ICDS AI Toolkit

Explainable AI Dashboard for Child Nutrition & Dropout Risk Prediction

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Reskill

AI for All Challenge

1. Summary

India runs one of the world's largest child welfare programmes through **Integrated Child Development Services (ICDS)**. Every day, Anganwadi centres collect large amounts of data related to child nutrition, attendance, and growth. However, this data is mostly used only for reporting purposes and not for **early, preventive decision-making**.

The **ICDS AI Toolkit** is an **Explainable AI-powered decision support system** that transforms fragmented ICDS data into **clear, actionable, and trustworthy insights**. It identifies children at nutrition risk, predicts dropout risk at an early stage, and most importantly, explains *why* a child is flagged. The solution is integrated directly with **Power BI**, making it practical, scalable, and easy to adopt within government systems.

2. Problem Statement

Despite availability of ICDS data, several challenges persist:

- Data is **fragmented** across registers and Excel files

- Anganwadi workers see **numbers, not insights**

- No system exists to **flag at-risk children early**

- No explanation is available for *why* a child is marked critical

- Interventions often happen **too late**

This leads to delayed nutrition support, higher dropout risk, and inefficient use of limited resources.

3. Target Users & Stakeholders

The solution is designed for multiple levels of ICDS stakeholders:

- **Anganwadi Workers** – identify which child needs immediate attention

- **Supervisors** – monitor Anganwadi performance

- **Block & District Officials** – identify village-level hotspots

- **Policy Makers** – use aggregated insights for planning

4. Solution

The **ICDS AI Toolkit** acts as a **decision-support layer** on top of existing ICDS data.

What the system does:

- Analyses child nutrition and attendance data

- Assigns **Nutrition Risk Level** (Safe / Warning / Critical)

- Predicts **Dropout Risk** (Low / Medium / High)

- Generates **clear reasons** for every prediction

- Visualises insights through an **interactive Power BI dashboard**

The system **supports human decision-making**, it does not replace it.

5. Data Used & Responsible AI Approach

Data Type

- **Synthetic (dummy) ICDS-like data** used for the hackathon prototype

Why synthetic data?

- Real ICDS child data is **sensitive and protected**

- Privacy and ethical AI practices are followed

- Data structure closely mirrors real ICDS datasets

Important Note

The AI logic and dashboard are **fully compatible with authorised real ICDS data** without any modification.

6. AI Methodology

Why Explainable AI?

In government and social welfare systems:

- Trust is critical

- Decisions must be auditable

- Frontline workers must understand outputs

Therefore, the project avoids black-box models.

6.1 Nutrition Risk Scoring

Each child is evaluated based on:

- Weight

- MUAC (Mid-Upper Arm Circumference)

- Attendance percentage

- Age vulnerability

A **rule-based weighted scoring system** assigns:

- Risk Score (0–100)

- Risk Level (Safe / Warning / Critical)

6.2 Dropout Risk Prediction

Dropout risk is predicted using:

- Attendance trends

- Nutrition risk score

- Age-related transition risk

Output:

- Low

- Medium

- High

This enables **early intervention**, not reactive reporting.

6.3 Explainability Layer

For every child, the system generates **human-readable reasons**, such as:

- "Low attendance, Poor nutrition"

- "Low MUAC"

- "Irregular attendance"

This ensures **complete transparency**.

7. Power BI Integration

Why Power BI?

- Already used in many government departments

- Low learning curve

- Scales easily from village to national level

- Supports Python integration

Deployment Modes

Case 1: CSV-Based Workflow

- Python script generates output CSV

- CSV uploaded into Power BI

- Suitable for pilots or low-connectivity areas

Case 2: Direct Power BI Python Integration

- Python script runs inside Power BI

- No manual uploads

- Refresh re-runs AI logic automatically

8. Dashboard Features

The Power BI dashboard provides:

- **Risk Distribution**

- **Dropout Risk Overview**

- **Child-level Detail Table** with reasons

- **Village & Anganwadi Comparison** heatmaps

- **Interactive filters** for village, gender, and risk level

All visuals update dynamically.

9. Social Impact

Primary Beneficiaries

- Children aged 3–6 years

- Anganwadi workers

- ICDS supervisors and officials

Tangible Impact

- Early detection of malnutrition

- Prevention of school dropouts

- Better targeting of nutrition interventions

- Reduced long-term health and education loss

10. Scalability & Future Scope

- Integration with health and education datasets

- Role-based dashboards

- District → State → National rollout

- Deployment through platforms like **AIKosh**

- Gradual enhancement with ML models after validation

11. Ethical & Responsible AI Considerations

- No personal identifiers used

- Explainable decision logic

- Privacy-aware synthetic data usage

- Human-in-the-loop decision making

12. Conclusion

The **ICDS AI Toolkit** demonstrates how **responsible, explainable AI** can strengthen India's child welfare systems. By converting fragmented data into actionable intelligence, the solution empowers frontline workers, improves governance, and enables early interventions that can genuinely improve child outcomes.