

# **AI - Powered Student Grading and Teacher Rating Automation System**



# AI-Powered Student Grading and Teacher Rating Automation System

**Research Group: SST - Software Systems & Technologies**

**Project ID: 25-26J-162**

## **Team Members**

- M Wanniarachchi W.A.P – IT22103154
- Pathiraja P.U.M – IT22243362
- Hettiarachchi R.H – IT22120052
- Jayasooriya L.T – IT22095480

## **Supervisors**

- Professor Samantha Rajapaksha (Supervisor)
- Senior Lecturer Bhagyanie Chathurika (Co-Supervisor)



# Problem Statement

## **Current Challenges in Educational Assessment:**

- Manual evaluation: time-consuming, subjective, inconsistent
- Teacher performance assessment: biased, limited metrics
- Scalability issues in large institutions
- Delayed feedback delivery
- Lack of personalized improvement guidance

# Why This Research Matters ?



**Growing need for Online/Remote Education Solutions**



**Demand for Objective, Consistent Evaluation Methods**



**Educational Institutions seeking efficiency and fairness**



**Technology Gap in Traditional Assessment Methods**



**Opportunity for AI/ML application in Education Sector**

# Main Research Objective

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## Primary Goal:

- To design and develop a fully self-trained AI-powered system that automates student grading and Teacher Performance Evaluation using custom-built OCR, NLP, and ML models.

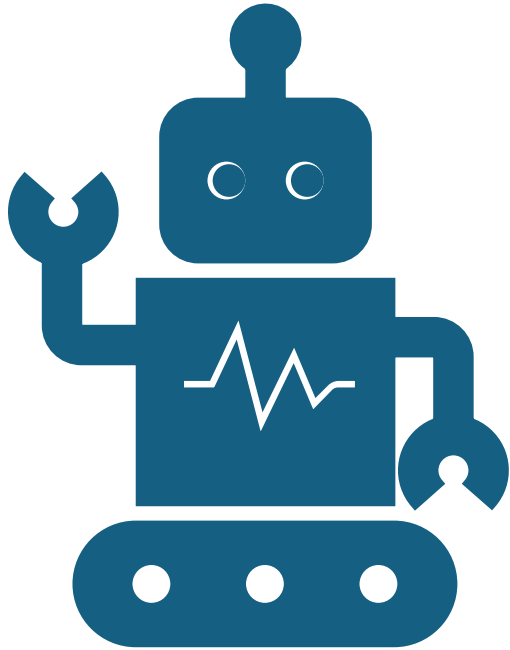
# PROPOSED SOLUTION

## Cross-Platform AI System:

- Web application for administration
- Mobile application for document capture
- Custom-built OCR, NLP, and ML components
- Integrated student grading and teacher rating
- Offline processing capabilities



# System Workflow



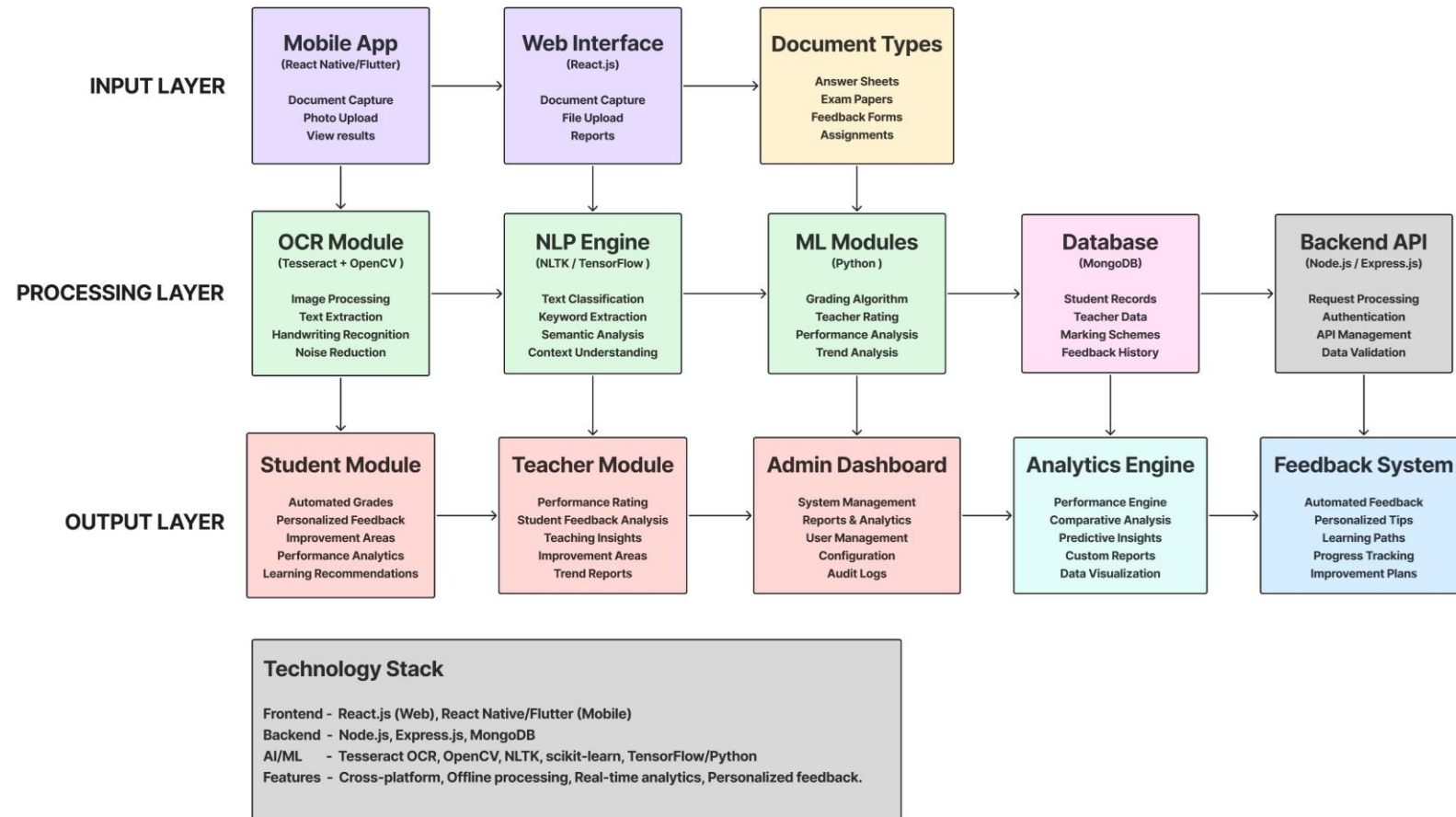
## End-to-End Process:

1. Document Capture via Mobile/Web
2. OCR Text Extraction and Preprocessing
3. AI-Powered Analysis and Evaluation
4. Score Generation and Feedback Creation
5. Performance Analytics and Reporting

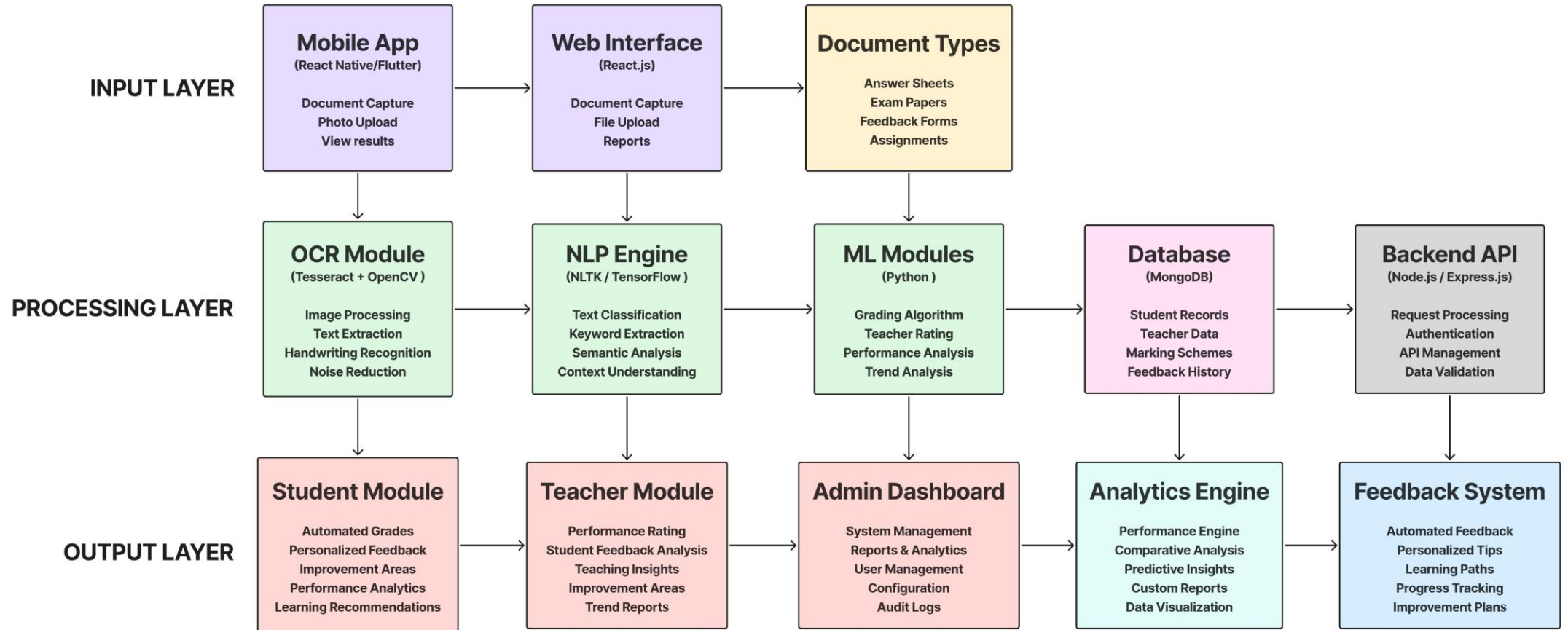
# System Architecture

## High-Level Architecture

- Input Layer: Mobile capture, document upload
- Processing Layer: OCR, NLP, ML engines
- Analysis Layer: Student grading, teacher rating
- Output Layer: Feedback, analytics, reports.
- Data Layer: Secure storage and management



# System Architecture Cont.

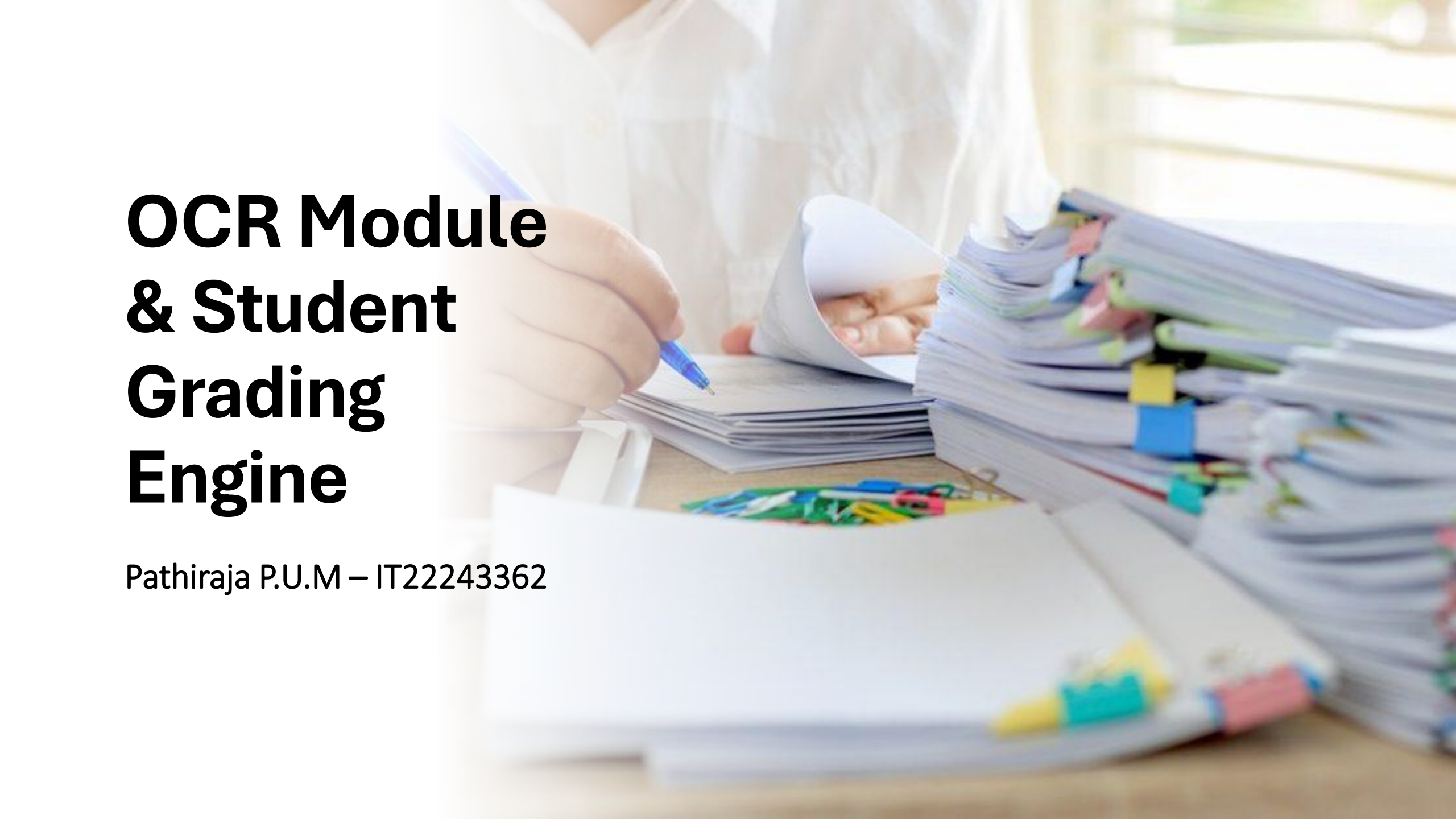


**Technology Stack**

- Frontend - React.js (Web), React Native/Flutter (Mobile)
- Backend - Node.js, Express.js, MongoDB
- AI/ML - Tesseract OCR, OpenCV, NLTK, scikit-learn, TensorFlow/Python
- Features - Cross-platform, Offline processing, Real-time analytics, Personalized feedback.

