Software Engineering Capstone Projects – Monday Session

Project: Clear Chain

Abstract: Moving to a new city (and potentially a new country) is challenging. Administrative tasks can pile up, and part of the swath of tasks new residents face is the need to subscribe to services. For newcomers to London, Ontario, these services include London Hydro, Union Gas and garbage collection. For this project, Versatile Crocodiles engaged London Hydro as a client and designed a system that serves as a "one-stop shop" for new London Hydro subscribers: clients could register for London Hydro and automatically be registered for services such as Union Gas and garbage collection. The main objective behind this project was to utilize blockchain technology to securely transfer data. As a deliverable, our team used Ethereum blockchain technology to create a proof of concept which takes the form of a fully functional "mock" front end and blockchain back end. Users taking the role of customers can securely log on and input registration, information which is then stored on a blockchain. System administrators taking the role of either London Hydro or partner service providers can then view transactions made by customers. Since information written to the blockchain is immutable, administrators can view "transaction history" - thus, the blockchain serves as a reliable source of customer information.

Team: Clear Chain

Demo Link: https://www.youtube.com/watch?v=2N74rN_uGVA

Project: Haptics Based Surgical Training Tool for Cerumen Removal (H.I.C.R.E.P.T.)

Abstract: Otolaryngologists face a problem when training residencies in the impacted cerumen removal procedure. Cerumen, commonly referred to as earwax, can harden and partially or completely block the ear canal causing hearing loss, discomfort and even deafness. This is extremely common in the population over age sixty-five, with half experiencing this condition. This procedure is relatively straightforward, but dangerous due to working in close proximity to the eardrums. Perforations, tinnitus, and other forms of damage have been unfortunate and unacceptable results of this operation due to a lack of confidence and effective practice of the procedure. Current practice methods have been cited as inefficient, unrealistic, and difficult to measure performance due to lack of performance feedback. With the aging population on the rise, this procedure will only become more in demand for the near future. Therefore it is of utmost importance that surgeons feel comfortable in their technical skill to perform the procedure. We believe that developing an effective training solution will lead to this increase in competence. Our solution acts as a tool to assist wax removal training in a reliable way, providing a much more realistic experience through simulation, real time performance metrics, and haptic feedback. This development will help those negatively affected by the condition and improve the audiology community through increased quality of care.

Team: Duo Queue

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Demo Link: https://www.youtube.com/watch?v=xlwoGm9rXig&feature=youtu.be

Project: The Rabbit Hole

Abstract: People have an excess of food options at their fingertips constantly. With fast food and giant chains on every street corner people have become familiar with popular restaurants very quickly. Black Box Tech identified a need for those who don't want the typical chain, known all too well restaurant. There is something to be said for the quaint hole-in-the-wall environment, something not easy to find. Black Box Tech developed the Rabbit Hole it is a hole-in-the-wall locator to address this need to locate the restaurant a user is looking for and deliver the unique hole-in-the-wall experience and cuisine.

Team: Black Box Tech
Olyvia Bakker, Aidan Donworth, Eric Ingratta, Ghaid Saadaldin

Demo Link: https://www.youtube.com/watch?v=dcB2M25TlvE

Project: A Deep Learning-Based System for Forecasting Household Energy Consumption

Abstract: This project was completed in collaboration with London Hydro. With a growing global population and the rise in industrialization, efficient energy production and consumption has become increasingly important. Without improvements in efficiency, energy consumption needs are expected to be double the world's energy production capacity by 2040. Energy consumption forecasts can provide significant improvements to energy efficiency through a diverse range of descriptive and prescriptive measures. Forecasts can be used by energy distributors to inform optimal operational decisions, establish innovative programs such as energy trading, and serve as a foundation for insights relating to energy consumption disaggregation and household energy profiling. Further, energy users can benefit from the integration of forecasts into consumer applications through behavioural nudges that influence energy usage and help individual households make decisions that are more cost effective and environmentally conservative. This project explored two forecasting models to produce a 72 hour forecast for a household's energy consumption using weather and past energy consumption data in the Green Button Standard: a long short-term memory recurrent neural network (LSTM RNN) and a vector autoregression model. A cloud-based software system was implemented that productionized the process for creating LSTM RNN models for individual households. The system provided access to forecasts from the saved models via a REST API.

Team: Otta
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Demo Link: https://www.youtube.com/watch?v=hlLxLGfsgTc

Project: SpendSense

Abstract: To remain up to date in the age of information, it is more important than ever to utilize everything available to harness information in a way that we can leverage. With millennials making up 50% of the workforce worldwide, any tools to help manage spending are essential when it comes to personal finances and saving for the future. Spendsense is an application targeted to young adults to capture spending habits in a quick and convenient process. With all the purchases people are making daily, SpendSense aims to help by efficiently scanning a receipt or document to help develop a purchase history, and use analytics to help break down outgoing cash flow in every aspect of our lives to inform users with expenses so that they may make educated decisions for their future.

