MICHIGAN STATE UNIVERSITY

09/09: Team Status Reports

The Capstone Experience

Dr. Wayne Dyksen
Dr. James Mariani
Luke Sperling
Griffin Klevering
Jared Singh Sekhon

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

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Status Report Presentation

Data Consistency and Reconciliation Tool

The Capstone Experience

Team Ally

Venkata Chinmayee Mannava
Linh Thao Nguyen
Abishek Pemmada
Tinku Sharma
Julia Sznitka
Jordan Tansingco

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

Team Ally

Status Report

[1 of 4]

Data Consistency and Reconciliation Tool

- Ally Financial Inc.
  - A leading all-digital financial services company
    - Established in 1919, rebranded in 2010
  - Car financing, mortgage lending, corporate finance, wealth management, and online banking services
  - Serving over 11M customers with personalized solutions and resources
- Project Overview
  - Manual data management & analysis from numerous sources is challenging
  - Regular users, analysts, managers, and administrators login to monitor data and manage data definitions
    - Ensures consistency and accuracy across sources, improving reporting and decision-making
  - Web-based tool connects to data sources & also allows users to upload datasets
  - Utilizes ML tools to run consistency checks
  - Generates reports and displays dashboards highlighting discrepancies

Team Ally

Status Report

[2 of 4]

Data Consistency and Reconciliation Tool

- Server Systems / Software
  - SQL – Installed
  - Snowflake – On trial & progress on getting account from sponsor
  - GCP – all team installed
- Development Systems / Software
  - PyTorch – Installed
  - Python 3.10 – Installed
  - React – Initial frontend set up
- Project Plan Document
  - Mockup UI – 70 % complete
  - Program Architecture – 50% complete
  - Overall: 20% Complete

Team Ally

Status Report

[3 of 4]

Data Consistency and Reconciliation Tool

- Client Contact
  - 2 PM every Friday on Teams
  - Met 2 times
- Team Meetings
  - At 4:20 PM every Tuesday in person
  - Met 7 times
- Team Organization
  - Back end: Linh, Chinmayee, Julia, Abishek, Jordan
  - Front end: Julia, Chinmayee, Jordan
  - Database Management: Linh, Chinmayee, Abishek
  - Snowflake & Cloud: Abishek, Tinku

Team Ally

Status Report

[4 of 4]

Data Consistency and Reconciliation Tool

Risks

- Risk 1
  - Upload dataset from user to Snowflake cloud and use SQL to query and send back
  - Use small test dataset first and split into 3 storage layers (raw, process, metadata) to manage each step within Snowflake no need to send to back-end again
- Risk 2
  - Defining the validation rules to deal with different data sources
  - Allow upload one file at a time and deal with each type separately save it to cloud
- Risk 3
  - Using the ML model to look at different types of content of data sources and creating correlation rules
  - Familiarize with banking data and efficient methods to utilize ML techniques
- Risk 4
  - Security of data when AI to analyze and process the data
  - Filter out the confidential information and hide the label of the data and just analyze the consistency of the content type, range, and differences

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Status Report Presentation

Seller Agent Management Platform

The Capstone Experience

Team Amazon

Ziad Bakki
Jiwoo Jeong
Ethan Tunney
Meet Patel
Tyler Nguyen
Daniel Berezovsky

Department of Computer Science and Engineering
Michigan State University

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From Students…
…to Professionals

Team Amazon

Status Report

[1 of 4]

Seller Agent Management Platform

- Sponsor Overview
  - Online global marketplace
  - Founded by Jeff Bezos
  - Founded in 1994
- Project Overview
  - Automate manual seller tasks using agents
  - Use slack to ask for approvals and feedback
  - Implement web-based interface to configure agents
  - Be robust, scalable and secure (e.g. queues, authentication)

Team Amazon

Status Report

[2 of 4]

Seller Agent Management Platform

- Server Systems / Software
  - AWS CDK - ran and stood up initial infra
  - Slack pipeline – created and functional
  - EventBridge pipeline – set up
  - ECS infrastructure – set up
- Development Systems / Software
  - Langgraph - prototype created
  - Frontend/NextJS - prototype created
  - FastAPI backend - prototype created
- Project Plan Document
  - System Architecture Slide - 50%
  - Functional slides – 50%

Team Amazon

Status Report

[3 of 4]

Seller Agent Management Platform

- Client Contact
  - Received specs and deliverables
  - System design – approved
  - Recurring meetings – Set up on Friday from 2:30-3:30 pm
- Team Meetings
  - Scheduled for Tuesdays after class at 4:30-5:30 pm
  - First sprint tasks – assigned and partially completed
- Team Organization
  - Infrastructure: Meet, Daniel, Jiwoo
  - Database: Ethan, Tyler
  - Frontend: Ethan, Ziad
  - Backend: Ziad, Meet, Daniel, Jiwoo
  - Agent: Tyler, Daniel

Team Amazon

Status Report

[4 of 4]

Seller Agent Management Platform

Risks

- Risk 1
  - Figuring out IAM permissions
  - Use CDK to automate provisioning of IAM
- Risk 2
  - Langgraph HITL and 8-hour Agentcore Runtime limitation
  - Use Langgraph checkpointer and store in database
- Risk 3
  - Authentication (session-based)/Call SP API with token/storing credentials securely – top priority.
  - Use KMS, Secrets Manager, AWS Cognito, look into authorization docs.
- Risk 4
  - Scaling/Robust design
  - Use SQS and Dead letter queues

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Status Report Presentation
Modeling Michigan's Energy Future

The Capstone Experience

Team Anthropocene Institute

Tommy Maceri
Quinn Fransen
Raama Katragadda
Chad Hildwein
Navya Bhardwaj
Ishraj Singh Yadav

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

Team Anthropocene Institute

Status Report

[1 of 4]

Modeling Michigan's Energy Future

- Sponsor Overview
  - Sustainability driven organization
  - Connect investors to create environmentally friendly technology
  - Increase awareness regarding renewable energy practices
- Project Overview
  - Aggregate data on Michigan renewable energy consumption
  - Use machine learning to create future projections
  - Link energy choices to pollution, health, and economic outcomes to promote awareness of the public and policymakers
  - Display the data in user friendly webapp

Team Anthropocene Institute

Status Report

[2 of 4]

Modeling Michigan's Energy Future

- Server Systems / Software
  - VM installed and configured
  - Flask template is pushed and operational
  - Set up data ingestion pipeline using EIA API
- Development Systems / Software
  - Initial React webapp developed and pushed with graphics
  - Setup SQL database to store and retrieve data for ML model
  - Built and tested linear/polynomial regression model
- Project Plan Document
  - First draft of functional specs finished
  - First draft of System Architecture done
  - 15% Complete

Team Anthropocene Institute

Status Report

[3 of 4]

Modeling Michigan's Energy Future

- Client Contact
  - Met with the sponsors once
  - Set up a virtual weekly meeting on Wednesday evenings
- Team Meetings
  - We have met 6 times
  - Set up weekly meeting for Wednesday at 11:30AM
- Team Organization
  - Backend- Raama, Navya, Tommy, Ishraj
  - Frontend- Chad, Quinn (Rotational depending on need)

Team Anthropocene Institute

Status Report

[4 of 4]

Modeling Michigan's Energy Future

Risks

- Quality Data
  - Gathering Michigan specific nuclear energy/emissions data
  - Researching reliable APIs to gather data
- Machine Learning Model
  - Unknown complexity and unsure of future projections
  - Build multiple models and talk to clients for their needs
- Determining health impact
  - Public health data sparse and modeling is complex
  - Engage with institutions to gather reliable data
- Interactive Model
  - Communicating trade-offs (cost vs. health vs. emissions) in a clear way
  - Prototype visual dashboards early and get sponsor feedback for clarity

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Status Report Presentation

AO Quick Capture

The Capstone Experience

Team Auto-Owners

John Cvetkovski
Kevin Lin
Zhi Lin
Yaotong Lu
Reed Miller
Luis Sanchez Perez

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From Students…
…to Professionals

Team Auto-Owners

Status Report

[1 of 4]

AO Quick Capture

- Sponsor Overview
  - Regional insurer offering auto, home, live & business coverage
  - Founded in 1916, based in Lansing, MI
  - Sells policies through independent agents in 26 states
- Project Overview
  - Web app that lets users upload car accident photos
  - AI analyzes the images to identify damage and estimated repair costs
  - Speeds up the insurance claim process by providing instant damage and cost estimates
  - Policyholders will log in, enter claim info, upload accident photos, and receive an AI-generated report with repair options

Team Auto-Owners

Status Report

[2 of 4]

AO Quick Capture

- Server Systems / Software
  - OpenJDK 21 downloaded and works
  - Spring boot 3 dependencies added, able to make call to frontend
  - Angular 18 setup is complete, able to view frontend
- Development Systems / Software
  - Docker desktop downloaded, container is up and running
  - Example data set for training AI model located
  - VM's downloaded and working
- Project Plan Document
  - Skeleton Created, Roles assigned
  - Work on System Architecture diagram has begun
  - 10% Complete

Team Auto-Owners

Status Report

[3 of 4]

AO Quick Capture

- Client Contact
  - Client has been contacted, we have met once
  - Weekly conference call scheduled for Fridays at 2 P.M.
  - In-person meeting in December at Auto-Owners mentioned, no set date yet
- Team Meetings
  - Scheduled on Tuesdays at 4:30 P.M.
  - Online meeting scheduled as needed at least once weekly
- Team Organization
  - Frontend: Reed & Kevin
  - Backend: John & Zhi
  - AI/ML: Luis & Yaotong

Team Auto-Owners

Status Report

[4 of 4]

