Final Design Report

Team Members

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Project Abstract

For our senior design project, we are developing a smart home control interface tailored to user profiles, including a customizable dashboard, device controls, and routine management. Features include AI-driven voice interaction and simplified interfaces for elderly users. This project entails front-end UI design and backend programming while integrating emerging technologies like 3D models and VR to enhance usability and demonstrate real-world application.

Project Description

Our senior design project focuses on developing an advanced **smart home control interface** tailored to individual user profiles. The system integrates innovative features like customizable dashboards, device controls, routine management, voice assistant capabilities, and VR-based visualization for enhanced usability. Each team member's unique strengths were strategically utilized to ensure effective task distribution and project success. Below is a detailed description of the system and the collaborative process.

The smart home interface is designed to personalize and streamline user interactions with their home environments. Its key features include:

1. **Customizable UI:** A flexible user interface accommodates diverse profiles based on factors such as age, family size, pets, occupation, and technological fluency.
2. **Central Dashboard:** A hub for monitoring and controlling smart devices, enabling users to easily manage lighting, climate, security, and more.

3. **Voice Assistant Integration:** A conversational AI allows natural interaction for device control and access to information, ensuring accessibility for all users, including those with limited technical proficiency.
4. **Routine Management:** Automated schedules and routines tailored to users' daily activities and preferences.
5. **Real-Time Notifications:** Alerts for events like security breaches or low battery levels in devices.
6. **Immersive VR Demonstration:** A virtual reality component showcases a 3D model of a smart home to demonstrate the interface's functionality.

The team divided tasks based on individual expertise to maximize efficiency and quality:

- **Salma Mohammad:** Specializing in UI/UX design, Salma developed the customizable interface using Figma Sketch and built an adaptable central dashboard. She also implemented intuitive pop-up controls and iteratively refined the UI based on usability testing.
- **Quoc Luong:** Focused on networking and system compatibility, Quoc conducted research into user profiles, tested the UI across platforms, validated voice assistant performance, and ensured seamless communication between devices.
- **Daniel Chandler:** With a background in VR and machine learning, Daniel created the VR demonstration, integrated ML algorithms for personalized recommendations, and ensured automation routines worked smoothly. He also contributed to accessibility research and refined real-time notifications.
- **Elbthel Zeleke:** An expert in backend development, Elbthel managed the creation of backend services, implemented security protocols, and integrated external APIs for device communication. She also designed user profile management tools and documented technical specifications.

The Implementation and Process of our project is as follows:

1. **User Profile Research:** Quoc identified customization parameters such as age, family size, and tech fluency to inform the interface design.
2. **UI Design and Development:** Salma designed the interface with flexibility and inclusivity, ensuring intuitive usability for various demographics, including simplified options for elderly users.
3. **Device Control and Automation:** Elbthel developed secure backend services for storing and updating user profiles and device states, while Daniel worked on automation routines to personalize experiences.
4. **Voice Assistant Integration:** Salma led the integration of a conversational AI, ensuring the assistant was responsive and easy to use.
5. **System Testing and Feedback:** Quoc validated system compatibility across platforms and conducted user testing to refine features.

The system incorporates emerging technologies, such as VR, to enhance the user experience and provide an engaging demonstration. The inclusion of accessibility features ensures the interface is usable by a wide audience, including those with disabilities or limited technical skills.

Our smart home control interface represents a convergence of personalization, technology, and user-centric design. By leveraging each team member's strengths, we have built a system that adapts to individual needs, integrates seamlessly with smart devices, and demonstrates its capabilities through a cutting-edge VR experience. This project showcases our collective expertise and commitment to creating technology that enhances everyday living.

User Stories

1. As an older user, I want to create a user account and receive a simplified interface so that I can easily navigate and use the smart home features without feeling overwhelmed.
2. As a young, tech-savvy user, I want to create a user account and access advanced features so that I can customize my smart home experience to fit my lifestyle and preferences.
3. As a user, I want to set up home reminders and alarms for my schedule to help with household management.
4. As a pet owner, I want to unlock special functions related to pet care, such as feeding schedules and reminders, so that I can ensure my pets are well taken care of while managing my home.
5. As a caregiver for an elder, I want to access the account settings and features remotely so that I can assist them with their smart home management and ensure they are safe and comfortable.
6. As a user, I want to be able to create an account profile so that my UI is curated for me, my household, and my schedule.

