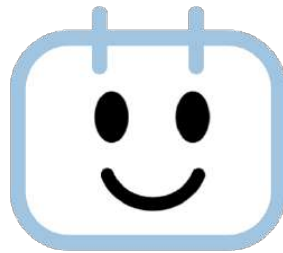


# Final Report - Altri



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May 22, 2022



The City College  
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## **Background**

Feeling frustrated and or overwhelmed is common in people with busy schedules. It can be challenging to keep track of everything and sometimes missing or forgetting things can cause negative emotions. Then, those negative emotions might lead to meltdowns and social isolation. Although this can happen to anyone, adults with Autism Spectrum Disorder (ASD) tend to experience a hard time managing their intrusive thoughts and emotions.

According to the Centers for Disease Control (CDC), about 1 in every 54 children in the US have been diagnosed with Autism Spectrum Disorder (ASD). ASD is a developmental condition that tends to emerge during early childhood which typically can be diagnosed before the age of 3. It's characterized by a broad range of conditions that includes behavioral, communication and social challenges. Since it's a spectrum disorder, the subtypes and severity of symptoms vary widely in each individual. As of today, neither are the underlying causes nor cure for ASD are known and it lasts an entire lifespan.

As individuals with ASD turn into adults, many of them struggle with their managing symptoms. Although treatment plans may help improve symptoms, adults with ASD often need the help of others for everyday tasks as they have a hard time doing so themselves. A research study analyzed 81 participants with ASD who attended school and discovered that by the age of 26, about half of participants lost some of their daily living skills (Dattaro, 2021). The loss of their daily living skills made it challenging for them to be independent and they became less likely to pursue future endeavors such as employment.

Losing daily living skills isn't the only thing adults with ASD struggle with. According to Autism Speaks, about 40% of adults with ASD are non-verbal. Some may find it challenging to express their emotions or communicate with others such as their employer. In addition, several sources mentioned that up to 80% of individuals with ASD suffer from executive function disorder. Executive function refers to a broad group of cognitive skills that enable people to complete tasks and interact with others around them.

In fact, some adults with ASD participating in job training programs at nonprofits like Goodwill NY/NJ have trouble expressing themselves and completing tasks on their own. We first met with Goodwill NY/NJ through a virtual site visit over Zoom where we spoke with some of the program participants. During the meeting, we noticed one individual was living on his own and had technical difficulties. He couldn't hear us nor was he able to speak into his

computer's microphone and he struggled for about an hour. We also visited in-person where we observed a non-verbal group of participants and learned that they were brought to different work sites (i.e., supermarkets) to learn how to perform tasks to find a job. While observing them, we noticed that some of the program participants had trouble communicating with their program leaders and needed help to express their needs.

## **Statement of the Problem**

After consolidating our findings from online research and Goodwill NY/NJ site visits, we've identified three pain points of adults with ASD that need, but lack solutions to: difficult to stay organized, struggle to interact with others and loss of daily living skills. Although there are solutions in the market that attempt to solve those pain points, they have weaknesses.

There are numerous scheduler and planner apps that help people structure their day such as Microsoft Outlook. However, Outlook's intended users are those working in corporate environments (i.e., office) and not individuals with ASD working in non-corporate environments (i.e., supermarket). In fact, most apps similar to Outlook are widely used for scheduling virtual meetings between co-workers and not designed to be ASD-friendly. For instance, to view the entire schedule of a day, users have to scroll excessively. Also, the overwhelming number of features are difficult to look at and use on mobile.

There are solutions to help individuals with ASD communicate such as augmentative and communication (AAC) devices. But they're designed for children and not adults in which the market lacks solutions for adults. A research study on individuals with ASD between the ages of 2 to 21 discovered that their skill levels were below age level expectations (Bal, V. H. et al., 2015). The study concluded that treatment plans need to focus on daily living skills, especially for those transitioning into young adulthood. There are AI chatbots like Siri that can foster communication skills and help people throughout their day. However, their algorithm doesn't train the chatbot to tailor their responses towards individuals with ASD. At times, the AI chatbot might not understand what's being said to them or give confusing responses which can frustrate individuals with ASD.

Despite the struggle with staying organized, social interaction and being independent, adults with ASD deserve to be equipped with the skills needed to complete tasks on their own. It will help them thrive in both their personal and professional lives. Adults with ASD are found to

have "average or above-average" intelligence and their skills are desired by a lot of employers (Oesch, 2019).

