09/01,08: Capstone Overview

The Capstone Experience

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Luke Sperling

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Michigan State University

Fall 2021

From Students…
    …to Professionals

CSE498, Collaborative Design

- "The Capstone Experience"
- Instructors
  - Dr. Wayne Dyksen ("Dr. D.")
  - James Mariani
  - Luke Sperling
- Class Meetings (aka All-Hands Meetings)
  - Mondays, Wednesdays 10:20 – 11:40 a.m. Eastern Time
  - Microsoft Teams General Channel
- Website
  - capstone.cse.msu.edu
  - Check it often.
- Syllabus
  - www.capstone.cse.msu.edu/other-links/syllabus
  - Read it thoroughly and carefully.
- Email
  - Check your email often.
  - Read our email immediately, thoroughly and carefully.

Professional Meeting Expectations

- Starts at 10:20 a.m. EDT Promptly
  - Joined the Microsoft Teams Meeting
  - Ready to Go
  - Microphone Muted
  - Video On
  - Looking Professional
- No…
  - Other Electronic Devices
  - Hats or Hoods
  - Coats
  - Eating
  - Sleeping
  - "Breaks"
- Questions? (How to…)

COVID Considerations

- MSU On-Campus Requirements
  - Completed Vaccination
  - Indoors Wear Mask Covering Nose and Mouth
- Capstone Lab In-Person Use Requirements
  - Completed Vaccination Two Weeks Prior
  - Wear Mask Covering Nose and Mouth
  - Providing false information including about vaccination status will be considered a violation of MSU Integrity of Scholarship policy. See the syllabus for details.

COVID Considerations

- Protect your health.
  - Get vaccinated.
  - Ensure social distancing.
  - Wash your hands frequently.
  - Carry and use hand sanitizer.
  - Avoid "social gatherings."
    - Any and All
    - Even 25 or Less People
- Protect your teammates' health.
  - Sanitize your team's Capstone lab areas and devices before and after use.
  - Do NOT work with your teammates in person if you have ANY symptoms of ANY sickness.

COVID Considerations

- It is not possible to receive a grade of "incomplete" in CSE498, Collaborative Design.

- Missing a significant amount of time during the semester for whatever reason will most likely result in the need to retake the course.

Capstone Overview

➢Course Logistics

• Client Projects

• Course Logistics (Continued Next Meeting)

Meeting Attendance

- Significant Impact on Final Grade
- Microsoft Teams Attendees List
  - Who
  - When Joined /Left
- Google Form "Are you there?"
  - Random Times and At End
  - 1 Minute To Respond
  - No Response?
    - Left Meeting
    - Absent

Google Form Attendance Check

↑↑↑↑↑↑↑↑
Only An Example

Course Goals

- Give You Experience In
  - Real World
  - Corporate Setting
- Start Your Transition
  - From Student…
  - …To Professional
- Start Your Transition
  - From…   "Make one of these." –CSE Professor
  - …To   "Solve my problem." –Customer/Client

Course Goals

- Teams of Students
- Build Significant Software System
  - Design
  - Develop
  - Debug
  - Document
  - Deliver
- For Project Sponsor / Client
  (Note: We'll use "project sponsor" and "client" interchangeably.)
- In 15 (Short) Weeks

Course Goals

- Build a significant software system.
- Work in a team environment.
- Learn to work in a remote environment.
- Learn new tools and environments.
- Build and administer systems.
- Develop communication skills.
- Develop interview talking points.
- Learn to do stuff on your own.
- Etc…

Project Deliverables

- Project Plan Presentation & Document
- Alpha Presentation
- Beta Presentation
- Project Software
- Project Video
- Design Day

See Major Milestones.

All-Hands Meetings

Presentations By

- Dr. D.
- Instructors
- Teams
  - Status Reports
  - Formal Presentations (30% of Final Grade)
    - Project Plan
    - Alpha
    - Beta
  - Project Videos
- Guest Speaker(s)

All-Hands Meetings Agendas

- 09/01: Capstone Overview 1
- 09/06: (US Labor Day, No Meeting)
- 09/08: Capstone Overview 2
- 09/13: Project Plan
- 09/15: Team Status Report Presentations
- 09/20: Risks and Prototypes
- 09/22: Schedule and Teamwork
- 09/27: Team Project Plan Presentations
- 09/29: Team Project Plan Presentations
- 10/04: Team Project Plan Presentations
- 10/06: Resume Writing and Interviewing
- 10/11: Creating and Giving Presentations
- 10/13: Team Status Report Presentations
- 10/18: Team Alpha Presentations
- 10/20: Team Alpha Presentations
- 10/25: Break Days

- 10/27: Team Alpha Presentations
- 11/01: Design Day and the Project Videos
- 11/03: Team Status Report Presentations
- 11/08: Intellectual Property
- 11/10: Ethics and Professionalism
- 11/15: Team Beta Presentations
- 11/17: Team Beta Presentations
- 11/22: Team Beta Presentations
- 11/24: Team Status Report Presentations
- 11/29: Team Status Report Presentations
- 12/01: Team Status Report Presentations
- 12/06: Project Videos
- 12/08: Project Videos and All Deliverables
- 12/09: Design Day Setup
- 12/10: Design Day
- 12/17: Capstone Wrap-Up
  7:45 a.m — 9:45 a.m. ET

The Capstone Labs

- 3322EB, 3340EB, 3352EB, 3358EB
- Door Lock
  - Electronic Keypad
  - Code = ########
  - Do Not Give Out to Other Students
- Systems
  - Up to Three per Team
    - Two 27" iMacs
    - One Dell Rack-Mounted Server (Optional)
  - Team 100% Responsible
    - Building
    - Maintaining
    - Securing
    - Backing Up
- WiFi
  - SSID: CSE498, CSE498 5MHz
  - Key: ???????

- Conference Room (3322EB)
  - Team Meetings
  - Client Conference Calls
  - Google Conference Calendar
- Appliances
  - Water Cooler/Heater Nota Bene: The water cooler is not connected to a drain. Do not pour things into it, like rinsing out your water container.
  - Whirlpool Refrigerator
    - Cold Water From Bottled Water
    - Ice From Bottled Water
  - Microwave
  - Keurig Coffee Maker
- Lockable Storage
  - One Drawer Per Team
  - As Needed
  - Assigned by Dr. D. and Instructors
  - Obtain Keys from CSEOffice

The Capstone Labs

- ~~3322EB~~, 3340EB, 3352EB, 3358EB
- Remote Access Instructions will be emailed.
- In-Person Access
  - Fully Vaccinated Two Weeks Prior
  - Mask Covering Nose and Mouth
  - Sanitizing Wipes
    - Keyboard and Mouse
    - Desktop
    - Before and After Use
  - Hand Sanitizer

Scheduled Lab Times

- No Formal Lab Sessions
- "Credit" for Scheduled Weekly Meetings
    - Team Meetings
    - Client Conference Calls
    - Triage Meetings with Instructors
- Meeting Times TBA With
    - Team
    - Client
    - Instructors
- Students must be available to meet.
    - Team Meetings
    - Triage Meetings
    - Client Conference Calls

CSE498 Prerequisites

- Must Have Successfully <u>Completed In Advance</u>
  - CSE325 or CSE410
  - CSE335
  - At Least Two CSE Technical 400-Level Courses Chosen From CSE402, CSE404, CSE410, CSE415, CSE420, CSE422, CSE425, CSE431, CSE435, CSE440, CSE450, CSE460, CSE471, CSE472, CSE476, CSE477, CSE480, and CSE482
  - WRA (Tier I Writing Requirement)
- Ability to Read Email
  - Immediately
  - Carefully
  - Completely

Integrity of Scholarship

- MSU's policies will be enforced.

- Individual and teamwork must be original.

- Providing false information to the professor, instructors or team members about matters related to the course will be considered academic dishonesty.

- Violators…
  - …will be referred to the appropriate deans.
  - …will receive a grade of F (0.0) in the course.

