DigiClips Media Search Engine

Design Document

Team: sdmay23-03

Client: DigiClips Inc.

Advisor: Dr. Ashfaq Khokhar

Team Members:
Aashish Komaragiri- Team Engagement Officer
Elijah Shelby- Testing Officer
Grace Rasmussen- Team Organization Officer
Khushveen Kaur Umra- Advisor Interaction Officer
Matthew Karmelich- Client Interaction Officer

Email: sdmay23-03@iastate.edu

Website: sdmay23-03.sd.ece.iastate.edu

Executive Summary

Development Standards & Practices Used

For this project, all the Engineering standards will be software focused, as we will not be designing, implementing or utilizing any circuits or hardware components. Furthermore, we will be using practises such as object-oriented programming while following the specific IEEE Engineering standards for software development practices as follows:

- **IEEE Std 830-1998**: Recommended Practise for Software Requirements Specifications
- **IEEE Std 829-2008**: Standard for Software and System Test Documentation
- **IEEE Std 26531-2015**: International Standard for Systems and Software Engineering – Content management for product life-cycle, user, and service management documentation
- **IEEE Std 1063-1987**: Standard for Software User Documentation

Summary of Requirements

I) Automated Email Reports produced after a search query

- Create a readable format for the email reports
- Create a reporting tool that conducts automated searches on the DigiClip's database and alerts the clients
- Collect media information from the database based on the searched keyword/phrase
- Improve the "help" functionality in the email reports
- Organize the retrieved information in a user-friendly formatted report

II) Graphical Representation of Data

- Retrieve data from media segments being searched
- Perform data analysis on factors such as:
    - Viewer ratings on certain keywords searched by clients
    - Sentiment Analysis on the positives and negatives towards certain keywords
    - Length of the requested media segments
    - Competitor / Current client advertisements

Applicable Courses from Iowa State University Curriculum

- Com S 309 - Software Development Practises
- Com S 327 - Advanced Programming Techniques
- Com S 363 - Introduction to Database Management Systems
- S E 339 - Software Architecture
- S E 317 - Introduction to Software Testing
- S E 319 - Construction of User Interfaces

New Skills/Knowledge acquired that was not taught in courses

In addition to the course listed above, this project required us to get familiar with Angular, a TypeScript-based open-source web application. We also needed to get familiar with Amazon Web Services, a cloud computing web service, and more advanced examples of database management systems.

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1 Team

1.1 Team Members

- Aashish Komaragiri
- Elijah Shelby
- Grace Rasmussen
- Khushveen Kaur Umra
- Matthew Karmelich

1.2 Required Skill Sets for Your Project

Table 1: Required Skills

Skill	**Reason for Use**
Github	Keep track of code utilized in client software development.
Libraries	APIs and Libraries can be used to develop the graphical representation of data for clients in an easy, readable manner.
Web Scrape Internet (Selenium)	Gather data from the internet (all types of media) that can be useful for certain client's requests.
Testing (CyPress)	Create automated testing that can test the functionality of our code implementations.
Database	Send/receive (write queries) data that is relevant for client's request.
FFMPEG (Video recording)	Find media platforms where we are able to record and monitor data that is relevant. Also, update closed captioning.
Angular	Project will be done in Angular, so knowledge of Angular and built-in libraries is a must.
APIs (Postman)	Making requests when sending/receiving data.
Sentiment Analysis	Develop a way to detect positivity/negativity of media segments to send to the client.

1.3 Skill Sets covered by the Team

Table 2: Skills coverage

Skill	**Person(s) Responsible**
Github	Aashish Komaragiri Elijah Shelby Grace Rasmussen Khushveen Kaur Umra Matthew Karmelich
Libraries	Aashish Komaragiri Elijah Shelby Grace Rasmussen Khushveen Kaur Umra Matthew Karmelich
Web Scrape Internet (Selenium)	Aashish Komaragiri Elijah Shelby
Testing (CyPress)	Matt Karmelich Khushveen Umra
Database	Aashish Komaragiri Elijah Shelby Grace Rasmussen Khushveen Kaur Umra Matthew Karmelich
FFMPEG (Video recording)	Grace Rasmussen Khushveen Umra
Angular	Aashish Komaragiri Elijah Shelby Grace Rasmussen Khushveen Kaur Umra Matthew Karmelich

APIs (Postman)	Aashish Komaragiri Elijah Shelby Grace Rasmussen Khushveen Kaur Umra Matthew Karmelich
Sentiment Analysis	Matt Karmelich Aashish Komaragiri

1.4 Project Management Style Adopted by the team

The project management style that our group adopted for this project is the Agile framework. Our core concept is to create an engaging, collaborative work atmosphere in which every team member may contribute project-related ideas or opinions while speaking with each other/our client. This fosters an environment in which everyone feels welcome and capable of contributing to the project. We believe that this is the greatest method to excel in any project-related lesson, therefore we picked Agile.

We feel that by using an Agile Team, we will be able to work much more quickly as a team and solve problems more readily. Because we are working iteratively, striving to finish tasks one after the other, we are constantly on track with our project and goals.