AO Quick Capture

Risks

- Risk 1
  - Lack of training data for our AI model
  - Develop our own data set using multiple online resources about car repair estimations
- Risk 2
  - Developing an AI chatbot feature for free that doesn’t violate our NDAs
  - Clarify specifications and restraints with our sponsor
- Risk 3
  - Configuring Spring boot to connect to MSSQL running in a docker with data volumes
  - Read docker and Spring boot database connection documentation
- Risk 4
  - Connecting our AI/ML model in Python to our Spring boot backend
  - Create a separate project for testing this specific connection

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Status Report Presentation

An AI Tool to Learn Management of Patient Messages

The Capstone Experience

Team Corewell Health

Noah Austad
Chase Grove
Tri Khuc
Sabrina Lee
Graham Parker
Toan Pham

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

Team Corewell Health

Status Report

[1 of 4]

An AI Tool to Learn Management of Patient Messages

- Sponsor Overview
  - Corewell Health is a Michigan Based Non-profit Health Care System Healing over 1.3 Million Michigan Residents
  - Result of Beaumont Hospital and Spectrum Health Merger
  - Over 12,000 Licensed Physicians across 21 Hospitals and 300+ Out-patient Facilities
- Project Overview
  - Creating an Academic Resource for Medical Students & Professors
  - Generating Pediatric Test Cases for Practice using AI
  - Developing a Study Tool for Board Exam
  - Making an Accurate Prescription and Referral System

Team Corewell Health

Status Report

[2 of 4]

An AI Tool to Learn Management of Patient Messages

- Server Systems / Software
  - Backend – Hosted on Railway, Backend working
  - Frontend – Hosted on Vercel, Front end working
  - Supabase Database – Operational and connected
- Development Systems / Software
  - VSCode – operational, front end working
  - Currently use React.js, looking to transition to Next.js
  - Backend – Golang, LLM – OpenAI and Python
- Project Plan Document
  - Document created
  - Tasks Assigned
  - 30% Complete

Team Corewell Health

Status Report

[3 of 4]

An AI Tool to Learn Management of Patient Messages

- Client Contact
  - Weekly Status Reports sent to Client by Client Correspondent
  - Standing Weekly Meetings with Client Thursday 5:00-6:00pm
- Team Meetings
  - Weekly In-Person Meetings held Tuesdays 4:30PM, Extra Virtual Meetings Held as Needed
  - 5 In Person Meetings Held as of 09/08/2025
- Team Organization
  - Sabrina Lee, Client Correspondent
  - Front End – Sabrina, Toan, Noah
  - Back End & Database –Graham, Chase
  - AI – Noah, Tri

Team Corewell Health

Status Report

[4 of 4]

An AI Tool to Learn Management of Patient Messages

Risks

- Transitioning Frontend Framework
  - Currently written in React.js, which limits development capabilities
  - Looking into Next.js, Nuxt.js, Angular, Vue
- Verification for Pediatric Cases
  - AI generated pediatric cases would need to be fact checked for accuracy
  - Potentially introduce third AI model, use Rouge metrics
- Major Latency Issues
  - Current build runs slowly leaving medical students with the impression it is broken
  - Move client-side database calls to the server-side
- Increasing Sophistication of AI Student Evaluation
  - No model for exam questions and current case evaluations are too generic
  - Creating tags for USMLE questions and patient cases

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Status Report Presentation

AI Rule Metadata Generator

The Capstone Experience

Team Delta Dental AIRMG

Sricharan Devarapalli
Sainatha Paamujula
Akilesh Dhileepan
Alexander Simon
Aditya Aggarwal
Sit Soe

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From Students…
…to Professionals

Team Delta Dental AIRMG

Status Report

[1 of 4]

AI Rule Metadata Generator

- Sponsor Overview
  - Dental Insurance provider
  - Processes millions of claims annually
  - Headquartered in Okemos, MI
- Project Overview
  - Extract metadata from rules
  - Summarizes incosistent and complex data
  - Utilized by SMEs
  - Helps to create packages to export

Team Delta Dental AIRMG

Status Report

[2 of 4]

AI Rule Metadata Generator

- Server Systems / Software
  - SQLAlchemy and PostgreSQL/MySQL hosted on MSU server (server is not setup yet)
  - OpenAI API
- Development Systems / Software
  - Gitlab is operational and waiting for client access
  - Everything will be run locally so there is no need for a web server
  - FastAPI, Angular, Bootstrap are configured
- Project Plan Document
  - Created a skeleton document
  - Roles assigned for each member
  - 5% Complete

Team Delta Dental AIRMG

Status Report

[3 of 4]

AI Rule Metadata Generator

- Client Contact
  - Meetings every Friday on Teams at 8 AM
  - Have met 2 times
- Team Meetings
  - Meetings after every class in-person
  - Have met 4 times
- Team Organization
  - Frontend and UI/UX: Sricharan, Akilesh, Alexander
  - Backend and Database: Sainatha, Sit, Aditya

Team Delta Dental AIRMG

Status Report

[4 of 4]

AI Rule Metadata Generator

Risks

- Database
  - Creating a schema for their data
  - More meetings with client to clarify
- Budget
  - OpenAI API cost
  - Use a mini model and also check how extensive their sample data is
- Prompt Engineering
  - Developing one fine-tuned prompt to efficiently parse all types of data
  - Continuous testing and updating of the prompt
- Search algorithm
  - Don’t know how the sample data will be structured
  - More meetings with client to clarify

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Status Report Presentation

Insurance Quoting Assistant

The Capstone Experience

Team Delta Dental IQA

Raduan Moustafhim
Patrick Oleksik
Ronnit Chopra
Nam Nguyen
Hunter Haack
Charles Selipsky

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From Students…
…to Professionals

Team Delta Dental IQA

Status Report

[1 of 4]

Insurance Quoting Assistant

- Sponsor Overview
  - One of the largest dental insurance providers in the U.S.
  - Sells highly configurable dental insurance packages to businesses of varying sizes
  - Provides coverage to more than 83 million Americans
- Project Overview
  - Manual data entry is tedious and time consuming
  - Data is gathered across various mediums
  - Our goal is to automate process through AI
  - Allows for efficent and accurate quote generation

Team Delta Dental IQA

Status Report

[2 of 4]

Insurance Quoting Assistant

- Server Systems / Software
  - LLM call working
  - Azure Document Intelligence functioning
  - Migrating MongoDB from local to cloud
- Development Systems / Software
  - Quarkus and FastAPI up and connected
  - Quarkus and Angular up and connected
  - Quarkus and MongoDB up and connected
- Project Plan Document
  - Intense work underway
  - No pages finished but roles assigned and outline developed
  - 10% Complete

Team Delta Dental IQA

Status Report

[3 of 4]

Insurance Quoting Assistant

- Client Contact
  - Two meetings with client so far
  - Recurring meetings scheduled for Friday at 11am
- Team Meetings
  - Have met roughly seven times so far
  - Formally scheduled Tuesdays after class
- Team Organization
  - Frontend: Raduan and Nam
  - Backend (AI): Patrick and Charles
  - Backend (REST/DB): Hunter and Ronnit

Team Delta Dental IQA

Status Report

[4 of 4]

Insurance Quoting Assistant

Risks

- Risk 1
  - Not accurately and efficiently parsing data from various media
  - File format specific presentation to LLM
- Risk 2
  - Not getting consistent results from extremely different company formats
  - Applicable examples with examples pulled in with semantic search
- Risk 3
  - Not generating PDFs with desired quality
  - Top level communication with client
- Risk 4
  - Software not user friendly to non-technical users
  - Use product in the context of the user (see if actual underwriter can test)

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Status Report Presentation
Habitat Identification Using Drone Imaging

The Capstone Experience

Team GM

Shane Carr

Sungu Han

Yigit Gunduc

Noah Homyak

Ryan Meitzner

Tanner Shirel

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From Students…
…to Professionals

Team GM

Status Report

[1 of 4]

AI Flora Identification

- Sponsor Overview
  - Founded in 1908
  - Largest share of American vehicle market
  - Industries include Automotive, Financing, Defense, Software
- Project Overview
  - Flora Species Identification via Drone Footage
  - Identifies species much faster than manual labelling
  - Separates native from invasive species
  - Can be used to single out invasive species and preserve natural ecosystem balance

Team GM

Status Report

[2 of 4]

AI Flora Identification

- Server Systems / Software
  - PostgreSQL database – basic design implemented
  - Google Earth API – Map is visible in frontend
- Development Systems / Software
  - Flask Backend – Basic backend implemented
  - React + TypeScript Frontend – up and running
  - Segment Anything Model + DINOv2 for Object Detection – basic model implemented
- Project Plan Document
  - Executive summary and functional specs written
  - 10% Complete

Team GM

Status Report

[3 of 4]

AI Flora Identification

- Client Contact
  - Met with the client three times. with weekly meetings taking place on Fridays, 2-3pm.
  - Meeting Friday, 2-5pm at Lansing GM plant to see drone and ecosystem in person
- Team Meetings
  - Met twice so far
  - Weekly meetings on Thursday, 1-2pm in EB 3352
- Team Organization
  - Sponsor Contact – Sungu
  - Program Manager – Shane
  - Machine Learning – Yigit, Shane
  - Frontend – Ryan, Noah
  - Backend – Tanner, Sungu
  - Database – Noah

Team GM

Status Report

[4 of 4]

AI Flora Identification

Risks

- Risk 1
  - Machine learning algorithm to identify flora species
  - Compare and test different image recognition models with a focus on plants and flora species
- Risk 2
  - Processing large amounts of image data
  - Efficient algorithms to parse images quickly
- Risk 3
  - Distributing and sharing data to GM
  - API and documentation to allow the extraction of data from DB
- Risk 4
  - Poor image quality may hurt model accuracy
  - Advanced Models and preprocessing techniques to increase performance

