



SafeMap

Travel safely with confidence!

Senior Design Final Report

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Background

Although there's much to love about New York City, whether it be for its diversity, food, landmarks, culture, etc., there's plenty of things to dislike about the city. One of these things being its crime. Despite the fact that there's plenty of crime everywhere, we want NYC to keep its locals and tourists safe. According to the index crime statistics table presented by the NYPD, the number of crimes in NYC has continued to rise, with crimes like robbery, felony assault, burglary, and grand larceny auto increasing at the start of 2023 [1].

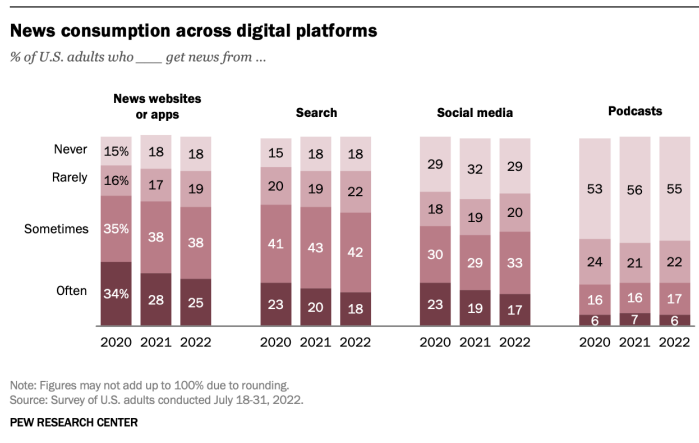
	January 2023	January 2022	+/-	%
Murder	30	31	-1	-3.2%
Rape	130	132	-2	-1.5%
Robbery	1332	1265	67	5.3%
Fel. Assault	2056	1790	266	14.9%
Burglary	1298	1211	87	7.2%
Grand Larceny	3998	4079	-81	-2.0%
Grand Larceny Auto	1223	1164	59	5.1%
TOTAL	10067	9672	395	4.1%

Furthermore, the New York Times states that major crimes in NYC increased by 22%. They report that the number of arrests, robberies, and crimes in subway systems have risen [2]. Not only does New York crime affect its locals, it also affects its tourists. There have been multiple incidents where tourists visiting New York have been at the wrong place, at the wrong time. This was unfortunately the case for Chris Ruby of Kansas City who encountered two men fighting in Manhattan and was shot in the shoulder [3]. Fortunately, he survived, and he no longer had the desire to stay in New York.

NYC is the largest city in the United States, accounting for a population of approximately 8.6 million people [4]. According to Wikipedia, NYC has the largest educational system amongst all the cities in the world. New York State is also “the nation’s largest importer of college students” [5]. Students attending universities in New York State and NYC surpass the number of students in other cities in the U.S. [5]. Furthermore, according to the New York State Comptroller, NYC has consistently ranked as a top 10 destination globally. New York State Comptroller also mentions that in 2019, NYC had welcomed 66.6 million tourists [6]. This means that there’s millions of students of all ages and tourists combined who rely on NYC’s safety, and this doesn’t even account for the families and employees that reside in NYC.

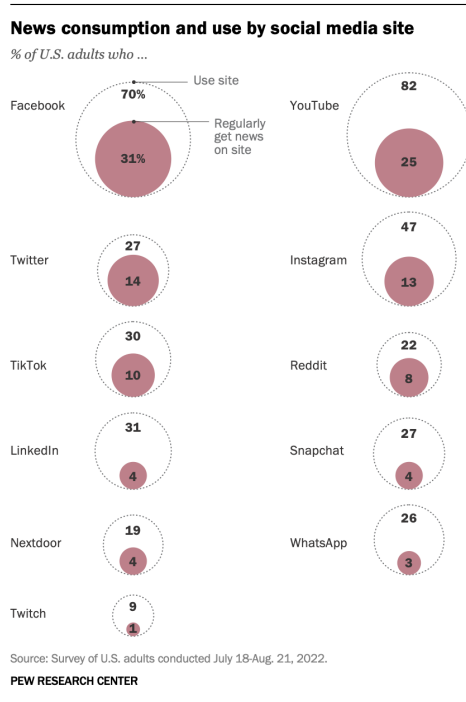
Statement of the Problem

According to the Pew Research Center, the top three platforms U.S. adults use to access their news is through news websites and apps, accounting for about a quarter of U.S. adults (23%), 12% of adults prefer search, and 13% of adults prefer social media [7].

