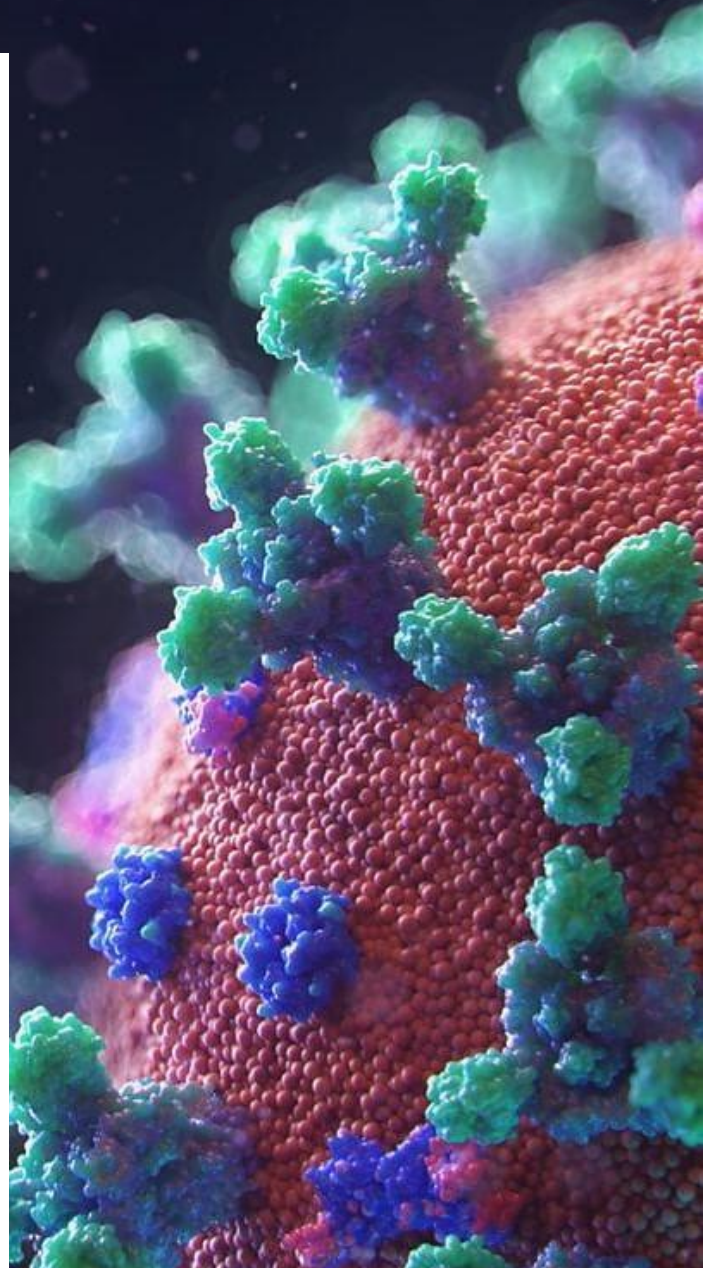


AA+ COVID-19 Testing Solution

ANYTIME ANYWHERE

Powered by Deepiotics



MAY 2020

ESDS Software Solution Pvt. Ltd.



Vision

“To provide the easy, affordable, scalable and rapid testing solution for COVID-19 for individual and the health care entities.”

Introduction

We at ESDS help healthcare and other sectors with the cutting edge Artificial Intelligence and Deep Learning technology to solve the enormous problems faced in the industry.

With the help of the experts in the medical field, we have developed a technological solution to identify the COVID-19 patients. Our Deep Learning and advanced AI-driven platform uses the conventional x- ray platform that helps to identify corona infection from Chest x-ray within 5 minutes. With the help of the available samples, we can meet the accuracy level of 100%. However, we believe that our technology would stand at least accuracy of 96%. As we get more samples of the patient over a period of time, the efficiency of platform will increase to 99.50% -100% permanently.

This process of adopting the conventional method along with the integration of AI & Deep Learning, we believe, we can solve the common problem associated with the current slow and sluggish process of testing in both rural and urban areas.

About Solution

Approach

We are team of radiologist and technology specialists, we have established the COVID-19 suspect detection method through traditional x-rays using AI.