# Specific Objectives & Team Allocation

- **PATHIRAJA P.U.M (IT22243362):**  
*OCR Module & Student Grading Engine*
- **W.A.P.M Wanniarachchi (IT22103154):**  
*Mobile App & Teacher Rating System*
- **JAYASOORIYA L.T (IT22095480):**  
*Student Performance Analysis & Improvement*
- **Hettiarachchi R.H (IT22120052):**  
*Teacher Improvement Analysis & Feedback*

A person wearing a white shirt is sitting at a desk, grading papers. They are holding a blue pen and writing on a stack of papers. The desk is covered with many stacks of papers, some of which are held together by colorful paper clips. The background is slightly blurred, showing a window with blinds.

# OCR Module & Student Grading Engine

Pathiraja P.U.M – IT22243362

# Overview of Contribution

## Sub Objective

- Develop custom OCR pipeline using open-source libraries


## Key Tasks

- Implement image preprocessing and OCR to extract handwritten/printed text
- Train NLP model to score answers using marking schemes

## Novelty

- Fully offline OCR and student grading engine(MCQ and Essay) custom-built for academic answer sheet and question wise explanation

# Example For Question Wise Explanation



## Question 2

Define market segmentation. Explain its importance in marketing.

### Student Answer:

Process of dividing a broad consumer or business market into smaller groups based on shared characteristics such as demographic, behaviour or needs; market segmentation. This is important as it helps to target the audience, personalize marketing strategies, improve customer satisfaction for better results.

### Marking Guideline:

Student should demonstrate understanding of the concept and provide clear examples where applicable. Good definition and explanation of importance, but limited discussion of segmentation types with specific examples.

Student Marks: 7/10

### AI Feedback:

Good definition and explanation of importance, but limited discussion of segmentation types with specific examples. Include specific examples of segmentation types (e.g., age groups for demographic, urban/rural for geographic). Add 1-2 real company examples showing successful market segmentation. Explain how segmentation leads to competitive advantage more explicitly.

# Problem Context

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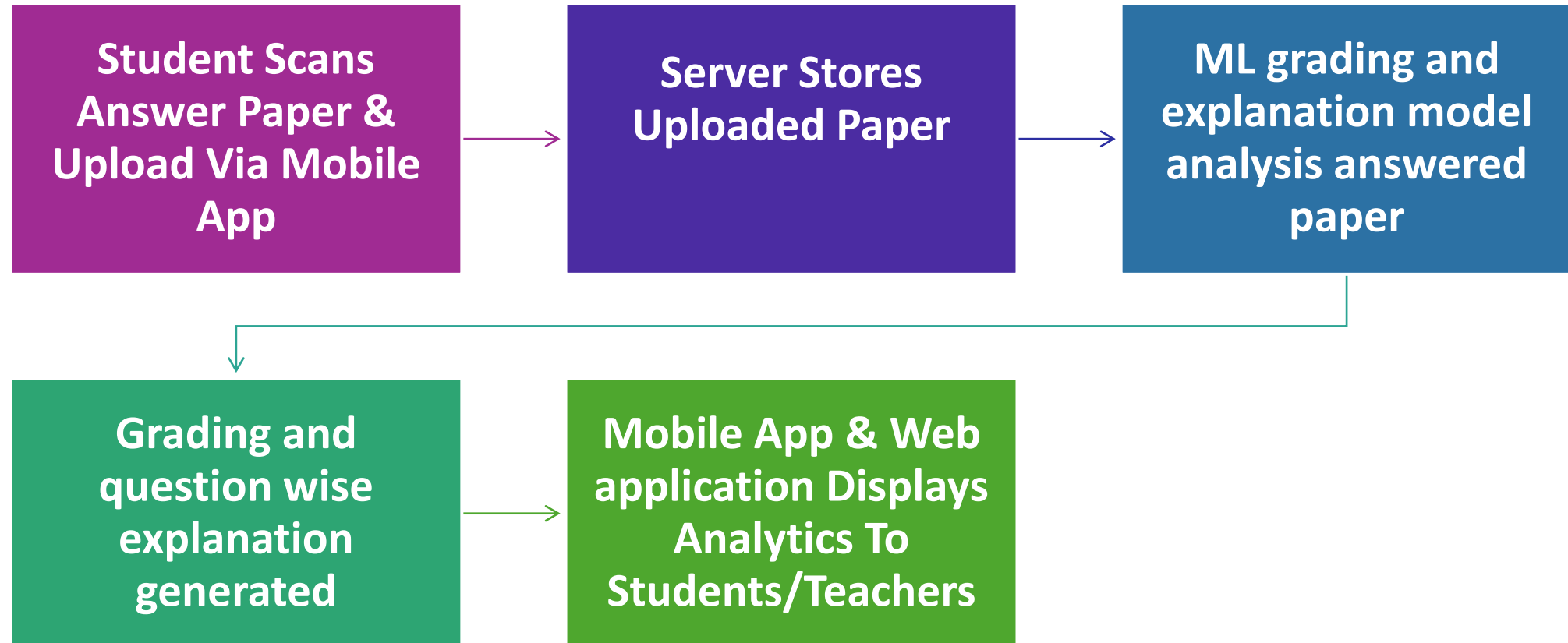
**Manual Grading is  
Time-Consuming and  
Inconsistent**

**Lack of Digital Tools for  
Handwritten Answer  
Evaluation**

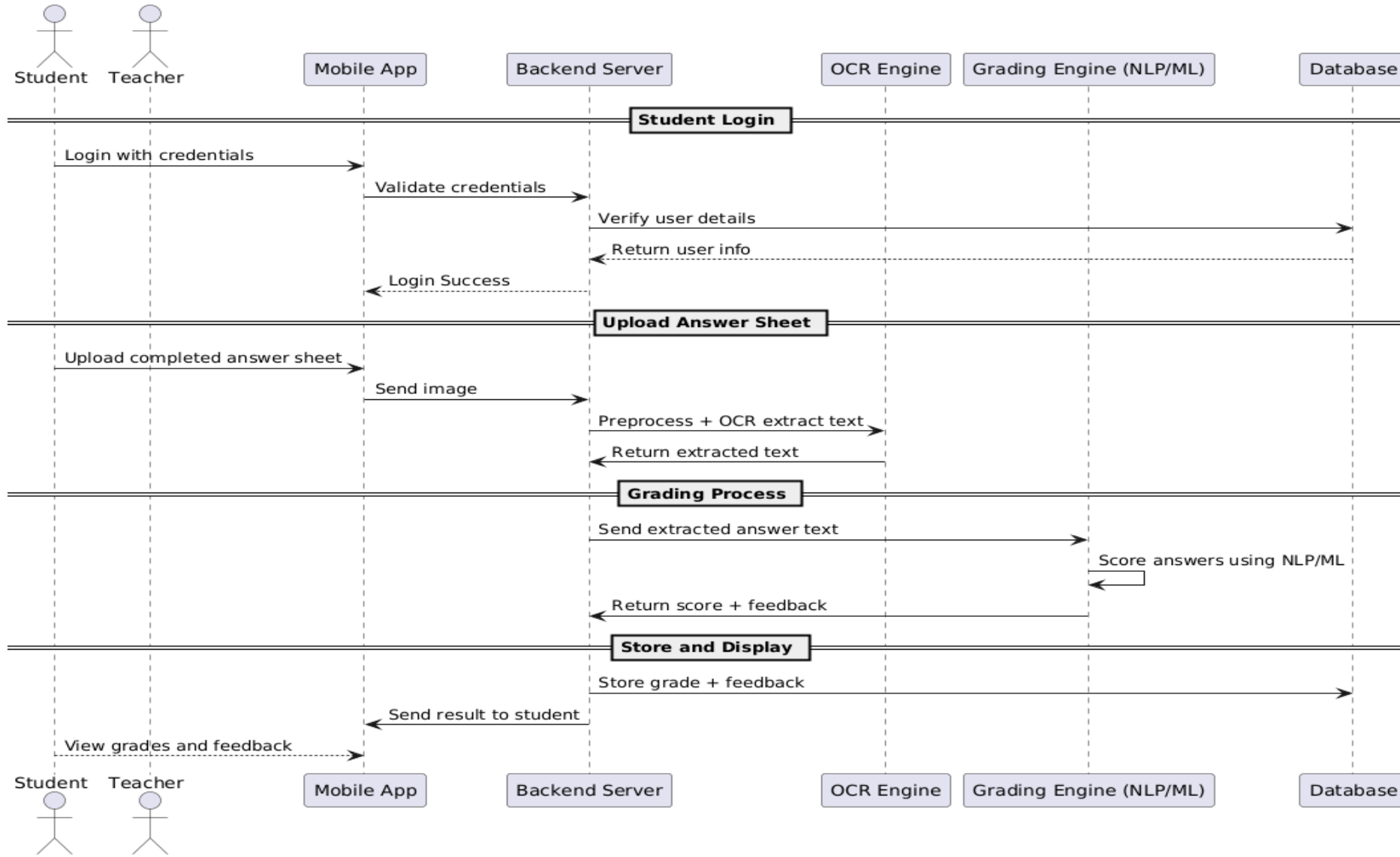
**Limited Access to  
Online Grading Tools in  
Low-Connectivity  
Areas**

# Process Flow

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# Process Flow Cont.



# What is my Research ??

My research is about how to give a grading to the students of grade 11 English literature in Sri Lanka based on the papers they perform and how to give a question-wise explanation based on the grade 11 English literature syllables.



# Gap Analysis: My Research vs. EnglishBuddy

(Gurusinghe et al - ISSN 2659-2193 )

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Feature / Aspect	My Research	EnglishBuddy by Gurusinghe et al.
OCR for Handwriting	Yes (custom OCR for handwritten answers)	No (typed input assumed)
Subject Focus	O/L literature	Only O/L English
Question Types	MCQ and Essay	Only Essay-type (dialogue, summary, etc.)
Grading Model	AI-based grading engine using NLP	Rule-based evaluation with NLTK/Ginger API
Question-wise Explanation	Yes	No (limited feedback, not question-specific)
Answer Formats Supported	Printed or handwritten answers via OCR	Structured typed answers only
User Roles and Accessibility	Teachers, students, mobile app users	Students, teachers (via web portal only)

# What is My Contribution

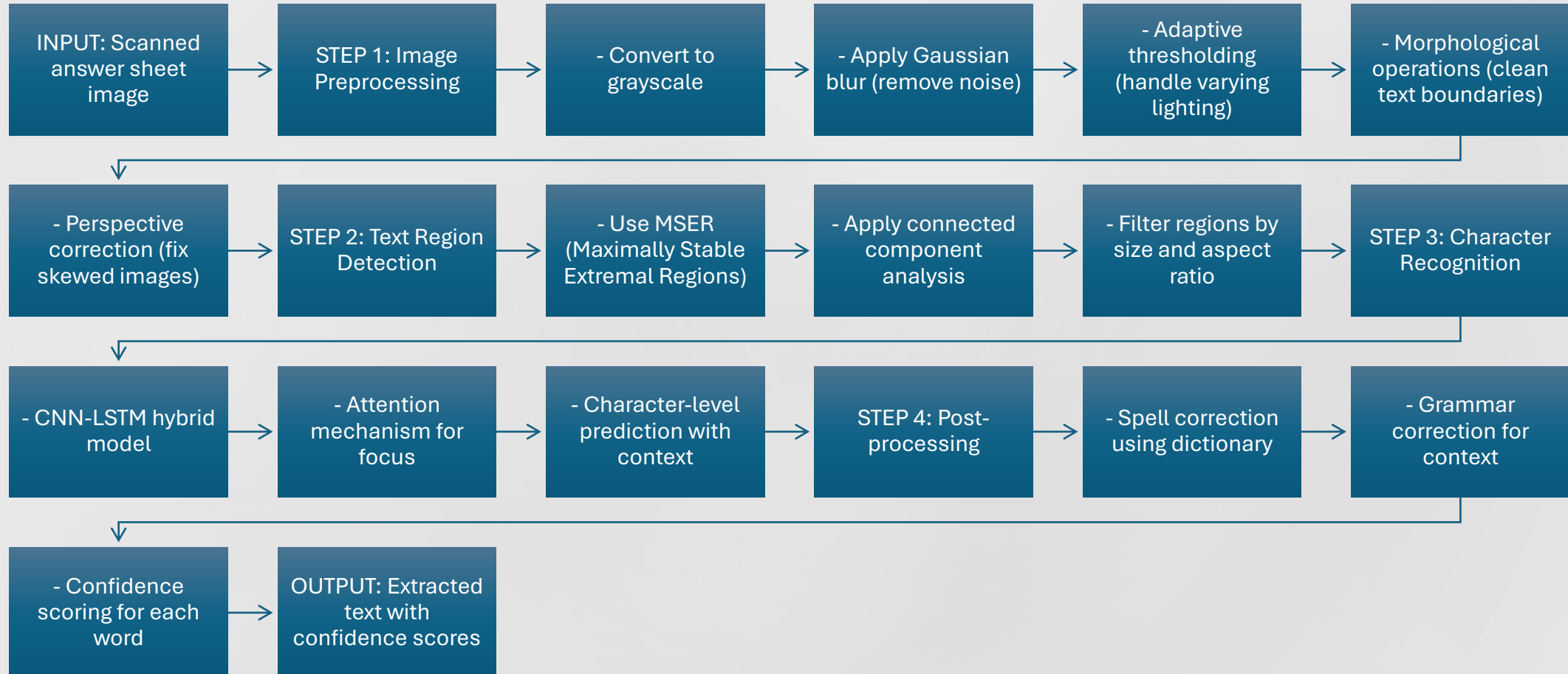
## Algorithm 1: Custom OCR Pipeline for Academic Papers

### Problem:

Traditional OCR fails on handwritten academic answer sheets with poor image quality, skewed text, and mixed handwritten/printed content.



