

Autism Bridge



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Abstract

Job hunting is a hard and exhausting process for everyone. For adults on the autism spectrum, this process is far more challenging. Research has shown that about 85 percent of adults on the autism spectrum are underemployed or unemployed. The high unemployment rate is not due to their lack of ability to perform the job. The high unemployment rate is mainly due to employers' lack of understanding about autism, the social or communication difficulties people experience, anxiety issues, difficulties in applying for jobs, or handling interview situations effectively. In the current market, there are existing platforms that help people with ASD in job searching, such as Hire-Autism, and Asper/Autism Network (AANE). However, none of these platforms in the market solve the problem of the high unemployment rate mainly because of not combining all the necessary tools to isolate and fix the causing roots of the high unemployment rate. Therefore, our team's approach to solving this problem is to develop a professional all-in-one platform, Autism Bridge, designed specifically for people with ASD to obtain the desired job role and connect with recruiters. With this approach, we aim to isolate and fix the causing roots of the problem. Autism Bridge is an app-based solution that aims to tackle the foremost causes of the high unemployment rate among people with Autism Spectrum Disorder. Our platform allows people on the spectrum to browse for an ideal job position, and potential employers can learn more about their candidates. Thus, helping maintain their employment and develop their careers. The application will also facilitate the hassle of the interview process by providing a customized virtual reality job interview set by the employer and reduce workplace mutual misunderstanding by providing a workplace tasks VR overview. Autism Bridge engages interaction and closes the gap between the potential employers with potential ASD employees in the current job market. As a result, our solution provides an efficient fix to the foremost causes of the high unemployment rate among people with ASD.

Background

According to the CDC, Autism spectrum disorder (ASD) is a developmental disability that can cause significant social, communication, and behavioral challenges. Diagnosing ASD can be very difficult because there is no medical test to make a diagnosis [2]. Therefore, doctors often have to observe a child's behavior and development to make a diagnosis. People on the autism spectrum often experience varying autistic symptoms such as communication challenges and restricted, repetitive behaviors. Research also has shown that genetics are involved in most cases of ASD, and children born to older parents are at a higher risk of having autism as well. Although there's no cure for autism, early intervention treatment services can improve a child's development.

The CDC stated in a recent report that one in 54 children had a diagnosis of ASD by age 8 in 2016, a nearly 10 percent increase over 2014 when the estimate was 1 in 59. The trend of estimated autism prevalence from 2004 to 2020 reflects a continuing rise based on an analysis of school records of 8-year-olds from 11 monitoring sites across the United States. From current statistics, Autism Speaks indicated that an estimated 707,000 to 1,116,000 teens (70,700 to 111,600 each year) will enter adulthood and age out of school-based autism services in the next decade [1]. Many young adults with

Autism will be joining the workforce, but there's a severe unemployment issue they face. It is estimated that fewer than 1 in 6 adults on the autism spectrum have full-time work. As the number of people diagnosed with Autism and the demand for employment increase, it is becoming imperative for companies to understand how hiring these individuals can provide unparalleled value. Due to the nature of ASD, people on the autism spectrum experience many communication difficulties or anxiety. However, they are still highly intellectual individuals that display a range of strengths and abilities. According to a recent study, "more than 70% of autistic children and adults had a special isolated skill in memory (52% of the sample), visual spatial abilities (32%), calculation, drawing or music (about 17% for each area)" [7].

Estimated Autism Prevalence 2020



While many people on the autism spectrum are capable individuals skilled in a specific field they are interested in, many are still unemployed. There are existing platforms that try to tackle this problem. The first one is Hire-Autism, a platform that allows ASD individuals to browse job openings targeted for ASD but lacks the technology for easy accessibility, such as mobile application channels. The second one is LinkedIn, an employment-oriented platform that connects everyone but does not target ASD individuals. None of them exploit the potential benefits of using VR as an interviewing tool or as a way to help with the anxiety of doing a real interview and further using VR as a way to reduce the workplace mutual misunderstanding by providing a weekly/monthly tasks overview to the ASD employees. There's a lack of an existing platform that exposes potential employers to potential ASD employees or vice versa and facilitates features that resolve around ASD people with unique requirements involving their motor, communication, and sensory skills.



A substantial population of adults on the autism spectrum who want to enter the workforce struggle to find opportunities or experience difficulties regarding job applications. We know that ASD individuals are capable of having and sustaining successful careers. Companies understand that ASD individuals possess unique strengths and skills that they can benefit from it. These findings have led to the creation of our application named *Autism Bridge*, where we provide a professional platform that engages the interaction between potential employers and potential ASD employees. Besides simplifying the job research process for ASD job seekers, the application also uses customized virtual reality interviews for ASD employees. The VR can ease the application process by reducing any anxiety the ASD job candidate might experience. The application further reduces the mutual misunderstanding that ASD employees and employers will most likely experience by featuring the workplace tasks virtual reality overview.




Problem Statement





Autism is one of the fastest-growing developmental disabilities in the US [1]. Yet very few tech innovations have been made to support autistic adults [6]. On top of that, more than half of young adults with autism remain unemployed and unenrolled in higher education in the two years after high school [9]. Unsurprisingly nearly half of 25-year-olds with autism have never held a paying job [1].


Nonetheless, this high unemployment rate among people with ASD is not due to their lack of ability to perform the job. The high unemployment rate is mainly due to employers' lack of understanding about autism, the social and communication difficulties ASD people experience, anxiety issues, difficulties in applying for jobs or handling interview situations effectively, difficulty in multi-tasking, or time management and obsessional behaviors [9].