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Status Report Presentation

Prompt Assistant: Mastering the Art of Prompt Engineering

The Capstone Experience

Team HAP

Snigdha Akula
James Chen
Anthony Greig
Praseedha Vinukonda
Aditi Viswanatha
De'Janae Williams

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
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Team HAP

Status Report

[1 of 4]

Prompt Assistant: Mastering the Art of Prompt Engineering

- HAP
  - HAP is a non profit health plan company that offers individual, group, Medicare, and Medicaid coverage in Michigan
  - HAP provides wellness programs, preventive care, and disease management support
  - HAP is a part of Henry Ford Health, serving about 500,000 members across Michigan
- Project Overview
  - An interactive prompt engineering tool that guides users' step by step with creating high quality AI prompts, with gamified scoring, and instant testing through different LLMs
  - Most AI users lack guidance on creating LLM prompts, which leads to unclear or ineffective prompts, so this tool will help address the skill gap
  - Target users are anyone who interact with AI tools often and want to improve the reliability of AI outputs
  - Users build prompts through guided fields and can provide feedback to help the tool to continuously improve

Team HAP

Status Report

[2 of 4]

Prompt Assistant: Mastering the Art of Prompt Engineering

- Server Systems / Software
  - PostgreSQL database schema created (tested locally)
  - Dockerized backend, deployed live on Render
- Development Systems / Software
  - VSCode + GitLab for collaborative development and version control (tested & actively use)
  - Next.js + TypeScript + Tailwind CSS for frontend (framework scaffolded & tested locally).
  - GitLab CI/CD configured for automated builds & deployments (tested successfully on backend).
- Project Plan Document
  - Project Plan has been started
  - Worked on Executive summary, Functional Specifications, and Screen Mockups
  - ~20% Complete

Team HAP

Status Report

[3 of 4]

Prompt Assistant: Mastering the Art of Prompt Engineering

- **Client Contact:** Stephen Neubecker (VP Digital Self Service)
  - First meeting with client occurred: August 29th
  - Weekly conference call at 10:30am every Wednesday
  - In-person meeting with client is TBD
- **Team Meetings**
  - Meet in-person every Monday 9am-10am and Wednesdays 5pm onwards
  - Meet in-person every Thursday from 4:20pm-6pm and Friday from 11am-3pm
  - Team met seven times so far
- **Team Organization**
  - Engineer 1 (AI/DevOps) – De' Janae
  - Engineer 2 (Backend & Database Architect) - Snigdha
  - Engineer 3 (Frontend Architect/AI) - Praseedha
  - Engineer 4 (Frontend UI/UX Specialist with DevOps) - Anthony
  - Engineer 5 (Full-Stack Feature Owner 1 / Application Feature Engineer) - Aditi
  - Engineer 6 (Full-Stack Feature Owner 2 /Backend & Frontend Integrations Engineer) - James

Team HAP

Status Report

[4 of 4]

Prompt Assistant: Mastering the Art of Prompt Engineering

Risks

- Risk 1
  - The core functionality depends on the external OpenAI API, which could be slow or unavailable
  - Implement error handling and automatic retries. Also build a mock service that mimics the API, allowing development to continue offline or during outages
- Risk 2
  - We need to figure out what makes up a good prompt, which requires LLM template source/inspiration
  - Watch prompt engineering courses/research on the Internet
- Risk 3
  - The AI's response might not always be the valid JSON expected, which could cause our application to crash.
  - We will use advanced prompt engineering to guide the AI's output. Also validate the structure of every response before processing it and log the raw output to simplify debugging.
- Risk 4
  - Prompts that work well with one model version may perform poorly with other versions
  - We'll test all the available LLM's and select the top two or three best performing LLM's

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Status Report Presentation

Electronic Laboratory User's Guide 2.0

The Capstone Experience

Team Henry Ford Innovations

Rocco Camilletti
Cole Current
Ashton Kushner
Rafid Munjid
Elijah Porter
Andrew Roth

Department of Computer Science and Engineering
Michigan State University

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From Students…
…to Professionals

Team Henry Ford Innovations

Status Report

[1 of 4]

Electronic Laboratory User's Guide 2.0

- Sponsor Overview
  - National leader in healthcare innovation
  - Focused on making meaningful differences in both patients and communities
  - Committed to groundbreaking research
- Project Overview
  - Continue last semester's work on modernizing the eLUG
  - Develop a cross-platform mobile app (Android and iOS)
  - Alter the website to match Henry Ford preferences
  - Migrate previous work to new architectures

Team Henry Ford Innovations

Status Report [2 of 4]

Electronic Laboratory User's Guide 2.0

- Server Systems / Software
  - MySQL database (working, might need to be replaced)
  - ExpressJS (working, might need to be replaced)
  - Apache (working, might need to replaced)
- Development Systems / Software
  - React (has warnings, deprecated version in use)
  - iOS app currently in Swift (& dummy Android app in Java)
  - NodeJS
- Project Plan Document
  - Waiting for architecture requirements from Henry Ford
  - Direction of development decided (improve architecture)
  - 15% Complete

Team Henry Ford Innovations

Status Report

[3 of 4]

Electronic Laboratory User's Guide 2.0

- Client Contact
  - Met with client twice
  - Scheduled weekly Friday meetings (with pathology team)
- Team Meetings
  - Scheduled for Thursdays after class
  - Met three times
- Team Organization
  - Front end (mobile): Ashton, Rafid, Elijah
  - Back end (database): Andrew, Cole, Rocco

Team Henry Ford Innovations

Status Report [4 of 4]

Electronic Laboratory User's Guide 2.0

Risks

- Unknown target architectures
  - Current code is implemented in Swift, MySQL, and NodeJS (all of which might have to be changed).
  - Discuss further with Henry Ford Innovations
- Improve implementation security
  - Last semester's work didn't place a huge emphasis on security, that will need to be changed in our version.
  - Learn and follow best security practices when reviewing code
- Henry Ford IT team
  - The Henry Ford IT team has very limited availability this semester.
  - We will have to make the time count every time we can meet with them.
- Working with other medical systems
  - None of us have medical degrees and we are unfamiliar with the terminology
  - Consult with sponsors and speak up when we lose track of what is being said

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Status Report Presentation

Kohl's Cash Hero

The Capstone Experience

Team Kohl's

Arik Hamacher
Travis Ngo
Zaid Qourah
Kyle Raeside
Devang Sethi
Tommy Whaley

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

Team Kohl's

Status Report

[1 of 4]

Kohl's Cash Hero

- Sponsor Overview
  - Founded in Brookfield, Wisconsin in 1962
  - Ranked 31st of Top 100 Retailers 2025
  - Well known for Kohl's Cash system
- Project Overview
  - Gamified reward system
  - Targets younger audience
  - Drive sales and engagement
  - Improve online shopping experience

Team Kohl's

Status Report

[2 of 4]

Kohl's Cash Hero

- Server Systems / Software
  - React v19.1.0 frontend setup and running
  - Maven 3.9.11, Spring Boot 3.5.5, and OpenJDK 21 setup and running
  - MySQL DB setup, waiting on DECS VM
- Development Systems / Software
  - VSCode/IntelliJ installed and configured
  - Git setup and configured
- Project Plan Document
  - Software systems portion started
  - Rest of work delegated out
  - 10% Complete

Team Kohl's

Status Report

[3 of 4]

Kohl's Cash Hero

- Client Contact
  - Client meetings on Mondays at 12:30PM
  - Met three times, met once with two other client members
- Team Meetings
  - Weekly meetings on Wednesdays at 12:30PM
  - Met four times, brainstormed project structure, worked on client pitches
- Team Organization
  - Frontend: Arik, Travis, Devang
  - Backend: Tommy, Zaid, Kyle

Team Kohl's

Status Report [4 of 4]

Kohl's Cash Hero

Risks

- Recommendation Algorithm
  - Engineer an algorithm to curate items based on data we collect
  - Clearly defining the scope and methodology of the algorithm
- Data Quality
  - Filter and sort out inaccurate data
  - Apply weights based on certain actions (i.e. adding to cart/wishlist)
- Integration
  - Make it easy to integrate with Kohl's existing site
  - Working closely with the client to make it seamless
- Security
  - Prevent customers from cheating/automating the system
  - Limiting rewards and user testing

MICHIGAN STATE UNIVERSITY

Status Report Presentation

MY VR Language Tutor

The Capstone Experience

Team Launch

Anh Dao
Caleb Flosky
Evan Fioritto
Joseph Pacentine
Molly Thornber
Nolan Jolley

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

Team Launch

Status Report

[1 of 4]

My VR Language Tutor

- Sponsor Overview
  - Develop digital solutions for various other companies
  - Design product plans and strategies
  - Code, develop, & improve applications for clients
- Project Overview
  - Immersive VR language learning tool
  - Helps bridge the gap between learning a language and putting it into practice
  - Scalable for beginning language learners up to advanced learners looking to practice conversational fluency
  - AI-driven NPCs carry conversations with users based on their environment; signs for users to practice reading and pronunciation

Team Launch

Status Report

[2 of 4]

My VR Language Tutor

- Server Systems / Software
  - FastAPI backend
  - Aim to launch on AWS
  - Backend will handle communication between Unity and AI services
- Development Systems / Software
  - Starting scenes created in Unity and tested on VR headset
  - Microphone input/response processing set up on Unity client
  - API contracts established between Unity backend; Azure integration in progress
- Project Plan
  - Finished text descriptions, presenting to sponsors
  - Finalizing Mockups/Diagrams after sponsor meeting
  - 80% Complete

Team Launch

Status Report

[3 of 4]