Evaluation of the algorithm:

We have used area under receiver Operating Characteristic Curve (AUC) along with Sensitivity and Specificity at the operating point to evaluate the performance of our algorithm. We validated it on a test set of 6730 cxrs with 2972 confirmed COVID-19 positives. To detect signs of COVID-19, we have observed an AUC on this test set. We observed the sensitivity to be **0.955** and specificity to be **0.762**. While there are no WHO guidelines yet for an imaging based triage Tool for COVID, WHO recommends a minimum sensitivity and specificity of 0.9 and 0.7 for community screening tests for Tuberculosis , which is a deadly infectious disease in itself.

Sensitivity:

Sensitivity is the probability that a test will indicate 'disease' among those with the disease: **0.955**

Specificity:

Specificity is the fraction of those without disease who will have a negative test result: **0.762** , Positive Predictive Value: **0.760** & Negative Predictive Value: **0.956**

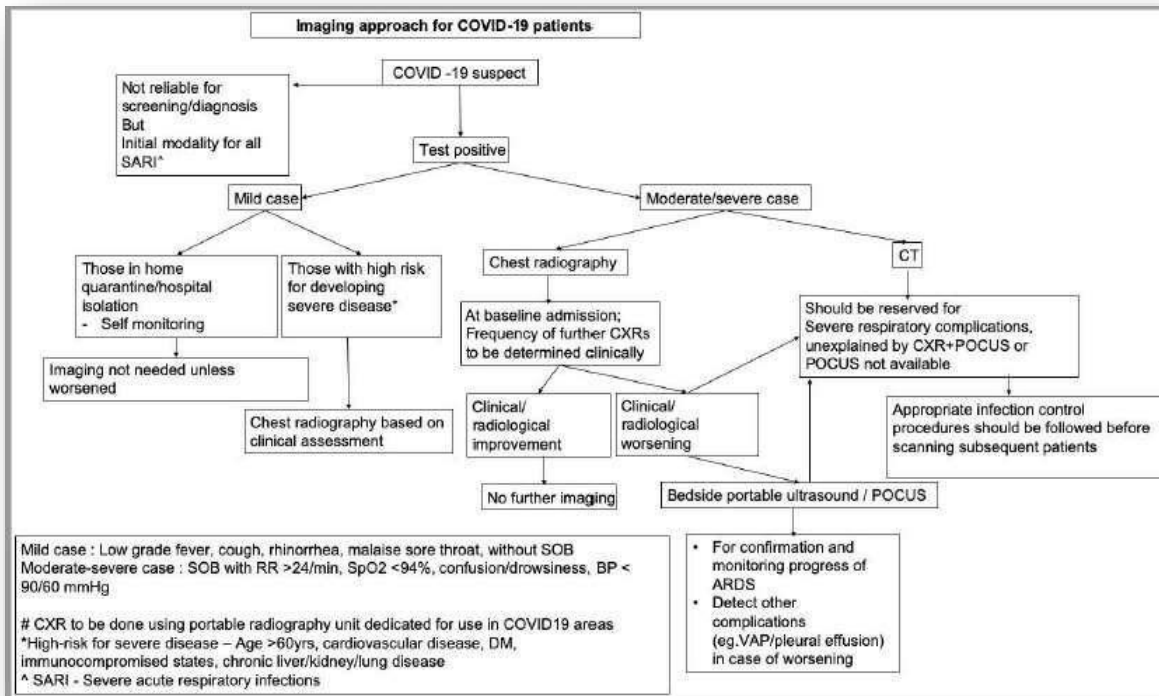
Role of CXR in Covid-19 finding:

CXR can be used for assessing disease progression/severity.

