

# USING LLMS TO IMPROVE STUDENT OUTCOMES

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## PROBLEM STATEMENT

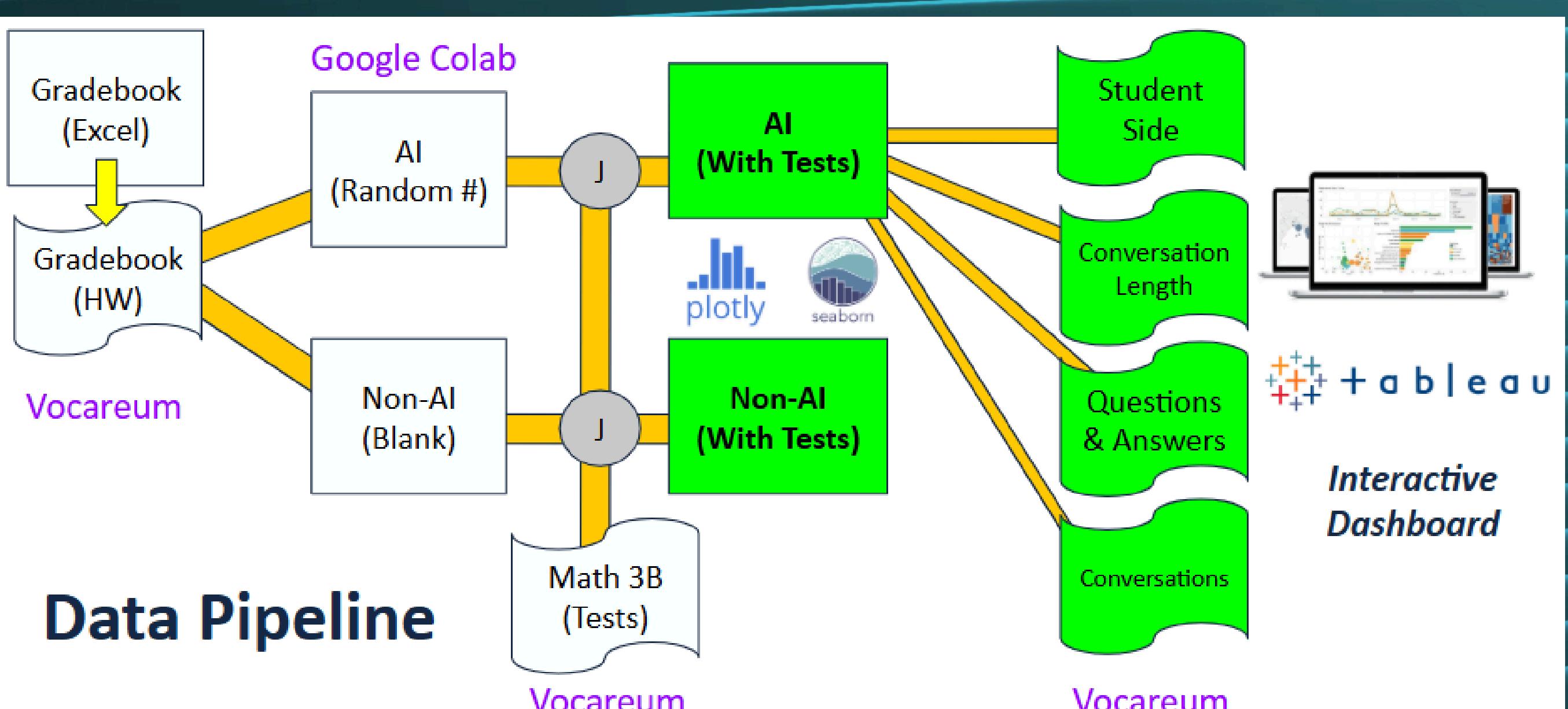