My VR Language Tutor

- Client Contact
  - Met with client via Teams; requested GitLab access for them, received hardware, establishing API financing
  - Scheduled weekly Teams meetings for Tuesday at 9am
- Team Meetings
  - Met 5 times so far; 2 formal team meetings & 3 informal chats
  - Scheduled weekly meetings for Monday at 5:30pm and team work sessions for Friday at 5pm
- Team Organization
  - Backend team: Evan & Nolan (Unity backend integration), Molly (Azure API integration), Anh (server set-up)
  - Unity team: Caleb (Unity XR Gameplay), Joseph (Unity Systems)

Team Launch

Status Report

[4 of 4]

My VR Language Tutor

Risks

- Risk 1
  - High latency during “conversation” with NPCs
  - Send smaller payloads, look into more efficient data transfer, and prioritize performance
- Risk 2
  - Rigid and unnatural dialogue from NPCs
  - Effectively prompt LLMs & leverage appropriate models; test to ensure responses are natural
- Risk 3
  - Pronunciation assessment is specific to different accents & locales
  - Provide settings so user can pick which language locale they want to learn and be graded on
- Risk 4
  - Text & conversational expectations might be too difficult for beginning language learners
  - Implement different difficulty settings

MICHIGAN STATE UNIVERSITY

Status Report Presentation

FGL Parser & Renderer

The Capstone Experience

Team Ludus

Abhay Saji
Umut Temel
Nicholas Seals
Isabella Nelsen
David Oh
Zakariya Sattar

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

Team Ludus

Status Report

[1 of 4]

FGL Parser & Renderer

- Sponsor Overview
  - Founded in 2016
  - 3500+ Organizations use Ludus
  - Selling tickets online
- Project Overview
  - Simplify the creation of BOCA tickets
  - By creating a web based editor
  - With reality-accurate rendering
  - And modern IDE features

Team Ludus

Status Report

[2 of 4]

FGL Parser & Renderer

- Server Systems / Software
  - MongoDB Database created but not connected
  - Editing Interface accepts and parses basic commands
  - Rendering surface created but not rendered to
- Development Systems / Software
  - Installed Typescript as a development dependency in our project
  - BOCA Printer supplied by Ludus for testing
  - Actively using the Chevrotain and Monaco Editor libraries in building our application
- Project Plan Document
  - Coded mockup front-end layouts
  - Started prototyping potential final UI layouts
  - 25% Complete

Team Ludus

Status Report

[3 of 4]

FGL Parser & Renderer

- Client Contact
  - We have spoken with our client, and have agreed on a high-level solution to their request.
  - We will meet weekly, Friday at 3:00pm.
- Team Meetings
  - We will meet weekly, Tuesday 8:00pm, and whenever needed.
  - We have met three times to discuss team roles, our high-level plans for the project, and early implementation details.
- Team Organization
  - Isabella – UI Design/Frontend, Some backend
  - Umut – Creation and connection of the backend to the frontend
  - Abhay – Rendering
  - Nicholas – Rendering
  - Zakariya – Parsing
  - David – Parsing

Team Ludus

Status Report [4 of 4]

FGL Parser & Renderer

Risks

- Risk 1 – Calculate/Estimate Render CPU Time
  - We don't know how much CPU time the rendering will take, this will affect our user experience.
  - Start looking at the rendering ASAP and have unit tests. Use benchmark testing. Don't set in stone how often we render/what triggers rendering to make adapting to different render times easier.
- Risk 2 – Building a Lexer To Efficiently Parse FGL
  - We are unsure on how to build an efficient parser/lexer for the FGL language, to convert the FGL language into objects we can work with in our renderer.
  - We plan on studying on how languages like HTML parse their language, and implementing something similar, as FGL is similar.
- Risk 3 – Ensuring that the Rendering Output Matches the Physical Printing Output
  - How are we going to verify that what we render is what is going to be printed by the printer programmatically? Do we want a pixel-perfect rendering, and if so, how do we get that?
  - We plan on printing tickets as an immediate stop-gap, and then further examining previous software renderers and deep-diving more into testing methods as a spike for this project.
- Risk 4 – Working With a Low-Level Language in a High-Level Environment
  - To boost performance, we are considering doing all the rendering in a low-level language (C++, Rust), and connecting this to the high-level environment of the browser
  - We will study how compiling C++/Rust to WebAssembly works and how to integrate this code into the browser.

MICHIGAN STATE UNIVERSITY

Status Report Presentation

ML/AI Pipeline for Condition-Based Maintenance

The Capstone Experience

Team Magna AI4CBM

Michael Gryn

Daniel Chen

Hector Dominguez Rojas

Lizabeth Hanks

Ethan Springer

Athul Syam

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Michigan State University

Fall 2025

From Students…
…to Professionals

Team Magna AI4CBM

Status Report

[1 of 4]

ML/AI Pipeline for Condition-Based Maintenance

- Sponsor Overview
  - Global automotive manufacturing company
  - Manufactures anything from brackets to entire vehicles
  - 164k+ People, 28 Countries, 338 Facilities
- Project Overview
  - This project aims to design, develop, and deploy an end-to-end Machine Learning (ML) pipeline for CBM of industrial machinery, leveraging modern sensor technology and robotics middleware.
  - Frontend dashboard for preventative machine diagnosis
  - Modular implementation for easy scaling

Team Magna AI4CBM

Status Report

[2 of 4]

ML/AI Pipeline for Condition-Based Maintenance

- Server Systems / Software
  - SQLite Database – working with placeholder data
  - Magna Sensors – Not yet received, client gave a rough time of this week
- Development Systems / Software
  - ROS2 System (Humble) – Created initial bridge node to sensors and temperature average every second with incoming data
  - MQTT (Mosquitto) – Implemented script with dummy data to simulate sensors
  - PyTorch (ML Model) – created simple SAMIRA model for predictive failure
- Project Plan Document
  - Started on Thursday, 9/4
  - Technical section is the most developed
  - 15% Complete

Team Magna AI4CBM

Status Report

[3 of 4]

ML/AI Pipeline for Condition-Based Maintenance

- Client Contact
  - Talked to twice, communicating through email
  - Meetings on Fridays at 1:00 PM
- Team Meetings
  - Met 5 times so far
  - Meet together after class on Tuesdays and Thursdays as well as discussions after client meetings
- Team Organization
  - Client mandates rotating roles for frontend, pipeline, and modelling
  - Daniel – sensor data pipeline
  - Michael, Athul – Data preprocessing
  - Liz, Ethan – Model investigation
  - Hector – Initial UI

Team Magna AI4CBM

Status Report

[4 of 4]

ML/AI Pipeline for Condition-Based Maintenance

Risks

- Risk 1
  - How to get sufficient amount of self-obtained training data
  - Contact labs on campus, worst case online data
- Risk 2
  - Creating a model that can predict in advance when the machine will fail
  - Extension research and prototyping ML models with predictive capabilities to forecast failure
- Risk 3
  - Database may not handle multiple high speed writes and its storage size
  - Have database overwrite oldest sensor data
- Risk 4
  - Data pipeline cannot deliver statistical analysis of sensor data in a timely manner to the model and begins to fall behind
  - Test upper limit of data flowrate to stress test system to get ahead of potential problems

MICHIGAN STATE UNIVERSITY

Status Report Presentation

LLM 3D Model Interpretation & Decomposition

The Capstone Experience

Team Magna LLM3DMID

Ankit Mudunuri
Achint Nagra
Andrew Nguyen
Saatvik Palli
Noah Patenaude
Jathin Mahendra Sabbineni

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Fall 2025

From Students…
…to Professionals

Team Magna LLM3DMID

Status Report

[1 of 4]

LLM 3D Model Interpretation & Decomposition

- Sponsor Overview
  - Founded in Aurora, Ontario. One of the world's largest automative suppliers.
  - Designs and manufactures a wide range of vehicle systems – Powertrain, Electronics, Seating, Exteriors, Vehicle Assembly.
  - Focuses on future automative systems investing in electric vehicles, autonomous driving, and ADAS
- Project Overview
  - Design a holistic comparison tool for 2 variants of a car part. Comparing materials, geometry characteristics, etc.
  - Decomposition of parts to obtain, store, and describe metadata by understanding the points of similarity and differences.
  - Use a geometric deep neural network to embed parts as vectors and measure similarity with cosine distance
  - Creating a Semantic search through a web interface to help query through part characteristics.

Team Magna LLM3DMID

Status Report

[2 of 4]

LLM 3D Model Interpretation & Decomposition

- Server Systems / Software
  - We have Gitlab set up, and python working on all the machines.
  - We have Neo4j server running using docker.
  - We have downloaded the 10K model dataset for training/usage.
- Development Systems / Software
  - We have the basic front end website template running to select and view the model.
  - We have generated model point cloud so it can be used for model similarity.
  - We have tested cosine similarity for multiple models which would be used to find model similarity.
- Project Plan Document
  - We have made rough tech stack diagram and the workflow for each part of the application.
  - We have created a document for the project plan and made a basic outline of multiple sections.
  - 10% Complete

Team Magna LLM3DMID

Status Report

[3 of 4]

LLM 3D Model Interpretation & Decomposition

- Client Contact
  - We have met 3 times.
  - Weekly meeting Tuesday, 9am.
- Team Meetings
  - We have met together 4 times.
  - Weekly meetings on Wednesdays at 6pm and Sundays at 10am.
- Team Organization
  - Model Embedding (Ankit), Metadata generation (Saatvik), Neo4j (Noah)
  - Frontend Website (Andrew), Backend Flask 1 (Jathin), Neo4j Backend Flask, ETL(Achint)

Team Magna LLM3DMID

Status Report

[4 of 4]

LLM 3D Model Interpretation & Decomposition

Risks

- Semantic Search
  - We need to understand the “intent” of the user when they search for a specific model and streamline all different types of words that have the same meaning
  - We will be able to use agentic model to tag the data set to see the similarity.
- Embedding Model
  - We need to have a model that has good enough accuracy to find similarities distinct models.
  - We can train an LLM that can find similarities between model.
- Model Normalization
  - There are different sizes of the same models in the dataset. To compare and display, we need to normalize all the model for better view and working.
  - We will extract metadata from the model and scale appropriately.
- Metadata Labeling
  - We need to find a way to label all the models in the data set so semantic search can use it.
  - We can run an LLM and a defined set of all relevant words to label.