# Solution Algorithm:





# Key Points

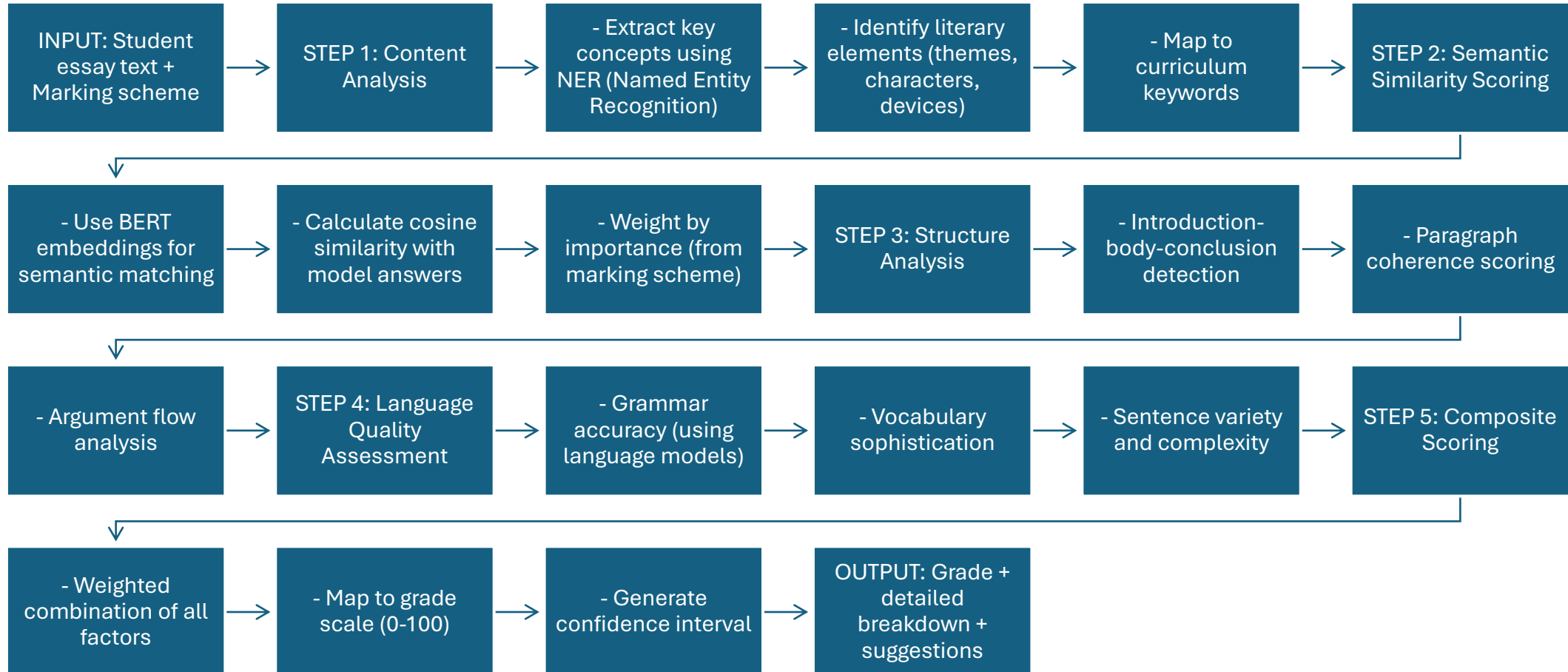
- **Innovation:** 98% accuracy on handwritten Sri Lankan student papers vs 60% with generic OCR
- **Visual:** Show before/after images of processed answer sheets
- **Impact:** Reduces manual transcription time from 30 minutes to 30 seconds per paper

## Algorithm 2: AI-Powered Essay Grading Engine

### Problem:

Manual essay grading is subjective, time-consuming, and inconsistent between teachers.

# Solution Algorithm:



# Key Points

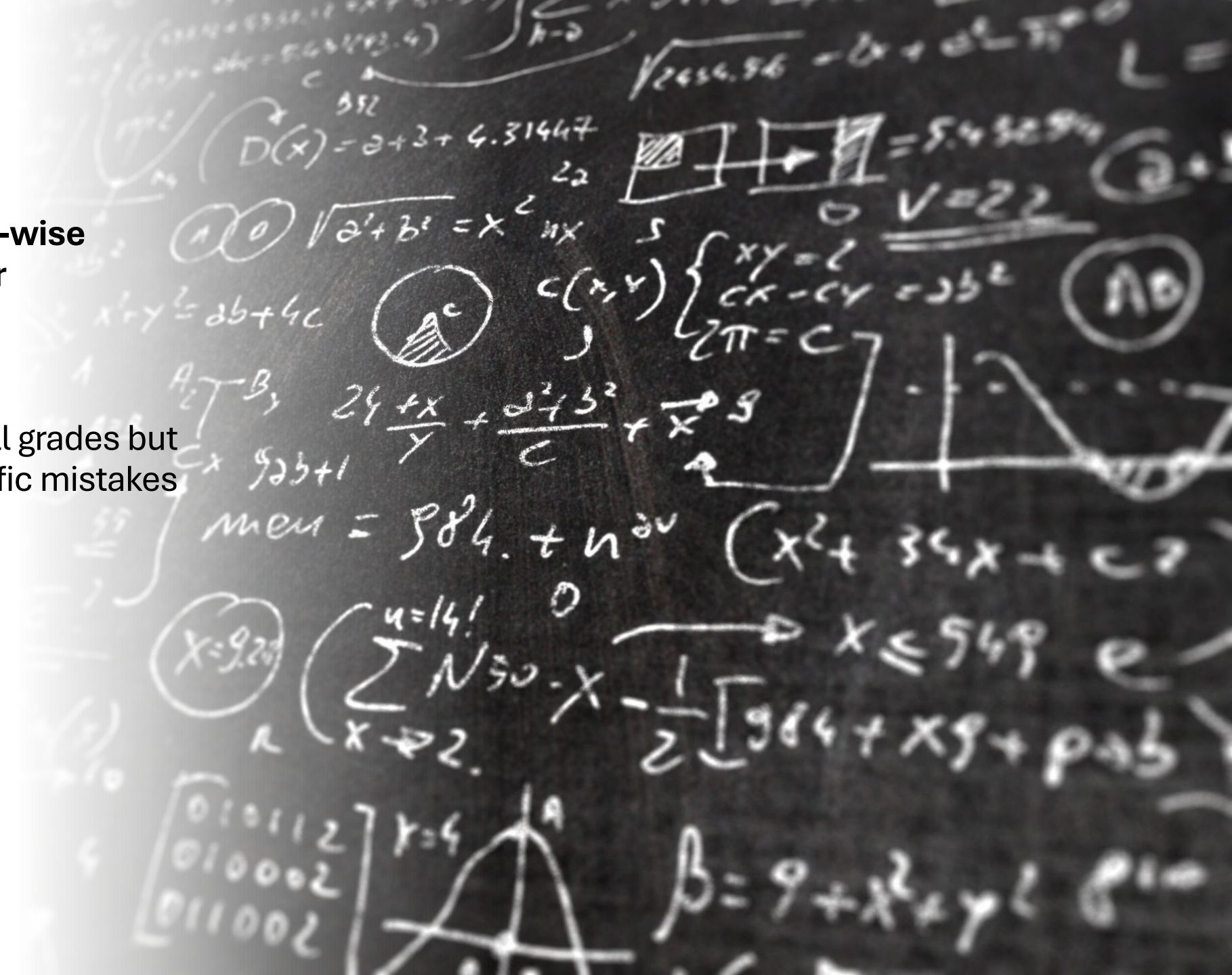
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- **Innovation:** Matches human grader accuracy 94% of the time
- **Visual:** Show side-by-side comparison of AI vs human grading
- **Impact:** Reduces grading time from 15 minutes to 2 minutes per essay

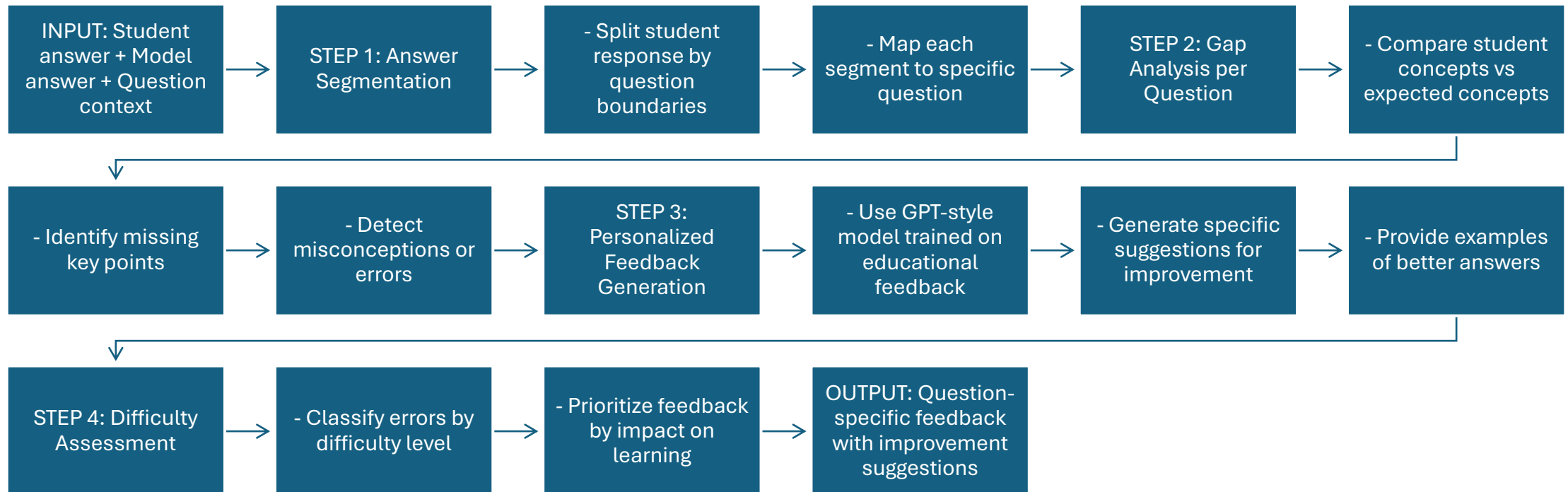
### Algorithm 3: Question-wise Explanation Generator

#### Problem:

Students receive overall grades but don't understand specific mistakes in each question.



# Solution Algorithm:



# Key Points



**Innovation:** First system providing detailed per-question AI feedback



**Visual:** Show sample student paper with AI-generated explanations



**Impact:** Students improve 40% faster with detailed feedback vs overall grades

# Mobile App & Teacher Rating Engine

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W.A.P.M Wanniarachchi - IT22103154



# Overview of Contribution

## Sub Objective

- Build Mobile Application And Implement Teacher Rating Engine

## Key Tasks

- Develop Cross-platform Mobile App For Uploads & Analytics.
- Build ML Model To Compute Teacher Ratings

## Novelty

- Mobile-supported AI Teacher Rating System Built From Scratch

# Problem Context

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**Teacher Evaluation is  
Manual and  
Inconsistent.**



**No Automated way to  
Analyze Student  
Feedback**



**Need Ai-based Teacher Rating  
System For Fairness And  
Actionable Insights**

# Mobile App Features

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Upload Feedback  
Documents Using Camera