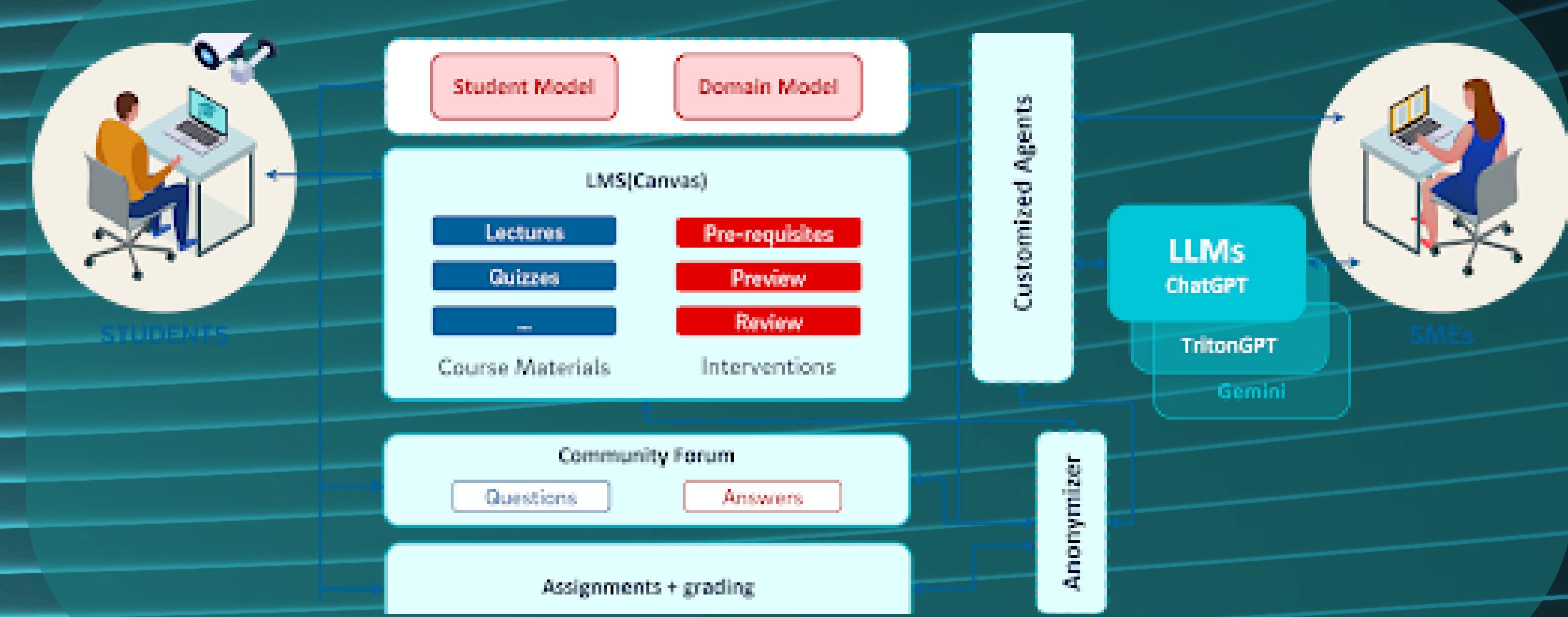
Educators lack data-driven insight into how student interactions with an LLM-based AI

