AI Presentation

MathBangla: A Next-Gen Bengali NLP and Mathmatical Equation Generation AI
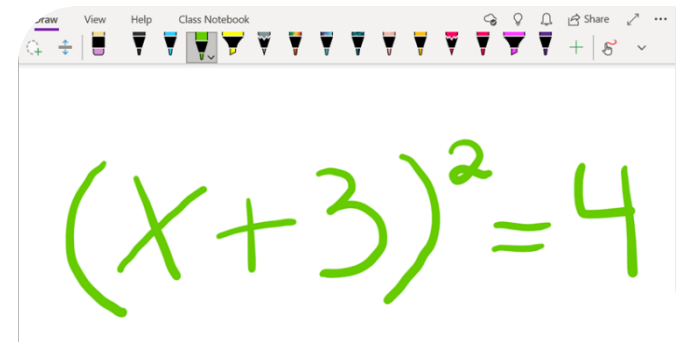
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Submit On: 16-07-2025

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SMUCT

WHAT IS MATH-BANGLA?

MathBangla is a dual-purpose Bengali AI system designed for advanced language and mathematical understanding.

- **Objective 1**: A next-gen Bengali NLP model that understands regional dialects, slangs, and informal structures.

- **Objective 2**: A Bengali-language mathematical reasoning engine that transforms textual math problems into structured algebraic equations.

$$(x+3)^2=4$$

TWO CORE OBJECTIVES

1. All-in-One Bengali NLP Engine
    1. Understands standard Bengali and all major dialects.
    2. Can translate between dialects (example: Dhakaiya → Barishali).

2. Bangla-to-Equation Converter
    1. Understands and extracts logic from Bengali text-based math problems.
    2. Produces algebraic equations in a clean and accurate format.

UNIQUE FEATURES

- Supports dialects like Sylheti, Chittagonian, Rangpuri, etc.

- Built-in dialect translator (useful for informal speech/text analysis).

- End-to-end Bangla math problem solver with no English dependency.

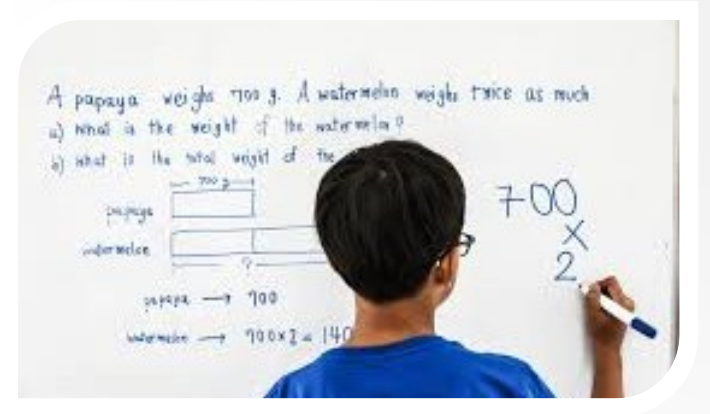- Output: Equations only, no unnecessary explanation or English phrases.

WHY BENGALI NLP?

- Bengali is one of the top 6 languages globally, yet lacks AI tools for dialects.

- Local dialects are underrepresented in NLP research and applications.

- Tools like this can empower local voice tech, chatbots, and educational AI apps.
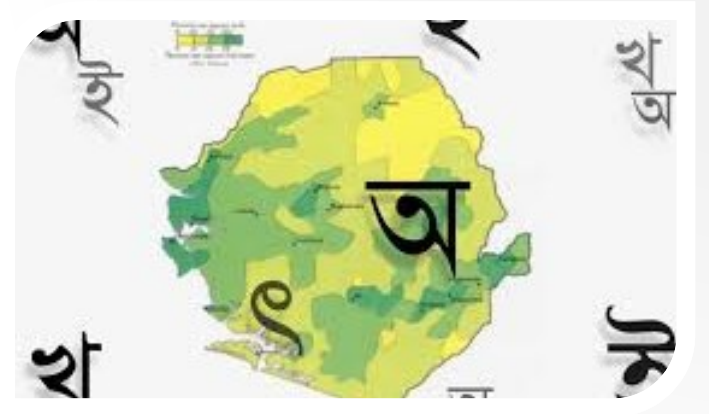
WHY MATH CONVERSION?