Capstone Overview

✓Course Logistics

➤Client Projects

• Course Logistics (Continued)

Team / Project Generalities

- Clients
  - Vary in Size and Type
  - Client/mentor contacts are "volunteers."
- Team Contact Person
  - Picked By Team
  - Main Point of Contact for Client

Team / Project Generalities

- Project Types
  - All Significant Software Development
  - Vary in Specifics
- Project Level of Difficulty
  - Hard Enough
  - But Not too Hard
- Deliverable
  - To the Client
  - By the Due Date

Team / Project Generalities

- Challenges
  - Very Short, Unforgiving Timeline
  - Client Contact
  - Team Dynamics
  - Project Plan (in ~3 Weeks)
  - Entirely New…
    - Languages
    - Environments
    - API's
    - SDK's
    - Processes
    - Protocols
    - Etc.
  - Project Management
  - Etc…

Project Specifics

- Vary
  - Type
  - Current State of Specificity
- Challenge
  - Connect with Client
  - "Nail Down" the Project
    - Hard Enough
    - Not too Hard
    - Avoid Feature Creep
  - Course Feature, Not Bug

Intellectual Property and Non-Disclosure Agreements

- Intellectual Property Agreement
  - You agree to assign ownership of intellectual property that may be created as a result of your project to your client.
    - Copyrightable Program Code
    - Patentable "Ideas"
  - Most clients will require an IP agreement.
- Non-Disclosure Agreement
  - You agree not to disclose client confidential information.
  - Most clients will require an NDA.
- To date…
  - Most code has not gone directly into production.
  - No patents have resulted.
- Use agreements provided by MSU.
- Always Contact Dr. D. Before Signing Anything

Project Teams

1. Ally
2. Amazon
3. Anthropocene Institute 1
4. Anthropocene Institute 2
5. Atomic Object
6. Auto-Owners
7. Bosch
8. Delta Dental Data Science
9. Delta Dental Knowledge Science
10. Dow
11. Evolutio
12. Ford
13. GM
14. Herman Miller
15. Lockheed Martin Space
16. Malleable Minds
17. Meijer
18. Microsoft
19. Mozilla
20. MSUFCU
21. PwC
22. Rocket Mortgage
23. Stellantis
24. TechSmith
25. United Airlines Airport Operations
26. United Airlines Quality Assurance
27. Urban Science
28. Vectorform
29. Volkswagen
30. Whirlpool

Team Ally

Project Overview

Digital Avatar Assistant

- Functionalities
  - Improve AI Assistant for Ally Customers
  - With Digital Avatar
  - Embedded in any Webpage

- Features
  - Provide Assistance with Financial Questions
  - Visual Representation of Customer Service Agent
  - Interact with Customer using NLP
  - Adapt based on Sentiment

- Technologies
  - React / Angular
  - Amazon Web Services

Detroit, Michigan
Charlotte, North Carolina

Team Amazon

Project Overview

Amazon Web Services: AWSome Availability Zones

- Functionalities
  - Optimize Network Latency on AWS
  - For AWS Users Picking Availability Zones
  - With Interactive Web Application
- Features
  - Collect and Analyze Latency Data
  - With Automated Tool
  - Provide Visualization of Latency Information
  - Store Data in Central Repository
- Technologies
  - AWS Cloud Platform
  - Amazon QuickSight
  - Shell Scripting


amazon

Seattle, Washington
Detroit, Michigan

Team Anthropocene Institute 1
Project Overview

Air Pollution Health Outcomes Forecasting Tool

- Functionalities
  - Detect and Map Impacts of Air Quality
  - Predict Health Burdens of Pollution Events
  - With Robust ML Framework

- Features
  - Synthesis Data from Multiple Sources
  - Develop ML Model to Predict Health Concerns
  - Geographically Map Air Quality

- Technologies
  - HTML / CSS / JavaScript
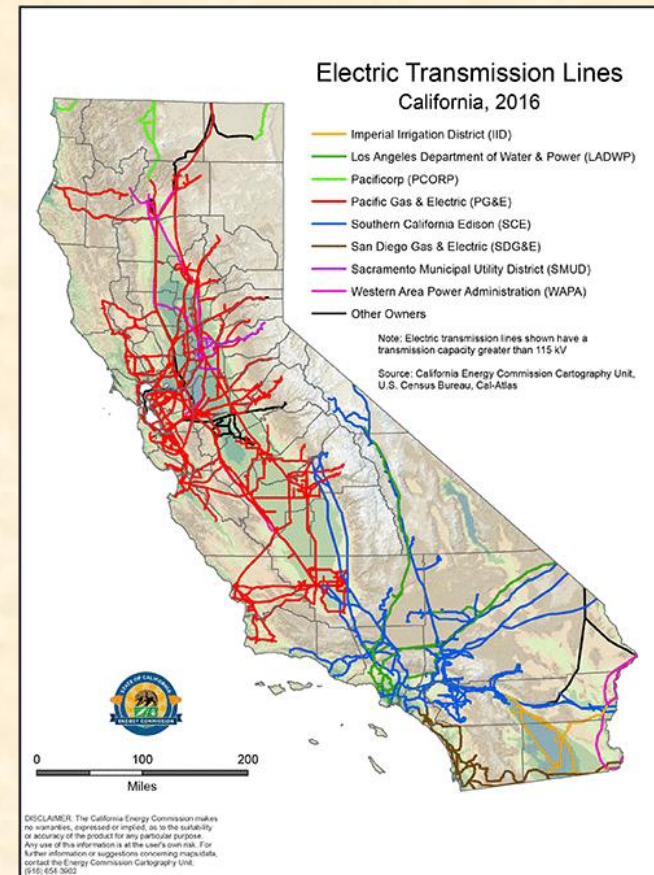 - Database Technologies
  - Machine Learning

Anthropocene Institute
Palo Alto, California
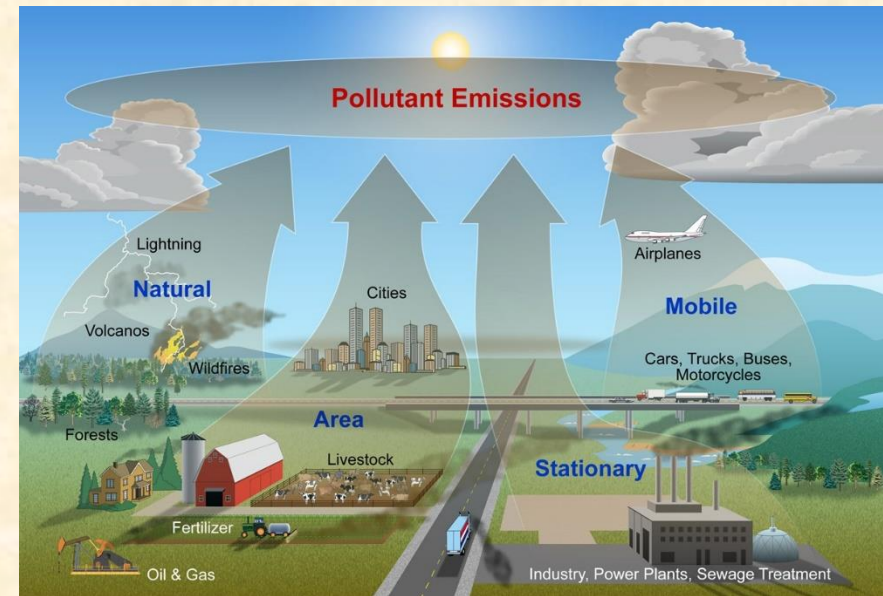
Team Anthropocene Institute 2
Project Overview

Electricity Grid Planning Tool

- Functionalities
  - Provide Cost/Benefit Predictions of SMRs
  - To Electrical Sub-stations in California
  - With ML Model
- Features
  - Model Impacts of SMR Deployment
  - Predict Electricity Generation, Pricing, etc.
  - Identify Benefits of Replacing Coal and Gas Plants
- Technologies
  - HTML / CSS / JavaScript
  - Database Technologies
  - Machine Learning

Electric Transmission Lines
California, 2016

- Imperial Irrigation District (IID)
- Los Angeles Department of Water & Power (LADWP)
- Pacificorp (PCORP)
- Pacific Gas & Electric (PG&E)
- Southern California Edison (SCE)
- San Diego Gas & Electric (SDG&E)
- Sacramento Municipal Utility District (SMUD)
- Western Area Power Administration (WAPA)
- Other Owners

Note: Electric transmission lines shown have a transmission capacity greater than 115 kV

Source: California Energy Commission Cartography Unit, U.S. Census Bureau, Cal-Atlas

Anthropocene Institute
Palo Alto, California

Team Atomic Object
Project Overview

Stroodle: Learning Management System

- Functionalities
  - Streamline and Manage Curriculum Planning
  - For Educators
  - With a Web Application
- Features
  - Provide Mobile Dashboard for Students
  - Support Offline Access and Editing
  - Integrate with 3rd Party Applications
- Technologies
  - React / JavaScript
  - Node.js
  - NoSQL

ATOMIC OBJECT

Grand Rapids, Michigan

Team Auto-Owners

Project Overview

Yard Wars: Weathering the Storm

- Functionalities
  - Simulate Tree Placement
  - To Help Protect Homes from Damage
  - In a Virtual Reality Application
- Features
  - Track Statistics with a Dashboard
  - Implement Various Difficulty Levels
  - Model Realistic Simulations with Multiple Kinds of Trees
- Technologies
  - Unity Game Engine
  - C#
  - Oculus Rift

