Cigniti

COVID-19 Triage – Different Perspectives

A Tech Brief

World's Leading AI & IP-led Digital Assurance & Digital Engineering Services Company

Introduction

COVID-19 is rampant across India, infecting close to 17,000 people and claiming the lives of 550 people. The country is well into its 4th week of a nationwide lockdown. While there is a slow-down of the virus in certain areas, we still have a fair amount of red zones across the country. With some parts of the country opening up, in the coming days and weeks, “preventive testing” will become even more important. Being a very populous nation of 1.3 billion people, it would not be possible to test even a small fraction of the populace. Hence there is a definite need for “out of the box” solutions that can help with triaging and assessment, of who needs to get the tests done on a priority.

We, at RoundSqr (part of Cigniti), have looked at 2 variants of this triage.

STREAM 1: Spectral analysis of cough sample to predict COVID-19 possibility

STREAM 2: End-to-end triage, along with a specific “Call For Action”, focusing on frontline workers

Stream 1: Spectral Analysis

We have previously worked on identifying Tuberculosis based on how a person coughs. That was based on both spirometry and spectral analysis of the cough. The spirometry process is a bit cumbersome for both the doctors and the users. However, we were able to achieve close to 85% accuracy using pure cough sound analysis. The approach and algorithms used are detailed in the following brief:

https://iopscience.iop.org/article/10.1088/1361-6579/aad948/meta

Leveraging this experience, we intend to validate whether we can re-purpose this TB solution for COVID-19 detection as well. Using linear and non-linear regression methods, we will conduct a spectral analysis of the cough sounds of the subjects (suspected users). These cough sounds will be normalized with other audio samples. This data, when fed into a classification model along with other data (like medical history, demographic data, and other symptoms…) might help in providing a COVID-19 prediction with an uncertainty measure.

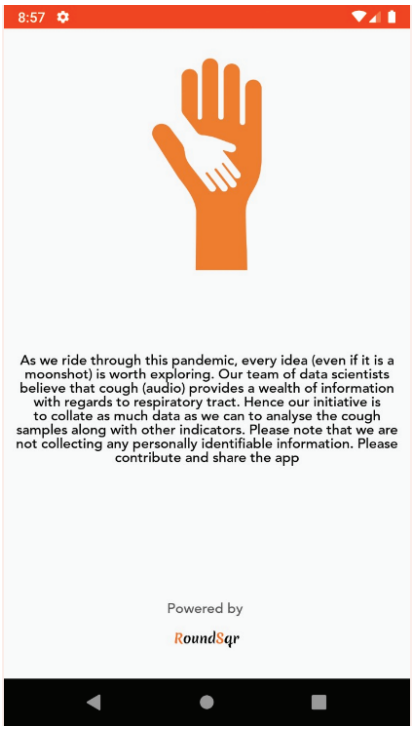
How do we intend to do this

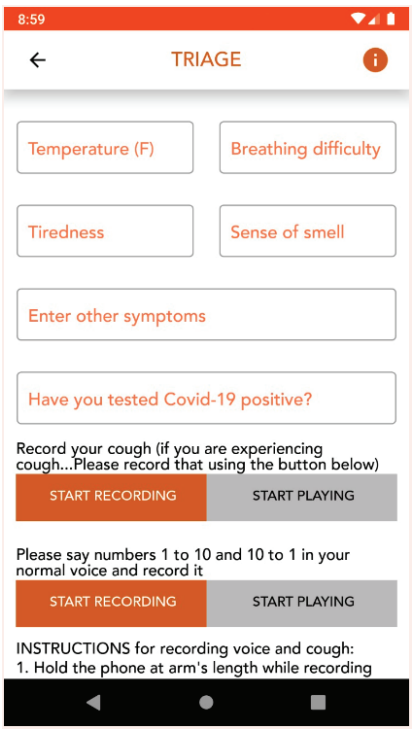
There is no doubt; that this is a research project. The principal aspect is to obtain data to run our hypothesis. To facilitate data collection, we intend to use a mobile app (Android-based) to collect relevant data, including