Project Tasks & Timeline

Task List

1. Research user profile factors such as age, pets, family size, occupation, and tech fluency to define customization parameters. (Quoc Luong)
2. Design the customizable UI to accommodate various user profiles and ensure adaptability using Figma Sketch. - Salma Mohammad
3. Develop the central dashboard for monitoring and controlling connected smart devices. - Salma Mohammad
4. Implement other intuitive controls in other menu pop ups for managing smart home settings across different device types. - Salma Mohammad
5. Develop the voice assistant integration for natural user interaction and simplified control. - Salma Mohammad

6. Design real-time notification system for alerts on important events within the smart home. - Salma Mohammad
7. Test the customizable UI across different user profiles to ensure an intuitive user experience. (Quoc Luong)
8. Develop VR component for the immersive, interactive experience using 3D models of a home. (Daniel Chandler)
9. Research and integrate machine learning algorithms for personalized recommendations based on user behavior.(Daniel Chandler)
10. Test the voice assistant functionality to ensure reliable and accurate responses. (Quoc Luong)
11. Validate the performance of automation routines to ensure they run smoothly across different user profiles.(Daniel Chandler)
12. Refine the UI based on usability feedback to optimize for ease of use and personalization. - Salma Mohammad
13. Test system compatibility across various smart home devices and platforms. (Quoc Luong)
14. Validate real-time notifications system to ensure timely and relevant alerts.(Daniel Chandler)
15. Research accessibility features to ensure the system is inclusive for all users.(Daniel Chandler)
16. Obtain user feedback through testing and refine features accordingly. (Quoc Luong)
17. Document the final project implementation and provide user guidelines.(Daniel Chandler)
18. Prepare and present the project demo showcasing all major features, including voice assistant and VR integration.(Daniel Chandler)
19. Create backend services for storing and updating user profiles and device states:- Elbthel Zeleke
20. Develop security protocols for user data and smart home device control:- Elbthel Zeleke
21. Integrate the system with external APIs for device communication and data exchange:- Elbthel Zeleke
22. Design and develop user profile management tools for easy updates and customizations:- Elbthel Zeleke
23. Document user requirements and the technical specifications of the smart home interface:- Elbthel Zeleke
24. Investigate automation routines based on daily user activities and preferences for improved efficiency:- Elbthel Zeleke

Timeline

August 8th – September 15th: Project Planning and Research

- **Aug 8 - Aug 18:** Define project objectives, deliverables, and team roles.
- **Aug 19 - Aug 31:** Conduct user profile research and document customization parameters.

- **Sept 1 - Sept 15:** Develop detailed UI/UX wireframes using Figma Sketch.

September 16th – November 3rd: Initial Development Phase

- **Sept 16 - Oct 6:**
  - Develop the central dashboard for device monitoring and control.
  - Start backend development for storing and updating user profiles and device states.
- **Oct 7 - Oct 20:**
  - Implement intuitive controls for smart home settings.
  - Integrate security protocols for data and device control.
- **Oct 21 - Nov 3:**
  - Develop backend services for external API integration.
  - Begin research on machine learning algorithms for personalized recommendations.

November 4th – December 15th: Midway Development

- **Nov 4 - Nov 17:**
  - Begin development of voice assistant integration.
  - Design the real-time notification system for alerts.
- **Nov 18 - Dec 1:**
  - Build user profile management tools for customization updates.
  - Develop initial VR components for immersive 3D experiences.
- **Dec 2 - Dec 15:**
  - Test UI functionality across user profiles and platforms.
  - Start integration of automation routines based on user activities.

January 8th – February 16th: Refinement Phase

- **Jan 8 - Jan 21:**
  - Complete and validate voice assistant functionality.
  - Refine machine learning integration for recommendations.
- **Jan 22 - Feb 4:**
  - Test the performance of automation routines and make adjustments.
  - Finalize and test real-time notifications system.
- **Feb 5 - Feb 16:**
  - Conduct usability feedback sessions for UI refinement.

February 17th – March 31st: Final Development and Testing

- **Feb 17 - Mar 3:**
  - Enhance VR component for the final presentation demo.
  - Conduct compatibility testing with various smart home devices and platforms.
- **Mar 4 - Mar 17:**
  - Integrate accessibility features for inclusivity.
  - Test all system features as a cohesive unit.
- **Mar 18 - Mar 31:**
  - Debug and ensure all components meet the project's functional requirements.

April 1st – May 6th: Documentation and Presentation

- **Apr 1 - Apr 14:**
  - Finalize project documentation and user guidelines.
  - Refine the engineering notebook to document contributions and processes.
- **Apr 15 - Apr 28:**
  - Prepare the project demo showcasing all features, including the VR integration.
  - Conduct practice sessions for the senior design showcase presentation.
- **Apr 29 - May 6:**
  - Present the project at the senior design showcase.