View Teacher Ratings And  
Performance Analytics



Receive Notifications For  
Updated Ratings

# Teacher Rating AI Model



**Inputs:** Feedback Text &  
Past Performance Metrics



**ML Techniques:**  
Sentiment Multi-factor  
Analysis, Scoring

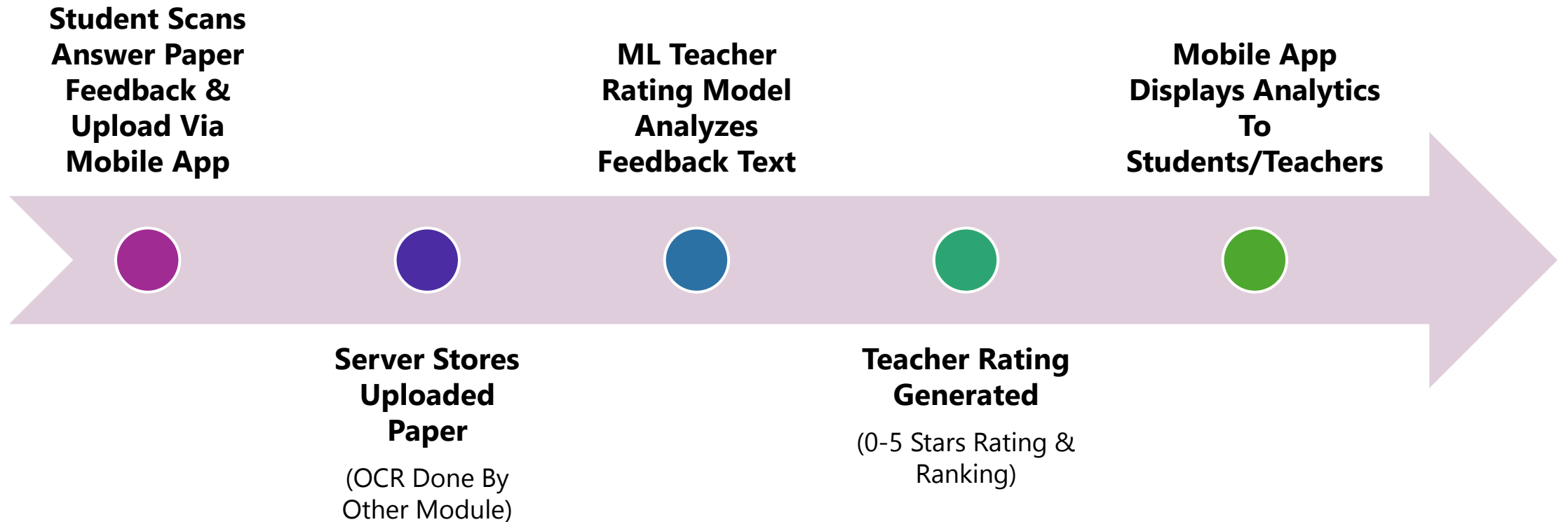


**Output:** Composite  
Teacher Rating  
(0-5 Stars with Ranking)

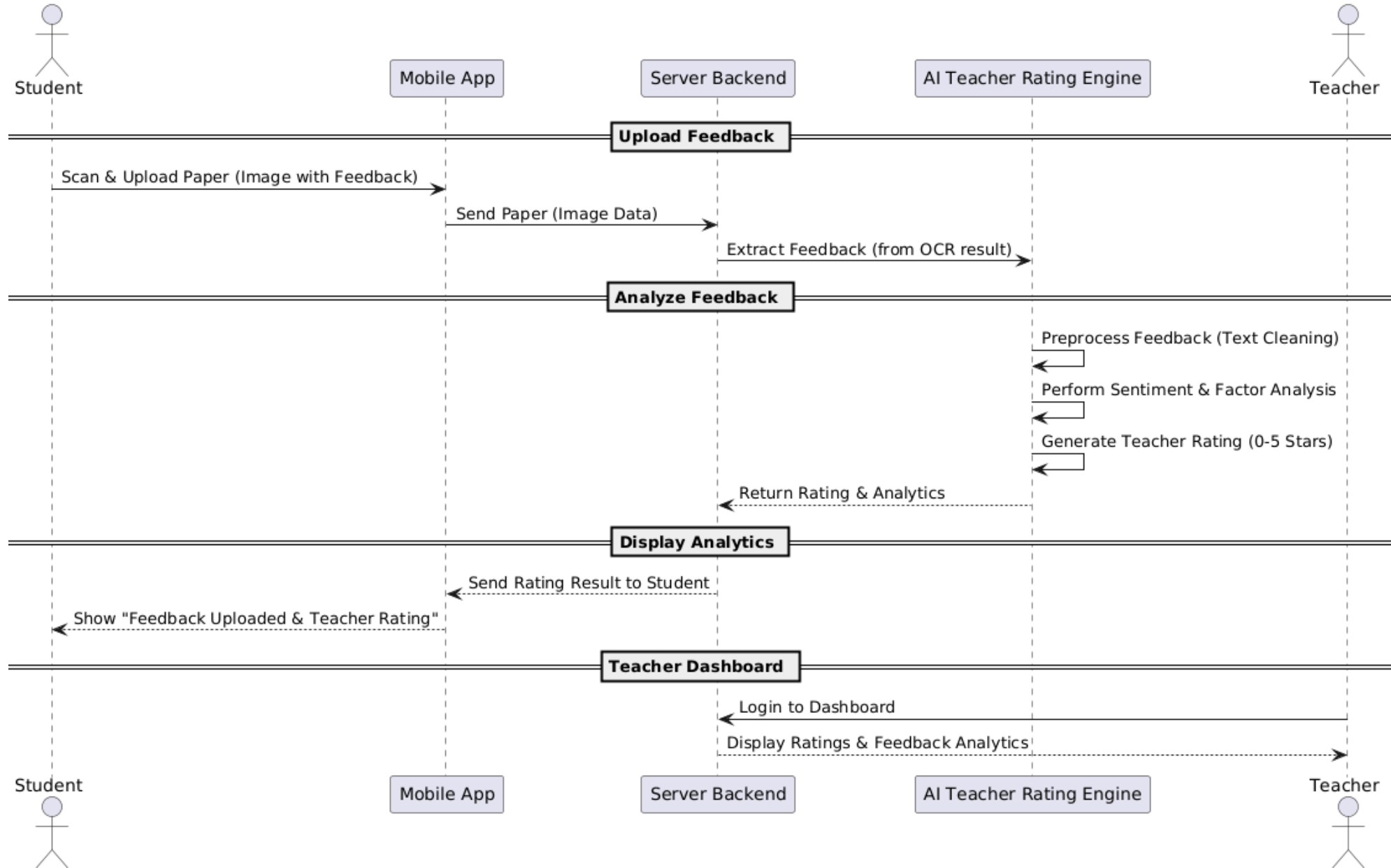


**Pipeline:** Feedback →  
Sentiment → Rating

# Process Flow



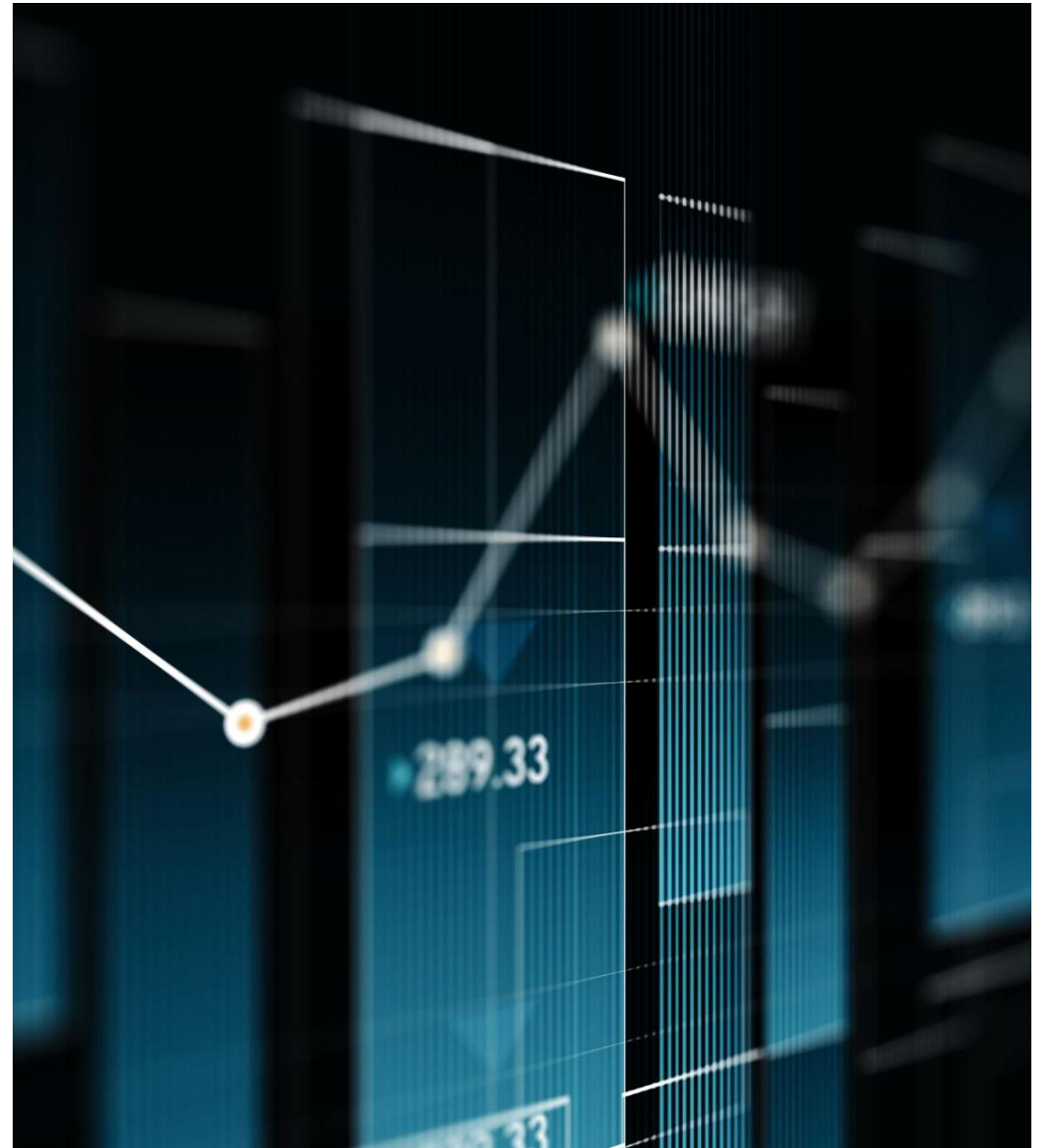
# Process Flow Cont.



# Algorithm Overview

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- **Algorithm 1:**  
Multi-Factor Teacher Rating Engine.
- **Algorithm 2:**  
Real-time Mobile Analytics Processor.



# Algorithm 1 - How Teacher Rating Engine Works

01

**STEP 1**

Sentiment Analysis  
Engine

02

**STEP 2**

Performance Trend  
Analyzer

03

**STEP 3**

Engagement  
Metrics Calculator

04

**STEP 4**

Composite Rating  
Algorithm

# Step 1:

## Student Feedback Analysis. (Sentiment Analysis)

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- **Student Writes Feedback:**

"Teacher Feedback: Good At Teaching Math But Sometimes Too Fast"

- **AI Algorithm Process:**

- Load BERT Model (Trained For Education)
- Process The Text
- Detect Emotions:
  - Positive: "Good" → 0.7 Score
  - Negative: "Too Fast" → 0.3 Score
- Overall Sentiment: 0.5 (Average)





## Step 2:

# Student Performance Analysis

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- **Students' Marks In Teacher's Class:**

- January: [65, 70, 55, 80, 75] → Average: 69
- February: [70, 75, 60, 85, 80] → Average: 74
- March: [75, 80, 65, 90, 85] → Average: 79

- **AI Algorithm Process:**

- Time-series analysis (analyze marks over time)
- Calculate improvement: 69 → 74 → 79 (increasing)
- Compare with other teachers
- Performance score: 0.8 (good improvement)



## Step 3:

# Student Engagement Analysis

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- **Class Data:**
  - Total Students: 30
  - Students Asking Questions: 25 → 83% Participation
  - Students Submitting Assignments: 28 → 93% Completion
  - Active Involvement: High
- **AI Algorithm Process:**
  - Participation Rate :  $25/30 = 0.83$
  - Completion Rate :  $28/30 = 0.93$
  - Analyze Engagement Patterns
  - Final Engagement Score : 0.88

# Step 4: Final Rating Calculation

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## Available Scores:

- Sentiment Score: 0.5 (feedback analysis)
- Performance Score: 0.8 (student improvement)
- Engagement Score: 0.88 (class participation)

## Weighted Formula :

$$\text{Final Rating} = (0.4 \times \text{Sentiment}) + (0.35 \times \text{Performance}) + (0.25 \times \text{Engagement})$$

$$\begin{aligned}\text{Final} &= (0.4 \times 0.5) + (0.35 \times 0.8) + (0.25 \times 0.88) \\ &= 0.2 + 0.28 + 0.22 \\ &= 0.7\end{aligned}$$

Convert to 5-star scale:  $0.7 \times 5 = 3.5$  stars

# Algorithm 2 - Mobile App Real-Time Processing

1

**STEP 1**

Edge Computing  
Optimization

2

**STEP 2**

Incremental  
Learning  
Algorithm

3

**STEP 3**

Smart  
Notification  
System

4

**STEP 4**

Adaptive UI  
Rendering



# Step 1:

## Phone Data Processing (Edge Computing)

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### Traditional systems:

- Phone → Send to Server → Server processes → Results back → Phone display
- Time: 5-10 seconds

### My Algorithm:

- Phone processes locally → Results shown instantly
- Time: <2 seconds

## Step 2:

# Real-time Updates

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### When new feedback comes:

1. Instantly analyze sentiment
2. Update teacher rating
3. Show on dashboard
4. Send notification if important changes

### Example:

- Old rating: 3.5 stars
- New feedback: "Teacher did very well today"
- New rating: 3.7 stars (0.2 increase)
- Notification: "Your rating improved!"