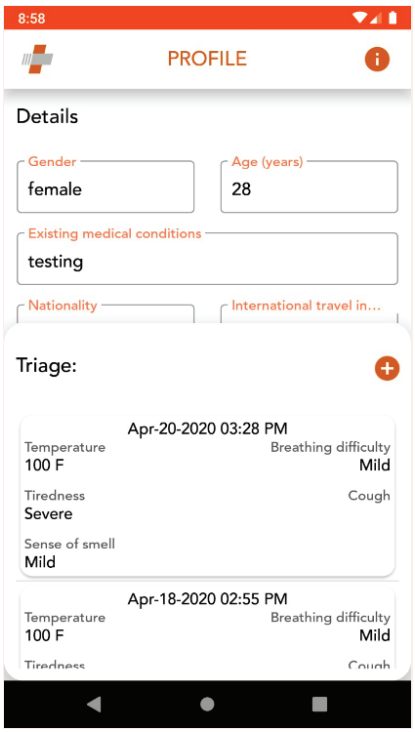
- Basic Demographic Data: Age, Gender, Nationality, and International Travel (last 2 weeks)
- Medical Data: Existing Medical History, Temperature, Breathing Difficulty, any Loss of Smell or Taste, and Feeling of Tiredness
- Audio Data: Cough and few spoken sentences (counting from 1 to 10, and the English / Telugu / Hindi alphabets).

Application Screens

The data collection app itself is a set of simple screens where information about the profile (one-time) is collected and multiple triage performed for each profile.







Where are we right now?

The overall solution is to develop a mobile application (in Android to start with) that can be used to answer a few simple questions, provide audio samples (of a short cough and some spoken words), and calculate the probability of COVID-19 symptoms. This app can be used as the first line of defence before formal testing is carried out, thereby ensuring that the testing resources are optimally utilized as well as making sure that truly at-risk patients are tested as required.

The App is in Google Play Store, and we are in the process of collecting data.

Stream 2: Frontline Workers Triage Portal

As per WHO, close to 22,000 healthcare workers globally have been infected by COVID-19. The Nurse to the Patient ratio in India is 1.7:1000. In addition to the healthcare workers, we have essential services – law and order, eCommerce, food delivery, volunteers, ASHA workers, etc. All of them are more susceptible to COVID-19, considering their exposure to patients.

Opening up the economy by selectively removing lockdown restrictions on specific industries like farming, logistics, construction, eCommerce, online food ordering, etc., only means that more people have the risk of exposure and, more importantly, cause the spread of the virus, unless aggressively detected and checked. Apart from the possibility of infection, frontline workers are also under a lot of psychological and physical stress. Unless proper identification of these symptoms and appropriate/timely interventions are carried out, this is just a time bomb waiting to explode.

We believe a proper triage on a regular basis is a step in the right direction, in terms of understanding the physical as well as the mental health of the frontline workers. With proper analysis, reporting, and exception highlighting, we can equip the supervisors/department heads with the transparency required to ensure that the frontline workers are giving optimal service.

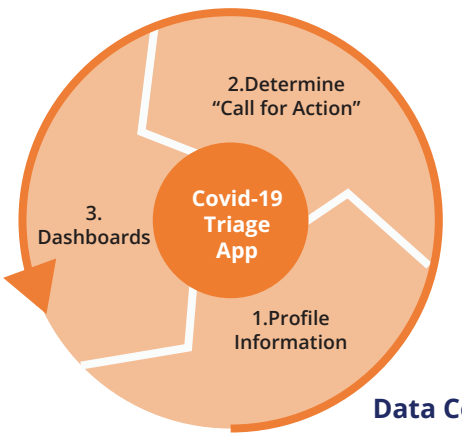
How do we intend to do this

We have built a set of questions (physical and psychological), based on standard COVID-19 symptoms, aimed at assisting the Triage process. The frontline worker (or an operator who can collect this data for each of the workers) will have to answer these questions. The intent is to collect such information diligently and consistently, twice a day (start and end of a shift).

The three steps involved in the process are

Act on the information

- Identify anomaly symptoms (high temparature, fatigue etc or graded responses to metal state)
- Surface the information to reporting authorities
- Recommend a possible action - Change in Shift, Day Off, Further Investigation, Ability to Call / Talk



Triage Information

- Health Conditions - Temparature, Sense of Smell, Breathlessness, Fatigue
- Collecting cough sample
- (Optional) Questions pertaining to mental state adminstered over a period of time
- (Configurable) Ability to view and self-moniter symptoms