Effort Matrix

Task Description	Salma	Quoc	Daniel	Elbthel	Total
Research user profile factors	2	3	1	1	7
Design the customizable UI	4	1	1	2	8
Develop the central dashboard	5	1	1	1	8
Implement intuitive controls	4	1	1	1	7

Develop voice assistant integration	3	3	2	1	9
Design real-time notification system	3	1	3	1	8
Test the UI across user profiles	2	4	1	1	8
Develop VR component for interactive experience	2	1	5	1	9
Research and integrate machine learning for recommendations	2	1	4	2	9
Test voice assistant functionality	2	4	1	1	8
Validate automation routines	2	1	4	1	8
Refine the UI based on usability feedback	4	2	1	1	8
Test system compatibility across devices	2	4	1	1	8
Validate real-time notification system	2	1	3	1	7
Research	2	1	4	1	8

accessibility features					
Obtain user feedback and refine features	2	4	1	1	8
Document final implementation and user guidelines	2	1	3	2	8
Prepare and present project demo	2	2	3	1	8
Create backend services for user profiles and devices	1	1	2	5	9

ABET Concerns Essay

Project Constraints Essay

Our smart home control interface project faces several constraints that will shape its design and development:

Technical Complexity

Integrating advanced features like machine learning algorithms for personalized recommendations, voice assistant integration, and ensuring compatibility with a wide range of smart home devices presents significant challenges. Developing a seamless user experience requires deep understanding of diverse systems and platforms, as well as meticulous testing to ensure reliability across various environments.

Quality of Life Enhancement and Inclusivity

We aim to enhance users' quality of life by increasing convenience and security. By making home automation more accessible, we hope to benefit not only tech-savvy individuals but also the elderly and people with disabilities. Designing an inclusive, user-friendly interface necessitates considering cultural diversity, supporting multiple languages, and accommodating different lifestyle needs to ensure our solution is accessible to a broad audience.

Security and Privacy Concerns

Handling personal data—including user preferences and device states—raises significant security concerns. To prevent privacy breaches and unauthorized access, we plan to implement strong encryption and user authentication protocols. Additionally, compliance with data protection regulations like the General Data Protection Regulation (GDPR) and the California Consumer Privacy Act (CCPA) requires strict data handling procedures and explicit user consent, which may limit certain functionalities or demand additional resources.

Resource Constraints

As college students, we may face limitations in time, access to technology, and expertise. We must devise alternative methods that align with our project objectives while remaining realistic about our resources.

Environmental Sustainability

Environmental sustainability influences our project design. We plan to incorporate energy-efficient protocols and features that promote resource conservation—such as smart energy management and integration with renewable energy sources—to minimize the environmental footprint of smart homes.

Self-Assessment Essays

=> Daniel Chandler:
We decided to create a smart home control interface that focuses on delivering a highly personalized user experience. The system will feature a customizable UI that adapts to individual user profiles, taking into account factors like age, pets, occupation, tech fluency, and potentially more. Our goal is to ensure the interface feels intuitive and tailored to each user's unique needs. The design will include a central dashboard for monitoring connected devices, intuitive controls for managing settings, automation of daily routines, and real-time notifications for important events. We are also considering integrating a voice assistant to enhance user interaction and simplify control. Additionally, we may showcase the app using a 3D model of a home, possibly incorporating VR technology for an immersive, interactive experience. I am currently a 5th-year Computer Science student with a strong foundation in web development and programming. I've taken courses like Website Management (IT 1040C) and Visual Data Interfaces (CS 5124), which provided me with solid experience working with HTML and CSS. Right now, I'm enrolled in a Machine Learning course (CS 5137), which will be useful for implementing AI features in our projects. Although we haven't officially decided on a programming language for the project, I've already completed a Python Programming course (CS 2021), so I am comfortable using Python if we choose it. My coursework has given me practical skills that I'm eager to apply in real-world applications. This blend of web development, machine learning, and programming knowledge positions me well for contributing to our project.

I spent four CO-OP terms working with a VR/Web development team, primarily focused on VR solutions for patients. While my official role was as a QA team member, I frequently contributed to programming tasks for both the Web development and Simulation (VR) development teams. During my time in QA, I gained significant experience working with Jira, where I wrote test cases, managed test executions, and created detailed bug reports. In addition to my QA responsibilities, I had hands-on involvement in both Web and VR development projects. I became proficient in using Unity for VR development and contributed to various features across both platforms. This diverse experience has given me a well-rounded skill set in both quality assurance and development. I am highly motivated to participate in this project because it combines cutting-edge technology with personalized user experiences, two areas I am passionate about. The idea of creating a smart home interface that adapts to individual preferences excites me, as it holds the potential to enhance people's daily lives through convenience and automation. I am particularly drawn to the challenge of designing a system that caters to a wide variety of users, from tech-savvy individuals to those who may be less familiar with technology. This project offers an opportunity to push the boundaries of what smart homes can do, making them not only functional but also deeply intuitive and accessible. My preliminary approach to designing this solution will involve user-centered design principles, starting with research to understand the diverse needs and behaviors of potential users. I plan to focus on simplicity and ease of use, ensuring that the interface is intuitive and customizable. By integrating features like real-time notifications, a voice assistant, and a dynamic UI, I aim to create a seamless experience. I expect our system to significantly improve smart home management by making it more personal and efficient. To self-evaluate, I will consider user feedback and usability testing as key indicators of success. I will know I've done a good job when the system not only functions as intended but also receives positive feedback for its adaptability and ease of use.

