Deep Learning for Hyperthyroidism Detection

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Overview

Problem Description

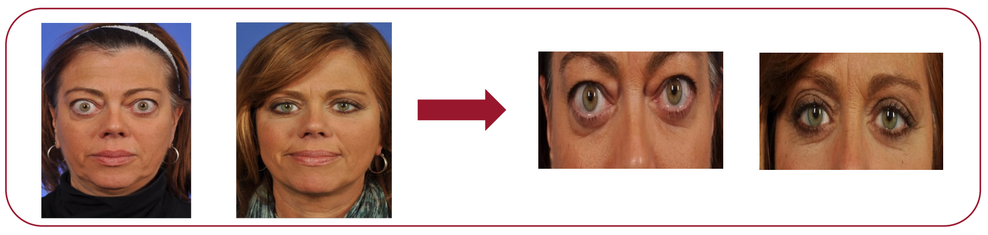
Hyperthyroidism (overactive thyroid) occurs when your thyroid gland produces too much of the thyroxine hormone. It can cause excessive body's metabolism, weight loss, irregular heartbeat , muscle weakness etc.

Goal

To build and compare different Computer Vision based models with different data augmentation techniques to be able to predict with higher accuracy.

Dataset

- **No existing dataset available**
- Collected 1400 images from the internet with 600 positive and 700 negative examples.
- Down sampling of images from 512x512 to 224x224 pixels.

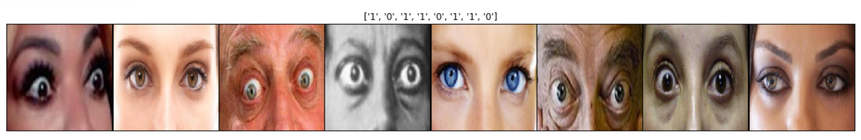


- Train: 700, Validation : 300, and Test : 300 (over multiple epochs with data augmentation)

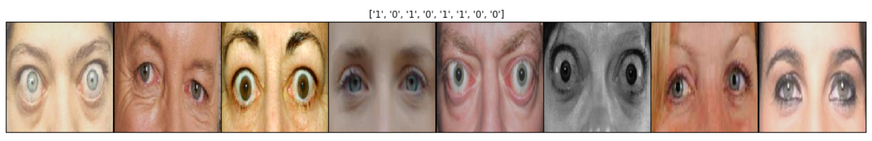
Data Augmentation and Network Architectures