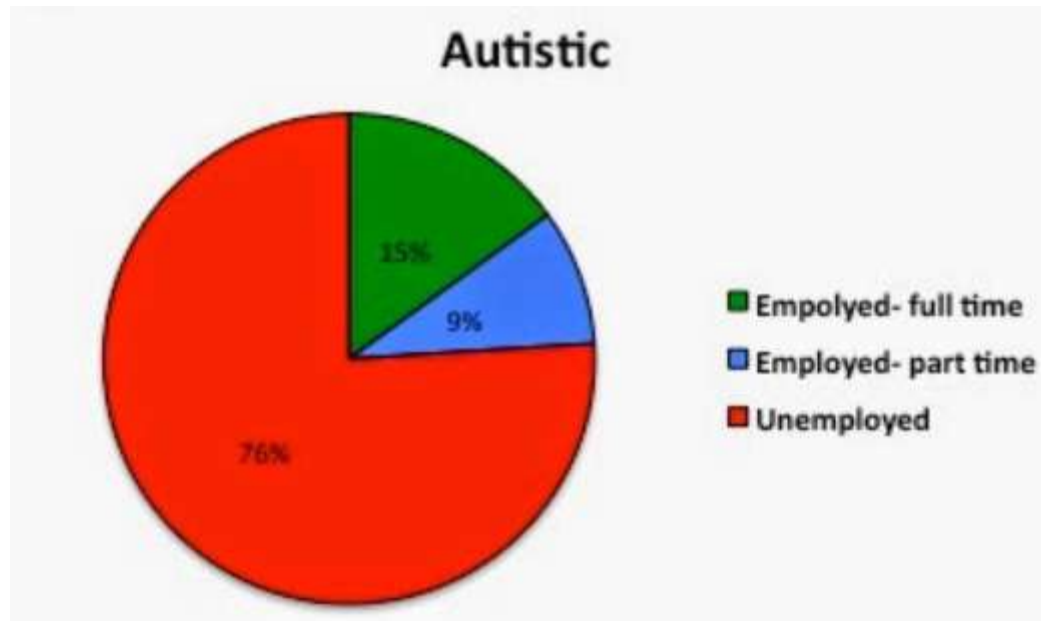
**UNEMPLOYMENT
RATES**
for **ADULTS**
with **AUTISM**
have reached
as high as
88%



Source: 43 Roux AM, Rast JE, Anderson KA, et al. National Autism Indicators Report: Vocational Rehabilitation 2016 Life Course Outcomes Research Program, A.J. Drexel Autism Institute, Drexel University, Philadelphia PA

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AUTISM



In the current market, there is a lack of applications that offer an efficient solution to the problem of the high unemployment rate among people with ASD. The most known example is a website called Hireautism.org [4]. This website is an excellent solution to the stated problem because it provides job seekers with meaningful employment opportunities commensurate with their skills, but Hireautism.org has its limitations and inconveniences. Some of those inconveniences include the lack of a mobile platform application and the limited approach they provide for handling the interview process. They are not using existing technological tools such as VR environments to fix a foremost problem that people with ASD face when they are looking for jobs. Instead, they use a user-friendly web platform where users can intuitively create a professional profile and be matched based on their strengths and locations. While their approach is great, it is not enough as the high unemployment rate among people with ASD is still high. They do not focus on improving their job interview skills and task comprehension skills in their workplace, which; is why we believe the problem is still present. After knowing these limitations encountered by the best-known platform in the current market, our team got the incentive to come up with a novelty approach to solve the problem of the high unemployment rate faced by people with Autism Spectrum Disorder. Therefore, our solution is a professional network application with a special focus on people with ASD. The mobile app closely connects job seekers with ASD and potential employers by providing opening job positions. Besides matching the correct job candidate and showing the candidates the opening positions, the application facilitates the hassle of the interview process by providing a customized virtual reality job interview environment set by the employer. The VR feature can further reduce the mutual misunderstanding between the ASD employees and the employers by providing a workplace tasks overview. The VR technology used in the interview process and in the workplace will reduce the candidates' anxiety levels, and overcome any phobias they might have from doing an in-person interview.



Rationale

Our application solution tackles each of the foremost causes of the problem of the high unemployment rate faced by people with ASD. As previously stated, employers' lack of understanding about autism, difficulties in applying for jobs, and handling interview situations effectively are the main causes of the high unemployment rate among people with ASD. By providing a professional network mobile application with the main focus on people with ASD, we eliminate the difficulties in applying for jobs and the employers' lack of understanding of autism. The app eliminates the difficulties in applying for jobs and maintaining their jobs because it closely connects them with recruiters, talent managers, and employers, from job hunting to job interviews, to their workplace experience. Hence, applying for jobs becomes easier and more convenient and maintaining jobs becomes more tangible and manageable. The application eliminates the employers' lack of understanding of autism because the app is aimed at and used exclusively for recruiters, talent managers, and employers who are looking for a candidate with ASD, especially with their special talents. By providing a virtual reality interview process within the platform application, we can eliminate the hassle of handling the interview process. The application's virtual reality interview process facilitates the interview of the candidate with ASD by reducing their anxiety levels and reducing any social and communication difficulties that can occur while doing the interview. According to the article "How can virtual reality help those with autism" by Sol Rogers [8], using VR to create role-playing environments for practicing social skills or alleviating phobias has proven to be successful. These phobias can include but are not limited to a fear of public transport, classrooms, balloons, and animals [8]. With that in mind, by providing virtual reality interview environments on the platform application, we can facilitate the interview process and even eliminate the phobia of having to do an in-person interview with a potential employer. Furthermore, by providing a feature where job seekers can specify their weaknesses, they can narrow their search of finding an ideal

job. Hence, the application aims to tackle the high unemployment rate among people with ASD by eliminating its foremost causes.



