

# CoreMentis

POWERED BY INTEL® AI

INTEL UNNATI® INDUSTRIAL TRAINING PROGRAM

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CoreMentis

# IDEA TITLE

1

## OUTLINE

### User Requirements

- Real-time multimodal query input support
- Contextual, multimodal responses delivery
- Adaptive real-time student engagement detection

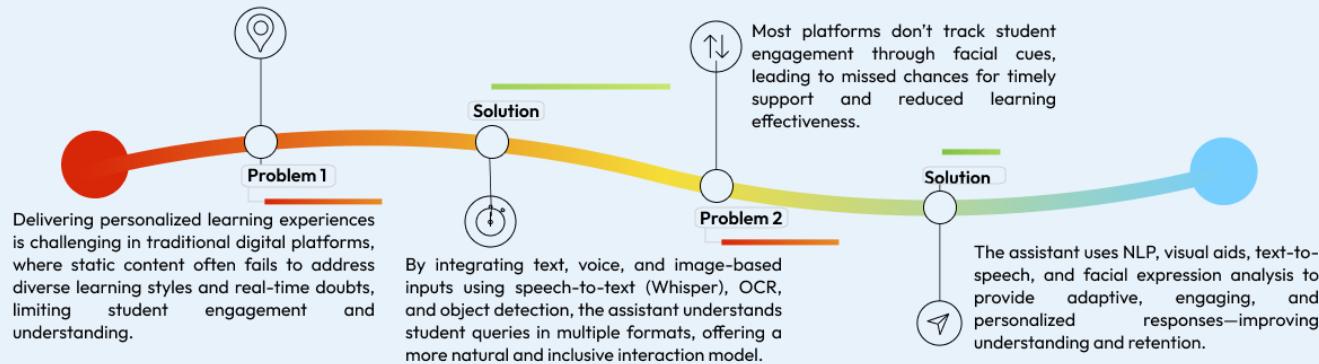
### Solution Components

- Multimodal Input & Processing Module
- Intelligent Response & Adaptive Engagement System
- Accessibility Features

- 01 Accepts student queries via text, voice, and images using speech-to-text and OCR. Combines insights from all inputs through multimodal fusion for unified understanding.
- 02 Uses NLP for contextual answers, provides visual aids and text-to-speech, and adapts responses based on facial expressions and engagement levels. Ensures personalized, interactive learning for better concept retention.
- 03 Interactive web app where students submit queries and receive multimodal responses. Backend manages model inference and data processing, optimized for low-latency using Intel AI PC with GPU/NPU acceleration.

2

## RESOLUTION



3

## UNIQUENESS

- Seamless integration of active and passive learning inputs:** Detects student behavior in real-time, not just on prompt.
- Smart Context Retention Across Multimodal Conversations:** Remembers past inputs across formats for smarter responses.
- Classroom-Centric AI Optimization on Edge Hardware:** Runs efficiently on Intel AI PC with low latency, no cloud needed



