Skin Disease Image Classification Using Convolutional Neural Networks
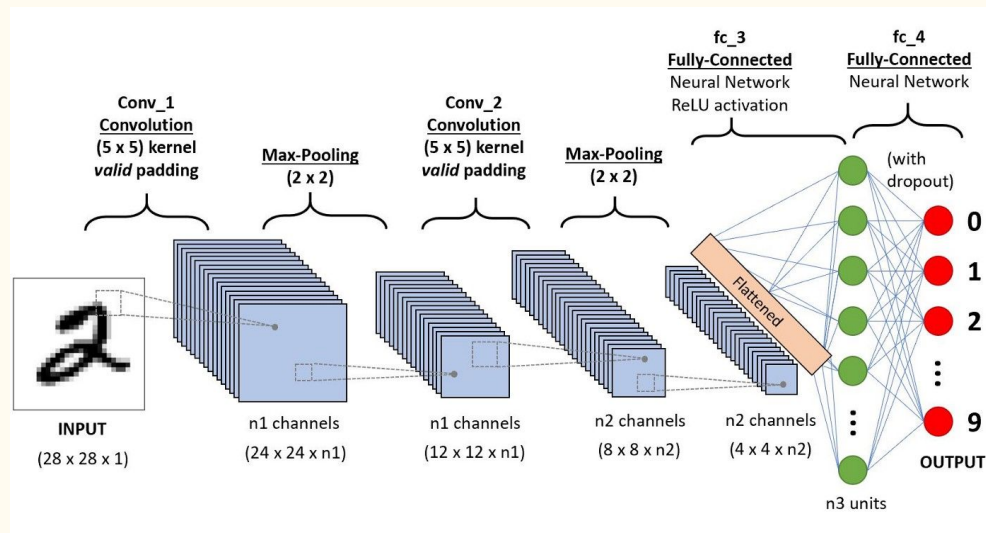
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By Ryan Johnson

Problem

- Few Doctors Performing In Person Visits
- Medical Staff Overworked and in Short Supply
- Not Everyone Has Access to a Webcam, Cell Phone or Internet
- Diagnosing a Skin Condition is Difficult if not Familiar

Problem Cont.

- Image Classification
- Convolutional Neural Networks
- Goal of 50% Accuracy

Data

- Scraped from Dermnet by Shubham Ggoel, posted on Kaggle
- 15,557 Training Images, 3,946 Testing Images
- 23 Very Broad Categories

Data Cont.

- Watermarks
- Categories Very Broad With Varying Amounts of Samples
- Varying Body Parts
- Performed NLP to Attempt Sub-division of Categories

