TRACE**TB**

Transformative Research & Artificial Intelligence (AI) Capacity
for Elimination of TB and Responding to Infectious Diseases

Using AI and Data Science to Combat COVID

An Overview of the COVID Solutions Developed Through the TRACE-TB Project

The **TRACE-TB Project, supported by USAID and led by Wadhwani AI**, is working to introduce AI-powered solutions to combat tuberculosis. The innovations led by TRACE-TB contribute towards strengthening the delivery of the TB cascade of care in India, and enabling the sustainable use of AI within public health systems under the NTEP, to eliminate the spread of tuberculosis in the country by 2025.

INTRODUCTION

The USAID-supported TRACE-TB project, led by Wadhwani AI, aims to develop and deploy innovative artificial intelligence (AI) solutions to combat COVID-19, tuberculosis and other infectious diseases in India.

India's prowess in digital technology and AI is a key component in the project's ongoing work on enhancing public health responses to COVID-19. The AI- and ML-driven tools and frameworks created as part of the project will help reduce the burden on public health systems by facilitating timely decision-making and more efficient analyses of available data, the development of new epidemiological models, and other innovative tools to aid in COVID-19 case management. They will also boost the process of establishing a robust digital health data infrastructure as part of the Government of India's Ayushman Bharat Digital Mission (ABDM) initiative, thereby helping to strengthen the country's capacity to prevent, detect, and respond to infectious disease threats and health-security risks in the future.

COVID DECISION SUPPORT

Enabling effective monitoring and rapid response
Epidemiological models and tools that inform the response strategies and enable rapid decision-making for key administrators.

COUGH AGAINST COVID

Augmenting capacities for case management
AI-powered triaging solution to detect at-risk COVID-19 patients using cough sound data.

AYUSHMAN BHARAT DIGITAL MISSION SUPPORT

Building resilient public health systems
Adopting a systems theory approach towards building and rolling out the ABDM nationally.

AI UNIT AT THE E-HEALTH DIVISION, MoHFW

Applying AI across the public health spectrum
Conceptualise, design, test and deploy AI solutions in partnership with the e-Health division at the Ministry of Health and Family Welfare.

AI CENTER OF EXCELLENCE (CoE)

Augmenting the overall delivery of health services
A CoE to be established at AIIMS to research, ideate, and deploy public health AI solutions.
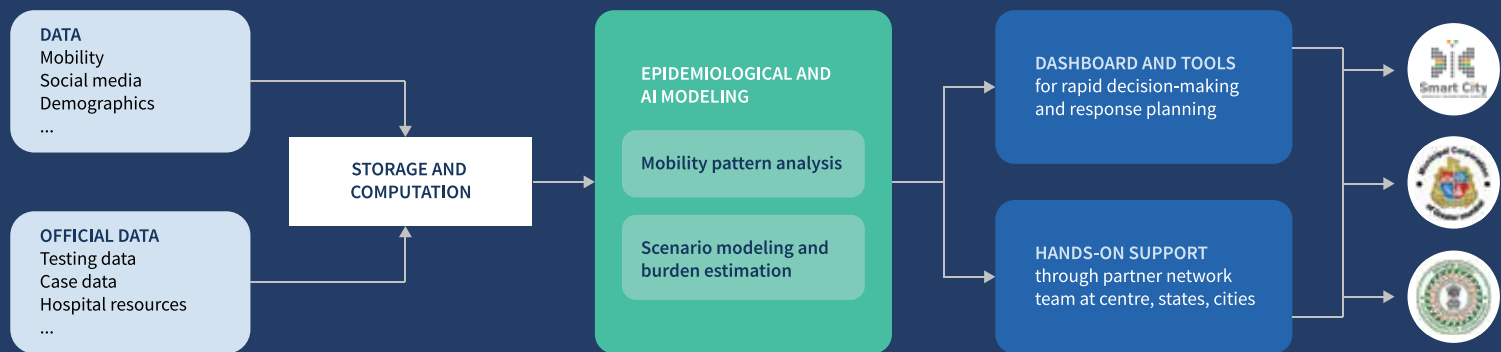
AN OVERVIEW OF THE MODELING EFFORTS DEVELOPED TO SUPPORT PUBLIC AUTHORITIES

COVID Decision Support

During the first COVID-19 infection wave, the TRACE-TB Project deployed a forecasting framework that was used in Mumbai, one of the most densely populated cities in the world, as well as in other resource-constrained regions such as the state of Jharkhand, India.