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# TECHNICAL APPROACH

1

## TECH STACK

### Frontend Development



React.js

### Backend Development



Flask

TECH  
STACK

### Optimization Engine



OpenVINO

### Github Link

### Demo Link

### Future Development

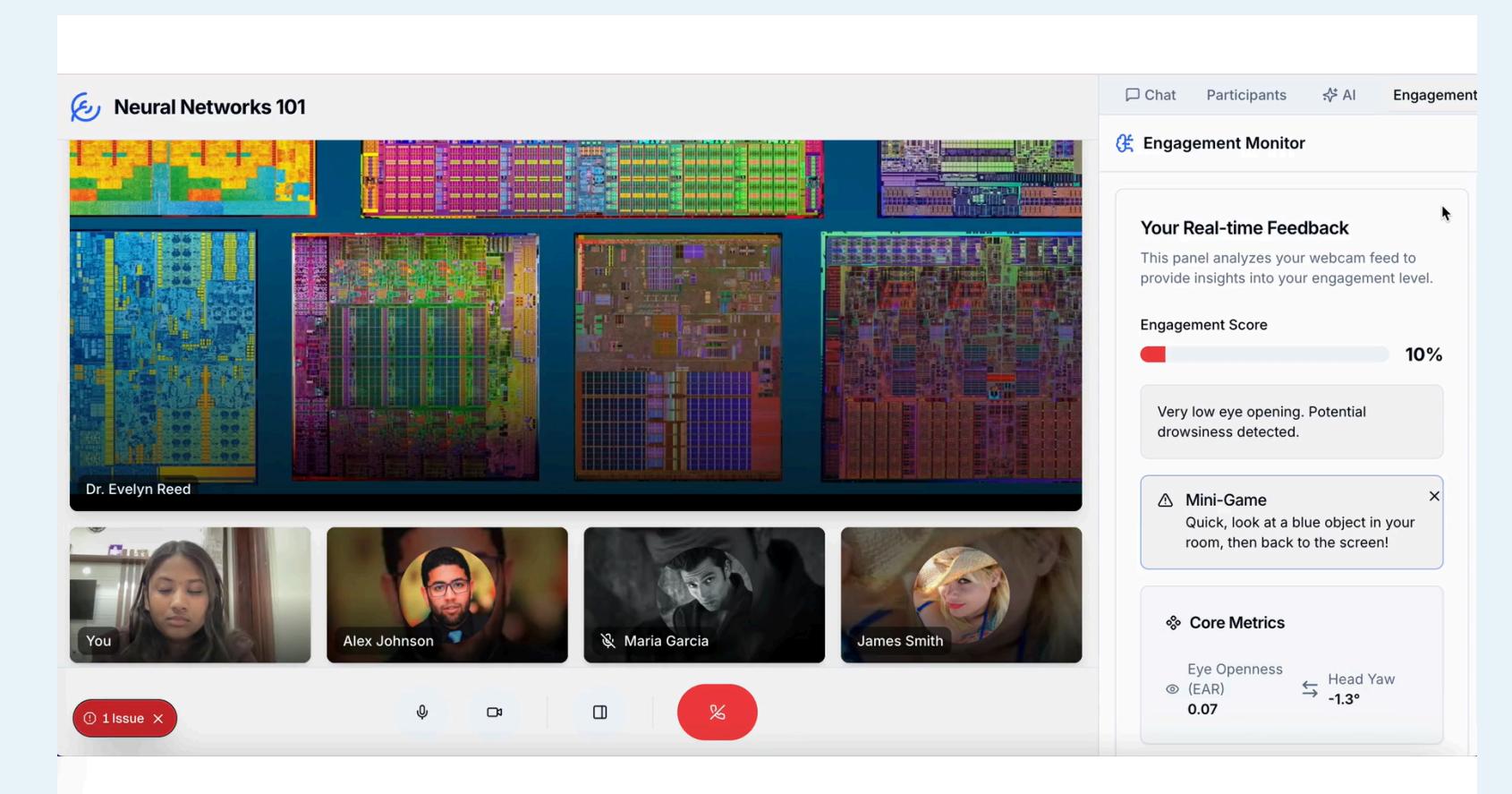
