The Capstone Experience

From Students…to Professionals

COMPUTER SCIENCE AND ENGINEERING 2017-2018

MICHIGAN STATE UNIVERSITY

The Capstone Experience

Department of Computer Science and Engineering

CSE498, Collaborative Design

Dr. Wayne Dyksen
Professor of Computer Science and Engineering

The Capstone Experience provides the educational capstone for all students majoring in computer science at Michigan State University. Teams of students build software projects for corporate clients.

During the Capstone Experience, students

- design, develop, debug, document, and deliver a software project for a corporate client,
- work in a team environment,
- develop written and oral communication skills,
- become proficient with software development tools and environments, and
- consider issues of professionalism and ethics.

Corporate clients are local, regional, and national including Accenture, Amazon, Aptiv, Auto-Owners Insurance, Boeing, Bosch, Dow Chemical, Ford Motor Company, GE, General Motors, Google, Herman Miller, Meijer, Microsoft, Mozilla, MSU Federal Credit Union, Proofpoint, Quicken Loans, SpartanNash, Spectrum Health, Symantec, TechSmith, TWO MEN AND A TRUCK, Union Pacific Railroad, Urban Science, USAA, Whirlpool and Yello.

2017-2018

Michigan State University

At the end of each semester, the College of Engineering sponsors Design Day, at which student teams from throughout the College showcase their Capstone projects throughout the Engineering Building.

Computer science capstone teams demonstrate the software projects that they have designed, developed and delivered for their corporate client. Teams compete for four awards, which are conferred by a panel of corporate judges.

THANKS TO AUTO-OWNERS INSURANCE

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We thank Auto-Owners Insurance, a Fortune 500 company headquartered in Lansing, Michigan, for their continued support of Michigan State University and the Capstone Experience, including the printing of The Capstone Experience booklet.

Check out the Capstone Experience web site at www.capstone.cse.msu.edu.

The Capstone Experience

Department of Computer Science and Engineering

Fall 2017

Spring 2018

Corporate Sponsors

Peter Faricy

Vice President
Amazon Marketplace

Amazon
Seattle, Washington

amazon

"The MSU Capstone Course provides students with real-world experiences within the global online retail industry. Students get to apply what they've learned in the classroom to actual business problems. The most recent Amazon student capstone team produced a software system that helps podcast producers generate revenue by finding Amazon products that are related to their podcasts contents."

April Clobes

President and
Chief Executive Officer

MSU Federal Credit Union
East Lansing, Michigan

MSU Michigan State University Federal Credit Union
Building Dreams Together

"As a Design Day judge, I have evaluated Capstone projects from many of the corporate sponsors. The software systems produced by the MSU students rival that of professional developers. Our latest Capstone project, Digital Assistant and Personal Financial Coach, provides MSUFCU members with a chatbot to answer their personal financial questions using iMessage, Facebook or Amazon Alexa."

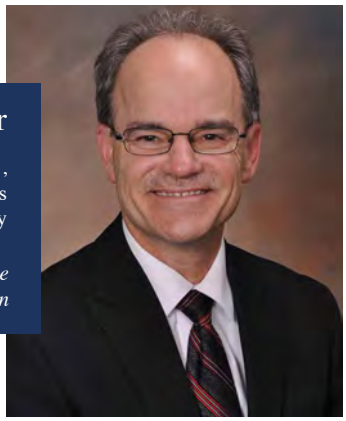
Linglong He

Chief Information Officer

Quicken Loans
Detroit, Michigan

Quicken Loans
Engineered to Amaze

"Experiences like Michigan State's Capstone project provide talented men and women the opportunity to take classroom learning and apply it to real-world situations. The team collaboration and hands-on experience lays the foundation for a great career in technology. Our partnership with Michigan State's Capstone project has enabled us to hire highly-skilled technologists to work on critical projects at Quicken Loans and further solidify Detroit as a major technology hub."



Jim Schumacher

Senior Vice President ,
Information Systems
and Technology

Auto-Owners Insurance
Lansing, Michigan

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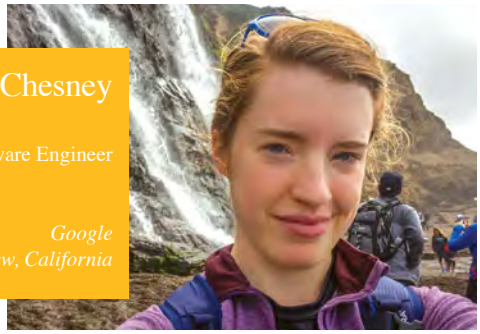
"Auto-Owners Insurance is proud to be a long-term capstone project sponsor. The business-like environment of the capstone experience provides a unique opportunity for students to develop into professionals. Our strategic partnership has enabled us to identify and recruit many outstanding Michigan State University graduates."

Capstone Alumni



Mairin Chesney

Software Engineer

Google
Mountain View, California

Google™

"The Capstone Experience at MSU was invaluable on multiple fronts. From a technical perspective, we learned about the software design process from conception to completion. From an interpersonal perspective, we learned about the trials and joys of working on a team. On all fronts, this experience was phenomenal preparation for my job as a Google software engineer working on Google Maps."

Hometown: Brighton, Michigan

Vince Cogswell

Software Engineer

Microsoft
Redmond, Washington

Microsoft

"Learning how to give and defend technical presentations is a key feature of the capstone experience, which I use often in my work at Microsoft."

Hometown: Kalamazoo, Michigan

Max Goovaerts

Software Engineer

Facebook
Menlo Park, California

"Software development in the business world differs from class. You're developing a solution to solve a business need; the requirements aren't always clear and change throughout the development cycle. The Capstone Experience allows students to learn this first-hand in order to prepare them for the real world and set them up for success."

Hometown: Ann Arbor, Michigan

TJ Kelly

Software Engineer

TechSmith
Okemos, Michigan

TechSmith®

"The MSU Capstone experience provided me with the essential skills required to be successful in a corporate engineering environment. I enjoyed working on real-world problems with my team and learning how to professionally communicate with a client. I learned important skills such as preparing, presenting, and defending technical presentations, which are crucial to becoming an effective team member in a full-time engineering position. I apply the skills which I acquired from this course every day as a Cloud Engineer at TechSmith Corporation."

Hometown: Jackson, Michigan

The Capstone Experience

Fall 2017

Project Sponsors

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Avata INTELLIGENCE

Venice, California

Ford

Dearborn, Michigan

GM

Warren, Michigan

Humana

Louisville, Kentucky

meijer

Grand Rapids, Michigan

Michigan State University Founded 1855

East Lansing, Michigan

Microsoft

Redmond, Washington & Boston, Massachusetts

Firefox

Mountain View, California

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yello

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Amazon

Faia: Fashion Artificial Intelligence Assistant

Amazon is the largest online retailer in the world, selling a wide variety of products and services including a complete line of clothing and apparel.

Today, nearly 25% of millennials buy most of their clothing and apparel online. Paid subscription services provide personal fashion assistants who select and send clothing to their customers based on the customers' style preferences.

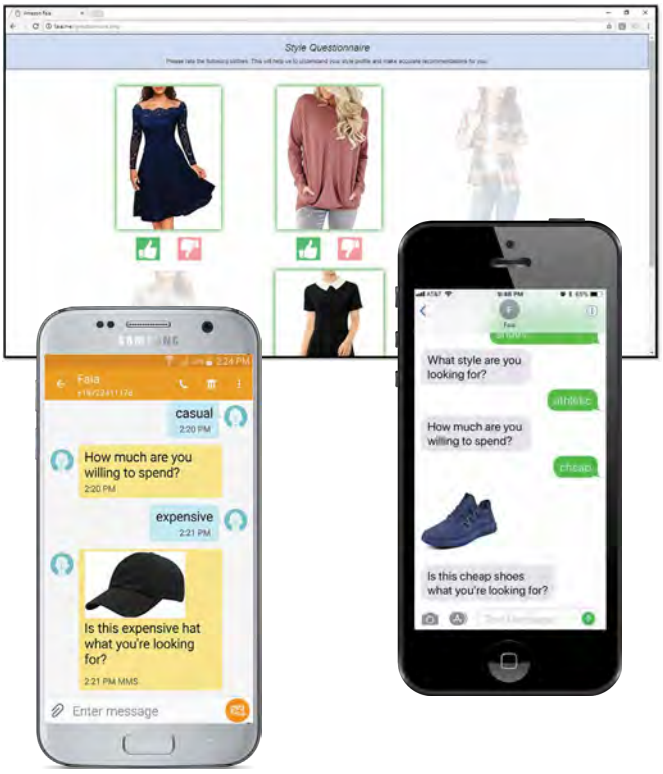
Our Fashion Artificial Intelligence Assistant, Faia, competes directly with this trending market by providing the same service for free through texting.

For example, an Amazon customer might text Faia "Find me a shirt I'd like." She responds by texting choices of shirts that complement that customer's personal fashion style. Faia also texts shirts that are bought by others with similar tastes.

As customers text with Faia, they tell her what they like and dislike. Over time, using artificial intelligence, Faia learns more and more about each customer's personal style preferences so she can provide better and better recommendations for clothing and apparel.

Customers text with Faia for an easy and complete shopping experience from getting recommendations to rating clothing to adding things to their Amazon shopping cart.

Our Fashion Artificial Intelligence Assistant web signup page is written using PHP and hosted on EC2. Faia is built using Amazon Lex and is powered by Python AWS Lambda functions.



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Auto-Owners Insurance
House of Hazards

With over 100 years of experience, Auto-Owners Insurance is a Fortune 500 company with more than 6,200 independent insurance agencies in 26 states and a written premium of almost $6 billion.

Auto-Owners insures homes throughout the Midwest. So, understanding and teaching home safety is an important aspect of their mission.

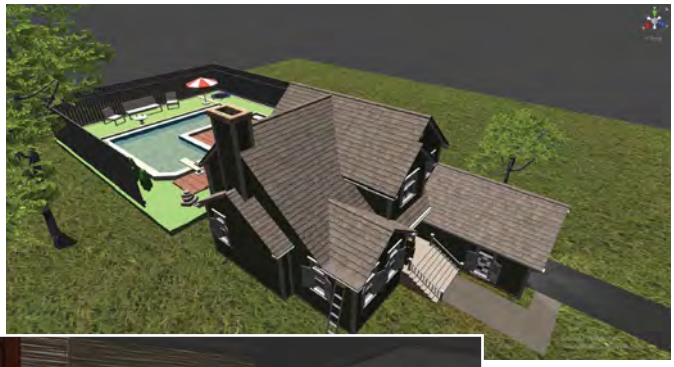
Our House of Hazards is a competitive virtual reality game that is designed to teach Auto-Owners' associates about just that, home safety. Associates learn in an enjoyable, immersive and interactive way while getting a realistic experience.

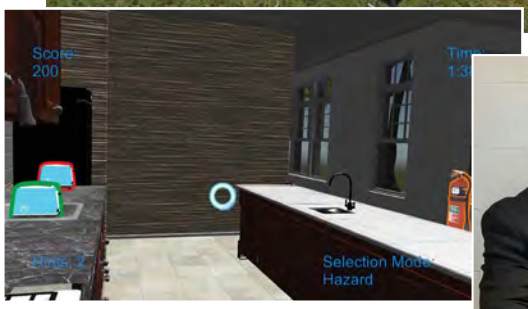
Using an Oculus Rift Headset, Touch controllers and sensors, a player explores a virtual furnished home. A player is tasked with identifying potential hazards to the occupants and to the property itself. Players are educated about home safety with a simulation of a realistic everyday home.

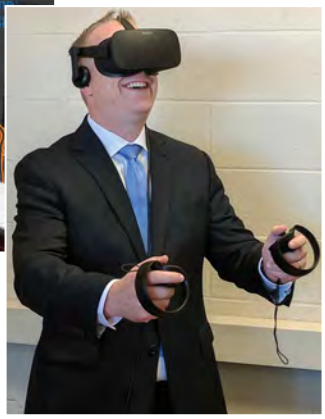
Our game features three difficulty levels. In the easiest level, hazards are easy to find and numerous. In harder levels, hazards are harder to find, and identifying harmless items as hazardous results in the loss of points.

To give our game a competitive feel, the scores are recorded and displayed on a leaderboard.

Our House of Hazards game is played on a Microsoft Windows PC with the Oculus Rift Headset, Touch controllers and sensors. The Oculus Rift hardware communicates the input to our game, which is implemented using the Unity game engine.







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Avata Intelligence

Security Analytics Suite: Configuration Setup Tool

Founded in 2013, Avata Intelligence leads the security industry in artificial intelligence (AI) and advanced analytics solutions including AVA, an intuitive AI application, which is used in a variety of sectors including public safety and defense.

For example, AVA can be used to analyze past crime records to predict when and where future crimes are likely to occur. With this knowledge, law enforcement can patrol exactly when and where crimes are most likely to occur, thereby increasing safety and security.

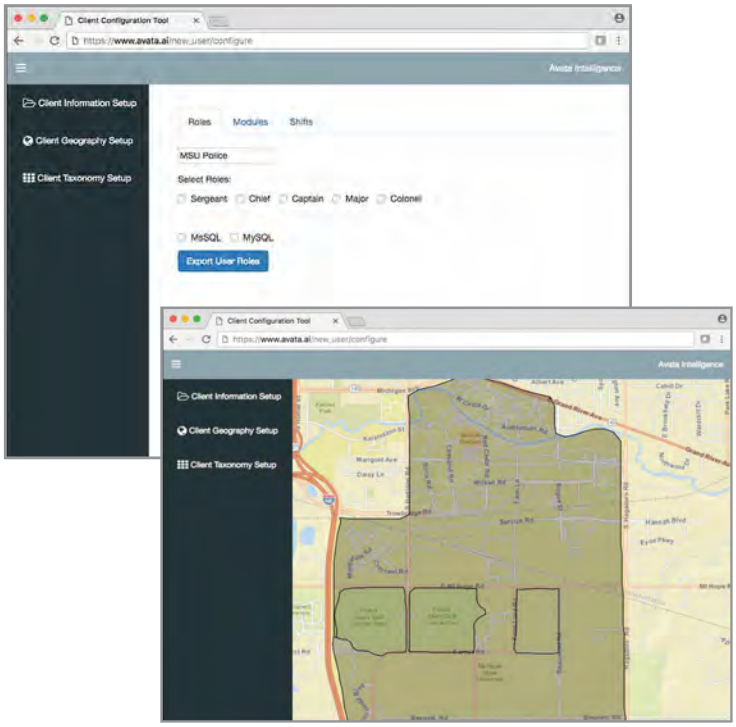
Our Configuration Setup Tool is a web app used by Avata engineers to aid in the onboarding process of new clients, specifically targeting police and law enforcement agencies.

Previously, in order to onboard a new client, an Avata engineer would obtain information about them by manually reading through PDF files and printouts and then writing computer scripts to enter this information into a database.

Our Configuration Setup Tool provides an intuitive user interface to streamline the new-client onboarding process. Our app automatically generates the appropriate MySQL or MsSQL script needed by an engineer to add a new client into the Avata client database.

By automating the onboarding process, Avata is reducing their time and cost spent on customer acquisition.

The front-end of our Configuration Setup Tool is written in ReactJS using ArcGIS, a JavaScript API. The back-end is implemented in Java with Spring Boot.



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Ford Motor Company
Ford Smart Parking

Ford Motor Company is a Fortune 500 automotive company headquartered in Dearborn, Michigan, employing 201,000 employees worldwide and selling 6.65 million vehicles in 2016.

Often times while driving around crowded places you do not know where there is open parking. You waste time and gas looking for parking spaces, which leads to arriving late to meetings and unpleasant moods.

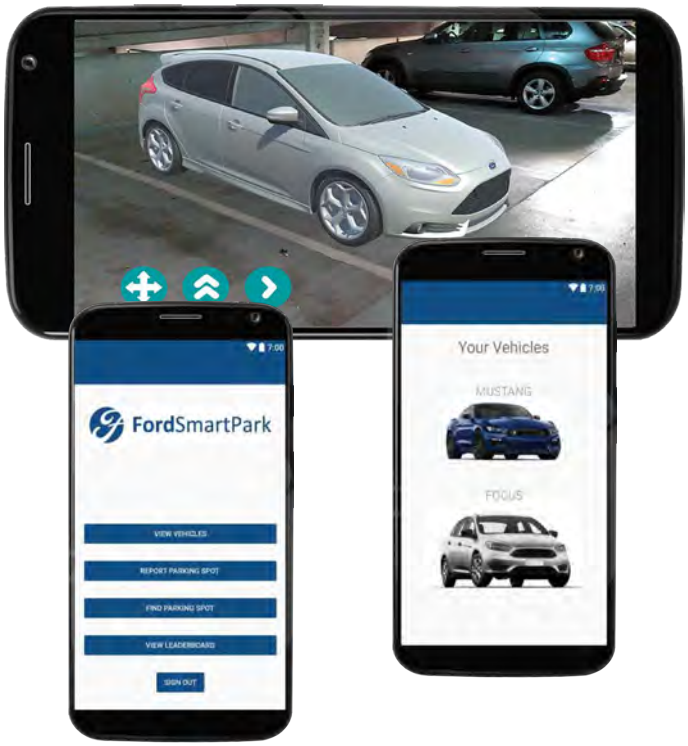
Our Ford Smart Parking app allows pedestrians to report open spots and it then enables drivers to find those spots. This helps drivers save time and gas when parking in crowded places whether on college campuses or at work.

