

MICHIGAN STATE

UNIVERSITY

01/19: Team Status Reports

The Capstone Experience

Dr. Wayne Dyksen
James Mariani
Luke Sperling
Griffin Klevering
Tommy Hojnicky

Department of Computer Science and Engineering
Michigan State University
Spring 2023



*From Students...
...to Professionals*

MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Ally Offers Ecosystem

The Capstone Experience

Team Ally

Jered Brophy

Winnie Yang

Kainan Chen

Charles Kellogg

Aesha Ray

Jack Cruz

Department of Computer Science and Engineering
Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Ally

Status Report

[1 of 4]

Ally Offers Ecosystem

- Sponsor Overview
 - Top 25 U.S. financial holding company, founded by GM in 1919
 - Offers financial products for consumers, businesses, automotive dealers, and corporate clients
 - Always striving to stay up to date with new and upcoming technology
- Project Overview
 - Building a web app to target both Ally partnered businesses and Ally customers
 - Businesses can upload offers and deals to be promoted towards the targeted customers
 - Customers can view good promotions and deals from nearby businesses



Team Ally

Status Report

[2 of 4]

Ally Offers Ecosystem

- Server Systems / Software
 - AWS lambda: Server prepped
- Development Systems / Software
 - Tailwind: Installed and tested
 - ReactJS: Installed and tested
 - Express.js: Installed
- Project Plan Document
 - Started, have general idea for project composition as well as what software we will need to use. Initial risks and mitigations have been recognized.
 - We know how our schedule for the semester is going to look
 - 5% Complete



Team Ally

Status Report

[3 of 4]

Ally Offers Ecosystem

- Client Contact
 - Had two meetings to discuss setting up weekly conferences, project architecture, and overall goal
- Team Meetings
 - Met twice already in person and had a few zoom calls
 - Will meet twice a week after class
- Team Organization
 - Aesha: Client contact/business side back-end
 - Jered: Business side front-end
 - Charles: Customer side back-end
 - Winnie: Customer front-end + front-end/back-end integration
 - Kainan: Front-end/machine learning research
 - Jack: Database/back-end



Team Ally

Status Report

[4 of 4]

Ally Offers Ecosystem

Risks

- Machine Learning
 - Learning customer patterns for customer recommendations
 - Research machine learning and build a prototype
- Connecting businesses' offers to the customer
 - Promoting specific deals towards customers and what data to gather for this task
 - Using geo location and previous coupon downloads to connect customers to deals nearby and available
- Gathering geo-location data on customers + businesses
 - Using geo location to determine distance for recommendations between customers and businesses
 - Map out both customers and businesses to set a specific distance for recommendations
- Business data analytics for recommendations
 - Gathering customer activity
 - What coupons have been saved and used
 - What promotions tend to be the most successful
 - How many deals to promote and determining what deals make the cut
 - Determining successful promotions for nearby customers



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Amazon Group Buying Tool

The Capstone Experience

Team Amazon

Zane Aridi

Sara Ismail

Rashad Abada

Sungyu Kwon

Ryan Conley

Ashrey Gupta

Department of Computer Science and Engineering
Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Amazon

Status Report

[1 of 4]

Amazon Group Buying Tool

- Sponsor Overview
 - Amazon is the largest e-commerce website
 - They also offer other services through AWS which includes server hosting and cloud computing
 - Their mission is « ... to offer [their] customers the lowest possible prices, the best available selection, and the utmost convenience.»
- Project Overview
 - The tool offers a convenient way for groups of people to split purchases
 - It can be used by clubs, organizations, and friends that want to split expenses
 - People will have the option to add items to group carts
 - There will be a page to view different group carts and manage the settings of each one for the creator/admins



Team Amazon

Status Report

[2 of 4]

Amazon Group Buying Tool

- Server Systems / Software
 - We're planning to use AWS Elastic Compute Cloud for servers and waiting to get access from sponsors
 - We will use DynamoDB within AWS as well as Amazon RDS
 - Amazon API Access
- Development Systems / Software
 - Java on backend with IntelliJ IDE and Springboot framework --- IDE has been installed
 - React framework with JS, HTML, and Tailwind CSS on frontend also with IntelliJ --- initialized a React application with Springboot
 - TensorFlow for machine learning and want to look into using AWS SageMaker
- Project Plan Document
 - In the process of creating design specifications using diagrams
 - In the process of creating technical specifications with a system architecture diagram.
 - 10% Complete



Team Amazon

Status Report

[3 of 4]

Amazon Group Buying Tool

- Client Contact
 - Initial Client Meeting is done on Friday last week
 - Availability has been provided to the team and meeting will be scheduled soon
- Team Meetings
 - The team has 3 times to discuss project.
 - Our tentative meeting time is Friday at 1 pm, but we will be finding best availability of our time each week.
- Team Organization
 - Point of Contact – Zane, Backend/ML/Db – Sara, Ashrey, Ryan
 - FrontEnd – Sungyu, Zane, Rashad(all roles are flexible based on weekly demand)



Team Amazon

Status Report

[4 of 4]

Amazon Group Buying Tool

Risks

- Training unbiased machine learning model
 - Inaccurate recommendations because of biased training data
 - Collecting unbiased data for training M.L. model for product recommendations
- Ensuring secure and accurate transactions
 - Who can initiate a purchase for group, and how will costs be split
 - Owner/admin privileges for buying groups that can establish the settings of how group purchases will be facilitated.
- Authenticating Amazon users at login
 - Unrecognized users having access to the application
 - Explore Amazon's software for implementing the authentication gateway
- Implementing secure payment gateways
 - Making a secure payment methods page
 - Verifying and authenticating the payments methods used by user



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Machine Learning for Numeracy Training

The Capstone Experience

Team Anthropocene Institute

Xukai Fang

Ricky Horan

Daniel Passos

Christian Vaughan

Matthew McDerment

Phumapiwat Chanyutthagorn

Department of Computer Science and Engineering

Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Anthropocene Institute

Status Report

[1 of 4]

Machine Learning for Numeracy Training

- Sponsor Overview
 - Solving climate disruption dilemma
 - Science/Tech funding
 - Educating the public
- Project Overview
 - Improve numeracy skills
 - For the public
 - Government funding
 - Quizzes guided with user interaction (AI/ML)



Team Anthropocene Institute

Status Report

[2 of 4]

Machine Learning for Numeracy Training

- Server Systems / Software
 - Server for website (Image), local early
- Development Systems / Software
 - PyTorch for ML
 - JavaScript for frontend
 - Python Flask framework for backend
 - SQL for database
- Project Plan Document
 - Title page completed
 - Table of contents/executive summary in progress
 - 5% complete



Team Anthropocene Institute

Status Report

[3 of 4]

Machine Learning for Numeracy Training

- Client Contact
 - One meeting has taken place
 - Daniel Passos is our client contact
 - Weekly meetings w/ client set at 4:00 PM on Fridays
- Team Meetings
 - Met two times
 - Team meetings set at 4:40 PM on Tuesdays
- Team Organization
 - SQL database - Christian
 - Flask backend - Daniel
 - PyTorch ML - Poach & Fang
 - JavaScript frontend - Ricky & Matthew



Team Anthropocene Institute

Status Report

[4 of 4]

Machine Learning for Numeracy Training Risks

- Risk 1
 - Creating a sufficient design
 - Creating drafts to show clients next meeting
- Risk 2
 - Properly processing data and training ML models
 - Start with basic training on ML models and progress
- Risk 3
 - Efficiently increasing numeracy skills
 - Have testers and record progress over time
- Risk 4
 - Grab attention & entertain
 - Attempt to gamify the learning process



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

The Summarizer

The Capstone Experience

Team Auto-Owners

Ian Byram

Jiahui Hu

Jonathan Kippe

Thinh Nguyen

Brylee Pavlik

Tyler White

Department of Computer Science and Engineering

Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Auto-Owners

Status Report

[1 of 4]

The Summarizer

- Sponsor Overview
 - Insurance Company
 - HQ in Lansing, MI
 - 5,394 Employees (2019)
- Project Overview
 - Summarize document contents
 - Use sentiment analysis
 - Create a report with key metrics
 - Display the report using a web application



Team Auto-Owners

Status Report

[2 of 4]

The Summarizer

- Server Systems / Software
 - MySQL database: researched how to set up database
- Development Systems / Software
 - PyCharm: everyone has installed and used
 - Flask/Django: researched applications/one team member has used
 - Jupyter Notebook: everyone has installed and used
 - GitLab: set up repository with all team members
- Project Plan Document
 - Completed outline
 - Assigned roles
 - 2% Complete



Team Auto-Owners

Status Report

[3 of 4]

The Summarizer

- Client Contact
 - Contacted Friday 1/13
 - Set up weekly meeting Fridays at 11 a.m.
- Team Meetings
 - Met 1/11 and 1/17
 - Set up weekly meeting Thursdays at 5:30 p.m.
 - Collected a When2Meet to understand team availability
- Team Organization
 - Back End: Jiahui, Ian; Front End: Jonathan, Tyler; Database: Tinh, Brylee



Team Auto-Owners

Status Report

[4 of 4]