MICHIGAN STATE UNIVERSITY

Status Report Presentation

VR Human-AI Multimodal Interaction

The Capstone Experience

Team Magna VRAI4MI

Mohammed Alanizy
Ryan Bolin
John Hidalgo
Preston Korytkowski
Aditya Menon
Ashish Pasula

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Michigan State University

Fall 2025

From Students…
…to Professionals

Team Magna VRAI4MI

Status Report

[1 of 4]

VR Human-AI Multimodal Interaction

- Sponsor Overview
  - World's largest automotive supplier
  - Specialize in vehicle systems and deep manufacturing
  - Design/supply high-tech kits for vehicles
- Project Overview
  - 3D interface (CAD) to interact with AI models
  - Simulate part construction, material testing
  - Accessible human machine interaction
  - Workflow to reduce design/build time

Team Magna VRAI4MI

Status Report [2 of 4]

VR Human-AI Multimodal Interaction

- Server Systems / Software
  - AzureAI; Three Accounts created with credits added
  - NextJS Server; Dev server created and tested on localhost
  - OpenAI imported into our program, and keys/connection with API established for all group members
- Development Systems / Software
  - Unity; All team members installed and running
  - NodeJS; All team members installed and running
  - FreeCAD; All members installed, basic model created
- Project Plan Document
  - Document template created;
  - Two mockups created
  - 40% Completed

Team Magna VRAI4MI

Status Report

[3 of 4]

VR Human-AI Multimodal Interaction

- Client Contact
  - Met 3 times, weekly meeting scheduled Monday morning
  - In Austria, attempting to meet in person in 2 weeks
- Team Meetings
  - Met 6 times both online and in-person
  - Meetings Wednesdays @ 6:00pm, hands-on after class
- Team Organization
  - Front-End Dev: Mohammed, John
  - Back-End Dev: Ryan, Preston
  - Agentic Dev: Aditya, Ashish

Team Magna VRAI4MI

Status Report

[4 of 4]

VR Human-AI Multimodal Interaction

Risks

- How can we simulate model changes in realtime?
  - After requesting an alteration, how can we edit the model, and produce an updated one without an extended delay?
  - Can we keep object properties on hand, so that updates can happen quickly and on the fly? Data gets continuously fed into our AI model.
- How can we handle different kinds of gestures/voice prompts?
  - Countless unclear gestures and voice prompts. How do we handle them?
  - Limit the number of gestures and generalize voice commands.
- How can we maintain high performance in VR?
  - How can we keep VR user experience comfortable while simulating complex models?
  - Utilize external servers to handle processing load.
- How will we retrieve and store data of object properties?
  - What kind of storage is ideal for our data? How do we get the necessary data for the object simulation?
  - If existing DB, request access. Otherwise request data set from Magna.

MICHIGAN STATE UNIVERSITY

Status Report Presentation

Intelligent Network Security for High-Risk Traffic

The Capstone Experience

Team McKesson

Aneesh Kapole
Dev Khakhar
Karena Lam
Aisha Latif
Divya Nadella
Conner O'Sullivan

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

Team McKesson

Status Report

[1 of 4]

Intelligent Network Security for High-Risk Traffic

- Sponsor Overview
  - Fortune 10 pharmaceutical distributors and healthcare IT company
  - Played a role in distributing vaccines during Covid 19
  - Headquarter in Irving, Texas with operations across US and internationally
- Project Overview
  - Help manage firewall rules for high-risk access
  - Business/Technology owners will be managing and attesting to firewall rules
  - Interactions with web-based application to assess risk, allocate ownership, track compliance, and monitor usage
  - Overall, provide an easier, more organized firewall management system that will strengthen security internally

Team McKesson

Status Report

[2 of 4]

Intelligent Network Security for High-Risk Traffic

- Server Systems / Software
  - PostgreSQL web instance made on supabase
  - SQL table tested for CRUD operations, RLS policy made
  - Flask setup and running locally
- Development Systems / Software
  - SMTP notification prototype made and tested
  - React frontend integrated with Flask backend
  - REST API for adding/pulling data to/from PostgreSQL
- Project Plan Document
  - Outline has been made, tasks assigned for individual sections
  - System architecture diagram made
  - 5% Complete

Team McKesson

Status Report

[3 of 4]

Intelligent Network Security for High-Risk Traffic

- Client Contact
  - Met 2 times
  - Weekly meetings over teams on Fridays from 1pm-2pm
  - Potential extra meeting on Tuesdays to discuss firewall rules and updates (time TBD)
- Team Meetings
  - Met 4 times
  - Weekly meetings in person on Tuesdays and Thursdays from 4:20pm-5:20pm
- Team Organization
  - Project Managers: Aneesh and Karena, Product Managers: Dev and Divya, Team Leads: Aisha and Conner
  - Backend: everyone; Front end: Aisha, Dev, and Divya; Power BI: Aisha and Divya; Database: Aneesh, Conner, and Karena

Team McKesson

Status Report [4 of 4]

Intelligent Network Security for High-Risk Traffic

Risks

- Risk 1
  - Integrating PowerBI into our web application
    - Prototype a PowerBI dashboard on a localhost web-server with sample data
- Risk 2
  - Processing large files of data and having it affect performance
    - Utilize indexes and data-structures to optimally store and query data
- Risk 3
  - Display differentiation for business vs technology owners
    - Implement role-based login with a simplified PowerBI view for “business owners”
- Risk 4
  - How to properly weigh different risks/vulnerabilities for the Risk Engine
    - Consult with sponsor to get more detailed attributes for the risk engine to better suit their needs

MICHIGAN STATE UNIVERSITY

Status Report Presentation

Environmental Awareness with BeBot

The Capstone Experience

Team Meijer

Connor Fischetti
Christian Montgomery
Elliott Olivero
Tess Martin
Matt Willemin
Marcus Cohen

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

Team Meijer

Status Report

[1 of 4]

Environmental Awareness with BeBot

- Sponsor Overview
  - Major supermarket chain
  - Midwest focused
  - Environmental clean up efforts around MI beaches
- Project Overview
  - Increase public awareness of Meijer's environmental efforts
    - Provide educational modules about pollution, aquatic ecosystems, etc.
    - Create visual dashboards and statistics for the BeBots
  - Provide volunteers and corporate sponsors ways to get involved

Team Meijer

Status Report

[2 of 4]

Environmental Awareness with BeBot

- Server Systems / Software
  - We are configuring “Custom Vision” computer vision software to identify types of trash from images
- Development Systems / Software
  - Everyone has installed IntelliJ/Java
  - Everyone has accessed Azure
  - React installed, project has been created and running locally
- Project Plan Document
  - We have assigned all parts to team members
  - We have begun working on our individual sections
  - 10% Complete

Team Meijer

Status Report

[3 of 4]

Environmental Awareness with BeBot

- Client Contact
  - Met on Thursday 8/28
  - Meeting set up every Friday
- Team Meetings
  - Met online 8/26 in person 8/28
  - Meet in person after class and after client meetings
- Team Organization
  - Christian, Connor, Marcus - Backend (Comp Vision, Azure SQL)
  - Matt, Tess, Elliot - Frontend (React, React Native)

Team Meijer

Status Report

[4 of 4]

Environmental Awareness with BeBot

Risks

- Reliably integrating Computer Vision AI into our systems
  - Data output consistency/unknown output formats
  - Weeding out false positives and negatives with predictor AI
- Securing Private Information
  - How to store PPI data and call it securely
  - Learn Meijer's security standards/methods for their sensitive data
- Deploying Web app on Azure
  - Deploy React and React Native implementations on Azure's server
  - Use Azure's docs to standardize our code for proper deployment
- UI for real time graph and statistics
  - Real time graph updates with MS PowerBI
  - Schedule updates/looking into "Cron Jobs"

MICHIGAN STATE UNIVERSITY

Status Report Presentation

Remote Interface for Small-Scale Autonomous Race Cars

The Capstone Experience

Team Michigan State University CSE

Patrick Hogan
Ali Abboodi
Daphne Martin
Skanda Vijaykumar
Christian Wilkins
Zach Estepp

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

Team MSU CSE

Status Report

[1 of 4]

Remote Interface for Small-Scale Autonomous Race Cars

- Sponsor Overview
  - Michigan State University – CSE Department
  - MSU – PoliMOVE
    - Won Indy Autonomous Challenge in 2024
- Project Overview
  - Small-scale Model Car
  - Decrease risk of full-scale crash and high costs associated
  - Gathering Sensor Data, Caching Maps
  - Reworking the front end web app

Team MSU CSE

Status Report

[2 of 4]

Remote Interface for Small-Scale Autonomous Race Cars

- Server Systems / Software
  - None
- Development Systems / Software
  - ROS2: Installed and we are currently learning
  - React for frontend: Installed and Tested
  - Flask for backend: Set up from previous team
- Project Plan Document
  - We have an outline
  - We will begin creating mock-ups soon
  - 15% Complete

Team MSU CSE

Status Report

[3 of 4]

