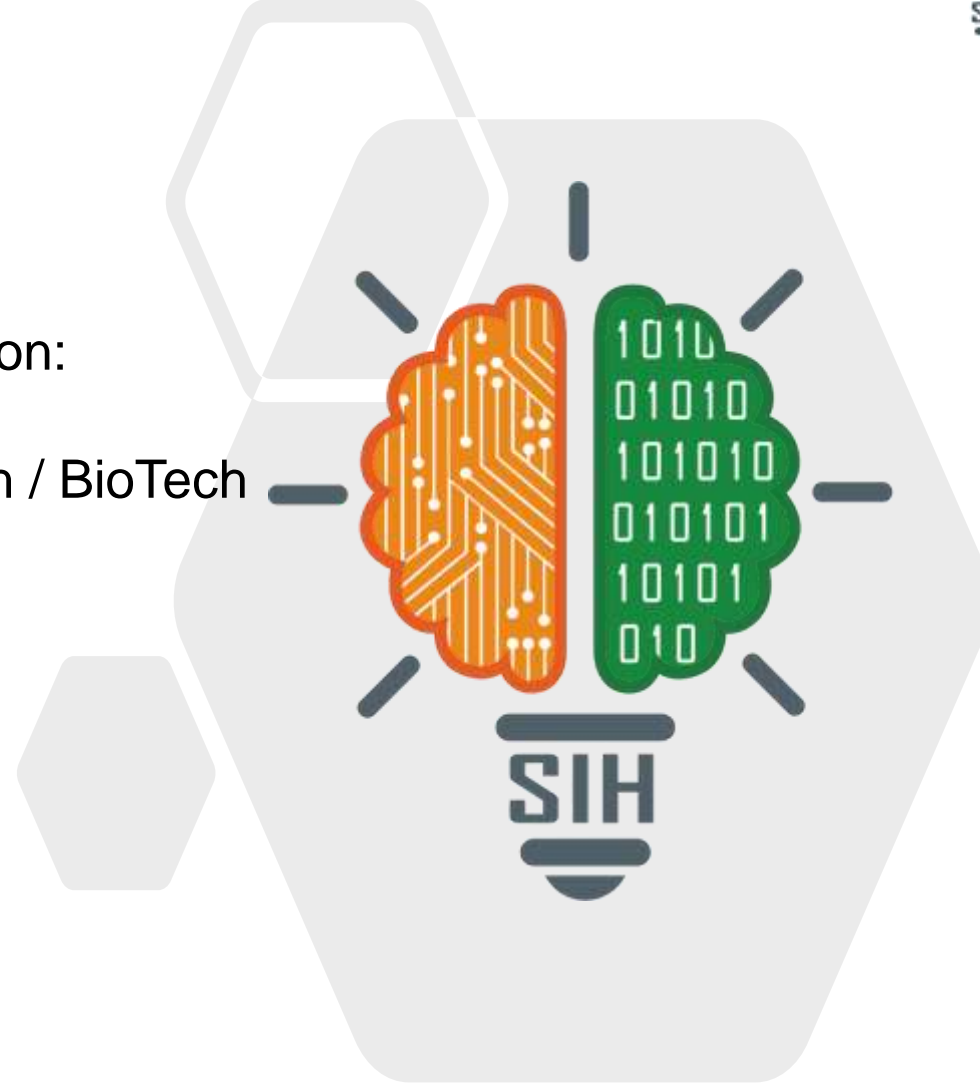# SMART INDIA HACKATHON 2025

- **Problem Statement ID –** SIH25131

- **Problem Statement Title-** Student Innovation:

  Swadeshi for Atmanirbhar Bharat - MedTech / BioTech

- **Theme-** Student Innovation

- **PS Category-** Software

- **Team ID -**

- **Team Name -**

Health Hacker

Sehat Sathi (Ai-powered medical report analyser)

PROBLEM DEFINITION

❖ Medical reports contain complex terms, ranges, and abbreviations that patients cannot easily interpret.
❖ Rural populations, non-English speakers, and visually impaired patients struggle most.
❖ Lack of clarity causes anxiety, misinformation, and overdependence on doctors for trivial clarifications.