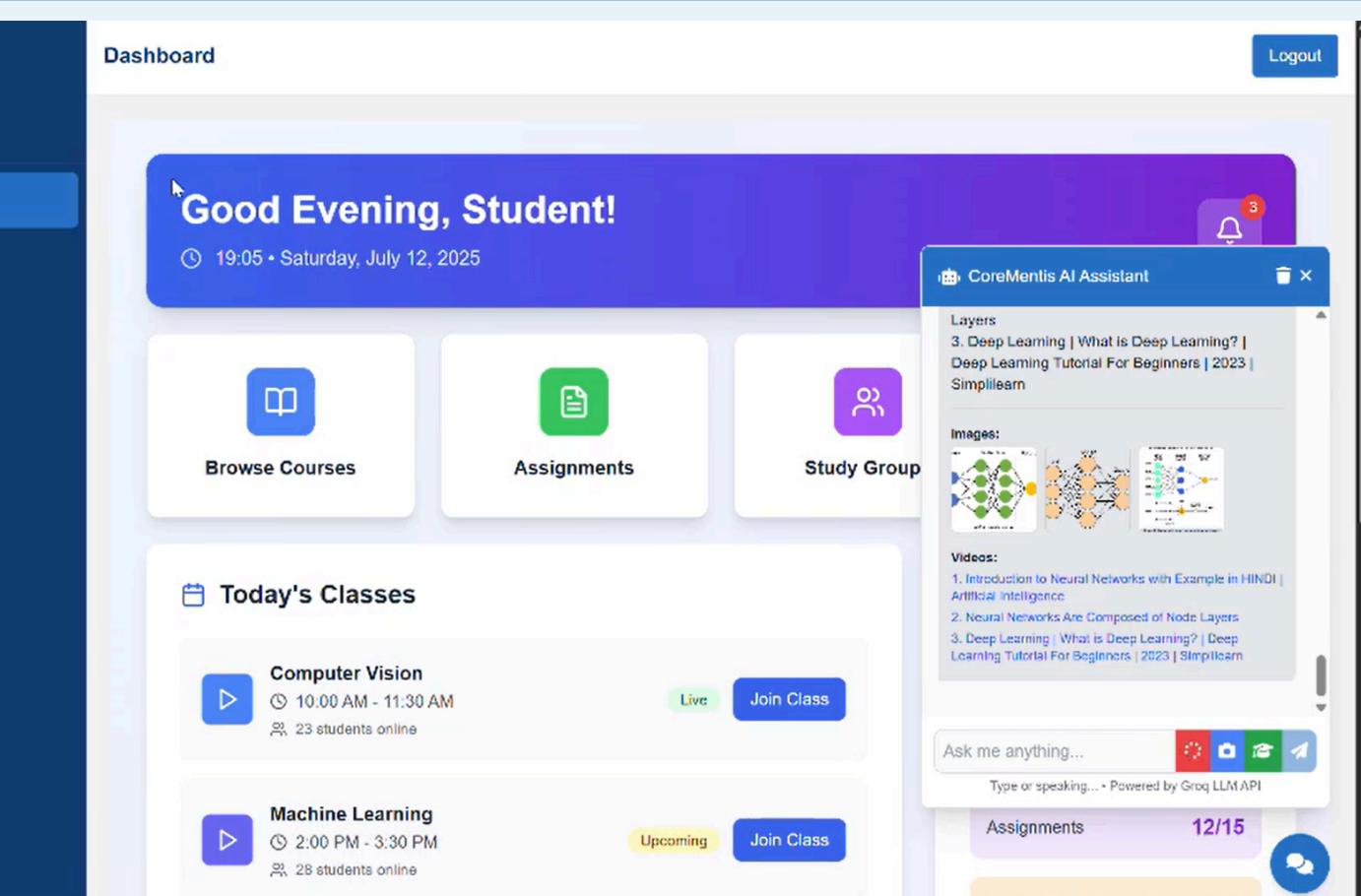
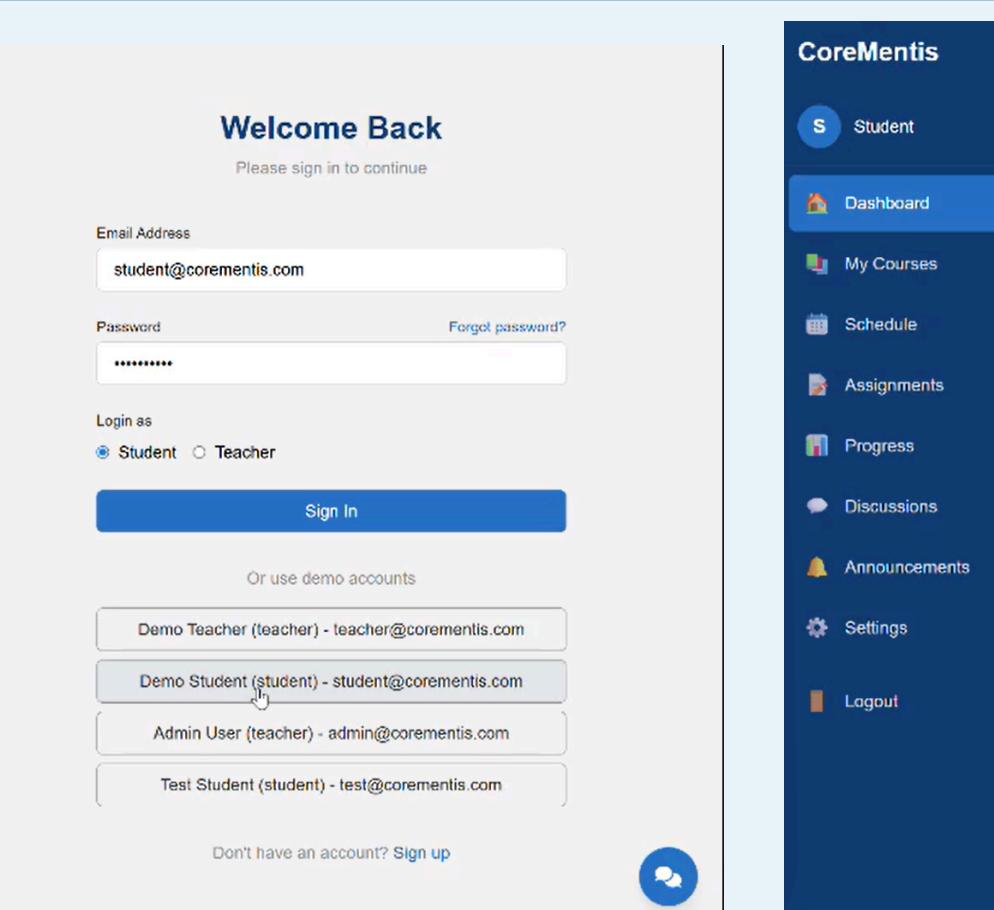
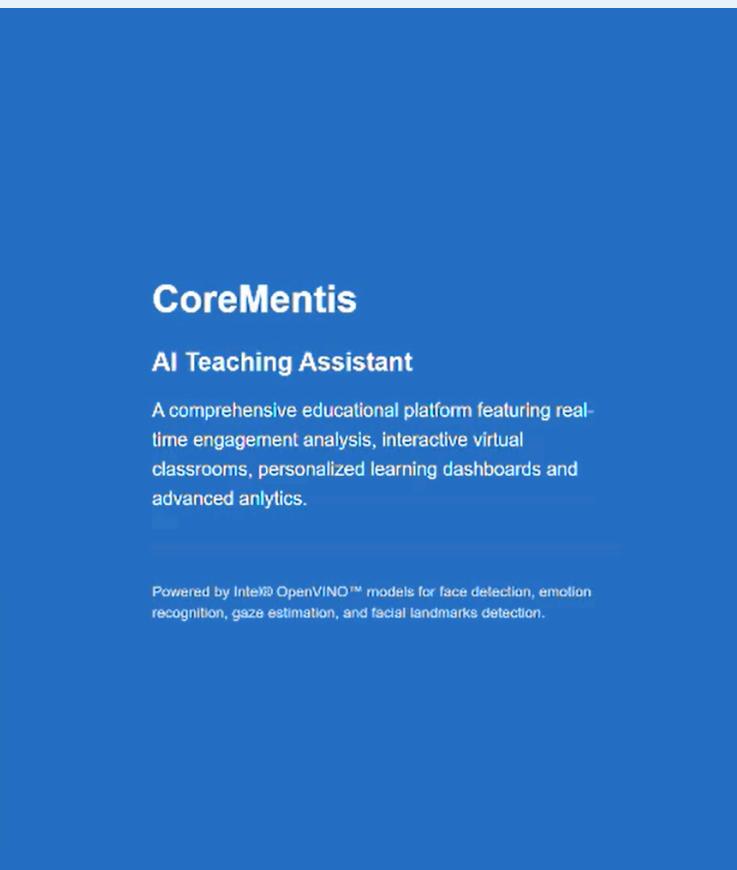
- A dashboard for parents to track student progress and receive AI-driven tips for home learning support.
- Keeps remote students synced with in-class activities using real-time summaries and visual cues.
- Shares anonymized learning insights across classrooms to improve adaptive teaching strategies.
- Uses augmented reality to visually demonstrate complex concepts in an interactive 3D environment.