Data augmentation to prevent overfitting and increase training dataset size

Original

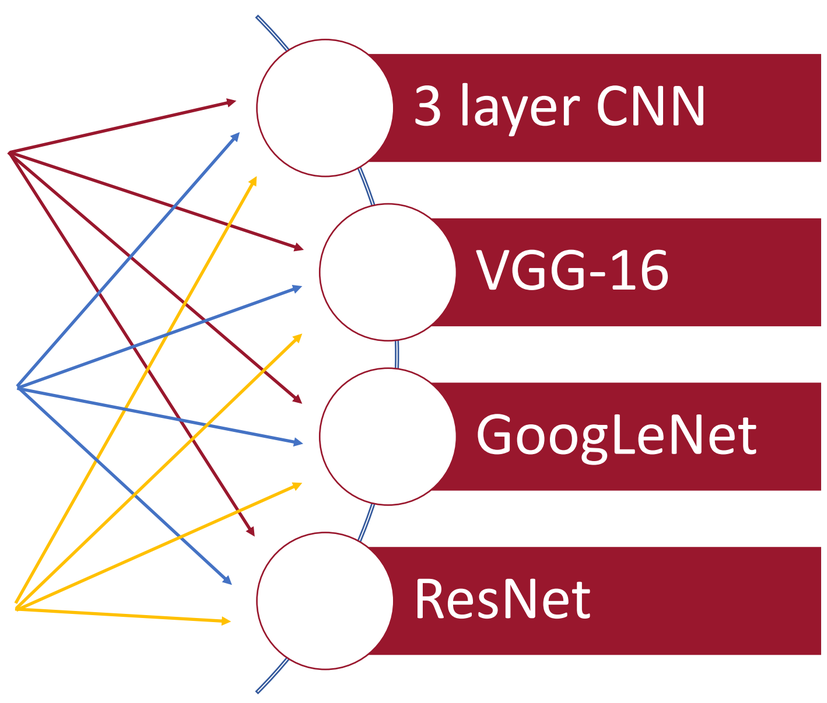


Color Jitters, Horizontal Flip, and Rotate



Google AutoAugment : 16 diff. types

Different Deep Learning architectures with varying model complexities



Preliminary model

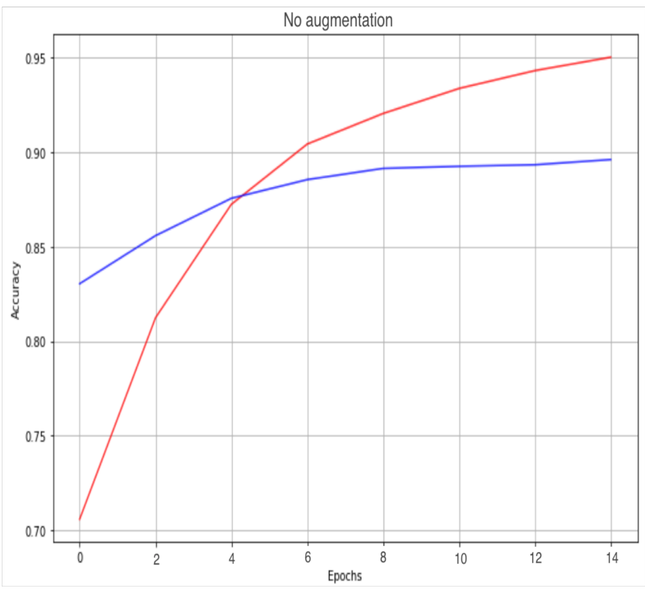
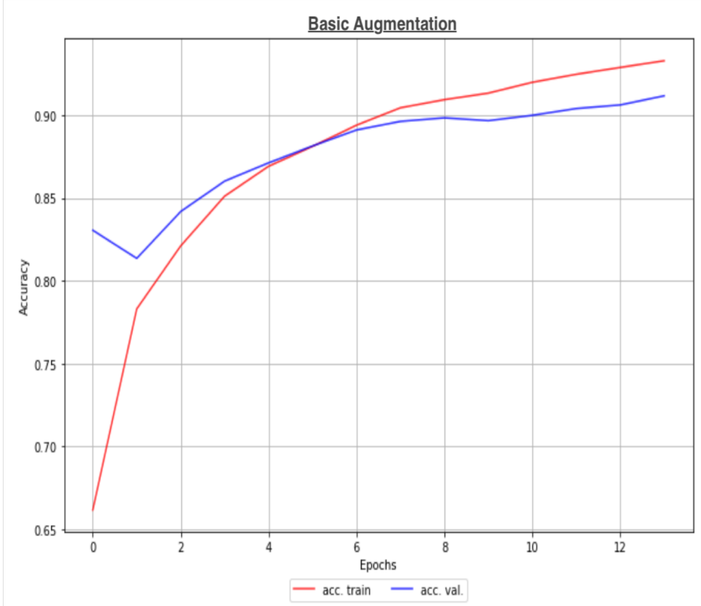
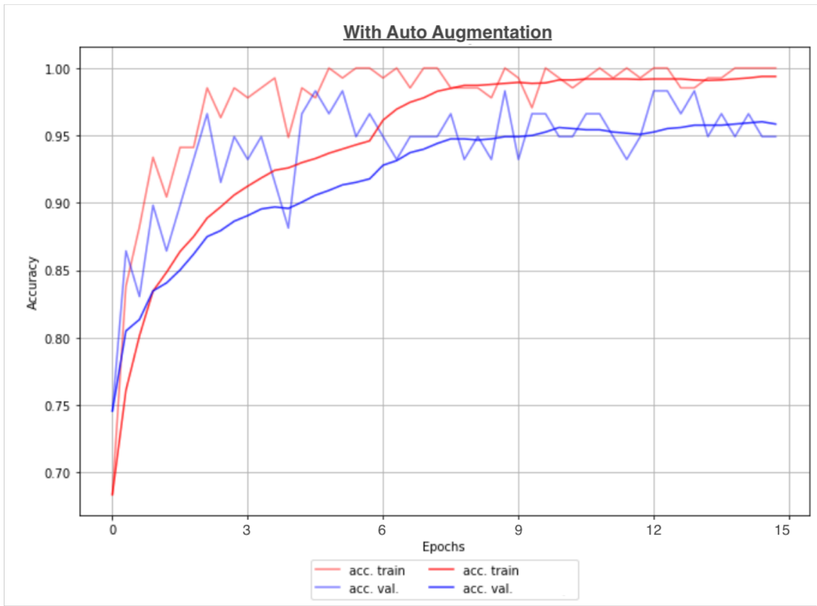
Traditional deep model with small convolutional filter sizes

Complex model with different architecture than traditional models

Deep model with very different network style

Results and Conclusion:

- **Deep Learning models with transfer** learning can be used for the applications with very small dataset
- **Different Data Augmentation techniques** help the model learn better and may increase the test accuracy by 4% -6%
- **Models with complex architecture** DO NOT guarantee better performance

Model:	3 Layer CNN	GoogleNet	VGG-16	ResNet
Test Accuracy:	83%	95%	**96%**	93%

VGG-16 train and validation Accuracies with different Augmentation