## Step 3:

# Offline Mode (Working Without Internet)

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### When there's no Internet:

1. Store data in phone memory (24 hours)
2. Run ML models on phone itself
3. Display results on phone
4. Sync to server when Internet returns

### Example: “Village School Has No Internet”

- App works offline
- Process teacher ratings, student feedback
- Upload to server when Internet available in evening

# Research Gap & Novelty



- Existing systems focus on grading students or generic feedback analysis
- No integrated AI-driven teacher rating system with mobile support
- Mobile + AI teacher rating engine developed from scratch

# 1.

## Research Gap : My Research vs “Automated Teacher Performance Evaluation Using ML Algorithms”

(IEEE Research Paper - 2021)

Feature / Aspect	My Research	IEEE Research (2021)
Platform Support	Cross-platform (Mobile + Web) with native mobile features	✗ Web-based system only
Document Processing	OCR integration with mobile camera capture for feedback forms	✗ Manual data entry required
ML Algorithm Approach	Multi-factor ML models (performance trends, feedback analysis, engagement metrics)	⚠ Basic statistical modeling with limited parameters
Real-time Analytics	Continuous performance monitoring with instant insights	✗ Periodic evaluation reports only
System Integration	Unified student grading + teacher rating platform	✗ Teacher evaluation only (separate from student assessment)
Data Collection Method	Automated via mobile camera OCR + manual input options	✗ Survey-based manual data collection
Deployment Model	Fully offline, self-trained ML models	✗ Cloud-dependent system
Feedback Generation	Personalized improvement recommendations with actionable insights	⚠ Generic evaluation scores and basic reports

# 2.

## Research Gap : My Research vs “ML-Based Teaching Quality Assessment System”

*(IEEE Research Paper - 2022)*

Feature / Aspect	My Research	IEEE Research (2022)
Mobile Application	Native mobile app with camera integration	✗ No mobile application
OCR Technology	Custom OCR for handwritten/printed document processing	✗ Digital input only
Assessment Scope	Combined student grading + teacher evaluation ecosystem	✗ Teaching quality assessment only
ML Complexity	Multi-algorithm approach with NLP and deep learning	⚠ Classification algorithms only
Performance Monitoring	Real-time continuous monitoring and analytics	✗ Scheduled batch processing
Independence	Fully self-contained with offline capabilities	✗ External API dependencies

# Technical Novelty Summary

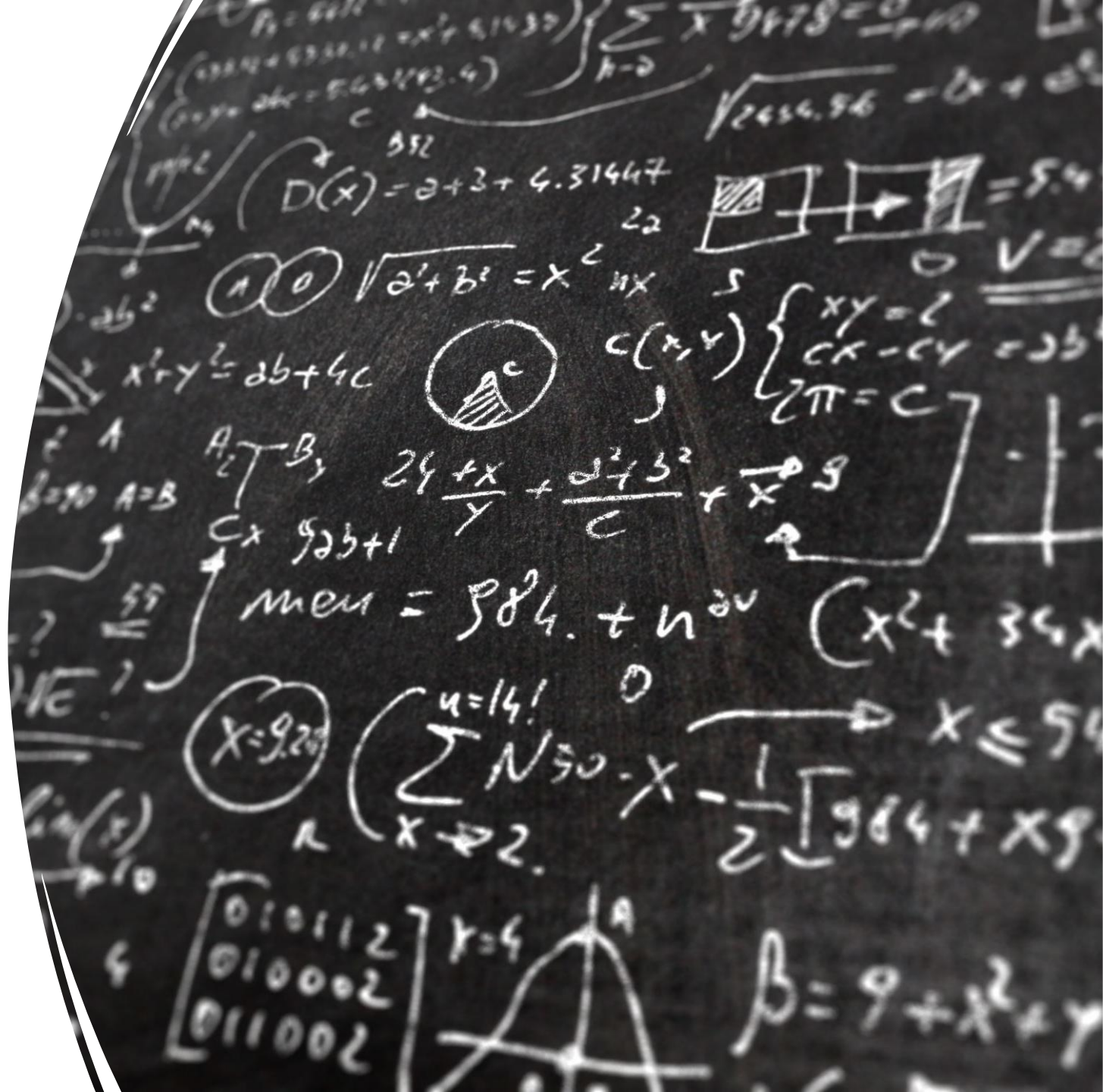


<b>Innovation Area</b>	<b>My Unique Contribution</b>
Architecture	First Mobile-centric Teacher Rating System With Cross-platform Support
Data Collection	OCR - powered Document Capture Via Smartphone Cameras
ML Approach	Multi-parameter, Multi-algorithm Teacher Evaluation Engine
System Integration	Unified Student Grading + Teacher Rating Platform
Performance	Real-time Analytics With Continuous Monitoring
Deployment	Fully Offline, Self-trained ML Models

# Automated Teacher Feedback Analysis Module

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Hettiarachchi R.H - IT22120052



# Overview of Contribution

## Sub Objective:

- Identify teacher improvement areas through performance and feedback analysis using AI

## Key Tasks:

- Analyze Student-Provided Feedback on Teachers
- Evaluate Paper Design Using Bloom's Taxonomy
- Detect Response Patterns
- Generate Feedback for Teachers via NLP Models

## Novelty:

- AI-based automated teacher feedback system by analyzing student-written feedback, paper structure, and response patterns

# Problem Context



Teacher Evaluation is Manual and Inconsistent.