After evaluating the weaknesses of existing solutions, we realized that there needs to be a way to break down and organize tasks that won't make adults with ASD feel overwhelmed. There must also be a way to help them develop their daily living skills and communication skills without having to rely on another person. As a result, we developed Altri, an Android app that helps adults with ASD between the ages of 18 to 40 stay on top of their tasks through a scheduler and develop their daily living as well as social skills through Altri (AI chatbot) which replicates human interaction in most cases. Altri can be used in both personal and professional settings. Besides the main users, the app can be used by their caregivers or employers if they don't know how to add tasks at first. The end goal is that the users will be able to input their schedule on their own.

## **Rationale of Solutions**

The goal of our app is to help adults with ASD stay organized, develop independence and improve their social skills, while supporting them. It's achieved by combining a scheduler and an AI chatbot whose name is Altri. The combination of two existing technologies with the addition of other helpful features makes our app more accessible.

Unlike most scheduler and planner apps, the fields to add a task are shown vertically on the screen with a medium-sized font which makes it easy to read and fill out. Users can attach an optional image or video to a task as a visual reminder for how to and or what to do. Visual aids can help them stay focused and promote their daily living skills. Also, the task only has a start time because some adults with ASD can be too fixated on time which can cause them to feel overwhelmed. To further help users deal with feeling overwhelmed, they will view one task at a time, but they're able to view all of their task(s) if they want to. Since lack of motivation can cause difficulties to staying organized, random messages will be shown after a task is completed to confirm task completion and encourage them to complete their remaining task(s). There are also notifications to remind users that it's time to start the task.

Compared to other AI chatbots, users can speak to and text Altri which in both cases, Altri's responses are read out loud via Text to Speech. Altri is trained to have simple, yet specific responses that are easy to understand by everyone on the spectrum. Altri will establish a

relationship with users to help them improve their daily living skills and social skills. For example, Altri can help guide users through completing their task and search on Google if needed. For those who are uncertain or confused on how to interact with Altri, they're able to watch a video walkthrough. Overall, Altri will replace the need of having another person present with our users as Altri is always there for them and will help them to the best of its ability.

Altri is customizable as users can change the background color of the entire app. Studies have shown that individuals with ASD tend to be hyper-sensitive to certain colors than those without ASD (Salazar, 2021, March 9). In general, colors create different feelings and effects for people. We wanted to make our users to feel comfortable using our app, so we implemented a feature for users to change the background color. Although other apps also allow users to change the background color, they tend to have too many options to choose from and some even have different modes (i.e., light mode) which can be overwhelming and confusing. With that in mind, we narrowed down our color options to four (Blue, Yellow, Red, Green) based on user feedback.

## **Design and Development of Systems**

### Technologies Used

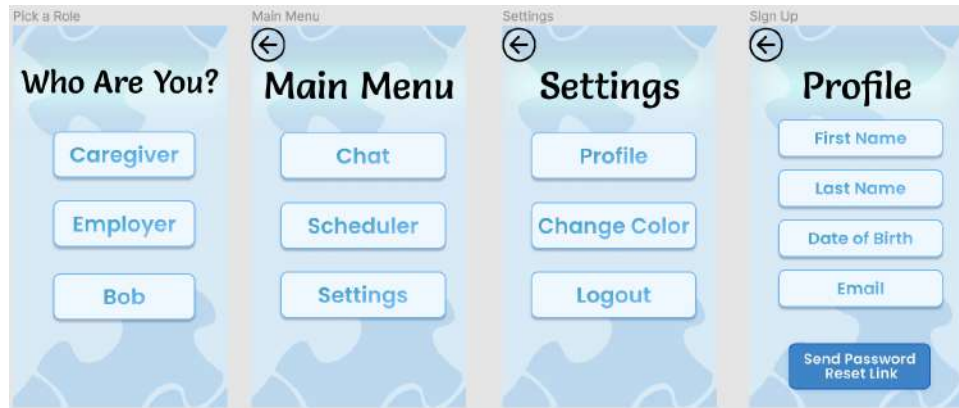
1. Android Studio
2. Back4App: Store and retrieve user data (i.e., personal information, task information)
3. Google API: Speech to Text
4. Google Text to Speech: Text to Speech