VITA Virtual Interactive Training Agent

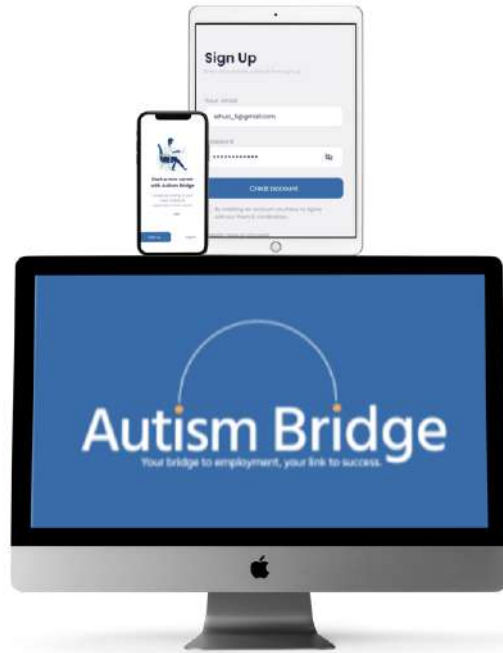
Interviews present a difficult social challenge for everyone and involve a constant need of repeated training and practice. For young adults with autism or other developmental disabilities, the interview training process had a need for a more effective and efficient way to produce better outcomes. With years of research the Dan Marino Foundation and University of Southern California Institute for Creative Technologies developed the VITA software specifically for individuals with disabilities by using the very latest in virtual reality technologies.

Characters: Alex, Kevin, & Michele | Environments: Hotel Lobby, Restaurant, Executive Office, & Warehouse | VITA | December 2019

Fig. 2 VR screenshot of the interview scenario in which the participant (interviewee) is questioned by the confederate therapist (interviewer) while the coach therapist (in the doorway) observes and provides feedback



The app will be available as a mobile application compatible with Android and IOs operating systems. In terms of technical resources, an Oculus VR headset or a Google cardboard headset is recommended (which is very affordable) but not necessary to do the virtual reality interview. In terms of security, each user will log in based on their username and password matching it with the information stored in the database (Firebase). Only verified employers can post job positions. The verification will be done by doing some screening during the creation of an employer account. After the employer account has been approved, then the employer can post job positions and set up a customized virtual environment for that job position. Hence, ensuring the security and safety of all users. Lastly, in terms of human resources, our team is composed of individuals with the correct knowledge and skills such as excellent programming knowledge of Dart, Python, Java, C++, C# languages, experience in developing mobile applications, knowledge of relational databases, and experience working with the unity engine.



Google Cardboard VR VR Glasses Box VR
Glasses Cardboard

\$10.50

Add to cart

Actual Color: Brown

Brown
\$10.50

Free shipping, arrives by Wed, Dec 15 to
[Brooklyn, 11237](#)

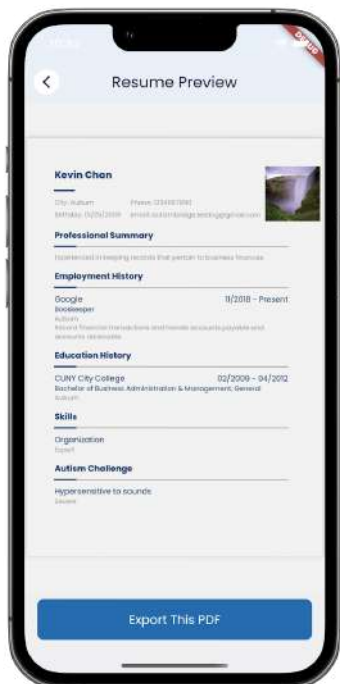
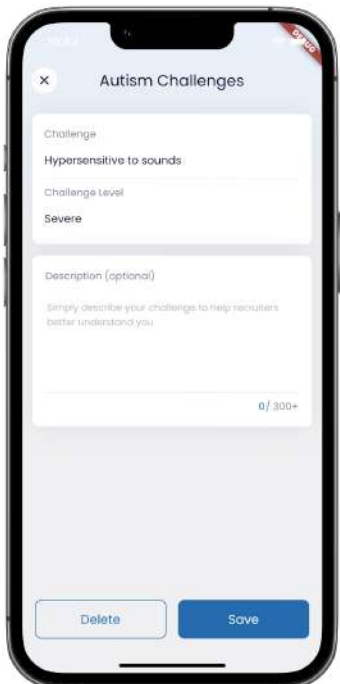
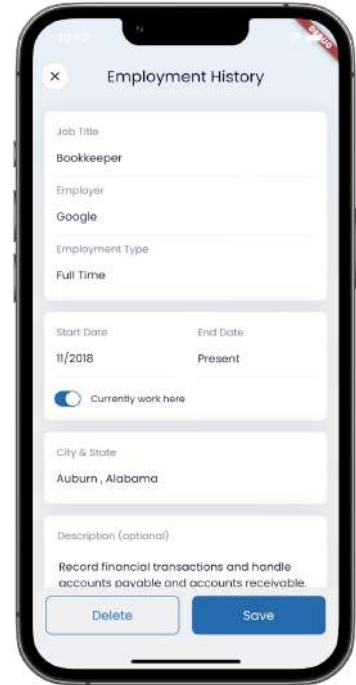
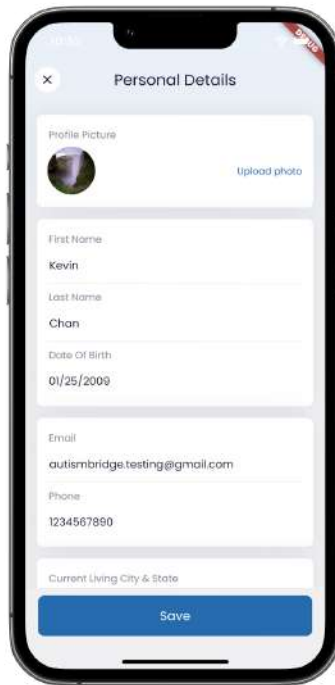
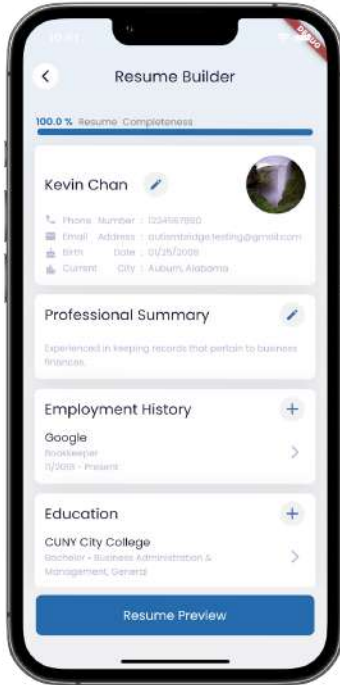
Want it faster? [Add an address](#) to see options
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Design and Development of Systems