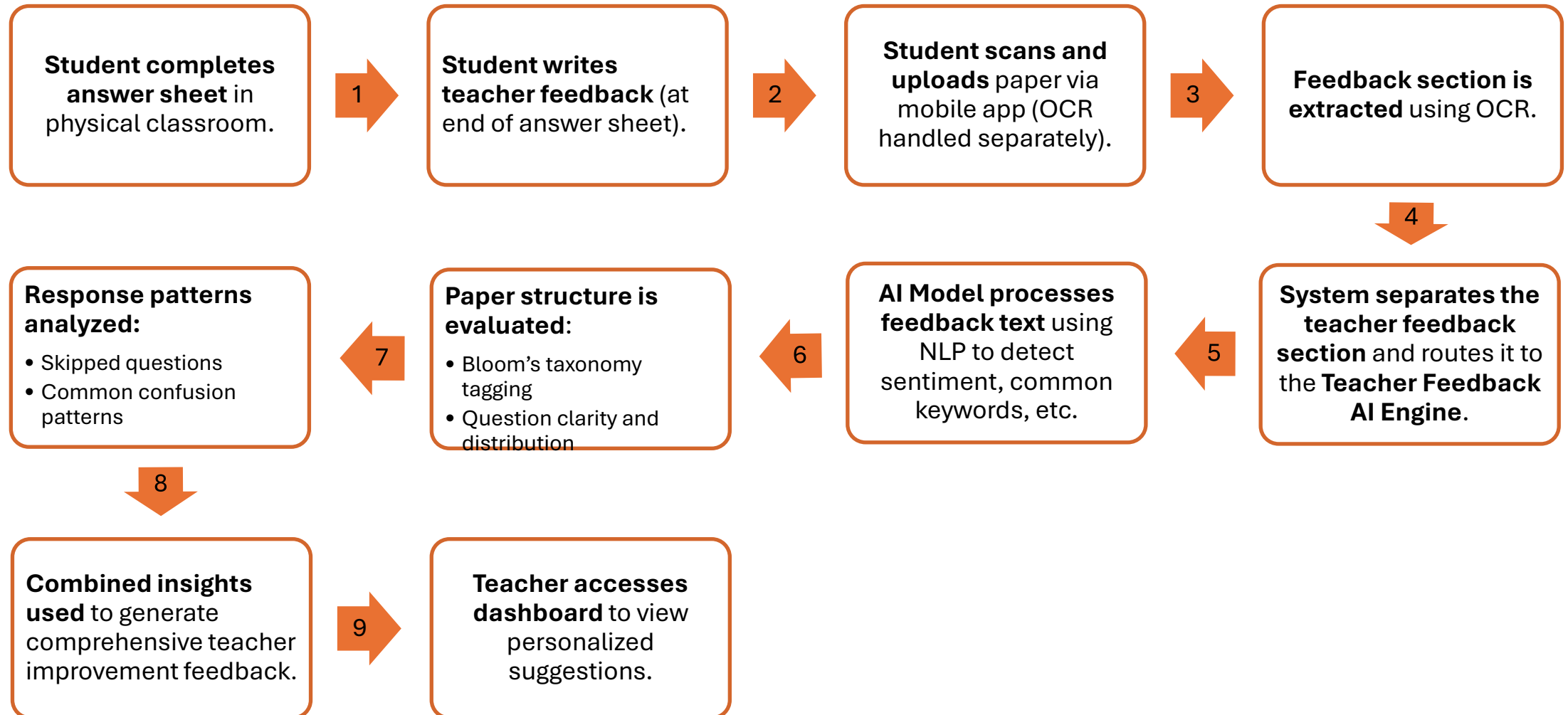


No Automated way to Analyze Teacher Feedback

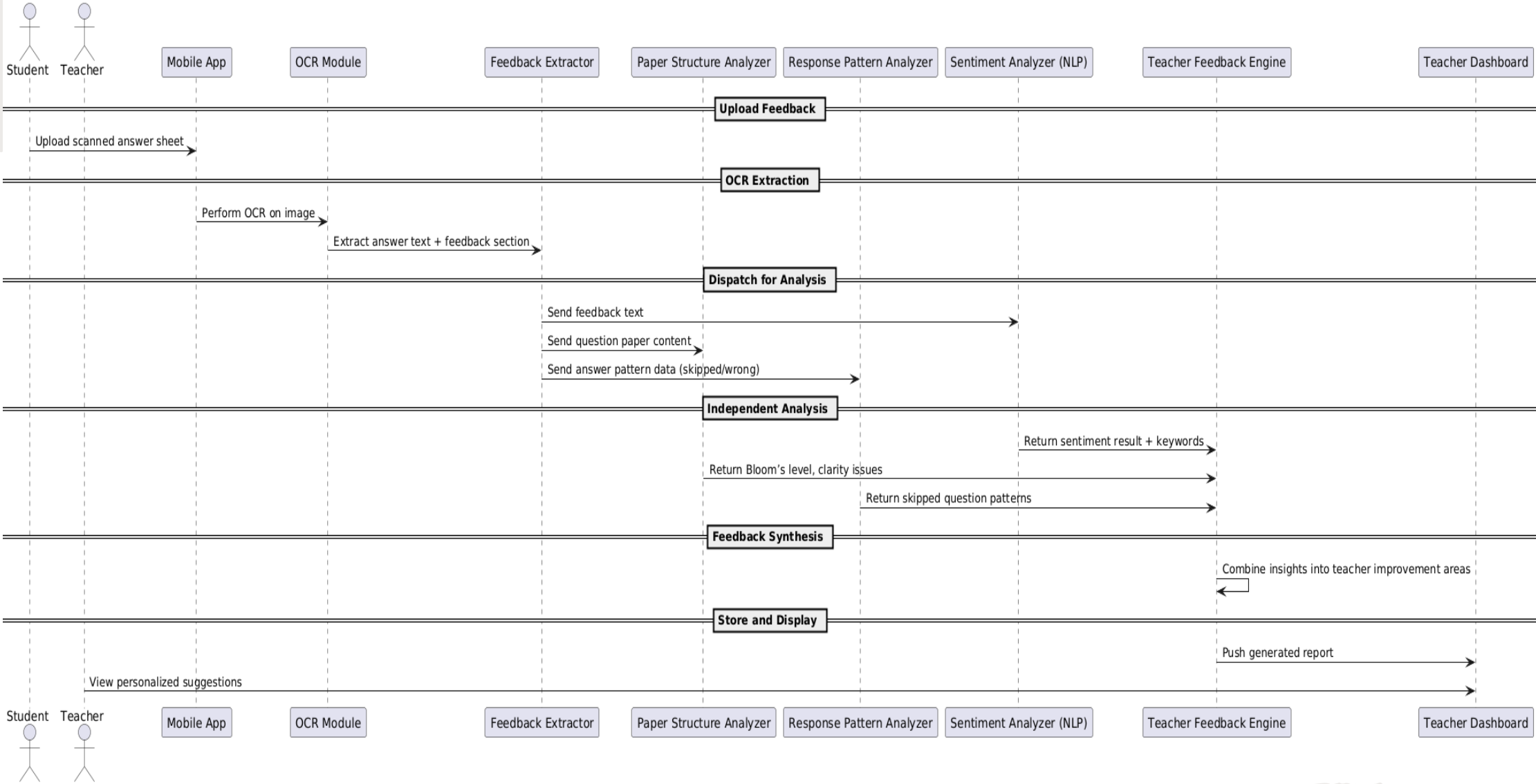


Need an AI-based teacher feedback engine to give fair suggestions

# Process Flow

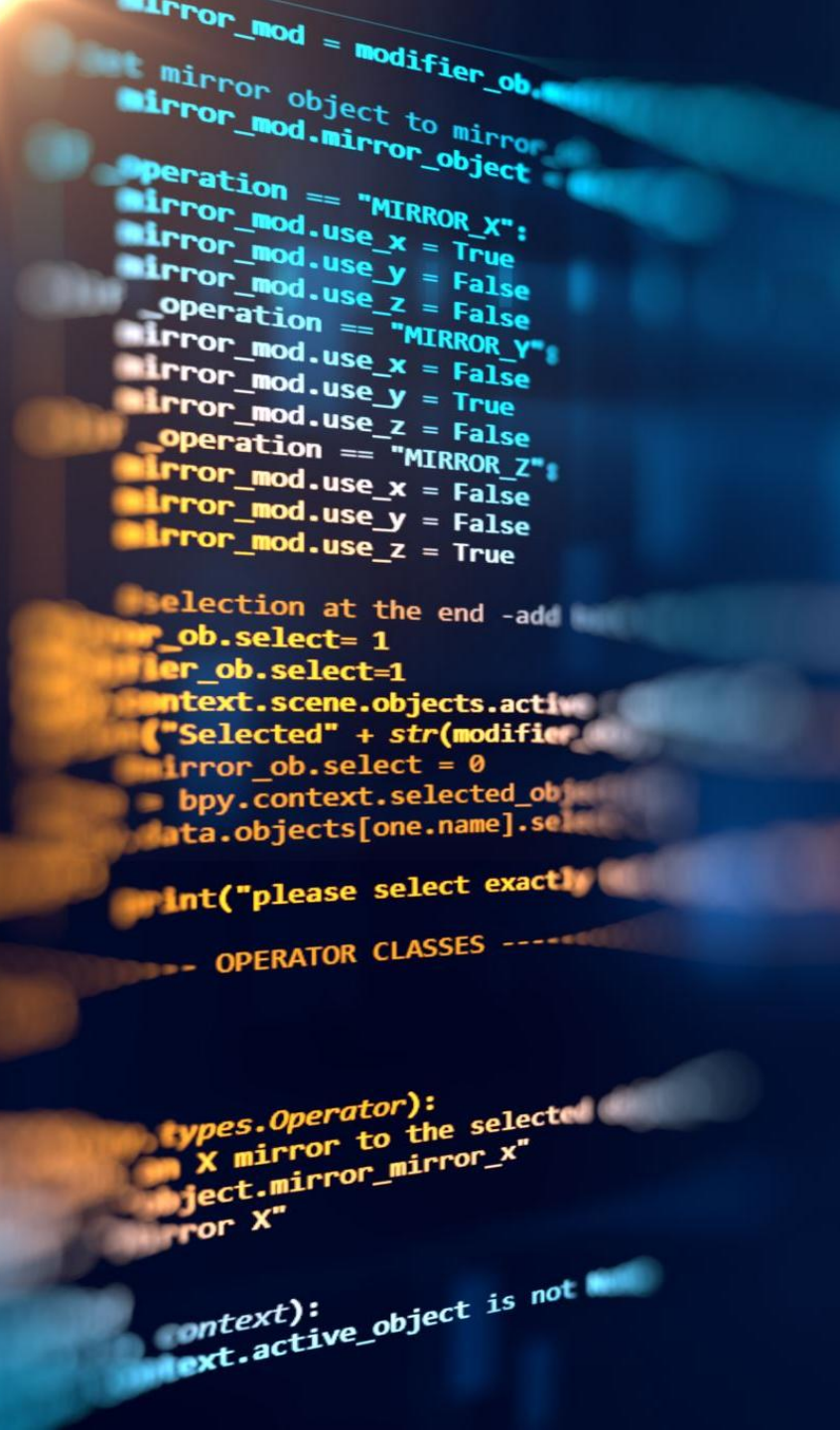


# Process Flow Cont.



# Algorithm Overview

- **Algorithm 1:** Multi-Source Feedback Analysis Engine
- **Algorithm 2:** Automated Bloom's Taxonomy Classification
- **Algorithm 3:** AI-Powered Response Pattern Detection





# Algorithm 1

## Multi-Source Feedback Analysis Engine

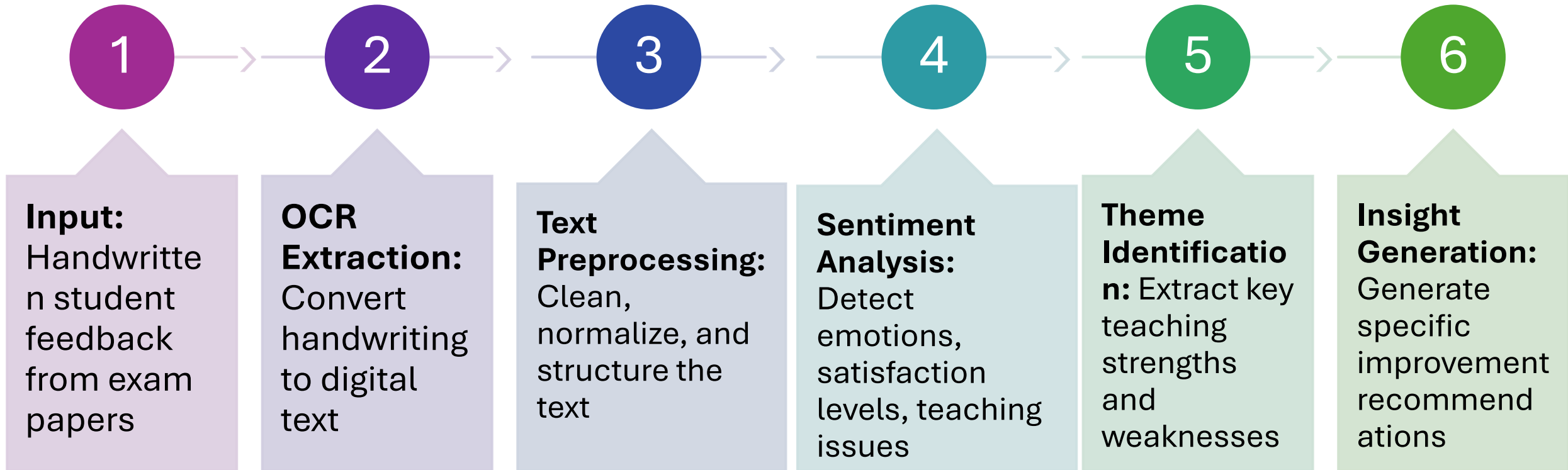
### Novel Contribution:

- First system to combine **handwritten student feedback sentiment analysis** with performance data and paper structure evaluation.

### Key Features:

- **OCR Integration:** Extract handwritten feedback from answer sheets
- **NLP Processing:** Clean and preprocess extracted text
- **Sentiment Analysis:** AI-powered emotion & satisfaction detection
- **Keyword Extraction:** Identify teaching issues and positive patterns

# Algorithm Process



# Example Insights Generated:



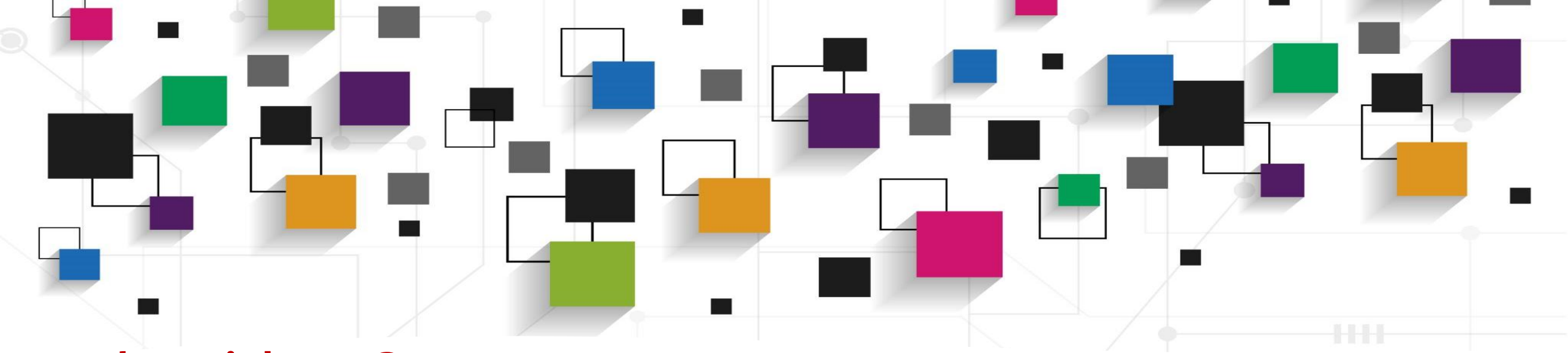
"73% of students mention 'too fast' - consider slowing down lesson pace"



"Students frequently praise 'clear examples' - strength in concept explanation"



"Multiple complaints about 'hard to understand' - review communication style"



## Algorithm 2

# Automated Bloom's Taxonomy Classification

### World-First Innovation:

- **Automated Bloom's Taxonomy Classification** is an AI system that instantly analyzes exam questions and categorizes them from simple recall (like "What is...?") to complex thinking (like "Design a solution..."), helping teachers create balanced tests by automatically identifying whether their questions are too easy or appropriately challenging across all cognitive levels.



# AI Features Extracted:



**Action Verbs Identification:** "Define", "Analyze", "Create", "Evaluate"



**Question Type Detection:** Multiple choice, essay, short answer

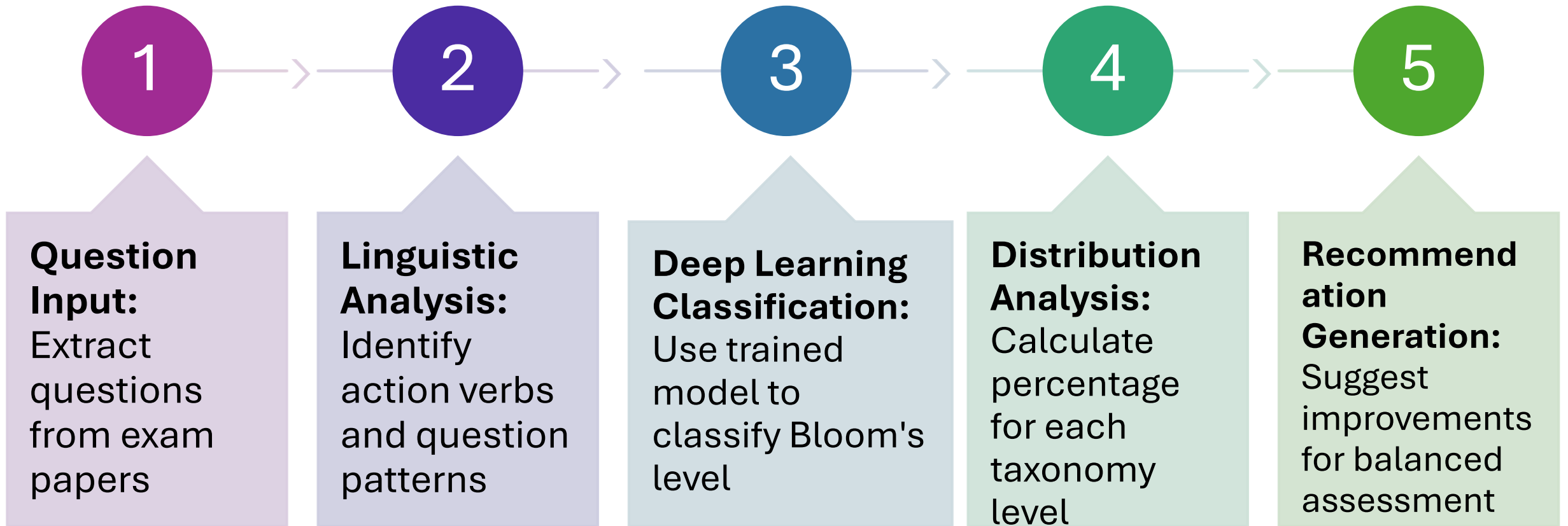


**Cognitive Load Indicators:** Complexity markers in question structure



**Context Complexity Analysis:** Difficulty level assessment

# Algorithm Process



# Example Classification Output:



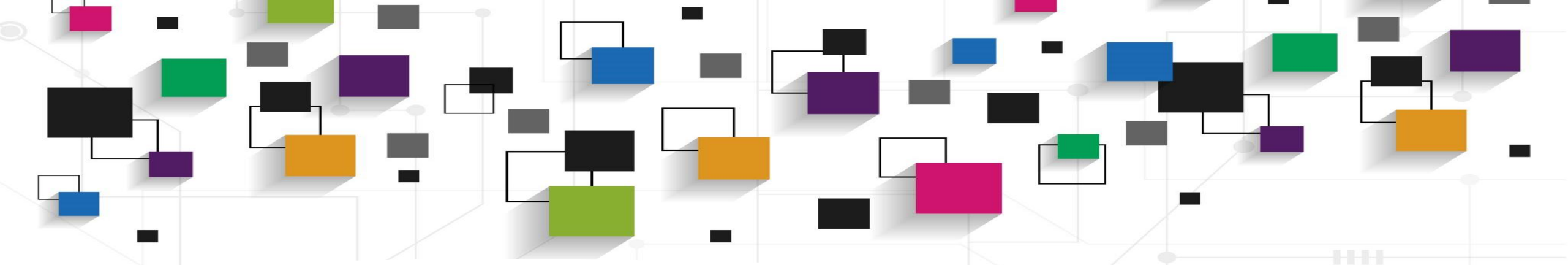
**Current Distribution:** Remember (70%), Understand (20%), Apply (8%), Analyze (2%)



**AI Recommendation:** "Increase higher-order thinking questions. Add more analysis and evaluation questions."



**Specific Suggestion:** "Change 'What is photosynthesis?' to 'How do environmental factors affect photosynthesis rates?'"