When a pedestrian sees an open spot, they open the app to login and fill out a short survey to report the spot. Drivers can login and press a button which shows them the nearest parking space available.

Our Ford Smart Parking app is mirrored on Ford's SYNC onboard vehicle system so that a driver of a Ford vehicle can find a parking space using their car's touch screen.

In addition to finding a place to park, users can place virtual Ford vehicles into their home garage to see if they will fit.

Our Ford Smart Parking app, written in Java, runs on Android devices. Parking spots are stored in a Firebase database. Virtual vehicles are displayed using the Google Tango and Android APIs.



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General Motors
Automated Workplace Safety System

General Motors is one of the world's foremost designers and manufacturers of cars and trucks sold in more than 125 countries. Headquartered in Detroit, GM operates almost 400 facilities on six continents around the world.

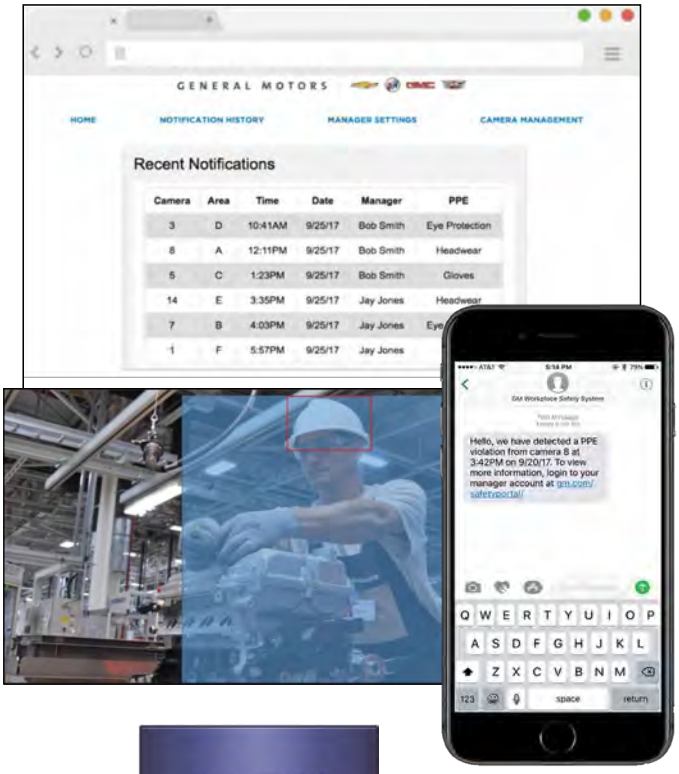
Among GM's facilities are its many factories that build and assemble cars and trucks. In order to ensure the safety and well-being of those who work in these factories, GM provides a variety of personal protective equipment (PPE) including helmets, goggles and vests.

Our Automated Workplace Safety System determines if workers are missing any of their PPE by analyzing the video from cameras stationed at factory entrances. Our system uses object detection models to identify the workers and their PPE as they pass by.

If a worker is determined to be missing any of their PPE, a text message is sent to their safety manager, and a violation incident is recorded in a database.

Safety managers use our companion web app to display statistics and graphs of the PPE violation incidents, which can be sorted by camera, time or PPE. In addition, managers use our web app to indicate shift changes, and to add and remove cameras.

Our Workplace Safety System utilizes an NVIDIA Jetson to run the object detection models. Camera configuration with NVIDIA's Jetson is written in Python. Our web app, written in HTML, CSS, PHP and JavaScript, is connected to a MYSQL database. Twilio is used to send SMS text messages.



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Humana
MyHumanaBot

Humana promotes health and wellness by offering many innovative products and services to a diverse customer base. Humana takes pride in providing personalized plans for each of its members.

To ensure that current and prospective members understand their options, Humana communicates the value of their plans through intuitive, easy-to-use customer service tools.

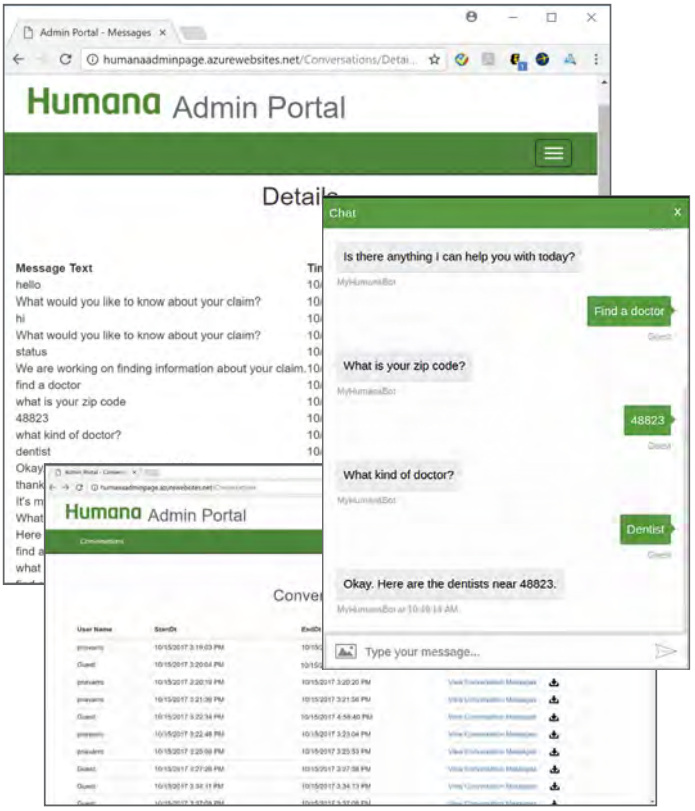
One of these tools is our MyHumanaBot, which provides a natural, in-person conversational experience. Users ask MyHumanaBot questions just as they might ask a Humana customer service agent. MyHumanaBot responds with accurate answers, quickly and efficiently.

For example, after logging into the Humana web portal, members can ask specific questions about their account such as "What are my current health insurance plans?" or "What's the status of my most recent claim?"

Users can ask more general questions such as "Can you help me find a doctor?" to which MyHumanaBot may respond "Sure, what kind of doctor are you looking for?"

Conversations are saved and viewed using our companion administrative web portal, which is used by Humana associates for continuous improvement of MyHumanaBot.

Our MyHumanaBot uses Microsoft's Bot Framework written in C# along with Dialogflow for natural language processing. All components are hosted on Microsoft Azure.



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Meijer

Meijer Fresh-ipes

Committed to providing customers with new and innovative shopping experiences, Meijer is one of the largest supercenter chains with 237 stores located throughout the Midwest.

Our Meijer Fresh-ipes app streamlines meal planning, shopping and meal preparation for Meijer customers.

As items are purchased, Fresh-ipes adds them to a customer's virtual pantry that tracks their availability as ingredients for recipes. Stock of pantry items is adjusted automatically when used in recipes or manually by the customer.

Fresh-ipes offers intelligent recipe recommendations based on ingredients that are available in a customer's virtual pantry. Customers add recipes to their planned meals or favorite recipes. When preparing meals, customers view recipe directions on their mobile device or Amazon Echo Show.

Fresh-ipes provides customers with purchase recommendations based on planned meals and low ingredient stock in their virtual pantry. Customers add items to their shopping list manually and from items recommended by our app. Additionally, Fresh-ipes offers the options for curbside pickup or delivery.

Our Fresh-ipes app encourages customers to shop at Meijer by making meal planning and shopping easier and simpler.

Android, iOS and Amazon Echo Show apps make requests to the .NET Core Web API and SQL Server database hosted in a Microsoft Azure Cloud environment. These requests integrate with the Yummly API to provide recipe recommendations.

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Michigan State University
SEA: Spartan Experience App

The nation's pioneer land-grant university, Michigan State University (MSU) is one of the top research universities in the world. With over 50,000 students, MSU is home to nationally ranked and recognized academic, residential college and service-learning programs.

Our Spartan Experience App (SEA) is a mobile app that provides useful information for both students and visitors to enhance their MSU experience.

Looking for a bite to eat? SEA shows categorized menus within each dining hall, including dietary restrictions.

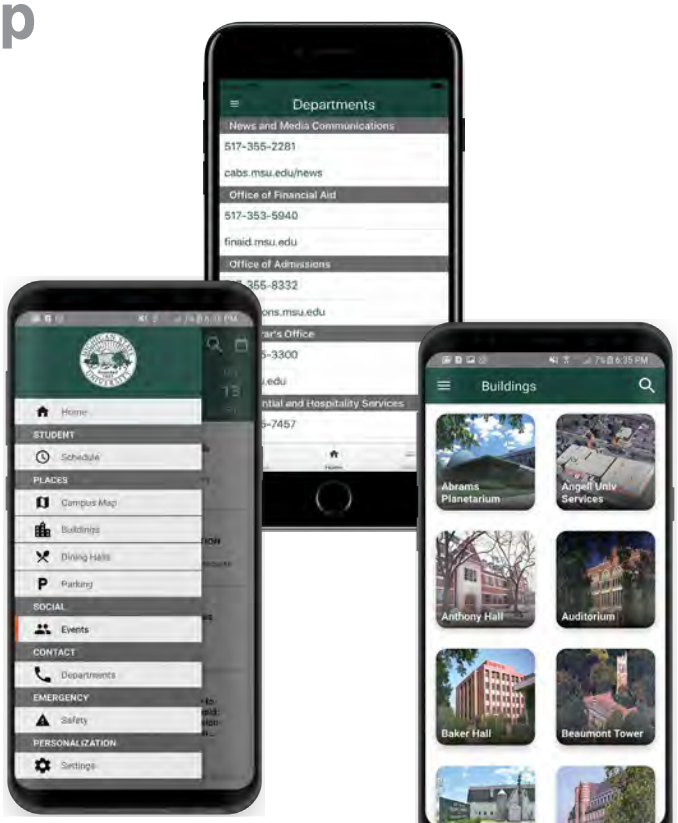
Not sure where your first class is? Use our app to search for building locations and get directions.

Visiting and not sure where to park? SEA gives parking locations as well as navigation to get to them.

Wondering when the next football game is? Our app notifies users of current and upcoming events and keeps them connected with a live Twitter feed.

SEA's personalized home view provides relevant and contextual information based on the user's location and time of day. Users see nearby dining halls and are alerted to upcoming events. A countdown timer helps students avoid being late to their next class.

Our SEA: Spartan Experience App is developed with Swift for iOS platforms and Java for Android platforms. The AWS Lambda API is written in Python and uses PostgreSQL as the underlying database.



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Microsoft

Enhanced Company Portal with Graph

Headquartered in Redmond, Washington, Microsoft is a long-time technology leader and innovator. For decades, they have provided enterprises with a comprehensive body of technological solutions created to drive productivity.

More and more, people are using their personal mobile devices to do work that was once done only in the office. This not only enhances work flexibility and productivity, but it also lowers company hardware costs. However, accessing sensitive company data on a personal device poses a potential significant security risk.

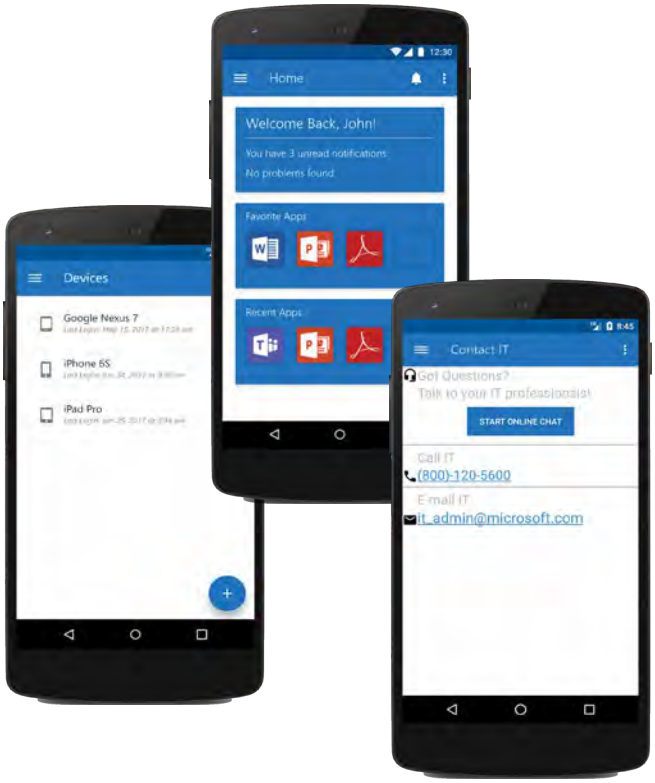
Our Enhanced Company Portal with Graph is an Android app that enables employees to access company resources safely and securely using their personal mobile devices.

Our app uses Microsoft Graph to provide users with a single endpoint for information and resources across all Microsoft programs, applications and platforms within their organization.

After using our app to enroll their personal devices, employees can access valuable company resources, data and applications directly on their personal devices. In addition, users can contact their company's IT department directly from within our app to open and resolve service tickets quickly and efficiently.

To provide for safety and security, once a user's mobile devices are enrolled, their enterprise IT team can ensure that employee devices are compliant with the company's security policies.

Our application is written in Java using Android Studio.



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Mozilla Corporation

Taking Firefox Screenshots Testing Suite to 11

Mozilla is a global, nonprofit organization dedicated to improving the World Wide Web. Mozilla's international community of developers creates open source software such as Firefox, which is one of the most widely used browsers today.

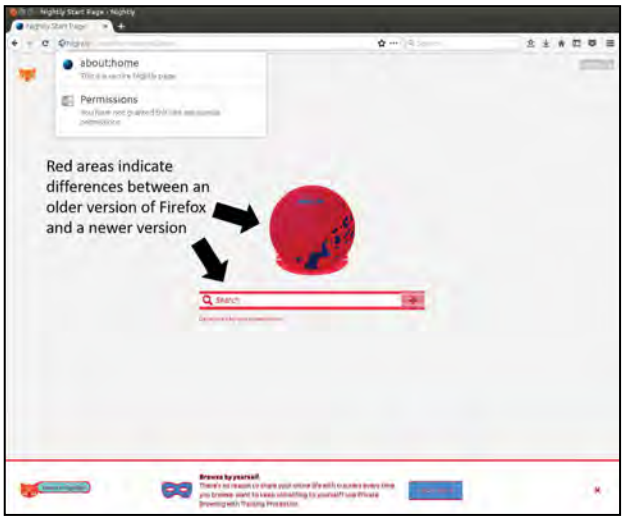
Firefox requires automated quality assurance during development to provide an excellent and consistent user experience. Occasionally, developers may inadvertently change the user interface.

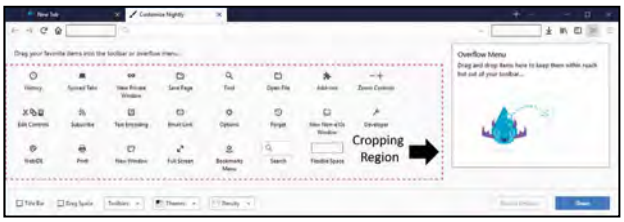
Mozilla's Firefox Screenshots Testing Suite detects inadvertent changes and alerts developers by taking a screenshot of a development version of Firefox, comparing it to a known "good" screenshot, and highlighting any differences.

Our improvements to the Firefox Screenshots Testing Suite make it more reliable and efficient. The tool now automatically crops screenshots to relevant areas, reducing false positives. Additionally, the tool takes a more varied sample of the Firefox user interface. Finally, better communication now exists between the screenshot testing suite and other quality assurance tools.

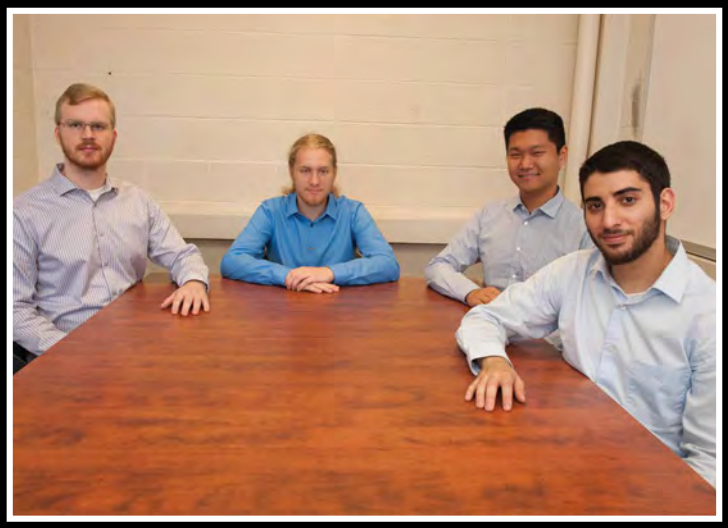
Our combined improvements make the Firefox Screenshots Testing Suite a more important piece of Firefox's overall quality assurance process.