Considering that our application is designed specifically for users with ASD, the application provides a package service for our users to apply for jobs. More specifically, the package service contains three key activities:

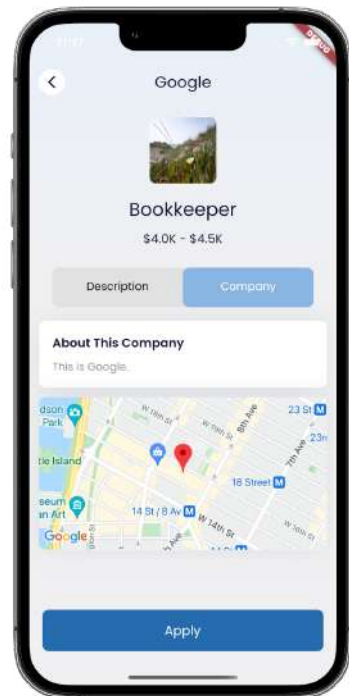
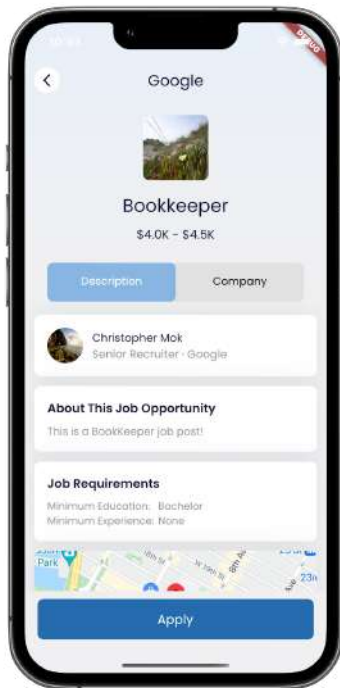
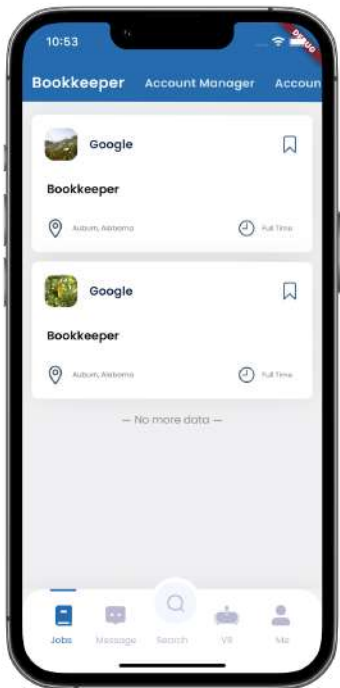
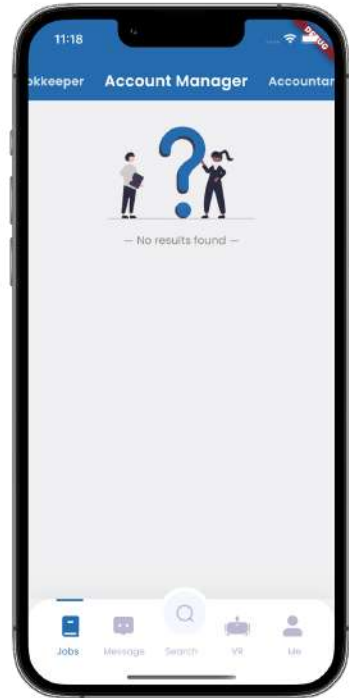
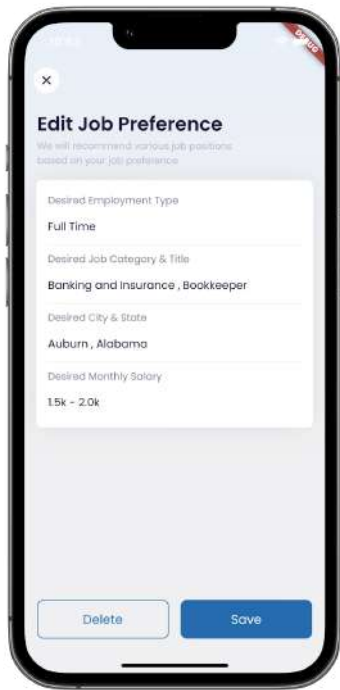
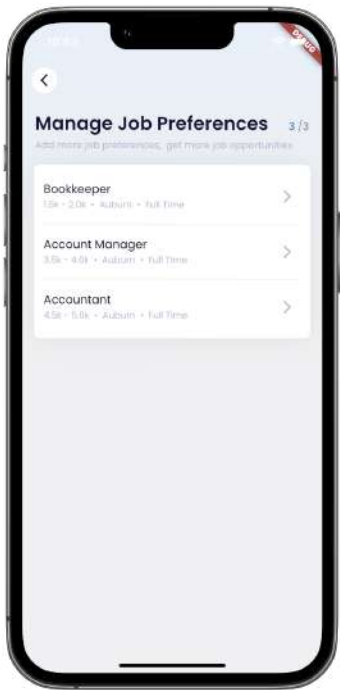
1. ***Resume builder for ASD users***: consider that writing a decent resume is quite challenging and not intuitive for ASD users due to the potential language disorder, the application first provides ASD users a friendly and intuitive resume builder feature. The resume builder has multiple sections with an intuitive fill-in blanks pattern for each section, including personal details, professional summary, employment history, education, skills and workplace challenge. After all section are completed, the resume is generated with one simple click, users can have an in-app preview of what the generated resume will look like and can also send the resume to their desired email address. In addition, the resume builder is customized for ASD users to further ease the resume generation process. First, the workplace challenge section(optional section) aims to help the recruiters to better understand their applicants' challenge so that the appropriate workplace accommodation can be arranged. Second, most of the input fields have an auto-complete feature to help ASD users to type more comfortably.