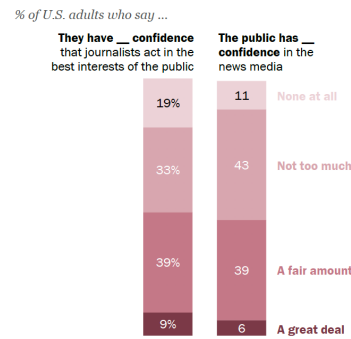


Furthermore, they reported that about a third of U.S. adults get their news from Facebook [8]. It’s known that social media isn’t necessarily a reliable source for news consumption due to

misinformation, algorithms showing inaccurate or incomplete news to certain groups of users, etc. A survey conducted by the Pew Research Center also shows that less than half of U.S. adults feel confident in the news media [9].



No more than half of U.S. adults feel confident in the news media or think other Americans feel this way



And Americans say skepticism of the media is a good thing, but see room for confidence to rise



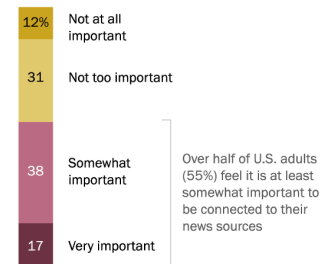
Note: Respondents who did not give an answer not shown.
Source: Survey of U.S. adults conducted Feb. 18-March 2 (views of the public's confidence, skepticism, increase in confidence) and April 20-26, 2020 (own confidence).
"Americans See Skepticism of News Media as Healthy, Say Public Trust in the Institution can Improve"
PEW RESEARCH CENTER

More interestingly, they also conducted a survey that showed that 55% of U.S. adults felt that it was somewhat important to be connected to the sources they get their news from. In addition to this, the majority of these adults felt that they do not have a personal connection with their news sources [9].

This data shows that adults in the U.S. are getting their news from digital sources, mostly news websites and apps, but that they're also not confident in the news media. Most importantly, they feel that there is a lack of personal connection to these sources. This lack of confidence and connection to the news media can be

Over half of Americans desire a personal connection with their news sources ...

% of U.S. adults who think it is ___ to be connected to news organizations they get their news from



... but most do not feel that personal connection

% of U.S. adults who ...



Note: Respondents who did not give an answer not shown.
Source: Survey of U.S. adults conducted Feb. 18-March 2, 2020.
"Americans See Skepticism of News Media as Healthy, Say Public Trust in the Institution can Improve"
PEW RESEARCH CENTER

detrimental to the lives of U.S. adults, and more specifically due to the scope of this project, New Yorkers and tourists in NYC. While there are apps like *Citizen* that aim to provide trustworthy crime news, they don't provide a connection to its users. That being said, we developed *SafeMap* in order to address these concerns.

Rationale of Solutions

Our solution to the aforementioned concerns is *SafeMap*. *SafeMap* is a mobile application that provides the general public, specifically New Yorkers and its tourists, with accurate and wide-ranging incident and non-incident data with the purpose of providing incident awareness as well as a connection to these users. There isn't an application in the market that's dedicated to serving New Yorkers and tourists in New York specifically. Although there are crime alert applications that exist, they don't cater to the lifestyle of people who reside in NYC. As mentioned in the *Background* section, NYC is the largest city in the United States, it's home to more college students than any other city in the United States, and is also ranked as a top 10 destination globally, but its crime rates are steadily increasing and its affecting locals and tourists.

With all of this being said, *SafeMap* provides incident data to address the lack of incident awareness and also provides non-incident data, such as job, apartment, and event listings, to provide a connection between this news source and its target users. Having access to incident data concurrently with non-incident data will allow New Yorkers and its tourists do the following:

- Determine if locations and their routes are unsafe
- Determine if the location at the listings are unsafe

- Continue their usual lifestyle while staying safe
- Make informed decisions while exploring as a tourist

Users will be able to identify such incidents and non-incidents on a map and receive alerts of crime nearby. Whether users are exploring new areas, going to places they visit often, or want to learn about the incidents that usually occur in a particular area, they can use *SafeMap* in any situation. *SafeMap* is a multi-purpose tool after all.