The Summarizer

Risks

- Risk 1
 - Team is unfamiliar with how to connect MySQL server to web app
 - We will start up a MySQL server and basic web app and try to connect them
- Risk 2
 - Team is unfamiliar with how to create sentiment analysis model and maximize its performance
 - We will experiment with sentiment analysis using multiple datasets in Jupyter Notebook
- Risk 3
 - Team is unsure how to create successful abstractive text summarizer
 - We will experiment with abstractive text summarization using small text files and working our way up. We will also try multiple models in Jupyter Notebook
- Risk 4
 - Team is unsure of how to upload text files to web app/database and integrate it with model
 - Once we have initial web app and database running, we will sample uploading a basic text file



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Web Interface for Car Simulation Tool

The Capstone Experience

Team Bosch

Judy Effendi
Tom Ladouceur
Alhassan Diallo
William Lu
Nicholas Ly
Kevin Meehan

Department of Computer Science and Engineering
Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Bosch

Status Report

[1 of 4]

Web Interface for CarMaker Simulation Tool

- Sponsor Overview
 - German Multinational Engineering and Technology Company Headquartered in Germany
 - Leading global supplier of technology and services.
 - Focused on developing the codes for more sustainability in the future.
- Project Overview
 - Make Autonomous Vehicles Safer
 - Web-Application to help Engineers Modify and Run Simulations on CarMaker
 - Secure to only the Engineers on the Team
 - Ability to Control Simulation through a set of features



Team Bosch

Status Report

[2 of 4]

Web Interface for CarMaker Simulation Tool

- Server Systems / Software
 - Will need to connect to Bosch's HIL machines, not started yet
- Development Systems / Software
 - Individual Development Setup is complete, which includes:
 - Node.js + npm
 - VS Code + Svelte extension
 - Python 3.10
 - Requesting access to receive our CarMaker License
 - Set up a Github repository for our code.
- Project Plan Document
 - Skeleton of project plan document has been created, sections assigned
 - Began basic system design
 - 10% Complete



Team Bosch

Status Report

[3 of 4]

Web Interface for CarMaker Simulation Tool

- Client Contact
 - Met 1/12/23 at 11am
 - Set-Up Weekly Meetings Friday at 3
- Team Meetings
 - Met 3 times (1/12/23 (2), 1/17/23
 - Weekly Team Meetings (Sprints) Tuesday and Thursday
- Team Organization
 - Have split the team half on the front-end, half on the back-end.
 - 1 designated client communicator.



Team Bosch

Status Report

[4 of 4]

Web Interface for CarMaker Simulation Tool

Risks

- How do we connect a Flask backend with a Svelte frontend?
 - With little experience in full-stack development as a team, we will have to learn how to translate frontend interactions to Python functionality.
 - We will research how we can connect Flask with a Svelte web application, and demo basic interactions between the two to prove effectiveness.
- How do we interface with CarMaker using Flask?
 - We will have to interact with CarMaker's API, a software we have never used before, in Python using Flask.
 - CarMaker has a large library of documentation and tutorials that we plan on taking into consideration during the development of our web interface.
- How do we design an optimal UI with Svelte and Tailwind?
 - Bosch wants a user friendly and effective web interface that simplifies the CarMaker software down to only the features their software engineers regularly use.
 - We will use a robust frontend designing tool such as Figma to form drafts of a possible web interface, and work closely with Bosch to design a UI they would benefit from.
- How do we communicate with Bosch's HIL machines?
 - Bosch utilizes several hardware-in-the-loop (HIL) systems that we would later have to communicate and interact with when our web application is near deployment ready.
 - Communication with the Bosch team is key to mitigate this risk, and we will work closely with them to learn how our software can interact with their systems as effectively as possible considering our team has no experience working with HIL machines.



MICHIGAN STATE

UNIVERSITY

Status Report Presentation
Driven Connect Application, Server, and
Backend

The Capstone Experience

Team Driven-4

Dongyu Lyu
Dorian Florescu
Tim Nwanze
Jon Yamashita
Ryan Dukovich
Anthony Eid

Department of Computer Science and Engineering
Michigan State University

Spring 2023



From Students...
...to Professionals

Team Driven-4

Status Report

[1 of 4]

Driven Connect Application, Server, and Backend

- Sponsor Overview
 - Consultation, Solutions, and Operations
 - IoT/IIoT PLM, Service Management, Security
 - One-Stop Shop for IoT Solutions
- Project Overview
 - Server Application for a new IoT Connectivity Board
 - Enable management of device remotely
 - View/Analyse Data collected by the device
 - API for an external system, OTA server for pushing firmware



Team Driven-4

Status Report

[2 of 4]

Driven Connect Application, Server, and Backend

- Server Systems / Software
 - MYSQL or Mongo
 - Needs Website Integration
 - Company Contact sending us SSH keys
- Development Systems / Software
 - Flask for website development
 - Shell website made
 - Needs scripts
- Project Plan Document
 - We have not started
 - That said, nothing has been written
 - 0% Complete



Team Driven-4

Status Report

[3 of 4]

Driven Connect Application, Server, and Backend

- Client Contact
 - We have currently set up weekly stand-ups every Friday
 - We have met with them once and are in a Microsoft teams chat with the clients
- Team Meetings
 - Currently we have met about four times and are in an online chat together
 - We have plans to meet at least twice every week
- Team Organization
 - Client Contact – Anthony
 - Databases – Tim & Jon
 - Front-End – Dorian & Ryan
 - Back-End – Dongyu & Anthony



Team Driven-4

Status Report

[4 of 4]

Driven Connect Application, Server, and Backend Risks

- Organization of Databases – High Importance – Medium Difficulty
 - Database can become too large and complex hence slowing down functionality
 - Proper organization of databases and proper space allocation for databases
- Linking parts of our system – High Importance – Medium Difficulty
 - The project requires us to link different technologies to function as a whole
 - Research database integration with flask
- Interaction with Hardware – Medium Importance – High Difficulty
 - The Driven connect IoT connectivity board is a new technology to us
 - The clients will provide the device for testing purposes
- Security – Low Importance – Medium Difficulty
 - Our project utilizes databases that hold user information
 - Develop ways to prevent breaches



MICHIGAN STATE

UNIVERSITY

Status Report Presentation

#BIKES4ERP Tracking

The Capstone Experience

Team Evolution

Zhilong Feng

Nick Filerman

Samantha Kissel

Jason Mih

Dorian Smalley

Austin Stickney

Department of Computer Science and Engineering
Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Evolutio

Status Report

[1 of 4]

#BIKES4ERP Tracking

- Sponsor Overview
 - Consulting company based in Chicago.
 - Helps with building and scaling an enterprise application.
 - Part of the Group Elephant non-profit organization.
- Project Overview
 - System to track and store GPS data from bikes in South Africa.
 - Theft detection and alerts.
 - Implemented through a web-based app.
 - Role based system.



Team Evolutio

Status Report

[2 of 4]

#BIKES4ERP Tracking

- Server Systems / Software
 - AWS/In process of gaining access.
 - Harness(for CI/CD)/In process of gaining access.
 - SQL Database/Temporary.
- Development Systems / Software
 - Git repository/Created and shared.
 - React app with Typescript/Initialized.
 - Raspberry Pi/Acquired.
- Project Plan Document
 - Not started.
 - 0% complete.



Team Evolutio

Status Report

[3 of 4]

#BIKES4ERP Tracking

- Client Contact
 - Met with once.
 - Future meetings scheduled.
 - Slack channel created.
- Team Meetings
 - Four meetings have been held.
 - Meet twice a week, more if needed.
- Team Organization
 - Sub-teams organized (Front-end, Back-end, Raspberry Pi).
 - Primary contact determined.



Team Evolutio

Status Report

[4 of 4]

#BIKES4ERP Tracking

Risks

- Map display
 - Unsure of method to display map on web-page.
 - Find and test APIs.
- Server communication
 - Unsure of how to send GPS information from raspberry pi to the server/database.
 - Use Wi-fi communication to get everything running.
- Determine what is considered stolen/lost
 - How long of a time between communications before marking as stolen.
 - If speed is greater than x , missed y pings, etc...
- Amount of data stored
 - How often should data be sent to server/database, and how long should data be kept.
 - Consult with Client about space needed & number of bikes.