- Most Bengali-medium students face difficulties in algebraic translation.

- No AI tool exists that supports solving math in pure Bengali.

- MathBangla enables faster understanding of complex word problems.

WHY OUR APPROACH IS UNIQUE

- Not just another Bengali POS tagger — it works on noisy, real-life dialects.

- First-of-its-kind Bangla Equation Generator engine using natural language.

- Two specialized modules fused together for deep understanding.

HOW IT WORKS – BENGALI NLP

- <u>Step 1</u>: Input sentence tokenized with dialect recognition layer.

- <u>Step 2</u>: POS tagging and syntax parsing (custom-trained on dialect corpora).

- <u>Step 3</u>: Semantic intent recognition and dialect translation if needed.

Tokenization

Natural Language Processing

['Natural', 'Language', 'Processing'

"We love NLP!"

Tokenization
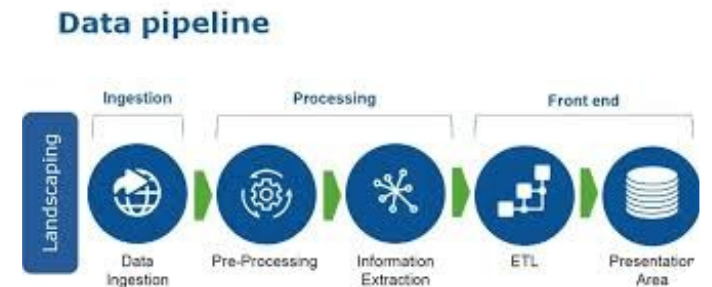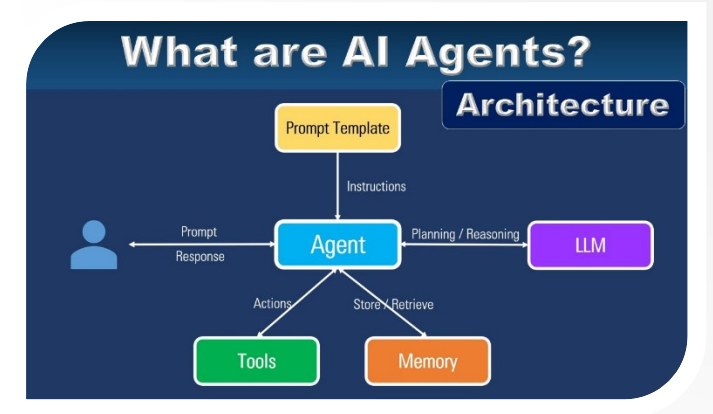
"We" "love" "NLP" "!"

HOW IT WORKS – MATH PATTERN ENGINE

- Step 1: Extract numerical values, quantities, and math-specific keywords.

- Step 2: Detect relationship logic (e.g., total, twice, difference, ratio).

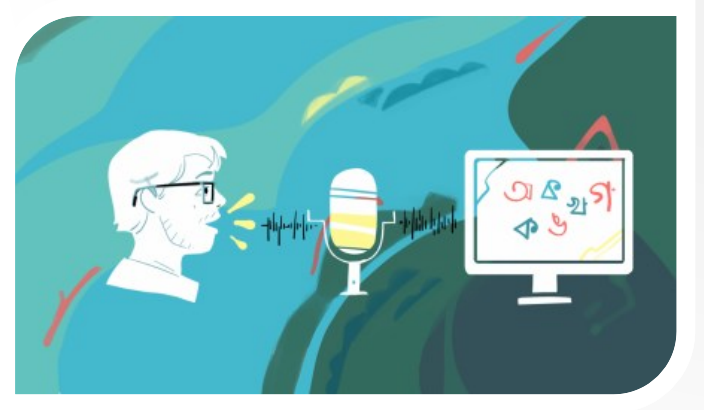- Step 3: Generate symbolic equations with variables.