## Initial Screens



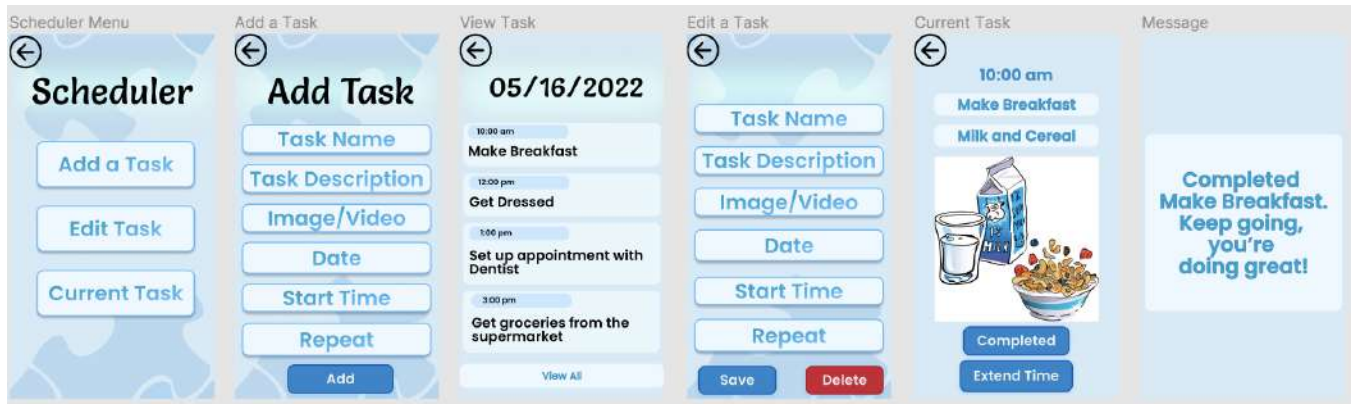
1. Main Screen: Users will see this screen when they first open the app.
2. Log In/Sign Up Screen: Once users click anywhere on the Main Screen, users can...
  - a. Log In (if they have an account)
  - b. Sign Up (if they don't have an account)
    - i. If they're already logged in and clicked on the "Sign Up" button, they will be asked to log out before creating a new account.
3. Sign Up Screen: Users need to fill out all fields. If there's an empty field or the email format is incorrect, when users click on the "Create Account" button, a warning message will show next to the field that needs to be corrected.
4. Log In Screen: Users will need to fill out both fields. If there's an empty field, the email format is incorrect or the information doesn't match our database, when users click on the "Log In" button, a warning will show next to the field that needs to be corrected.

## Main Screens



1. Pick a Role Screen: After creating a new account or logging into an existing account, users have to pick their role based on who they are.
  - a. If it's the caregiver or employer, they will be directed to the Scheduler Main Menu Screen.
  - b. If it's the main user, they will be directed to the Main Menu Screen.
2. Main Menu Screen: Users can...
  - a. Chat with Altri.
  - b. View the Scheduler.
  - c. View the Settings.
3. Settings Screen: Users can...
  - a. View their profile.
  - b. Change the background color of the entire app with four options (Blue, Yellow, Red, Green).
  - c. Logout of their account and be directed back to the Log In/Sign Up Screen.
4. Profile Screen: Users can...
  - a. View their personal information they've filled out during registration.
  - b. Send a password reset link to their email if they want to change their password.

