Artificial Intelligence Assisted Chest Radiograph - a screening tool for COVID 19

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AIM

- To study whether trained convolutional networks in artificial intelligence can be useful in assessing Chest radiographs of COVID -19 patients.
- To detect abnormalities and classify them as ‘Normal’ ‘Likely COVID-19’ and ‘Other Abnormalities’.
- Detecting the Region of Interest (ROI) in Chest radiograph.

MATERIALS AND METHODS

- Study Area : Department of Radiodiagnosis in Govt Medical College and ESI hospital, Coimbatore, INDIA.
- Study population : The study was done on RTPCR positive COVID-19 patients.
- Study period : March to May 2020, in ICU and July 2020 to Feb 2021,in Department of Radiodiagnosis in Govt Medical College and ESI hospital, Coimbatore, INDIA.
- Study Design: Retrospective and Prospective Observational study.
- Inclusion criteria : All RTPCR positive COVID-19 patients who undergo CXR screening during this period of study. No selection of bias in terms of patients Age and Sex.
- Exclusion criteria : Patients who cannot undergo Chest X-Ray & Pregnant Women.

MATERIALS AND METHODS

- Chest Radiographs performed between March, 2020 to May,2020 from ICU Department & July, 2020 to February, 2021 from Radiology department and ICU , Government Medical College and ESI hospital , Coimbatore were reviewed.

- During this study two types of X-Ray equipment's were used, Computed Radiography (CR) –CARESTREAM & Digital Radiography (DR) - CARESTREAM.

- We have conducted two studies as follows;
  - Statistical study of the software CHOCO (AI/ML driven) which acts as an aid for the radiologist to diagnosing Likely COVID -19 and Other Abnormalities against Normal.

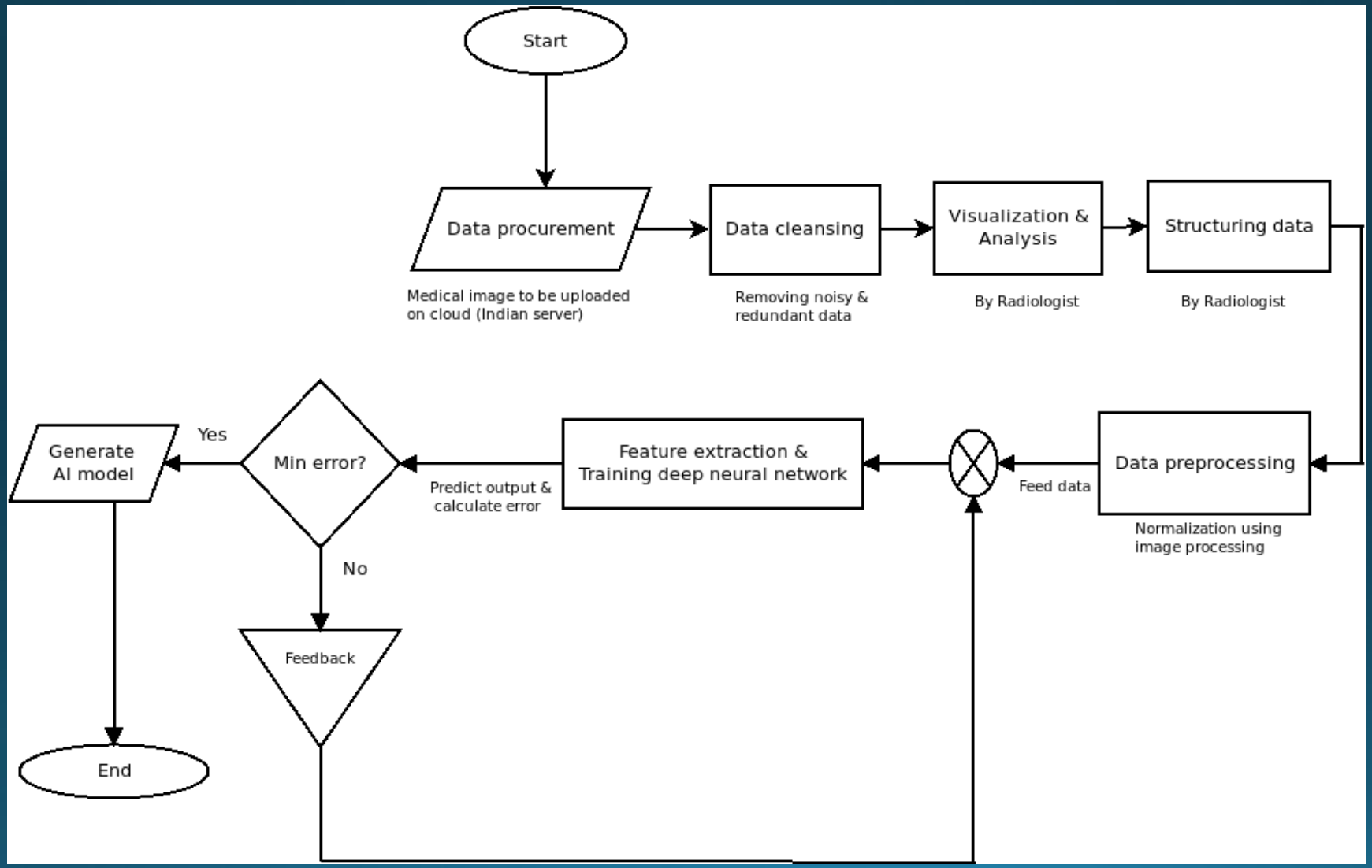
  - Statistical study of the software CHOCO (AI/ML driven) in detection of Region of Interest (ROI) in Chest Radiographs (CXR) which acts as an aid for the radiologist to diagnosing Likely COVID-19 and Other Abnormalities against Normal.