Auto-Owners
INSURANCE
LIFE · HOME · CAR · BUSINESS
Lansing, Michigan

Team Bosch
Project Overview

Hardware in the Loop (HIL) Vehicle Simulator

- Functionalities
    - Simulate Vehicle Systems
    - On Newer, Less Expensive Hardware
    - To Cut Development Costs and Save Time
- Features
    - Create a User-Friendly GUI
    - Interface with Radar ECU
    - Support Many Options for Configuration
- Technologies
    - Python
    - Bosch Radar
    - PEAK-System
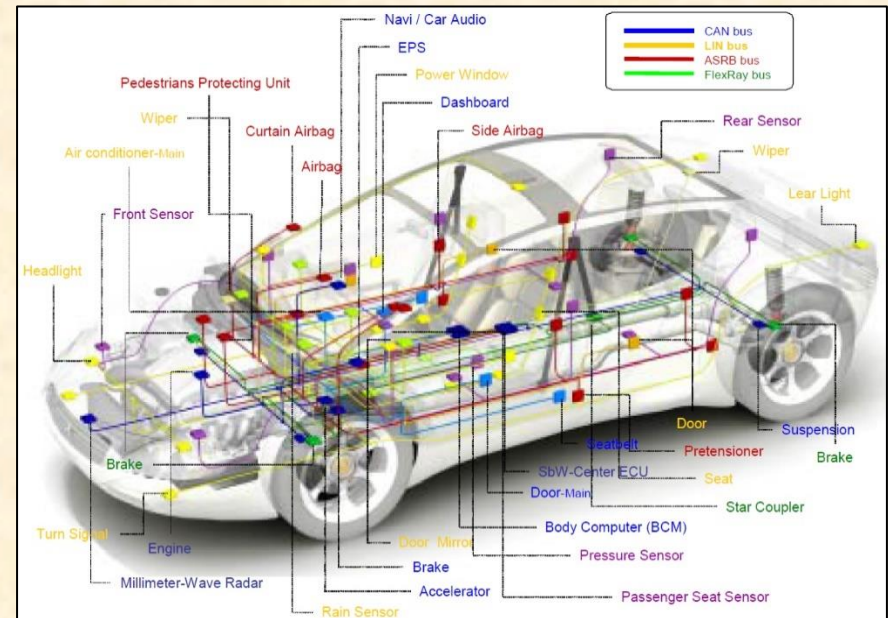
BOSCH
Invented for life

Plymouth, Michigan

Team Delta Dental Data Science
Project Overview

Smart Benefit Plan Recommender Engine

- Functionalities
  - Recommend Insurance Plan to Customers
  - To Expedite Insurance Purchasing
  - For Individuals and Small Businesses
- Features
  - Segment Existing Customer Data with ML
  - Place New Customer Into Existing Segments
  - To Determine Best Insurance Plan
  - Provide Easy-to-use Web Dashboard
- Technologies
  - Snowflake
  - Azure
  - Docker
  - SQL
  - Machine Learning with Python
 - HTML / CSS / JavaScript

△ DELTA DENTAL®

Okemos, Michigan

Team Delta Dental Knowledge Science

Project Overview

Microsoft Excel Data Extractor/Modeler

- Functionalities
  - Improve Efficiency of Delta Dental Employees
  - By Modeling and Extracting Excel Data Autonomously
  - With Web-Based Tool

- Features
  - Take Excel Spreadsheet as Input
  - Use Context to Create Labels and Collect Data
  - Extract Relevant Data
  - And Store in Persistent Database
  - Remove Reliance on One-time Programs

- Technologies
  - Microsoft Excel / Excel APIs
  - Angular / JavaScript / TypeScript
  - Node + Express
  - MongoDB
  - MEAN Stack

DELTA DENTAL®

Okemos, Michigan
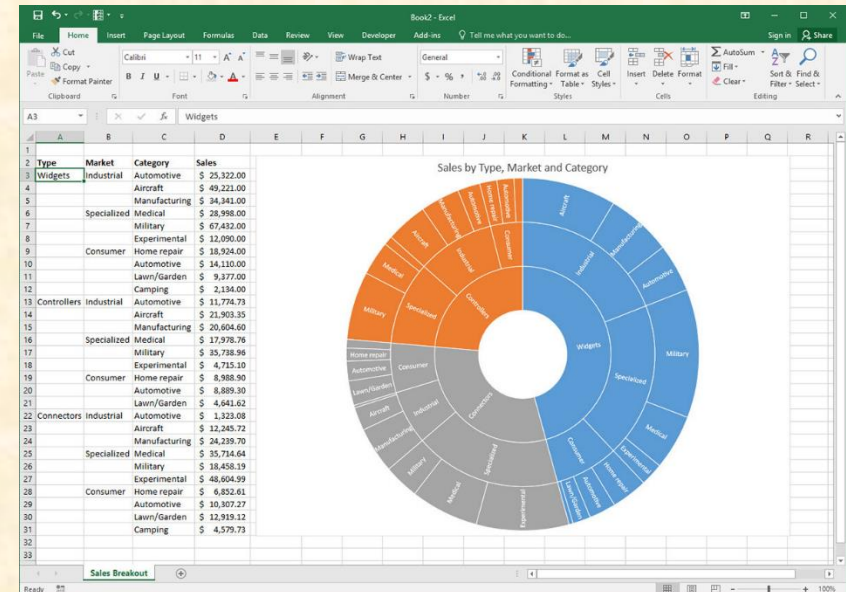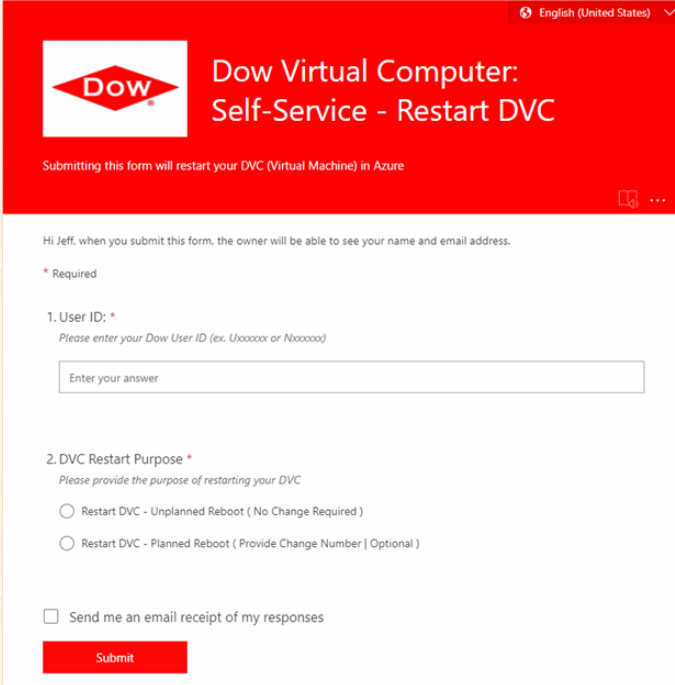
Team Dow
Project Overview

Virtual Computer Service Enhancements

- Functionalities
  - Track when Users are Operating Dow's VMs
  - To Minimize Computation Time and Cut Costs
- Features
  - Communicate Critical Info to Customers
  - Track what Applications are Being Used
  - Visualize Collected Data
- Technologies
  - Azure
  - Aternity
  - Microsoft Forms

Midland, Michigan

Team Evolutio
Project Overview

ERP Kids: Wildlife Conservation

- Functionalities
  - Educate Children on Elephant Conservation
  - And The Work Done by Rangers
  - With Interactive Walk-through Mobile Game
- Features
  - Simulate Conservation Rangers' Tasks
  - Allow User to Experience Conservation Work
  - Integrate Real Drone Footage and Threat Data
  - Provide Informational Section
  - Allow Donations for Conservation
- Technologies
  - C#
  - Android / Kotlin / Android Studio
  - iOS / Swift / Xcode
  - Unity

4 Elephants lost every hour

3 Rhinos killed every day

ēVOLUTIO
Chicago, Illinois

Team Ford

Project Overview

Crowd-Sourced EV Emergency Recharge

- Functionalities
  - Help Stranded Electric Vehicle (EV) Drivers
  - Via Other EV Operators
  - With a Mobile App Service

- Features
  - Negotiate Prices Between Stranded and Rescuer
  - Collect Data for Analysis
  - Support Newly Developed Technologies into System

- Technologies
  - Android / Kotlin / Android Studio
  - iOS / Swift / Xcode
  - Database Technologies

Dearborn, Michigan

Team GM
Project Overview

Enhanced MISP User Interface

- Functionalities
  - Provide Analysts with Streamlined Access
  - To Open-Source Malware Software
  - With a User-Friendly UI
- Features
  - Improve Search Functionality
  - Offer Better Contextualization
  - Implement Many QOL Improvements
- Technologies
  - Python
  - Bootstrap Framework
  - MISP
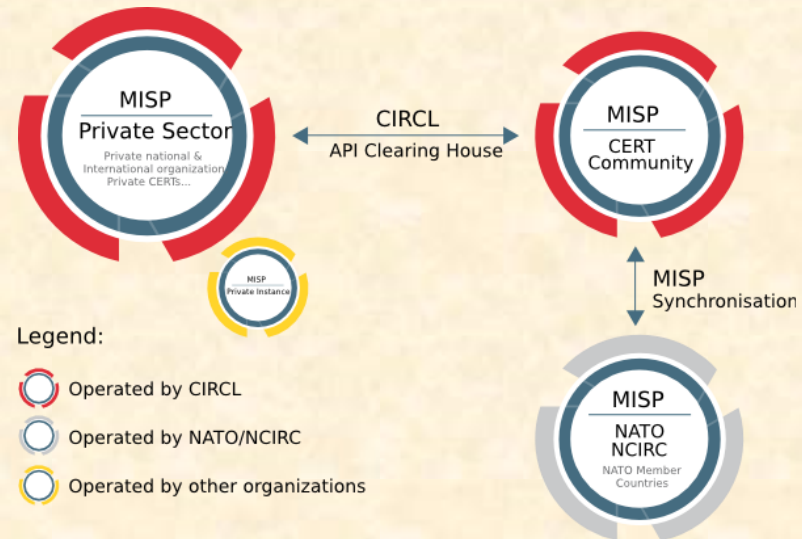
Detroit, Michigan