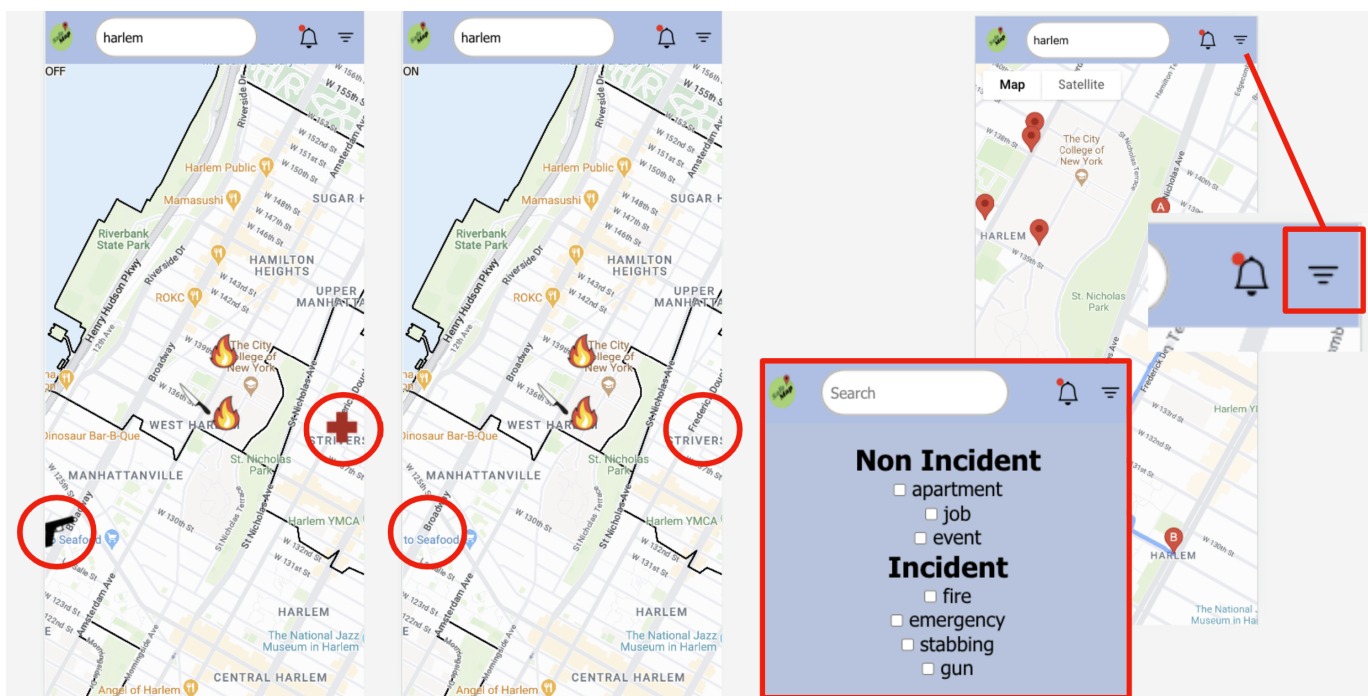
Design and Development of Systems

Considering that our application's target audience is the general public, we designed *SafeMap* in a way that's user-friendly, intuitive, simple, and, most importantly, multi-purpose.

In terms of design, we decided to implement a minimal number of screens and features to make navigation across the application easy. Also, our screens are icon and image-based to easily communicate different types of crimes and listings as well as to avoid appearing cluttered with text. *SafeMap* offers the following:

1. Map to locate incidents and non-incidents: Our map screen is SafeMap's home page where users can visually locate different types of incidents as well as non-incidents like job, apartment, and event listings. Incidents and non-incidents are represented with an appropriate icon on the map in order to easily communicate to users what is occurring or being offered in that area. Users are able to filter incidents and non-incidents on the map using the **filter button** with the purpose of reducing their anxiety while using the application as being aware of all crime at all times can be overwhelming. Another anxiety reducing feature we offer is **Toggle On/Off**. With Toggle On/Off, users can reduce the scope of incidents shown on the map. Toggle Off displays

crime in all of New York. Toggle On displays incidents only in the user's zip code. The map screen includes a **search bar** that utilizes the shortest path algorithm. The purpose of this feature is to allow users to search a destination and see what incidents are occurring there at that point in time. The search bar automatically loads the shortest path without needing users to press other buttons like on *Google Maps* where users have to select a mode of transportation and choose from different routes.