MATERIALS AND METHODS

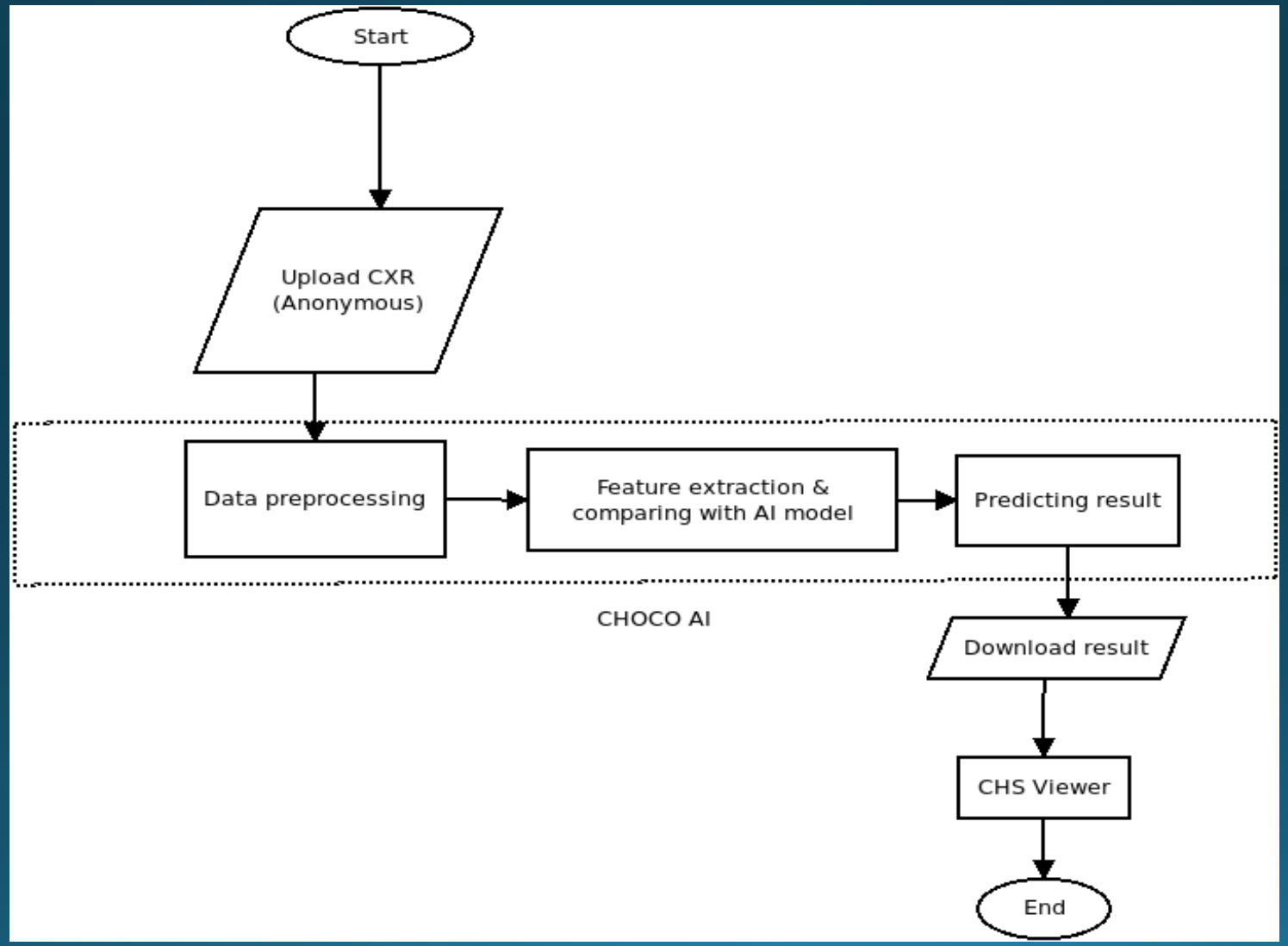
- *Data has been analysed using CHOCO software. Continuous variables are expressed and categorical variables are expressed using sensitivity and specificity. Accuracy value will be considered as statistically significant.*