=> Elbthel Zeleke:

For my senior design project, I will be working on the back-end development of an advanced smart home control interface. I'm looking forward to this project as it involves creating a customizable and dynamic system that can tailor itself to a user's specific needs, such as language preferences, technical skills, and daily routines. I'm hoping to apply my experience in software development, especially in back-end development and system integration, to contribute meaningfully to this project. I hope the project will further my understanding of modern software systems, particularly in relation to device integration and personalized user interfaces. Additionally, it provides an excellent opportunity to work with technologies like 3D modeling and potentially VR, which is new territory for me. I see this as an opportunity to grow my technical skills while also improving my soft skills, such as teamwork, communication, and problem-solving. My college courses have equipped me with a good foundation in computer science, particularly in areas directly relevant to this project's objectives. Courses such as CS 2028C Data Structures and CS 4092 Database Design and Development have equipped me with the technical skills needed for effective database management, data integration, and back-end development. EECE 3093C Software Engineering has deepened my understanding of software design principles and project management, which are crucial for integrating various components into our smart home system. Additionally, EECE 4029 Operating Systems and

Systems Programming has given me insight into system processes and multitasking, which will be valuable in managing the integration of multiple devices. Furthermore, the overall curriculum has strengthened my problem-solving abilities and familiarity with diverse technologies. These skills and knowledge will be directly applicable as I work on developing and refining the smart home control interface. My co-op rotations at Learn 21 have significantly enhanced my practical skills in software development and project management. During my time as a Software analyst intern, I worked on back-end development, which involved database management, analyzing software for bugs, and integrating new software with existing systems. I was actively involved in the transition from .NET 2 to .NET 6, assisting with testing, debugging, and ensuring the seamless functionality of the upgraded applications. This role required a strong attention to detail and problem-solving skills, which I developed further through hands-on experience. This internship deepened my skills in C#, SQL, and web application development, as I worked closely with the development team to implement and refine software solutions. This experience will directly translate to my work on the smart home control interface, especially when it comes to handling user profiles and managing the integration of device data. I'm motivated to contribute to this project due to its potential to significantly enhance people's everyday lives. As smart home technology continues to grow in popularity, I'm looking forward to being part of a system that provides a seamless and personalized user experience. The task of integrating multiple features into a cohesive interface is an exciting opportunity to elevate my technical skills. I initially plan to conduct research to stay informed about the latest developments in smart home security, identify gaps in the current solutions, and ensure our system is both safe and user-friendly. Following that, I plan to build a strong and flexible back-end infrastructure that guarantees efficient communication between the system's components. By collaborating closely with my team, I aim to ensure that our solution is both effective and innovative. I expect our project to deliver a fully functional smart home control interface that is adaptable to various user needs. I anticipate that my contributions to the back-end will ensure the system operates efficiently, integrates data seamlessly, and scales to accommodate a range of devices and user profiles. To evaluate my progress, I will set specific goals for each feature I develop and actively seek feedback from both my team and faculty advisor to ensure alignment with the project's requirements. Additionally, I will assess my success based on the system's performance during our testing phases. I will measure effectiveness by how well the system runs, how intuitive it is for users, and whether it meets their needs. Ultimately, I will consider my work successful when the system demonstrates reliability, usability, and adaptability.

=>Salma Mohammad:

For my senior design project, my team and I are developing a smart home control interface tailored to individual user profiles. The system will include features such as a customizable dashboard, device controls, routine management, and voice assistant integration. User profiles will be personalized based on factors such as family status—whether users have pets, children, or are couples—as well as their age, with simplified interfaces and routines designed for elderly users. Additionally, we plan to incorporate a conversational AI component to enhance user interaction. My primary responsibility is to design an intuitive, user-friendly interface that not only elevates the smart home experience but also leverages emerging technologies like 3D models or virtual reality for real-world demonstrations. As a computer science student with a strong