2. Non-incident information pages: The non-incident data that *SafeMap* offers is job, apartment, and event listings. These three categories have their pages which include the listing name, address, contact information, and an about and description section. As mentioned previously, *SafeMap* offers non-incident data in addition to incident data so that users can identify crime near those listings. Having access to non-incident and incident data concurrently


helps the users make informed decisions about which jobs to apply to, which apartment to move into, and which venues to avoid.

Job	Apartment	Event
 <p>Listing Name:McDonald Cashier</p> <p>Verified:Yes</p> <p>Address:1286 1st Ave., New York, NY 10021</p> <p>Contact Info Phone: 1-800-244-6227 Website: https://www.mcdonalds.com</p> <p>About: Classic, long-running fast-food chain known for its burgers & fries.</p> <p>Description: Hiring McDonald Cashier for \$15/ hour to join our team. Benefits Included.</p>	 <p>Listing Name:Apartment Greystone</p> <p>Verified:Yes</p> <p>Address:212 W 91st St, New York, NY 10024</p> <p>Contact Info Phone: (212) 432 765 Website: www.bestapartmentny.com</p> <p>About: Greystone is an apartment in New York.</p> <p>Description: Full service rental building, offering Studio, 1 bedroom, and 2 bedroom apartments. Packed with amenities inside and out.</p>	 <p>Listing Name:BlackPink Concert</p> <p>Verified:Yes</p> <p>Address: 4 Pennsylvania Plaza, New York, NY 10001</p> <p>Contact Info Phone: (212) 465-6741 Website: https://www.msg.com/madison-square-garden</p> <p>About: Madison Square Garden, colloquially known as The Garden or by its initials MSG, is a multi-purpose indoor arena in New York City.</p> <p>Description: Madison Square garden is hosting blackpink concert get your tickets now</p>


3. Receive incident alerts in Notification inbox: Users will receive alerts of incidents nearby through their notification inbox. The alerts state what kind of incident it is, the time it occurred, how far the incident is from the user, where the user is at the time of the incident, and it also includes a screenshot of where the incident is taking place.

Your Messages


Subject: gun Incident Nearby at you 12/26/12
 Occured at 160 covenant street 1 mile away from you



Subject: gun Incident Nearby John 1234 on 12/26/12
 Occured at 160 covenant street 1 mile away from John



Subject: gun Incident Nearby John 1234 on 12/26/12
 Occured at 160 covenant street 1 mile away from John



4. View incident statistics: In our statistics screen, users are able to view the top three incidents from the last seven days in the area they select. This screen includes a responsive pie chart with percentages, icons to represent the type of incident, number of times that incident was committed, and percentage of overall increase or decrease of that crime within the last seven days.



In terms of the development, SafeMap uses the following:

- 1. ReactJs:** Currently one of the most popular web frontend frameworks developed by facebook. We chose to use React because there is a vast market of ReactJs developers and development of our application could easily be transferred
- 2. MongoDB:** Currently one of the most popular NoSQL document based databases. MongoDB provides a free tier, is fairly easy to learn, and is ideal for early development. Also, like reactjs, has a vast market of developers so new developers can easily work on the application.
- 3. Google Maps API:** Used google maps api to create maps and google geolocation so we do not have to reinvent the wheel. It also provides a feel that most of our users are already used to.

Evaluation with Users and Partners

The types of users we interviewed and surveyed varied slightly throughout this course. Due to the adjustments we made to our target audience and mission, we received feedback from two different groups of users, and we explained this change further in the **Branding** section.