- **Institutional Ethical committee, Government Medical College and ESI hospital , Coimbatore vide Protocol No.: IHEC No. 20910 & 20920.**

SOFTWARE(CHOCO) TRAINING PROCESS



SOFTWARE(CHOCO) WORKFLOW

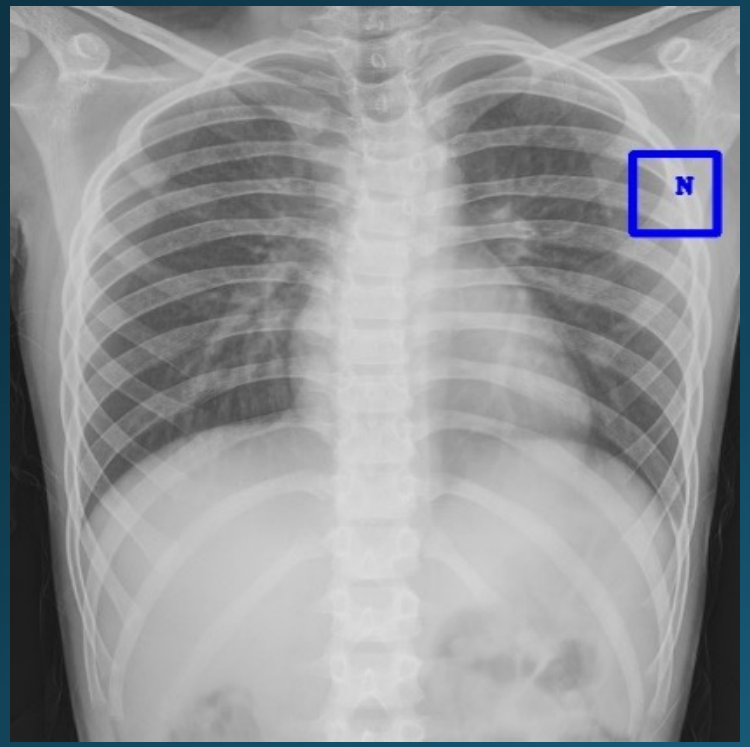


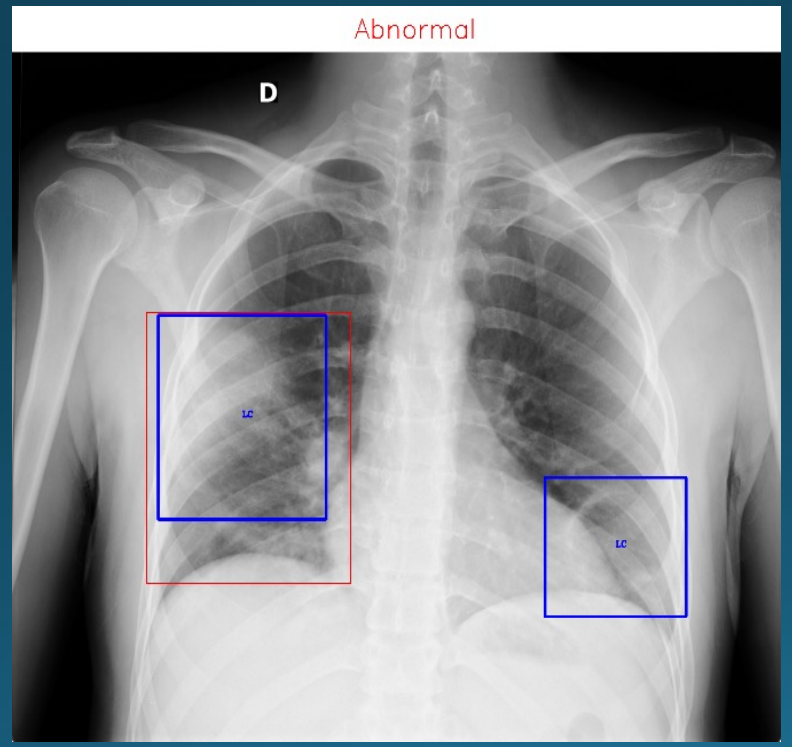
PERFORMANCE OF AI (CHOCO) IN DETECTION AND CLASSIFICATION OF '**ABNORMALITIES**'