Data Collected

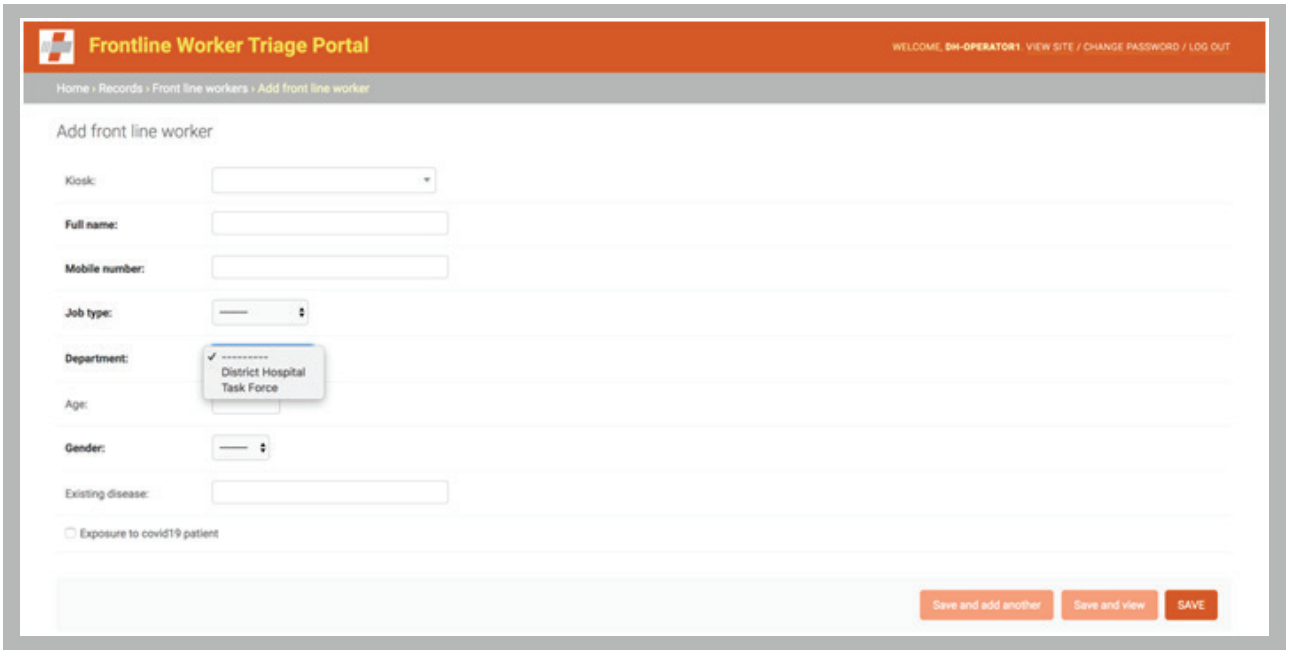
- Basic Profile Information - Age, Gender, Nature of Work
- Exposure to Covid-19 patients
- Essential and one-time information

The information collected will comprise:

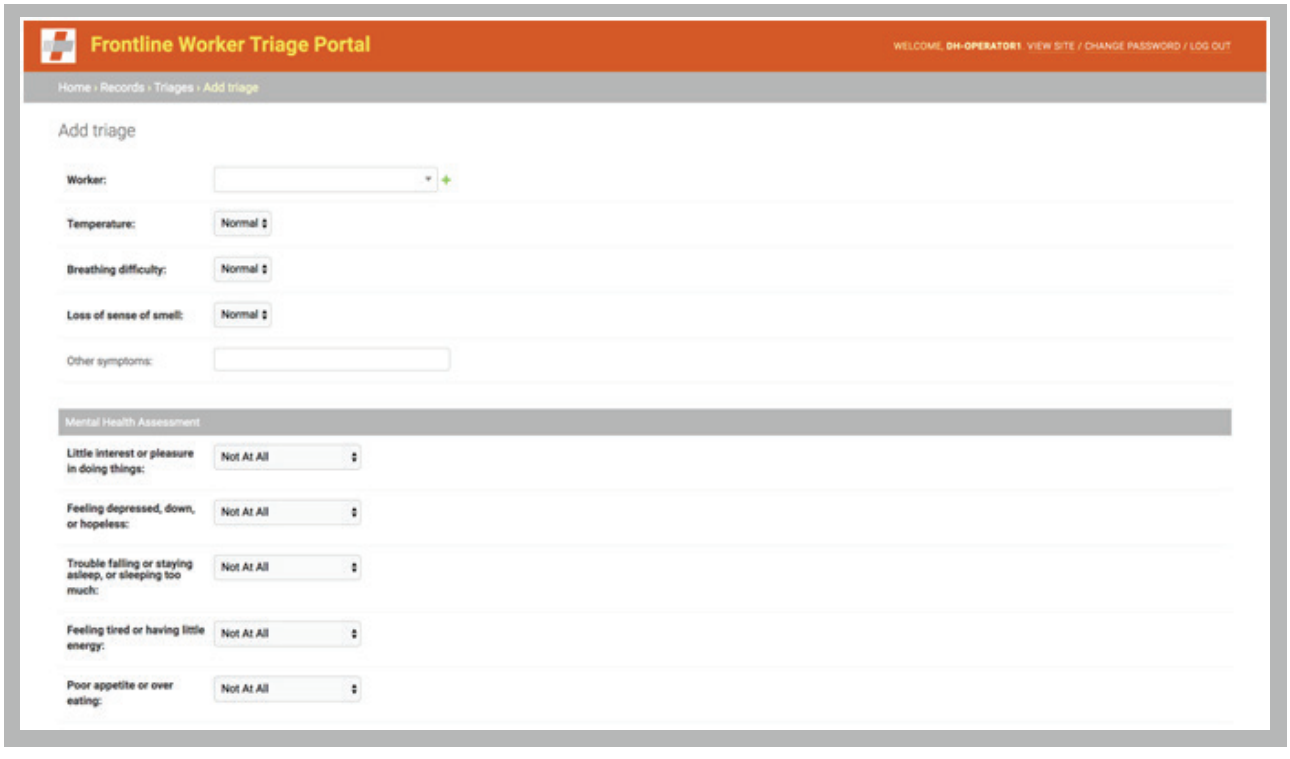
- Basic Profile Information – Age, Gender, Nature of Work
- Health Conditions – Temperature, Sense of Smell, Breathlessness, Fatigue
- Questions pertaining to mental state, administered over a period of time