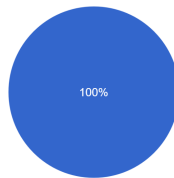
Up until our Technology Update in the Spring semester, our target audience was individuals with Autism Spectrum Disorder (ASD). We were able to communicate with these individuals through the Goodwill site of the Possibilities & Advance Programs. We conducted two in-person interviews at Goodwill with about 12 young adults with ASD in the Fall and Spring semester. We also surveyed our neurotypical (individuals without ASD) peers, friends, and family that live in NYC throughout this course. Although our target audience shifted in the middle of the Spring semester from users with ASD to the general public, the features and design choices influenced by those with ASD received positive feedback from the general public.

Our interviewees with ASD said they preferred a simple, uncluttered, and icon and image-based application, and that is what we delivered. During our second in-person interview at Goodwill, we received positive feedback on our design and the features we had implemented. The only suggestion they made was to revert back to our past logo. The general public as well as our community evaluators and professor Zhigang Zhu liked our last logo, which is our current logo, so we reverted back to that logo!



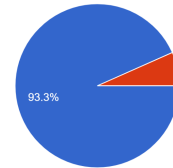
By the middle of the Spring semester, we received plenty of feedback saying that our application would better serve the general public, so we changed our audience and only surveyed the general public moving forward. Below is their feedback on the application we had so far. Nearly all of our potential users think our application name and logo are inviting and fitting.

Is our application name 'SafeMap' inviting and fitting?
15 responses



● Yes
● No

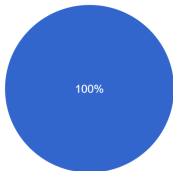
Is our logo inviting and fitting?
15 responses



● Yes
● No

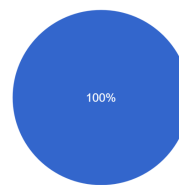
We asked about potentially adding non-incident data to our filter button in order to further serve our new audience as well as differentiate us from other applications, such as *Citizen*. All respondents answered positively, so we added it.

Would you like a 'Non-Incident' filter that shows Apartment, Job, and Event listings on the map in addition to incidents?
15 responses



● Yes
● No

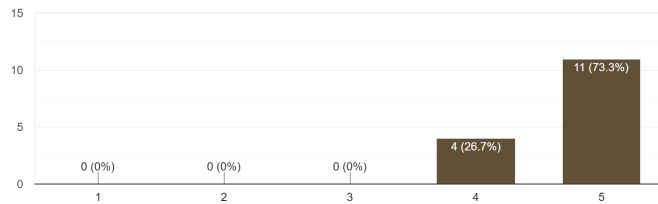
Do you think the 'Non-Incident' filter is a feature that sets our Incident Awareness application apart from our competitors?
15 responses



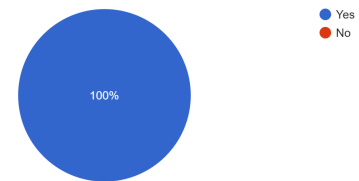
● Yes
● No

They also gave us positive feedback on *SafeMap's* navigation and practicality. Lastly, we also had them rate all of our screens, such as Map, Listing Information, Notification Inbox, and Statistics screen, on a scale of 1-5 on how clear, simple, intuitive, and informative they were, and nearly all of them rated a 4-5.

On a scale of 1-5, how easy and intuitive is it to navigate SafeMap?
15 responses



Do you think our features consider real-life use scenarios?
15 responses



Overall, our application received overwhelming positive feedback even after a slight change in our brand. All types of users had good things to say about *SafeMap's* development!

Discussion of Potential Markets and Future Work

SafeMap's target consumer is the general public and this includes locals, tourists, families, students, employees, etc. that want to gain incident awareness. That being said, there is a wide range of potential markets for *SafeMap* to pursue. One market we want to target is the educational sector. We would like to work alongside different educational institutes. Many schools and universities have their own campus safety alert system, and we believe that *SafeMap* could offer additional and higher quality safety. Not only would students find *SafeMap* helpful to stay safe on and near campus, but they could use our non-incident data, such as job, apartment, and event listings, to find jobs near campus that can reduce commute time, find apartments near campus if students don't want to dorm on campus, and find events to go to with classmates. They can do all these things while staying safe by simply checking if there's any crime near those locations. *SafeMap* could be advertised in school letters and shared via school email. Another market we want to pursue is the tourism sector. With millions of people visiting New York City every year, we want to help tourists have a safe and pleasant time in our home! This market could allow us to work with all kinds of companies that host activities that tourists like to enjoy

while they visit. For instance, *SafeMap* could partner with TicketMaster, which is a company that sells tickets for events like concerts and sport events. Tourists could use *SafeMap* to determine if the venue is far from their homes and if the commute is safe. *SafeMap* could also be advertised in subway systems. *SafeMap* could help NYC become a safe place to visit and, in turn, increase NYC's tourism rate.

