Deep Learning Final Project Proposal

BMEN 4000

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Problem Statement

In a study done by UNICEF, Pneumonia is the leading cause of death among children under 5 years old, accounting for approximately 880,000 deaths in 2016. Bacterial and viral pathogens contribute to the disease and require immediate antibiotic and support treatment. Early detection of the disease via chest x-rays are vital to a child's survival, however post image analysis can become backlogged due to volume and low resources. In this project, we explore a transfer learning framework using Google's ImageNet model to effectively classify normal, viral, and bacterial pneumonia in pediatric chest X-rays images.

Data used

Chest X-Ray Images (Pneumonia)
https://www.kaggle.com/paultimothymooney/chest-xray-pneumonia

Deep learning model/approach investigated

Convolutional neural network (transfer learning using Xception Net).
Global Average Pooling.
Test 2, 4, 8 layers with relu activation on top of pretrained model.
First layer will be 1024 units and further layers will be found through experimentation.
Softmax pool to 3 classes
Number of epochs, batch size, and training step will be determined empirically.

Method of assessment and metrics for success

- Accuracy
    - Analyze distribution of dataset
    - Train and test accuracy to check for overfitting
- Test and Train loss
- Confusion matrix
- F1 score - ensure low false negatives and positives
- Sensitivity - proportion of actual positives that are are identified as such
- ROC Curve
    - Precision to help when costs of false positives are too high
    - Recall to help when costs of false negatives are too low

- Visualize activation maps to see what the model believes is important for classifications
    - Ensures model interpretability and should match our intuition

Allocation of responsibilities

Kevin

- Code
    - GCP setup
    - Training
    - Model optimization
- Metrics
    - Visualize activation maps
- Paper
    - Write up abstract and materials and methods
    - Write up results and conclusions
- Presentation

Alex

- Code
    - Model setup in Tensorflow
    - Training
- Metrics
    - Confusion matrix
    - F1 score
    - Sensitivity
    - ROC Curve
- Paper
    - Write up introduction
    - Write up results and conclusions
- Presentation

Deliverables

(April 11) Project proposal

(April 18) Initial results and project status

(May 2) 4 page IEEE style paper/report
5 minute NeurIPS/IEEE style presentation

(May 9) Push code to github repo