Remote Interface for Small-Scale Autonomous Race Cars

- Client Contact
  - Friday 2:00-3:00
  - Medium Varies
- Team Meetings
  - Tues 4:20-5:20
  - We have met 4 times so far
- Team Organization
  - Front End: Skanda, Ali
  - Back End: Daphne, Christian, Patrick, Zach

Team MSU CSE

Status Report

[4 of 4]

Remote Interface for Small-Scale Autonomous Race Cars

Risks

- Risk 1 – Caching Maps
  - Accessing map data offline
  - Mitigation: Store map data locally
- Risk 2 – Running 2 cars at once
  - Need to figure out how to run 2 cars at once
  - Mitigation: Communicate with both cars in 2 separate instances
- Risk 3 – Working off a previous team's codebase
  - We are inheriting a previous teams codebase
  - Mitigation: Documenting code, running and testing
- Risk 4 – Hardware is not functional
  - We are unable to get the board to power on
  - Mitigation: Obtain functional hardware or diagnose issues with current board

MICHIGAN STATE UNIVERSITY

Status Report Presentation

Citing Slavery Data Presentation

The Capstone Experience

Team Michigan State University Law

Daniel Loudon
Joshua Patrick
Wyat Soule
Yuxuan Li
Kadin Eastway
Ken Pham

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

Team Michigan State University Law

Status Report

[1 of 4]

Citing Slavery Data Presentation

- Sponsor Overview
  - MSU College of Law – a global leader in legal education
  - Professor Justin Simard – project creator and organizer
  - Lindsey Simard and Cisco Meraki's engineering team
- Project Overview
  - Streamline research by making historic slavery data accessible
  - Used by researchers, family historians, and educators
  - Used as a reliable source for historical US slavery case data

Team Michigan State University Law

Status Report [2 of 4]

Citing Slavery Data Presentation

- Server Systems / Software
  - Existing website hosted on Heroku
  - Creating developer environment using Railway
- Development Systems / Software
  - Ruby on Rails installed and works on all machines
  - SvelteKit installed and works on all machines
  - PostgreSQL installed, databases created and running locally
- Project Plan Document
  - Assigned sections to each person
  - Began creating the Figma mockups to present to the client
  - 50% Complete

Team Michigan State University Law

Status Report

[3 of 4]

Citing Slavery Data Presentation

- Client Contact
  - Met with client twice virtually
  - Weekly Zoom meeting on Wednesdays 4:15 PM
- Team Meetings
  - Already met 6 times
  - Twice a week in-person 4:30 PM Tuesdays & Thursdays
- Team Organization
  - Backend: Daniel, Ken, Wyat
  - Frontend: Joshua, Kadin, Yuxuan

Team Michigan State University Law

Status Report

[4 of 4]

Citing Slavery Data Presentation

Risks

- Authentication
  - Authentication is intertwined with Ruby on Rails, need to migrate to Svelte
  - Proxy on /admin/url, convert devise to devise-jwt
- Data Validation
  - Making sure thousands of cited cases are valid
  - Utilizing EyeCite, CourtListener API, understanding how court cases work
- Balancing Cost and Performance
  - Improving the website's functionalities while reducing the cost
  - Migrating hosting providers from Heroku to Railway
- Data Authenticity
  - Authenticate that the summaries for the cases are reliable and verifiable enough for production
  - Use a system that will only properly approve sources that follow a strict algorithm

MICHIGAN STATE UNIVERSITY

Status Report Presentation

AI-Powered Financial Wellness Coach

The Capstone Experience

Team MSUFCU

Alexander Goluska
Anuj Jadhav
Bruno Budelmann
Grant Perlmuter
Rion Ando
Ronith Arum

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

Team MSUFCU

Status Report

AI-Powered Financial Wellness Coach

- Sponsor Overview
  - MSU Federal Credit Union is the credit union for the Michigan State University community, founded in 1937 in East Lansing, and it is the world's largest university-based credit union.
  - MSUFCU has over 300,000 members worldwide, in which they deliver modern digital banking and branch services for both local students and residents as well as world-wide.
- Project Overview
  - Build an interactive AI financial wellness coach prototype for MSUFCU's web/mobile banking app.
  - Help MSUFCU members, especially students and young professionals, to budget, analyze, and track monetary goals.
  - Chat with an in-app AI coach in web and mobile banking for budgeting insights, alerts, and one-tap actions.

Team MSUFCU

Status Report

[2 of 4]

AI-Powered Financial Wellness Coach

- Server Systems / Software
  - Database: PostGreSQL, starter database running
  - Middleware: MCP Server, starter server
  - Financial Wellness Coach API: FastAPI, starter code that can run locally
- Development Systems / Software
  - Frontend: React, in Development
  - LLM Agent: OpenAI, Early Functional Prototype
- Project Plan Document
  - Finished framework and started filling in information for project plan document
  - Each section assigned and being worked on concurrently for consistency
  - 40% Complete

Team MSUFCU

Status Report

[3 of 4]

AI-Powered Financial Wellness Coach

- Client Contact
  - Weekly Meetings: Wednesdays, 2:30PM - 3:30PM
  - Met twice with client, established client connections and more detailed project specifications
- Team Meetings
  - Weekly Meetings: Tuesdays, 2:00PM - 2:50PM
  - Met five times as a team
- Team Organization
  - Frontend (React, OAuth, etc.): Anuj, Bruno
  - Backend (Agent, MCP, APIs...): Alexander, Grant, Rion, Ronith

Team MSUFCU

Status Report

[4 of 4]

AI-Powered Financial Wellness Coach

Risks

- Building out an MCP Server
  - Model Context Protocol servers allow an LLM Agent to query information securely, and they require distinct interactions between different layers of functionality.
  - We are looking into Firebase as service for the MCP Server.
- Create a mobile-compatible front-end web-application interface
  - We need a user-interface for users to interact with and connect to the LLM Agent that can also work on mobile.
  - We are building a basic “Hello World!” application for the interface.
- Develop AI Agent for Natural Language Processing
  - We need the implementation for the agent-based LLM that properly can create appropriate responses and financial advice.
  - We are researching different LLM services and determining which would be most appropriate and how to work with them.
- Populate SQL database with mock financial information
  - We need to create a database and determine how mock data would be structured.
  - MSUFCU Team suggested creating generic mock data as we advance in development.

MICHIGAN STATE UNIVERSITY

Status Report Presentation
Weather Monitoring and Impact Assessment

The Capstone Experience

Team NetJets

Jeet Jhaveri
Joseph Robertson
Imad Nasser
Sai Morusupalli
Omar Almazrouei
Raj Ambekar

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

Team NetJets

Status Report

[1 of 4]

Weather Monitoring and Impact Assessment

- Sponsor Overview
  - Founded in 1964. Created fractional jet ownership
  - Largest private jet fleet in the world
  - Customers buy shares of, flight time, or even entire jets
- Project Overview
  - Increase airline efficiency
  - By monitoring weather conditions through web app
  - Create historical weather database

Team NetJets

Status Report

[2 of 4]

Weather Monitoring and Impact Assessment

- Server Systems / Software
  - AWS: Bought service and deploy dummy site
  - Database: Testing DynamoDB, SQL
  - API's: Baron Weather API for Aviation
    AWC Weather Center by NOAA
- Development Systems / Software
  - Front-end: React, JS, CSS, etc…
  - Open-Source API's for receiving weather data
  - Third-Party plugins for interactive map and data visualization
- Project Plan Document
  - UX designs being created with Figma
  - Document has outline. Waiting on sponsor response for specifics
  - 0.5%

Team NetJets

Status Report

[3 of 4]

Weather Monitoring and Impact Assessment

- Client Contact
  - Met once on Friday 08/29
  - Waiting on sponsor to set up weekly meetings
- Team Meetings
  - Met 6 times
  - Meetings: T/Th 4:20-4:50pm
- Team Organization
  - Front-end: Sai (Visualizing API data, GUI), Imad (Site structure)
  - Back-end/Database: Joseph (Creating database using SQL), Raj (Data management)
  - UI/Security: Jeet (Creating secure login), Omar (Interactable elements ex. Buttons)

Team NetJets

Status Report

[4 of 4]

Weather Monitoring and Impact Assessment

Risks

- Risk 1
  - Security risks on the backend
  - Create login page (created dummy page) with error checking
- Risk 2
  - Software performance engineering
  - Researching WebSockets and filtering data
- Risk 3
  - Data Accuracy
  - Careful source selection and cross-checking data
- Risk 4
  - Scalability
  - Using AWS (as requested) and modulating project

MICHIGAN STATE UNIVERSITY

Status Report Presentation

AI Services & Vendor Navigator

The Capstone Experience

Team PACE

Ryan Aljaari
Serena Brown
Arnav Deol
Shuja Husain
Kunal Kale
Ivy Nguyen

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

Team PACE

Status Report

[1 of 4]

AI Services & Vendor Navigator

- Sponsor Overview
  - A program of all-inclusive care for the elderly in Michigan
  - Includes medical and specialty services for participants from their home and in the PACE centers
  - Coordinates services provided from outside vendors or facilities
- Project Overview
  - Assist personal care by providing vendor information with structured filters through a mobile and web application
  - Chatbot to inquire relevant information from the database
  - Admin dashboard to allow internal administrators to upload, edit or remove vendor entries manually or by uploading files

Team PACE

Status Report

[2 of 4]

AI Services & Vendor Navigator

- Server Systems / Software
  - We have set up Docker with React Native Expo and Flask app
  - Sponsor is building a server to access and use PACE documents
  - PACE is hosting the web app and database on that server
- Development Systems / Software
  - We are using React Native and have a basic running app
  - We have a PostgreSQL database set up with Flask
  - Dockerized hosting for the web app and database
- Project Plan Document
  - The project plan functional specifications and mockups are complete as well as technical specifications rough draft
  - 15% complete

