Wadhwani AI

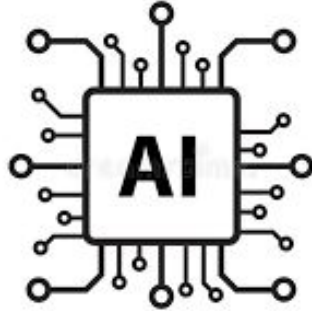# A Multidisciplinary approach to social impact

Ministry of Electronics and Information Technology, Azadi Ka Amrit Mahotsav week

Mr. Shekar Sivasubramanian, Head Solutions, Wadhwani AI
30 November, 2021

Inaugurated on **18th February, 2018**, by Hon'ble Prime Minister Shri Narendra Modi, Wadhwani Institute for Artificial Intelligence (Wadhwani AI) is an independent nonprofit institute developing and deploying multidisciplinary AI-based solutions to achieve social impact for underserved communities in India and other developing countries.
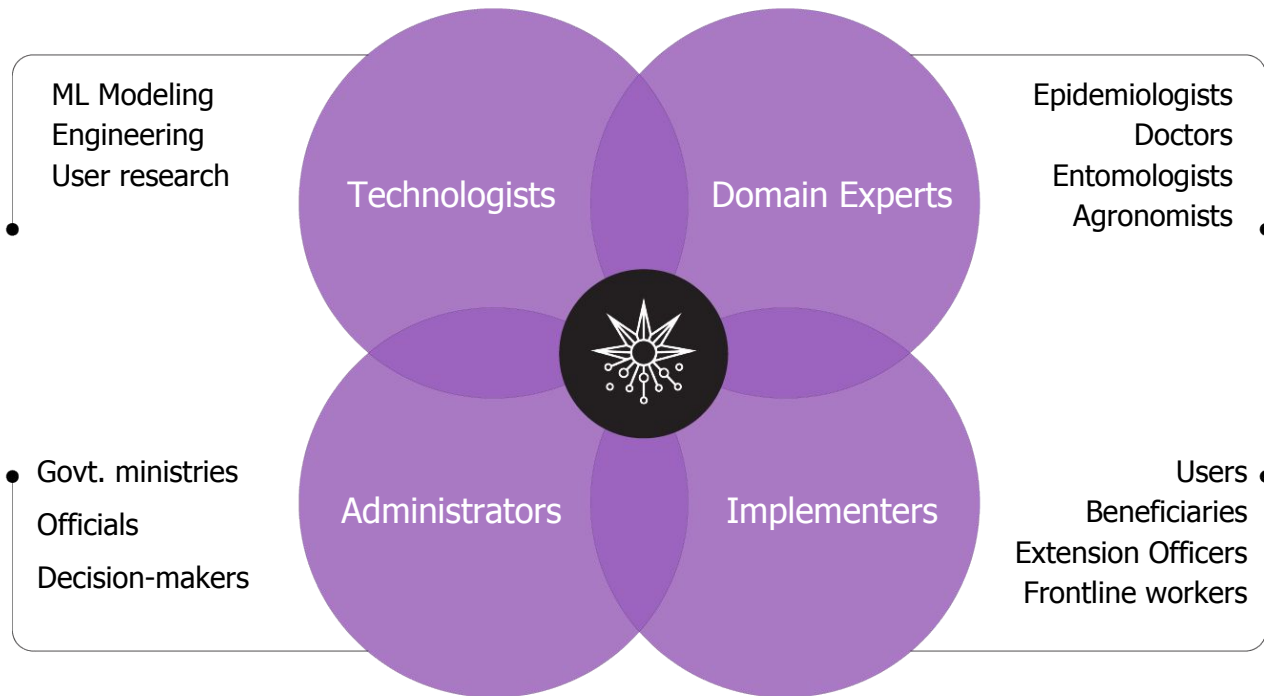
Our work

Build and deploy multidisciplinary AI-based solutions for social impact. 10+ solutions in healthcare and agriculture. Aim to reach ~20 in next two years. No cost for social impact and research purposes.
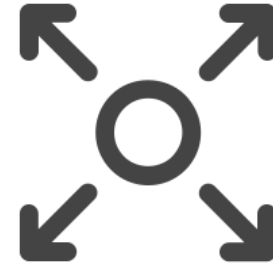

Capacity building support in AI and data to public administrators, multilateral organizations, nonprofits and other research institutes. Currently working with National Health Authority, Ministry of Health and Family Welfare and Central TB Division.