Our Partners
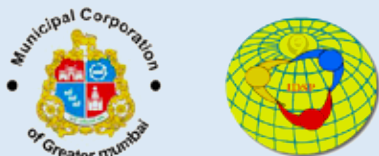
FORECASTING FRAMEWORK

The COVID-19 forecasting framework allowed our partners to:

- Collate information, resources, and expertise from various sources.
- Build sophisticated models and tools to better understand the on-ground reality and the evolution of the pandemic.
- Act on data-driven insights and make use of the hands-on support that was made available through the COVID-19 Data Consortium.

NOTEWORTHY ACHIEVEMENTS

- Supported Mumbai from June 2020 to January 2021 with eight forecasts and provided insights from data analysis to increase case discovery by ~25% in the under-tested wards.
- Supported Jharkhand (up to six districts) from September 2020 to January 2021 with three forecasts and data analytics. Consultants worked with IDSP Ranchi.

- The empirical comparison of our methods with other advanced models in the ReichLab hub on real-world data further points to their efficacy.

- The deployed system was used to drive decision-making and planning with good accuracy (worst case Mean Absolute Percentage Error < 20%) in both locations.
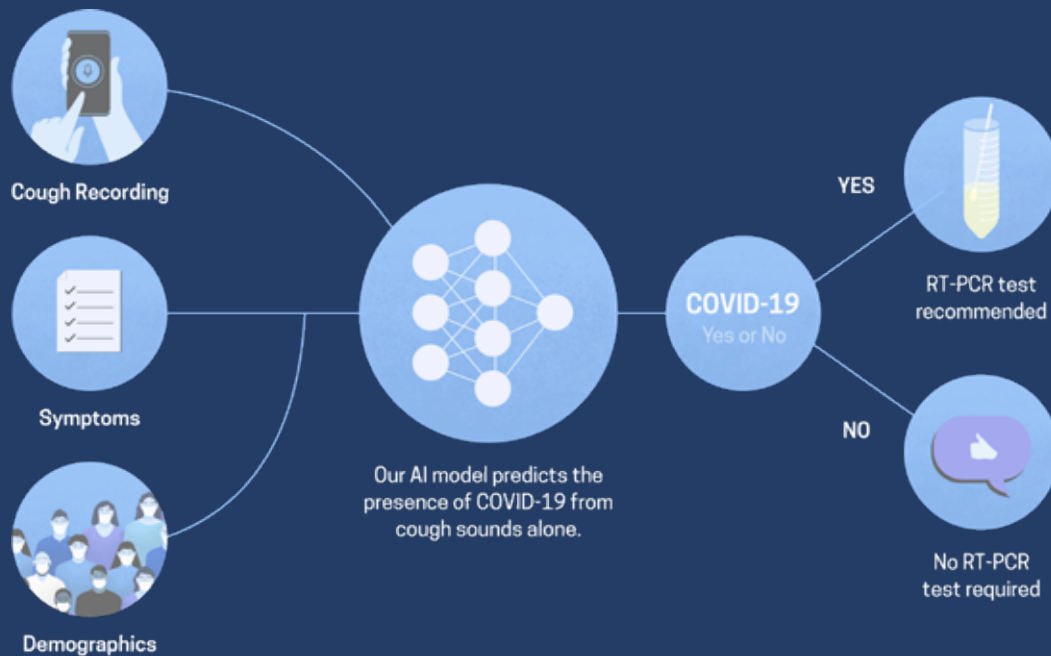
Cough Against COVID

When work began on this project in April 2020, the world was in the early stages of the COVID-19 pandemic. The need of the hour was to test suspected cases at a rapid rate so that COVID-positive cases could be isolated and further transmission minimised. The testing capacity was woefully limited and ramping it up was expensive and time-consuming, particularly in rural and remote areas.

Therefore, it was crucial to devise a triaging method that allowed the most probable suspected cases to be prioritised for testing.

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AN OVERVIEW OF THE COUGH AGAINST COVID MODEL

NOTEWORTHY ACHIEVEMENTS

- The project successfully demonstrated that solicited cough sounds have a statistically significant signature for COVID-19 cases, even for asymptomatic patients.

- We built the largest known COVID-verified cough sounds dataset in the world, containing data from ~8,000 subjects (collected in 27 facilities, across four states.)

- Our research paper, titled *Impact of Data-Splits on Generalisation: Identifying COVID-19 from Cough and Context*, was accepted at the AI for Public Health Workshop at the International Conference on Learning Representations.