Team Herman Miller
Project Overview

Live Platform CAD Ingestion

- Functionalities
  - Support Efficient Sensor Analysis
  - By Automatically Import CAD Files
  - Into Existing Space Mapping Tool
- Features
  - Generate Floorplans from CAD Files
  - Support Many Popular File Types
  - Ensure Hardware Constraints are not Violated
- Technologies
  - Mapbox
  - Javascript
  - MySQL

HermanMiller
Zeeland, Michigan

Team Lockheed Martin Space
Project Overview

SmartSat™ Satellite App Store

- Functionalities
  - Application Store for Satellite SDKs/Software
  - Improve Reusability of SDKs and Software
  - Manage Versioning and Distribution of SDKs
  - Automate Testing of Applications
- Features
  - Facilitate Upload of Source Code or Binaries
  - Automate Collection of Application Attributes
  - Implement RESTful API to Automate App Store Functionality
  - Develop Web Front-End
- Technologies
  - React / Flask / PostgreSQL
  - Python
  - Docker / Jenkins / Nexus / Conan C++
  - Yocto Linux / VxWorks

LOCKHEED MARTIN

Littleton, Colorado
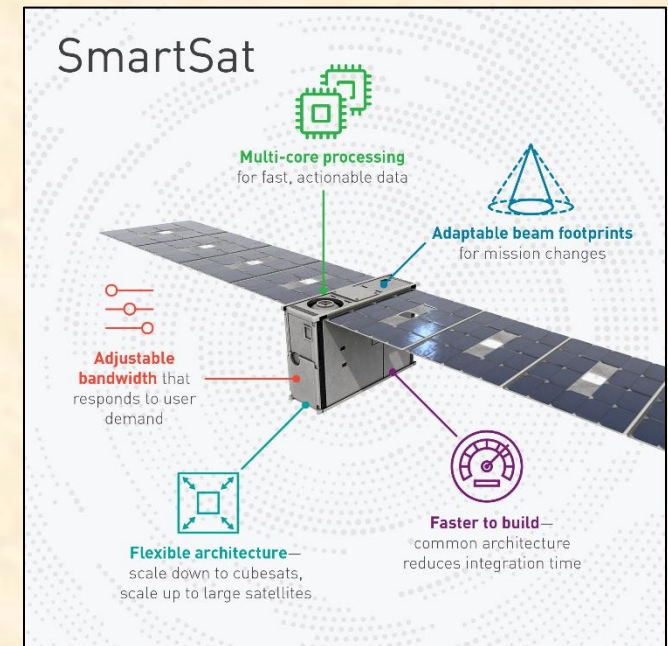
Team Malleable Minds

Project Overview

Review Aggregator for Educational Programs

- Functionalities
  - Improve User Experience of Clients
  - By Expanding Existing Review Aggregators
  - Used by Educational Programs
- Features
  - Offer a Recommendation Engine
  - Filter Obscene Reviews
  - Implement Data Collection Module
  - Improve Search Functionality
- Technologies
  - Python
  - React / JavaScript
  - Amazon Web Services
  - Okta
  - Elasticsearch
  - Machine Learning
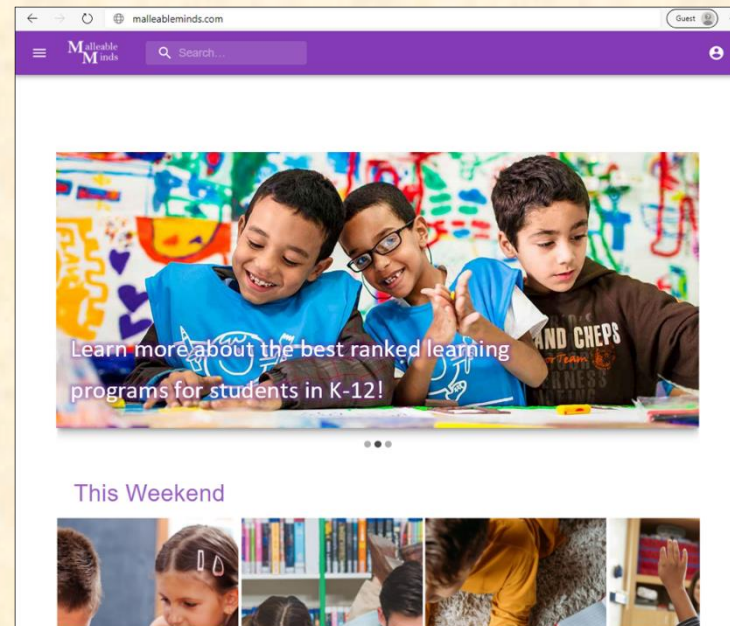
M alleable
M inds
Venice, California

Team Meijer

Project Overview

mHealthy: Healthy Eating Application

- Functionalities
  - Help Customers Make Healthy Choices
  - By Providing Easy-to-Understand Information
  - With a Mobile Application
- Features
  - Integrate with Meijer Website and App
  - Create Categories Such as Gluten-Free
  - Provide Suggestions for Healthy Eating
- Technologies
  - Android / Kotlin / Android Studio
  - iOS / Swift / Xcode
  - Microsoft Azure

meijer

Grand Rapids, Michigan
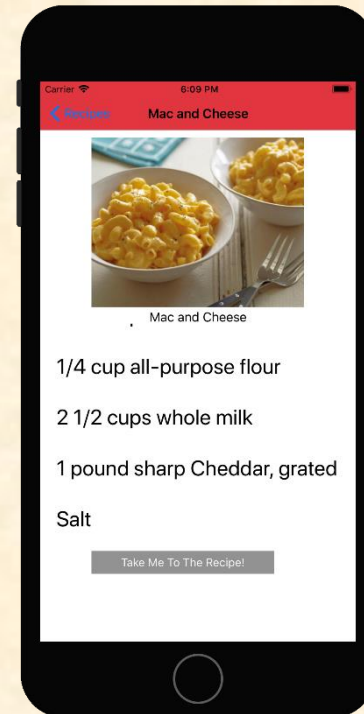
Team Microsoft
Project Overview

Feedback Prompt for Ratings in Google Play Store

- Functionalities
  - Automate and Streamline Feedback Collection
  - For Microsoft Intune Android Application
  - To Improve Developer Response

- Features
  - Offer Users Option to Rate and Review Application
  - Parse and Summarize Feedback Automatically
  - Automate Email/Teams Bot/Other to Alert Developers
  - Determine Features Users Most Request

- Technologies
  - C#
  - Android / Kotlin / Android Studio
  - iOS / Swift / Xcode

Microsoft

Redmond, Washington

Team Mozilla
Project Overview

Improve High Contrast Mode for Firefox

- Functionalities
  - Improve Firefox Desktop UI
  - To Simplify High Contrast Mode Controls
  - Provide Greater Accessibility to Firefox
- Features
  - Redesign UI Controls
    - Buttons
    - Checkboxes
    - Text Input
  - Improve Tabs Bar
  - Update Menus/Panels
  - Support Dark and Light Themes
- Technologies
  - JavaScript / CSS
  - C++
  - Git / Mercurial
  - Windows / OS X / Linux

Firefox Browser
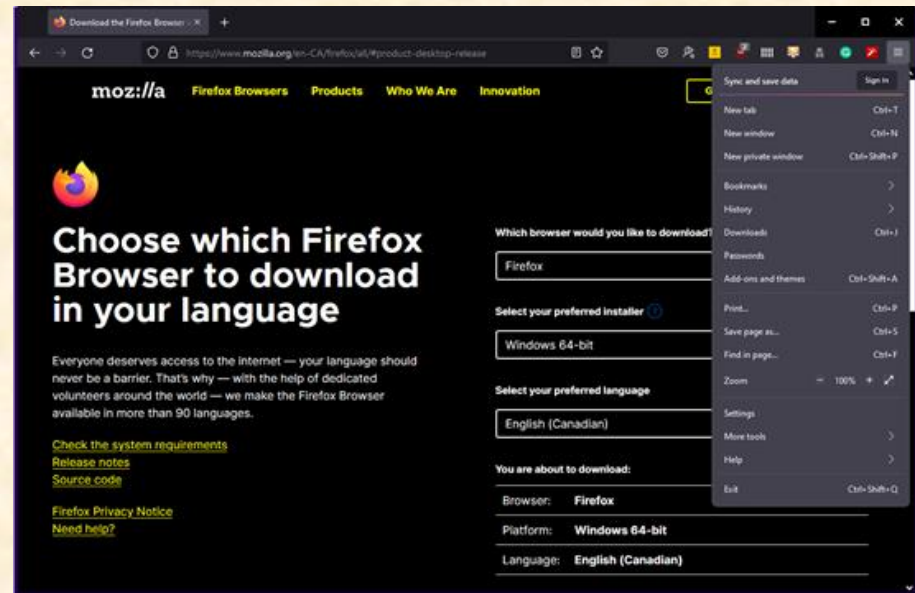
Mountain View, California