interest in UI design and AI, this project offers an ideal opportunity to merge my technical expertise with my creative passions. Throughout my college career, several courses have shaped my approach to software development and will guide my contributions to this project. In CS5167 User Interface I, I learned the fundamentals of React.js and how to design interfaces focused on user experience. EECE 3093 Software Engineering taught me the importance of software lifecycle processes, Mohammad 2 specifically in project management tools like Jira and how to navigate working with a team on the creation of a full-scale software app. This class specifically taught us how to engage with a client in the creation of an app, and how to evaluate and adapt audience needs to our app design and development process which will be crucial in researching our audience and creating UIs that fit specific people's needs. Meanwhile CS4092 Database Design and Development equipped me with the skills to design and optimize databases to create a working full-stack application. We learned about relational databases and how to optimize their building. Courses like EECE4005 Web Programming Development & Hacking gave me deep insight on not only how to build a working full stack website, but also how to incorporate security measures into my website that are necessary when working with user's sensitive information. My academic foundation has given me both technical skills, such as proficiency in React.js, SQL, and database design, as well as non-technical skills like teamwork, communication, and project management needed to complete this project. In addition to my coursework, my co-op experiences have given me real-world insights into the software development process that I will apply directly to our senior design project. As a Software Developer for Carbon Copy Assets, I worked on an app using React.js, Ethereum, and Privy Wallet, gaining valuable experience in app development and blockchain integration. I worked closely with my client, Dr. Jones, to cater to the audience he sought to use the app for. Since I was mostly navigating my own schedule, I required good communication skills to communicate with my client, and also implement my own project management methods. I used an Agile SCRUM project management process to always check in with the client while building the app in order to make sure he's getting the final result he wanted. As a Software Tester and Mohammad 3 Developer for Kurist, I conducted thorough testing of a platform connecting international patients with medical experts by helping find bugs in the application, document and report the errors, and document how I changed the code to fix the bug. My work at both companies taught me essential testing practices, manual software editing, and project management skills using tools like Jira and Tuskr. These experiences have prepared me to ensure our smart home project is both functional and efficient. My motivation for this project comes from my long-standing interest in creating user-friendly applications that bridge technology and human experience. Although I am most seasoned in full-stack web development, I am particularly excited to participate because of the opportunity to incorporate AI and VR, which aligns with my interests in both software development and creative technology. It will add an extra layer of challenge and interest to this senior design project. In terms of approach, I plan to lead the development of the user interface, ensuring it is customizable and adaptable to different user profiles and will use React JS as well as libraries like ANT design and bootstrap to assist in a clean UI design. I also plan to collaborate with the team to integrate the backend logic and device controls using Postgre. My expected results are a polished, fully functional UI smart home interface that is easy to navigate for each user based on their respective profile, and demonstrates its value through a 3D model or VR integration. To

evaluate my contributions, I will regularly seek feedback from my teammates and faculty advisor to ensure that my work aligns with the project's goals. We will thoroughly document our individual contributions and project progress throughout the development process Mohammad 4 via our project documentation to help evaluate and accredit each team member's contributions. My expected technical end product is a full-stack developed UI that is hooked up to a 3D model or VR integration to show the demonstration of our app. In addition, I will want a full engineering notebook worth of documentation of research, project management, contributions and all other documentation relevant to the project, and a full-fledged presentation that pitches and describes our idea for the senior design showcase at the end of the year. I will know that I have done a good job when the user interface runs smoothly, all features are accessible, our documentation is comprehensive, organized, and easy to follow and the end product is intuitive and engaging for users. Achieving these outcomes will signify the completion of the project, but I will continuously refine the interface to ensure it meets the highest standards of usability and design.

=> Quoc Luong:

I major in Computer Science at the University of Cincinnati. Our team's senior project is focusing on developing a personalized smart home control interface. The app will adapt to individual profiles based on some factors such as age, pets, career fields, languages and more. The main component would be how the app can monitor and control every activity of the home users every day. It will keep track of the habits or the patterns and then it can make decisions based on that. The goal is to create a flexible and user-friendly smart home solution tailored to diverse needs. This is my last year at the University of Cincinnati. Therefore, I have enrolled in a variety of courses in college. I know there are some courses that can be applied to this senior project. For example, Software Engineering EECE-3093C is a class where we have to make any software project. So, my team decided to build a web application for people who want to work out. Thanks to this project, I have learned some web design skills. I had a chance to touch on HTML and CSS to build the website. I think with this knowledge, it will be helpful to build the smart home application. Another class that I think can help me with this project is Database Design CS-4092. This course helped me improve my skill of handling data. Building the smart home application would require a lot of customer data. Therefore, database skills would be 100% helpful for this project. I have experience with web development thanks to a co-op at Thai Hoa company in Vietnam two years ago. Therefore, I know enough web design skills such as HTML and CSS. I think this would benefit the project since the goal is to build and develop a user-friendly smart home application. Also, I have another co-op for Cenovus in Lima, Ohio. I had a lot of chances to have my hands on software maintenance. I think this technique would be beneficial for the smart home application because any apps in this world will require a maintenance throughout the year. With maintenance, we can assure that the software in the app can run smoothly without any errors or bugs. I am very excited about this project because of a few reasons. First, we live in a modern world nowadays with a lot of technologies around us. Therefore, building a smart home would be necessary for many people to live a life easier. With smart home devices, any activities everyday will be much more convenient for the customers. The second reason is that I am the type of person that wants to learn something new every day. I know with this project I would have a chance to explore some new fields that I have never had touch on. Besides, I can also learn from my teammates. Overall, I think doing this project will