- The codebase, models, and anonymized datasets were open-sourced and shared on GitHub to maximise the impact of our technology.

We are leveraging this experience for the screening of tuberculosis using a similar cough-sounds solution, in partnership with the Central TB Division, Govt. of India.

ABDM Support

The Ayushman Bharat Digital Mission (ABDM) was launched nationally by the Honourable Prime Minister of India in September 2021. It aims to develop key building blocks to support the digital health infrastructure of India.

They are as follows:

- Ayushman Bharat Health Account (ABHA; previously known as Health ID)

- Healthcare Professionals Registry (HPR)

- Health Facility Registry (HFR)

- Personal Health Records (PHR)

ROLLING OUT THE ABDM

Wadhwani AI has supported the rollout of the ABDM in three ways:

- **Policy Inputs:** Provided policy level inputs during early consultations of National Digital Health Blueprint.

- **Project Monitoring Unit (PMU):** Supported the ABDM by instituting a PMU managed by IQVIA. This PMU spearheaded pilot rollout of the ABDM in six union territories from 2020 to 2021.

- **Wadhwani AI - IIC Fellowship:** Placed six Wadhwani-IIC Fellows at the NHA since August 2020 to spearhead teams across verticals, and play a role in managing modules such as ABHA, HFR, HPR, Unified Health Interface, and the integration of the ABDM with other government programs.

NOTEWORTHY ACHIEVEMENTS

A number of key milestones were achieved by the ABDM team, in which IQVIA and Wadhwani AI-IIC fellows played a critical role. Both were deputed by Wadhwani AI at the NHA.

- Rollout of multiple building blocks of ABDM, including 150+ million ABHAs (health IDs) created, with ABHA application downloaded 290,000+ times; 15,000+ health facilities registered; and 8,300+ doctors registered.

- Aided policy-making, strategy, stakeholder consultations, communications, and integration with government programs.

- Assisted in driving pilot adoption across six union territories, thereby enabling the national rollout of the ABDM in September 2021.

- Designed and implemented system-level architecture and frameworks for all building blocks.

- **AI Media Scanning Solution for the Integrated Health Information Platform (IHIP):** An AI-powered solution to mitigate the challenges associated with manual media scanning for event-based infectious disease surveillance. The objective is to augment the media scanning capabilities of the Media Scanning and Verification Cell (MSVC) at the National Centre for Disease Surveillance (NCDS). The solution has been successfully deployed within the Government of India's flagship Integrated Health Information Platform (IHIP), in partnership with the National Centre for Disease Control (NCDC).

- **AI Solution for Teleradiology:** An AI-powered solution to detect radiological features in digital x-rays for addressing the paucity of trained radiologists in remote healthcare facilities.

- **Clinical Decision Support System (CDSS):** An AI-powered clinical decision support system, integrated with the Government of India's eSanjeevani telemedicine platform, for better patient management.

AI Unit at the e-Health Division, Ministry of Health and Family Welfare (MoHFW)

Wadhwani AI has established an AI Unit at the e-Health Division of the MoHFW. In addition to enabling the ministry to become AI-ready, the AI Unit will discover high-potential tech solutions and impact cases, and develop and deploy solutions at scale. The AI Unit aims to aid the ministry in developing a resilient national healthcare system and bolster the capacities of the system through the use and integration of data science, data analytics, data synthesis, AI solution development and modeling for the predictive analysis of epidemics and pandemics.

The AI Unit is currently working on the following use cases prioritised by the e-Health division:

Centers of Excellence for AI in Healthcare

Wadhwani AI, with support from USAID and in partnership with the Ministry of Health and Family Welfare, is planning to launch two state-of-the-art Centers of Excellence for Artificial Intelligence. Hosted at the All India Institute of Medical Sciences (AIIMS) and the Indian Institute of Technology (IIT-D) in New Delhi, these Centers of Excellence will help to improve digital and technological capacities across healthcare in India.

Through testing and deploying innovative AI solutions in healthcare, Wadhwani AI aims to help build robust systems that will enable a healthier society and a more sustainable economy.

Wadhwani AI is a nonprofit and independent institute that builds and deploys AI solutions for social impact, and supports governments and civil society organizations with AI/ML capacity building. With a team of around 90 professionals, our expertise encompasses AI/ML research and innovation, software engineering, domain knowledge, and user research. **We are the official AI partner of the Central Tuberculosis Division (CTD) of the Ministry of Health and Family Welfare (MoHFW), Government of India.** Learn more at **wadhwaniai.org.**