In terms of future work, we will continue to implement the non-incident listings. We want to add more listings so that our audience continues to grow. Considering that our target customer is the general public, this can even include individuals with ASD, which are our former target customers. We want to work with Goodwill again in the future to continue our mission of making our UI user-friendly for all users. A potential feature we could add allows the user to customize the UI on their account. This way, individuals with ASD or older individuals that aren't tech savvy can adjust our UI in a way that simplifies the user experience. Lastly, we want to figure out a way to continue to reduce user anxiety while having access to a multitude of incident data.

Branding

SafeMap's brand changed for the better throughout the Fall and Spring semester of this course. The major change in our brand was the shift in our target audience. In the Fall semester, our original target audience was individuals with ASD and our mission was to help these individuals build independence by providing them with incident alerts while they travel. However, based on the feedback we received throughout the Spring semester from community evaluators and surveys answered by individuals with ASD as well as the general public, we thought it was best to reevaluate our brand. The feedback we often received was that our application could serve users other than those with ASD and might even be more suitable for the

general public. Because our mission was always centered around incident awareness and we realized that a larger community of users could also benefit from our application, we changed our target audience from people with ASD to the general public. In addition to the shift in our audience, we also adjusted the mission of our application to be a platform dedicated to providing incident awareness. With these adjustments, *SafeMap* could have a lot more applications and can be used by a larger audience. Thanks to the community evaluators and survey respondents, *SafeMap* became a multi-purpose tool for raising incident awareness! Furthermore, because our original audience was individuals with ASD, the majority of our features and design choices were influenced by their preferences. We realized that the features and design choices we made to accommodate these individuals were also suitable for the general public since they were made to be user-friendly and easy to use for those that would typically have a harder time using technology. Because of this, we were able to continue our development smoothly even after adjusting our audience and mission.

Below is our original and final brand. We kept our application name *SafeMap* the same throughout the application development because our users thought it was fitting. However, we made a lot of changes to our logo and ultimately decided on the green logo with a red navigation icon because it was the most popular logo amongst our survey respondents, community evaluators, and our professor. Our slogan, “Travel safely with confidence”, remained the same as well because our mission was always centered around helping the user feel safe and confident while traveling by providing them with incident awareness.

Original Brand:



Slogan:

Travel safely with confidence!

Mission:

Helping ASD individuals achieve their goal of traveling independently while keeping them safe

Final Brand:



Slogan:

Travel safely with confidence!

Mission:

To create a platform dedicated to providing all audiences incident awareness and make incident and non-incident data easily accessible at all times, for all purposes

References Cited

1. “NYPD Announces Citywide Crime Statistics for January 2023.” *The Official Website of the City of New York*, 3 Feb. 2023,
www.nyc.gov/site/nypd/news/p00073/nypd-citywide-crime-statistics-january-2023.
2. Marcius, Chelsia Rose, and Ed Shanahan. “Major Crimes Rose 22 Percent in New York City, Even as Shootings Fell.” *The New York Times*, 6 Jan. 2023,
www.nytimes.com/2023/01/05/nyregion/new-york-crime-stats.html.
3. Woods, Amanda, and Tina Moore. “Tourist Visiting From Kansas Shot in Manhattan, Cops Say.” *New York Post*, 7 Apr. 2021,
nypost.com/2021/04/07/innocent-tourist-visiting-from-kansas-shot-in-nyc-cops.
4. World Population Review. “The 300 Largest Cities in the United States by Population 2023.” *World Population Review*, worldpopulationreview.com/us-cities.
5. Wikipedia contributors. “Education in New York City.” *Wikipedia*, Mar. 2023,
en.wikipedia.org/wiki/Education_in_New_York_City.
6. Office of the New York State Comptroller. “The Tourism Industry in New York City.” *Office of the New York State Comptroller*,
<https://www.osc.state.ny.us/reports/osdc/tourism-industry-new-york-city#:~:text=Since%201991%2C%20the%20number%20of,have%20helped%20support%20this%20growth>.