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Virtual Reality Network Monitoring

The Capstone Experience

Team GM1

Keerthi Gogineni

Adam Anderson

Eric Gabbard

Paul Schulte

Nick Wang

Yilong Xie

Department of Computer Science and Engineering

Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team GM1

Status Report

Virtual Reality Network Monitoring

- Sponsor Overview – Adam
 - Multinational automotive manufacturing
 - Headquartered in Detroit, Michigan
 - Largest automaker in the US

Project Overview - Keerthi

- Visualize digital traffic flows in Virtual Reality
- Allow modular and immersive network monitoring
- Used by GM Employees
- Through a Virtual Reality headset



Team GM1

Status Report

Virtual Reality Network Monitoring

- Server Systems / Software - Paul
 - No server request from client
 - Simple CSV data processing for now
 - Waiting for server space/ instruction from TM
- Development Systems / Software - Yilong
 - VM up and running on one machine
 - VM licensing issue for the other machine
 - Unreal Engine installed and played around with
 - GitHub Repo setup with every teammate
- Project Plan Document
 - Not started yet
 - Will start as soon as we get data/start coding
 - 0% complete



Team GM1

Status Report

Virtual Reality Network Monitoring

- Client Contact - Eric
 - Met with Primary client
 - Met with Network Specialist
 - Scheduled 8am Meetings every Tuesday
- Team Meetings
 - Meeting after class Tuesdays, and online Fridays at 5:15pm
- Team Organization
 - Customer Liaison (Keerthi)
 - Unreal Engine Expert (Eric & Adam)
 - Network Specialist (Paul & Nick)
 - Data Analyst (Yilong)



Team GM1

Status Report

Virtual Reality Network Monitoring

Risks - Nick

- Data Processing
 - Analyze and pinpoint specific data given by client.
 - Consistent communication with client to ensure understanding
- Proper Data Visualization
 - We need to properly display information in a graphical user friendly way.
 - Keeping design consistent, and in-line with GM standards
- Scalability for Large Data Streams
 - Make sure data is handled efficiently and without much overhead
 - Keep UI simple but informative, and test on low-end hardware



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Application Lifecycle Framework

The Capstone Experience

Team GM 2

Muhammad Huwio

Gram Boyle

Muxing Dai

Veeresh Rajendran

Sneha Sarkar

Han Zuo

Department of Computer Science and Engineering

Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team GM 2

Status Report

[1 of 4]

Application Lifecycle Framework

- Sponsor Overview
 - Largest inter/national car manufacturer
 - 6 million cars produced in 2020
 - HQ based in Detroit, Michigan
- Project Overview
 - Migrating from Sharepoint to Sharepoint cloud
 - Streamline process from upload to distribution
 - Re-imagine application owner upload form
 - SMTP server to notify supervisors of application status



Team GM 2

Status Report

[2 of 4]

Application Lifecycle Framework

- Server Systems / Software
 - In lab servers → Not yet started
 - Tomcat server → Not yet started
- Development Systems / Software
 - Spring Boot backend → hello world in progress...
 - Maria DB → Not yet started
 - Angular js front end → Workspace initialized
- Project Plan Document
 - Started... but needs more information from the client
 - 5% Complete



Team GM 2

Status Report

[3 of 4]

Application Lifecycle Framework

- Client Contact
 - Meet twice with the project client
 - Setup weekly meeting every Friday
- Team Meetings
 - Meet four times, twice in person
 - Meeting every Tuesday after class
 - Setup weekly triage with TM
- Team Organization
 - Muhammad, and Muxing → Backend
 - Gram, and Han → Frontend
 - Veer, and Sneha → Database



Team GM 2

Status Report

[4 of 4]

Application Lifecycle Framework

Risks

- Risk 1
 - Vague description on what is done through application and what is manual
 - Consult with client for exact workflow of application and users
- Risk 2
 - Potential server compatibility issues
 - Research compatibilities with other software and consult with client for suggestions if necessary
- Risk 3
 - Practical (server) vs local runtime environment build and deployment
 - Research CI/CD pipelines and setup mock development environments
- Risk 4
 - Sample Server and Frontend datapoints unavailable
 - Make mock schemas until official data is provided



MICHIGAN STATE

UNIVERSITY

Status Report Presentation

GHG Scope 3 Automation

The Capstone Experience

Team Kellogg's

Lily Albitar

Randy Carnahan

Michael Dittman

Ayoung Du

Shreesha Maddur

Jacob Zawacki

Department of Computer Science and Engineering
Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Kellogg's

Status Report

[1 of 4]

GHG Scope 3 Automation

- Sponsor Overview
 - Multinational food manufacturing company
 - Eggo® Waffles, Pop-Tarts®, Rice Krispies® Treats, Nutri-Grain®
 - Headquarters in Battle Creek, MI
- Project Overview
 - Kellogg's wants to reduce scope 3 emissions (employee commuting, distribution, business travel, waste from operations)
 - We will create an automated dashboard in Celonis that tracks scope 3 GHG emissions
 - Will help reduce manual labor, improve data accuracy, and reduce costs from external assessors for GHG accounting



Team Kellogg's

Status Report

[2 of 4]

GHG Scope 3 Automation

- Server Systems / Software
 - ClimaTiq - up and running externally, have API keys
 - SAP (System Analysis Program) – up and running on site
- Development Systems / Software
 - Celonis – training in progress, test dashboards created
 - PHP Storm – installed
 - Postman – set up and sending test API requests
- Project Plan Document
 - Roles have been assigned
 - Documents have been created
 - 5% Complete



Team Kellogg's

Status Report

[3 of 4]

GHG Scope 3 Automation

- Client Contact
 - Friday 12:30-1:30 every week
 - Scheduling Agile Training Sessions
- Team Meetings
 - Tuesdays/Thursdays 4:30-5:00
 - Every day after class and as needed, met 5 times so far
- Team Organization
 - Data Engineer – Michael, Randy, Ayoung
 - Dashboard Development – Jacob, Shreesha
 - Automated Workflow - Lily



Team Kellogg's

Status Report

[4 of 4]

GHG Scope 3 Automation

Risks

- Risk 1
 - Linking Celonis connectors with SAP database
 - Practicing with sample connectors using sample data in Celonis
- Risk 2
 - Integrating ClimaTiq API with Celonis
 - Sending test API requests with Postman
- Risk 3
 - Verifying the accuracy of automated GHG emissions calculations
 - Verify automated processing against previous data model done by hand
- Risk 4
 - Understanding measurable ESG (Environmental Social Governance) processes
 - Collaborate with ESG staff



MICHIGAN STATE
UNIVERSITY

Status Report Presentation

SmartSat™ Software Development Kit & AI Platform

The Capstone Experience

Team Lockheed Martin Space

Kurt LaBlanc
Robert Francis
Maxwell Lu
Tyler Holt
Kyle Soderlund
Jackson Haugen

Department of Computer Science and Engineering
Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Lockheed Martin Space

Status Report

[1 of 4]

SmartSat™ Software Development Kit & AI Platform

- Sponsor Overview
 - One of four major divisions of Lockheed Martin
 - Global security and aerospace company
 - Products include satellites, space probes, missile defense systems
- Project Overview
 - Optimize in-orbit programmability of the SmartSat
 - Create SDK manager
 - Extend platform for AI/ML integration
 - Demonstrate capabilities on hardware



Team Lockheed Martin Space

Status Report

[2 of 4]

SmartSat™ Software Development Kit & AI Platform

- Server Systems / Software
 - Electron, made “Hello World” app
 - Flask, made “Hello World” app
 - RPM, received example packages from client
- Development Systems / Software
 - UDOO Bolt with AMD V1000 GPU, waiting for delivery
 - AMD ROCm, waiting on proprietary distribution
 - ONNX, basic understanding of its purpose
- Project Plan Document
 - Team has read through and discussed posted examples
 - From client meeting we have a good idea of system architecture and hardware/software components
 - 0% Complete



Team Lockheed Martin Space

Status Report

[3 of 4]

SmartSat™ Software Development Kit & AI Platform

- Client Contact
 - We have met with the client once over Zoom
 - Weekly client meetings are scheduled for 1 PM Tuesdays
- Team Meetings
 - Our Team has met 4 times so far
 - Twice weekly meetings are planned
- Team Organization
 - Rob, Tyler, Kyle, and Kurt on SDK manager
 - Max and Jackson working on AI platform



Team Lockheed Martin Space

Status Report

[4 of 4]

SmartSat™ Software Development Kit & AI Platform

Risks

- Risk 1
 - Tech stack integration: Flask, Electron, ONNX, ROCm
 - Develop simple apps and connect them
- Risk 2
 - Nobody on the team has experience with Machine Learning
 - Research ONNX, the technology LM uses, and experiment with common ML libraries
- Risk 3
 - Using RPM in an automated way to create SDK packages
 - Exploring RPM to create manual packages first, using sponsor as a resource
- Risk 4
 - Working with AMD GPUs and integrated programming
 - Familiarizing ourselves with the hardware, speaking with those who have previously used the hardware (Dom in CSE MS)



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Dashboard for Data Visualization

The Capstone Experience

Team Magna

Joey Meng
Jannik Eisenlohr
Augie French
Suraj Karthikeyan
Rondy Gonzalez
Ria Mokashi

Department of Computer Science and Engineering
Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Magna

Status Report

[1 of 4]

Dashboard for Data Visualization

- Sponsor Overview
 - Magna International is a leading global automotive parts supplier.
 - Magna has 345 manufacturing plants, 90 product dev/engineering/sales centers in 28 countries.
 - Magna USA is headquartered in Troy, Michigan.
- Project Overview
 - The project aims to integrate dashboards created in AWS QuickSight and the current LMDD website.
 - The problem we aim to solve is to create a unified data visualization system for the operations of the new autonomous delivery robot project.
 - Magna managers will use the dashboard to see the status, efficiency, capabilities of the autonomous delivery robots on the field.
 - Managers at Magna can see what vehicles, routes, deliveries are on time, the average speed of a robot, the battery consumption, and various other metrics.