Team MSUFCU
Project Overview

"Spaving": Giving based on Spending Habits

- Functionalities
  - Simplify and Improve Charity Donations
  - Of MSUFCU Clients
  - By Expanding a Charity-Supporting Application
  - Using Machine Learning
- Features
  - Analyze Spending Habits to Suggest Charities
  - Identify Patterns between User Data and Others
- Technologies
  - Node.js
  - React
  - Amazon Web Services

MICHIGAN STATE UNIVERSITY®
FEDERAL CREDIT UNION
Building Dreams *Together*
East Lansing, Michigan

Team PwC
Project Overview

Collaboration Bot for Microsoft Teams

- Functionalities
  - Automate Setup of Teams/OneDrive Environment
  - To Allow Employees to Collaborate Seamlessly
  - With a Teams Bot

- Features
  - Automatically Configure Teams and OneDrive
  - Remove Need for IT Admin
  - Develop Teams Bot as Convenient UI
  - Hosted on Microsoft Azure

- Technologies
  - Microsoft Azure
  - Microsoft Teams
  - Power Platform

pwc

Detroit, Michigan

Team Rocket Mortgage
Project Overview

ROCKY Team Challenge Application

- Functionalities
  - Track Goals and Challenges for Rock FOC Employees
  - To Increase Productivity and Engagement
  - With a Web Application
- Features
  - Support Both Admins and Users
  - Visualize Leaderboards for Top-Scoring Employees
  - Handle Custom Challenges with Many Settings
- Technologies
  - Angular
  - .NET
  - Amazon Web Services

ROCKET
Mortgage
Detroit, Michigan
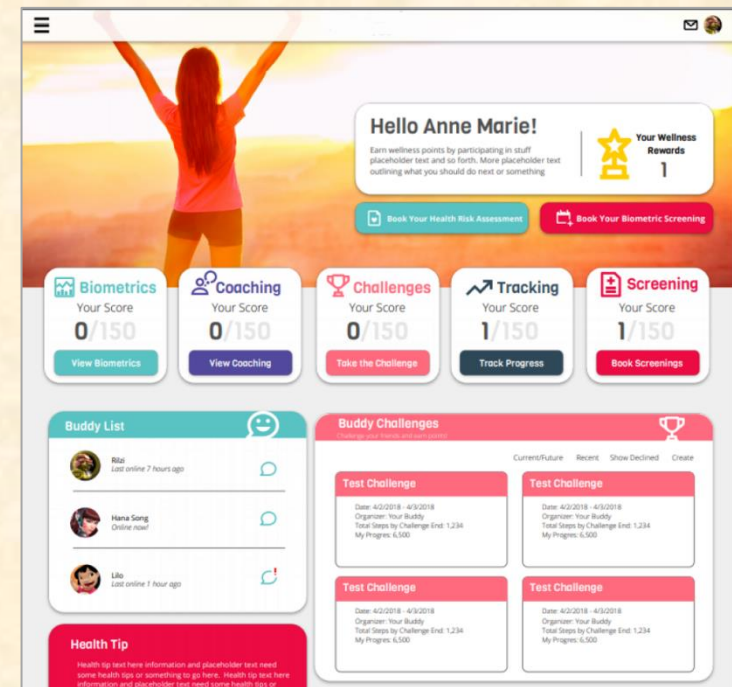
Team Stellantis
Project Overview

Interactive Digital Assistant

- Functionalities
  - Provide Employees with Quick Answers
  - Using Digital Assistant
  - That Interfaces with Stellantis Services
- Features
  - User NLP to Parse and Respond to Questions
  - Hosted in the Cloud
  - One Central Assistant for All Employees
  - Log and Analyze all Interactions
  - To Improve Assistant Over Time
- Technologies
  - Google Cloud Platform

STELLANTIS

Auburn Hills, Michigan
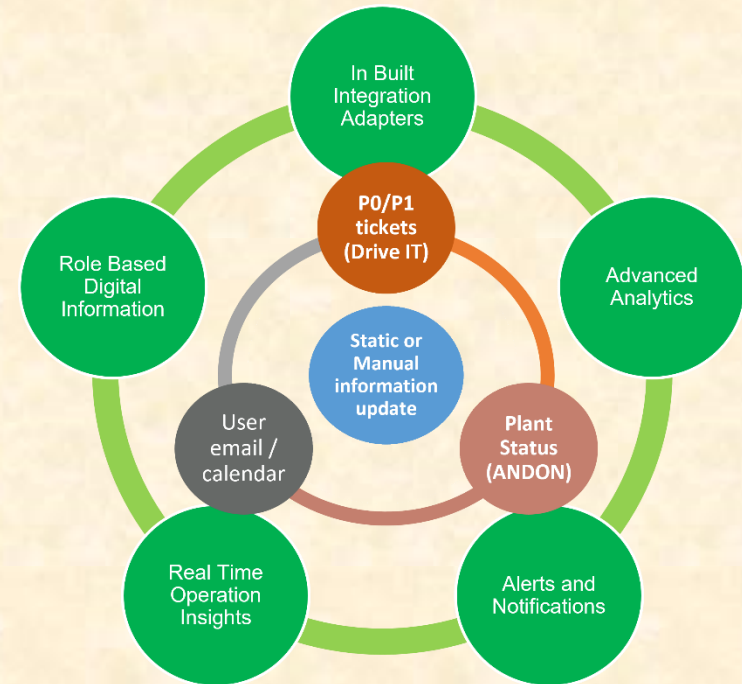
Team TechSmith
Project Overview

Snagit Template Creator

- Functionalities
  - Streamline the Template-Creation Process
  - For an Existing Graphics Editor
  - Distribute Templates with a Website
- Features
  - Share Templates Online and Download Others'
  - Support Both Mac and Windows
  - Integrate Created Templates with Snagit
- Technologies
  - .NET
  - Docker
  - RESTful Web Services

TechSmith®

Okemos, Michigan

Team United Airlines Airport Operations

Project Overview

Gate Hazard Geo-Mapping

- Functionalities
  - Display and Map Hazards at Airport Gates
  - To Help Train UA Employees
  - With Interactive Mobile Application
- Features
  - Display 2D and 3D Models Overlaid on Map
  - Allow User to View any Gate from Any Location
  - Provide Feedback on User Progress
- Technologies
  - 2D and 3D Model Visualization
  - Android / Kotlin / Android Studio
  - iOS / Swift / Xcode
  - Database Technologies

UNITED

Chicago, Illinois

Team United Airlines Quality Assurance
Project Overview

QA Audit Center

- Functionalities
  - Provide Auditing Platform for QA
  - That Integrates with Existing Software
  - With Web-based Application
- Features
  - Allow User to Complete and Sign Audit Logs
  - Generate PDFs and Save in Database
  - Allow Pictures to be Saved and Analyzed
  - Allow Stylus/Handwritten Text Input
  - Scrape Government Sites Regularly
  - To Keep Up-to-date with Regulations
- Technologies
  - SQL Database
  - Web Development

UNITED

Chicago, Illinois
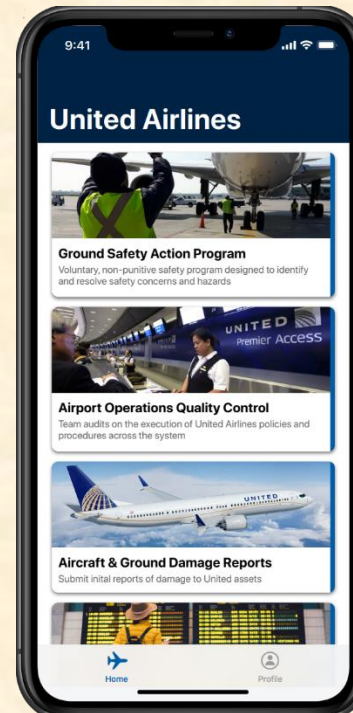
Team Urban Science
Project Overview

Independent Repair Facility (IRF) Insights

- Functionalities
  - Provide Dealerships with Operational Insights
  - Into the Automobile Aftersales Market
  - To Improve Services Offered by Dealers
- Features
  - Utilize Car GPS and Diagnostics
  - To Determine Where a Vehicle is Repaired
  - Visualize Gathered Data in Web Portal
  - Support Daily Updates and Database Integration
  - Leverage AI to Propose Improvements to Strategy
- Technologies
  - Angular
  - Microsoft SQL Server
  - Apache Cordova