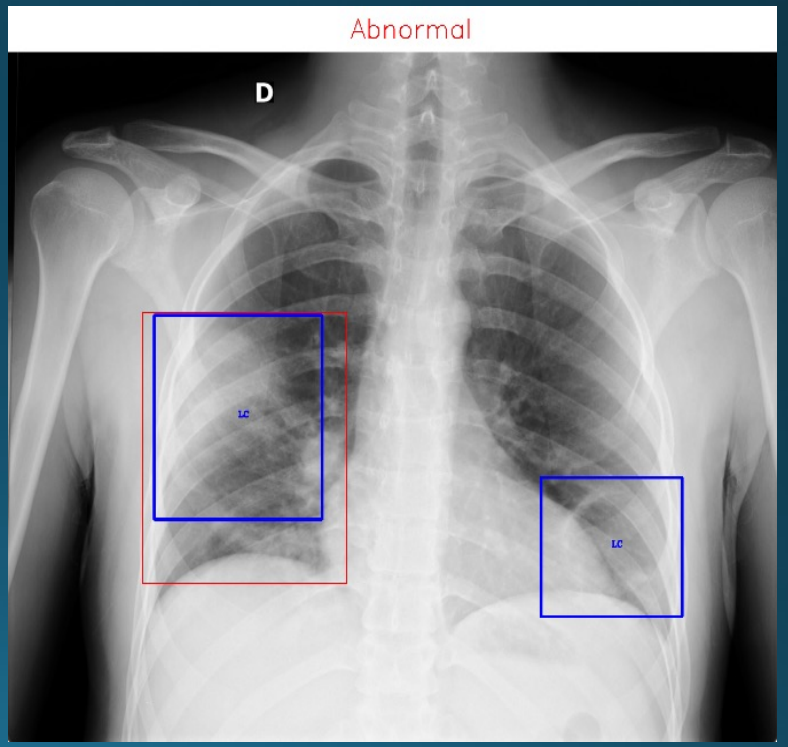
Total processed	True positive	True negative	False positive	False negative
791	344	400	19	28

CLASSIFICATION BY SOFTWARE (CHOCO)

RESULTS COMPARISON : AI(CHOCO) WITH RADIOLOGIST(S)