Our improvements to the Firefox Screenshots Testing Suite are written in JavaScript and use Mozilla's Mochitest and XPCShell frameworks to run tests. The tool includes a legacy Firefox extension which manipulates the user interface and takes screenshots.





Firefox®



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MSU Federal Credit Union
Digital Banking with Chatbots

Founded in 1937, Michigan State University Federal Credit Union offers financial services to members of the Michigan State University and Oakland University communities. With 250,000 members and over $3.7 billion in assets, MSUFCU is the largest university-based credit union in the world.

Currently, Credit Union members can speak to a customer service representative over the phone or through live chat on the MSUFCU website. Members can also log on to the Credit Union's website or mobile phone apps to view their accounts.

Our Digital Banking with Chatbots system enhances this customer support by allowing members to complete common tasks 24 hours a day with no wait time. The system also increases accessibility by expanding to three new platforms: Facebook Messenger, Google Assistant and Amazon Alexa.

The chatbot system allows for natural conversation. Members can check account balances, transfer funds, reset passwords and perform other tasks just as easily as they would speak to a teller at an MSUFCU branch.

These chatbot conversations can be initiated through the existing web chat, on Facebook, and even through voice controls with Google Assistant and Amazon Alexa. If a member needs more help, the chatbot connects them to a live representative.

The natural language processing (NLP) services are Dialogflow and Amazon Lex. Each communication platform connects to the NLP service and to a SQLite database through a custom API. The API, fulfillment application and web application are written in Node.js.

MICHIGAN STATE UNIVERSITY
FEDERAL CREDIT UNION
Building Dreams Together

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The Phoenix Group
OPEN v2.0: Smart Order Picking

The Phoenix Group (TPG), founded in 2001, is the largest independent Point of Sale (POS) distributor in the industry. Leveraging distribution agreements with every major manufacturer, TPG supplies banks and independent sales organizations with POS equipment and services.

TPG POS systems are custom-configured for each of its many customers. TPG technicians traverse through their large warehouse to pick up the parts and pieces needed to build each customized POS device. Maximizing warehouse order-picking efficiency is a high priority to meet increasing order volumes.

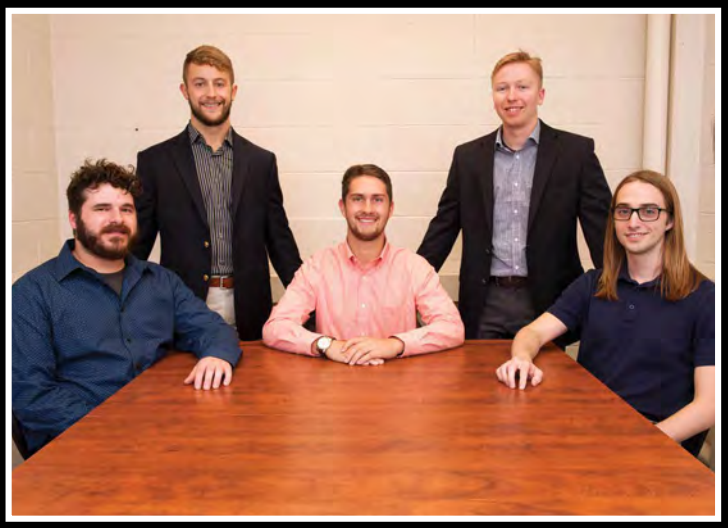
Our OPEN v2.0: Smart Order Picking app adds intelligent interactive order-picking features to TPG's proprietary logistics app OPEN. Our new features guide order pickers along the fastest route to fulfill an order and track inventory in real time.

Our app displays a warehouse map, which indicates the current location of the tablet, the items that must be picked for an order, and the fastest route to retrieve them all. Inventory is updated immediately when an item is picked so that warehouse stock is continuously up to date.

Our OPEN v2.0: Smart Order Picking features increase the speed that orders can be fulfilled and decrease the frequency of error throughout the process.

OPEN v2.0 is a Windows Presentation Foundation (WPF) application written in C#. It communicates with a backend API written in Node.js. An array of Bluetooth Low Energy Beacons broadcasts signals, which are used to determine location within the warehouse.

THE PHOENIX GROUP



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Rook Security

Cloud Security Event Processing and Alerting Platform

Rook Security is a managed threat response force that is dedicated to providing global IT security solutions that anticipate, manage and eliminate threats.

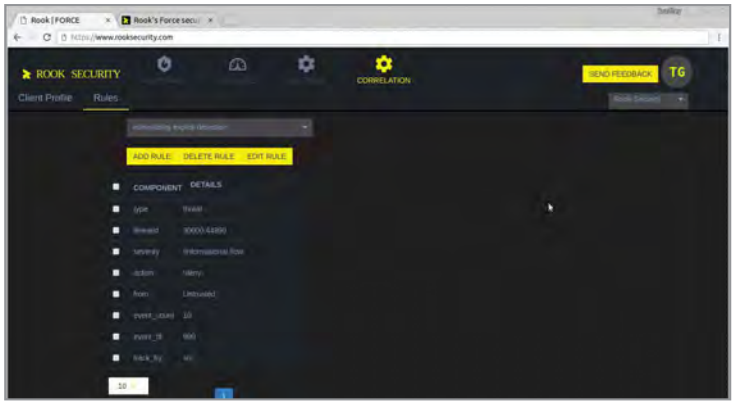
Our Cloud Security Event Processing and Alerting Platform analyzes log information from a client's computer network looking for security-related events. Rook receives millions of these events that must be parsed and correlated into discrete incidents.

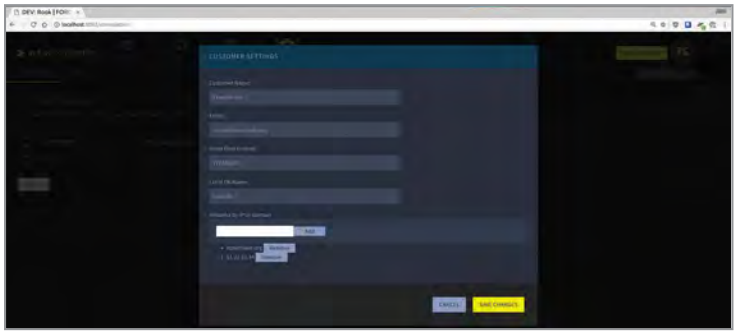
Our system provides a web interface that enables Rook engineers to edit existing correlation rules and to examine how these new rules perform, making it easier and more efficient to onboard new clients.

In addition, our system leverages Amazon Web Services (AWS) to create a reliable serverless architecture. Manageable from Rook's Force web platform, our AWS system scales easily and quickly with on-demand computing to accommodate a growing base of clients and sudden surges of incoming network events.

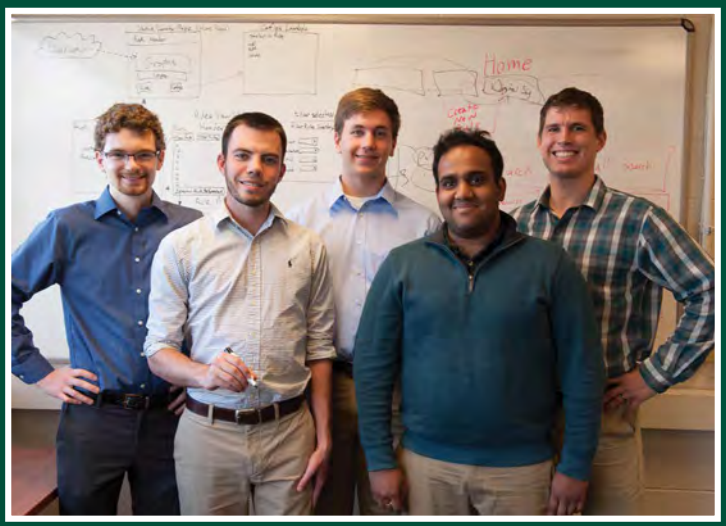
Our Cloud Security Event Processing and Alerting Platform is identical in functionality to Rook's previous version thereby keeping all of the same protections and making for a seamless transition for Rook's analysts and customers alike.

The analytical Lambda functions are written in Python. The backend RESTful API leverages the Django framework with the frontend written in JavaScript using React/Redux libraries. The platform takes advantage of multiple Amazon Web Services including Athena, S3 and EC2.





ROOK SECURITY



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Spectrum Health

Spectrum Health Symptom Checker

Spectrum Health is an integrated, not-for-profit health system based in Grand Rapids, Michigan that provides high quality healthcare through 12 hospitals and more than 140 service sites in West Michigan. Priority Health, its award-winning health plan, serves over 788,000 members across the U.S. and ensures that patients can affordably access quality care.

To increase accessibility of various cloud services, such as bill payments and appointment scheduling, Spectrum Health provides an app for Android and iOS users.

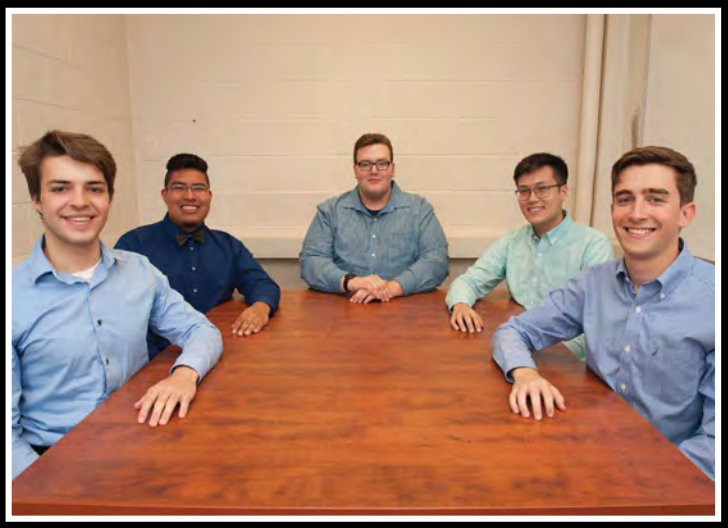
Our Symptom Checker is a feature within the application that recommends a healthcare service to patients based on the symptoms they are experiencing.

After a patient submits how they are feeling, they are presented a list of conditions commonly associated with their symptoms. After choosing which condition they feel fits them the best, the patient is given the option to schedule an appointment using MedNow, visit an Urgent Care center, or seek emergency care at a Spectrum Health Emergency Room.

Our other features added to the Spectrum Health mobile app include the ability for users to pay medical bills through Spectrum Health's secure Pay My Bill service, get in touch with providers through a Contact Us page, and view job opportunities through the Careers portal.

Our Symptom Checker and other features are written in Swift 4 for iOS devices and Java for Android devices. C# and ASP.NET Core 2.0 are used to implement our natural language processing RESTful API.

SPECTRUM HEALTH



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Symantec
Secure Application Layer API Proxy

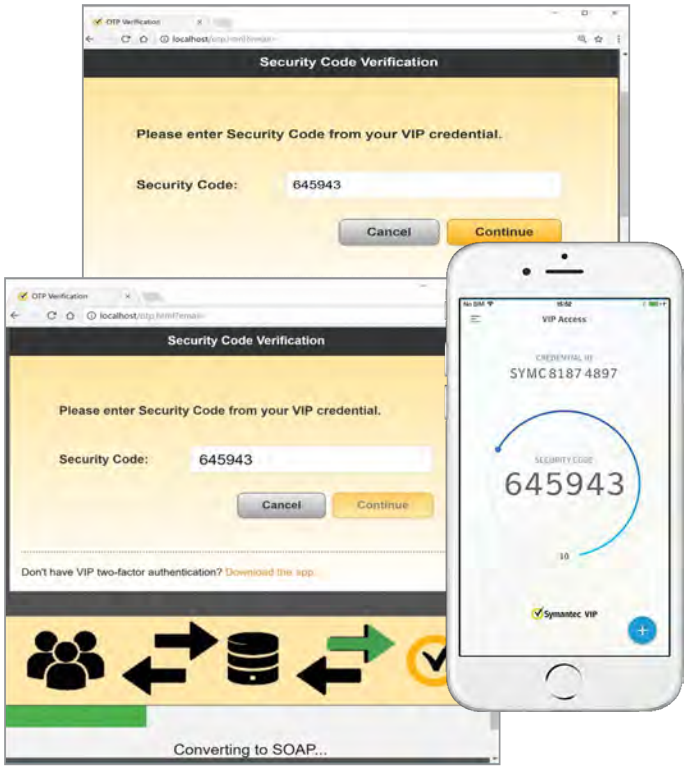
Symantec Corporation is a global leader in the cybersecurity industry, unifying cloud and on-premises security to protect users, information, messaging and the web.

As companies move their critical data from behind their own firewalls to running in the cloud, they must add additional layers of security to protect their data. One layer added is that of Symantec's VIP, which is a popular multi-factor authentication tool used during the login process.

When a company purchases VIP, they are given access to a web interface that enables the company to integrate and secure their services. To access the VIP web interface, software developers currently must form web requests–that is, messages sent over the internet–using a traditional web messaging protocol called Simple Object Access Protocol (SOAP).

Our Secure Application Layer API Proxy simplifies access to the existing SOAP web interface by introducing a more modern one. We leverage a more efficient, flexible and easier to use protocol called Representational State Transfer (REST). Our proxy accepts REST-style web requests and converts them to a SOAP format for VIP. Once the proxy receives a SOAP response back from Symantec's already existing systems, it sends that response back to the user in a REST format. Most importantly, our service preserves the superior level of security that VIP guarantees its customers throughout this process.

Our Secure Application Layer API Proxy is written in C# using the .NET framework and uses signed JSON Web Tokens (JWT) for secure communication between the proxy and end user.



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TechSmith
TechSmith Director

TechSmith helps people easily create visual content such as images and video, to communicate more effectively. Our products, including Snagit and Camtasia, are used by more than 30 million users worldwide, and growing.

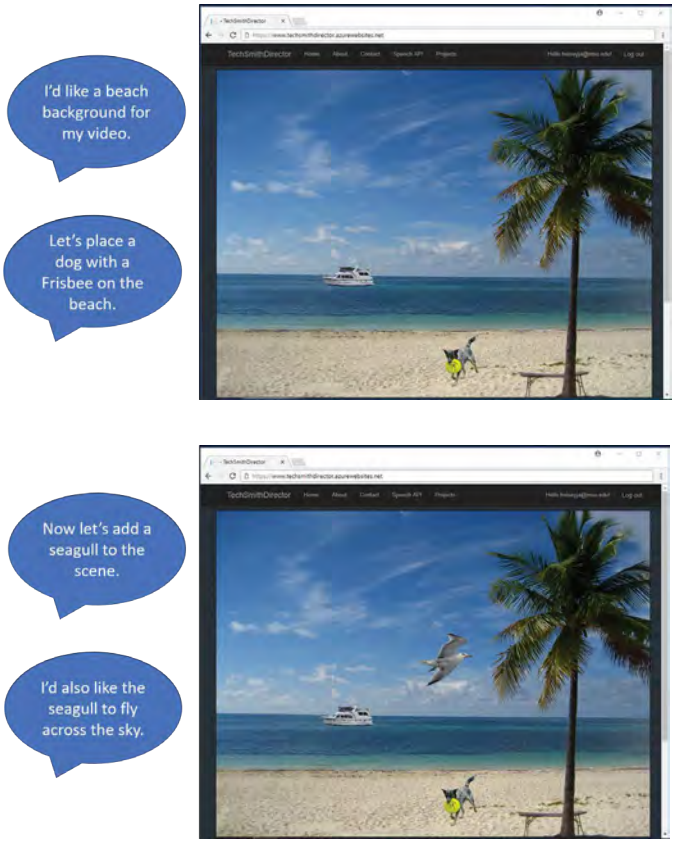
Due to the complexity of many video editing platforms, video creation is difficult for the average person. There are often countless menus, buttons and settings that require time and experience to learn and understand.

Our TechSmith Director strips the need for a complicated interface by interpreting the user's spoken commands to create a video. Users dictate commands to Director and let the software handle the tedious work. The user further edits their video project using simple drag and drop functionality.

For example, a user may create a video by saying things like "I'd like a beach background for my video" followed by "Let's place a dog with a frisbee on the beach." Animations may be added simply by saying "I'd like the dog to walk across the beach." Users also search for audio clips in the same way.

Video projects are saved so users may view and edit them later. Multiple projects are stored and managed through a single user interface.

TechSmith Director is written in C# using ASP.NET Core, HTML and JavaScript. The site is hosted on Microsoft Azure and data is stored on a SQL server. Voice commands are processed using Microsoft Cognitive Services.



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TWO MEN AND A TRUCK®
Online Moving Estimator

TWO MEN AND A TRUCK is the fastest-growing franchised moving company in the country with more than 400 locations in 42 states and 4 countries.