Team Magna

Status Report

[2 of 4]

Dashboard for Data Visualization

- Server Systems / Software
 - Waiting on access to internal Magna site
 - Waiting for AWS access
 - Waiting on access to internal git repo
- Development Systems / Software
 - VMWare Fusion with Windows 10 set up on the iMacs
 - The team is in the process of setting up Python IDEs on their personal machines
 - Custom Git Repo has been prepared by Magna for this project
- Project Plan Document
 - Document created and added to Teams
 - First pages and Table of Contents added
 - 15% Complete



Team Magna

Status Report

[3 of 4]

Dashboard for Data Visualization

- Client Contact
 - We have talked with our client; we have scheduled a weekly conference call on Friday Noon every week.
 - We have met with our client once so far.
- Team Meetings
 - We have met as a team twice so far.
 - We have a weekly meeting as a team.
 - We have scheduled an in-person meeting after our Triage meetings on Tuesday's 4:40 PM.
- Team Organization
 - Suraj is our client contact and backend programmer.
 - Joey is the overall project manager
 - Jannik is our main backend programmer
 - Augie and Rondy will be our AWS programmers
 - Ria is the team's main S3/Database manager



Team Magna

Status Report

[4 of 4]

Dashboard for Data Visualization

Risks

- We will have to visualize a lot of data.
 - There are over 9 different variables that Magna wishes us to integrate into the visualization dashboard. This might lead to a very complicated visualization process considering we will have to deal with so much data.
 - We will work with the Magna team to find a streamlined process to visualize all the data we get from the vehicles on the ground.
- Integration of several distinct platforms
 - The project is basically geared towards integrating various platforms together including AWS, QuickSight, and LMDD website. This can get very tedious on top of having to handle integrating different platforms together.
 - We will establish a single backend that handles all the different platforms as a single unit, for example instead of connecting QuickSight to AWS and then AWS to LMDD, we aim to create a single backend that connects to all of them simultaneously.
- Amazon S3 may not work as intended
 - The project proposal is connecting data stored in S3 to update dynamically with QuickSight, this may not be possible in the way that Magna wants.
 - We will explore other data storage alternatives such as DynamoDB or RDS instead..
- Data Formatting
 - We do not know how Magna will format and stream the data to our backend, it could be inefficient or slow or in some way hard to use.
 - We will work with the team at Magna to create and streamline a data format that will be easy to use for our project.



MICHIGAN STATE
UNIVERSITY

Status Report Presentation
Organization Efficiencies Utilizing
Wifi Locating
The Capstone Experience

Team Meijer

Josh Erno

Naveen Kumanan

Grace Mora

Matt Norris

Haichen Sun

Marv Zurek III

Department of Computer Science and Engineering
Michigan State University

Spring 2023



From Students...
...to Professionals

Team Meijer

Status Report

[1 of 4]

Organization Efficiencies Utilizing Wifi Locationing

- Sponsor Overview
 - Regional Retailer
 - Founded in 1934 in Greenville, MI
 - Over 245 stores in 6 Midwest states
- Project Overview
 - Enhance Shop and Scan in existing Meijer phone application
 - Helps prevent stealing and track customer activity
 - Makes Shop and Scan use easier for customer
 - Used by client to track activity
 - Used by customer to shop at customer stores



Team Meijer

Status Report

[2 of 4]

Organization Efficiencies Utilizing Wifi Locationing

- Server Systems / Software
 - Blazor WebAssembly: web framework using C# and HTML. Have done tutorials.
 - Azure Web Services: cloud-based service for hosting websites. Still being researched.
 - Juniper – Mist: the type of Wi-Fi system that Meijer uses. Acquainted with the technology, but still being researched.
- Development Systems / Software
 - React Native/ReactJS: mobile app framework for Android and iOS. Up and running.
 - Microsoft Power BI: real time dashboard to monitor in-store traffic. Being researched.
- Project Plan Document
 - Assigned sections to each member.
 - Each member is gathering a sense of the requirements for their section.
 - 5% Complete



Team Meijer

Status Report

[3 of 4]

Organization Efficiencies Utilizing Wifi Locationing

- Client Contact
 - The first meeting with our client was Friday, January 13.
 - Friday will be the day we meet with our client each week.
- Team Meetings
 - Most of the time we meet online using Discord, but we will meet in person when necessary.
 - As of January 17th, we have met five times, four times online and once in-person in the lab on campus.
 - We anticipate three group meetings per week, increasing as necessary.
- Team Organization
 - Marv is the client contact.
 - Everyone working on status report.
 - So far, everyone is learning the technology needed for this project.



Team Meijer

Status Report

[4 of 4]

Organization Efficiencies Utilizing Wifi Locationing

Risks

- Risk 1
 - Working with Juniper-MIST Technology
 - Installing access points into Engineering building/lab for testing
- Risk 2
 - Sending notification to 'clerk' when customer is leaving
 - Working with Meijer team: will 'clerk' have device, will this vary from store to store?
- Risk 3
 - What type of data to show on dashboards, how to obtain it, and how to display it in a manner that is useful for the store
 - Work with Meijer team to figure out most useful information for the store
- Risk 4
 - How to increase customer engagement in a non-intrusive and ethical way
 - Send an adequate number of notifications, make customers feel like they are not being tracked



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Improved Peer Review in CourseLib

The Capstone Experience

Team Michigan State University CSE

Max Brombach

Justin Henkelman

Kishore Sirigiri

Dean Eggenberger

Santiago Rodriguez-Papa

Zhuofan Zeng

Department of Computer Science and Engineering

Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Michigan State University CSE

Status Report

[1 of 4]

Improved Peer Review in CourseLib

- Sponsor Overview
 - MSU Computer Science Department
 - Awards approximately 400 BS, 40 MS, and 20 PhD degrees in Computer Science yearly
 - CSE Department has about 45 faculty members
- Project Overview
 - Allow dialogue between students
 - Increase interactivity with marking diagrams
 - Improve accuracy and timing of email notifications
 - Enhance admin controls for review assignments



Team Michigan State University CSE

Status Report

[2 of 4]

Improved Peer Review in CourseLib

- Server Systems / Software
 - MariaDB running locally
 - Apache/PHP backend running locally
 - Website running on our machines
- Development Systems / Software
 - PhpStorm IDE setup per sponsor request
 - Docker containers plus GitHub are functional
 - Yarn/Node/Composer all working to host website locally.
- Project Plan Document
 - Slide deck downloaded and partially complete
 - Waiting on further project document plan specs
 - 5% Complete



Team Michigan State University CSE

Status Report

[3 of 4]

Improved Peer Review in CourseLib

- Client Contact
 - Met with Dr. Charles Owen
 - Meeting planned for Fridays at 11 am
- Team Meetings
 - Have already met twice
 - Further meetings are planned for Tuesdays at 5 pm
- Team Organization
 - Justin, Santiago, and Dean working on backend
 - Kishore, Zhuofan, and Max working on frontend



Team Michigan State University CSE

Status Report

[4 of 4]

Improved Peer Review in CourseLib

Risks

- Risk 1
 - Figuring out stylus support for diagram mark down
 - Create local stylus environment and incorporate
- Risk 2
 - Learning architecture of large preexisting system
 - Code review and weekly meetings with the author
- Risk 3
 - Sending emails in a PHP based system
 - Write barebones program to send an email in PHP
- Risk 4
 - Do not know how deploying to EGR servers works
 - Simple sandbox environment on EGR server for proof of concept



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Build-an-App for Humanities Researchers

The Capstone Experience

Team Michigan State University Linguistics

Daniel Magaway

Albert Crooks

Shiyu Yan

Hemkesh Agrawal

Tess Coleman

Department of Computer Science and Engineering

Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Michigan State University Linguistics

Status Report

[1 of 4]

Build-an-App for Humanities Researchers

- Michigan State Linguistics Department – MI Diaries
 - Group of researchers working on MI Diaries App
 - Focused on linguistic analysis of audio data
 - Team started during the COVID-19 Pandemic
- Project Overview
 - Audio recording app that can record, store, and send data to researchers for analysis
 - Refine and rewrite existing app using latest Flutter packages and libraries
 - Design an app-builder that allows customization of the base application



Team Michigan State University Linguistics

Status Report

[2 of 4]

Build-an-App for Humanities Researchers

- Server Systems / Software
 - App server is running (provided by client)
- Development Systems / Software
 - Flutter is downloaded on lab iMacs
 - Xcode and VSCode have been set up to develop in Flutter
 - Need to set-up Android Studio on lab iMacs
 - App-Builder framework is yet to be determined (will start as we finish the base app)
- Project Plan Document
 - Completed overview and started opening statement
 - 5% Complete



Team Michigan State University Linguistics

Status Report

[3 of 4]

Build-an-App for Humanities Researchers

- Client Contact
 - Met initially on 1/13
 - Scheduled weekly meetings with client on Fridays
- Team Meetings
 - Met three times
 - Keep in contact using Discord Channel
 - Aim to meet at least twice a week, plus any working sessions
- Team Organization
 - Lead Client Contact – Daniel
 - Flutter App Lead – Hemkesh
 - No defined app development roles yet, app work will be split up as we progress
 - No backend development work needed