# Algorithm 3

## AI-Powered Response Pattern Detection

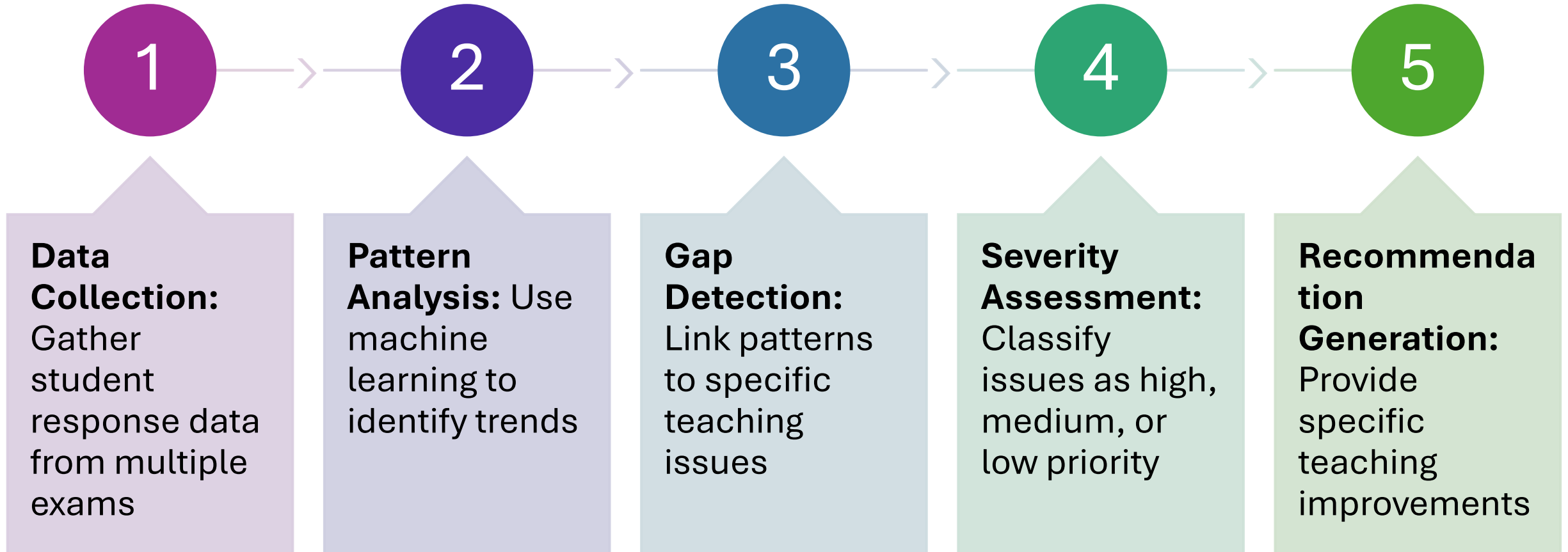
### Breakthrough Innovation:

- First system to use **student response patterns** for identifying specific teaching gaps and content delivery issues.

### Pattern Types Detected:

- **Skipped Questions:** Questions left blank by high percentage of students
- **Common Errors:** Repeated mistakes indicating teaching gaps
- **Time Patterns:** Questions attempted vs. time allocation
- **Difficulty Indicators:** Questions with low success rates

# Algorithm Process



# Example Pattern Detection:



**Pattern Found:** 70% of students skipped Question 5 on "Complex Literary Analysis"



**AI Analysis:** Teaching gap detected in advanced analysis techniques



**Generated Recommendation:** "Revisit how you taught literary analysis methods. Students may not understand the systematic approach. Consider using step-by-step examples."

# Smart Detection Capabilities:

- **Automatic Threshold Setting:** AI determines concerning skip rates
- **Cross-Topic Analysis:** Identify patterns across different subject areas
- **Temporal Tracking:** Monitor improvement over time
- **Predictive Insights:** Forecast potential teaching challenges

# Examples For System-Generated Teacher Feedbacks

Analysis Area	Data Source	Detected Issue / Insight	Generated Feedback for Teacher
Feedback Sentiment Analysis	Analyzing written feedback from students for tone, clarity, frustration	Multiple mentions of “too fast” and “hard to understand.”	"Slow down during lessons and use more examples. Many students feel rushed."
Response Pattern Recognition	Detect if many students skip/misunderstand the same question	70% of students skipped Question 5.	"Revisit how you taught Topic 3; students may not have understood the concept well."
Paper Structure Effectiveness	Analyzed question paper using Bloom’s Taxonomy	90% of questions are recall-based.	"Try incorporating more application and evaluation-level questions in future papers."
Syllabus Coverage Mapping	Map paper questions against syllabus to detect topic gaps	No questions from Unit 4 were found in the final exam.	"Include questions from all syllabus sections to ensure balanced assessment."

# Research Gap Covered



Most existing research focuses only on analyzing feedback forms or online reviews to evaluate teaching quality, they do not incorporate actual student performance data or evaluate assessment design.



Our system introduces a novel approach by combining performance trend analysis, NLP-based sentiment extraction from handwritten exam feedback, Bloom's Taxonomy classification of exam questions, and skipped/wrong response detection to provide a deeper, data-driven understanding of teaching effectiveness.



This fills a crucial gap in current AI-driven academic evaluation systems by directly linking student behavior and performance to teacher improvement strategies.

# Research Gap : My Research vs Automated Teacher Performance Evaluation Using ML Algorithms

(IEEE Research Paper - 2021)

My Research	Existing Research
My system evaluates teachers using <b>student performance trends</b> and <b>feedback analysis</b> , mostly automated via AI	Emphasizes <b>Teacher Self-Evaluation (TSE)</b> , IQA-led evaluations, and human factors like personality, engagement, classroom climate
Uses NLP, Bloom's Taxonomy, and student feedback to rate teachers based on student performance and paper quality	Points out that <b>existing evaluations ignore student outcomes</b> , lack real-time, structured insights, and mostly focus on compliance
Our goal is automated, non-biased, improvement-focused feedback	IEEE highlights problems in existing systems: fixed schedules, rigid criteria, compliance-based reviews

# Student Improvement areas & Performance analysis

Jayasooriya L.T – IT22095480



# Overview of Contribution

## Sub Objective

- Identify student improvement areas through performance analysis

## Key Tasks

- Use ML to analyze scores and errors to Detect weak learning areas; Generate personalized improvement recommendations

## Novelty

- Real-time AI feedback system for personalized academic support without external datasets

# Problem Context



**LACK OF CENTRALIZED STUDENT  
ACCESS TO EXAM RESULTS**

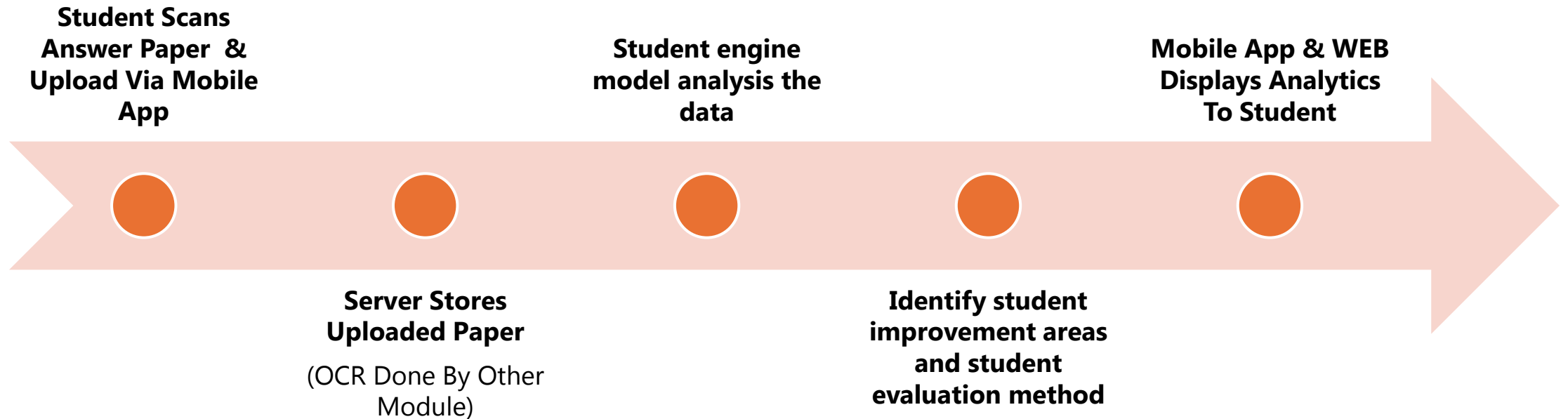


**LIMITED INSIGHT INTO QUESTION-  
WISE EVALUATION AND  
IMPROVEMENT AREAS**



**ABSENCE OF SECURE AND  
PERSONALIZED STUDENT ACCESS**

# Process Flow



# Performance Evaluation

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The *Appreciation of English Literary Texts* syllabus clearly outlines the evaluation process for Grade 11 students at the G.C.E. Ordinary Level. The following image illustrates the assessment criteria used in evaluating students' performance.

## 5. Performance Evaluation

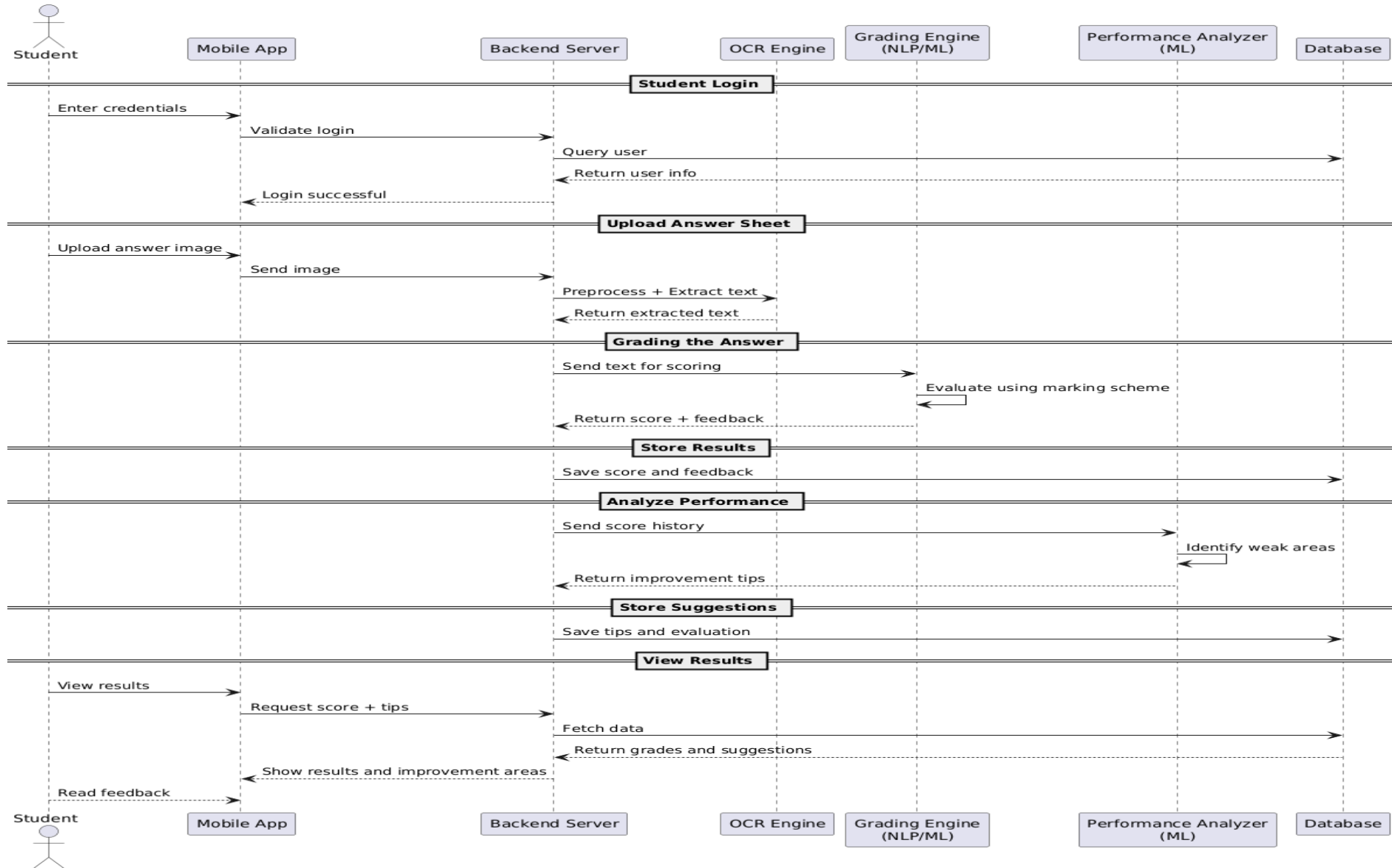
Appreciation of English literary texts is tested as a component of the G.C.E. (O/L) examination formatively as well as summatively at the end of a two year course of study. At school level it is assessed formally at term tests. It is also assessed informally in the classroom using a variety of techniques both oral and written. Conventionally literature is tested by written examinations. The test items most frequently used are the context question and the critical essay. The context question is more effective since it directly tests the candidate's familiarity with the texts. The critical essay tests the variety of skills listed in 4.0 above. The two types of items require assessment tools which are presented as criteria detailed out in band descriptors. (G.C.E. (O/L) Marking Scheme)

At term tests candidates are tested formally using the criteria detailed out at the national examination. The school based assessment takes a more informal nature. A variety of assessment tasks can be used. They are:

- dramatizations
- recitations
- group presentations
- debates
- creative writing sessions
- posters/ drawings
- simulations
- role plays
- questions of different types

Assessment tools for each of these activities may have to be developed. In using such tools the skills/competencies listed in 4.0 must be considered.