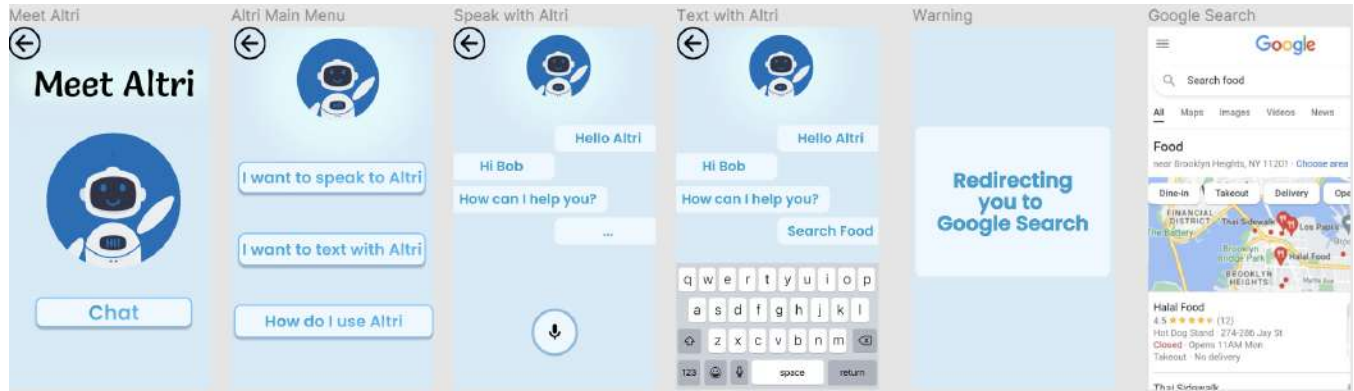
## Scheduler Screens



1. Scheduler Menu Screen: Users can...
  - a. Add a task.
  - b. Edit a task.
  - c. View their current task.
2. Add a Task Screen: Users need to fill out most fields except for Image/Video and Repeat fields as they're optional. If there's an empty field, when users click on the "Add" button, a warning message will show next to the field that needs to be corrected.
3. View Task Screen: When users click on the "Edit Task" button in the Scheduler Menu Screen, they will see their task(s) for the day.
4. Edit a Task Screen: When users click on a task in the View Task Screen, they will be directed to a screen where they could delete the task or make changes to the fields except for the Task Name.
5. Current Task Screen: Users will see the task they currently need to complete with relevant information (Start Time, Task Name, Task Description).
  - a. If a task is completed, users will click on the "Completed" button and will see a motivational message.
  - b. If users feel like they can't complete the task before their next task starts, they could click on the "Extend Time" button which adds an extra hour to the task.
6. Message Screen: Randomized messages to confirm task completion and encourage users to complete their remaining task(s).



## Altri (AI Chatbot) Screens



1. Meet Altri Screen: Users will be first greeted by Altri.
2. Altri Main Menu Screen: After users click on the “Chat” button in Meet Altri Screen, they can...
  - a. Speak to Altri.
  - b. Text with Altri.
  - c. Learn how to interact with Altri (video tutorial).
3. Speak with Altri Screen: Users interact with Altri by speaking into the microphone and sending what they said. Then, Altri will respond and the responses are read out loud.
4. Text with Altri Screen: Users interact with Altri by sending text messages. Then, Altri will respond and both Altri’s along with the user’s messages are read out loud.
5. Warning Screen: Users will see this warning when Altri is directing them to Google Search so they know what’s going on and won’t feel confused or overwhelmed.
6. Google Search Screen: Users will see their default browser navigated to Google searching the keyword they put in the chat.

## **Evaluation with Users and Partners**

After we built our prototype in Figma, we partnered with Goodwill NY/NJ to conduct two rounds of usability testing to show their program participants what we developed so far and garner their feedback. For each usability testing, we spoke with individuals with different dependency levels, some were more independent than others.

The first program we spoke with was the Bridges Program where participants were undergoing training to find a job. They thought our UX/UI design was mostly clear as they understood what most of the buttons did and how to navigate between screens. When asked about their preferred way to interact with Altri, majority of them preferred speaking, whereas some preferred texting and some preferred both. They really liked being able to change the background color of the app, so we collected their favorite colors to use as color options.

The second program we spoke with was the Next Steps Program where some participants already have jobs at retail stores like Burlington. They thought our app could help them throughout their day as some of them had more than ten tasks in a day which was hard to keep track of everything at times. Compared to the Bridges Program, their preferred way of interacting with Altri was both speaking and texting. We also made variations of the Scheduler and Altri screens with the buttons placed in different orders to learn which order made the most sense for them. They really liked having a motivational message after each task is completed because it helps them confirm that a task was completed. Towards the end, one participant asked if more colors would be added to the app and we showed him the changed background color feature which was well received by everyone.

Aside from the data we've gathered through the usability testing, we also factored in feedback from midterm evaluators, specifically from Tasha Stanton, one of the Program Managers at Goodwill NY/NJ. She mentioned that some individuals with ASD are fixated on time which often causes them to feel overwhelmed. To resolve this, we replaced the time duration for the task (used in all scheduler and planner apps) to only the start time so that users are not too focused on the end time when completing a task. Another feedback she gave was that it wasn't intuitive on how to interact with Altri to obtain a response. We've added a video tutorial to show users how to interact with Altri which was said to be a helpful feature during the usability testing with the Next Steps Program.

Overall, participants from both the Bridges and Next Steps programs were interested to use our app once it's launched to the Google Play Store. Thanks to the feedback we've received, we were able to discover insights we weren't aware of before which helped us refine our design to better meet the needs of our users.

