Chest X Ray based Deep Learning Model for Predicting Covid-19 from Whatsapp Images

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Background: Scarcity of skilled radiologists for interpretation of Chest X-rays (CXR) resulted in several deaths due to later presentation of COVID19 patients particularly in some rural areas.

Methods: We developed a machine learning(ML)-based solution that enables radiographers to get an automated interpretation of CXR over Whatsapp Medium. Our novel ML model worked on low-resolution Whatsapp images and addressed the issue of lack of large training dataset by using a multi-task deep learning (MTL) model trained with a small COVID dataset and two large CXR datasets meant for other diseases to co-learn best data features for CXR. This MTL architecture was validated on the COVID-19 test dataset of 373 images after Whatsapp compression. The Whatsapp service was also used in real-life to predict COVID-19 labels in a prospective study of 262 images which was later validated by RT-PCR results.

Results: Our MTL model resulted in a sensitivity and accuracy of 89% and 79%, respectively on high-resolution images, when compared to 89% sensitivity and 76% accuracy on Whatsapp images. On the other hand, the traditional deep learning architectures such Densenet and ResNext resulted in an approximate 20-25% drop in sensitivity and accuracy with Whatsapp compression. On real-life prospective data, our ML model had 98% sensitivity when labels were compared with RT-PCR results.

Conclusion: The use of MTL in our AI service resulted in a reliable performance that is minimally affected with Whatsapp compression

	High Resolution		Whatsapp		Whatsapp AI Service	
	Accuracy	Sensitivity	Accuracy	Sensitivity	Accuracy	Sensitivity
Densenet	0.72	0.64	0.54	0.38	0.58	0.85
Resnet	0.75	0.66	0.55	0.40	0.65	0.96
MTL	0.79	0.89	0.76	0.89	0.65	0.98