While TWO MEN AND A TRUCK customers can request to receive a moving estimate online, if the customer's home is over 2,000 square feet, an in-home consultation may be required, which takes time both for TWO MEN AND A TRUCK and its customers.

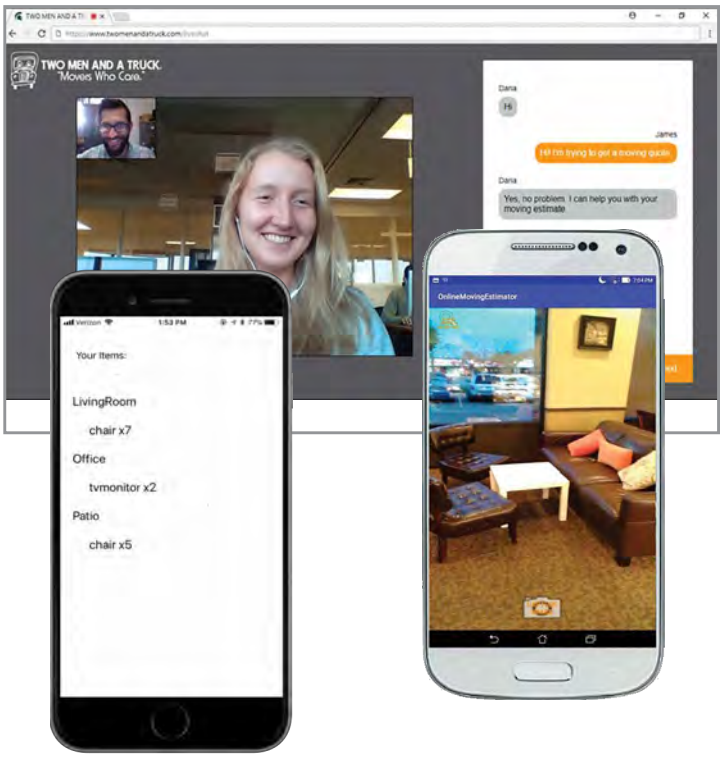
Our three new features for TWO MEN AND A TRUCK's Online Moving Estimator make the estimation process faster and more convenient for both parties.

First, our online video chat service enables a customer to connect with a TWO MEN AND A TRUCK agent who completes the estimate remotely through video conferencing.

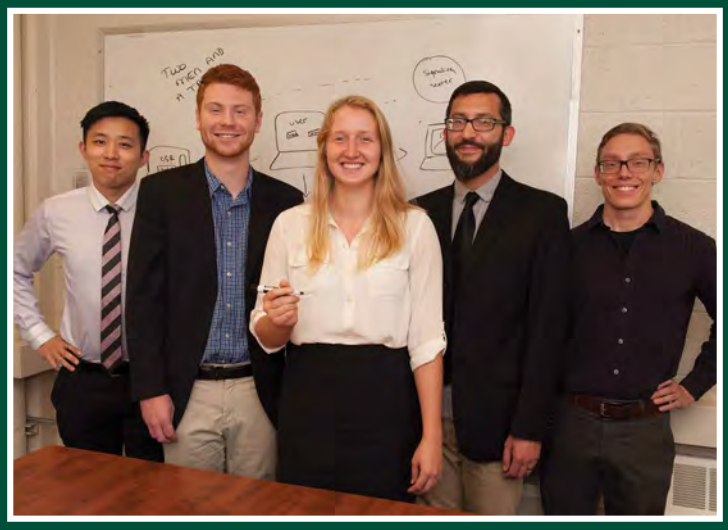
Secondly, our web app allows TWO MEN AND A TRUCK to select from a queue of waiting customers or schedule a video conference consultation at a later time.

Finally, our mobile apps remove the need for an agent to be involved and allow a customer to complete an estimate on their own time by using image recognition. Customers take pictures throughout their house or apartment, confirm objects in each image, and then submit a final list to obtain their estimate.

Our web app for Online Moving Estimator is written in CSS, HTML and JavaScript. The video conferencing uses WebRTC. YOLO provides the object recognition library. The backend uses ASP.NET/C# with a MySQL database. Our mobile apps are written in Swift 4 for iOS devices and Java for Android devices.



TWO MEN AND A TRUCK®



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Union Pacific

RailBuilder: The Great Race to Promontory

Headquartered in Omaha, Nebraska, Union Pacific is a leading transportation company with over 8,500 locomotives running on 32,100 miles of track across 23 states.

Union Pacific provides a variety of training software for its crews. For their simulation training to be effective, it must include realistic three-dimensional (3D) environments with appropriate topography, soils, water and vegetation.

Our application, RailBuilder: The Great Race to Promontory, enables users to generate accurate 3D terrain maps of the United States easily and quickly. Our companion railroad game showcases our terrain building capabilities.

Players easily create, name and save maps of any part of the continental US using our Map Creator editor. The resulting 3D maps include all of the appropriate topography, soils, water and vegetation depending on the area selected.

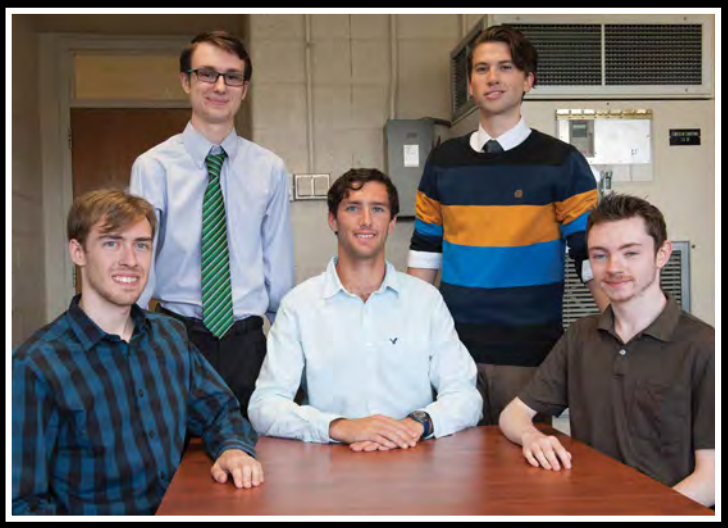
Once a map is created, our game places two rail stations on the map. A player must then connect the stations by building a railroad between them. RailBuilder is easy for anyone to learn how to play and provides a challenge for even the most experienced veterans.

RailBuilder is a standalone app that runs on any Windows computer. All maps are saved locally so each player enjoys a unique experience.

RailBuilder is written in C# using the Unity3D game engine. Our backend uses integration from Google Maps and the United States Geological Survey.

UNION PACIFIC

BUILDING AMERICA®



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Urban Science
VDA: Virtual Dealership Adviser

Urban Science is an internationally renowned solutions company with a passion for solving data-driven problems. Headquartered in Detroit, Urban Science specializes in providing science-based solutions for the automotive, health and retail industries.

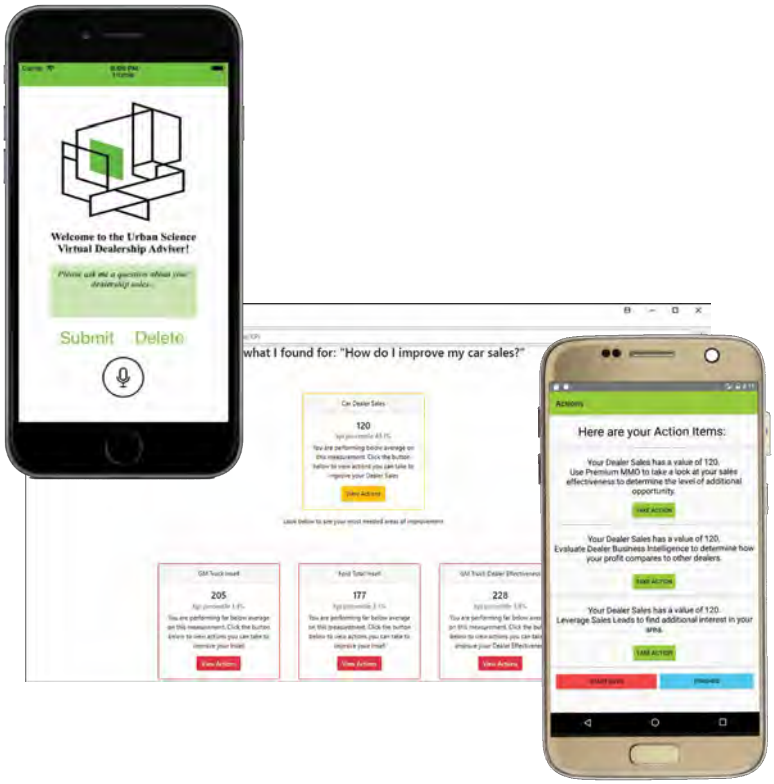
Within the automotive industry, Urban Science provides deep-data insights that dealerships use to improve their business. These dealerships frequently encounter the challenge of facing numerous metrics to analyze, making it difficult to determine which areas of their business need the greatest improvement.

Our Virtual Dealership Adviser targets these areas by allowing dealership employees to ask specific or general questions on how to improve segments of their business. For example, a user may ask: "How can I improve my SUV sales?"

Users choose between areas of improvement relevant to their question or those that offer the most room for improvement overall. Actionable solutions related to their area of improvement are then presented to the user, such as "optimize inventory mix to meet consumer demand" or "leverage sales leads to find additional interest in your area."

Using our intuitive interface, dealership employees can find quick, data-driven solutions, allowing them to respond effectively to their market.

Our Virtual Dealership Adviser is accessible through Android, iOS and web browsers. Our databases are hosted in Amazon Web Services. Microsoft Azure is used for hosting and language processing services.



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Yello
Automatic Resume Verification

Founded in 2008, Yello provides talent acquisition software that helps companies fill their most challenging job openings by hiring the right talent at the right time. Currently, Yello supports 20% of the Fortune 500 companies.

According to the Harvard Business Review, 80% of employee turnover is due to bad hiring decisions. In addition, it costs companies, on average, one-third of a new hire's annual salary to replace them.

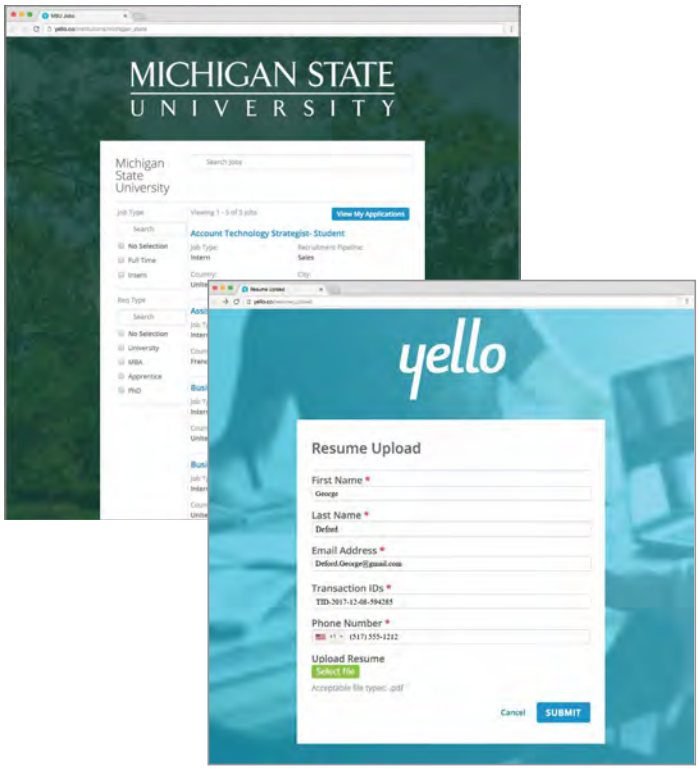
Our Automatic Resume Verification software helps Yello's client-partners identify and recruit the best candidates by automatically verifying a candidate's resume credentials.

Institutions such as universities or companies use one of our web apps to upload a prospective candidate's credentials including things like academic degrees and employment dates. Each credential uploaded is assigned a unique transaction ID which is then given to the candidate.

A candidate uses our second web app to upload their resume along with their transaction IDs. By providing the transaction IDs along with the resume, our system is able to verify the candidate's credentials automatically.

Candidate credentials are stored using a custom blockchain, which ensures scalability and security.

Our Automatic Resume Verification web apps are built with Ruby on Rails and hosted on an Amazon AWS EC2 instance. The blockchain is implemented in Python 3.6 and stored in a MySQL server.



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Design Day

Fall 2017

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Okemos, Michigan

TechSmith®

"TechSmith is a global technology company located just five miles away from MSU in Okemos. Our Capstone projects give students real-world experience with some of the latest trends including multimedia technologies, cloud computing and mobile applications, all of which add to their marketability. We also recruit the majority of our software engineers from MSU, so the Capstone Experience gives us a meaningful connection to many prospective employees."

Terry Ledbetter

Senior Vice President,
Chief Information Officer

Meijer
Grand Rapids, Michigan

meijer®

"Meijer is proud to have sponsored MSU computer science capstone projects over the past nine years. We have been impressed with both the capabilities of the students and the quality of the solutions they have developed. The latest project, Thrifty: Personal Shopping Assistant, provides Meijer guests with a chatbot to answer any questions they might ask of in-store Meijer associates. Thrifty tells shoppers where a product is located in the store, how much it costs, and if there are mPerks coupons available."

Randy Mott

Senior Vice President and
Chief Information Officer

General Motors
Detroit, Michigan

GM

"General Motors looks to Michigan State University to hire outstanding computer science graduates. Students in the Capstone course gain valuable experience with a wide diversity of state-of-the-art information technologies being used at GM. This is a tremendous chance for students to network with IT professionals and benefit from a powerful learning opportunity."

Elizabeth Klee

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Urban Science
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URBAN SCIENCE

"Our mission at Urban Science can only be accomplished with the best and brightest problem solvers, innovators and analytical thinkers, which is why we partner with The Capstone Experience at Michigan State University. We've sponsored twenty-one projects in the past ten years and have hired thirty-nine MSU graduates."

Capstone Alumni

Luke Pritchett

Software Development Engineer

Amazon
Seattle, Washington

amazon.com

"The MSU Capstone Experience took the strong foundation I had gained as a computer science student of MSU and applied it to a real-world business problem. By being able to work on the entirety of the design and development process, and by focusing on issues such as scalability, modularity and reusability, I am much more prepared for my work at Amazon."

Hometown: Midland, Michigan

Jordyn Castor

Software Engineer

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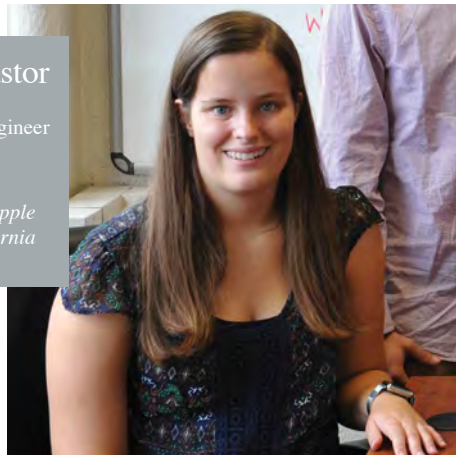

"The Capstone Experience at Michigan State University gave me real-world experience creating a text recognition application and making it accessible to those who are visually impaired or blind. This prepared me for my job at Apple, where I work on the Accessibility Design and Quality team, enhancing the accessibility of Apple products for those with disabilities."

Hometown: Grand Rapids, Michigan

Bryce Corey

Associate Software Developer

Auto-Owners Insurance
Lansing, Michigan

Auto-Owners INSURANCE
LIFE • HOME • CAR • BUSINESS

"The capstone experience was critical in my improvement with delivering a quality product on time as a software developer. I was able to gain necessary skills and experience within a team-based environment that provided a smooth transition into a work environment at Auto-Owners."

Hometown: Holt, Michigan

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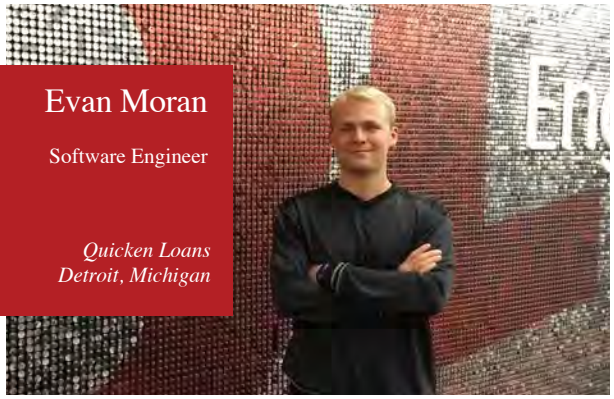

Quicken Loans
Engineered to Amaze

"In the field of information technology, problem solving skills are essential. The Capstone Experience allowed me to sharpen these skills in a real-world setting. The challenges and obstacles that I encountered in the course are analogous to those that I face now as a software engineer at Quicken Loans."

