2005X12

Robotics & Intelligent Machines
2000

# LCPS RSEF OFFICIAL ABSTRACT - 2019

Development of a Model for the Classification of Common Lung Conditions from Chest Radiographs (CXR)

Shelby Haeff

Identifying lung conditions on a chest radiograph (CXR) takes an experienced medical professional to accurately read and interpret, especially since most diagnoses must confirm with patient history, age, and laboratory tests. However, a number of lung conditions appear as increased opacities on a CXR, making it difficult for a radiologist to distinguish one condition from another. The emerging computer science field of machine learning provides aid to medical professionals in identifying diseases such as various lung conditions.

This project uses a Convolutional Neural Network (CNN) model to classify multiple lung diseases from CXR data. The lung conditions identified by the model include Enlarged Cardiomediastinal, Cardiomegaly, Consolidation, Edema, Atelectasis, Pneumothorax, and Pleural Effusion. The CNN model used is based on the ResNet-101 neural network executed by Apache MXNet. The model employs ImageNet pre-trained weights and trained on chest radiograph images from CheXpert Database provided by the Stanford Machine Learning Group. All images were cleaned, randomly shuffled, and filtered to exclude individuals under 18 years old. The augmentations utilized were random cropping and transformations, resizing of the images from 390x320 to 256x256, and randomly changing the hue, saturation, and lightness channels.

The model achieved training and validation accuracies of 73.2% and 73.4%. When tested on unseen chest radiographs, the model scored an overall accuracy of 73.6%. F1 scores based on test data for each disease ranged from 0.12 for Enlarged Cardiomediastinal to 0.70 for Edema. Results indicate using CXR data with this modelling approach successfully identifies lung conditions with varying effectiveness.

Deo RC. Machine Learning in Medicine. Circulation. 2015;132(20):1920-30.

Kording K, Benjamin A, Farhoodi R, et al. The Roles of Machine Learning in Biomedical Science. In: National Academy of Engineering. Frontiers of Engineering: Reports on Leading-Edge Engineering from the 2017 Symposium. Washington (DC): National Academies Press (US); 2018 Jan 22. Available from: https://www.ncbi.nlm.nih.gov/books/NBK481619/

Walsh, S., Calandriello, L., Silva, M., & Sverzellati, N. (2018). Late Breaking Abstract - A Deep Learning Algorithm for Classifying Fibrotic Lung Disease on High Resolution Computed Tomography. Idiopathic Interstitial Pneumonias. doi:10.1183/13993003.congress-2018.oa262

**I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).**