URBAN SCIENCE

Detroit, Michigan
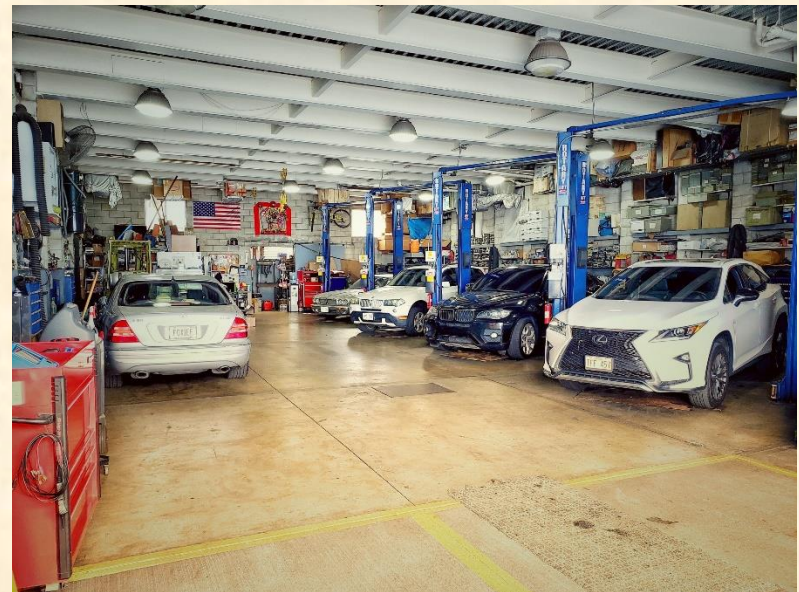
Team Vectorform
Project Overview

Smart Auto-Time Logging

- Functionalities
  - Improve Efficiency of Vectorform Employees
  - By Automatically Tracking Time
  - For Work on Billable Projects
  - With a System that Learns over Time
- Features
  - Handle Labeled Data
  - Learn to Function without User Labeling
  - Recognize Context within a Program
- Technologies
  - Git
  - Microsoft Teams
  - Swift
  - C#

Vectorform

Royal Oak, Michigan
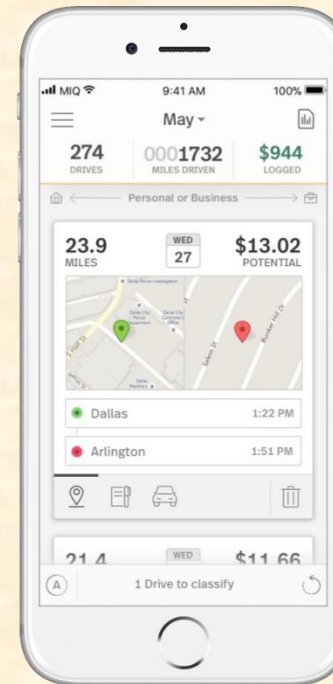
<u>Team Volkswagen</u>
Project Overview

Car-Net DriveView Social Competition App

- Functionalities
  - Motivate Drivers to Drive Safely
  - By Fostering Friendly Competition
  - With a Social Medial Mobile App
- Features
  - Offer Leaderboards, Achievements, and Levels
  - Interface Directly with Car-Net
  - Provide Many Features Typical in Social Media
- Technologies
  - Amazon Web Services
  - Angular
  - Android / Kotlin / Android Studio
  - iOS / Swift / Xcode

Auburn Hills, Michigan

Team Whirlpool

Project Overview

AI Recipe Converter

- Functionalities
  - Convert Recipes to a Machine-understandable Format
  - To Allow Automated Cooking
  - With Little Human Interaction
- Features
  - Scrape Cooking Recipes Online
  - Parse and Analyze Recipes with NLP
  - Convert Recipes to Format Machines can Understand
  - Store Recipe Instructions in Database on Device
- Technologies
  - Yummly
  - Natural Language Processing
  - NoSQL
  - Python
  - Database Technologies
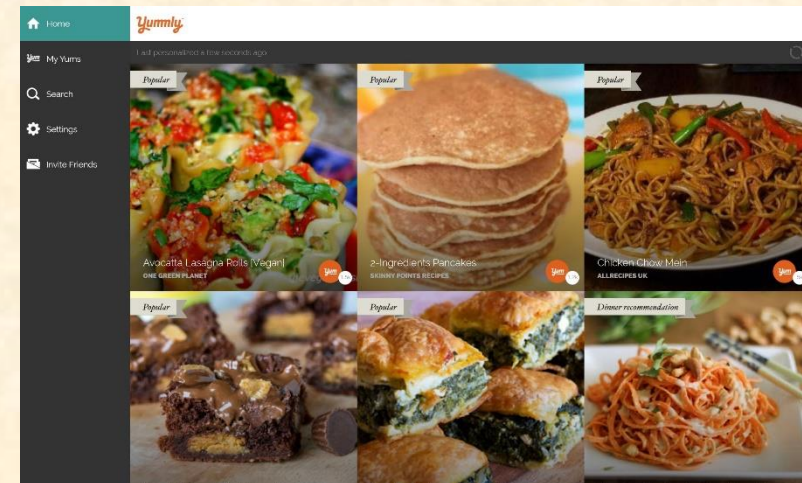
Whirlpool

Benton Harbor, Michigan

Team Member Survey

- Open Browser

- Go to www.capstone.cse.msu.edu

- Click on...

  - + Other Links

  - > Downloads

  - Team Member Survey: <u>Google Form</u>

First Assignments

- Read the Syllabus.
- Check out the Lab If So Desired (~~3322EB~~, 3340EB, 3352EB, 3358EB).
  - See if you can find it.
  - See if you can get in.
- Check out the Website.
- Research the Projects.
  - Sponsor
  - Technologies

What's Next?

- Teams

  Questions?

  - Receive assignments by email tonight. (Keep checking your email.)
  - Meet initially by tomorrow afternoon at the latest using Microsoft Teams private team channel.
  - Start researching technologies.
  - Start configuring lab machines.
    - Team assignments given in emailed project proposals.
    - Instructors will email remote access instructions.
- Project Sponsor / Client Contact
  - Contact by email by <u>tomorrow</u> COB (Close of Business).
  - Complete conference call or online meeting by <u>Friday.</u>
  - Review project proposal.

Capstone Overview

✓Course Logistics

✓Client Projects

➢Course Logistics (Continued)

Where are we?

- Teams/Projects
  - Assigned
  - Met and Working
- Sponsors/Clients
  - Contacted
  - Met and Scheduled Weekly Meeting
- James and Luke
  - Heard From
  - Met and Scheduled Weekly Triage Meeting
- Capstone Lab
  - Successfully Connected Remotely
  - Began Configuring Systems
- Projects
  - Read Project Description
  - Discussed with Client
  - Began Exploring and Configuring Technologies
  - Began Exploring and Configuring Systems

About Us

- Dr. D.
  - Title: Professor
  - Hometown: North Haledon, New Jersey
  - Education: Calvin College (BS), Purdue University (MS, PhD)
  - Experience: Professor @ Calvin, Purdue, Nebraska, MSU
- James Mariani
  - Title: Academic Teaching Specialist
  - Hometown: Sterling Heights, Michigan
  - Education: MSU (BS, MS, PhD Candidate)
  - Experience: Teaching Assistant, Instructor @ MSU
- Luke Sperling
  - Title: Graduate Teaching Assistant
  - Hometown: Birmingham, Michigan
  - Education: MSU (BS, MS, PhD Candidate)
  - Experience: Teaching Assistant @ MSU

Capstone Lab Machines

- Depends on Team Needs
  - Two 27" iMacs
  - Dell Rack-Mounted Server (Optional)
    - Connected to Outside World
    - Keep Secure
  - PC (Optional)
- Operating Systems on iMacs
  - Run macOS Big Sur
  - Install VMware Fusion (from OnTheHub.com)
  - Create Virtual Machines
    - Windows 10 VM from Instructors
    - Allocate Sufficient Cores and Memory
    - Others as Needed
  - Don't use Apple Boot Camp
- Not Required to Use Capstone Lab Machines

The Capstone Labs

- ~~3322EB~~, 3340EB, 3352EB, 3358EB
- Remote Access
  Instructions will be emailed.
- In-Person Access
  - Fully Vaccinated Two Weeks Prior
  - Mask Covering Nose and Mouth
  - Sanitizing Wipes
    - Keyboard and Mouse
    - Desktop
    - Before and After Use
  - Hand Sanitizer

The Capstone Labs

- Security
  - Keep lab doors closed.
  - Do not open doors for strangers
  - Do not give out door key code to others.
  - Do not invite non-capstone students to work in the lab with you.
  - Email Dr. D. and Instructors if door becomes unlocked.
- Wireless
  - SSID: CSE498
  - Key: ??????
  - Intended for Devices Requiring Lab Subnet
- ~~Coffee~~
  - ~~Some Provided by Dr. D.~~
  - ~~Bed, Bath & Beyond (Get 20% Off Coupon)~~
- Game Playing / Video Watching
  - Not On Monitors Facing Hallway
  - Not If Other Team Members Need Machine

The Capstone Labs

- Do <u>not</u> "maniac" the wires and cables.
- Keep the lab neat and clean.
  - Lived In, Okay.
  - Messy, Not Okay.
- Respect…
  - …other teams' spaces.
  - …shared spaces.
- Garbage Containers
  - Empty the small one by the coffee maker into a larger one.
  - Put larger ones out in the hall at night if near full.
  - Put back in the lab in the morning if empty.
- Turn the lights out if you're the last one out.
- Close the windows if you open them.
- Be careful with cabinet drawers; don't "maniac" them.
- ~~Water Dispensers (Cooler and Fridge) are <u>not</u> connected to a drain.~~

Devices Available From MSU

- For Capstone Project Use
- By Team for the Semester
- Includes "General Purpose" Devices
  - iOS
    - iPads
    - iPhones
  - Android
    - Tablet
    - Phone
  - Surface Pro 3
  - Oculus Rift
  - Something Else
- How do you get them?
  - Pick Them Up from Dr. D. or Instructors
  - Ship Them to You

If you need something, ask.