Build-an-App for Humanities Researchers

Risks

- Can you record audio while a Flutter app is in the background?
 - In Flutter v1 audio could not be recorded while the app was in the background. The app would appear to record, but would not actually store audio
 - Mitigation: Test a basic Flutter app written in Flutter v3 with latest audio libraries to see if this problem has been solved
- Can the app be used in iPad multi-task functionality?
 - Previous versions of app did not work with iPad multi-task, need to determine if we can make it work with newer libraries
 - Mitigation: Test newer version of the app using iPad to determine if current libraries fix the issue. If not, will need to find a workaround



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Image Similarity System

The Capstone Experience

Team Moii

Alex Day

Hunter Samoy

Michael Yin

Thalia Sakowicz

Joseph Pallipadan

Ethan Yang

Department of Computer Science and Engineering

Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Moii

Status Report

[1 of 4]

Image Similarity System

- Sponsor Overview
 - Software company out of Troy, MI
 - Use AI to track users in real time
 - Track availability, door access data, customer traffic, etc
- Project Overview
 - Develop Image Similarity System
 - Train a model
 - Track different items based on input image
 - Return an image match from database



Team Moii

Status Report

[2 of 4]

Image Similarity System

- Server Systems / Software
 - Vercel (Server Host) - Pending
 - Fire Base (Authn) - Pending
 - Google Cloud Platform - Pending
- Development Systems / Software
 - PyTorch (ML) - Active
 - ReactJS (Front-end) - Active
 - VS Code - Active
- Project Plan Document
 - Specs outlined
 - Solidifying system architecture
 - 15% Complete



Team Moii

Status Report

[3 of 4]

Image Similarity System

- Client Contact
 - Met with client last Thursday (online, since in Germany)
 - Scheduled weekly meeting every Thursday at 11:00A.M.
- Team Meetings
 - In-person meeting twice, last Thursday and this Tuesday
 - Online meetings multiple times
 - Weekly meetings Tuesday and Thursday after class
- Team Organization
 - Ethan, Hunter works on front-end
 - Michael, Joseph, Thalia works on ML/AI
 - Alex works on back-end



Team Moii

Status Report

[4 of 4]

Image Similarity System

Risks

- Risk 1
 - Operability: Method to transfer user-defined data from the front end to our model
 - Mitigation: Prototype data transfer method to model.
- Risk 2
 - Operability: Specifics of deploying model to application
 - Mitigation: Research existing examples to learn how to deploy a model to production.
- Risk 3
 - Operability: Handling over 5000 hours of video to train our model
 - Mitigation: Research existing examples to learn how to use a large amount of data.
- Risk 4
 - Operability: Images from CCTV footage is distorted
 - Mitigation: Test different visual filters on the images to correct



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Predictive Chatbot

The Capstone Experience

Team MSUFCU

Alexandra Case

Yu Chen

Will Kelly

Nick Wallace

Kaezar Leonard

Rikitio Takai

Department of Computer Science and Engineering

Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team MSUFCU

Status Report

[1 of 4]

Predictive Chatbot

- Sponsor Overview
 - Largest university credit union in the world
 - Founded in 1937 starting with only \$3,000 in assets
 - In 2022 \$7 billion in assets and serving 300,000+ members
- Project Overview
 - Modify the Chatbot, Fran to be a predictive coach
 - Analyzes past billing statements to provide suggestions
 - Example: recurring bill
 - Goal to ensure members have a better banking experience



Team MSUFCU

Status Report

[2 of 4]

Predictive Chatbot

- Server Systems / Software
 - MySQL, not sure if it is needed yet
- Development Systems / Software
 - Java/Kotlin for android development, not sure if needed yet
 - C/Swift for IOS development, not sure if needed yet
 - Development sandbox for Fran, waiting to receive from client
 - Python for API development, language will be used in the development sandbox
- Project Plan Document
 - Yes, it has started
 - Some outline written ~ 100 words
 - 5% complete



Team MSUFCU

Status Report

[3 of 4]

Predictive Chatbot

- Client Contact
 - We have talked to and met with the client
 - Weekly conference calls on Friday at 9am
 - No in-person meeting scheduled yet
- Team Meetings
 - Three meetings so far
 - Team meetings scheduled for Sundays at 4pm
 - Possibly meeting through the week as needed
- Team Organization
 - Client Contact – Kaezar Leonard
 - IOS Development: Alexandra Case, Kaezar Leonard, Will Kelly
 - Android Development: Nick Wallace, Rikito Takai, Yu Chen
 - Python/API: Yu Chen, Rikito Takai, Nick Wallace, Will Kelly, Alexandra Case, Kaezar Leonard



Team MSUFCU

Status Report

[4 of 4]

Predictive Chatbot

Risks

- Risk 1
 - We don't have access to the APIs yet
 - We have a meeting scheduled with the client Friday
- Risk 2
 - Unfamiliarity with AI training and machine learning
 - Testing and learning how to utilize machine learning within the APIs, further information will be given from client
- Risk 3
 - Not business students so not much background with finances
 - Ask client any financial questions and research
- Risk 4
 - Nobody on the team has experience with Fran
 - Use Chen's MSUFCU account to familiarize ourselves with Fran



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Provider Analysis Toolkit

The Capstone Experience

Team Roosevelt Innovations Data Science

Kirsten Gross
Marshall Kroske
Anna Parkinson
Zhenhao Zhao
Rajaditya Bajaj
Michael Stanley

Department of Computer Science and Engineering
Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Roosevelt Innovations Data Science

Status Report

[1 of 4]

Provider Analysis Toolkit

- Sponsor Overview
 - Smart platform for processing ancillary insurance claims;
 - Owned by Delta Dental;
 - 22M+ members managed.
- Project Overview
 - Full-stack web application with a cloud native architecture;
 - Utilize machine learning to help investigators identify the levels of risk of insurance fraud;
 - Create new collaboration features such as sharing and commenting;
 - Implement security features such as login and access control.



Team Roosevelt Innovations Data Science

Status Report

[2 of 4]

Provider Analysis Toolkit

- Server Systems / Software
 - A client-provided Snowflake database. We are currently in the process of getting NDA's signed to get access; in the meantime, we have a test database running if it's necessary.
 - Docker will be used as a scalable storage system when the system that will be built will ingest multiple claims. Docker has been installed.
- Development Systems / Software
 - Hello world program for FastAPI written and functional on our imacs;
 - Hello world program for Streamlit written and functional on our imacs;
 - Build machine learning models using Pytorch. The environment is already configured on the imacs.
- Project Plan Document
 - Plan document is started;
 - Only lightly started, awaiting access to codebase;
 - Have looked at the previous project plans and have decided our outline;
 - Approximately 5% completed.



Team Roosevelt Innovations Data Science

Status Report

[3 of 4]

Provider Analysis Toolkit

- Client Contact
 - We have maintained contact with our client. The weekly conference is scheduled for Friday at 1pm.
 - Have met with client already with next planned meeting 1/20.
- Team Meetings
 - Our team's weekly in-person meeting was scheduled for Friday at 2pm.
 - We already had a meeting on January 13.
- Team Organization
 - Front End – Anna, Kirsten, Michael
 - Back End – Raj, Marshall
 - Database Management – Marshall, Kirsten
 - Machine Learning – Raj, Zhenhao, Michael



Team Roosevelt Innovations Data Science

Status Report

[4 of 4]

Provider Analysis Toolkit

Risks

- Risk 1
 - Get NDA's and access to the code database.
 - Continue contact with client, let them know how much it will impede our project going forward.
- Risk 2
 - Identifying features from the given data and making a Machine Learning model based on the given data. Need to understand which part of data is more important in finding the fault for the provider.
 - Will need to work with Jessica Black as she works with provider directly and knows which measures are really used while detecting a fraud.
- Risk 3
 - Not understanding insurance and dental industry.
 - Work closely with our sponsor to understand the parts of these industries that we need to understand to layout data efficiently for the client.
- Risk 4
 - Identifying the most suitable UI for the users of application
 - Work with sponsor to generate desired UI mock-up



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Model-Driven UI Framework

The Capstone Experience

Team Roosevelt Innovations Knowledge Science

Cole Coughlin
Alex Hettle
Drew Hubble
Ben Lynch
Naffy Nihal
Yuqi Pan

Department of Computer Science and Engineering
Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Roosevelt Innovations Knowledge Science

Status Report

[1 of 4]

Model-Driven UI Framework

- Sponsor Overview
 - Tech Solutions company originally a part of Delta Dental
 - Provides end-to-end software systems for insurance companies
 - Data services, customer portals, claims and billing services, and more.
- Project Overview
 - Language-agnostic spec to define a business domain model.
 - Angular front-end module to dynamically generate UI according to an instance of the spec.
 - Quarkus back-end to process requests and create objects.



Team Roosevelt Innovations Knowledge Science

Status Report

[2 of 4]

Model-Driven UI Framework

- Server Systems / Software
 - Angular front-end starter project is running locally
 - Quarkus backend starter project is running locally
- Development Systems / Software
 - Front-end GIT repository is set up with initial push
 - Back-end GIT repository is set up with initial push
- Project Plan Document
 - Skeleton created.
 - Cover page and System Components section completed
 - 10% Complete



Team Roosevelt Innovations Knowledge Science

Status Report

[3 of 4]

Model-Driven UI Framework

- Client Contact
 - First client meeting on Wednesday
 - Weekly meetings scheduled for Tuesday
- Team Meetings
 - 2 hours of meetings + asynchronous communication
 - Weekly team meetings on Tuesdays and Thursdays
- Team Organization
 - Front End Team and Back End Team
 - Each team consists of 3 members including one head.