Explorer

```
corementis-master
  backend
    notebook_utils.py
    numpy_compat.py
    openvino_optimization...
    README_OPENVINO.md
    requirements.txt
    scraper_test_results.txt
    simple_api.py
    simple_server.py
    simplified_api.py
    speech_recognition_al...
    test_api.py
    test_context_manage...
```

2

## Screenshots



3



CoreMentis

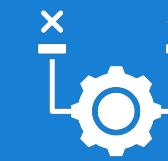
# FEASIBILITY AND VIABILITY

1

## EVALUATION

### Goals

### Requisites



### Viability

Use AI to provide real-time, multimodal responses to student queries through text, voice, and image.

Leverage NLP, speech-to-text, OCR, and facial expression analysis for personalized assistance.



### Practicality

Seamlessly integrate into existing LMS or be used independently for online learning.

Web-based interface ensures device-agnostic accessibility and user-friendliness.



### Affordability

Web-based interface ensures device-agnostic accessibility and user-friendliness.

Use of Intel AI PC with NPU/GPU reduces inference time without costly cloud usage.

2

## OBSTACLES

### Multimodal Fusion

Combining inputs from text, voice, and images in real time while maintaining contextual consistency is complex.

### Low-Latency Processing

Real-time responsiveness is critical for a seamless learning experience, but model inference can cause delays.

### Input Variability

Diverse accents, noisy audio, and facial expression differences can reduce input accuracy and system adaptability.

3

## SOLUTIONS

### Multimodal Fusion Engine

Implement asynchronous pipelines with shared context memory to unify inputs and generate accurate, coherent responses.

### Optimized Inference

Use OpenVINO to accelerate lightweight models on Intel NPU/GPU, reducing inference time and enabling real-time responsiveness.

### Robust Models

Integrate denoising, accent-aware speech recognition, and expression normalization for consistent user input handling.

# CoreMentis Methodology

AI-Powered Educational Learning System

## CoreMentis Hub

Integrated Learning Platforms  
OpenVINO Optimized

AI-Powered Learning Assistance  
Neural Network Integration  
OpenVINO Accelerated

Educational Methodology  
Adaptive Learning Framework  
Real-Time Analytics

Technical Implementation  
High-Performance Architecture  
OpenVINO Optimization

Development Approach  
Agile and User-Centric  
Continuous Integration

Natural Language Processing  
• Conversation Management  
• Context Awareness  
• Multi-turn Dialogues

Multimodal Input Processing  
• Speech Recognition  
• OCR Analysis  
• Computer Vision

Personalized Learning  
• User Profiling  
• Adaptive Responses  
• Progress Tracking

Engagement Analysis  
• Real-time Monitoring  
• Behavioral Analytics  
• Feedback Loop

System Architecture  
• Client-Server Model  
• RESTful API  
• Data Processing

API Integration  
• Model Selection  
• Performance Optimization  
• Fault-tolerance

Agile Methodology  
• Modular Design  
• Iterative Development  
• Continuous Integration

User-Centric Design  
• Responsive Interface  
• Accessibility  
• Inclusive UI

AI Models Integrated  
Whisper (Speech) | LLaMA (Language) | OpenVINO Runtime  
Hardware Accelerated Inference

OpenVINO Toolkit  
Intel's Deep Learning Deployment Optimization  
• Hardware Acceleration (CPU/GPU/APU)  
• Model Optimization and Quantization

Technology Stack  
Core Technologies and Frameworks

Backend  
• Python FastAPI  
• RESTful API Architecture  
• Agent Processing

AI/ML Stack  
• Whisper (Speech Recognition)  
• LLaMA (Language Understanding)  
• OpenCV (Computer Vision)

Frontend  
• React Native  
• Responsive Design  
• WebRTC Integration

OpenVINO Optimization Layer  
Intel's Deep Learning Acceleration Framework

Performance  
• Inference inference  
• CPU/GPU/APU support  
• Dynamic batching

Optimization  
• Model quantization  
• INT8 precision  
• Memory optimization

Deployment  
• Cross-platform  
• Edge deployment  
• Auto scaling

Data Management  
Secure and Optimized  
Privacy-First Approach

Educational Framework  
Pedagogical Excellence  
Collaborative Learning

API Development Pipeline  
Three-Tier Implementation Strategy

Simple API  
Basic Features  
Core Functionality

Optimized API  
Performance  
OpenVINO Integration

Full API  
Complex Suite  
of Features

### Development Flow

1. Prototype
  2. Optimize
  3. Scale
- Continuous Integration and Deployment

## CoreMentis Data Flow

Student Input --> Multimodal Processing --> AI Analysis (OpenVINO Accelerated) --> Personalized Response --> Learning