# Process Flow Cont.



# Gap Analysis: My Research vs. “A Needs Analysis in Second Language Teaching (English Language): A Study on Grade 10,11 Students in the Sri Jayawardenapura Educational Zone”

Feature / Aspect	Your AI Research	Existing Research
<b>Analysis Method</b>	AI-driven pattern recognition using ML	Manual questionnaires and interviews
<b>Data Collection</b>	Continuous automated assessment data	One-time survey (60 students)
<b>Skill Gap Detection</b>	Real-time automated identification	Manual teacher observation and student self-report
<b>Personalization</b>	Individual performance-based recommendations	Generic suggestions for all students
<b>Coverage Scope</b>	All English skills (speaking, listening, reading, writing, grammar)	Limited to speaking and listening focus
<b>Progress Tracking</b>	Continuous ML-based monitoring	Periodic manual evaluation
<b>Feedback Delivery</b>	Instant AI-generated suggestions	Delayed teacher-dependent feedback

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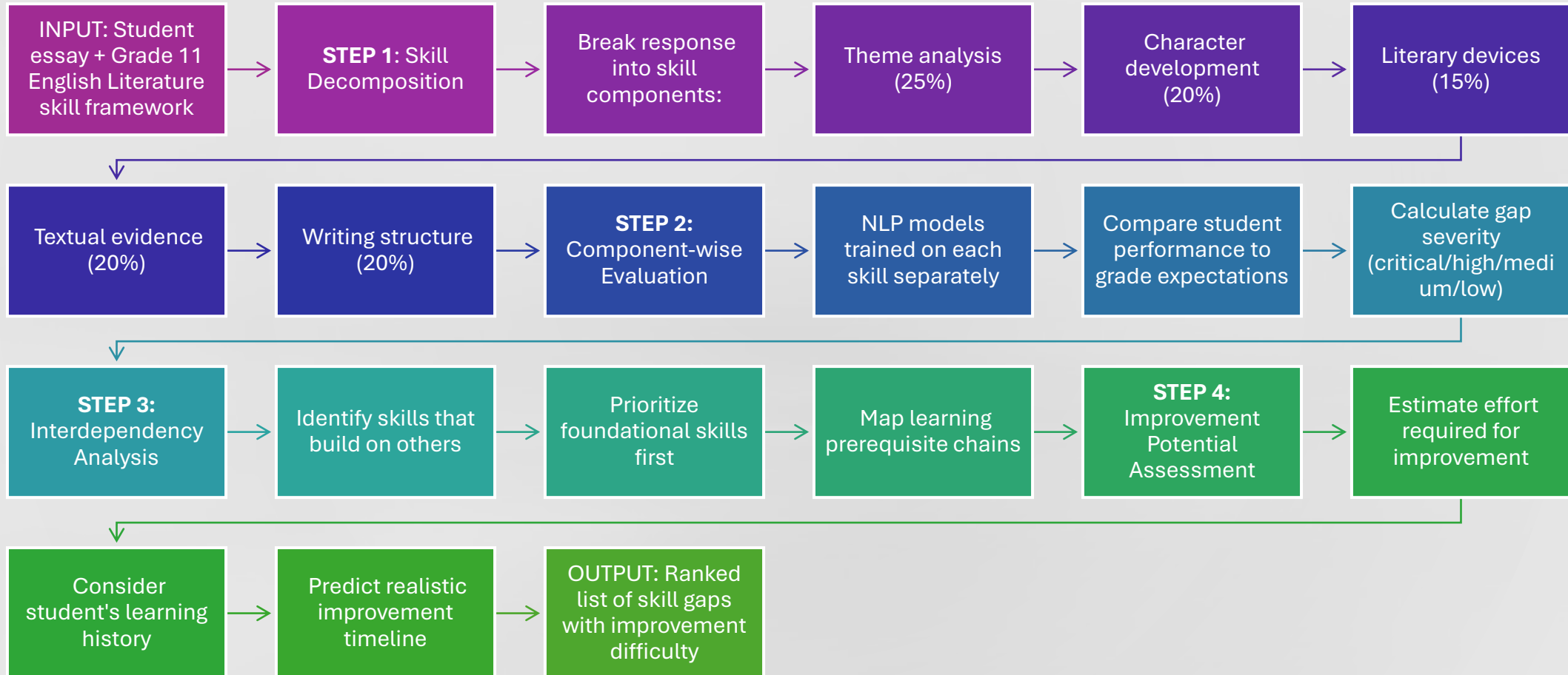
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# What is my contribution

## **Algorithm 1: Granular Skill Gap Detection**

**Problem:** Students know their overall grade but not specific skills to improve.

# Solution Algorithm:



# Key Points

- **Innovation:** First granular skill analysis for literature students
- **Visual:** Spider diagram showing student skill levels vs expectations
- **Impact:** Students improve 3x faster with targeted skill focus

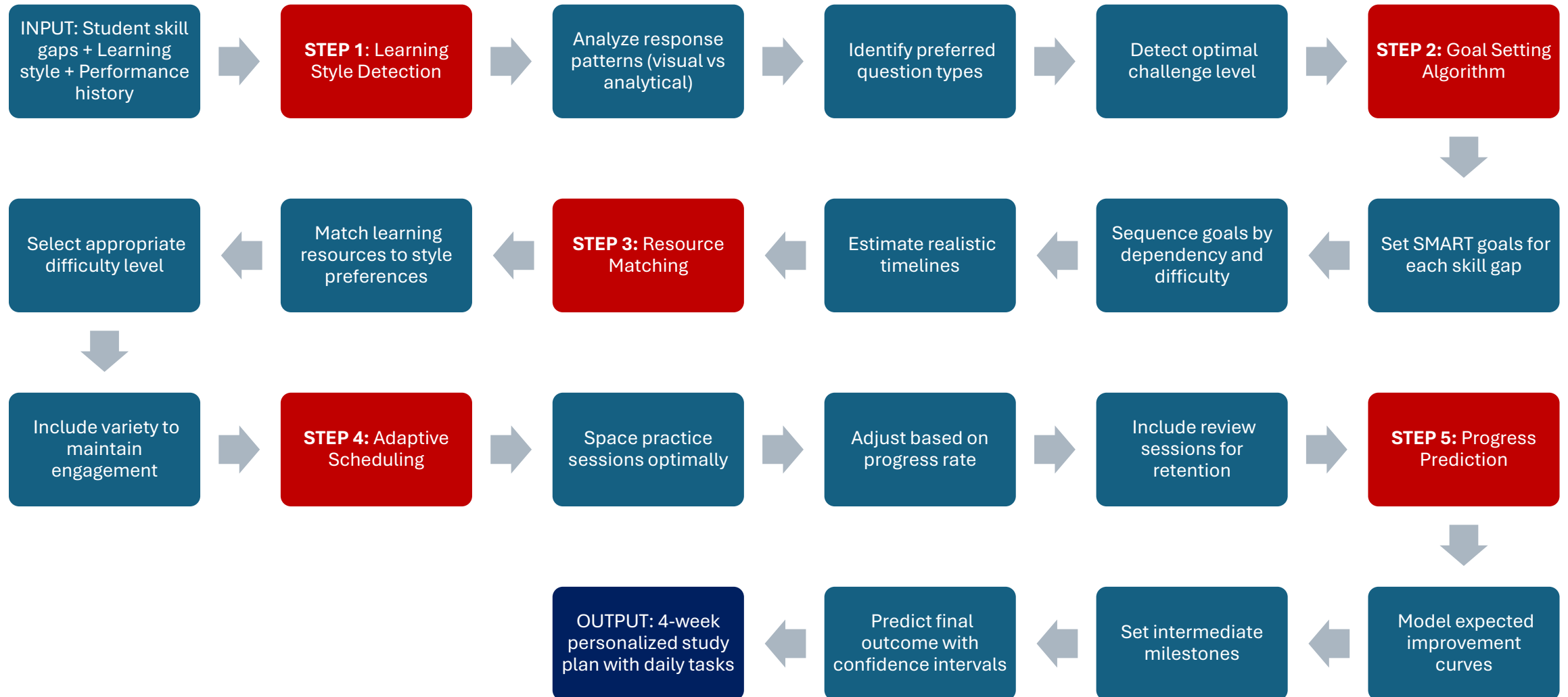


# Algorithm 2: Personalized Learning Path Generator

- **Problem:** Generic study advice doesn't match individual student learning patterns.



# Solution Algorithm:






# Key Points

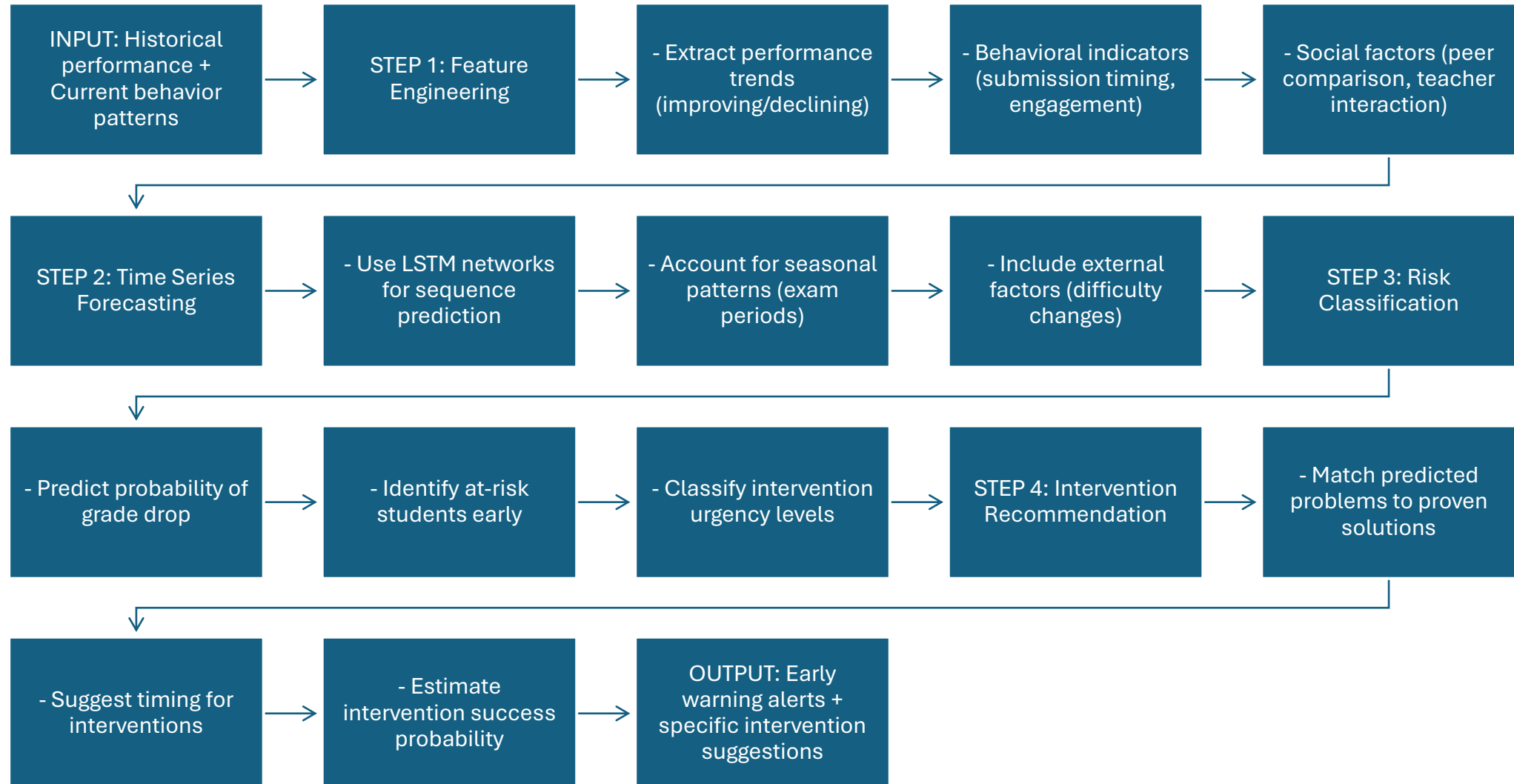
- **Innovation:** First AI-generated personalized literature study plans
- **Visual:** Gantt chart showing personalized learning timeline
- **Impact:** Students following AI plans score 25% higher on average



## Algorithm 3: Predictive Performance Modeling

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- **Problem:** Students and teachers don't know early warning signs of academic struggles.

# Solution Algorithm:



# Key Points



**Innovation:** Predicts student performance problems 6 weeks early



**Visual:** Dashboard showing risk indicators and recommended actions



**Impact:** Early intervention prevents 80% of predicted failures

**Thank You !**

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