Team Roosevelt Innovations Knowledge Science

Status Report

[4 of 4]

Model-Driven UI Framework

Risks

- Risk 1
 - How do we properly document a spec that other people can easily use?
 - Familiarize ourselves with ANTLR and other examples of a spec.
- Risk 2
 - How do we implement a spec?
 - Look at multiple schema and how they're implemented.
- Risk 3
 - What are the expected input and output formats?
 - Continue meeting with sponsor to discuss different ideas.
- Risk 4
 - What does a typical schema look like?
 - Study models and formatting to learn patterns.



MICHIGAN STATE

UNIVERSITY

Status Report Presentation

Building Optimal Shipments using ML

The Capstone Experience

Team RPM

Jonathan Ayoub

Ian Berriel

Shoimya Chowdhury

Nicholas Klein

Drew Markel

Yanjia Zhu

Department of Computer Science and Engineering

Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team RPM

Status Report

[1 of 4]

Building Optimal Shipments using ML

- Freight transportation across the country
 - Founded in 2012
 - Used by major motor vehicle companies (Tesla, General Motors, Ford)
 - 7.5k+ vehicle carriers, 50k+ vehicles transported per month, 14+ industries served
- Use ML to create optimized shipment routes
 - Reduce the number of stops
 - Teams within RPM making shipments will be using the program
 - The program will be used to determine the most optimal route for transportations

Team RPM

Status Report

[2 of 4]

Building Optimal Shipments using ML

- Server Systems / Software
 - Azure ML researching how to use it, as per client instruction.
 - DBvisualizer download in local machine.
 - VMware download in lab computers.
- Development Systems / Software
 - .Net Waiting for the client approve for right version
 - Visual Studio Code downloaded on local machine.
 - Jupyter NoteBook set up.
 - GIT Lab repository set up.
- Project Plan Document
 - In a research phase for ML and ML environments
 - Awaiting further information from the client regarding the software development kit, the preferred version of .NET, and how to query into the DB
 - 15% Complete

Team RPM

Status Report

[3 of 4]

Building Optimal Shipments using ML

- Client Contact
 - Met with client twice
 - Scheduled weekly meetings with client on Fridays (time TBD)
- Team Meetings
 - We have met 3 times as a team
 - Team meetings are scheduled on Monday nights at 6pm remotely and Tuesday after class.
- Team Organization
 - Jonathan Ayoub – Back end + ML
 - Ian Berriel – Back End + ML
 - Shoimya Chowdhury - ML + Front End
 - Nicholas Klein – ML + Customer liaison + Front End
 - Drew Markel – Back End + ML
 - Yanjia Zhu – Back End + ML

Team RPM

Status Report

[4 of 4]

Building Optimal Shipments using ML Risks

- Risk 1
 - The RPM database is very messy.
 - Team will work with client to figure out the valid data tables.
- Risk 2
 - Our team lacks significant ML experience/knowledge.
 - Team research to find useful packages and learn ML techniques.
 - Prepare questions to ask our client regarding ML techniques and environments.
- Risk 3
 - Team lacks experience using Azure.
 - Research Azure and meet with client to further discuss it.

MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Documenting Academic Harassment

The Capstone Experience

Targets' Tip

Brandon Lam

Yanping Lyu

Michael Monticciolo

Treasure Ogundiran

Lydia Wibbelman

Department of Computer Science and Engineering

Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Targets' Tip

Status Report

[1 of 4]

Documenting Academic Harassment

- Sponsor Overview
 - Support targets of academic harassment
 - Improve academic environments
 - Give targets a platform to document evidence, details and context of academic harassment incidents
- Project Overview
 - Functional web, iOS and Android applications
 - Help targets of academic harassment
 - Document harassment incidents
 - Create a portfolio of behaviors



Team Targets' Tip

Status Report

[2 of 4]

Documenting Academic Harassment

- Server Systems / Software
 - Firebase
 - API
 - SQL and Redis
- Development Systems / Software
 - Flutter | Hello world! created
 - Android Studio | Installed
 - Xcode | Installed
- Project Plan Document
 - Downloaded and started
 - First 2 slides completed
 - 20% Complete



Team Targets' Tip

Status Report

[3 of 4]

Documenting Academic Harassment

- Client Contact
 - Client meeting Monday @ 11:00am
 - Weekly conference call Wednesday @ 5:30pm
- Team Meetings
 - Weekly team meetings Tue, Thurs @4:30pm
 - 4 initial meetings
 - TM meeting Mondays @5:20pm
- Team Organization
 - Front End/Back End
 - Web/Mobile apps
 - API/Database



Team Targets' Tip

Status Report

[4 of 4]

Documenting Academic Harassment

Risks

- Risk 1
 - Unsure if Flutter is the right frameworks for our applications
 - Research into different frameworks for creating cross platform applications
- Risk 2
 - Making a fast database without spending money
 - Talk to client about options and concerns
- Risk 3
 - Fluid responsiveness between web/mobile applications
 - Creating different styles and layouts for different devices
- Risk 4
 - Not familiar with authentication forms
 - Research authentication methods online (OAuth, FirebaseAuth, etc.)



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

CAVE: Collaborative Video/Audio Editor

The Capstone Experience

Team TechSmith

Wenrui Li
Faran Meshinchi
Craig Smith
Marco Suriano
Rachel Townson
Kyle Wagner

Department of Computer Science and Engineering
Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team TechSmith

Status Report

[1 of 4]

CAVE: Collaborative Video/Audio Editor

- Sponsor Overview
 - Creates software that enables users to share ideas through video and image editing
 - Flagship Products: Camtasia, Snagit
 - Based in East Lansing
- Project Overview
 - Allow multiple users to asynchronously edit videos with shared media library and timeline
 - Media and projects secure; only accessible to invited users
 - Web application, compatible with Windows and MacOS
 - Core operations: trim and combine video/images, overlay audio



Team TechSmith

Status Report

[2 of 4]

CAVE: Collaborative Video/Audio Editor

- Server Systems / Software
 - Azure SQL Database: Holds the state of projects
 - Status: Deployed, wired up to a prototype
 - Azure Blob Storage: Holds uploaded user content
 - Status: Deployed, wired up to a prototype
 - Azure VM: Hosts backend
 - Status: Set up Express.js API, awaiting deployment
- Development Systems / Software
 - VS Code – Installed on all machines
 - React – Imported to project, static webpage
 - FFMPEG – Imported to project, prototype demonstrates core operations
 - GitHub repository – Managed by sponsor, all team members have access
- Project Plan Document
 - Not started



Team TechSmith

Status Report

[3 of 4]

CAVE: Collaborative Video/Audio Editor

- Client Contact
 - Had first meeting, went over project specs in detail
 - Weekly meeting Fridays @ 2pm
- Team Meetings
 - Weekly meetings: Tuesdays and Thursdays @ 4:30pm
 - Our team has met 3+ times
- Team Organization
 - Frontend UI: Marco, Kyle
 - Video Processing: Craig, Wenrui
 - Backend/Cloud: Rachel, Faran



Team TechSmith

Status Report

[4 of 4]

CAVE: Collaborative Video/Audio Editor

Risks

- Connection between frontend/backend
 - Displaying media list, synchronizing project state
 - Mitigation: Work with “dummy” JSON to create simple prototypes
- Limitations of client-side media processing
 - Lower powered devices may struggle to process large amount of media
 - Mitigation: Maximize use of lossless operations which are fast and cheap
- Data access security
 - Users should only be able to access projects and media they are invited to
 - Mitigation: Make prototype where permissions are handled in Azure and set manually



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Switch Alignment Mobile Game

The Capstone Experience

Team Union Pacific

Mike Walton
Zack Joyce
Jiayue Chai
Alexa Kelley
Daniel Wylie
Kyle Martin

Department of Computer Science and Engineering
Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Union Pacific

Status Report

[1 of 4]

Switch Alignment Mobile Game

- Sponsor Overview
 - Freight hauling rail-road
 - Operates in North America
 - Make shipments to 23 states in America
- Project Overview
 - Application that trains users to align railroad switches.
 - Allows employees to align switches in many environments and conditions without operating machinery.
 - This app will be used by employees in Union Pacific.
 - Users will play the game and be given immediate feedback should an error occur.