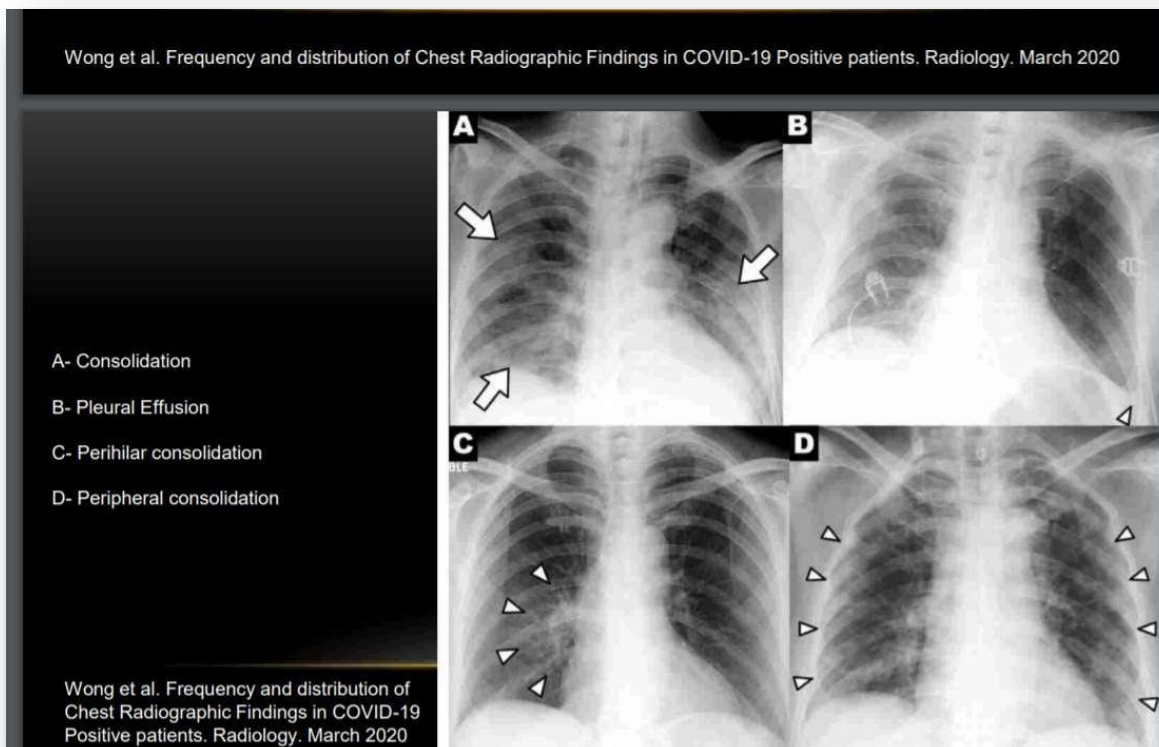
Symptom:

- Bilateral consolidation/ground glass opacities
- Peripheral and lower lobe predominance

ICRI Guidelines for CXR



Covid19 Imaging Recommendation by Indian Radiological and Imaging Association (IRIA)



Frequency and distribution of Chest Radiographic Findings in COVID 19

Facts:

- So far tested 6730 CXRs out of which 2972 X-rays are Corona positive.
- The X-rays are from various countries like India, US, UK and Italy.
- Model accuracy is 96% likely to be improved further when more X-rays are provided.
- Developed with help of Radiologists and AI specialists.
- Tested by one radiologist.
- Detects COVID with following:
 - Peripheral patchy opacity
 - Ground-glass opacity
 - Lower zone opacity

Deploying AA+ Covid-19 Testing Solution:

AA+ Covid-19 Testing Solution available both as a Web application and web-api and can be deployed within minutes. Built using our learning of deploying globally and remotely. The tool can be used to triage suspect patients in resource constrained countries to make effective use of RT-PCR test kits.

Process:

This is just a 4 step process:

1. Collect the X-ray Image
 - a. If Digital X-ray directly upload Dicom image
 - b. If older machine, take screenshot of X-ray with mobile or any other tool.
2. Navigate to the tool URL
3. Upload X-ray and
4. Click Verify button, within seconds results are shown.

References:

- High priority target product profiles for new tuberculosis diagnostics: report of a consensus meeting, tech. rep., World Health Organization, Apr 28-29, 2014.
- Covid 19 Imaging Recommendation by Indian Radiological and Imaging Association (IRIA), <https://iria.org.in/covid-19-imaging-recommendations-2/>
- Wong et al. Frequency and distribution of Chest Radiographic Findings in COVID 19
- Positive patients. Radiology. March 2020. nature are attributed to be the most common findings with respect to COVID related infections on CXRs. CXRs can help in identifying COVID-19 related infections and can be used as a triage tool in most cases.

