in India using a risk-adjusted approach. To train on our own Datasets, we used the Tensorflow Object Detection API, the pre-trained EfficientDet model from Tensorflow Zoo, and the Google Collab GPU.

Identification of diseases in human face and skin

Detection of facial irregularities and skin diseases is possible through a combination of factors applied when training the model. The methodologies are divided into detecting puffy eyes, wrinkles and dark spots for facial features and detecting irregularities on the skin. Early diagnosis of such problems help in eradicating the diseases completely. A lot of skin diseases when detected may show any other diseases that are caused by the skin condition or the skin condition caused by some other disease. Few strategies include training the models to detect the irregularities first and then using the algorithm to fine tune and provide results. This strategy effectively enhances the

results. It can be put simply as a more efficient method to detect signs of ageing and skin disease detection like rashes and acral lesions. This can be used to bring an early diagnosis to light.



Pre-trained EfficientDet model for detecting facial irregularities and skin diseases

CNN designs were trained and adjusted according to our requirements using the pre-trained EfficientDet model. We updated the software so that it detects what is required because our model is pre-trained. Furthermore the model has been trained to increase efficiency. The system has been programmed to deal with real-world images that may or may not be clear or accurate enough to detect what we require.

II. MATERIALS AND METHODS

CNN models

Artificial Neural Network are computational models that, with their neurons and neurotransmitters, mirror the overall standards of how to the brain works. Their essential distinctive element is their capacity to be prepared through regulated learning. During this technique, neural networks are prepared to address a framework utilizing accessible information that incorporates explicit matching of the framework's bits of feed backs and results.

CNN(ConvNet/CNN) is a Deep Learning method that can take an input image, give relevance (learnable weights and biases) to various aspects/objects in the image, and distinguish between them. When compared to other classification techniques, the amount of pre-processing required by a ConvNet is significantly less. While filters are hand-engineered in basic approaches, ConvNets can learn these filters/characteristics with enough training.

EfficientDet based on a convolutional neural network. EfficientDet is a type of object detection model that uses multiple optimizations and backbone optimizations, including BiFPN and a composite scaling method that simultaneously and uniformly scales the resolution, depth, and width of all backbones, functional networks, and box/class predictive networks.

EfficientNet is a CNN design and scaling method that uses a compound coefficient to scale all depth/width/resolution dimensions evenly. The EfficientNet scaling method consistently increases network breadth, depth, and resolution with a set of preset scaling coefficients, unlike standard practice, which adjusts these factors randomly. If we wish to use twice as much processing power, we can simply increase the network depth by a, the width by BN, and the picture size by y, where a, ß, and y are constant coefficients.

Training and testing datasets

The EfficientDet model has been created and trained by Google Research Team. The results were of great accuracy. Among object detection model designs, EfficientDet achieves the best performance in the fewest training epochs, making it a highly scalable architecture, especially when operating with restricted computing. This is in line with the findings of the EfficientDet researchers.

The EfficientNet models outperform existing CNNs in terms of accuracy and efficiency, while reducing parameter size and FLOPS by an order of magnitude.

Our EfficientNet-B7, in particular, delivers new state-of-the-art accuracy of 84.4 percent top-1 / 97.1 percent top-5 despite being 8.4x smaller than the best existing CNN.

EfficientDet is EfficientNet's object detection variant, built on the success of EfficientNet in picture classification tasks. EfficientNets are a type of network that achieves a high level of performance on benchmark tasks while adjusting for a number of efficiency characteristics including model size and FLOPS. The network comes in a variety of model sizes ranging from d0-d7, with the base model performing better than YOLOv3 with a smaller model size.

C. Methodology

Machine learning is a subset of artificial intelligence that studies computer algorithms and model to mimic the human-like behavior of machines. Our project is based on machine learning. Machine learning is a method of teaching computers to do what humans do based on the knowledge gained in. Machine learning algorithms use computational techniques to learn information directly from data, independent of the equations given as models. The model training is done using tools such as LabelImg. Libraries like Tensorflow Zoo and algorithms like EfficientNet and EfficientDet are used to detect facial features and irregularities found in images using a trained model developed in Python.

TensorFlow's Object Detection API is a framework for building deep learning networks that solve object detection problems. The framework already has a pre-trained model called Model Zoo. This includes a collection of pretrained models trained on the COCO dataset, the KITTI dataset, and the OpenImages dataset. These models can be used for inference. It is also useful for initializing the model when training with the new dataset.

EfficientNet is a CNN architecture and scaling method that uniformly scales all dimensions of depth/width/resolution using a compound coefficient. EfficientNet uses a compound coefficient to uniformly scale network width, depth, and resolution in a principled way.

Based on previous work on scaling neural networks (EfficientNet), by incorporating a new bidirectional function network (BiFPN) and new scaling rules, EfficientDet is a state-of-the-art detector before calculating the required power. The following figure shows the overall network architecture of the model.