Team PACE

Status Report

[3 of 4]

AI Services & Vendor Navigator

- Client Contact
  - First meeting with our client was on 8/28
  - Weekly conference call every Wednesday
- Team Meetings
  - Our team has met 7 times so far
  - Weekly in-person meeting Tuesday and Thursday after class
- Team Organization
  - Arnav and Ryan working on database (schema/data ingestion)
  - Kunal and Ivy working on AI/NLP integration
  - Shuja and Serena working on React component development

Team PACE

Status Report

[4 of 4]

AI Services and Vendor Navigator

Risks

- Cross-Platform Development
  - Using React Native for IOS and web introduce challenges like security, compatibility and debugging, and third-party library dependency
  - Implement error tracking to catch and debug cross platform bugs early
- Data Quality Issues
  - Data is scattered, duplicated or missing and vendor info can change
  - Build data validation layer before inserting into the database
- NLP Layer Misinterpretation
  - The NLP layer (OpenAI) could misinterpret queries or hallucinate answers
  - Use guardrails to limit scope of queries and intent validation
- Authentication Dependency
  - Authentication uses Henry Ford servers which we don’t have access to
  - Work with IT team to establish formal integration agreement

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Status Report Presentation

Clean and Sterilized Instrumentation

The Capstone Experience

Stryker IST

Suhas Rao Cheeti
Benjamin Eyke
Noah Vermeulen
Lee Sullivan
Jerry Chen
Ismail Abdi

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Fall 2025

From Students…
…to Professionals

Team Stryker IST

Status Report

[1 of 4]

Clean and Sterilized Instrumentation

- Sponsor Overview
  - Stryker is a global leader in medical technologies
  - Offer products and services in MedSurg, Neurotechnology and Orthopaedics
  - Driven to make healthcare better
- Project Overview
  - Problem: Surgical equipment does not always get fully clean during the sterilization process
  - Solution: Check that surgical equipment is cleaned, unbroken and packed properly
  - Audience: SPD Tech and Leaders, OR Leaders

Team Stryker IST

Status Report

[2 of 4]

Clean and Sterilized Instrumentation

- Server Systems / Software
  - GitLab repository has been set up, instructors and client have been invited
  - Virtual Machines set up on both iMacs and downloaded Office 365
  - Researching cloud-based PostgreSQL server options
- Development Systems / Software
  - React Native environment set up
  - VScode and Pycharm IDE setup
  - Python FastAPI will be used for the backend
  - Tested AI training/models on JupyterHub
- Project Plan Document
  - Basic skeleton/draft document made
  - Executive Summary Written, and Functional Specification Started
  - 25% Complete

Team Stryker IST

Status Report

[3 of 4]

Clean and Sterilized Instrumentation

- Client Contact
  - Scheduled weekly conference calls on Friday with client
  - Met with client twice on Microsoft Teams
- Team Meetings
  - Scheduled team meetings twice a week on Tuesday and Friday
  - Met with the team 4 times in person
- Team Organization
  - AI/ML trainer (Suhas, Lee)
  - Frontend UI/UX (Ismail, Suhas)
  - Backend (Noah)
  - Database management (Jerry)
  - Camera/Computer Vision (Benjamin)

Team Stryker IST

Status Report [4 of 4]

Clean and Sterilized Instrumentation

Risks

- Computer Vision Risk
  - Tracking tools and checking what state they are in through video
  - Research online libraries and similar programs, review prior Stryker capstones
- AI/ML Risk
  - Train an AI to check if a surgical tool is clean, unbroken and packed correctly
  - Research AI training models, break up into possibly separate AI's
- SPD Environment Risk
  - Each SPD (sterile processing department) within a hospital has different environmental factors and layouts.
  - Model needs to be trained in different light, time, and other environmental conditions with different room layouts
- Quantitative Results Tracking
  - Stryker would like results of time and money saved to be displayed to users
  - Learn the typical costs (workforce, man-hours, energy) for different procedures, and the time it takes to replace tools that are not sufficiently sanitized

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Status Report Presentation

Insight Weaver AI (IWAI)

The Capstone Experience

Team TechSmith

Trevor Burkis
Tuan Hua
Naod Ghebredngl
Hama Pashazadeh
Martin Sattam
Ky Vu

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From Students…
…to Professionals

Team TechSmith

Status Report

[1 of 4]

Insight Weaver AI (IWAI)

- Sponsor Overview
  - Video/Photo editing software company
  - Based in East Lansing, MI. ~350 employees
  - Software Snagit is used by many Fortune 500 companies
- Project Overview
  - Video editing software requires extreme skill and knowledge
  - Users of any skill level can create videos with simple AI tool
  - Upload clips and receive 3 cohesive AI edited videos
  - Users can further refine video using AI chat & quick actions

Team TechSmith

Status Report

[2 of 4]

Insight Weaver AI (IWAI)

- Server Systems / Software
  - GitHub repo up and accessed by everyone
  - Microsoft Azure instance created and accessible by team
  - Lab iMacs virtual machines ready to go
- Development Systems / Software
  - React project created with various endpoints
  - Tailwind installed across entire project
  - Typescript integrated as backend language and functional
- Project Plan Document
  - First drafts of screen mockups finished and approved
  - System architecture discussed with client and greenlit
  - 20% Complete

Team TechSmith

Status Report

[3 of 4]

Insight Weaver AI (IWAI)

- Client Contact
  - Met with client twice over Zoom and Slack
  - Established weekly Slack huddles on Fridays @ 1:30pm
- Team Meetings
  - Team met in-person discord 8 times
  - Scheduled meets Mon,Wed 6-8,Tu,Thu 4:30-7, Fri 12-3
- Team Organization
  - Azure: Hama, Martin, Trevor
  - UI/Local: Naod, Tuan, Ky
  - AI: Everyone after initial tasks complete

Team TechSmith

Status Report

[4 of 4]

Insight Weaver AI (IWAI)

Risks

- Creating Agentic AI
  - Team has no experience creating Agentic AIs. Needed for video creation
  - Hama taking charge of AI research and taking CSE 491 (Agentic AI)
- Using Microsoft Azure
  - Unsure of interaction between local and cloud processing in Azure
  - Trevor researching Azure authentication, video indexer and storage
- User uploaded videos across different OS
  - How to handle video files incoming from different OS and file types
  - Rapid MVP development on different devices
- Controlling FFmpeg with AI
  - Need AI to translate editing choices to FFmpeg commands
  - Testing out with example videos and basic commands with manual input

MICHIGAN STATE UNIVERSITY

Status Report Presentation

VR Railyard Safety Risk Identification

The Capstone Experience

Team Union Pacific

Timothy Alcorn
Antonio Capozzoli
Brayden Goff
Cameron Otton
Vivek Revankar
Will Schmidtfranz

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From Students…
…to Professionals

Team Union Pacific

Status Report

[1 of 4]

VR Railyard Safety Risk Identification

- Sponsor Overview
  - Union Pacific is a Class I freight hauling railroad company
  - They are the largest US railroad by revenue
  - Union Pacific also develops software tools for the entire railroad industry
- Project Overview
  - Create VR training software to avoid real world accidents
  - Train railyard workers to identify trains ‘in the foul’
  - Workers will use the software to learn before working with real equipment

Team Union Pacific

Status Report

[2 of 4]

VR Railyard Safety Risk Identification

- Meta Quest 3 / Hardware
  - The team has acquired and set up 2 VR kits for development
  - Arrangements made to ensure each team member has access to the kits for development
  - Windows computer for VR development in the lab
- Unity / Software
  - Every team member has installed and used unity
  - Every member has built functioning prototypes in engine
  - The team has created an initial scene and player controller
- Project Plan Document
  - Sections have been assigned to each team member
  - Partial draft of the document is in place, writing is in progress
  - 50% Complete

Team Union Pacific

Status Report

[3 of 4]

VR Railyard Safety Risk Identification

- Client Contact
  - Met twice, including in-person
  - Set up weekly meetings Thursdays at 1pm
- Team Meetings
  - Meet after every class
  - Discord communication for short notice meetings
- Team Organization
  - Environment: Cameron, Vivek, Brayden
  - Systems: Timothy, Antonio, Will

Team Union Pacific

Status Report

[4 of 4]

VR Railyard Safety Risk Identification

Risks

- Creating a comfortable VR experience
  - Make sure the simulator is not nauseating for inexperienced users
  - Play test within and outside the team
- Creating a realistic VR world
  - The VR visuals need to be accurate to the real-life environment
  - The team is looking to obtain assets from sponsor and outside sources
- Incomplete specifications from sponsor
  - We do not have full requirements from our sponsor as the user experience will go through many tweaks/iterations
  - Provide steady development progress and builds to sponsor to gather more feedback in shorter time
- Synchronize the train's movement, audio, and animations
  - Making the train and cars feel realistic requires multiple systems to work together
  - Researching animation controller and events-based systems

MICHIGAN STATE UNIVERSITY

Status Report Presentation

Generating Mapping Insights Using AI

The Capstone Experience

Team Urban Science

Abdulrahman Almazrouei
Anas Shaaban
Gabe McGuire
Harjap Khabra
Julia Mawi
Steven Spencer

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Michigan State University

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From Students…
…to Professionals

Team Urban Science

Status Report

[1 of 4]

Generating Mapping Insights Using AI

- Sponsor Overview
  - An automotive consulting & data analytics firm
  - Provides data-driven solutions to enhance sales
  - Helps dealers analyze their marketing performance

- Project Overview
  - Develop an interactive mapping application that displays KPIs
  - Allows users to plot and relocate dealership markers
  - LLM guidance to summarize market dynamics & legal risks
  - Used by OEM planners & dealers