Patient Report

Patient Name : Raj

Age : 32

Gender : Male

Date and Time : 20/05/2020 12:03:16

Nature Of Sample : Chest X-Ray

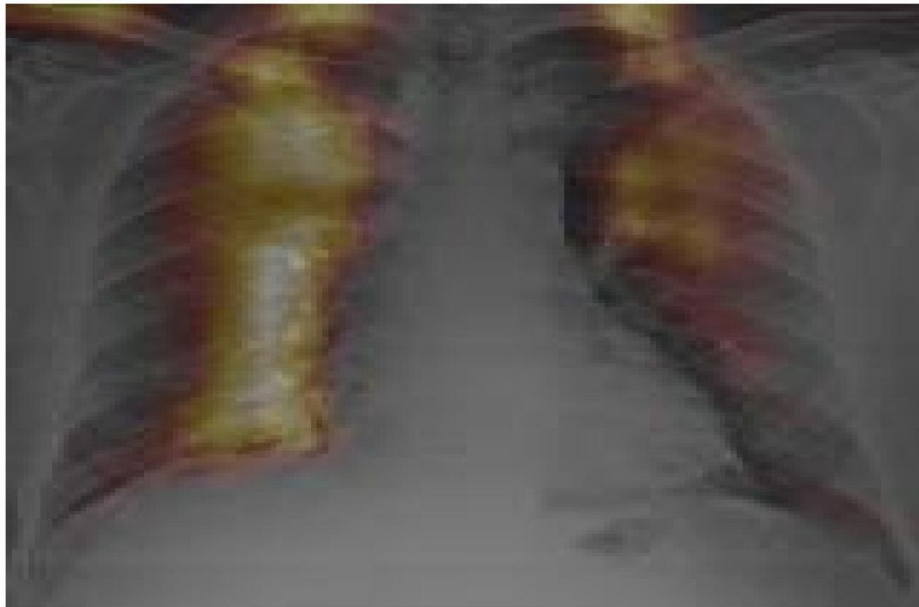
Confidence Score : 84.54229831695557

Prediction : Suspected

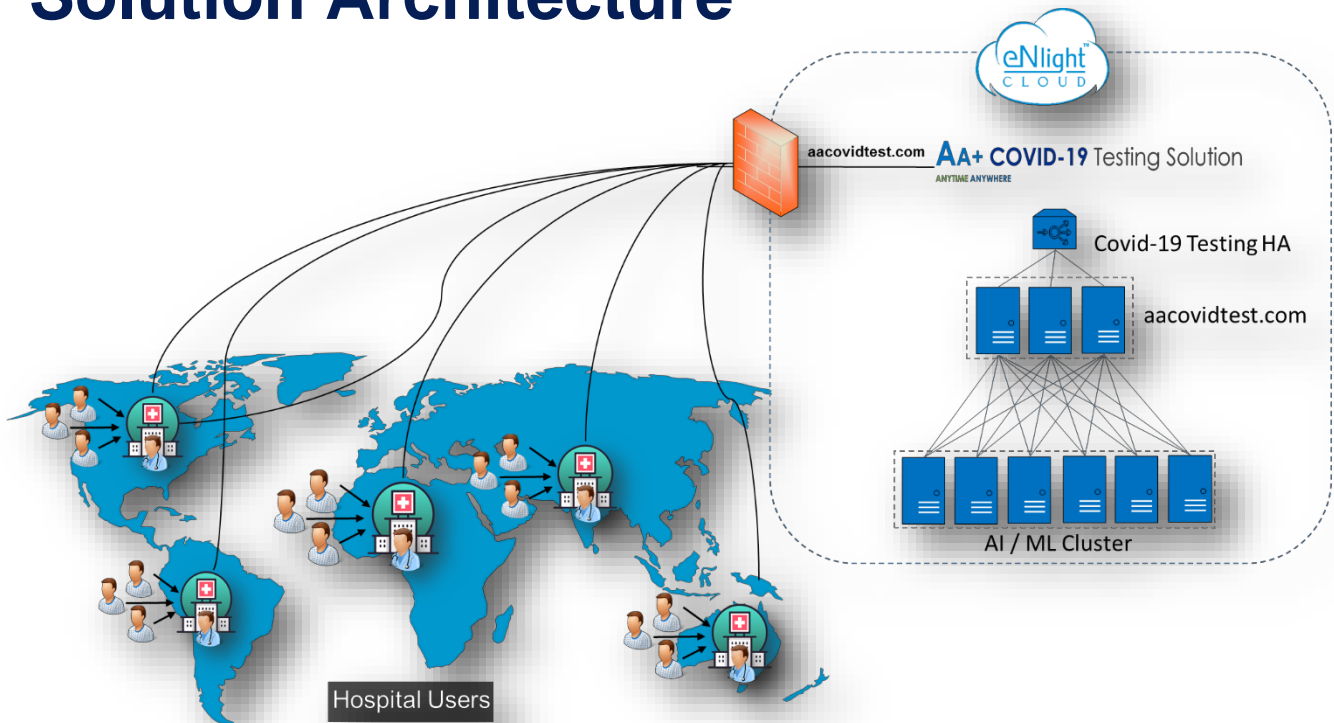
Remark :

The automatic platform is showing the result of X-ray based on the past records of such patients and COVID-19 disease and hence it's advisable to consult a doctor if needed before considering this result as the final result.