Resume builder Prototype



2. ***Matching the job seekers and the opening job positions:*** In order to match the job seekers and the job positions, the application first asks ASD users to fill out a picker-based job preference form. Then, based on our job matching algorithm, the application displays the corresponding opening job position list for the users in the job screen. The ASD users have to at least enter one job preference and can add up to three job preferences.

Job Board Prototype



3. ***Providing the customized Virtual Reality interview environment:*** The last and the most crucial part of a job applying process is the job interview. Our customized VR interview environment consists of two main characters, the applicant which is controlled by our users using a VR device, and the interviewer which is a non-playable character. The ASD users can move around the teleoperation targets using the VR controller, where the teleoperation system minimizes the potential VR motion sickness. Then, the ASD user can experience the whole interview process by interacting with the whiteboard and answer the interview question from the interviewer.

VR Interview Prototype



In terms of the implementation of the application, we will be using:

1. **Flutter**: it is Google's UI toolkit for building mobile applications. We choose Flutter because it has multi-platform deployment capability for both Android and iOS, and it has expressive, intuitive, and user-friendly UIs [5].
2. **Unity3D**: it is a powerful cross-platform 3D engine for game development. We choose Unity3d because Unity's virtual reality engine allows us to implement the VR interview environment for any VR headset (Oculus, HTC Vive, PlayStation VR), and the Flutter's Unity3D widget allows embedding Unity in Flutter [11].
3. **Firebase**: It is a Backend-as-a-Service (Baas). It provides developers with a variety of tools and services to help them develop quality apps, grow their user base, and earn profit. It is built on Google's infrastructure.

Evaluation with Users and Partners

Neurotypicals

Last year, we started to brainstorm and design our application, Autism Bridge. We interviewed over 40 neurotypicals (individuals who are not diagnosed with Autism Spectrum Disorder) throughout the Fall semester and Spring semester. In stage I of our application, we received feedback on whether the application MVP would be helpful to our intended users. Some feedback we got are the resume builder, job board and VR interview training would be beneficial to ASD individuals. Some think that it will be beneficial for neurotypicals as well. However, they also suggested that VR headsets are overly pricey for ASD individuals who are on job-hunting. Therefore, we also research on embedding the VR simulation in the application without using a VR headset. We also had a lot of positive feedback on our branding and logo. We also had feedback from the professor on implementing a more user-friendly resume builder. Therefore, we optimized the resume builder feature by including auto-complete to enhance user experience. We also improved our user interface based on the feedback on screen refinements such as increasing font size and deeper font color, and symmetric padding card views. We understand that due to the nature of the current employment ecosystem, our application aims for ASD individuals who lie on the higher end of the autism spectrum. We had a zoom meeting with experts from Autism Speaks, who also advised us to include a video submission in place of a text resume on our application which allows us to include more people on the lower end of the autism spectrum. All evaluations we received in the initial stage were relevant to the design of our application.