Team Union Pacific

Status Report

[2 of 4]

Switch Alignment Mobile Game

- Server Systems / Software
 - Oracle SQL Database – Status: Empty database up and Running
- Development Systems / Software
 - Unity 3D – Status: Empty project created
- Project Plan Document
 - Not started
 - 0% Complete



Team Union Pacific

Status Report

[3 of 4]

Switch Alignment Mobile App

- Client Contact
 - We met with our client on Friday, and will meet at 1:15 PM on Fridays weekly
 - We will meet our client team leader Jeff Girbach this Friday as he was on vacation during our first meeting.
- Team Meetings
 - We have our in-person meeting weekly on Wednesday's at 5 PM
 - We have met as a group in-person twice
- Team Organization
 - Our client contact is Jiayue Chai
 - Our team will be split into two main groups, one focusing on the server-side element of the project and the other on game development



Team Union Pacific

Status Report

[4 of 4]

Switch Alignment Mobile Game

Risks

- Risk 1
 - Integration of SQL in Unity 3D.
 - Mitigation: Find SQL libraries or assets in Unity 3D to help integration.
- Risk 2
 - Concurrency with Unity 3D as files are too large for Github.
 - Mitigation: Use Gitlab along with a .gitignore file
- Risk 3
 - Game performance when running on Zebra phone, which is used by Union Pacific employees
 - Mitigation: Possibly obtain a demo version of the device and use Unity device simulator to simulate screen dimensions
- Risk 4
 - Scalability of database and queries based on employees active
 - Mitigation: Consult clients about scale, make sure cost of queries isn't out of their comfort zone



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

United Airlines Airport Operations

The Capstone Experience

Team United Airlines Airport Operations

Austin LeBlanc

John Rumler

Ethan Malzone

Wu Yi

Satvik Ravipati

Stanley Duru

Department of Computer Science and Engineering

Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team United Airlines Airport Operations

Status Report

[1 of 4]

United Airlines

- Fly to many destinations domestically and abroad
- 69.42 million passengers in 2021
- 84k Employees worldwide
- Project Overview
 - Baggage and Boarding scan training software
 - Simulating unique passenger itineraries
 - Generate printable boarding pass and baggage tag images
 - Train computer vision program to scan passes and fit data to model



Team United Airlines Airport Operations

Status Report

[2 of 4]

- Server Systems / Software
 - NodeJS as a backend – installed and working on endpoint setup/packaging
 - MongoDB database – local database tested, waiting on docker before spinning up
 - Docker for deployment – gathering images and working on docker files
- Development Systems / Software
 - Flutter for cross platform frontend development – installed and working through tutorials/documentation
 - VSCode as IDE – installed and environment set up
- Project Plan Document
 - Started with specs and summary
 - 10ish% done (based on previous semester example)



Team United Airlines Airport Operations

Status Report

[3 of 4]

- Client Contact
 - Teams chat established with our project sponsor
 - Weekly meetings scheduled for every Friday
- Team Meetings
 - Team meetings are weekly at minimum, frequency modified as needed
 - Multiple organized chats established to create an easy environment for communication
- Team Organization (Initial Tasks)
 - Ethan – setting up Git workflow
 - Satvik – setting up Trello board
 - Austin & John – setting up Docker with MongoDB and NodeJS images
 - Yi – setting up backend environment
 - Stanley – working on test frontend app for familiarization



Team United Airlines Airport Operations

Status Report

[4 of 4]

Risks

- Risk 1
 - Developing and testing a cross-platform application
 - Researching and selecting the appropriate software and hardware
- Risk 2
 - Multi-device access and database synchronization
 - Selecting the appropriate backend framework
- Risk 3
 - Ease of use and setup for new users
 - Single-click startup, minimal complexity
- Risk 4
 - Site security/privileges
 - Research into proper security procedures (storing salted hashes, etc.)



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Aircraft Appearance Assessment Tool

The Capstone Experience

Team United Airlines Quality Assurance

Tony Kovari

Avi Lochab

Kenny Mei

Han Nguyen

Nandini Tengli

Shaojie (Jay) Zhang

Department of Computer Science and Engineering

Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team United Airlines Quality Assurance

Status Report

[1 of 4]

Aircraft Appearance Assessment Tool

- Sponsor Overview
 - United Airlines is a major (third largest globally) American airline company
 - United Airlines operates both globally and domestically with Chicago O'Hare being its most important hub
- Project Overview
 - Aim is to create an Aircraft Appearance Assessment Tool
 - This will be done by analyzing Social Media images, primarily from TwitterDescription Point 3
 - ML will be utilized to dynamically generate a rating



Team United Airlines Quality Assurance

Status Report

[2 of 4]

Aircraft Appearance Assessment Tool

- Server Systems / Software
 - Create a container with Docker, we can package all the required files in the container
 - Use iMac as the local web server
- Development Systems / Software
 - Using ReactJS as front-end development, since it provides a rich JavaScript library. Easy for future modification of the interface by other people
 - Using python as back-end development, since it has a lot of libraries, frameworks and tools. There are some tools for image analysis such as scikit-image and NumPy
- Project Plan Document
 - Build Local web Server on iMac and access it remotely.
 - Divide Project into two parts: Full-stack and ML
 - Researching on the technology stack and assign coding works next team meeting.



Team United Airlines Quality Assurance

Status Report

[3 of 4]

Aircraft Appearance Assessment Tool

- Client Contact
 - Can filter by exterior, interior, or both
 - Within each post, more filter (stretched goal)
 - Prefer web, focus on the look
- Team Meetings
 - Client meetings occur every Friday evening at 4:00 pm over Teams
 - Team meetings occur every Thursday after CSE498 lecture
- Team Organization
 - Han, Kenny, and Jay – Full Stack development
 - In-process of setting up iMacs to host a local website with a ReactJS frontend and a Python backend using Docker
 - Tony, Avi, and Nandini – Machine Learning
 - In-process of setting up iMacs to obtain all the necessary Python libraries for Machine Learning within the Windows VMWare



Team United Airlines Quality Assurance

Status Report

[4 of 4]

Aircraft Appearance Assessment Tool

Risks

- Risk 1
 - Risk - No required technologies given in project proposal.
 - Mitigation - After initial research by team, decide on platform technologies.
- Risk 2
 - Risk – Twitter API gets rate limited at 25 POST requests per 15 minutes.
 - Mitigation – Use search query and only work on relevant tweets or have a load button to avoid high latency
- Risk 3
 - Risk – Missing training data for aircraft quality rating and images of aircraft components
 - Mitigation – Acquire training set from client and become familiar with training platform
- Risk 4
 - Risk – Multiple aircraft may be in the photo
 - Mitigation – Limit images to photos with 1 aircraft



MICHIGAN STATE
UNIVERSITY

Status Report Presentation
Adaptive Assessment Generator for
Tech-ops Training
The Capstone Experience

Team United Airlines Training

Aref Zeitoun

Eric Raines

Lama Alqrni

Thad Greiner

Eshan Dixit

Akhil Tatineni

Department of Computer Science and Engineering
Michigan State University

Spring 2023



From Students...
...to Professionals

Team United Airlines Training

Status Report

[1 of 4]

Adaptive Assessment Generator for Tech-ops Training

- Sponsor Overview
 - Major American airline company
 - Headquartered in Willis Tower, Chicago
 - 84,100 employees
- Project Overview
 - Used for employee training
 - Summarizes educational content
 - Automatically generate questions
 - Validate manually inputted questions



Team United Airlines Training

Status Report

[2 of 4]

Adaptive Assessment Generator for Tech-ops Training

- Server Systems / Software
 - Tested backend server locally on a Windows 10 system using Python Django framework.
 - Set up the GitLab server group space
 - Have not yet set up any cloud servers/EGR servers for backend.
- Development Systems / Software
 - Configured both iMac machines with VMware fusion.
 - Ran a test prototype on a local Windows 10 machine using Python 3.8.10 and Django library to launch backend
 - Tested an open-source NLP question generator - "QuestGen" to generate questions.
- Project Plan Document
 - Started the project plan.
 - Started the executive summary and finished mockup designs for the application.
 - 15% complete



Team United Airlines Training

Status Report

[3 of 4]

Adaptive Assessment Generator for Tech-ops Training

- Client Contact
 - Had a high-level discussion going over questions we had on the project
 - Established meetings for Tuesday and Thursday at 10am
- Team Meetings
 - Have had three meetings so far going over project plan
 - Meetings scheduled for Wednesday at 5:30pm
- Team Organization
 - Have three teams planned: front end, back end, and AI
 - Front End: Akhil, Lama
 - Back End: Eshan, Thad
 - AI: Eric, Aref



Team United Airlines Training

Status Report

[4 of 4]

Adaptive Assessment Generator for Tech-ops Training

Risks

- Video/Image Content
 - It will be challenging to generate questions from visual data as opposed to regular text.
 - Data gathering from training content should be explicitly text.
- Specific ML Library
 - We need to know what libraries are acceptable to use, as well as which suit the purpose of natural language processing the best
 - We will discuss library usage with the client and research various open-source ML libraries
- Deciding what qualifies as a valid question
 - Determine if a question is fluent, relevant, and accurate.
 - Researching and experimenting with top performing NLP models such as BART, and Info-HCVAE.
- Data Gathering
 - We need to know what kind of information we should be using from the training materials to let's say train our machine learning model. There might be issues with the data the clients are willing to divulge.
 - We will work diligently with the clients around these issues by going through the training guides.