Tutor translate into improved learning outcomes. This project addresses this gap by analyzing real, anonymized student data from UCSD's Math 3B course and correlates usage patterns with academic performance.

## PIPELINE: ACQUIRE, PREPARE, ANALYZE, SCALE, REPORT

Vocareum is an online learning platform

- Acquires real anonymized student performance data
- Prepares and merges the sub-datasets
- Analyzes student-AI metrics using LLM-based tools
- Scales the analysis automatically to all students
- Generates clear reports that correlate AI usage with learning outcomes, using strict privacy safeguards

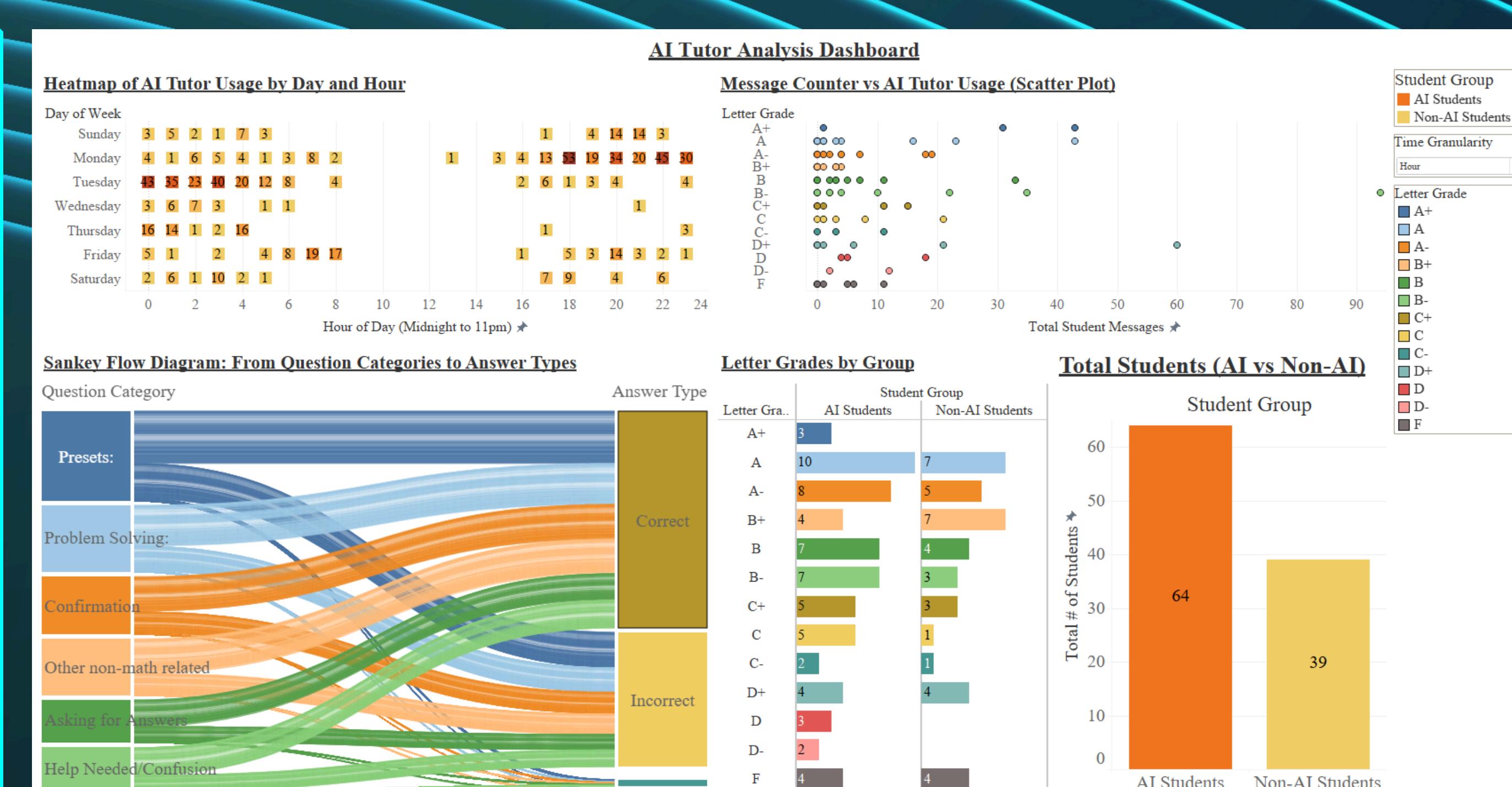


## FINAL SOLUTION ARCHITECTURE

The final solution integrates an LLM-powered analysis engine with a secure data pipeline that processes varied and anonymized student-tutor interactions with performance records. This architecture links usage statistics to learning outcomes at scale while ensuring reliability and strict data privacy.

## KEY INSIGHTS

- AI group - higher scores for HW Tests but not Midterm
- AI group has 64 students, Non-AI has 39 (of 140 in set)
- Sankey - categories have highest count of correct answers, then incorrect, and so on
- Heatmap - higher AI usage in the evening of Monday & morning of Tuesday than rest of week
- Scatter - most students used AI less and received decent grades (A - C-)
- Letter Grades - similar grades for both groups



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