

**Vuka! Let's unite towards
a TB-free world!**

9th SA
TB
Conference
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The Evolving Role of Artificial Intelligence in Tuberculosis Diagnostics & Treatment Optimization

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The Problem We Cannot Afford to Ignore



Tuberculosis (TB) remains a leading cause of global infectious disease mortality



1.6 million TB deaths annually (WHO 2024)



30 high-burden countries account for 87% of cases

Traditional diagnostic methods of sputum microscopy and chest radiography (CXR) often suffer from inter-reader variability and labour-intensive workflows

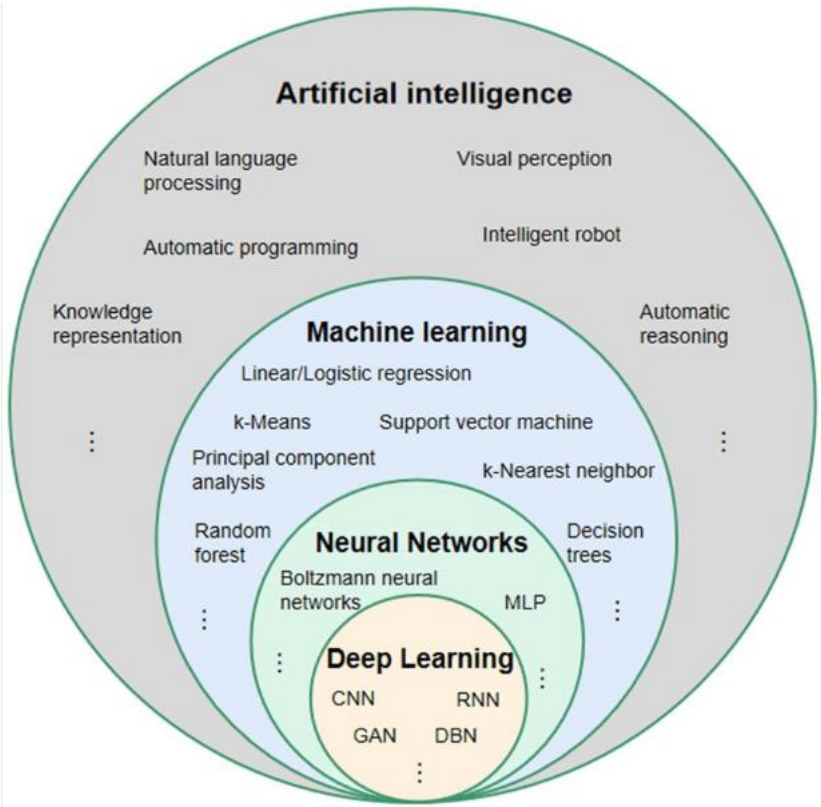


Average diagnostic delay: **2–3 months**

**WHO TB Fact sheet, 2024*

What if a machine could spot TB before a clinician does?

What Exactly IS Artificial Intelligence?