Application Screens

The workflow will start from setting up an organization, its departments, and the ability to add a frontline worker. The profile will be set up once (and it could be updated regularly if needed)



We recommend a protocol of collecting triage information from the staff twice a day – Start and End of a shift. Along with the standard health parameters, it is imperative to collect information regarding the Mental Health of the staff.



Outcomes will be monitored by the supervisor, and relevant actions will be taken – Recommend a Day Off, Reduce Shift Timings, Send for screening, and Recommend a Counselling session.

WORKER	TEMPERATURE	BREATHING DIFFICULTY	LOSS OF SENSE OF SMELL	OTHER SYMPTOMS	RISK	MENTAL ASSESSMENT	CREATED BY	CREATED
Somu	Normal	Normal	Normal	-		Moderately Severe Depression	DH-Operator1	April 20, 2020, 5:02 p.m.
Parvati	Mild	Mild	Normal	-		No Depression	DH-Operator1	April 20, 2020, 5:02 p.m.
Sundar	Mild	Normal	Normal	-		No Depression	DH-Operator1	April 20, 2020, 5:01 p.m.
Somu	Normal	Normal	Normal	-		No Depression	DH-Operator1	April 20, 2020, 5:01 p.m.

Where are we right now?

The core platform with the capability to set up an organization, (optionally) kiosks and operators, along with the ability to enter frontline worker details and carry out triage, is ready and deployed.

All the questions that are administered to determine Mental Health, and other information collected as a part of triage, are completely configurable.

We are looking at enhancing the platform by providing the following additional features:

Integration to any healthcare device – to collect vitals automatically

- Ability to configure and determine the ideal “call for action” recommendations based on the triage. A few examples of this could be a supervisor deciding to give a day off, changing the shift or providing counselling to the frontline worker
- Including a set of training videos, useful links and contact information that can be used by the frontline workers

Roundsqr (part of Cigniti) had made a commendable attempt to mitigate the Covid crisis by devising an accurate and automated triage system to classify and isolate the suspected cases. Moreover, the study proposes a scoring-based e-Triage system for COVID-19 along with several recommended solutions to enhance the overall outcome of e-Triage systems during the outbreak. The recommended solutions aim to reduce overcrowding and overheads in EDs by remotely assessing patients’ conditions and identifying their severity levels.

Analyst Recognitions

This tech briefs is issued for information only. Cigniti declines all responsibility for any errors and any loss or damage resulting from use of the contents of this tech briefs. Cigniti also declines responsibility for any infringement of any third party's Intellectual Property rights but will gladly acknowledge any IPR and correct any infringement of which it is informed.

About Cigniti

Cigniti Technologies Limited (NSE: CIGNITITEC; BSE: 534758) is the World's Leading AI & IP-led Digital Assurance and Digital Engineering Services Company providing software quality engineering, software testing, automation, and consulting services. 4100+ Cignitians worldwide help Fortune 500 & Global 2000 enterprises across 24 countries accelerate their digital transformation journey across various stages of digital adoption and help them achieve market leadership by providing transformation services leveraging IP & Platform-led innovation with expertise across multiple verticals and domains.

Our global customers have benefitted with measurable outcomes, millions of dollars of savings, significant ROI, and delightful, frictionless experiences utilizing our flagship digital assurance and full cycle software quality engineering services. Our AI-led digital engineering services cover Data engineering services, softwareplatform, and digital product engineering, AI/ML engineering services, intelligent automation, big data analytics, and Blockchain development.

We are headquartered in Hyderabad, India, with global offices spread across the USA, Canada, UK, UAE, Australia, South Africa, Czech Republic, and Singapore.

To learn more, visitwww.cigniti.com

Website LinkedIn YouTube Blog Facebook Twitter