Goodwill

Goodwill is a nonprofit organization that provides two main employment based programs named Bridge and Advance for ASD individuals. We were able to schedule four in-person visits with the help of Celina and Jeanne. ASD participants we met at Goodwill range from age 18 to 25. Most participants

in the program had obtained a high school degree or higher education level. Throughout our visits, we learned that most of them gain volunteer experiences through community services at Burlington, Old Navys and other Goodwill business partners. When speaking with the participants at Goodwill, we learned that most of them experience difficulties when keeping eye contact or communicating with others. Therefore, we implement the simulated workplace environment for ASD individuals to keep contact with the character and engage communication. Most participants like the idea of using VR headsets. We had one feedback on the usage of VR headset will cause nauseousness. Therefore, we included a teleportation system to avoid too much head movement that causes nauseousness. When showing our prototype to Goodwill participants, most of them understand the navigation and instructions of the application. Majority of the participants rated above 4 out of 5 points for our user interface and functionalities.

Discussion of Potential Markets and Future Work

Potential Markets

While we are working on the development application, we reach out to potential markets such as people with autism and recruiters or nonprofit organizations that are involved with employment for an inclusive workplace. There are more than 5,400,000 adults with autism in the United States. For our first group target users, people with Autism, we have been keeping contact with Goodwill and our mentor, Celina, for testing and refinement based on our application. In addition, we also spoke with more than 10 individuals on the Reddit autism community who are also willing to help with application testing. With the help of Goodwill participants and Reddit autism community, we hope to introduce more people with autism to the Autism Bridge. We also have reached out to Autism Speaks to speak with experts who are willing to help with our application design. We will tackle down the final MVP prototype then reach out to our second group of potential users, the recruiters, businesses or corporates.

As the number of people diagnosed with autism increases in the United States, it is becoming imperative for companies to understand how hiring these individuals can provide unparalleled value. Many companies are starting to see positive impacts that autistic individuals bring to the companies. Over the past two years, companies are starting to launch inclusive programs that promote diversity within the workplace which include a large group of autistic individuals. We had reach out to Autism Speaks where we had a chance to spoke with experts in the field of autism. They offered to help with our project and other related resources. Autism Speaks also offer a Workplace Inclusion Now employment based program where they hope to connect autistic individuals with recruiters as well. In addition, we are also reaching out to potential recruiters from companies such as Meta, Dell Technology, JP Morgan that offer nerodiveristy related workplace programs. We hope to connect with corporates that are offering more headcounts for autistic individuals in workplace.

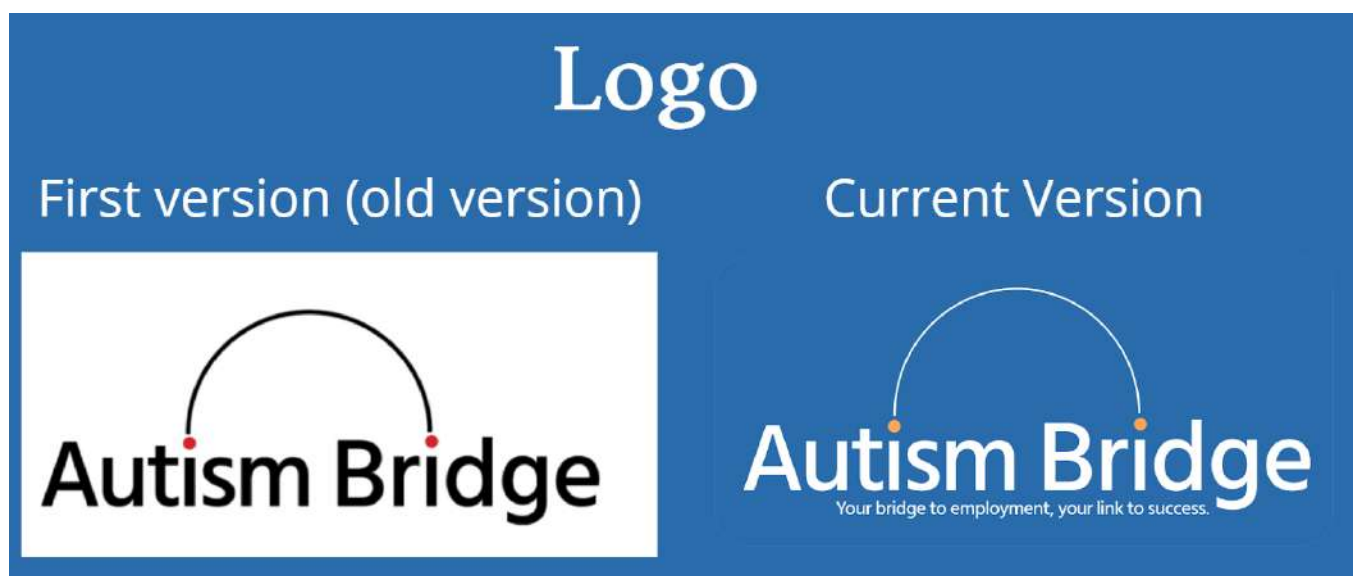
Future Work

Our current MVP prototype aim to target ASD individuals on the higher end of the autism spectrum. In order to enlarge our target autistic individual group, we will implement a video replacement of the current text resume builder. A video resume or a profile video would allow people with autism to add more characteristics to the video and also demonstrate their skills or speak about their experience. In addition, we are going to work on transitioning our current VR interview to a more interactive simulation. In order to engage individuals with Autism to avoid pausing or stopping during the interview simulation, we will implement an audio listener feature. The character who acts as the recruiter will listen and give appropriate hints or response according to the autistic individual's response to interview questions. Lastly, we will work on the recruiter's side by simplifying job postings or perhaps pulling from an existing job posting database that highlights to hire neurodiversity individuals. We also wants to ensure that the recruiter side's user interface is intuitive and simplified. As we mention in earlier in the potential markets, we will redefine our final MVP prototype and ask both of our main user groups for additional testing and feedback. We will then hope to collaborate with existing nonprofit organizations that aim to help autistic individuals or corporates to prepare for the launch of the application.