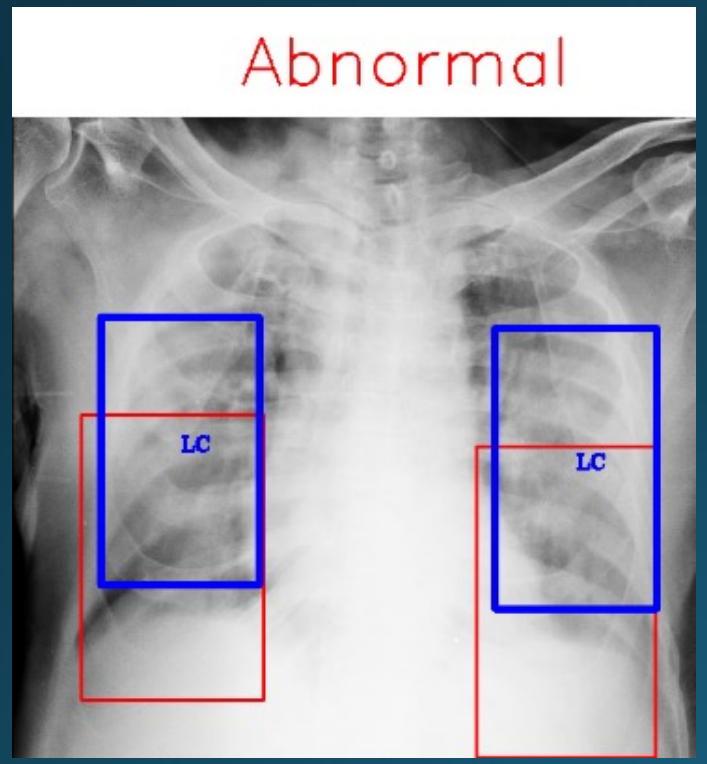


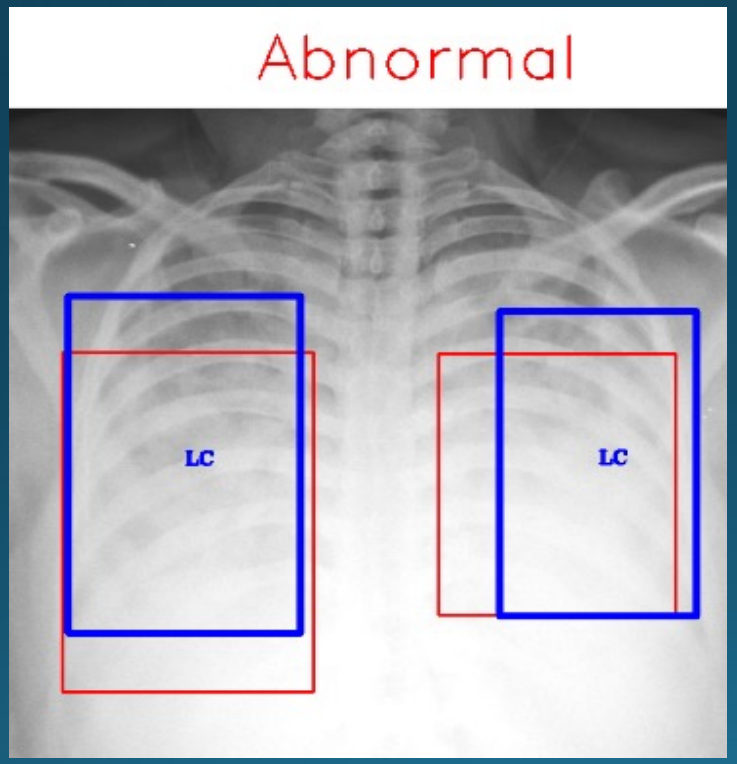


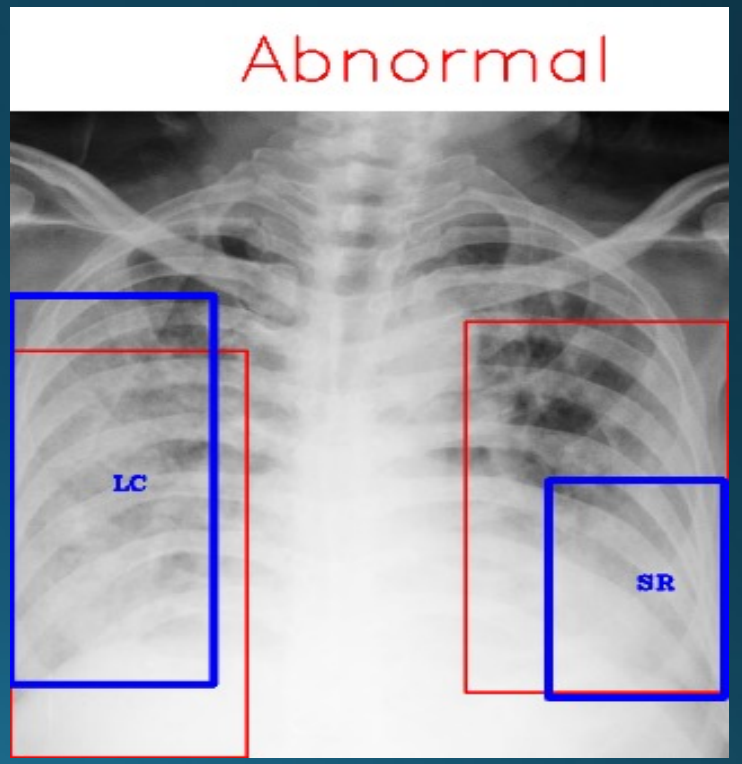


NOTE: Blue markings are by Radiologist(s) & Red markings are detected by the AI(CHOCO).