help me a lot for my future career. About defining whether I accomplish the task well or not, I can directly ask my teammates for feedback. Also, I can communicate with the project's advisor about how well I perform for this project. For me, not only finishing my part but also helping other teammates as a team would be more significant. Working as a team would definitely improve the overall project's performance. Our team will spend some time sitting down together and give each other feedback every week so that we can keep track of every member's progress. So, no one would be left behind. In conclusion, to accomplish the project successfully, we ourselves need to work together as a group and have a good communication between each team members.

Professional Biographies

=> Daniel Chandler:
Co-op or other experience and responsibilities

QA Analyst, VRPatients, Columbus, Ohio (4-semester CO-OP)
Wrote test cases for feature sets and bugs
Created and executed executions
Preformed system investigation
Implemented a few bug fixes and minor features
Skills/Expertise Areas

Programming: C++, JavaScript, Python
Operation Systems: Windows, and Linux
Web Development: HTML, and CSS
Areas of Interest

Nothing specific just anywhere I can develop software

=> Elbthel Zeleke:
Co-op Work Experiences
Software Analyst Intern
Company: Learn21

Dates of Employment: May 2022 - August 2022, January 2023 - May 2023, August 2023 - December 2023, May 2024 - August 2024

Reason for Continued Co-op Rotations: I decided to complete all four of my co-op rotations with Learn21 due to the great opportunities for growth and development that the company provided. Each rotation allowed me to build upon my skills, take on increasingly complex challenges, and contribute meaningfully to projects that aligned with my career goals. Additionally, the company

culture—characterized by collaboration, innovation, and support—resonated with my personal values and made each rotation a great experience.

Technical Skills and Expertise:
During my internship, I developed a comprehensive skill set in full-stack development, with a particular emphasis on back-end technologies. My technical expertise includes:

.NET Framework and Entity Framework: Played a role in the company's transition from .NET 2 to .NET 6, where I was responsible for testing, debugging, and ensuring the stability of web applications throughout the upgrade. This involved identifying and resolving errors, which deepened my understanding of both legacy and modern .NET environments.

Back-End Development: Worked extensively on back-end systems, including optimizing server-side logic, improving database interactions, and ensuring efficient data processing. My work in C# and SQL involved writing and optimizing queries, managing data integrity, and enhancing the performance of database-driven applications.

System Integration: Contributed to integration projects where I worked on linking external web applications with the company's core systems. This required synchronization of data and processes, as well as ensuring seamless communication between different software components. My involvement in these projects improved my skills in C#, and complex system architectures.

Front-End Development: Led efforts to modernize the user interface of the company's web applications, improving user experience and accessibility. My work involved refining layouts and implementing responsive designs using HTML, CSS, and JavaScript, making the web applications more user-friendly and visually appealing.

Bug Fixing and Client Support: Addressed numerous bugs and issues, both identified internally and reported by customers. My role in troubleshooting and resolving these issues enhanced my problem-solving skills and provided valuable experience in maintaining and improving existing codebases.

Database Management: Conducted various database management tasks, including creating, updating, and optimizing SQL queries. My work ensured efficient data retrieval and manipulation, contributing to the overall performance and reliability of the company's applications.

Non-Technical Skills and Expertise:
In addition to my technical accomplishments, my internship experience also allowed me to develop key non-technical skills, including:

Project Management: Successfully managed both individual and team projects, ranging from UI updates to back-end system integrations. This experience enhanced my ability to prioritize tasks, manage time effectively, and ensure project milestones were met on schedule.

Client Communication and Support: Provided direct support to clients, assisting them with technical issues and addressing their concerns. This role improved my ability to communicate complex technical concepts in a clear and accessible manner, as well as strengthened my customer service skills.

Adaptability: Engaged in a variety of tasks across front-end and back-end development, as well as system integrations. I approached each challenge with an open mind, learning and adapting to new tools and technologies to effectively support the projects I worked on.

Collaboration: Worked closely with cross-functional teams, including developers, project managers, and client support personnel. My ability to collaborate effectively and contribute to team efforts was instrumental in the successful completion of various projects during my internship.