We'll figure out how to get it to you.

For starters, use emulators.

Devices From Project Sponsors

- Special Purpose Devices
    - NVIDIA Jetson
    - Drone
    - Raspberry Pi
    - Etc...
- How do we/you get the devices?
    - Ship to Dr. D.'s House?
    - Pickup from Dr. D. and/or Instructors?
- Where do we keep the devices?
    - In Capstone Lab in Locked Cabinet?
    - One of Your Apartments/Homes?
- Who gets the devices if they are not a lab?
    - One or All of You?
    - Most Hardware-Smart Team Member?
- How do we return the devices?
    - Drop Off in Capstone Lab
    - Ship via UPS, USPS,...

Expectations & Workload

- Extremely High For Both

- Your MSU Career Capstone

- Addition to Your Personal Portfolio

- Experience Viewed Like an Internship

- Interview Talking Points

- Leverage Into a Job Offer

Schedules

- Schedules > All-Hands Meeting

- Schedules > Major Milestones
  - 09/15: Status Report Presentations
  - 09/27: Project Plan Presentations
  - 10/18: Alpha Presentations
  - 11/15: Beta Presentations
  - 12/06: Project Videos
  - 12/08: All Deliverables
  - 12/10: Design Day

- Attendance is required.
- No excuses are accepted.
- Do not schedule anything during these times including interviews, travel home, etc.
- Will coordinate with your interviews.

Meeting Attendance and Preparation

- Required and On Time
  - All-Hands (Class) Meetings
  - Team Triage Meetings
  - Team Meetings
  - Team Conference Call Meetings
- Attendance How
  - Microsoft Teams
    - Who
    - When Joined/Left the Meeting
  - Google Forms
    - One ore More at Random Time During Meeting
    - One at End of Meeting
    - 60 Seconds to Complete
- Attendance Categories
  - Join Time ≤ 10:20:00 a.m. ⇒ Present
  - 10:20:01 a.m. ≤ Join Time ≤ 10:25:00 a.m. ⇒ Late
  - Join Time > 10:25:00 a.m. ⇒ Absent
  - Miss Google Form (During or At End) ⇒ Left Meeting ⇒ Absent

Google Form Attendance Check

↑↑↑↑↑↑↑↑
Only An Example

Meeting Attendance and Preparation

- Point Deductions
    - Absent ⇒ -1.0 Point
    - Late ⇒ -0.5 Points
    - Missed Triage Google Form or Slides ⇒ -0.5 Points
- Final Grade
    - Start with +5.0
    - 1.0 Point == 1.0% of Final Grade
    - <u>Can Go Negative</u> ← **Note**
- Almost No Excuses Accepted
    - One or Two Excused Possible for Interviews (No Travel Should Mean No Conflicts)
    - Must Provide Information
        - Date, Company, Recruiter Name & Contact Info
        - In Advance
        - To Both Dr. D. and Instructors
- See Syllabus
    - <u>All-Hands Meeting Attendance</u>
    - <u>Grading</u>
- Must Attend (No Excuses Accepted)
    - Your Team Presentations
    - All Project Video Viewing
    - Design Day

Do NOT schedule interviews.
Do NOT schedule ANYTHING.
Do NOT buy plane tickets.

Team Organization

- Up to Each Team
- Organize into Roles
  - Sponsor/Client Contact
  - Program Manager
  - Developer
    - Web
    - Mobile
    - Back End
    - Front End
    - Etc.
  - Tester
  - Systems Administrator
  - Etc…
- Everyone must make significant technical contributions, including significant software contributions. ← **Fair Warning**

Team Dynamics

- Key to Success

- Significant Component of Course Grade

- Address Problems Immediately
  - Within Team
  - With Dr. D. and/or Instructors

- Be Ready to Discuss During Interviews

Grading

- Team (70%)
  - Project Plan Document & Presentation   10
  - Alpha Presentation   10
  - Beta Presentation   10
  - Project Video   10
  - Project Software & Documentation   25
  - Design Day   05
  - Total   70
- Individual (30%)
  - Technical Contribution   10
  - Team Contribution   10
  - Team Evaluation   05
  - Meeting Attendance & Preparation   05 ← Can Be Negative
  - Total   30

Grading

- Final Grade Sum Of...
  - Individual Total
  - % of Team Total Based on Team Contribution
- Grand Total =

    (Individual Total)

    +

    (Team Total) * (Team Contribution) / 10.0

- *Nota Bene*: Your Team Contribution will have a very significant effect on your final grade.

Grading

Effect of Team Contribution					
Technical Contribution	Team Contribution	Team Evaluation	Meeting Attendance	Team Total	Grand Total
10	10	5	5	70	100
10	9	5	5	70	92
10	8	5	5	70	84
10	7	5	5	70	76
10	6	5	5	70	68
10	5	5	5	70	60
10	4	5	5	70	52
10	3	5	5	70	44
10	2	5	5	70	36
10	1	5	5	70	28
10	0	5	5	70	20
Nota Bene: Assumes Perfect Score In Every Other Category					

Grading

- In order to be eligible to earn a non-zero final course grade, you must earn at least 50% in every one of the grading categories given above. That is, in order to be eligible to earn a non-zero final course grade, you must earn at least the minimal grades given below.
- Minimal Team Grade Requirements
  - Project Plan Document & Presentation   5.0 / 10.0
  - Alpha Presentation   5.0 / 10.0
  - Beta Presentation   5.0 / 10.0
  - Project Video   5.0 / 10.0
  - Project Software & Documentation   12.5 / 25.0
  - Design Day   2.5 / 05.0
- Minimal Individual Grade Requirements
  - Technical Contribution   5.0 / 10.0
  - Team Contribution   5.0 / 10.0
  - Team Evaluation   2.5 / 05.0
  - Meeting Attendance & Preparation   2.5 / 05.0

Grading

- In the capstone course, absence does <u>not</u> make your teammates' hearts grow fonder.
  - Nonresponsive
    - Email
    - Slack
    - Microsoft Teams Messages
    - Etc.
  - Miss Meetings
    - All-Hands
    - Triage
    - Client
    - Team
  - Miss Work ← **Key**
    - In Lab and/or Online with Teammates
    - During Sprints
    - Before Major Milestones

Grading

Unacceptable Excuses for Not Contributing

- They never asked me to do anything.
- They never let me do anything.
- I wrote 1000's of lines of code, but they weren't included in the project.
- My features were not included in the project.
- I work 40 hours per week at my job.
- I live 60 minutes from MSU.
- I didn't want to work on this project team.
- I ranked this project last.
- I did a lot of research about stuff that we never used.
- I was busy interviewing.
- Etc…

Grading

- We reserve the right to make changes with sufficient notice.
- No special consideration will be given for final grades, including but not limited to
  - effect on GPA,
  - status in any academic program including CSE,
  - financial aid,
  - rank in the armed forces,
  - job while a student at MSU,
  - job after anticipated graduation from MSU,
  - graduation,
  - mortgage,
  - wedding,
  - visa status,
  - effect on graduate school application,
  - or anything else.

Using Resources

- Ok For "Help"
  - People
    - Past Capstone Teams
    - Other Capstone Teams
    - Faculty Members
  - Articles
  - Sample Code
  - Etc...
- Not Ok For "Entire" Project
- If Unsure, Ask Dr. D. and/or Instructors

Using Existing Code

- Ok
  - Examples
  - Prototypes
  - Open-Source Code
    - Fragments
    - Libraries
    - Utilities
- Not Ok
  - Vast Amounts of Your Project
  - Not Open Source
- Ask client in advance.
- Document and report all existing code used.
- Be Careful!
- If unsure, ask Dr. D. And/or Instructors and/or your client.

Travel to Client

- Reimburse for Mileage for Personal Car
- Travel Within Michigan (Outside of Lansing)
  - Grand Rapids
  - Midland
  - Metro Detroit
  - Zeeland
- From East Lansing to Client and Back
- One Car Per Team Per Trip
- See Brenda in the CSE office in advance.

VISA

- Verified Individualized Services and Accommodations

- Let us know immediately.

- We will work with you.

Integrity of Scholarship

- MSU's policies will be enforced.

- Individual and teamwork must be original.

- Providing false information to the professor, instructors or fellow team members about matters related to the course will be considered academic dishonesty.

- Violators...
  - ...will be referred to the appropriate deans.
  - ...will receive a grade of F (0.0) in the course.