Hometown: Novi, Michigan

The Capstone Experience

Spring 2018

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Detroit, Michigan

USAA
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yello
Chicago, Illinois

Accenture

AMAP: Automated Malware Analysis Platform

Accenture is a professional services company that solves their clients' problems by providing services in strategy, consulting, digital, technology and operations. Accenture's iDefense provides timely, relevant and actionable cyber threat intelligence to the largest organizations in the world.

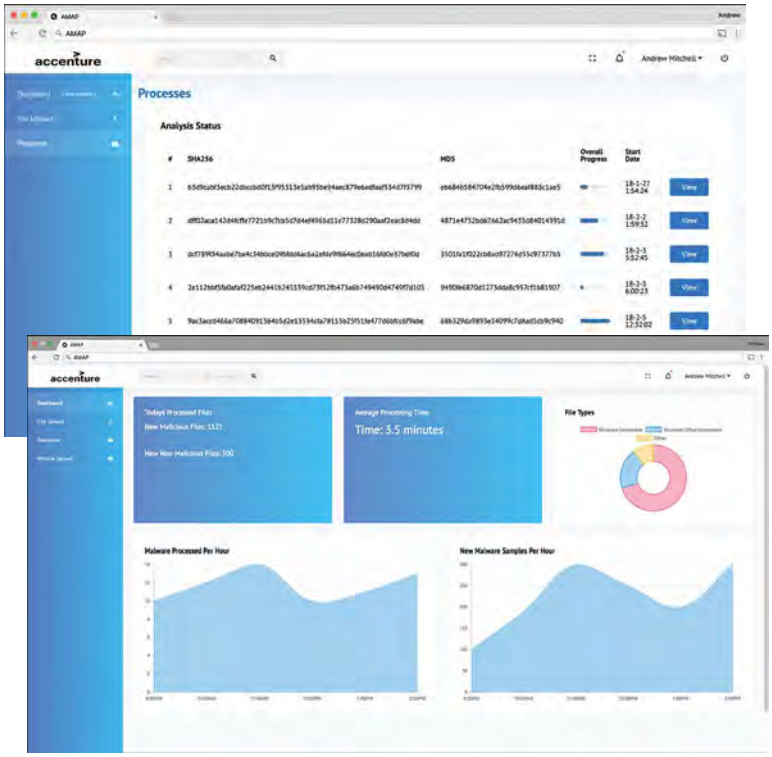
Malware is software that is intended to damage or disable computers. Accenture iDefense maintains a large database with more than 260 million samples of malware. Before being added to this database, each new malware sample must be analyzed to determine what it does and how it works.

iDefense uses various software modules to analyze malware. However, the number of malware samples is growing so fast that it cannot be processed manually.

Our Automated Malware Analysis Platform (AMAP) is a web app that combines iDefense's various malware analysis modules to process malware automatically at the speed and scale required.

For each batch of malware, users choose which iDefense malware analysis modules to apply. Our dashboard displays the status of malware currently being processed and the status of the overall system. Malware is also processed automatically by our system when users are not actively using it.

Our Automated Malware Analysis Platform runs as a web-based application with a backend written in Python. The underlying database holding malware samples and analysis output is mongoDB.



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Amazon

AMPED: Amazon Marketplace Podcast Earnings Detection

Amazon is an e-commerce and cloud computing company based in Seattle. Accounting for 1 in 3 online shopping transactions in North America, Amazon is the world's largest online retailer.

In the third quarter of 2017, Nielsen reported that 40% of Americans listened to a podcast. Despite having a large audience, podcast producers have few opportunities to profit from their work.

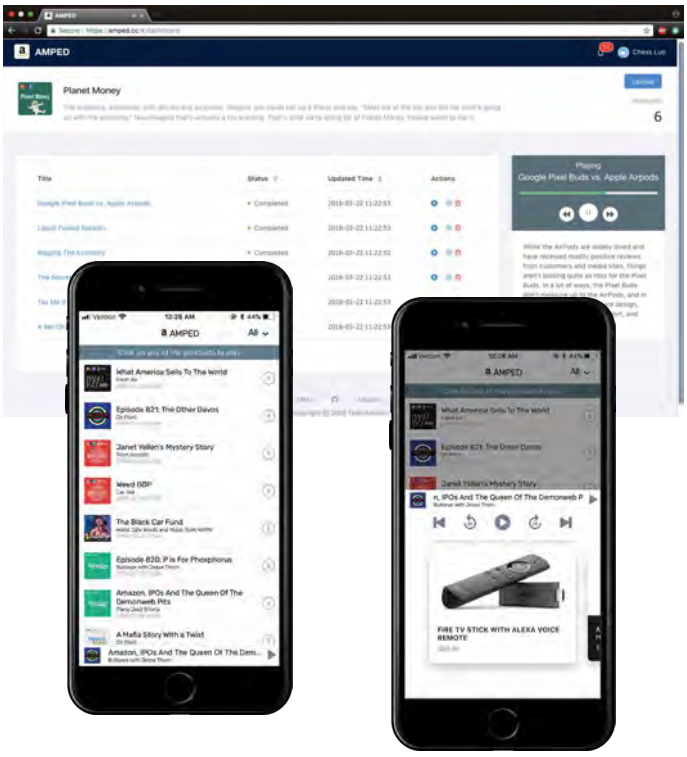
Our Amazon Marketplace Podcast Earnings Detection system (AMPED) provides podcast producers an additional source of revenue by finding products related to their content. The results are displayed on a dashboard for producers with an audio player integrated with the items.

For example, if a podcast producer is doing a tech review on the latest MacBook Pro, AMPED searches the Amazon marketplace for the latest MacBook Pro, and provides an image and link for the listener to buy it.

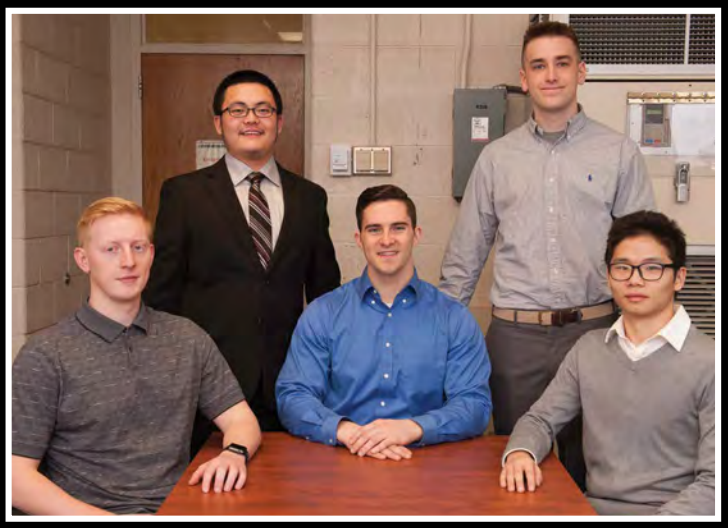
AMPED finds relevant products by first transcribing the podcast's audio content to text. Next AMPED comprehends the meaning of the text. Finally, AMPED searches the Amazon marketplace for the most relevant products.

Products appear in the bottom of the app as the podcaster mentions them. Listeners can choose to purchase the products in Amazon's app or website by clicking on the picture of the product.

AMPED is built with Python and is hosted on AWS Lambda serverless architecture. AMPED uses Amazon Transcribe for speech to text, Amazon Comprehend for natural language processing, and Product Advertising API to find products.



amazon



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Aptiv

CMS: Cybersecurity Management System

With over 147,000 employees in 45 countries around the world, Aptiv is a global technology company focused on creating the next generation of active safety, autonomous vehicles and smart cities.

Technology-focused mobility solutions introduce an increased need for implementing and testing product cybersecurity standards to ensure that Aptiv's products are not susceptible to malicious attacks.

Aptiv's cybersecurity lab conducts cybersecurity consulting and testing on every new product during the entire development process. The team works closely with product engineers to ensure the company's products are up to the latest security standards and impenetrable from outside attacks.

Our Cybersecurity Management System (CMS) is a web app that automates the entire product cybersecurity process. This five-tiered process includes threat analysis, mitigation remediation, vulnerability assessment, penetration testing and incident response.

Maintaining all cybersecurity-related information for Aptiv products, our CMS includes database trackers to visualize important trends and analyze data for threats, vulnerabilities, risks, incidents and mitigations.

CMS provides the source of communication between product and cybersecurity engineers who utilize our app's request system and task management service to increase productivity and streamline Aptiv's entire cybersecurity process.

Our Cybersecurity Management System is an ASP.NET app written in CSS and HTML. Our backend database is implemented with MS SQL.

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Auto-Owners Insurance
IMAGINE: IMAGe INtake Experience

Auto-Owners Insurance is a Fortune 500 company represented by over 4,900 associates nationwide. Founded in 1916, Auto-Owners Insurance provides its claims service to 2.7 million policyholders.

In order to appraise risks, Auto-Owners underwriters must evaluate physical environments such as homes or businesses with as much information as possible.

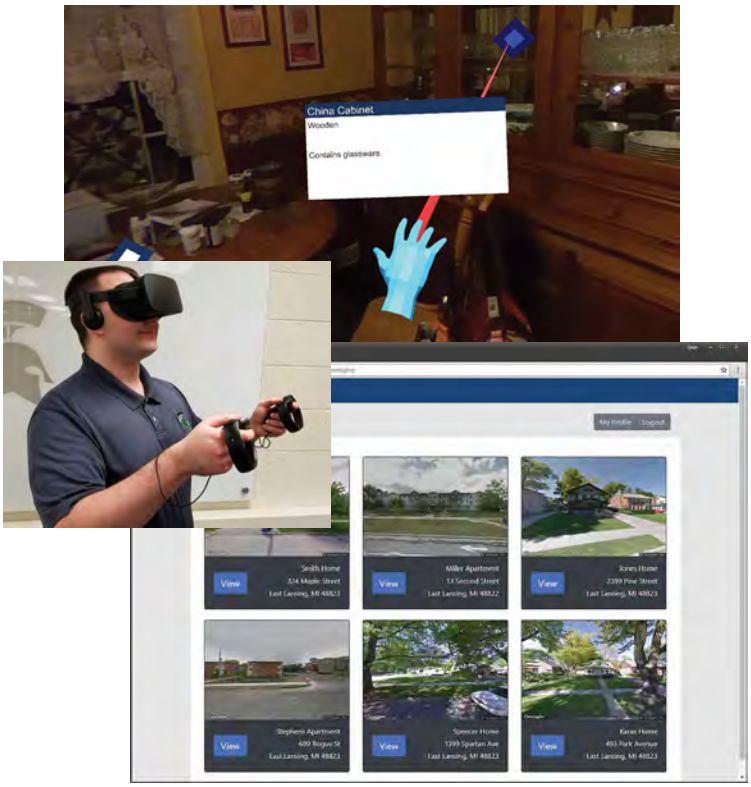
Our IMAGe INtake Experience system (IMAGINE) automates part of this process by identifying objects of interest in images taken of an environment and enabling Auto-Owners associates to recreate a physical environment at any time in virtual reality (VR).

Auto-Owners associates upload 360-degree images taken by a spherical camera to our web app, which analyzes the images to detect relevant objects such as a door or a piece of furniture. Associates can then display and edit information about the environments in those images.

Associates can create and edit names, descriptions and comments about environments and the objects in them. They can also download inventories of detected objects in various formats.

Our companion VR app creates a virtual version of the physical environment, which is viewed using an Oculus Rift headset. Associates use Oculus Touch controllers to select objects and to view and edit environment information such as item descriptions or comments.

IMAGINE is written in PHP and JavaScript and runs on all modern web browsers. Our virtual reality application is developed in Unity for the Oculus Rift platform and runs on Windows computers. Our object detection suite is written in Python using TensorFlow.



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LIFE • HOME • CAR • BUSINESS

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The Dow Chemical Company

Virtual Reality Simulation for Railcar Loading

With over 100 years of success and industry-leading innovation, Dow is a global leader in specialty chemicals, advanced materials and plastics. Along with Dow's ongoing innovation and success is a commitment to its employees' safety and wellbeing.

Dow manufactures hazardous chemicals that require care and knowledge when handling and transporting. Training new employees is dangerous because a mistake could have serious health implications if employees are exposed to these chemicals.

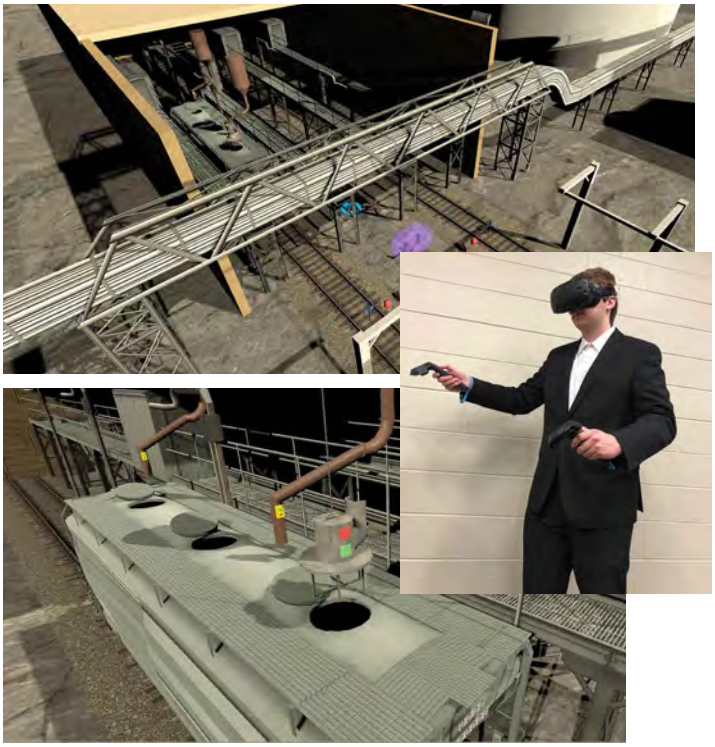
Our Virtual Reality Simulation for Railcar Loading eliminates this danger by training employees safely in a virtual environment. Our simulator trains employees in the proper way to load a railcar in a virtual railcar facility.

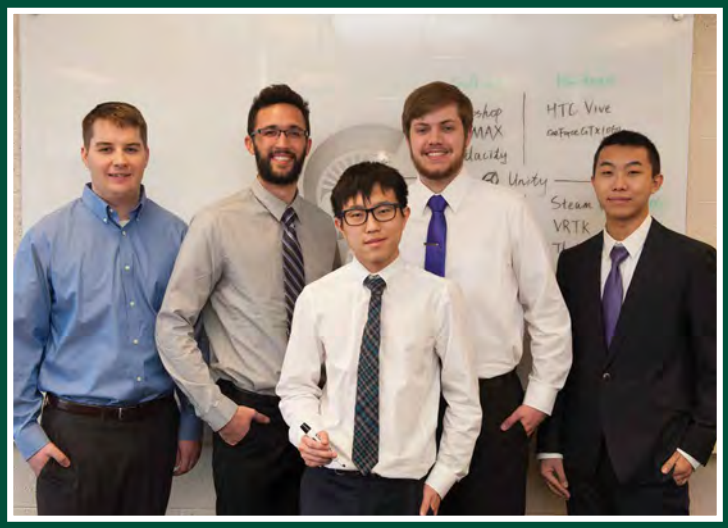
Dow employees wear an HTC Vive Headset and use two controllers to simulate a real working environment. Trainees are taught the steps needed to load a railcar properly and what to do when a spill occurs.

Our training simulator has two difficulty levels, non-certified and certified. The non-certified level gives a trainee hints to teach them the proper procedure. In the certified level, a trainee receives no aid, so they need to know what to do. Our simulator also includes scenarios where a spill occurs, so trainees can learn the proper way to clean a spill.

To help the employees learn, our training simulator gives the employees a score when they complete a session along with feedback on how to improve.

Our Virtual Reality Simulation for Railcar Loading uses Unity Game engine and is played on a Windows computer with the HTC Vive hardware.





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DRIVEN-4
2020 Business in a Box

DRIVEN-4 is focused on driving competitive advantage for their customers by providing strategies, insights and proven implementations of integrated process and technology to deliver products and services to market.

Our 2020 Business in a Box system shows how a connected product platform can bridge the gap between product design and consumer use.

