



AI-DRIVEN AGENTIC FRAMEWORK FOR ENGINEERING LAB LEARNING

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Background & Motivation

- Traditional CS/SE/IME labs require mastering complex tools first
- Focus on syntax and platforms limits deeper conceptual learning
- Lacks emphasis for students on critical thinking problem solving, and ethical decision-making
- Agentic Design Lab Framework shifts students from users to collaborators

Research Goals

- Reusable and scalable Agentic Design Framework
- Create lab modules using our system
- Embed Explainable AI into curricula
- Responsible and ethical use of AI

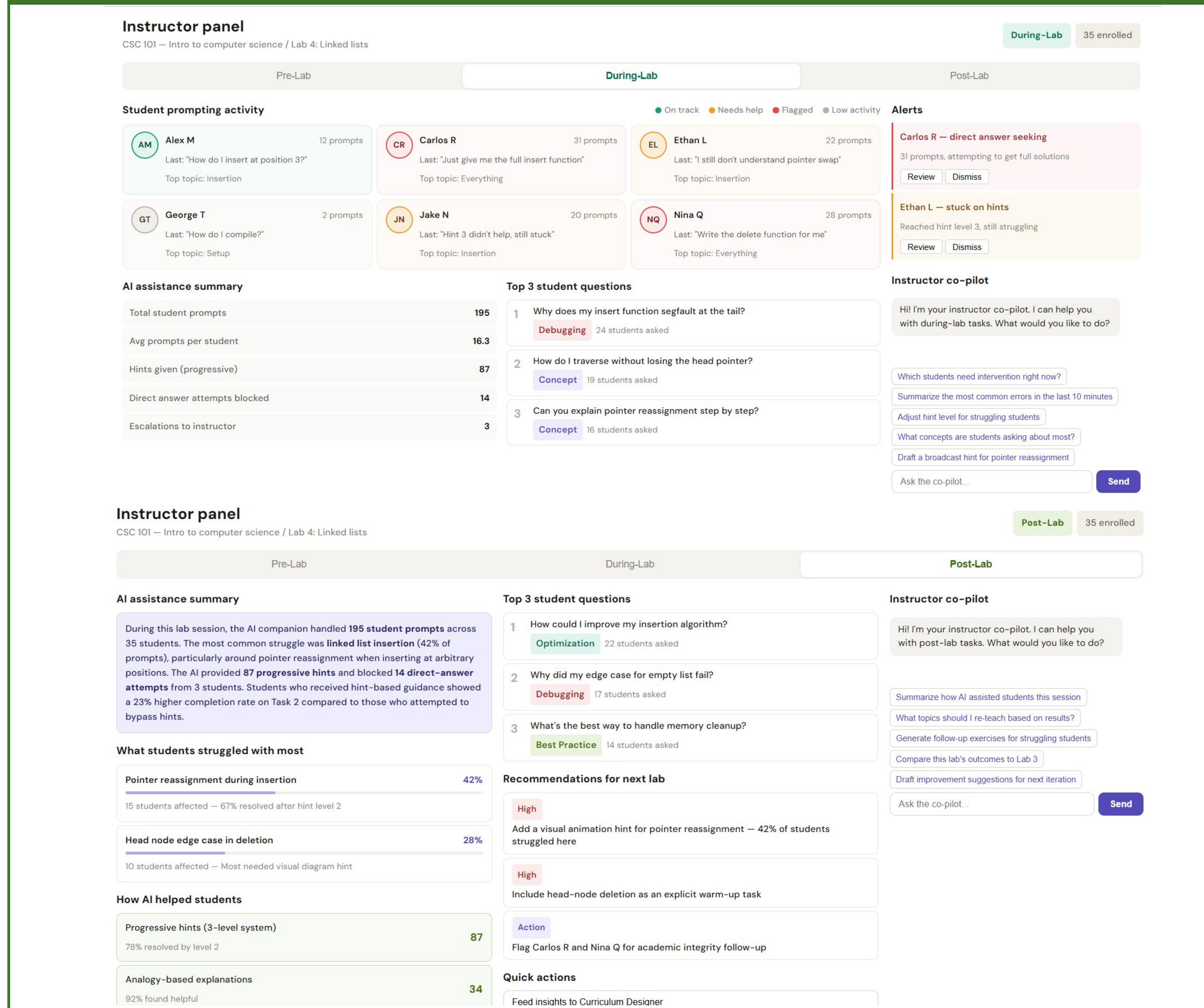
Preliminary Insights

- Pilot courses (CSC 480, 581) show good results
- Students report strong interest and deeper understanding of AI concepts
- Increased confidence in using advanced AI tools
- Limitations of agentic design: overhead, trust, sustainability, ethical use
- Active ethical discussions beyond assignments
- Framework inspires new student projects (e.g., Sustainable AI, Healthcare AI, Agriculture, Public Safety, Smart Manufacturing, Navigation)