Collaborative - Multidisciplinary - Impact focussed

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A radically collaborative approach is needed to develop AI-based solutions that make a difference

ML Modeling
Engineering
User research

Technologists

Domain Experts

Epidemiologists
Doctors
Entomologists
Agronomists

Govt. ministries
Officials
Decision-makers

Administrators

Implementers

Users
Beneficiaries
Extension Officers
Frontline workers

Multi-disciplinary problem solving approach

AI-based solutions must work within broader systems and programs for scaled impact.
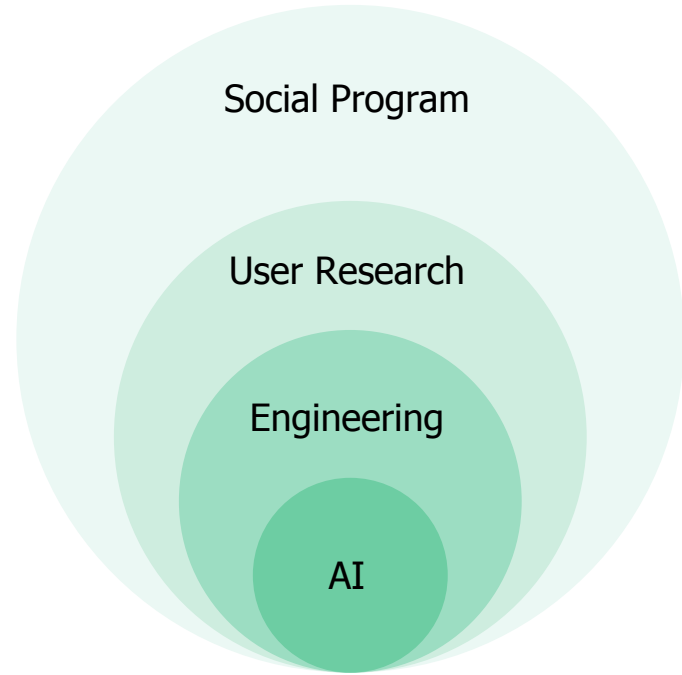
We have some of the best minds in the world, all pulling together, for the benefit to reach across India. That is our only reason to exist.

Social Program

User Research

Engineering

AI

Solution Design Principles to achieve social impact

- **Keep humans in the loop**
  - Minimize scope for interpretation errors, flag doubtful cases to user
  - Establish feedback loops at the systems level for validating a deployed solution with user

- **Explainable and interpretable**
  - Ensure confidence and explainability by providing interpretation uncertainty with ability to triage error
  - Incorporate learning algorithm, where applicable, to ensure that performance improves with time

- **Work with existing system and users**
  - Work within and integrate with programme and domain specific systems, by having same data vocabulary
  - Address user needs, with minimal disruptions to workflow

- **Rigorous, scalable, test-driven approach**
  - Ensure rigorously testing to manage risks in alpha, beta and early deployment stages
  - Build evidence and constantly iterate

- **Resilient and frugal**
  - Design for resilience against errors, hardware and software failure, changes in the digital ecosystem and workflows
  - Work with minimum hardware, software, internet connectivity
  - Address digital comfort levels of users

Tuberculosis: TRACE TB

Project description: Introduce AI solutions for TB and infectious diseases, strengthening the delivery of health care services and accelerating Government of India's effort to eliminate TB and respond to infectious diseases. Wadhwani AI is the official AI partner of the Central TB Division Government of India.

- **Objective 1:** Create an enabling system to adopt Digital and AI solutions for combating existing and emerging infectious diseases on a sustainable basis
- **Objective 2:** Research and development for innovative digital and AI solutions across the cascade of care to effectively manage the infectious disease threats
- **Objective 3:** Demonstrate early adoption of efficient Digital and AI solutions, for existing and emerging infectious diseases

Partners and donors include USAID, Everwell, World Health Organization, PATH, and BMGF

Current TB solutions overview

Screening

- Build classification algorithms for ultrasound scans to screen for pulmonary TB.

- Build algorithms that can screen for TB using cough sounds.

Diagnosis

- Deep Learning based computer vision solution for interpreting LPA test results with real time data integration into designated MIS system of India's National TB Elimination Program.