IDEA / SOLUTION:

❖ **AI-powered Medical Report Analyzer** to simplify blood tests, prescriptions, and diagnostic reports.
❖ Provides **color-coded results + text + local language voice narration** for inclusivity.
❖ Integrated **FAQ-based chatbot** for common health queries, with advanced support when online.

System Flow

Report Upload → OCR → Parameter Extraction → Range Comparison → Explanation → Voice Narration → Chatbot Interaction

PROBLEM RESOLUTION:

❖ Enables patients to independently understand reports.
❖ Bridges healthcare access gap in rural and non-English speaking areas.
❖ Makes healthcare inclusive for illiterate and visually impaired citizens.

UNIQUE VALUE PROPOSITION:

❖ Combines **AI + local language voice narration** → rare in current tools.
❖ Empowers **self-reliance (Atmanirbhar Bharat)** in health awareness.
❖ Scalable, low-cost, and designed for **real-world rural applicability**.

TECHNICAL APPROACH

Workflow

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TECHNOLOGY USED:

Frontend: Flutter (cross-platform, multilingual UI).

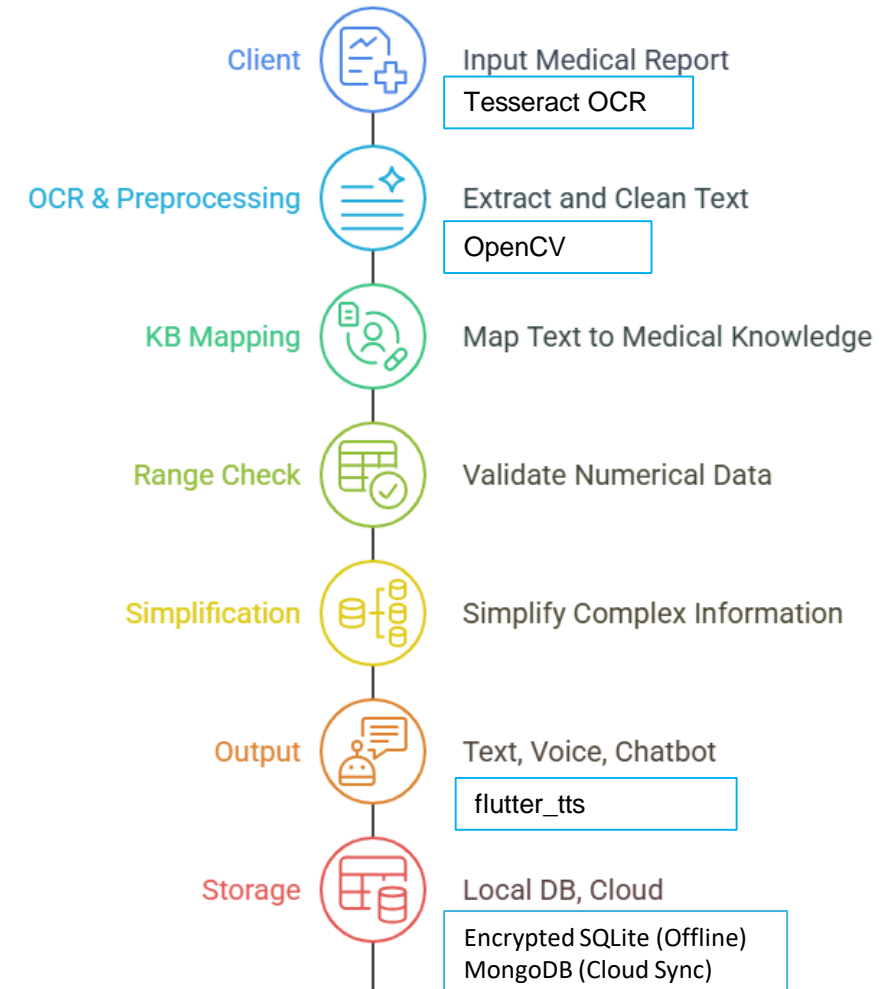**OCR Engine:** Tesseract OCR.

Preprocessing: OpenCV (Python integration).

NLP & Matching: RapidFuzz, Regex, template-based NLG.