INTEGRATION ARCHITECTURE

What are AI Agents? / Architecture

- Pipeline:
  - Bengali NLP Module → Math Pattern Recognizer → Equation Builder

- Interconnected modules handle translation, parsing, and expression generation.

- Modular system allows reuse of Bengali NLP engine for other AI applications.
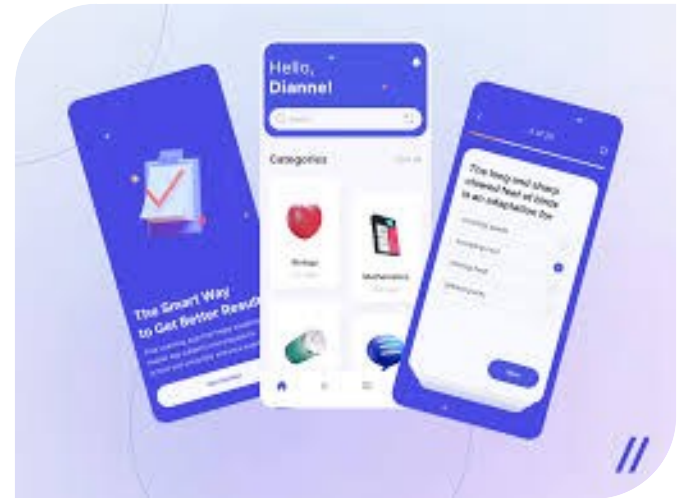

Data pipeline

APPLICATIONS – NLP SIDE

- Bengali virtual assistants that can understand dialect speech.

- Dialect-to-dialect machine translation system.

- Chatbots for healthcare, agriculture, and education using regional dialects.
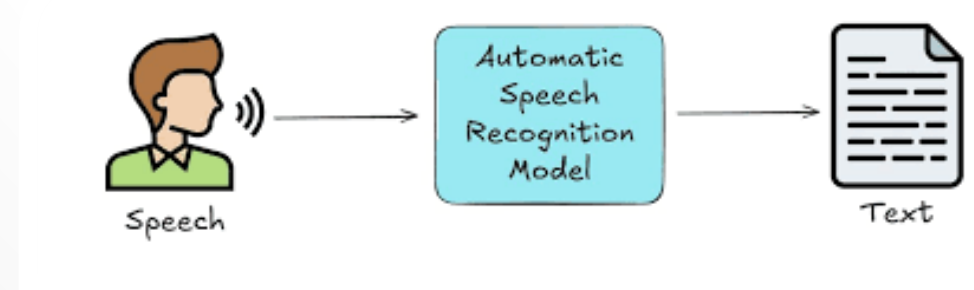
APPLICATIONS – MATH SIDE

- Bengali EdTech platforms for JSC, SSC, HSC level math problem solving.

- Exam prep apps that support math queries in Bengali language.

- Assistive tools for low-income or rural students with no English background.

FUTURE EXTENSIONS

- Add voice input/output (Speech-to-Math)

- Add OCR module for extracting math problems from printed textbooks.

- Gamified learning using Bengali spoken input and instant equation generation.

FOR WHOM?

- Students in Bengali medium (especially rural and underprivileged areas).

- Teachers seeking to create AI-supported learning materials.

- NLP researchers working with low-resource, underrepresented languages.

WHO ELSE BENEFITS?

- EdTech startups building smart Bengali learning tools.

- NGOs working on digital education and literacy.

- Government e-learning projects in national curriculum

SUMMARY & VISION

- MathBangla unites linguistic intelligence and logical reasoning in Bengali.

- Solves a real problem: language-first math education.

- Future: Expand to voice, OCR, cross-lingual education tools.