- Deep learning based computer vision solution for early diagnosis of Latent TB which reduces the risk of conversion of active TB patients
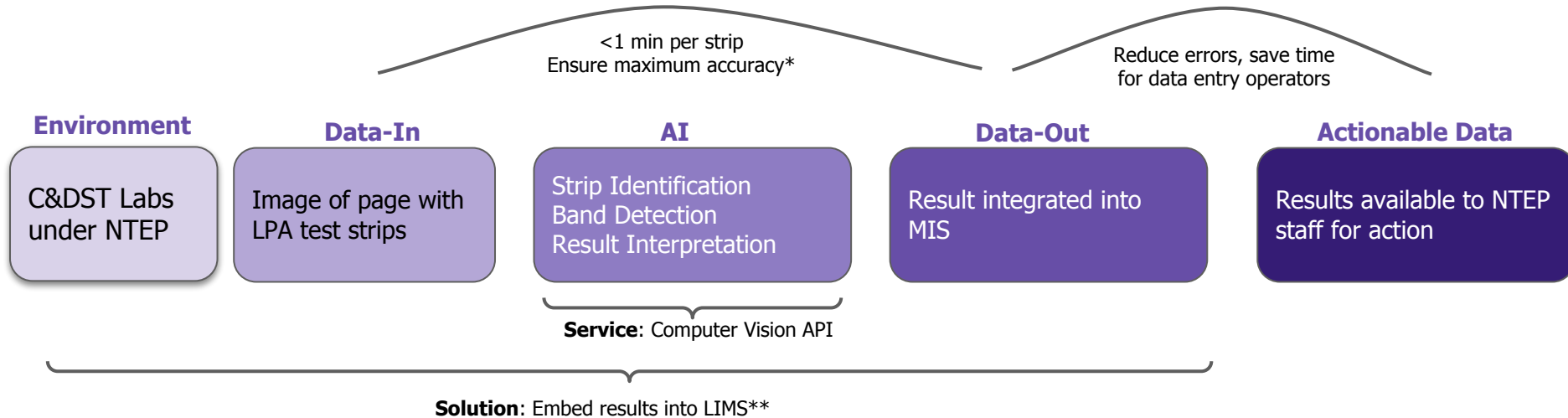
Treatment

- Our approach uses an AI-based predictive model for early identification of patients at risk of having treatment interrupted at the time of treatment initiation, in order to enable differentiated care
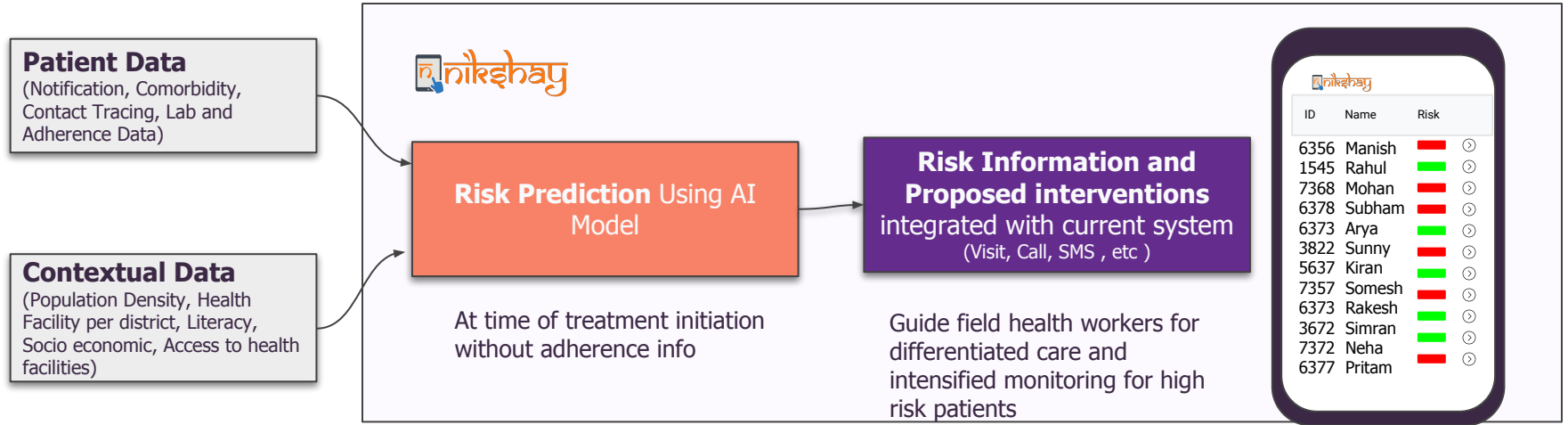
TB Diagnosis: Line Probe Assay (LPA)

Use computer-vision to enhance LPA interpretation and transcription

- Provide detailed interpretation in digital form
- Integration within Culture and Drug Sensitivity Labs (C&DST) performing first & second line LPA tests
- Support automated result interpretation and transmission of results to LIMS/Nikshay

<1 min per strip
Ensure maximum accuracy*

Reduce errors, save time
for data entry operators

Environment

C&DST Labs
under NTEP

Data-In

Image of page with
LPA test strips

AI

Strip Identification
Band Detection
Result Interpretation

Data-Out

Result integrated into
MIS

Actionable Data

Results available to NTEP
staff for action

Service: Computer Vision API

Solution: Embed results into LIMS**

Pilot with 6 Labs done, plan to scale to all 64 labs nationwide by H1 2022

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TB Treatment: Loss to follow-up