## **Discussion of Potential Markets and Future Work**

The target users of our app are adults with ASD from the ages of 18 to 40, caregivers and employers. As part of our initial launch, our users will include program participants from Goodwill NY/NJ. Currently, there isn't any other app in the market like ours that's targeted towards adults with ASD with the focus on user-friendly design and tailored AI chatbot. This gives us a leverage in the market as our competition is relatively low and there's a large number of potential users.

With that being said, there are some potential markets that we could dive into to expand our user base. Since iOS is the leading mobile operating system in the US, we hope to make our app available for iOS users in the near future. We chose to focus on Android first because majority of the program participants from Goodwill NY/NJ were Android users. Furthermore, we hope to expand our target age range to make our app usable by anyone with ASD of any age, especially children. It is also possible to market our app to adults with ASD and employers who work in corporate environments where virtual meetings are needed. However, not many companies currently focus on hiring individuals with disabilities. As a result, if we target that segment right now, it could be a risk for us.

After compiling user feedback, we hope to implement new features that they've requested. One of which is to add a task to the schedule by asking Altri to do it. Once it's developed, this will make it easier for users to add task(s), especially when there's a lot. Another feature is adding voice reminders for upcoming tasks, as we the only reminders we have are notifications. There were asks from our users to allow them to change Altri's icon to a picture from their camera roll. For this feature request, we might add an image field to the user profile, so that users can set and change their image which makes the app more customizable. Last but not least, to further encourage users to stick to their schedule, we're considering integrating gamification which is proven to increase engagement.

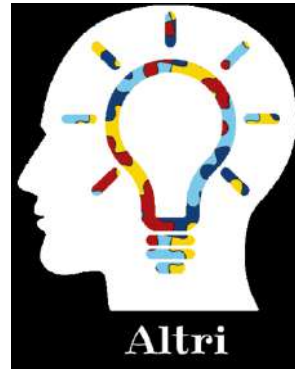
## **Branding**

Altri, our app and AI chatbot name, stems from the word "Altruism", the act of helping others without expecting anything back, which is one of the reasons why we created our app. Altri is always there to support and help users. Our app is free of charge with no premium

features, subscriptions nor ads because we wanted every user to share the same user experience and access to features to help them in their daily lives.



*Image 1.*



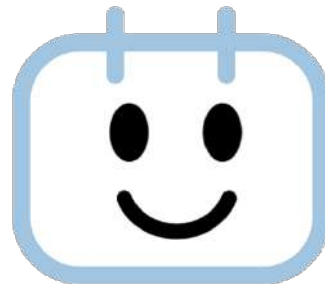
*Image 2.*



*Image 3.*



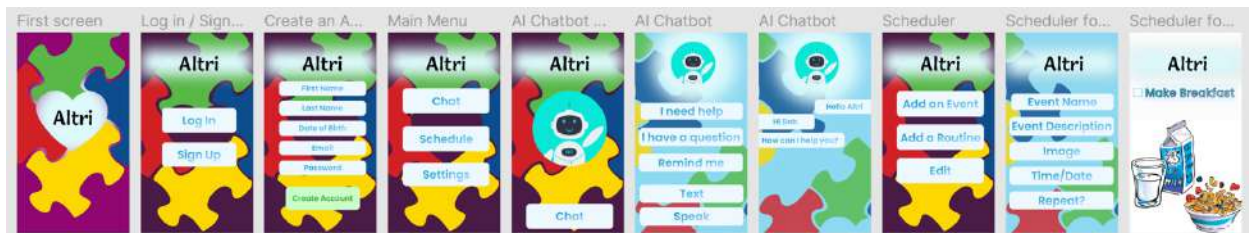
*Image 4.*



*Image 5.*

As we developed our app, we changed our logo a few times. Image 1 was our first logo where we placed a lightbulb colored by puzzle pieces in a head. The puzzle pieces symbolize Autism, and the lightbulb represents Altri who is the brain of our app. Image 2 was our second logo where we used white instead of black for the head and showed less of the puzzles with fewer colors to make it less overwhelming to look at. Image 3 was our third logo where we changed back to the design of Image 1. But we made the puzzle pieces bigger and only used primary colors to make it easy on the eyes. Image 4 was our fourth logo where we removed the lightbulb and showed only three puzzles to make it simpler. We also changed the color of the head to blue to match our app's default background color. However, in our UX survey for

branding and interface development, we've received mixed to negative reactions for our logo. Majority stated that it wasn't clear what our app does by just looking at the logo as some thought it was a brain teaser game. Some also thought that it was strange to have puzzle pieces placed into a head. Therefore, the feedback led us to our final logo in Image 5 which was decided during the usability testing with the Next Steps Program. Majority preferred the design out of the six we presented them. The outside represents a scheduler, and the inside (eyes, mouth) mimics a face to represent Altri as those are the two main features of our app.