Database: SQLite (offline), MongoDB (optional online sync).

Text-to-Speech: flutter_tts (offline voices).

Chatbot: FAQ JSON + RapidFuzz (offline); Online LLM integration (optional).

|		
Client	Input Medical Report	Tesseract OCR
OCR & Preprocessing	Extract and Clean Text	OpenCV
KB Mapping	Map Text to Medical Knowledge	
Range Check	Validate Numerical Data	
Simplification	Simplify Complex Information	
Output	Text, Voice, Chatbot	flutter_tts
Storage	Local DB, Cloud	Encrypted SQLite (Offline) MongoDB (Cloud Sync)

FEASIBILITY AND VIABILITY

FEASIBILITY ASSESSMENT:

❖ **Technical:** High feasibility using mature, low-cost open-source tools (Tesseract OCR, SQLite, Flutter, TF-Lite) with strong community support.
❖ **Operational:** Designed as an offline, low-maintenance mobile solution that works seamlessly in rural and remote areas.
❖ **Economic:** Built on free and open-source stack, ensuring affordability with no recurring license costs.
❖ **Social:** Multilingual text + voice narration ensures accessibility for non-English speakers, illiterate, and visually impaired patients.

POTENTIAL CHALLENGES

❖ **Data Variability:** Lab ranges may differ across labs.

❖ **OCR Accuracy:** Handwritten or poor-quality scans may reduce extraction accuracy.

❖ **Medical Sensitivity:** Misinterpretation of values can mislead patients.

❖ **User Awareness & Adoption:** Rural users may hesitate to trust digital tools.

❖ **Performance on Low-end Devices:** AI models may lag on cheap phones.
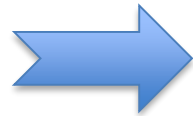
MITIGATION STRATEGIES:

➡ Use a flexible knowledge base with ranges from ICMR + global standards, allow lab-wise customization.

➡ Start with printed reports, enhance with preprocessing (OpenCV), and expand to handwriting with ML later.

➡ Add disclaimers + keep explanations educational (not diagnostic), validated with public health references.

➡ Provide voice narration in local languages + simple icons (color coding) for intuitive use.

➡ Use lightweight quantized models + offline template-based simplification.

IMPACT AND BENEFITS

Impacts

Economic: Reduces unnecessary consultations, lowers healthcare costs.

Technological: Advances offline AI in MedTech, scalable knowledge base.

Operational: Automates report explanation, ensures quick access to insights.

Societal: Improves health literacy, empowers rural & visually impaired citizens.

Global/National: Aligns with Atmanirbhar Bharat & UN SDGs.

Benefits

Societal:

Improve health literacy, empower rural and visually impaired citizens.

Economic:

Reduce unnecessary doctor visits, save healthcare costs for families.

Technological:

Advance offline AI integration, scalable knowledge base for more tests.

Global/National:

Support Atmanirbhar Bharat, contribute to UN SDGs on health & innovation.

Operational Efficiency:

Automate report interpretation, provide instant health awareness.

RESEARCH AND REFERENCES

SMART INDIA HACKATHON 2025

S. No	Title of the Paper / Documentation	Published / Presented in	Year of Publication	Key Insights
1	Understanding Laboratory Tests	MedlinePlus, U.S. National Library of Medicine	Updated 2023	Provides simple, patient-friendly explanations of common medical tests.
2	Lab Tests Online – Reference Ranges & Explanations	American Association for Clinical Chemistry (AACC) / ARUP Labs	Updated 2022	Detailed reference ranges, synonyms, and interpretations of abnormal values.
3	Dietary Guidelines for Indians	ICMR – National Institute of Nutrition (NIN)	2020	Offers India-specific standards for anemia, nutrition, and vitamin deficiencies.
4	Tesseract OCR Documentation	Google / Open Source Community	2024	Most widely used free OCR engine; reliable for scanned health reports.
5	OpenCV Documentation	OpenCV.org	2024	Image preprocessing improves OCR accuracy by removing noise and skew.
6	Flutter Official Documentation	Google	2024	Cross-platform framework enabling multilingual, offline-first apps.