Office Hours

- Any Time…
  - ~~Visit: 3149 EB~~
  - ~~Call: 353-5573~~
  - Email: (dyksen@msu.edu)
  - Message Using Microsoft Teams
- Make Appointment
  - Call Using Microsoft Teams
  - Meet Using Microsoft Teams

COVID Considerations

- MSU In-Person Requirements
  - Completed Vaccination
  - Indoors Wear Mask Covering Nose and Mouth
- Capstone Lab In-Person Use Requirements
  - Completed Vaccination Two Weeks Prior
  - Wear Mask Covering Nose and Mouth
  - Providing false information will be considered a violation of MSU Integrity of Scholarship policy. See the syllabus for details.

COVID Considerations [2 of 4]

- Protect your health.
  - Get vaccinated.
  - Ensure social distancing.
  - Wash your hands frequently.
  - Carry and use hand sanitizer.
  - Avoid "social gatherings."
    - Any and All
    - Even 25 or Less People
- Protect your teammates' health.
  - Sanitize lab areas and devices before and after use.
  - Sanitize your hands before and after use.
  - Do NOT work with your teammates in person if you have ANY symptoms of sickness.

COVID Considerations

- COVID Test ≠ Excused Absence

- It is not possible to receive a grade of "incomplete" in CSE498, Collaborative Design.

- Missing a significant amount of time during the semester for whatever reason will most likely result in the need to retake the course.

COVID Considerations

- Capstone Lab Lockdown
  - Highly Likely
  - Plan for it on a moment's notice.
  - Learn to work on the lab computers remotely.
  - Make a plan for specialized hardware distribution.
    - Where will you house it?
    - How will others get access to it?

Problems

- Address As Soon As Possible
  - Respectfully
  - Within Team
  - With Instructors
  - With Dr. D.

We don't have one of these.

Capstone Overview

✓Course Logistics

✓Client Projects

✓Course Logistics (Continued)

Questions?

Google Form
Attendance Check

What's ahead?

- Upcoming Meetings
  - 09/13: Project Plan
  - 09/15: Team Status Report Presentations
  - 09/20: Risks and Prototypes
  - 09/22: Schedule and Teamwork
  - 09/27: Team Project Plan Presentations
  - 09/29: Team Project Plan Presentations
  - 10/04: Team Project Plan Presentations

10% of Team Grade

What's ahead?

- Split-Hands Meetings
  - Used On Presentation Days
    - 09/15: Team Status Report Presentations
    - 09/27-10/04: Team Project Plan Presentations
  - Split by Teams by Instructor
  - Microsoft Teams Channels
    - James Teams
    - Luke Teams
  - Attendance Taken As Usual

What's ahead?

- Team Photos
  - Individuals Submit Photos
    - High Resolution
    - Business Casual Dress
    - Head to Just below Knees
    - Hands at Side
  - Photographer Creates Team Photo
  - Instructions From James Soon
  - See Team Photos in The Capstone Experience

Team Volkswagen, Fall 2020

What's ahead?

- Website, Email and Team's Messages
  - Check Constantly
  - Read Carefully
  - Not Seeing and/or Reading Email ≠ Valid Excuse
- Triage Meetings
  - Scheduled
  - Attendance & Preparation
- 09/27-10/04: Team Project Plan Presentations
  - Slide Deck Posted Online
  - Read and Review
  - Discuss in Triage Meetings

What's ahead?

- 09/15: Team Status Report Presentations
  - One Week From Today
  - Split-Hands Meeting
  - Slide Deck Template Posted on Downloads Page
  - Must Use Windows Version of Office 365 ← *Nota Bene*
  - Read Submission Instructions Carefully
  - Due by 11:59 p.m., Tuesday, 09/14
  - Upload Two Times to Microsoft Teams
    - To General Channel File Space
      Folder "Team Status Report Presentation Slide Decks"
    - To Capstone Team's Private Channel
  - Aggregated Slide Decks
    - By Instructor
    - Instructors will "drive" during split-hands presentations.
    - Presenters will say "Next slide please."

Read Me

- Presenting
  - The Status Report Presentations will be given on Wednesday, September 15.
  - The purpose of the Status Report Presentation is to convince everyone that your team has scoped your project, understands the functional, design and technical specifications, and that your team has a crafted plan to develop, debug and deliver your project to your client on time (Wednesday, December 8) and on budget ($0).
  - The time limit for your presentation is 4.5 minutes, which will be strictly enforced. Practice your presentation to ensure that you will finish within the allotted time.
  - Dr. D. will combine the teams' slide decks into two slide decks, one for James' teams and one for Luke's teams.
  - James and Luke will share and "drive" the slide deck for their teams.
  - We will meet in two "split-hands" meetings with one Teams channel for James' teams and one for Luke's teams.
  - Your team may have one or more presenters. All team members should turn their cameras on during their presentation.
  - The order of teams will be random.
- Creating and Editing
  - Use only the Windows version of Office 365.
  - You must use this PowerPoint slide deck template as is. Do not change the number of slides unless the instructions explicitly allow you to duplicate slides. Do not change the order of the slides. Do not change the styles. Do not edit the master slides.
  - Throughout the template, replace placeholders […] with the appropriate information.
  - Edit the center footer by clicking the Header & Footer button on the Insert ribbon. Change [Team Name] in the footer to your company name as in "Team TechSmith Status Report Presentation". If necessary, extend the width of the center footer textbox on the master slide, making sure that you re-center the enlarged textbox.
  - Do not include any company confidential information in your presentation.
  - Delete every textbox that includes "Delete this textbox" and every slide that includes "Delete this slide."

READ ME

- Submitting
  – All presentations are due to us and to your client by 11:59 p.m., Tuesday, September 14.
  – Name your PowerPoint slide deck file as "team-[team-name]-status-report-presentation.pptx" replacing "[team-name]" with your team's name (using all lower case and replacing all blanks with dashes) in your filename as in "team-auto-owners-status-report-presentation.pptx".
  – Upload your PowerPoint slide deck to the folder "Status Report Presentation Slide Decks" in our Microsoft Teams General Channel file space by 11:59 p.m., Tuesday, September 14. In addition, upload your slide deck to your team's private channel file space in case your slide deck is deleted by accident from the General Channel file space, and you need to prove that you did indeed upload your slide deck by the due date and time.
  – Email a copy of your slide deck to your client as well by 11:59 p.m., Tuesday, September 14. Do not cc us on that email. Include some professional text in the body of your email to practice being a professional and to avoid having your email sent to your project sponsor's junk folder.

MICHIGAN STATE
U N I V E R S I T Y

Status Report Presentation
[Project Title 36pt]

The Capstone Experience

Team [Team Name 24pt]

[Team Member 1 16pt]
[Team Member 2 16pt]
[Team Member 3 16pt]
[Team Member 4 16pt]
[Team Member 5 16pt]
[Team Member 6 16pt]

Department of Computer Science and Engineering
Michigan State University

Fall 2021

Team [Team Name]

Status Report

[Project Title]

- Project Overview
  - Description Point 1
  - Description Point 2
  - Description Point 3
  - Description Point 4

Status Information:
Think clicking "Status" on an Amazon order.
- You bought this on Wednesday, September 1. Helpful?
- We're going to send this to you. Satisfied?
- People who bought this also bought…. We good?

Where the $*(%($* is my order?

Delete this textbox.

- Project Plan Document
  - Status Point 1
  - Status Point 2
  - Status Point 3
  - Status Point 4

Include status information.
What's the status of your project plan document?
Have you started it?
How much have you written?
What percentage complete is it?
Delete this textbox and the brace to the left.

Team [Team Name]

Status Report

[Project Title]

- Server Systems / Software
  - Description &/or Status Point 1
  - Description &/or Status Point 2
  - Description &/or Status Point 3
- Development Systems / Software
  - Description &/or Status Point 1
  - Description &/or Status Point 2
  - Description &/or Status Point 3

Include **status** information.

Are all systems up and running?

Have you tested everything?

Delete this textbox and the brace to the left.

Team [Team Name]
Status Report

[Project Title]

- Client Contact
  - Status Point 1
  - Status Point 2
- Team Meetings
  - Status Point 1
  - Status Point 2
- Team Organization
  - Description Point 1
  - Description Point 2

Include status information.
Have you talked with/met with your client?
Have you scheduled a weekly conference call? When?
Have you scheduled an in-person meeting? When?
How many times has your team met so far?
Have you scheduled team meetings? How often?
Delete this textbox and the brace to the left.

Include status information.

Who's doing what?

Delete this textbox and the brace to the left.

Team [Team Name]

Status Report

[Project Title]

Risks

- **Risk 1**
  - Description
  - Mitigation
- **Risk 2**
  - Description
  - Mitigation
- **Risk 3**
  - Description
  - Mitigation
- **Risk 4**
  - Description
  - Mitigation

A "Risk" is a significant task that you need to accomplish that you currently do not know how to do. Usually, a risk is a "showstopper," meaning if you cannot complete the task, you cannot complete your project.

"Mitigation" for a particular risk is your plan for eliminating that risk; that is, your plan for figuring out how to accomplish the task.

List only "real" risks. For example, learning new computer languages is **not** a risk for an MSU CSE student.

Give "useful" explanations of how you are going to mitigate each risk. For example, "we will learn how to do it" is **not** a useful explanation.

Delete this textbox.