*Image 6.*

As our logo evolved, we also changed the colors we used in the design of our app. Image 6 shows our initial original color scheme where we used multiple colors to help users stay focused and engaged to the screen. But users found it to be too overwhelming with all the colors and it was difficult for them to look at the screen for a long period of time. As a result, we changed to using one color throughout the entire app in which the default color is blue. The reason why it's blue is because half of our users' favorite color was blue, while the other half were divided between other colors (yellow, red and green).

## **Video Link**

<https://youtu.be/An6BwxFOUAE>

## **Individual Contributions**

### Anthony

1. Redesigned some of the screens and added additional screens in the Figma prototype based on user feedback for the second usability testing.
2. Designed the final logo (Image 5).

3. Managed all communication with Goodwill and NYSID.
4. Created all of the presentation slides.
5. Maintained the weekly logs starting from Week 8 (3/21 – 3/27).
6. Sign Up Screen
  - a. Stored user information collected for creating a new account in the database.
  - b. Implemented warnings if a field was empty or the email format was incorrect.
7. Log In Screen
  - a. Verified login information matched the database to enable successful logins.
  - b. Implemented warnings if a field was empty or their information was incorrect.
  - c. Implemented forgot password to send a password reset link to user's email.
8. Pick a Role Screen: Retrieved the user's first name from the database and displayed it on the screen.
9. Add Task Screen
  - a. Stored task information in the database to be used in other screens.
  - b. Collaborated with Valeryia to implement the Image/Video field.
  - c. Implemented warnings if a field was empty with the exception of the Image/Video and Repeat fields as they're optional.
10. Current Task Screen
  - a. Retrieved task information (Start Time, Task Name, Task Description) from the database and displayed it on the screen.
  - b. Collaborated with Valeryia to display motivational messages to users.
11. Settings Screen
  - a. Profile Screen
    - i. Retrieved user information (Name, Date of Birth and Email) from the database and displayed it on the screen.
    - ii. Implemented sending a password reset link to user's email.
  - b. Change Color Button: Implemented the ability to change the app's background color based on the user selection.
  - c. Logout Button: Signed users out and directed them back to the Log In/Sign Up Screen.

12. Implemented popup (Toast) messages at the bottom of the screen when certain actions are carried out such as successfully creating an account, logging in and logging out.

### Paul

1. Maintained the weekly logs starting from the beginning of the semester to Week 7 (3/14-3/21).
2. Developed Altri (AI chatbot).
3. Implemented Text to Speech functionality.
4. Implemented Speech to Text functionality.
5. Implemented core features such as directing users to different screens and searching for anything via Google Search.
6. Implemented additional features such as telling the current time, solving math equations, and flipping a coin, along with basic conversation.
7. Implemented a warning screen when users switch from the app to Google Search.
8. Fixed an issue where texts were not visible due to color.

### Valeryia

1. Designed the initial completed Figma prototype.
2. Designed most of the retired logos (Image 1 to Image 5).
3. Pick a Role Screen: Redirected the Caregiver and Employer to the Scheduler Screen and the user to the Main Menu Screen.
4. Add Task Screen: Collaborated with Anthony to implement the Image/Video field.
5. Edit Task Screen
  - a. Retrieved all tasks for the day from the database and displayed them on the screen sorted by time.
  - b. Implemented editing (can't edit the Task Name) and deleting tasks.
6. Current Task Screen
  - a. Collaborated with Anthony to display the motivational messages to users.
  - b. Implemented the extend time feature.
7. Created reminders notifications for users to complete a task based on the task time.
8. General bug fixes including redirecting users to the right screen from Altri.

## Acknowledgments

We would like to sincerely thank the following individuals/programs for their help and support:

1. Zhigang Zhu
2. Goodwill NY/NJ (including Celina Cavalluzzi, Tasha Stanton and Jeanne Matos)
3. NYSID CREATE (including Megan Tatro)

“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.”

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