WeboDoc: A Web Based Application for Classifying Pneumonia and Malaria Infected Images

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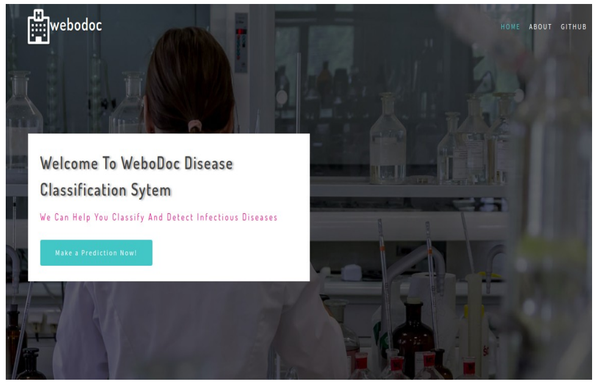
INTRODUCTION AND MOTIVATION

Pneumonia and Malaria has accounted for numerous premature death especially in developing countries in Africa and Asia where access to timely and good detection technologies is limited. WHO estimated that about 4 million death occur annually from air pollution diseases including pneumonia [3] and over 150 million people get infected annually especially children under 5 years old [4]. Malaria on the other hand was reported to cause approximately 438,000 deaths from 214 million infections in 2015 [5]. Automating the detection of infected patients with either pneumonia or malaria will ensure accurate diagnosis and will greatly improve health care in resource-scarce areas like Africa.



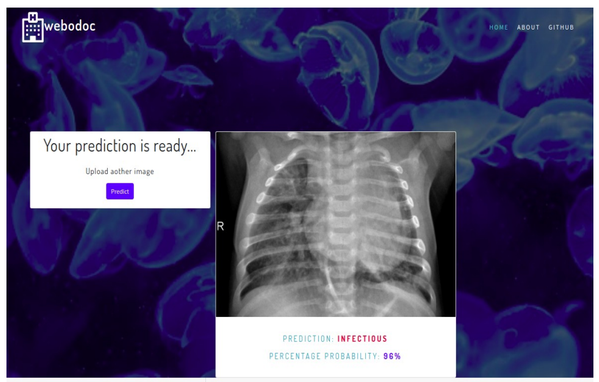


Fig 1. Interface of our prediction application (webodoc)

REFERENCES

[1] Rajaraman S, Antani SK, Poostchi M, Silamut K, Hossain MA, Maude, RJ, Jaeger S, Thoma GR. (2018) Pre-trained convolutional neural networks as feature extractors toward improved Malaria parasite detection in thin blood smear images. PeerJ6:e4568 https://doi.org/10.7717/peerj.4568

[2] Kermany, Daniel; Zhang, Kang; Goldbaum, Michael (2018), "Labeled Optical Coherence Tomography (OCT) and Chest X-Ray Images for Classification", Mendeley Data, v2

[3] World Health Organization, Household Air Pollution and Health [Fact Sheet], WHO, Geneva, Switzerland, 2018, http://www.who.int/newa-room/fact-sheets/detail/household-airpollution-and-health.

[4] I. Rudan, L. Tomaskovic, C. Boschi-Pinto, and H. Campbell, "Global estimate of the incidence of clinical pneumonia among children under five years of age," Bulletin of the World Health Organization, vol. 82, pp. 85–903, 2004

[5] Chan M. World Malaria Report. Geneva: World Health Organization; 2015

METHODOLOGY

We obtained two data sets comprising of pneumonia chest x-ray images (anterior-posterior) and malaria cell images, trained a convolutional neural network from scratch to automatically detect these infections, and infuse the trained models into a web application that can run locally as well as online.

- We start by processing our dataset, thereby splitting it into two folds, train and validation. and performed some resized pneumonia images to 150 x 150 and Malaria images to 100x100
- We trained two separate convolutional neural network to detect infections.
- Next, we saved, exported and embed the models into a Django powered web application with user interface that allows for upload and classification of images belonging to any of the categories
- Some key features of our web application are:
- ✓ It can be extended to include other trained classifiers/models.
- ✓ It has an easy to use interface.
- ✓ Ability to run locally as well as online.