X-Ray in Heat map



Solution Architecture



AA+ Covid-19 Testing solution architecture

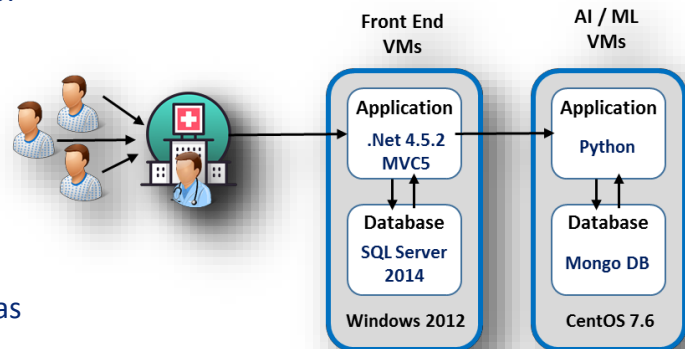
AA+ Covid-19 testing solution deployed on patented eNlight cloud platform with highest security & auto-scaling capacity which allow 1 lac scan test per day currently & can be scaled up, to handle 1 crore scan test per day. Higher availability of service is maintained by auto-scaling technology of eNlight cloud.

Hospital users & individuals can use this SaaS offering of ESDS by registration on www.aacovidtest.com from anywhere 24X7X365.

Software Stack

AA+ Covid-19 Testing solution has two main components.

1. Front end- Web application
2. AI / ML Engine
 - Training Library : Tensorflow, Keras



Hardware Stack

- CPU Used : Intel(R) Xeon(R) CPU E5-2698 v3 @ 2.30GHz
- GPU Used : NVIDIA Tesla T4

AA+ Covid-19 Testing Solution Benefits

1. Tool is helpful where PCR-Testing kits are less in number.
2. Radiologists are less or not available 24hours.
3. Hospitals where number of patients are more and radiologist's availability is less.
4. Remote areas where radiologists are not available.
5. Works on Web browser hence no installation required on PC.
6. Only access to internet is required, which also can be eliminated.
7. Takes Digital X-ray (Dicom), JPEG, PNG images.
8. X-ray can also be clicked from mobile and uploaded to software.
9. The time is around less than 5 minutes to process each X-ray and give results.
10. Can be used in Remote areas where Radiologists, Doctors are in short, they can take assistance of software and take appropriate decision.
11. It will detect only Covid findings in X-ray not any other disease.
12. At a very low cost, detects Corona infection from X-ray.
13. No touching is involved hence there is no need of wearing any protective equipment.

Disclaimer

All information/diagnosis provided via the AI Tool is for general information purposes and is not intended or implied to be used to make decisions on medical treatment or to make a diagnosis of a medical problem. No information provided is intended or implied to replace consultation with a qualified physician. ESDS does not practice medicine, nor does it provide medical advice. You should discuss your medical symptoms with your physician or other qualified healthcare providers before deciding on any medicine. All information from this or any other source needs to be reviewed carefully with your own doctor before you act upon it in any way. While this tool attempts to provide information, which may be relevant to you, no guarantees are made that some relevant information will not be missed.

Please note that all findings of the report, including advice, if any, suggestions, and/or recommendations have NOT been generated as part of any professional evaluation, but using AI (Artificial Intelligence). No patient has been examined prior to making these comments. ESDS does not practice medicine & neither is into healthcare business. You are advised to discuss the findings and correlate clinically with a physician or other qualified healthcare provider, and to only act upon the advice of a physician or other qualified healthcare provider.



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ISO
9001 : 2015



ISO/IEC
27001 : 2013



ISO/IEC
20000-1 : 2011



Government of India
MeitY Empanelled
Cloud Service
Provider



Govt. of Maharashtra
DIT Empanelled
Cloud Service
Provider



STQC AUDITED CSP



PCI SECURITY
CERTIFIED



TIER 3
DATACENTER



UK PATENTED
CLOUD
TECHNOLOGY



US PATENTED
CLOUD
TECHNOLOGY

ESDS 4 Bs

by 2024

1Billion

Touching lives
of 1B+ People

1Billion

Connecting 1B+
Smart Devices

1Billion

Unicorn in make in
India Advanced
Technology

1Billion

Growing 1B+
Trees