Branding

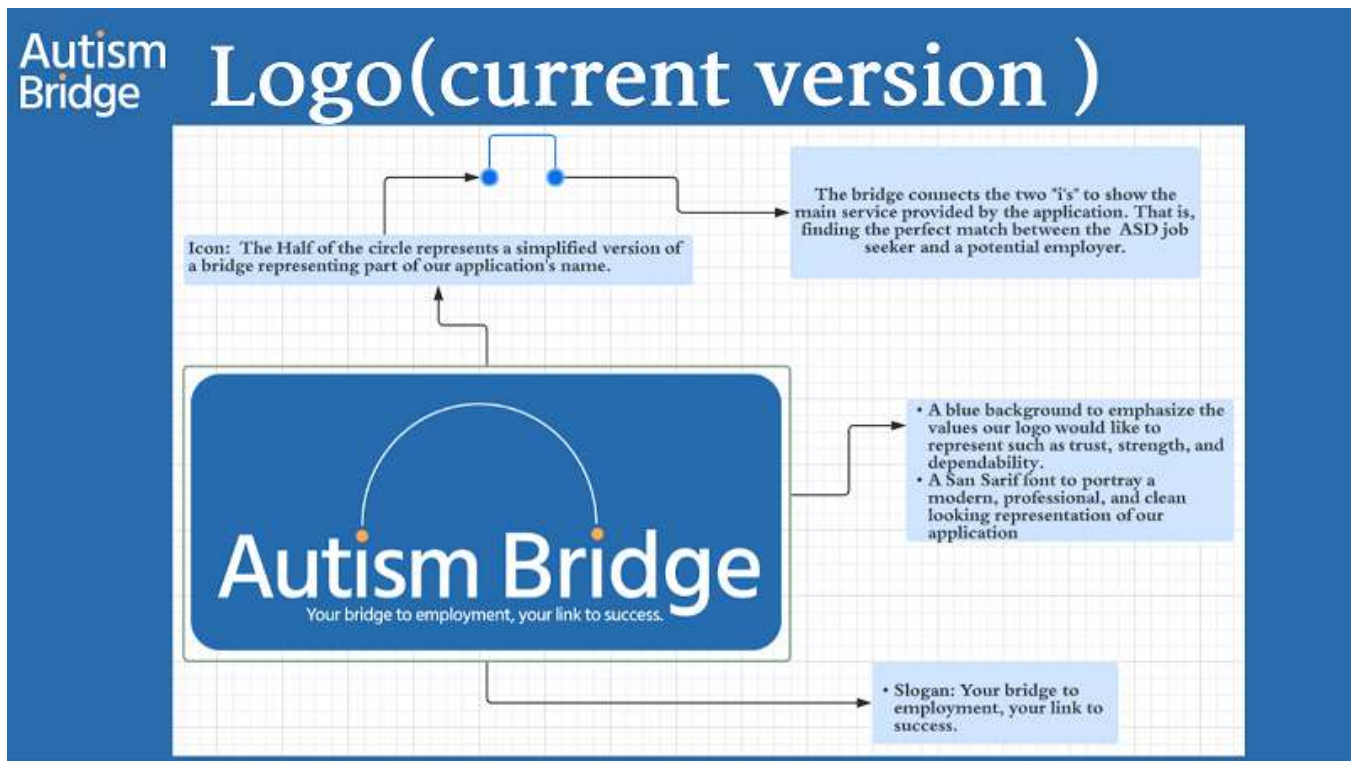
Evolution of Name and Logo

Our team came up with the application name "Autism Bridge." The name comes from our mission statement which is to provide a "bridge" or a connection between job seekers with ASD and employers. Unlike our logo, there was no evolution in our application name. The main changes we made to our logo include adding more colors and coming up with a slogan.



The rationale behind our logo goes as follows. At the top, there is a half-circle representing a simplified version of a bridge which is part of our application name. The connection between the two i's

is to emphasize the service provided by the application. That is, finding the perfect match between the ASD job seeker and a potential employer. The change to a blue background was to show the values of our logo. These values include trust, strength, and dependability. The font San Sarif choice is for a modern, professional, and clean look. Also, our team added a proper slogan at the bottom of our logo.



The app icon will be a simple version of our logo. We will have the same logo without the slogan and the simplified bridge connecting the letters. The app icon looks similar for android and IOS devices. Also, when the users enter the app, a splash screen will be displayed.

App icon



Splash Screen



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Contributions

A. Logo Design

- a. Initial Name – Billy Davila
- b. First Version Logo – Ai Hua Li
- c. Second Version Logo – Ai Hua Li
- d. Final Version Logo – Billy Davila
- e. Slogan – Ai Hua Li
- f. Mission Statement – Ai Hua Li
- g. App icon – Billy Davila
- h. Splash Screen – Ziyi Huang
- i. Figma Designs – Ai Hua Li, Ziyi Huang

B. Customer Feedback

- a. Google Forms Survey for Technology Solutions Updates – Ai Hua Li
- b. Distributed the Google forms – Ai Hua Li
- c. Set up in-person meetings and virtual meetings with Goodwill – Billy Davila
- d. Google Forms Survey for Branding and Interface Components updates – Ai Hua Li
- e. Distributed the Google Forms – Ai Hua Li
- f. Reached out to ASD individuals on social platforms such as Reddit – Ai Hua Li
- g. Reached out to recruiters on social platforms such as LinkedIn – Ai Hua Li
- h. Attended in-person visits at Goodwill – Ai Hua Li, Billy Davila, and Ziyi Huang
- i. Attended meetings with Zahn staff for general feedback – Billy Davila
- j. Attended meetings with UI experts for general feedback – Ai Hua Li, Billy Davila, and Ziyi Huang.
- k. Attended meetings with Autism Speak representatives – Ai Hua Li and Billy Davila.