Project Sought
I am seeking a capstone project that will allow me to build upon the skills I developed during my co-op experiences while also offering opportunities for growth in new areas. My previous work, which involved a blend of front-end and back-end development, system integration, and client support, has equipped me with a strong foundation in CS. I am particularly interested in projects that will allow me to utilize my existing knowledge, while also offering the opportunity to explore new areas through research and experimentation. I am open to tackling a range of challenges that extend my current skill set and introduce me to new technologies and approaches.

Ideally, the project will involve both independent problem-solving and collaboration with a team, allowing me to continue refining my technical skills and gain deeper insights into software architecture and user experience design. I'm looking for a project that enhances my current skills and helps me learn new ones, preparing me for future opportunities.

=> Salma Mohammad:
Co-Op Experiences
Software Tester & Developer, KURIST- Current - Fall 2024
Software Testing and Development:

Conducted comprehensive software testing for Kurist, an online platform connecting international patients with medical experts, ensuring functionality and reliability.
Developed and executed test cases for each component and feature of the program using Tuskr, covering a range of scenarios to validate software performance.
Performed manual testing to identify and address issues, ensuring the software met quality standards.
Project Management:

Utilized Jira for project management, reporting software problems and collaborating with higher-ups to facilitate timely resolutions.
Documented and tracked defects, coordinating with development teams to address issues efficiently.
Software Editing and Maintenance:

Edited and maintained software components, including those developed with a React.js front end and SQL backend, to ensure proper functionality and integration.
Implemented fixes and enhancements to improve overall software performance and user experience.
Software Developer, Carbon Copy Assets - Current - Fall 2024
App Development and Implementation:

Developed a volunteer tracker app using React.js, Ethereum, Privy Wallet, and Google Sheets API, integrating NFC chips to enable real-time tracking of volunteer hours.
Created and managed crypto wallet accounts for users, ensuring secure and efficient logging of volunteer hours via NFC chip scans.
Technical Skills and Integration:

Gained expertise in session and cookie management to enhance app security and user experience.
Integrated third-party tools, including Ethereum and Privy Wallet, into the application to enable seamless blockchain interactions and user authentication.
Project Launch and Demonstration:

Planned and prepared to launch and demo the app at the StartupCincy convention, showcasing its innovative features and functionalities.
Web Development, EDI Matrix LLC - 1 semester - Spring 2023
Design and Development:

Designed and visually laid out websites and digital applications, ensuring an aesthetically pleasing and user-friendly experience.
Developed user interfaces using React JS, including buttons, menus, and navigation bars, and page navigation functionality, with a focus on usability, consistency, and responsiveness across various devices.
Designed full tech stacks to accommodate frontend and backend functionality of programs using PERN tech stacks
Collaborated closely with web developers to ensure seamless translation of designs into functional websites and applications.
Usability and Functionality:

Conducted usability testing to identify and address areas where users might face difficulties, refining designs to optimize user experience.

Planned information architecture for websites and applications, ensuring a logical and intuitive flow of information.
Designed accessible interfaces adhering to accessibility guidelines and standards, ensuring usability for all users.
Additional Responsibilities:

Created FIGMA prototypes to visually represent design ideas and gathered user feedback prior to final development.
Maintained effective communication and collaboration with developers, copywriters, and other stakeholders to ensure successful project outcomes.
QA Analyst, EDI Matrix LLC - 1 semester - Summer 2023
Project Management:

Utilized Agile and Scrum methodologies to effectively manage IT solutions, ensuring timely project delivery.
Achieved SCRUM Master certification, demonstrating leadership in agile project management.
Leveraged project management tools to streamline team workflows and enhance collaboration.
Testing and Defect Identification:

Designed and executed comprehensive test plans, ensuring software functionality across various scenarios.
Developed detailed test cases covering functionality, compatibility, and failure scenarios.
Conducted usability testing, identifying and addressing issues to enhance user experience.
Identified, documented, and reported software defects, collaborating closely with developers to resolve issues.
Collaboration and Communication:

Worked closely with developers to provide detailed defect reports and collaborated on issue resolution.
Communicated effectively with project managers and stakeholders, providing updates on testing progress and software quality.
Analysis and Documentation:

Analyzed test results to identify trends and assess overall software quality.
Managed detailed documentation of testing procedures, defects, and resolutions, facilitating future regression testing and reference.
Skills & Expertise
UI Design & Web Development: - Vanilla JS, React JS, HTML, CSS, PHP
Database Design - Postgres, SQL
Programming - PHP, C++, Python
Areas of Interest
Web, App, or Software Development
Database Design and Applications
Conversational AI

Poetry, Writing, Literary applications of Software Development
Projects Sought
Open to anything, however, niches that would tie in all my interests would be...

