Facial Acne Vulgaris Detection Using Deep Reinforcement Learning

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Summary of the Proposal

With a use of adequate machine learning algorithms, computer has the capability of detecting meaningful relationships in a data set and has been widely used in many clinical situations to diagnose, treat, and predict the results. We thought what problems in medicine might benefit from machine learning and we decided to investigate on a use of image recognition in medical field. We are proposing to develop an app (either web application or ios/android app) where by an uploading a photo, the algorithm can detect whether that image has Acne Vulgaris or not. We will test Reinforcement Algorithms to see their capabilities for object detection problems.

Background

Machine Learning for Medical Diagnostics is slowly used in Medical field more widely. However most of the Machine Learning application are used in Hospitals or Health care industries. We had urged feeling to create something that every individuals can have access anywhere and anytime through their phone devices. With a start from simple acne detection, we can eventually let a machine to learn different skin diseases by feeding images and train it to give an accurate diagnose for many other skin problems. In order to develop this app, we are going to attempt to improve existing reinforcement algorithms.

Goal and Objectives

The core of our method is to extract features of images based on Reinforcement Learning. An agent will receive as an *environment* a pre-processed greyscale image (we will test colored images too) and will perform an *action* which consists of selecting two variables x and y (we will also test more variables). These variables will be used for setting the dimensions of the object selection. We will also test multi-object selection, which can be easily done with some experimentations on the action space.

Data and Methods

Our project steps are followings:

- Gather data set images of facial acne.
- Reduce the dimensions of each image to some fixed values (we will try 50x50, 100x100, ... 500x500).
- Feed an image (*environment*) to the agent and perform some action.
- Use x and y variables to locate the object.

- Inverse and return the pre-processed image back to its original configuration with the object indicator.

1 Novelty

One downside to our original idea is the fact that the user (we) have to correct the agent's selections. Therefore, in order to make our project unique from previous object detection work, we will attempt to *automatize* the object detector as much as possible. This can be done, we believe, by having a *discriminator* making judgement on the quality of the object detection. The *discriminator* is a feature inspired from GANs (Generative Adversarial Networks). For the GAN, we can have acquire some *dataset* belonging to the object in consideration and use that as the *real* data, whereas the agent's object detection will be the *fake* data fed into the discriminator. Therefore, the agent will inheret the role of the *generator*.

References

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