MICHIGAN STATE

UNIVERSITY

Status Report Presentation
Fostering Office Collaboration in a Hybrid
World
The Capstone Experience

Team Urban Science

Josie Beach

Puyu Cai

Baraa Hegazy

Jacob Miller

Nicole Schneider

William Wyrick

Department of Computer Science and Engineering
Michigan State University

Spring 2023



From Students...
...to Professionals

Team Urban Science

Status Report

[1 of 4]

Fostering Office Collaboration in a Hybrid World

- Sponsor Overview
 - Urban Science is a global consulting firm that utilizes APIs in business marketing and strategy. They've worked with almost every major car manufacturer.
 - Started by Jim Anderson, who graduated from Wayne State in 1977
 - HQ is located in Detroit, 21 offices worldwide
- Project Overview
 - The goal is to create a web app that encourages employees to return to the office
 - Employees are able to create events, schedule meetings, and reserve seating in spaces within their office building
 - Alerts employees when a work friend is attending a meeting
 - Software can be used by anyone in the company



Team Urban Science

Status Report

[2 of 4]

Fostering Office Collaboration in a Hybrid World

- Server Systems / Software
 - Created the front-end repository
 - Created a figma for desktop UI
- Development Systems / Software
 - Using Visual Studio Code with Angular
 - Created a simple login page
 - Firebase database is set up
- Project Plan Document
 - Created a template/outline
 - Reviewed previous team's Project Plans



Team Urban Science

Status Report

[3 of 4]

Fostering Office Collaboration in a Hybrid World

- Client Contact
 - Talked with client twice
 - Set up weekly conference call, Tuesdays at 12:00 PM
- Team Meetings
 - Met 3 times
 - Plan weekly meetings on Sunday
- Team Organization
 - Divided work in pairs of two
 - Designated sub-teams of front-end (Design), front-end (Data), back-end



Team Urban Science

Status Report

[4 of 4]

Fostering Office Collaboration in a Hybrid World Risks

- Connecting the database to angular
 - Need to have our database connected to angular
 - Looking online and asking client
- Database storage
 - We now only have the free version which is 1 GB
 - Need to decide if we want to pay or choose another database
- Adding map seats to application
 - Allow users to reserve seating from a map view
 - Search online for how to incorporate a map view of a company
- Ability to run on IOS and Android
 - Need to have a version of our application for both
 - Will use Capacitor and make sure to be communicating



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Flexible VR Training

The Capstone Experience

Team Vectorform

Gabe Misajlovski

Michael Burkett

Matthew Burkett

Casey Stironek

Wu Jiuhoa

Ayaan Shaik

Department of Computer Science and Engineering

Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Vectorform

Status Report

[1 of 4]

Flexible VR Training

- Sponsor Overview
 - Strategic Consultants, Digital Solutions, and Developing new technologies
 - Microsoft-certified in application development
 - Partnered with Neurable to develop brain-computer interface solutions
- Project Overview
 - Virtual Reality Employee Training system
 - Artificial intelligence or human trainer
 - AI will learn from observing human trainers
 - Lifelike scenarios and human interactions



Team Vectorform

Status Report

[2 of 4]

Flexible VR Training

- Server Systems / Software
 - MySQL SQLite databases (Currently still debating necessity) (not currently running)
 - GitHub (Client is currently setting up)
 - Description &/or Status Point 3
 - Microsoft Azure (Account Created)
- Development Systems / Software
 - VMWare Windows Virtual Machine (Up and running)
 - Unity (Downloaded)
 - Photon PUN 2 Engine (Downloaded)
 - Blender
- Project Plan Document
 - Roles have been assigned
 - 30% Complete



Team Vectorform

Status Report

[3 of 4]

Flexible VR Training

- Client Contact
 - Already in contact (Met once over Teams)
 - Meetings Fridays at 1:30 pm
 - Our Contact is Matthew
- Team Meetings
 - Held 2 in-person meetings so far
 - Fridays at 12pm
- Team Organization
 - Roles have been assigned
 - Discord Server created
 - Teams chat created with the client



Team Vectorform

Status Report

[4 of 4]

Flexible VR Training

Risks

- Unity Engine
 - The Unity Engine and its library are complex and vast
 - Only two members have experience
 - We will have a meeting in which we create a simple Plinko simulation to teach/learn how the Unity Engine works (Hasn't happened yet)
- Multiplayer
 - Very complex and time consuming; Can make scalability difficult
 - Little experience implementing it
 - We have created a small Unity project using Photon (Completed)
- AI
 - Complex and multi-faceted
 - No experience with OpenAI
 - We are exploring useful tools and creating a Unity project that implements a simple chat box with OpenAI or ChatGPT (Incomplete)



MICHIGAN STATE

U N I V E R S I T Y

Status Report Presentation

Predicting Malware C2 Channels

The Capstone Experience

Team Vectra

Ettore Campriani

Aidan Erickson

Nathaniel Ferry

Sam Kwiatkowski-Martin

Muhan Luo

Aidan McCoy

Department of Computer Science and Engineering

Michigan State University

Spring 2023



*From Students...
...to Professionals*

Team Vectra

Status Report

[1 of 4]

Predicting Malware C2 Channels

- Sponsor Overview
 - Cybersecurity threat detection and prevention
 - Products built on machine learning and artificial intelligence
 - HQ: San Jose, CA | Employees: ~600
- Project Overview
 - ML model that predicts future C2
 - C2 communication used to establish persistence
 - It could be used by any company that uses web services
 - Through the use of ML would detect and prevent C2 comms



Team Vectra

Status Report

[2 of 4]

Predicting Malware C2 Channels

- Server Systems / Software
 - Flask (In Progress)
- Development Systems / Software
 - Wireshark (Downloaded, tested)
 - Suricata (Downloaded)
 - Python (Downloaded and tested use of ML libraries)
 - PyTorch, scikit-learn, pandas
- Project Plan Document
 - Currently creating project plan
 - About 30% complete



Team Vectra

Status Report

[3 of 4]

Predicting Malware C2 Channels

- Client Contact
 - Meetings on Fridays at 4:00 P.M.
 - In-person meeting planned for January 22nd
- Team Meetings
 - Met 2x in person
 - Meetings on Tuesdays at 4:40 P.M.
- Team Organization
 - Acquiring PCAP data – Aidan E.
 - Suricata PCAP analysis – Muhan
 - Develop web app – Sam
 - Train the ML model – Nate, Ettore, Aidan M.



Team Vectra

Status Report

[4 of 4]

Predicting Malware C2 Channels

Risks

- Lack of PCAP data / mechanisms to get data
 - Inadequate network data. PCAPs provided by Vectra, but real data needed
 - Generating network packets using tools provided, adapting for variance.
- Getting ML up and running
 - Decide on a library / algorithm, figure out how to represent our inputs and outputs
 - Do more in-depth research on different ML algorithms. Research a way to represent our data (primarily signatures) for the algorithm.
- How we express the product on a website
 - This service is not focused on a webapp, so visualization of our product is an area of discussion
 - Find a way to visualize our algorithm and output data



MICHIGAN STATE
UNIVERSITY

Status Report Presentation
SmartCook: An Intelligent System
for Induction Cooktop Cooking
The Capstone Experience

Team Whirlpool

Clarence Nanamori

Alexis Tochiki

Preston Harrell

Daniel Nguyen

Ziming Qiu

Ashu Acharya

Department of Computer Science and Engineering
Michigan State University

Spring 2023



From Students...
...to Professionals

Team Whirlpool

Status Report

[1 of 4]

SmartCook

- Whirlpool Overview
 - In 2021, over \$22 billion in sales with 69,000 employees
 - Based in Benton Harbor, MI
 - Leading kitchen and laundry appliance company
- Project Overview
 - Would assist users in culinary school and home chefs
 - Auto progress through recipe according to customer actions
 - Detect what type of pan is currently on the stovetop
 - For optimal temperature automation
 - Use the Whirlpool Induction Cooktop and current Recipe App



Team Whirlpool

Status Report

[2 of 4]

SmartCook

- Server Systems / Software
 - We don't foresee needing a server currently
- Development Systems / Software
 - Flutter for app development installed
 - Tensor Flow or similar ML library – needs further research
 - App source code downloaded – resolve dependency errors
- Project Plan Document
 - Downloaded and shared
 - Assigning roles and looking to come up with basic UI
 - 0% complete with presentation



Team Whirlpool

Status Report

[3 of 4]

SmartCook

- Client Contact
 - Overview of project goals and current implementation
 - Next time: finish up onboarding and specifications
- Team Meetings
 - Scheduled virtual meetings with client on Fridays 9am EST
 - Scheduled in-person meetings with group on Tues and Thurs
- Team Organization
 - Download source code and configure Figma on iMac and PC's
 - Flutter: Alexis, Clarence, Ziming; ML: Daniel, Ashu, Preston



Team Whirlpool

Status Report

[4 of 4]

SmartCook

Risks

- Pick the appropriate IDE – likely IntelliJ vs VSCode
 - Determining which is better for Flutter and this app's development
 - Install and compare the interface and dev process of each
- Resolve source code dependency errors
 - Current Flutter build has many missing dependency errors
 - A true showstopper – make requirements doc after resolving
- Find method to know when ingredients have been added
 - Must use only stovetop temperature and pan inductance to know
 - Find and implement ML model to recognize change in metrics in real time
- Research and choose a suitable ML model for pan recognition
 - Three unique identifiers per pan for classification
 - Use ML algorithm to classify as already registered pan or identify as new