Interactive poetry platform
AI-powered writing assistant
Poetry visualization tool
Storytelling and Narrative Generation tool

=> Quoc Luong:
Co-op Work Experiences
Work Experience
Process Control Engineering
Cenovus, Lima, Ohio
September 2023 – December 2024

Managed and maintained virtual machines within the development network, optimizing resources and ensuring seamless operation for development teams
Spent extensive time working on the company's server network, performing regular maintenance, troubleshooting issues
Ensured all company machines were consistently updated with the latest software versions, enhancing system security and performance
Project Management Co-op
EMCOR, Cincinnati, Ohio
August 2022 – December 2022

Developed project plans, schedules, and budgets to ensure projects are delivered on time and within budget
Tracked project progress, providing regular status updates, and reports to stakeholders
Web Development
Duc Loi Auto, Dak Lak, Vietnam
September 2020 – December 2020

Maintained the company website to ensure there were no bugs or errors
Built user interfaces to make it more consistent and visually attractive
Updated the website by adding more functional features
Desk Assistant
Scioto Hall, Cincinnati, Ohio
May 2019 – August 2019

Assisted freshmen with move-in, checked in and out mail delivery
Directed communications systems
Handled complaints and concerns of residents
Answered inquiries about the dorm and provided directions to places on campus

Skills
Technical: Python (Django), C/C++, HTML/CSS, Excel
Language: Bilingual in Vietnamese and English
Project Sought
I am open to any projects because I want to learn new things and new skills. There are some fields that I am very interested in such as:

Artificial Intelligence
Website Development
Application Design

Budget

Expenses to Date:
To date, there have been no expenses incurred for the development of the project.

Monetary Value of Donated Items and Sources:
No items or services have been donated for the project.

Appendix

References:

Akbar, M. A., Shafique, U., & Rehman, A. (2023). Design and implementation of RESTful API for IoT-based smart home systems. *ResearchGate*. Retrieved from https://www.researchgate.net/publication/376614598_Design_and_Implementation_RESTful_API_for_IoT_Based_Smart_Home_Systems

Nordic APIs. (n.d.). APIs are breaking the barriers to smart home automation. Retrieved from https://nordicapis.com/apis-are-breaking-the-barriers-to-smart-home-automation/

CLTC. (2021). Implementing a research prototype of a next-generation voice assistant. *Center for Long-Term Cybersecurity*. Retrieved from https://live-cltc.pantheon.berkeley.edu/publication/implementing-a-research-prototype-of-a-next-generation-voice-assistant/

Forbytes. (n.d.). VR development: Overview of the key aspects. Retrieved from https://forbytes.com/blog/vr-development-overview/

Iberdrola. (n.d.). Virtual reality: The present and future of innovation. Retrieved from https://www.iberdrola.com/innovation/virtual-reality

Code Repositories:

- GitHub Repository: https://github.com/elbthelzeleke/SeniorDesign2024

Meeting Notes:

- **Meeting 1 (August 12, 2024):** Defined project objectives, deliverables, and team roles. Discussed initial concepts for UI and backend architecture.
- **Meeting 2 (August 25, 2024):** Reviewed user profile research findings. Discussed customization parameters and finalized UI wireframe drafts.
- **Meeting 3 (September 8, 2024):** Presented initial dashboard designs. Reviewed integration strategy for APIs. Assigned backend and machine learning tasks.
- **Meeting 4 (November 17, 2024):** Demonstrated initial VR prototype. Discussed feedback from early system testing.
- **Meeting 5 (November 26, 2024):** Refined automation routines and voice assistant functionality based on user feedback.

Evidence of Work Hours:

Each team member contributed at least 45 hours as detailed below:

- Salma Mohammad:
  - Designed and refined UI/UX (25 hours)
  - Developed the central dashboard and integrated voice assistant (15 hours)
  - Conducted usability testing and implemented feedback (5 hours)
- Quoc Luong:
  - Researched user profiles and validated system compatibility (20 hours)
  - Conducted user testing and provided refinements for voice assistant (15 hours)
  - Collected and analyzed user feedback (10 hours)
- Daniel Chandler:
  - Created VR demonstration and integrated machine learning algorithms (25 hours)
  - Validated automation routines and tested notifications (15 hours)
  - Designed accessibility features (5 hours)
- Elbthel Zeleke:
  - Developed secure backend services and integrated APIs (25 hours)
  - Designed user profile management tools (10 hours)
  - Drafted technical documentation (10 hours)

This appendix provides a comprehensive summary of the references, collaborative efforts, and supporting documentation that justify the scope and depth of work completed by each team member.