DATASETS

Malaria Cell Images
size : 27,558
Classes: 2
Channel: 3
Sample Images

Fig 2. Infected Malaria Cell

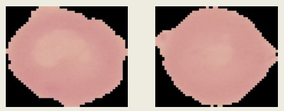


Fig 3. Uninfected Malaria Cell

Pneumonia Chest X-rays
size : 5,863
Classes: 2
Channel: 3
Sample Images

Fig 4. Infected Pneumonia Image

Fig 5. Uninfected Pneumonia Image

CONCLUSION

In this work, we trained two convolutional neural network on Malaria and Pneumonia images and embed it into a web application that can run locally. This application can help health practitioners to quickly detect pneumonia and malaria infected patients. Malaria images are in the form of microscopic slide smears while pneumonia images are from chest X rays. We show that our application can be infused into any hospital's existing system and can be useful in areas with scarce health personnel and limited resources.

CNN ARCHITECTURE

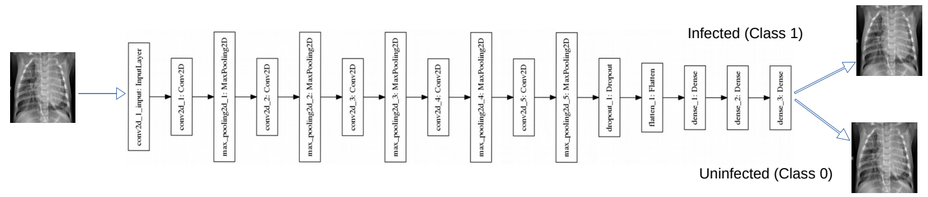


Fig 6. CNN Architecture for Pneumonia Chest X-ray Model

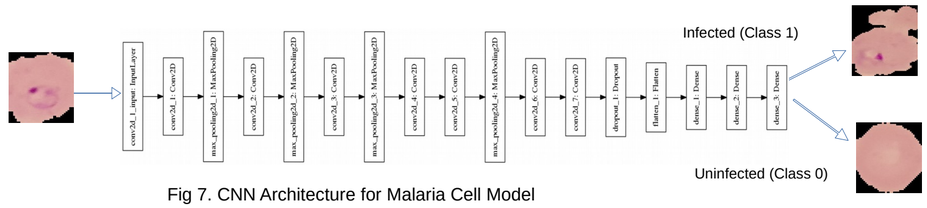


Fig 7. CNN Architecture for Malaria Cell Model

RESULTS

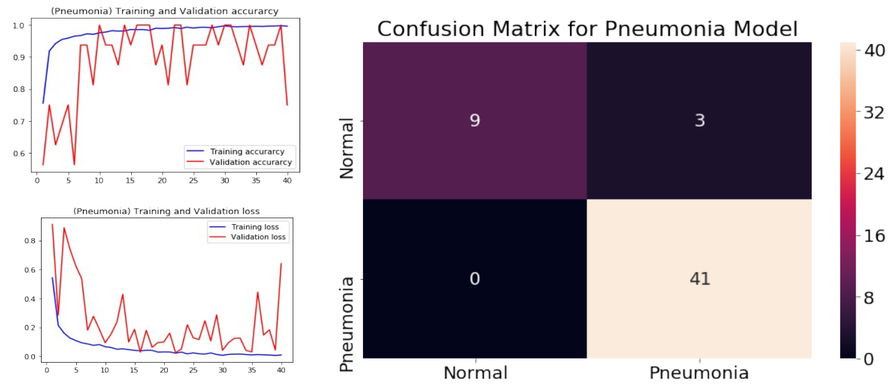


Fig 8. Training,validation and confusion matrix of Pneumonia Classification Model

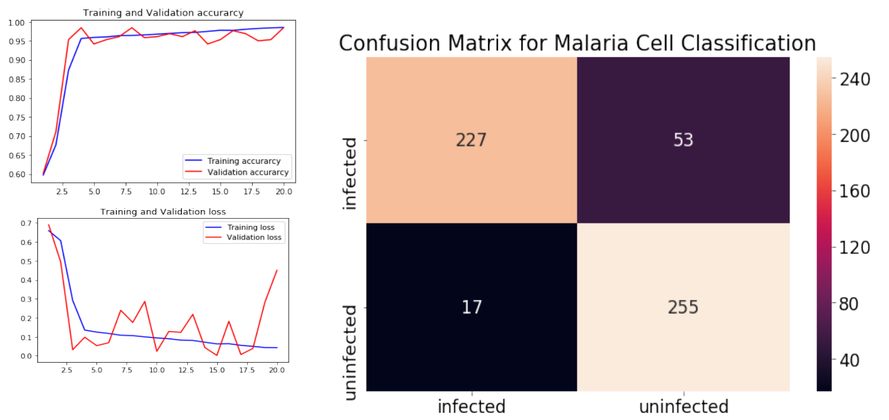


Fig 9. Training,validation and confusion matrix of Malaria Cell Classification Model