Patient Data
(Notification, Comorbidity, Contact Tracing, Lab and Adherence Data)

Contextual Data
(Population Density, Health Facility per district, Literacy, Socio economic, Access to health facilities)

nikshay

Risk Prediction Using AI Model

At time of treatment initiation without adherence info

Risk Information and Proposed interventions integrated with current system
(Visit, Call, SMS , etc)

Guide field health workers for differentiated care and intensified monitoring for high risk patients

ID	Name	Risk
6356	Manish	🔴
1545	Rahul	🟢
7368	Mohan	🔴
6378	Subham	🔴
6373	Arya	🟢
3822	Sunny	🔴
5637	Kiran	🟢
7357	Somesh	🔴
6373	Rakesh	🟢
3672	Simran	🟢
7372	Neha	🟢
6377	Pritam	🔴

Our approach uses an AI-based predictive model for early identification of patients at risk of LFU at the time of *treatment initiation*, in order to enable differentiated care

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➔ Use AI Model trained on patient and contextual data

➔ Generate risk score to predict high risk LFUs

➔ Propose programmatic interventions corresponding to risk level

➔ Monitor and analyse the efficacy

NIKSHAY

➔ Make risk stratification available to the end user to take up required intervention

➔ Provide ability to log activities in accordance with the new interventions

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Our AI models performed better than rule based systems. Plan to pilot in Q1 2022 in several districts

Agriculture: Pest Management

Vision

Solving a social problem for smallholder farmers using AI which can be scaled easily and is cost effective

Solution aim

AI-powered early warning system available through smartphones applications that helps farmers protect their crops by determining the right time to spray pesticides through immediate, localized advisory, thus reducing excess pesticide spend and increasing net income. We use an object detection algorithm to identify and count pests to generate a scientifically accurate advisory.

Solution Summary: 2018-21

- Selected crop, initial data collection, model building and solution development completed despite COVID interruptions.

- Pilot with ~850 farmers via partners in 2020 found promising results in reduced pesticide use and increase net income. Resulted in increase in partners and buy-in from State (Telangana and Odisha) and Central Governments (NITI Aayog).

- Deployed with 6,000+ farmers in 10 States across India, successfully predicting infestations in three districts in Panjab. Plan to reach ~50,000 farmers by Kharif 2022 and explore AI models for advisory for other crops and pests.

- Winner of Google.org AI Impact Challenge 2019 and NASSCOM AI Gamechangers 2021
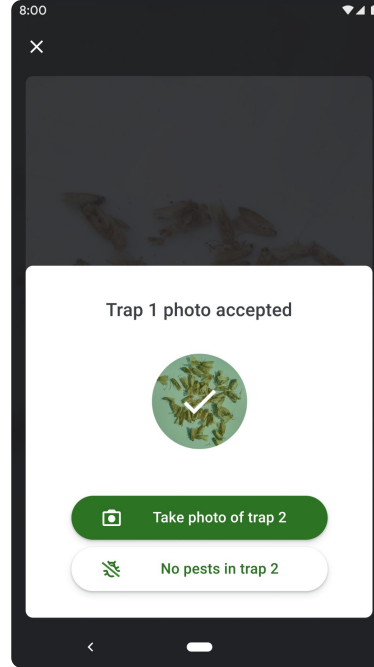
AI-based Pest Management App

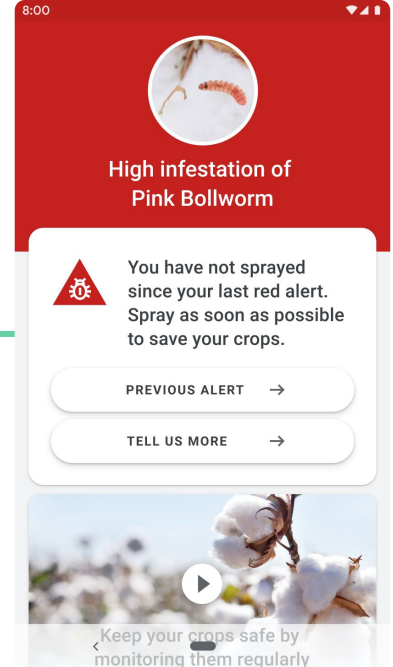A farmer or extension worker empties the moths from the pheromone trap.

He then opens the app and captures 2 trap images.

The pests are detected and counted from the image uploaded.

An advisory is then generated on the app.

App Flow

Thank you!

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www.wadhwaniai.org