C. Overall Idea

- a. Brainstorming – Ai Hua Li, Billy Davila and Ziyi Huang
- b. Business Model Canvas First Version – Billy Davila
- c. Business Model Canvas Last version – Billy Davila
- d. Defined first project idea – Ziyi Huang
- e. Developed and enhanced project idea – Billy Davila
- f. Research about potential competitions – Billy Davila
- g. Completed Zahn Competition Proposal – Ai Hua Li
- h. User Stories – Ai Hua Li
- i. Conducted general research – Ai Hua Li, Billy Davila, and Ziyi Huang
- j. Slides – Ai Hua Li, Billy Davila, and Ziyi Huang

D. Zahn related work

- a. Completed Zahn Competition Proposal – Ai Hua Li
- b. Attended interview for Zahn Competition – Ai Hua Li, Billy Davila, and Ziyi Huang
- c. Attended Orientation – Ai Hua Li, Billy Davila, and Ziyi Huang
- d. Attended workshops – Ai Hua Li, Billy Davila, and Ziyi Huang
- e. Completed Zahn assignments – Ai Hua Li and Billy Davila

- f. Completed First round-robin pitch – Billy Davila
- g. Completed Second round-robin pitch – Billy Davila
- h. Completed Third round-robin pitch – Ai Hua Li
- i. Completed Final round-robin pitch – Ai Hua Li
- j. Completed First Zahn milestone – Ai Hua Li, Billy Davila, and Ziyi Huang
- k. Completed Second Zahn milestone – Ai Hua Li, Billy Davila, and Ziyi Huang
- l. Completed Final Zahn milestone – Ai Hua Li, Billy Davila, and Ziyi Huang
- m. Made and uploaded Zahn demo video – Ai Hua Li

E. CREATE related work

- a. Completed CREATE proposal – Ai Hua Li, Billy Davila, and Ziyi Huang
- b. Constantly reported Megan about gift card usage – Billy Davila
- c. Made the poster and cardboard presentation – Ai Hua Li
- d. Made CREATE video – Ai Hua Li
- e. Presented at the Symposium – Ai Hua Li, Billy Davila, and Ziyi Huang
- f. Returned gift card, expense report, and receipts – Billy Davila
- g. Completed CREATE final report – Ai Hua Li, Billy Davila, and Ziyi Huang

F. Development and Implementation

- a. Installed all dependencies – Ai Hua Li, Billy Davila, Ziyi Huang
- b. Initialize GitHub repo – Ziyi Huang
- c. Initialize Unity3D environment - Ziyi Huang
- d. Initialize firebase database – Ziyi Huang
- e. Initialize Flutter environment and connect with - Ziyi Huang
- f. Developed sign in and sign up function for recruiters and job seekers – Ziyi Huang
- g. Developed the first version of the home page for the recruiter side – Billy Davila
- h. Developed the home page for the job seeker side – Ziyi Huang
- i. Developed the second version of the main page for the job seeker side – Ziyi Huang
- j. Refactored the recruiter side - Ziyi Huang
- k. Developed the resume builder feature – Ziyi Huang
- l. Developed the the job preferences and job board feature – Ziyi Huang
- m. Developed the VR interview feature in Unity - Ziyi Huang
- n. Redesigned the layout and UI based on customer feedback – Ziyi Huang
- o. Commit and merge all code in the GitHub repo – Ziyi Huang
- p. Tested the VR interview on Oculus headset - Ziyi Huang
- q. Tested and run it in the Android and iOS emulator – Billy Davila, Ai Hua Li, Ziyi Huang

G. Final Report

- a. Abstract – Billy Davila
- b. Background – Ai Hua Li
- c. Problem – Billy Davila
- d. Rationale – Billy Davila
- e. Design and Development of Systems – Ziyi Huang
- f. Evaluation with Users and Partners – Ai Hua Li
- g. Discussion of Potential Markets and Future Work – Ai Hua Li

- h. Branding – Billy Davila
- i. Acknowledgments – Ai Hua Li, Billy Davila, and Ziyi Huang
- j. Youtube video – Ai Hua Li

Acknowledgments

Foremost, we would like to express our sincere gratitude to our senior design advisor Professor Zhigang Zhu for the continuous support, immense knowledge, and feedback received on the development of this project. His guidance helped us in all the time of research and writing of this report and the development of this project.

Besides our capstone design advisor, we would like to thank our industrial mentor Celina Cavalluzzi, for helping us coordinate in-person meetings at Goodwill and guiding us during the CREATE presentation. We would also like to thank Professor Hao Tang for suggestion and feedback on VR interview development.

Our sincere thanks also go to Kesia Hudson, Steven Monzon, Katherine Olives and Chris Bobko for the insightful feedback we received during our multiple meetings. Without them, we will not have made it into the finals and eventually won the grand prize.

Our special thanks to Suyin Liang and Ruiqian Hu for Logo, Brading and UI suggestion.

Finally, the work in this project is our own. Any outside sources have been properly cited. The project is supported by the CCNY CEN Course Innovation Grant.