RESULTS COMPARISON : AI(CHOCO) WITH RADIOLOGIST(S)







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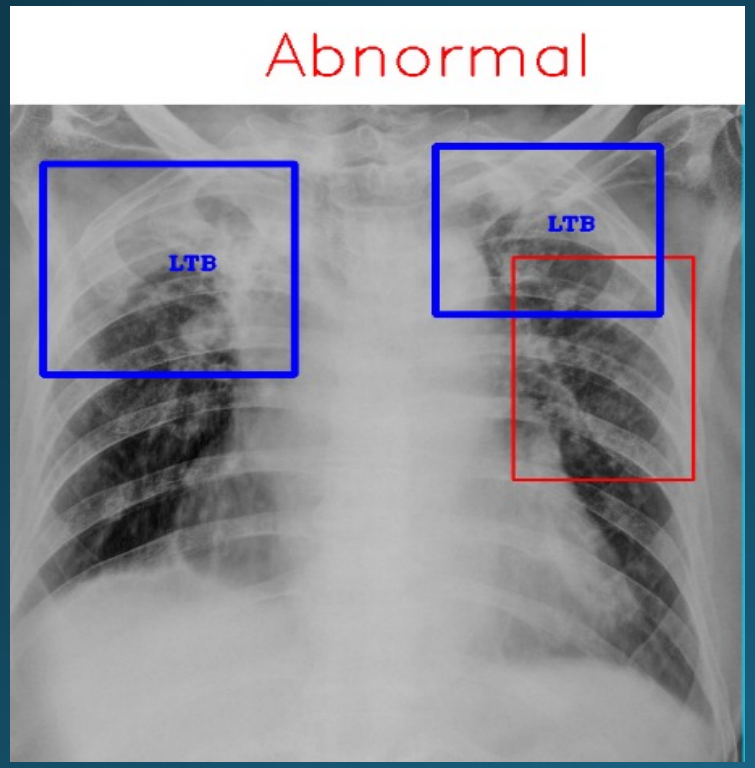
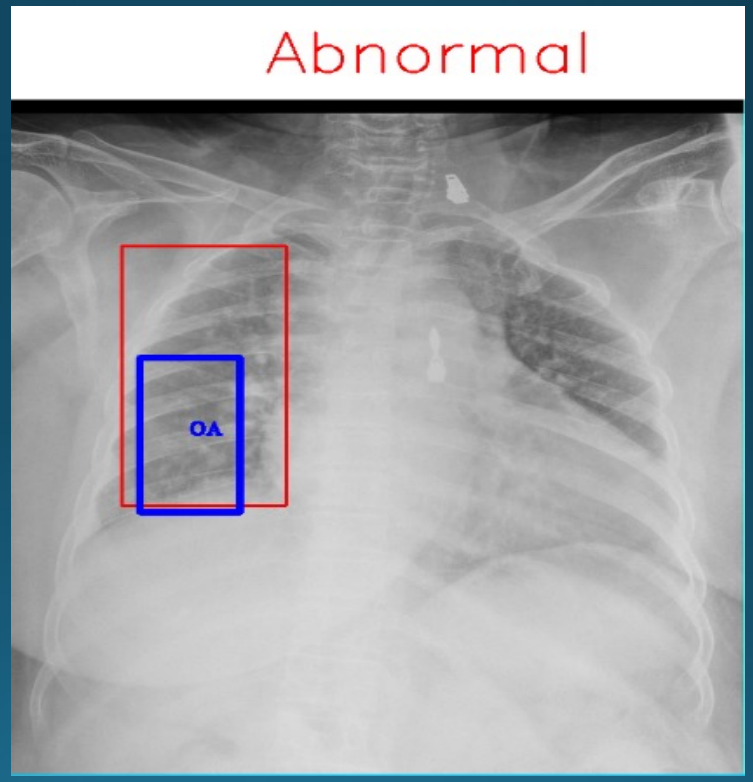
RESULTS COMPARISON : AI(CHOCO) WITH RADIOLOGIST(S)





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DETECTION PERFORMANCE – ROI (Region of Interest)

- *Detecting the Region of interest (ROI) in Chest radiograph was also done by the software with Sensitivity of 92%, Specificity of 86% and Accuracy of 87.1%.*

Detection of ROI	Sensitivity	Specificity	Accuracy
	92%	86%	87.1%

CONCLUSION

- AI aide helps in Screening , Triaging and Rapid Diagnosis in COVID-19 patients.

- The study shows that CHOCO – a commercially available AI platform performs reasonably well with CXR image and can be used for rapid screening for a huge population, especially in rural places. Apart from Screening and Triage , this software can be used to diagnose and monitor COVID-19 & other lung aliments.