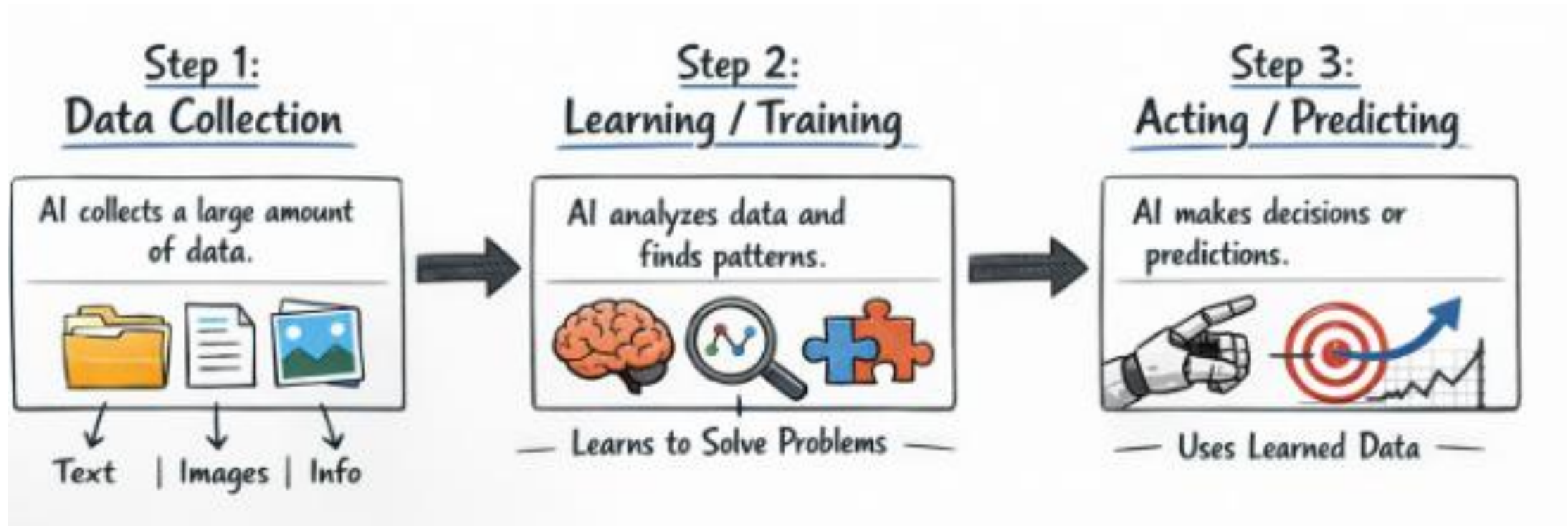


AlphaSignal.ai

Key Points:

Term	Simple Definition	TB Example
AI	Computers mimicking human intelligence	Interpreting chest X-rays
Machine Learning	Computers learning from data	Predicting drug resistance
Deep Learning	AI modeled on the human brain	Reading microscopy slides
Algorithm	A set of rules/instructions	TB risk scoring

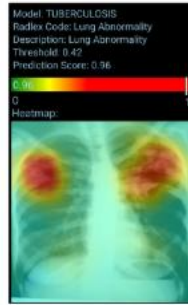
How Does AI Actually Learn?



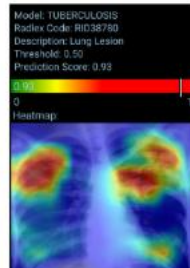
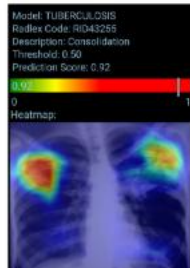
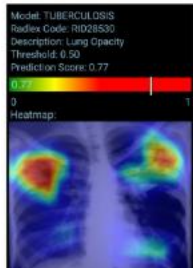
Seeing What Human Eyes Miss



(a)



(b)



TRADITIONAL APPROACH

- 👨‍⚕️ 1 Radiologist
- 🕒 5-10 min per film
- 😴 Fatigue affects accuracy
- 🏥 Hospital-based only
- 💰 High cost

AI-POWERED APPROACH

- 🤖 Unlimited capacity
- ⚡ Seconds per image
- 📊 Consistent every time
- 📱 Mobile/remote capable
- 💵 Cost-effective at scale

AI System	Sensitivity	Specificity	Setting
qXR (Qure.ai)	95%	91%	India, Africa
CAD4TB	88%	90%	14 countries
DeepMind CXR	Expert-level	Expert-level	UK/Global

Beyond X-Rays — The Diagnostic Revolution



Four Pillars of AI-Enhanced TB Diagnosis



MICROSCOPY

AI auto-detects TB bacteria in resistance from sputum slides
+20% sensitivity



GENOMICS

Predicts drug resistance from DNA sequencing >95% accuracy



BIOMARKERS

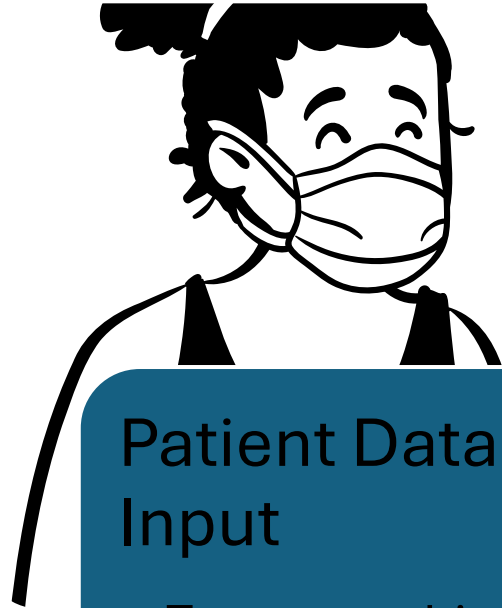
Blood/urine AI signatures for diagnosis & latent TB