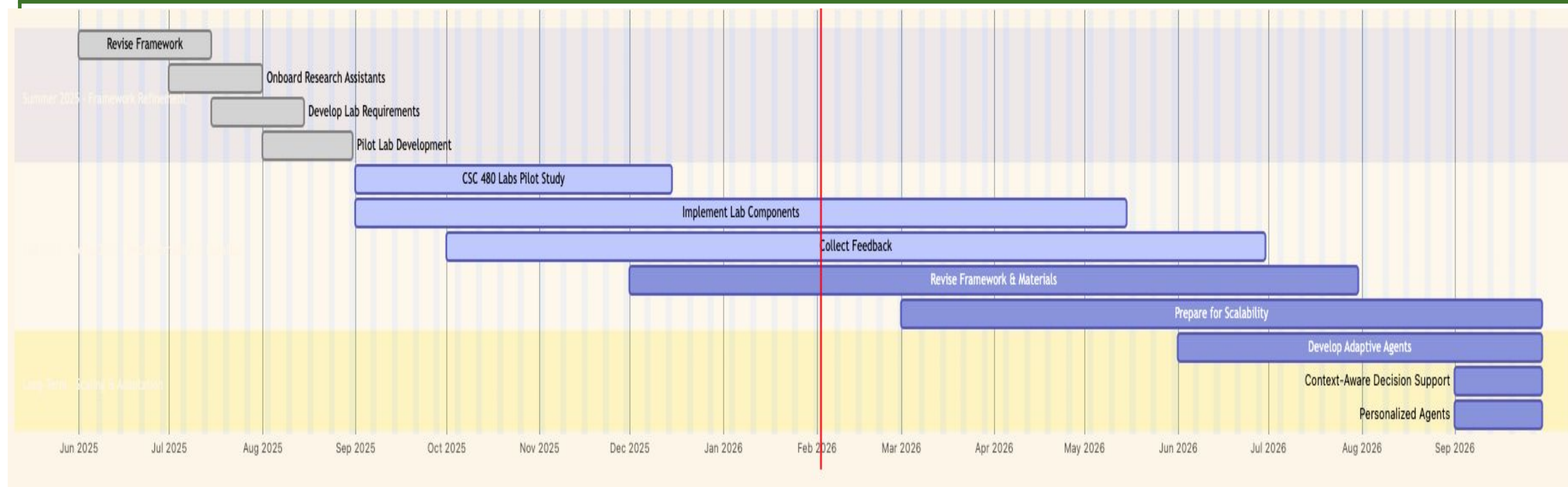
Expected Outcomes

- For Students:
 - Improved skills in AI literacy
 - Enhanced critical thinking and problem-solving skills
 - Development of responsible AI practices
- For Faculty:
 - Improved efficiency in lab preparation and teaching through a customizable framework
- For CSU System:
 - Shareable library of agentic lab modules
 - Resources shared via CSU AI Commons
 - Forward-thinking strategy for broader AI impact on education across disciplines

Instructor Dashboard



Planned Work



Related Work

- Agentic AI leverages autonomy, goal-orientation, and context-awareness—often built on Reinforcement Learning (RL)
- Uses orchestration tools (AutoGen, Crew.AI, LangGraph) with foundational models (ChatGPT, Gemini, etc.)
- Informed by student projects (TransitFinder, REGAL) and ethical frameworks (e.g., ETHICAL Principles AI Framework)

Methodology

- Contextual Inquiry
 - Interviews, focus group discussions
 - Surveys
 - observations
- Curriculum includes
 - CSC 203, 480, 569, 581
 - IME 101, 144, 312, 335/336, 432
- System Design:
 - Agents connect to external APIs (ArcGIS, Google Maps, PubMed) and generative AI models
- Evaluation methods
 - Objective Metrics: Task success rate, resource utilization, code quality, robustness.
 - Qualitative Rubrics: Architectural elegance, documentation clarity, error handling.

Case Studies

- Search and Rescue Agent System
- CSC 480-F25 Intro to AI: revision and testing of seven weekly labs

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