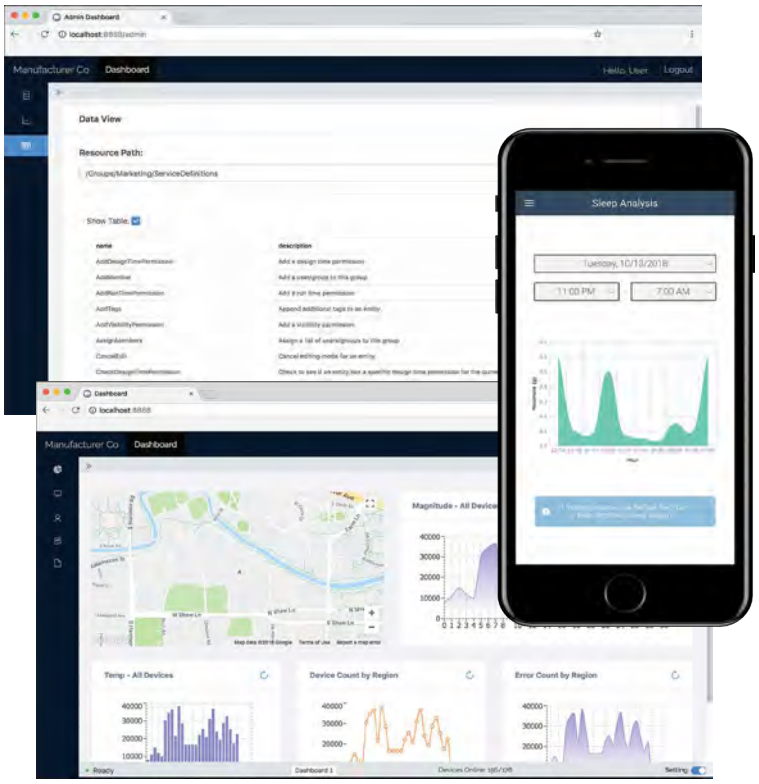
Our system comprises both manufacturer and consumer platforms to provide the insight needed to improve product design and consumer relationships while at the same time providing consumers with an enhanced experience for improving their daily lives.

Our web-based manufacturer portal provides for domain-specific configuration to create a dashboard for users in various job roles to visualize data and perform actions specific to their fulfillment of business and consumer needs. The built-in device simulator allows manufacturers to digitally simulate connected products before they are produced.

Our showcase of the platform demonstrates its use through the eyes of a mattress manufacturer and its consumers. When placed in the mattress, our connected device uses accelerometer and temperature sensors to transmit sleep cycle information to the platform.

The end-consumer experiences the platform through a mobile app that provides sleep analysis, suggestions to improve sleep quality and augmented reality visualizations for servicing their device.

Our web portal is written in CSS, HTML and ReactJS. Our device simulator is written in Java. Our mobile app is built in React Native for Apple iOS devices.



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General Motors

Plato: DevBot for Microsoft Teams

Founded in 1908, General Motors designs and manufactures a wide variety of vehicles that meet the needs and expectations of drivers around the globe.

GM's continued success requires its software developers to integrate an expanding number of software applications into their workflow. To do so, they use several unique applications to design, develop, test, and maintain software. Having to frequently maneuver between these applications hinders the development process.

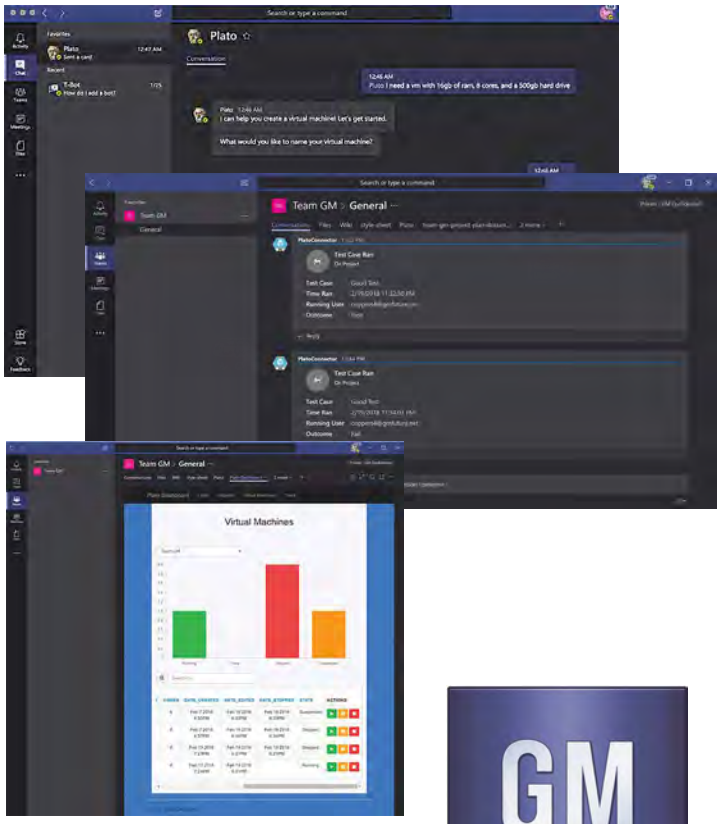
To enable collaboration and teamwork, GM developers use Microsoft Teams, a chat-based workspace. Developers are members of a channel, which is specific to their team where they can chat, manage files, and access external applications.

Our DevBot for Microsoft Teams system (Plato) extends the functionality of Microsoft Teams through the creation of three separate but cohesive applications.

Our first Plato app is an artificially intelligent chatbot that enables team members to create and manage virtual machines and test cases. A graphical web dashboard embedded into Microsoft Teams in the form of a tab is our second extension. Our third app is a Microsoft Teams connector that enables the team to configure regular notifications about the system's activity.

GM developers using our apps have full control over their resources and can monitor resource allocation, run tests and update the status of virtual machines all within a familiar Microsoft Teams environment.

Our Plato system is designed with the Microsoft Bot Framework, Microsoft LUIS, C# with .NET, AngularJS, HTML and CSS, and is deployed into Microsoft Teams.



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Herman Miller

Adjust: Augmented Reality Chair Adjustment

Headquartered in Zeeland, Michigan, Herman Miller is one of the world's largest producers of high-end office furnishings. The company's ergonomic office chairs are used in modern workspaces around the globe.

Every Herman Miller chair is highly configurable to match the unique needs of each user, ensuring proper ergonomic support in any office setting.

Adjust is our augmented reality (AR) chair adjustment app for owners of Herman Miller chairs.

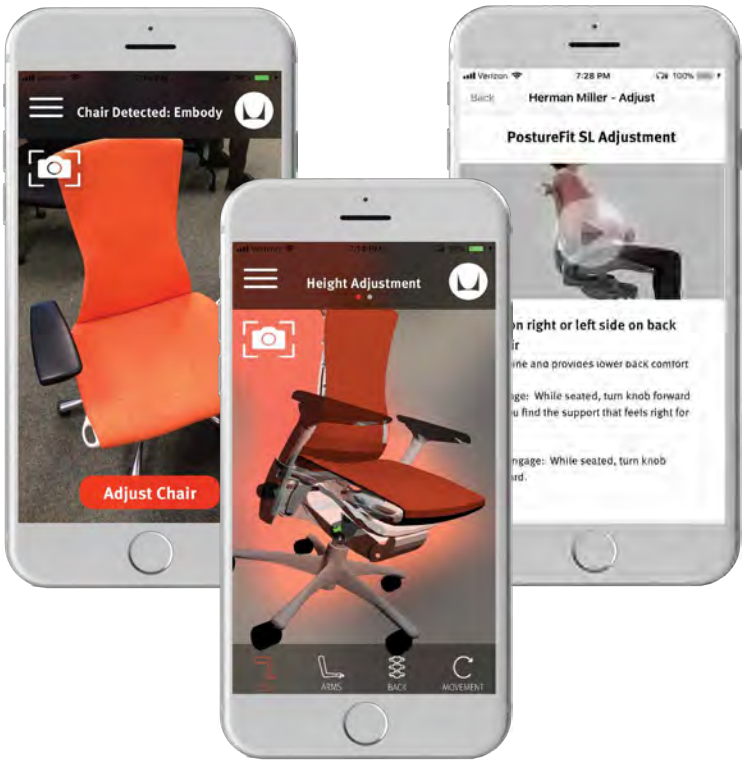
Adjust automatically identifies the model of a chair using an iPhone's camera along with computer vision and machine learning.

Once the chair model is known, Adjust displays an interactive 3D model and guides the user through an ergonomic adjustment session by highlighting the relevant chair parts.

Tapping on any highlighted part presents an instructional video and additional adjustment tips. For returning users, the application menu features a gallery option, which enables users to interact with a variety of Herman Miller chairs.

Our Adjust app reduces the need for in-person training sessions, allows for day-two training and eliminates the need for paper reference texts. Chair owners can locate any adjustment instantly using our built-in search functionality.

Adjust is a native iOS app written in Swift. Object recognition is performed using Microsoft Custom Vision and CoreML. Interactive 3D chairs are rendered using Apple's SceneKit.



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Meijer

Thrifty: Personal Shopping Assistant

Meijer is a large supercenter chain located in the Midwest. With 237 supercenters in six states, Meijer is one of the largest retailers and private companies in the nation.

From shopping carts to self-checkouts, Meijer always leads on the frontline of innovation to ensure Meijer guest satisfaction.

Our Personal Shopping Assistant app (Thrifty) continues that tradition by enabling a guest to ask Thrifty anything they would ask an in-store Meijer team member. In addition, a guest can navigate through coupons and check competitor pricing.

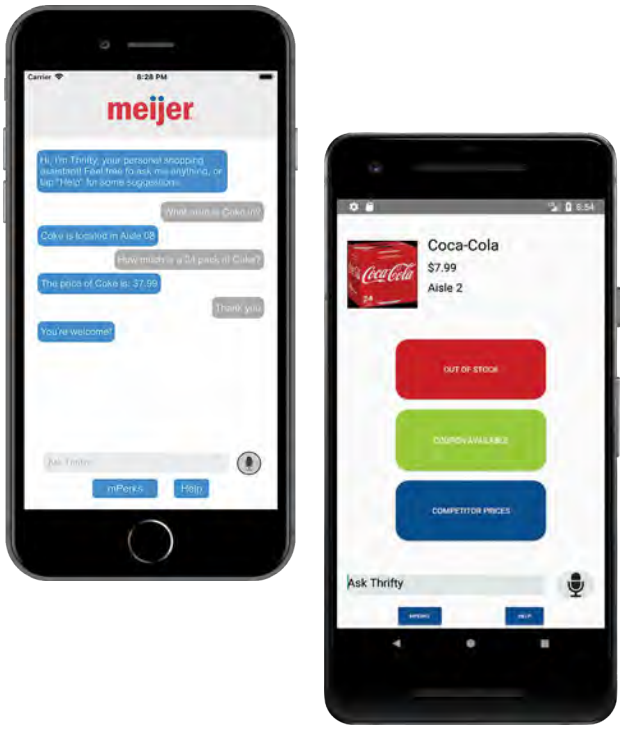
Meijer guests interact with Thrifty using either text or voice. If Thrifty isn't sure what they mean, it responds with a list of possibilities from which a guest can select.

After an item is selected, Thrifty tells a guest where it's located in the store, how much it costs, and if there are any coupons available from Meijer's rewards program, mPerks. Guests can clip all coupons to their mPerks account and display a single barcode at checkout to apply all of their savings.

Thrifty also informs guests of item prices at competitors like Target or Walmart.

If an item is missing from the shelf, Thrifty notifies a Meijer team member to check for more.

Thrifty is built using the Microsoft Bot Framework and is hosted on Microsoft Azure cloud services. It uses Microsoft LUIS for natural language processing and supports both Apple iOS and Google Android devices.



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Michigan State University
Pulse: Classroom Engagement System

Michigan State University (MSU) is the nation's pioneer land-grant university and is a world-renowned research university, with top-tier academic and service-learning programs.

Our Classroom Engagement System (Pulse) provides a simple and convenient interface that enables extended engagement between course instructors and students. Pulse is designed around attendance, communication and analytics.

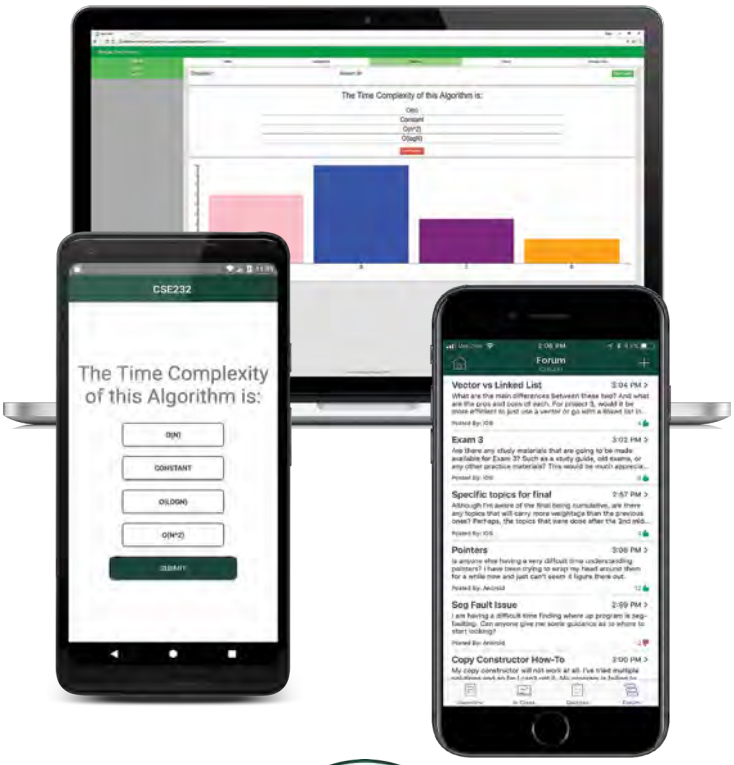
Attendance is made easy. Students simply respond to a notification that is sent to their mobile device as they enter a classroom. The student is then transported into the app to access the class material.

Pulse allows students and instructors to access multiple classroom resources on a compact and intuitive platform. Pulse offers a class overview page with course information, as well as a class forum where students and instructors can hold discussions.

Pulse's quizzes replace paper quizzes, thereby saving paper and time. The quizzes can be taken during class or at any time. Progress bars and timers are available to enhance the user experience.

Analytics are collected and displayed by our instructor-side web app for evaluation in real-time. Based on student responses to questions, instructors can vary the content in their lectures.

Our Pulse mobile apps are native apps for Apple iOS and Google Android developed with Swift and Kotlin, respectively. Our web apps are created with Vue.js. The backend interface consists of several platforms from Amazon Web Services.



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Mozilla Corporation
Dark Theme Darkening

Mozilla is a global, not-for-profit organization dedicated to improving the World Wide Web. They have an international community of developers who contribute to open-source software.

Mozilla's most popular open-source project is Firefox, the second most used web browser globally. Its most recent release, Quantum, includes new styles, features and ways for users to customize the appearance of the browser.

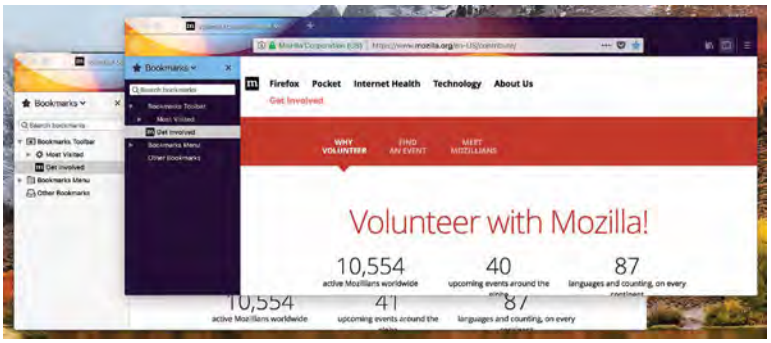
Users are reluctant to switch internet browsers once the browser has been personalized to their liking. Previously, themes only had the ability to alter the appearance of the default toolbars and tabs.

Our Dark Theme Darkening increases the customizability of Quantum to include menus, popups, settings pages, loading indicators, sidebars, icons and added theme transitions. Additionally, Google Chrome themes can now be imported directly into Firefox.

The default Dark Theme is updated to reflect the new additions. Extending theme support in the browser gives theme developers more power to express their creativity, and gives users more surface area on which to enjoy themes.

In the screenshots to the right, one can see the current un-themed sidebar and settings page in the background, while the foreground shows the same content themed.

Our Dark Theme Darkening is implemented using CSS and JavaScript, and impacts hundreds of millions of users.



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MSU Federal Credit Union

Digital Assistant and Personal Financial Coach

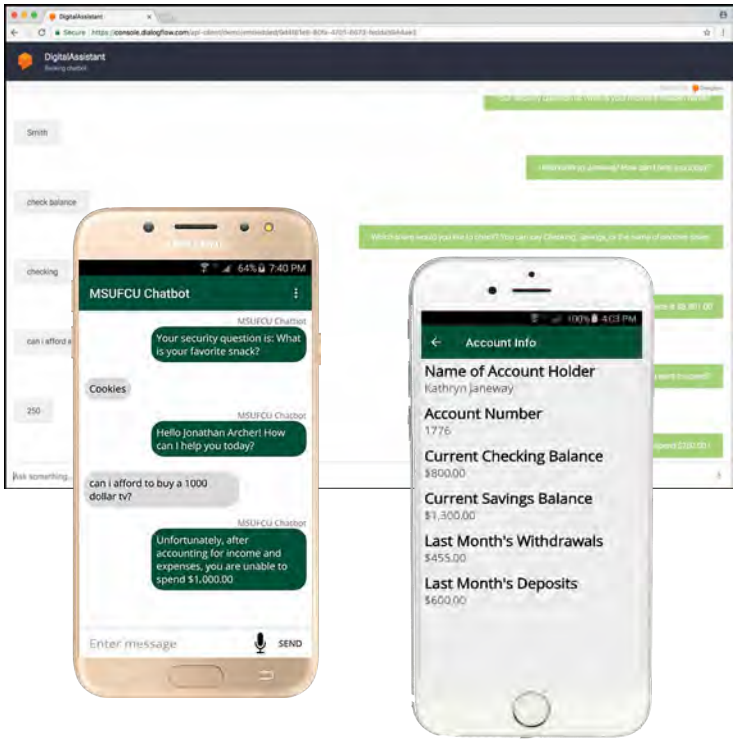
Founded in 1937, Michigan State University Federal Credit Union (MSUFCU) is the largest university-based financial credit union in the world. With over 246,000 members around the globe, customer service is a high priority for MSUFCU.