Team Urban Science

Status Report

[2 of 4]

Generating Mapping Insights Using AI

- Server Systems / Software
  - Connected MS SQL database to backend
  - Initialized .NET Web API backend
  - Successfully called Azure AI Foundry Agent Service
- Development Systems / Software
  - Initialized Angular CLI and NodeJS
  - Set up Mapbox connection to the UI
  - Containerized development with Docker
- Project Plan Document
  - Started skeleton layout
  - Working on project overview
  - 10% Complete

Team Urban Science

Status Report

[3 of 4]

Generating Mapping Insights Using AI

- Client Contact
  - Met with client twice
  - Recurring meetings on Thursday's
- Team Meetings
  - Met five times – constant contact through Teams
  - Meet twice weekly
- Team Organization
  - Frontend: Steven, Anas
  - Backend/Database: Harjap, Gabe, Julia, Abdulrahman

Team Urban Science

Status Report

[4 of 4]

Generating Mapping Insights Using AI

Risks

- Risk 1
  - LLM finding reliable/trustable legal guidance
  - Prompting techniques/database of legal documents/RAG
- Risk 2
  - Too many graphical units (performance)
  - Caching/Viewport filtering/spatial server-side Indexes
- Risk 3
  - Context size limitations for LLM
  - Using LangChain to summarize prompts for the LLM
- Risk 4
  - Air distance reliability and accuracy with population data
  - Ensuring robust datasets and efficient processing and querying

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Status Report Presentation

Team UWM Status Report

The Capstone Experience

Team UWM

Evan Gasper
Nick Vu
Jon Price
Yevgenia Minchuk
Prabhaav Ravikumar Pillai

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From Students…
…to Professionals

Team UWM

Status Report

[1 of 4]

Team UWM Status Report

- Sponsor Overview
  - Largest wholesale mortgage lender in the nation founded in 1986
  - Known for making the “mortgage process better for independent mortgage brokers, homebuyers, and real estate agent alike.”
  - Over 7,000 employees and nearly a 2 million square foot campus
  - Headquartered in Pontiac, Michigan
- Project Overview
  - Modernize the IT Goals Dashboard
  - Overhaul the frontend UI and update the backend database
  - UWM currently uses an Excel spreadsheet
    - UWM IT team members use to track goals progress

Team UWM

Status Report

[2 of 4]

Team UWM Status Report

- Server Systems / Software
  - Port – Pushed a change to INT servers. Up, tested, and running
  - Azure SQL – Database service. Needs implementation
- Development Systems / Software
  - Docker Desktop – Up, tested, and running
  - VSC & VS – Up, tested, and running
  - Jira, Bitbucket, Git – Up, tested, finished sample tickets
  - Swagger UI – Up and needs implementation. Waiting on database.
- Project Plan Document
  - Started 9/7/25
  - Added Risks, Company Description, started System Architecture Diagram, and Functional Specifications
  - 10% Complete

Team UWM

Status Report

[3 of 4]

Team UWM Status Report

- Client Contact
  - Met with Jenni Sproul on UWM campus on 9/3/25
  - Weekly meeting with Jenni on Tuesdays after capstone meeting
- Team Meetings
  - Going to go to UWM as a team on Fridays
  - Met in person 4 times as a group
- Team Organization
  - Team meetings after Jenni check-in & weekly trip on Friday
  - Evan & Nick – Frontend – Rebuilding Widgets, attach to the API
  - Prabhaav, Jon & Yevgenia – Backend – Get SQL Database Up & Add Data
  - Jon – Team Lead (Rotates Bi-weekly) – Oversee Team Progress

Team UWM

Status Report

[4 of 4]

Team UWM Status Report

Risks

- UWM Proprietary Packages and Software Restrictions
  - All development needs to occur on the UWM laptops, which also includes plugin and tool compliance policies.
  - Use UWM tools and ask for approval from DevOps team which may take time.
- Frontend must be built and tested without backend database.
  - We are given a codebase that utilizes a SQL database, that is not yet connected.
  - Carefully detach the broken UWM provided backend API from the frontend without breaking the code, replacing it with dummy data.
- Handling an already existing codebase such that we must ensure existing features remain working.
  - As an example, our codebase includes data migrations that must remain functional when we make a new database.
  - Include more frequent test cases and get more familiar with the codebase, including making UML diagram.
- User inputting potentially invalid data into the SQL Database
  - We are asking the user to create a goal widget on the website, this means users will be able to enter things like emojis, bullet points, etc.
  - Extensive error checking and edge case handling.

MICHIGAN STATE UNIVERSITY

Status Report Presentation

Packet Forge: AI Network Protocol Engine

The Capstone Experience

Team Vectra AI

Samuel Barnhart
Nihar Bollareddy
Sean Finkel
Yeji Lee
Kaajal Shah
Aanshik Upadhyay

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Fall 2025

From Students…
…to Professionals

Team Vectra AI

Status Report

[1 of 4]

Packet Forge: AI Network Protocol Engine

- Sponsor Overview
  - Cybersecurity company headquartered in San Jose
  - Utilizes AI for detection, inestigation, and response solutions
  - Brad Woodberg and Campbell Robertson
- Project Overview
  - Utilize AI to generate packet captures
  - Manual PCAP generation takes too much time and effort
  - Used by data scientists at Vectra
  - Will be used to test parsers, train models, and validate detection logic

Team Vectra AI

Status Report

[2 of 4]

Packet Forge: AI Network Protocol Engine

- Server Systems / Software
  - Local SQLite seeded for protocol definitions
  - SQLite server has been created
- Development Systems / Software
  - Environment setup complete
  - Began implementation of extraction pipeline
  - Web scraper implemented
- Project Plan Document
  - Started work
  - Made an outline and began smaller sections
  - 20% Complete

Team Vectra AI

Status Report

[3 of 4]

Packet Forge: AI Network Protocol Engine

- Client Contact
  - Held two meetings with contacts through Microsoft Teams
  - Weekly meeting Friday at 12:30 pm
- Team Meetings
  - Team has met twice
  - Weekly meeting Monday at 2 pm
- Team Organization
  - Sean, Kaajal, and Nihar are working on RFC parsing and AI integration
  - Sam and Yeji are working on RFC scraping. Aanshik is completing the database

Team Vectra AI

Status Report

[4 of 4]

Packet Forge: AI Network Protocol Engine

Risks

- Risk 1
  - Filtering the correct RFCs
  - Cross-validate results with Wireshark and create a list for at least one protocol to benchmark accuracy
- Risk 2
  - LLM integration
  - Secure API access or pivot to a local Ollama setup
- Risk 3
  - Generating realistic PCAP metadata
  - Build a metadata profile module that simulates realistic traffic behavior
- Risk 4
  - Accurate extraction of protocol semantics from RFCs
  - Maintain a protocol database used to review errors while testing

MICHIGAN STATE UNIVERSITY

Status Report Presentation

Intelligent Recognition and Inventory System (IRIS)

The Capstone Experience

Team Whirlpool

Sarah Johnson
Christian Anovert
Salma Elsaadany
Sarah Swann
Hamed Alnuaimi
Kerry Dai

Department of Computer Science and Engineering
Michigan State University

Fall 2025

From Students…
…to Professionals

Team Whirlpool

Status Report

[1 of 4]

Intelligent Recognition and Inventory System (IRIS)

- Sponsor Overview
  - Manufacturer and Marketer of Home Applicances
  - Own several appliance brands (KitchenAid, Maytag, etc.)
  - Contacts work in advanced devlopment technology (R&D)
- Project Overview
  - Recognizing products loaded in/out of fridge via live feed
  - IRIS Values: Over/Under buying avoidance, food waste reduction, meal planning
  - Everyday consumers will be able to track their groceries via the app or website

Team Whirlpool

Status Report

[2 of 4]

Intelligent Recognition and Inventory System (IRIS)

- Server Systems / Software
  - Google Firebase: Main software for our database
  - Flutter: Will be used for the front end
  - Pycharm: Main IDE for python integration. Everyone has downloaded and began working with it
- Development Systems / Software
  - Python: Everyone has it downloaded and updated
  - Client Source Code: Currently not given. Working around it
  - OpenCV: Everyone has setup and began working on it. Enrolled in free course to learn how to implement
- Project Plan Document
  - Design and Technical Specifications are halfway finished
  - Functional Specifications, Executive Summary, & System Architecture are complete
  - 23% Complete

Team Whirlpool

Status Report

[3 of 4]

Intelligent Recognition and Inventory System (IRIS)

- Client Contact
  - Initial contact on 9/3/25
  - Weekly call Thursdays at 11am
- Team Meetings
  - Team has met 4 times so far
  - Regular meeting Tuesdays at 4:30pm
  - Additional meetings as necessary
- Team Organization
  - Backend: Kerry (Video Cropping), Christian (Privacy/Security), Sarah J (ML Model Training), Salma (Databases)
  - Frontend: Hamed (Website), Sarah S (Mobile)

Team Whirlpool

Status Report

[4 of 4]

Intelligent Recognition and Inventory System (IRIS)

Risks

- Video/Image Conditions
  - Software adaptable to multiple camera angles and environmental conditions
  - Build a large, diverse training set for a variety of instances
- Product Appearance Variance
  - Identifying same product in different packing and different varieties of the same product (e.g. shredded vs sliced cheese)
  - Start with high level classification before refining to specific types
- Hardware and Software Integration
  - Integrating between our code, source code, and hardware (camera)
  - Use OpenCV as standard link and test each stage separately
- Speed of Machine Learning Model
  - Ability of model to keep up with live feed with multiple items being loaded in
  - Choose lightweight architectures, batching & frame skipping (video), testing