Mainly targeted on optimization is to enhance the performance of the function networks. While maximum preceding detectors definitely appoint a top-down function pyramid community (FPN), we discover top-down FPN which is inherently restrained through the one-manner data glide. Alternative FPNs, which includes PANet, upload an extra bottom-up glide on the fee of greater computation. Recent efforts to leverage neural structure search (NAS) found the greater complicated NAS-FPN structure. However, at the same time as this community shape is effective, it's also abnormal and tremendously optimized for a particular task, which makes it tough to evolve to different tasks.

To deal with those issues, we recommend a brand new bi-directional function community, BiFPN, which consists of the multi-degree function fusion concept from FPN/PANet/NAS-FPN that permits data to glide in each the top-down and bottom-up directions.

D. Related Works

a) A CNN based on TensorFlow for face recognition

Face detection is the basis for our project work. The CNN used had an amazing advantages like high practical value, recognizes specific character and retains accuracy even in case of poor or corrupt

datasets. But we have seen problems like over fitting, exploding gradient and class imbalances also in some cases.

b) Deep Learning for Face Detection: Recent Advancements

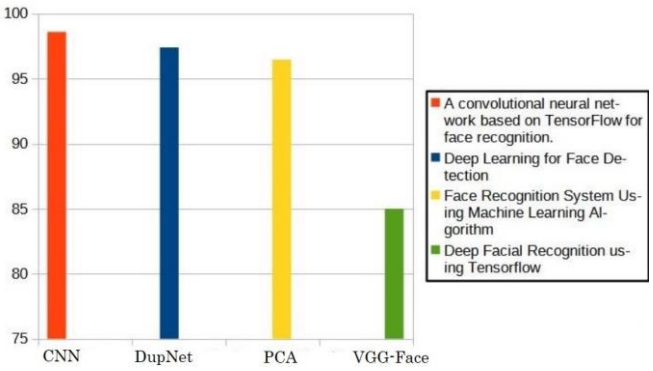
An old technique of deep learning for face detection has seen a few advancements as well. There has been a development where re-identification of redundant data is possible, facial poses; expressions and scales of images as well as occlusions have good accuracy and lastly now low resolution images and usage of proposed anchors have been explored. There are also a few downsides to this, the technique used is very old and not that progressed in terms of face detection. Extensive study is still required in the face detection field and there are many data privacy concerns.

c) Face Recognition System Using Machine Learning Algorithm

Face recognition in A.I is a frequent and ever-growing requirement. Many smartphone companies also have been using this technology. They are used for guarding private details online and study on partial facial occlusion is done. There have been attempts to solve the problems in A.I such as the massive data burden, vulnerable detection, and potential breach of privacy.

d) Deep Facial Recognition using Tensorflow

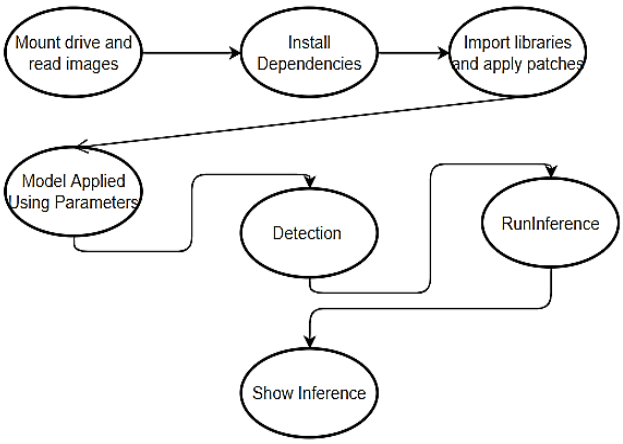
The prevalence of Deep Learning has made face detection a tractable problem. There are problems like none of the implementations of VCG-face reproducing each step in the workflow. There are no detailed documentation and steps for reproducing each step in the work flow. Old and not as accurate as today's approaches. But we have seen a few advancements as well like Tensorflow framework to reproduce a seminal deep learning facial recognition VGG-face data set. This method has particularly used Texas Advanced Computing Center's Maverick 2 supercomputer for performing the work. Seventy eight percent validation on the two thousand six hundred and twenty two images.



III. RESULTS

The algorithms used in our project are the latest for face recognition. It also incorporates a way to get the exact percentage of abnormalities that cause aging. It also detects skin diseases. Models designed with these algorithms can be trained with much less effort. The system we create and train will be able to detect signs of skin disease and aging using the trained model. Users can get one-click diagnostics using the developed algorithm. It is expected to detect symptoms such as skin rashes, terminal lesions, facial irregularities like wrinkles, puffy eyes and dark spots.

After using twenty to thirty visual representation of the image datasets to check the accuracy of the Tensorflow algorithm accuracy is 97%.



A direct transition from data acquisition to model training leads to suboptimal results. There may be a

problem with the data. If not, applying image enhancement will only extend the dataset and reduce over fitting. Image preparation for the object detection model includes, but is not limited to: Making sure the annotations are correct, making sure the EXIF orientation of the image is correct, resize the image and update the image annotations to match the new size of the image. Various color corrections such as grayscale and contrast adjustment improve model performance and also formatting the annotations to match the requirements of the model input. Hence we can conclude with amazing results in our project work.

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