7. Forman-Katz, Naomi, and Katerina Eva Matsa. "News Platform Fact Sheet." *Pew Research Center's Journalism Project*, 24 Apr. 2023, www.pewresearch.org/journalism/fact-sheet/news-platform-fact-sheet/?tabId=tab-b39b851c-e417-48ef-9b10-93ee21a0030e.
8. "Social Media and News Fact Sheet." *Pew Research Center's Journalism Project*, 14 Dec. 2022, www.pewresearch.org/journalism/fact-sheet/social-media-and-news-fact-sheet.
9. Gottfried, Jeffrey, et al. "Americans See Skepticism of News Media as Healthy, Say Public Trust in the Institution Can Improve." *Pew Research Center's Journalism Project*, 25 May 2021, www.pewresearch.org/journalism/2020/08/31/americans-see-skepticism-of-news-media-a-s-healthy-say-public-trust-in-the-institution-can-improve.

Final Video Link: <https://youtu.be/TPCIAjM5eXM>

Acknowledgments

“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.”

Team *SafeMap* would love to thank professor Zhigang Zhu, Goodwill NY/NJ, and our community evaluators. Being able to visit the Goodwill site of the Possibilities & Advance Programs and speak with their students with Autism Spectrum Disorder inspired us to create an application related to incident awareness. Our community evaluators gave us a lot of valuable feedback throughout the Spring semester and helped create the application *SafeMap* is today. Lastly, we're thankful for our professor Zhigang Zhu who provided us with all the resources we needed to create an assistive application.

Contributions

1. Idea

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- 1.2. **Note taking & asking questions at 1st Goodwill meeting:** Ashley Diaz, Ruhi Rownak, Rishika Lama Tamang, Solomon Zhang
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- 1.4. **Research potential competitors:** Ruhi Rownak, Rishika Lama Tamang
- 1.5. **Tech related research:** Solomon Zhang

2. Logo

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- 2.2. **Second draft logo:** Ashley Diaz, Ruhi Rownak, Rishika Lama Tamang, Solomon Zhang
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3. Customer feedback

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- 3.3. **Created Google Form survey for Assistive Application Updates:** Ashley Diaz
- 3.4. **Created Google Form survey for AAC/SDS at CCNY:** Ashley Diaz
- 3.5. **Reached out to The AccessAbility Center/Student Disability Services (AAC/SDS) at CCNY:** Ashley Diaz
- 3.6. **Reached out to Goodwill to schedule 2nd in-person interview:** Rishika Lama Tamang
- 3.7. **Hosted 2nd in-person interview at Goodwill:** Ashley Diaz, Ruhi Rownak

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- 4.3. **Map Screen frontend:** Ashley Diaz
- 4.4. **Notification Inbox Screen frontend:** Ashley Diaz
- 4.5. **Non-incident Listing Information Screens frontend:** Ashley Diaz
- 4.6. **Statistics Screen frontend:** Ashley Diaz
- 4.7. **Login & SignUp Screens backend:** Solomon Zhang
- 4.8. **Map Screen backend:** Solomon Zhang
- 4.9. **Notification Inbox Screen backend:** Solomon Zhang

- 4.10. **Non-incident Listing Information Screens backend:** Solomon Zhang
- 4.11. **Statistics Screen backend:** Solomon Zhang
- 4.12. **API/ Routing backend:** Solomon Zhang
- 4.13. **Google Maps API implementation:** Solomon Zhang
- 4.14. **MongoDB Database Design:** Solomon Zhang
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 - 5.3. **Presentation deck for Brand Updates:** Ashley Diaz, Ruhi Rownak, Rishika Lama Tamang
 - 5.4. **Presentation deck for Midterm Evaluation:** Ashley Diaz, Ruhi Rownak, Rishika Lama Tamang
 - 5.5. **Presentation deck for Entrepreneurship Updates:** Ashley Diaz, Ruhi Rownak, Rishika Lama Tamang
 - 5.6. **Presentation deck for Assistive Application Updates:** Ashley Diaz, Ruhi Rownak, Rishika Lama Tamang
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