Method

- 4 CNN Layers of Increasing Filter Size, 2 FC Layers
- Activation - elu, Kernel - he_normal
- Image Augmentation - Shear, Zoom, Rotate, Flip
- Maintained RGB Colorspace
- Compared My Model With Transfer Learned Resnet50 Model
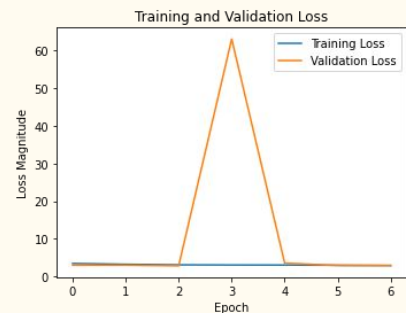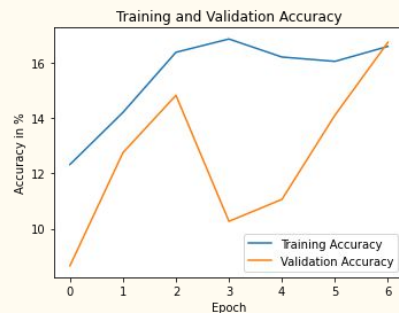- Verified Both Models on CiFar10 Image Set
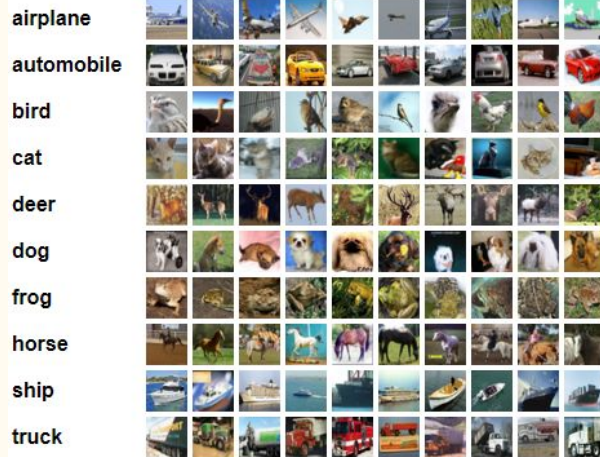
Modeling - Skin Image Set
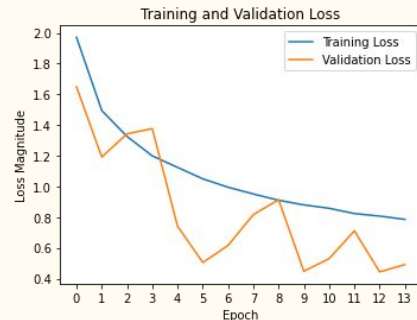
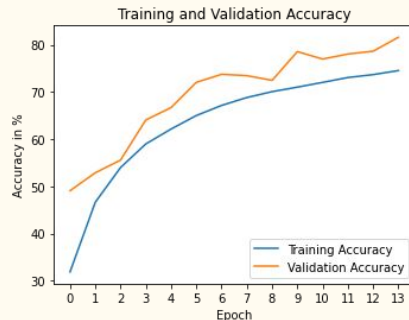- My Model - 20% Validation Accuracy
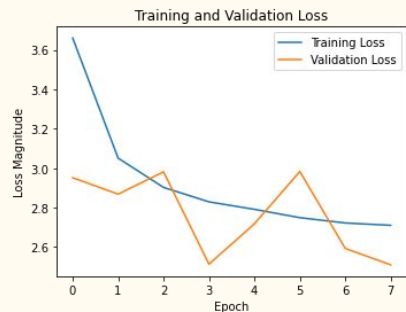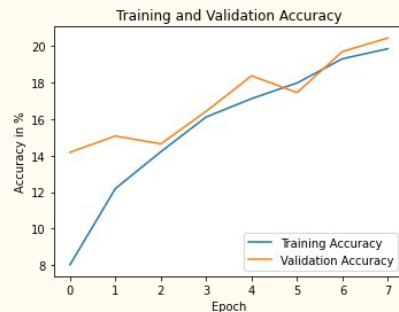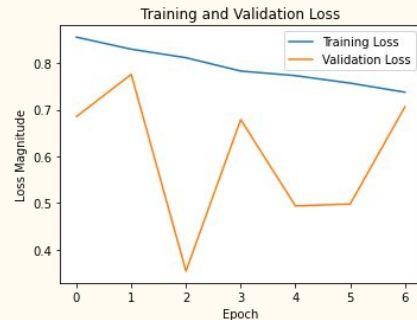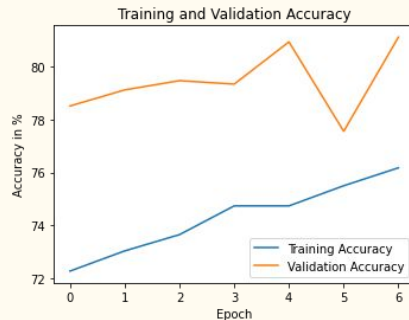

- Resnet 50 Model - 16% Validation Accuracy

Modeling - CiFar10 Image Set

- My Model > 80% Validation Accuracy

- Resnet 50 Model > 80% Validation Accuracy

Further Research

- Remove Watermarks or Obtain Images Without
- Sub-Divide the Image Set Into More Categories and Separate Body Parts
- Run Images Through a Body Part Classifier Before Condition Classifier
- Obtain Larger Dataset Per Sub Category
- Tune Dangerous Conditions to Have a Low False Negative Rate
- Return Top 5 Most Likely Conditions Instead of Just the Most Likely Condition

Recommendations

- Implement the model as an API and or a mobile device app.

- Allow users to submit their own pictures to improve accuracy even more and have them classified by body part. Design app so when inputting images there are only fixed options to select.

- Work with Physicians and Medical Students to check accuracy of submitted pictures and provide free/low cost human classification, similar to CAPTCHAs.

- Encourage Nurses and Physician Assistants to use for initial diagnosis.