Our Digital Assistant and Personal Financial Coach expands the capabilities of MSUFCU's existing apps for Apple and Android devices. In addition, it offers services through a web app, an Amazon Alexa app, Facebook Messenger and iMessage.

Using a chatbot interface, MSUFCU members can get answers to questions to everything from "What's my account balance?" to "Can I afford to buy a laptop?" Our bot also offers financial planning services. If a member cannot afford a laptop, for example, our Digital Assistant and Personal Financial Coach will suggest a plan for a member on how to save for one.

For MSUFCU members who prefer a hands-free approach to banking, our Alexa skill can respond to the same voice commands as the chatbot interface. Our Apple and Android apps, as well as Facebook Messenger and iMessage, all accept the same voice commands.

Our Digital Assistant and Personal Financial Coach Apple iOS app is written in Swift, and the Google Android app in Java. Our Alexa skill is written in JavaScript. The natural language processing is handled using DialogFlow. All six of the available apps contact a SQLite database hosted on a server.



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FEDERAL CREDIT UNION
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The Phoenix Group

Customer Service System with Chatbot

The Phoenix Group (TPG), an Ingram Micro company, is one of the largest distributors of credit card terminals. They offer customers a vast selection of devices from all major manufacturers and take pride in having outstanding customer service.

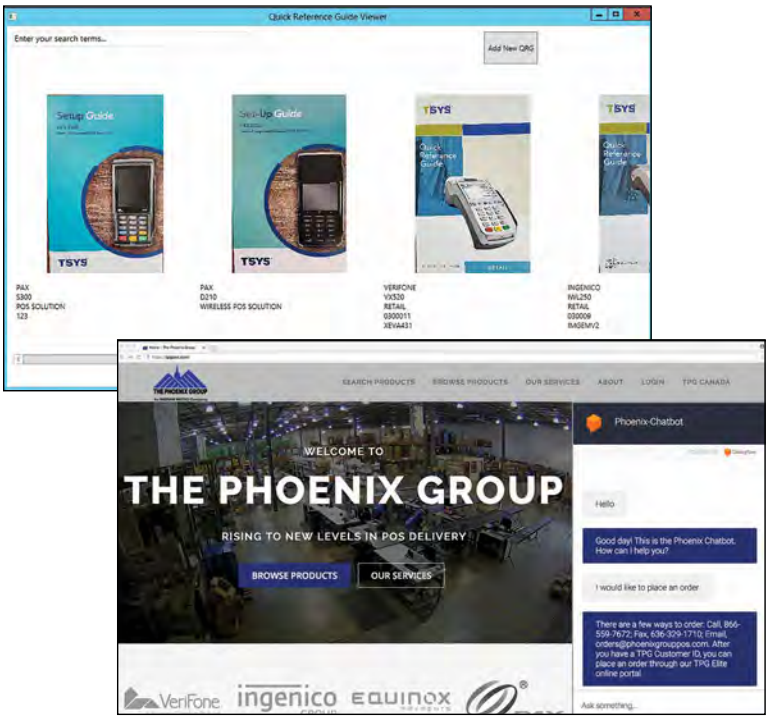
Customer service associates at TPG frequently reference paper device manuals to provide customers with helpful information. With hundreds of manuals to reference, TPG associates need a better way to manage and access them.

Our Customer Service System enables TPG to convert paper manuals to a digital format using optical character recognition (OCR) technology. An associate easily adds new manuals into the system by uploading images of its pages. Once added to our system, a specific manual can be found quickly by searching for it and viewed conveniently as an eBook.

Our Customer Service System enables TPG's customer service associates to maintain their outstanding responsiveness despite a growing lineup of carried devices.

Additionally, our Customer Service Chatbot provides an informative resource for customers visiting TPG's website. Customers can converse with the chatbot to ask about TPG and the devices it offers.

Our Customer Service System is a Windows WPF application written in C# that communicates with our custom remote server where the digital manuals are stored. Our Customer Service Chatbot is implemented using Google Dialogflow and is written in AngularJS.



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Proofpoint
Next Generation Malware Analysis Platform

Proofpoint is a leading next generation cybersecurity firm that provides comprehensive cloud-based security solutions to protect organizations from advanced threats and attacks that target email, mobile apps and social media.

Every day Proofpoint blocks threats in more than 600 million emails, 7 million mobile apps and hundreds of thousands of social media accounts. This volume of threats makes it increasingly more difficult to rely solely on human analysis.

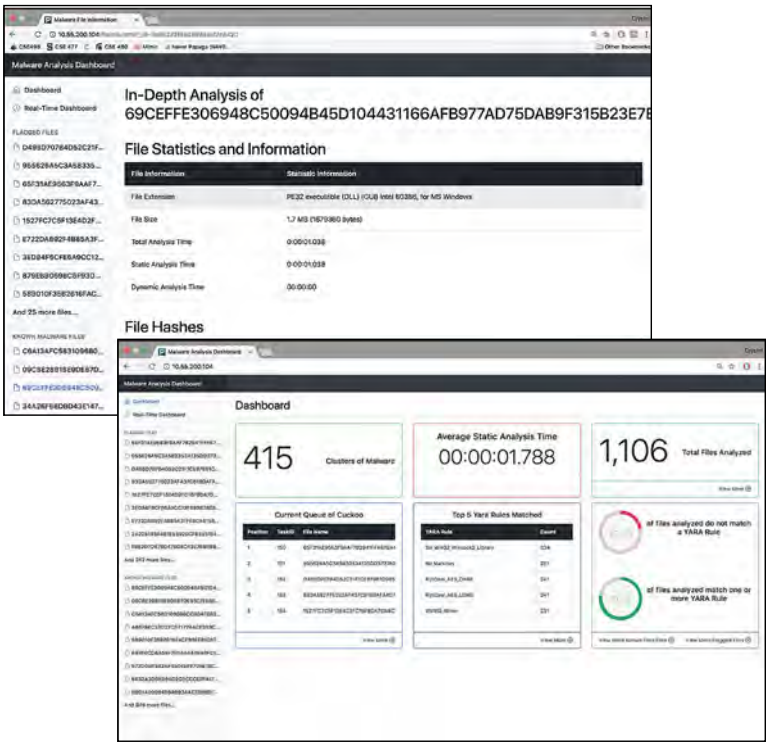
Our Next Generation Malware Analysis Platform provides a comprehensive tool for analyzing malware samples automatically and quickly.

Our system first analyzes malware using a basic set of tools. Depending on the results of this initial analysis, our system determines whether or not more in-depth analysis should be done.

Malware is classified and identified using something called a signature. Our system clusters malware based on similarity, thereby enabling Proofpoint analysts to generate signatures more efficiently.

Analysts use our dashboard to visualize the results of malware analysis. Additionally, they can view malware of interest and apply filters.

Our Next Generation Malware Analysis Platform uses Bootstrap. A RESTful API based on NodeJS communicates with the MongoDB Database. Cuckoo, YARA, ClamAV and Suricata are utilized for the malware analysis tools. All of our tools run on virtual machines handled by an ESXi Hypervisor.



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Quicken Loans

Fundamenta: Trust in New Home Construction

Quicken Loans is the largest online mortgage lender in the US, and is the nation's largest FHA lender and premier Veteran Affairs lender.

New home construction is a complex process involving many parties including the home buyer, the builder, subcontractors and inspectors. Dependencies among the steps in the building workflow can cause bottlenecks. Lack of communication can further delay the process.

Our Trust in New Home Construction web app (Fundamenta) facilitates the home building process. Fundamenta is a platform for organization and collaboration among parties involved in a build.

Fundamenta displays a construction workflow comprised of tasks for all parties. It visualizes the workflow with progress bars that show who completes tasks and when, along with all construction deliverables.

In addition, Fundamenta provides a conversation page, which enables messaging between parties.

Blockchain technology manages the workflow, opening new tasks for completion when contingent steps are finished, and stores all data pertaining to a home build.

Our Fundamena app keeps all parties informed on the current state of a home build, thereby bringing transparency to the entire process.

Fundamenta is written in C# with React and the .NET framework. Hyperledger Fabric blockchain is used with the Composer framework. The database is implemented using Microsoft SQL Server.

Quicken Loans®
Engineered to Amaze®

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Rook Security
Endpoint Data Monitoring and Analysis Agent

Rook Security, based out of Indianapolis, Indiana, is a leader in the managed detection and response service, providing IT security solutions to clients around the world.

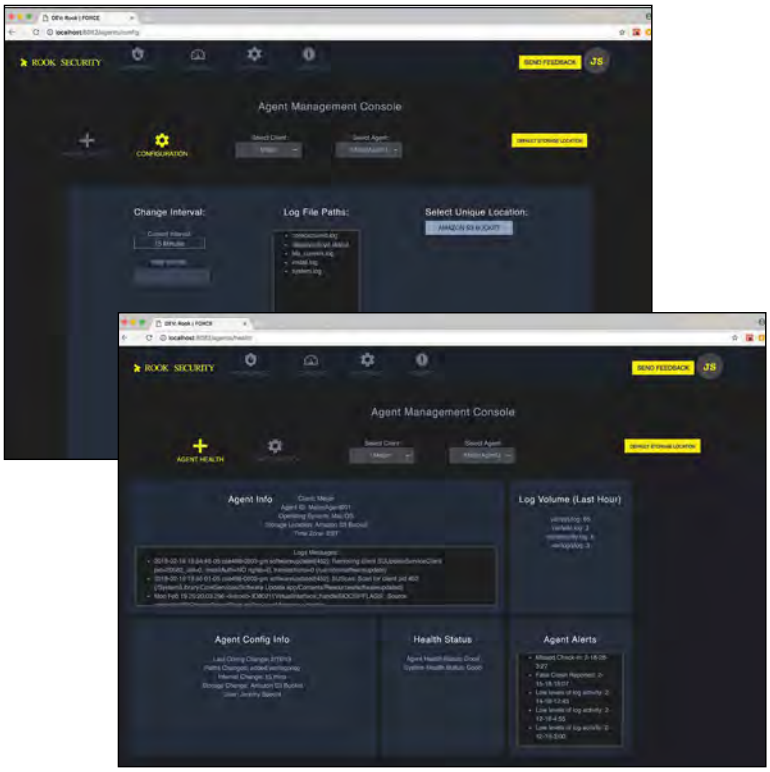
Rook's Force Platform protects their clients from malicious attacks by analyzing log data about client devices and appliances such as critical application servers. This log data is collected by Rook's software agents running remotely on client host computers.

Rook's diverse client base is growing quickly. In order to keep up with this growth, Rook's log data agents must support various operating systems, and be easy to install and configure on client computers.

Our Endpoint Data Monitoring and Analysis Agent sends the digital defenders at Rook their clients' system and application logs from client machines running Microsoft Windows, Apple MacOS or Linux operating systems. This enables client computers to continue working seamlessly and securely with our agent running in the background.

In addition to the agent, an extension of the Force Platform enables Rook analysts to deploy and configure agents as well as view agent health metrics. The ability of our agent to be managed remotely by Force Platform administrators ensures that any infringing anomalies are acted upon quickly.

Our Endpoint Data Monitoring and Analysis Agent system is written in Go for Windows, Mac, and Linux. The logs are stored using Amazon Simple Storage Service (S3). Our extension of the Force Platform is written in Python using the Django web framework. The front end utilizes ReactJS and Redux.



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SpartanNash
Volunteer Tracking System

SpartanNash is a wholesale grocery distributor, supplying more than 2,100 independent grocery retail locations throughout the US, as well as a grocery retailer with more than 140 corporate supermarkets in 47 states.

Known as the local grocery store, SpartanNash values its close relationship with the local community. As part of their commitment to these local communities, SpartanNash sets yearly goals of volunteer hours for their associates.

Our Volunteer Tracking System provides a new automated way for SpartanNash to keep track of associates' volunteer hours, replacing the previous manual "paper and pencil" system.

Our cross-platform app provides a simple and intuitive user experience. SpartanNash volunteers keep track of volunteer hours easily by using our web app. Social media integration and gamification increases overall participation.

When a SpartanNash associate logs into our app, the leaderboard is displayed showing their progress towards reaching their individual goal along with overall company progress. Associates can compare their progress with others.

SpartanNash supervisors manage the system using our companion administrative web portal.

Our Volunteer Tracking System is developed using React Native. Our administrative web portal is written with PHP and HTML. All of the data is stored in a MySQL database with Oauth2 security measures.

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Spectrum Health
Spectrum Health Go

Spectrum Health is a not-for-profit health system based in Grand Rapids, Michigan that provides high quality healthcare at over 140 sites in West Michigan, including 12 hospitals, 8 urgent care centers and 43 laboratories.

Patients, visitors and volunteers often have trouble navigating the large Spectrum Health facilities. Our Spectrum Health Go mobile app helps these patrons find their destinations with ease.

Our Spectrum Health Go app employs the user's smartphone camera and waypoints set up throughout the facility. These waypoints are posters that include the Spectrum Health Go icon, a QR code and the name of the waypoint.

After launching the app, a user chooses from a list of destinations and scans the nearest waypoint. Spectrum Health Go then displays an arrow that points to the next waypoint on their route along with a textual description of the directions. As the user turns, the arrow remains pointed towards the next waypoint.

Administrative assistants at Spectrum Health use our companion web app to view data about the routes, alter routes, and add or remove waypoints to improve navigation.

Our Spectrum Health Go mobile app supports both Apple iOS and Google Android devices and is written in Swift and Java, respectively. Our web app is written in C# and HTML. Data is stored using Microsoft SQL Server.

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Symantec

Detecting Security Threats from User Authentications

Symantec is a global leader in providing security and information management solutions. Their customers range from consumers and small businesses to large global organizations.

Symantec's flagship authentication solutions include Symantec VIP, a multifactor authentication solution that enables businesses to secure access to networks and applications without affecting productivity.

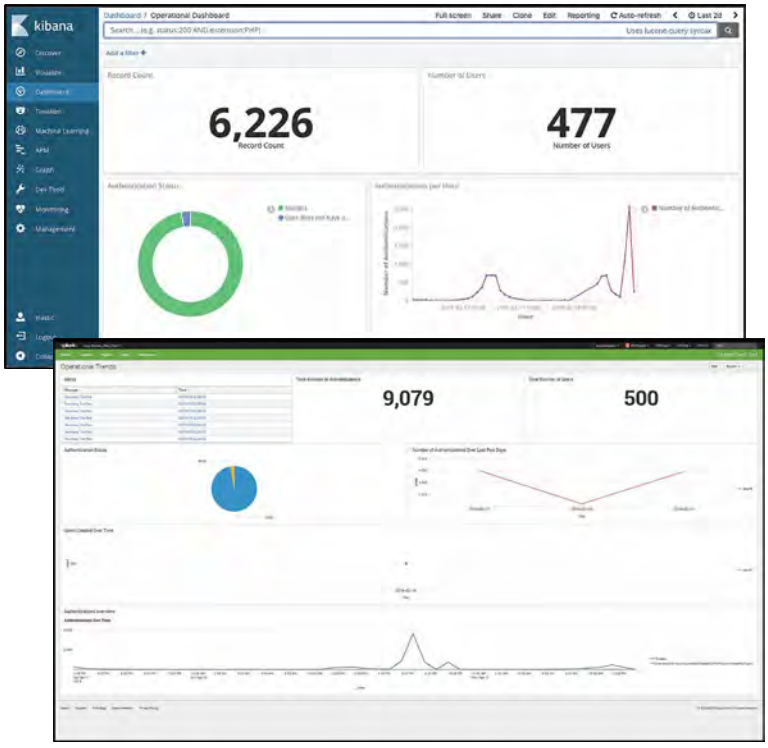
Our system detects security threats by analyzing user authentication patterns and visualizing the results using Splunk and Elasticsearch, Logstash and Kibana (ELK).

Our custom Splunk and ELK apps enable VIP customers to view and analyze various operational and security trends in near real time. Both apps ingest and visualize VIP authentication log data pulled from Symantec servers using their VIP Reference Client.

A VIP customer initially configures their Splunk or ELK apps with their VIP account certificate. The apps open directly to pre-built dashboards, which show operational data and security trends. Users can add custom charts and panels to their dashboard.