POINT OF CARE

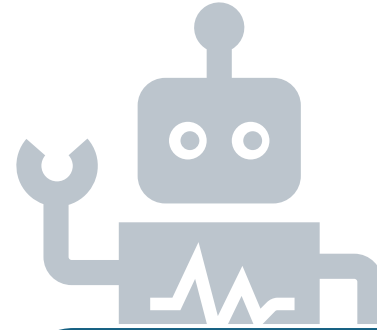
Smartphone TB testing in remote areas

The Right Drug, for the Right Patient, at the Right Dose



Patient Data Input

- Treatment history
- HIV status
- Geography
- Demographics



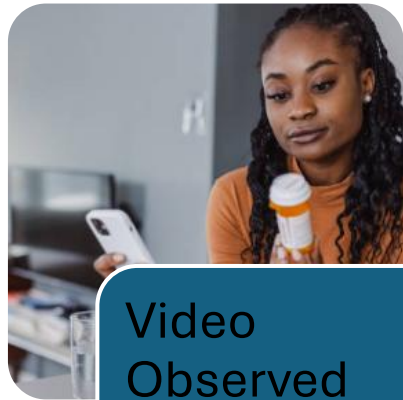
AI Output

- HIGH resistance risk
- Recommend: DST + alternate regimen
- AUC 0.85 predictive accuracy

***Standard dose ≠
Optimal dose for
every patient***

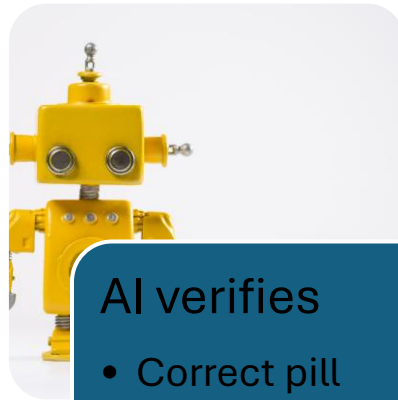
Accounts for:
weight, genetics,
kidney function, HIV
medications

AI Supported Treatment Adherence



Video Observed Therapy

- Pt films themselves taking pills



AI verifies

- Correct pill
- Swallowed
- Right time



If dose is missed

- Alert sent to pt

Intervention	Completion Rate Improvement
Standard DOT	Baseline
AI-powered VOT	+18–22%
AI chatbot reminders	+15–30%
Predictive risk alerts	Earlier intervention in 89% of at-risk patients

2024 systematic review in *PLoS Neglected Tropical Diseases* titled “**Video-observed therapy (VOT) vs directly observed therapy (DOT) for tuberculosis treatment**”

AI Is Powerful — But Not Perfect

PROMISE ✓	CAUTION ⚠
Faster diagnosis	Needs quality data
Consistent accuracy	Can inherit biases
Scalable to LMICs	Infrastructure gaps
Personalized care	"Black box" decisions
24/7 availability	Regulatory gaps
Cost-effective	Equity of access
Critical Questions for Our Context	
• <i>Was this AI trained on patients who look like mine ?</i> • <i>Does it perform the same in my setting as in the study ?</i> • <i>Who is accountable when AI gets it wrong ?</i> • <i>Does this tool reduce or reinforce health inequity ?</i>	

What This Means for YOU

- UFS will be launching a short course: Applied AI Public Health Professionals
- University of Maryland free online AI introduction course

Learn

- Once you are AI literate, advocate for AI tools that have been trained on data coming from patients like yours

Advocacy

Explore

- Explore AI tools for TB

Question

- Find out if your facilities are using AI
- Ask the providers of the service to explain to you how it works