Team: Virtualytic
Kevin Freeman, Joshua Evans, Aaron Yung

Demo Link: https://www.youtube.com/watch?v=1p66E4-_nAg&feature=youtu.be

Project: MyShopr | Recipe-Driven Shopping Economizer & Map

Abstract: Everybody needs to eat. UberEats, DoorDash, Chef's Plate, HelloFresh, we live in a world where software and technology are constantly developing to make everything more convenient. But with that innovation, there is a price. Outside of the grocery shopping experience itself MyShopr is an organizational tool for creating new recipes and making grocery lists. This allows users to quickly browse recipes and automatically add them to their shopping lists. In this, users are given a wider range of things to eat than they would on any other food related software service. MyShopr then aims to bridge the gap between convenience and frugality, by helping the user with their grocery shopping experience. There are two factors that take up the majority of time while going grocery shopping. Firstly, finding the item you desire. Secondly, finding the cheapest option for that item. MyShopr eliminates these time-consuming factors by providing a user-interface that guides the user through the store to each of their items. With MyShopr users will be able to save a significant amount of time and money on each of their grocery shopping trips, removing some of the inconvenience whilst providing value to both the user's wallet and the store's sales.

Team: MDMJ
Matthew Northmore, Davinderpal Cheema, Marcus Chien, Jeremy Ellis

Demo Link: https://www.youtube.com/watch?v=gVigKQpFp-k

Project: Just Flow

Abstract: Managing music has proven to be a difficult, and time consuming task for countless individuals. Collecting your favorite songs and organizing them into playlists can take away from the overall enjoyment music provides. Streaming platforms like Spotify have made music management easier for individuals through song recommendation and playlist sharing but it is still far from perfect. Individuals can spend hours trying to form playlists in a world where time is so valuable. Once a playlist is formed most people are unaware or don't take the time to properly order the songs. A bad song order in a playlist can result in choppy sounding transitions and an overall lack of flow. Now, imagine a tool that could optimally organize all your existing playlists, so that they seamlessly flow and has the ability to create entire playlists based on songs that sound similar to your favorites? This would not only significantly reduce the overall time to create a playlist but it would make the listening experience more enjoyable for everyone. This is what Just Flow aims to accomplish

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Demo Link: https://www.youtube.com/watch?v=pDK_ES1m4_g

Project: Forestcasting (Pythia)

Abstract: Forest fire managers are responsible for strategically planning firefighting efforts to maximally prevent damages to communities and the environment. In recent years, the focus of forest fire management has shifted from suppressing forest fires after they break out, to proactive fire prevention through the use of analytics and data driven decision making. Pythia has developed Forestcasting, a forest fire management tool that provides vital information to aid firefighting resource allocation. The Forestcasing tool is comprised of (1) a machine learning model that calculates the probability a forest fire could occur in a given area, and (2) a mathematical damage algorithm that estimates the severity of damages caused by said fire. Forestcasting's results give forest fire managers the tools and data required to take appropriate precautions. As forest fire severity and frequency are increasing, fire management capacity is decreasing and the expenditures of forest managers are rising due to higher forest fire suppression costs. With steadily rising costs, Canadian wildland fire

management agencies are investing in new initiatives to prevent damages. Forestcasting aims to fill this gap by equipping forest fire managers with a tool to enhance decision making, consequently decreasing costs and damages.

Team: Pythia
Samatha Campbell, Shima Kananitodashki, Tharmiga Loganathan, Ivan Zvonkov
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Demo Link: https://youtu.be/0TOiHwv9nYo
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Project: Augmented Reality Neurosurgery Simulator

Abstract: Currently, surgeons must use 2-dimensional magnetic resonance image (MRI) scans to perform brain surgery. Visualizing how the 2D scans match up on an actual 3D brain is a difficult skill. Our Augmented Reality Neurosurgery Simulator application can be used on Android smartphones during surgery training to make this step obsolete, by projecting an augmented 3D tractography of the needed brain connections into the real world. It can be used preoperatively as well, so surgeons and trainees can rehearse in a new way, by moving the connections around, highlighting connections of interest, and changing the transparency of connections not of interest.

Team: RED BLK
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Demo link: https://youtu.be/yHHlXUnu5Pg
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Project: AR We There Yet?

Abstract: Technologies such as Google Maps have allowed individuals to confidently travel to a destination, however navigating within a venue still can be a source of anxiety and irritation as possible delays or confusion can cost one additional time, money or opportunities. The pain of navigating only mounts when a large crowd is introduced, as visibility is significantly reduced. Traditional signage and maps are limiting as they must be interpreted and analyzed, and do not provide real-time feedback. Combining these limitations with the desire to be self reliant, there is an inevitable frustration with on site navigation. To address these daunting factors, intuitive and affirming wayfinding techniques or tools should be introduced for large event grounds. AR We There Yet? will be an augmented-reality based wayfinding solution, available on mobile phones and devices. Using a real-time, real-world overlay, AR We There Yet? will ease the consumer's ability to navigate. The app overlays the user's view of the physical world with a wayfinding arrow to direct them through the various attractions and busy crowds in a simple and efficient manner. Large and multi-site event grounds and venues will benefit from this solution as they can provide an improved customer experience that will result in better profitability and brand building.

Team: JAM Tech
Jake Sakon, Arianna Basilone, Monanshi Shah (JAM Tech)
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Demo Link: https://youtu.be/GJVQ1ebo0dI
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