While our dashboards do help to visualize data trends and behavior, security analysts may not always be viewing the dashboards. To prevent an analyst from missing an important security event, both the Splunk and ELK apps alert analysts via alternate methods when threats are detected.

Our Splunk app is written using the Splunk Enterprise software and dashboards are created with Splunk Processing language. Our ELK app runs on an Amazon Machine Image hosted on Amazon Web Services.



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TechSmith
Snagit and Camtasia Output Extensibility

TechSmith engineers engaging products which help people share ideas and information around the globe. With a focus on visual content, TechSmith software provides users with intuitive communication solutions.

TechSmith's flagship products, Snagit and Camtasia, create image and video files for sharing with others. The TechSmith Extensibility Framework (TEF) provides support for the creation of specialized output plugins, which enable users to output their media directly to another product or service.

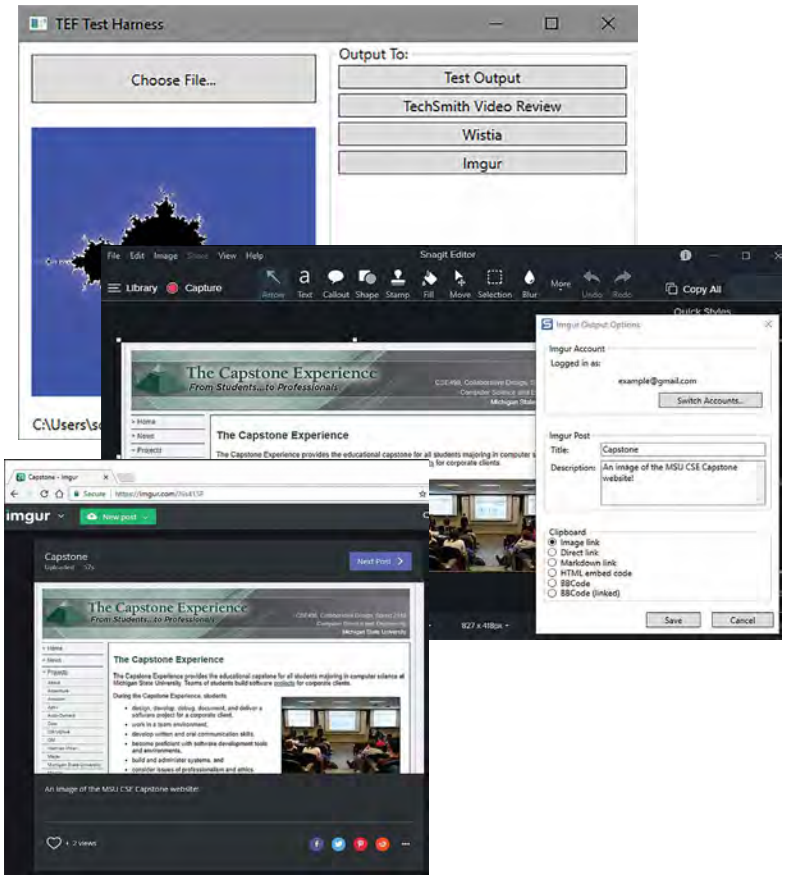
Imgur is a popular website for hosting images. TechSmith Video Review is a TechSmith service where users can have others review their videos. Wistia is a popular video hosting site used by businesses.

Our Snagit and Camtasia Output Extensibility suite of TEF outputs features three new options. These enable users to send their media directly from Snagit or Camtasia to Imgur, TechSmith Video Review and Wistia.

Users can specify several options specialized to these destinations, such as a review-by date for TechSmith Video Review.

Supplementing the addition of our plugins, our test harness is used to aid in output development and demonstration. The harness, much like Snagit and Camtasia, can dynamically load any TEF output plugin. Consequently, it serves as a tool for developers to help create any future outputs.

Our outputs are written in C# using abstraction provided by TEF. The user interface design for both the outputs and harness utilizes C# and XAML under WPF.



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Union Pacific

"Alexa, what's my work schedule look like?"

Union Pacific is a leading transportation company headquartered in Omaha, Nebraska. Union Pacific has over 8,500 locomotives running on 32,100 miles of track across 23 states with almost 43,000 employees.

Union Pacific currently provides access to scheduling information for trainmen, yardmen and enginemen (TY&E) employees by phone or web app. Employees are on call 24/7 and are assigned trains to work on through a revolving list of employees. Train schedules are frequently updated, so employees must always stay up to date.

Our custom Google Assistant and Amazon Alexa voice assistants provide Union Pacific TY&E employees hands-free access to their place in the list as well as up-to-date train schedules that they can listen to individually or in groups. Voice assistants provide a fast and flexible solution to access essential scheduling information.

Our system also keeps a detailed log of every employee interaction with the assistants. These logs are viewable through our companion web app that enables managers to monitor the application's usage statistics and to filter the logs to see individual assistant or user statistics.

Alexa uses the Amazon Developer Console and Google Assistant uses DialogFlow to map dialogs. Each voice assistant sends HTTPS requests to a NodeJS web URL, which calls a Java web service that accesses a MySQL database and returns a response. Our web app is implemented with HTML5, CSS and JavaScript.

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Urban Science
Mobile Maestro

Urban Science is a consulting firm that helps clients identify and improve market share, sales and profitability, and customer loyalty. They work closely with their sister company, Talem Technologies, to build medical devices that empower disabled people.

Talem Technologies has an exoskeleton arm, the X-Ar, that enables wheelchair bound people with Duchenne muscular dystrophy to regain control of their arms and experience a much larger range of motion.

The X-Ar is purely mechanical and must be calibrated to a stable angle of incline, which is adjusted using a push button key fob. Unfortunately, using this key fob presents a significant challenge for some users.

Our Mobile Maestro app enables users to control their X-Ar from their mobile devices, which are often mounted on their wheelchairs. Using touch button or voice controls, users can adjust the mount, lock and unlock the joints, enable auto leveling and voice controls, and put the app into standby mode.

Mobile Maestro also adjusts the incline calibration automatically when the user changes inclines and it provides user profiles to allow quick settings changes.

Our app supports both Apple iOS and Google Android devices. It is fully integrated with Siri and Google Assistant, allowing the user to access all touch button controls through them at any time. Furthermore, the user can add new voice commands to trigger any of the available actions.

Our Mobile Maestro app is written using Ionic for cross platform development and MySQL for data storage. The mobile devices communicate with the X-Ar using Bluetooth Low Energy.

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USAA

LIMElight: Life Insurance Made Easy

USAA is a Fortune 500 company based in San Antonio, Texas. USAA provides a range of competitive financial products and services to the military community and their families.

Life insurance is one of USAA's primary services. Applying for life insurance can be a time-consuming and tedious process for customers.

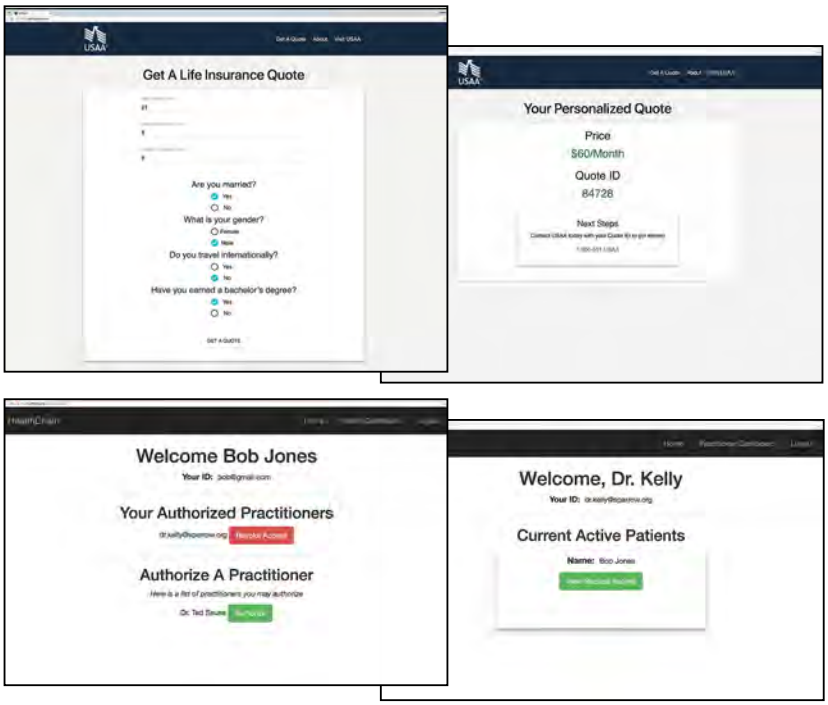
Our Life Insurance Made Easy app (LIMElight) delivers personalized quotes quickly and easily, thereby expediting the underwriting process and converting more life insurance applicants to enrolled USAA members. LIMElight accomplishes this by using machine learning and blockchain technology.

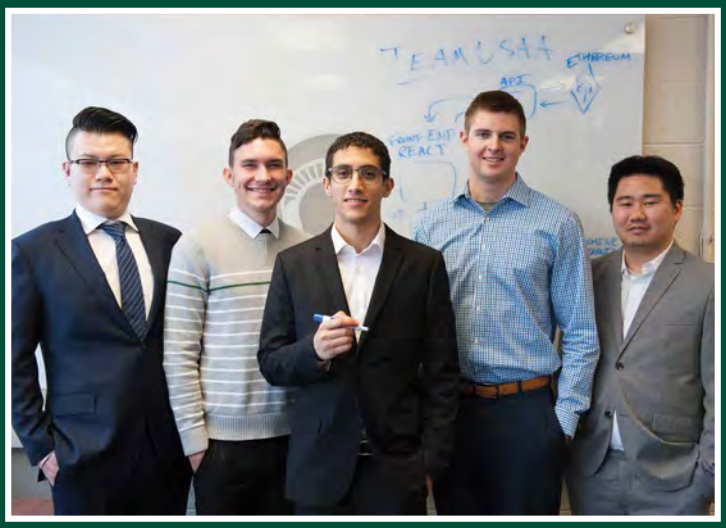
Applicants use a mobile-friendly web app to answer a few questions about their demographic and lifestyle. Our machine learning model then assesses the risk class of the applicant and quickly generates a personalized life insurance quote.

LIMElight also enables USAA and medical providers to exchange applicant medical records via blockchain technology.

Due to the nature of blockchain, information stored on the blockchain is secure, immutable and easily accessible by authorized parties. As a result, USAA underwriters have quicker access to the medical records that are critical in the life insurance underwriting process.

Our LIMElight quote generation web app is built utilizing React with a Python machine learning component. Our medical record interface uses Angular with a Hyperledger blockchain solution.





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Yello
IVAT: Interview Video Analysis Tool

Yello is a Chicago-based company that provides software for talent acquisition. Their products help recruitment teams hire the right talent at the right time.

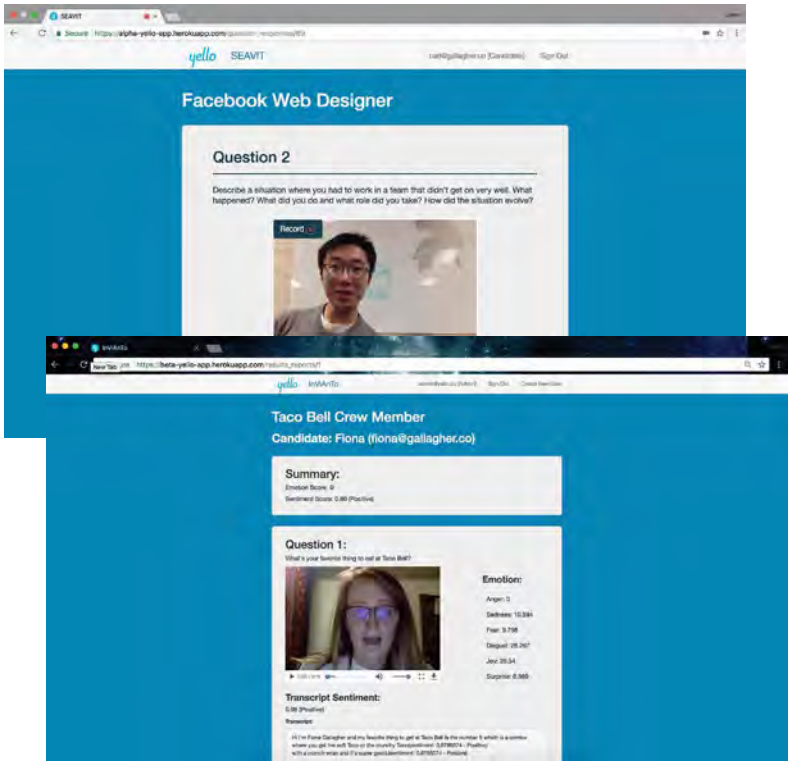
When evaluating job applicants, recruitment teams often have conflicting assessments due to differing opinions of applicants. This is challenging for recruiters when selecting candidates with conflicting reviews.

Automated emotion and sentiment analysis provides unbiased assessments to help evaluate candidates. Our Interview Video Analysis Tool (IVAT) automatically evaluates a candidate's sentiment (speech attitude) and emotion (facial expressions) in a video interview.

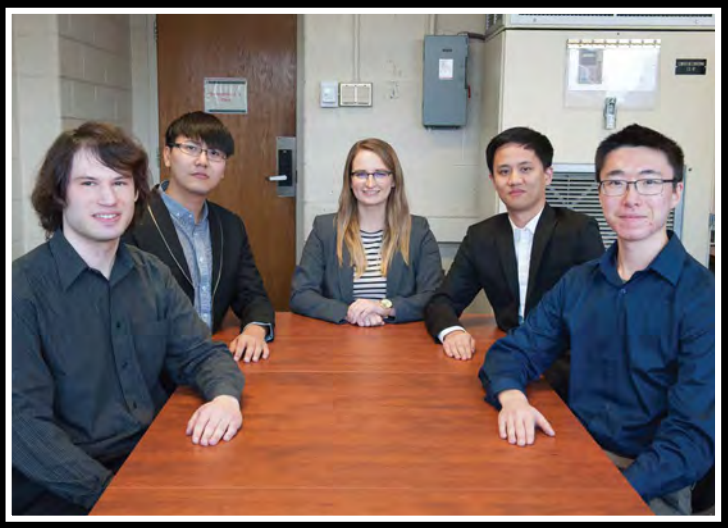
IVAT allows recruitment teams to set up video interview questions, schedule live interviews, and invite candidates to an interview. A candidate can pre-record video responses to interview questions or participate in a live interview.

A candidate's speech is processed and evaluated in terms of the sentiment of their words being negative, positive or neutral. Likewise, a candidate's facial expressions are analyzed and summarized across a set of emotions such as angry, sad or joyful.

IVAT is built with Ruby on Rails. The video interviews are streamed and archived using TokBox's OpenTok API. Sentiment analysis is done with Microsoft's Video Indexer and Emotion analysis uses Kairos Human Analytics API. Videos are stored on Microsoft's Azure cloud storage.



yello



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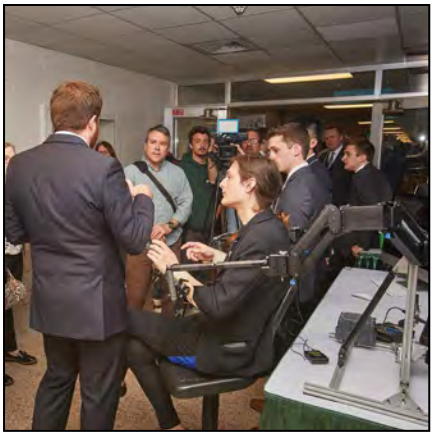
Design Day

Spring 2018



Design Day Award Winners

Fall 2017

Auto-Owners Exposition Award
Team Amazon

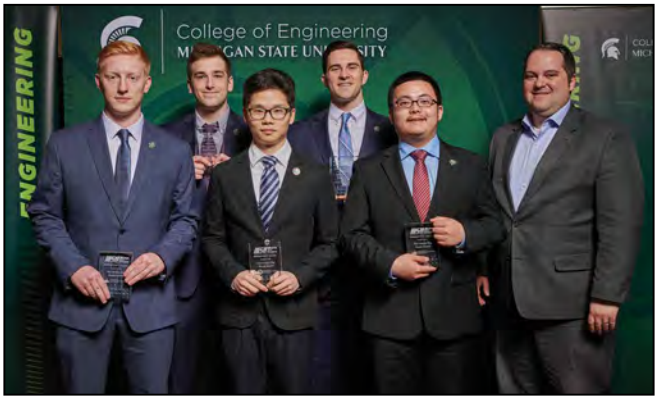
MSU Federal Credit Union Praxis Award
Team Yello

TechSmith Screencast Award
Team Union Pacific

Urban Science Sigma Award
Team Michigan State University

Spring 2018

Auto-Owners Exposition Award
Team Phoenix Group



MSU Federal Credit Union Praxis Award
Team Amazon

TechSmith Screencast Award
Team Quicken Loans

Urban Science Sigma Award
Team Herman Miller

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