Another crucial characteristic of an Agile Team is flexibility. We may use an Agile approach as a group to investigate the project objectives provided by our customer DigiClips and develop plans to meet them. We may discuss any results with our clients and start a dialogue about potential difficulties, deterrents, and weighing benefits and drawbacks. It will help us to be more proactive and keep track of project changes.

We believe that flexibility and efficiency in work completion are extremely vital qualities. Following an Agile framework provides us the best chance of doing this and delivering a project that our clients will be pleased with.

1.5 Initial Project Management Roles

Table 3: Management Roles

Name	Role	Responsibility
Grace Rasmussen	Project Manager	Assign Tasks to Team, Set Milestones, Ensure Project Goals are delivered on time, Meditate Conflicts
Matt Karmelich	Team Leader	Assists Team Manager in initiating actions that must be done to meet project deadlines
Khusveen Kaur Umra	Team Member	Technical and Organizational Portions of the Project, setting up meetings with the client, and advisor. Assist with technical portions of the project, software programming
Elijah Shelby	Team Member	Assist with technical portions of the project, software programming
Aashish Komaragiri	Team Member	Assist with technical portions of the project, software programming

2 Introduction

2.1 Problem Statement

DigiClips is a media content analysis company that records and extracts data from a variety of media sources, including television, radio, magazines, newspapers, social media, blogs, and web media. They keep this data in a searchable database and format. It provides both its clients and users a user interface via which they may search the database for keywords or phrases relevant to their interests, which can then be used in numerous audio or video clips taken from various media sources. The database results are then emailed to the clients, along with research reports that include URL links, video, metadata, and Nielson ratings.

General Problem Statement -

Clients using DigiClips currently do searches via a front-end-supported search engine. This engine provides Keyword email notifications to DigiClips, along with reports that may be sent straight to clients. Clients can then read over the reports they received and request edited copies of the television and radio portions. Currently, these altered versions of the segments in the email reports do not allow clients to specify a certain segment duration. The issue we are working on is developing a solution that uses the search engine and the results to generate automatic email reports, allowing customers to choose the duration of the required audio and video snippets to the desired length. These reports will also feature a graphical depiction of the results' studied data, which will be shown to the clients and the administrators of DigiClips.

Proposed Solution -

I) Automated Email Reports:

This project will look into existing solutions and create efficient automated email modules that will present the findings from various media sources depending on the keywords and phrases of interest in these segment recordings. This project will concentrate on upgrading the email alerts setup page with a lot more field testing so that the organization can get an advantage in the industry by allowing their clients to request certain sections of the recorded segments depending on their preferences. The automatic email report procedure is as follows:

- Automated searches on the DigiClips database for the search engine will regularly be performed to alert the client about their searched keywords
- When the keywords searched by the client are allocated in the database, the specific client will be sent an automated alert email with links to the edited copies of the audio and video segments

- The automated emails will be structured in a readable format, that will allow the client to search through various sources of media that include the keywords searched by them
- The client will have the option to request further a specific portion of the segments that may be specific to their searches
- This will also include working on the Options Page of the DigiClips website, based on the frontend search engine, which will allow the clients to select the specific parameters for their preferred methods of media recordings
- The options page will include a more user-friendly interface for the clients, which will allow them to precisely set their preferences, which will be reflected significantly in the automated email reports that they will receive

II) Graphical Representation of Data:

This project will study existing methods and design effective graphical representations of data for the DigiClips web dashboard, which will be available to DigiClips administrators and their clients in addition to the frontend search engine. When a customer searches for keywords or phrases from several sources of data, these graphical representations of data will incorporate the analytical components of the results retrieved from the search engine database. This graphical depiction will provide their clients with a greater opportunity to evaluate any mentions of the keywords. The graphical representations of data procedure is as follows:

- Segments of audio and video clips that are recorded will be regularly monitored to store the data in the database
- Data recorded from the segments will be formatted in an easy and readable manner that will further be displayed in the automated email reports
- When certain keywords or phrases are searched multiple times, a graphical representation of the data found in the database will be displayed on the online dashboard
- The graphical representation will include the media analytics reports of the data recorded from the various sources of media to display the when, where, costs, an viewer ratings of the competitor ads for the advertising clients
- Analytic Reports for other clients will include results of hit reports, viewership, audience numbers, length, and tone (negative, neutral, positive)
- These graphical representations of data will be reflected in the automated email reports, while keeping the client's preferred methods of media recordings in mind, and will also be reflected on the DigiClip's website, to regularly showcase a general history of recorded data.

2.2 Intended Users and Uses

I) Administrators - Bob Shapiro and Henry Bremers

Two of the intended users of this project are Bob Shapiro and Henry Bremers. Bob Shapiro is the Chairman of DigiClips Media Incorporated. Henry Bremers is the Senior Software Engineer in charge of managing DigiClips software. They are intended users for this project because they are administrators of DigiClips and the front-end search engine, which allows them to see how their clients have been interacting with the website. They are also the ones who will directly handle the tasks we will be working on for this project.

Key Characteristics and Needs Relevant to the Project:

- Produce results from Television, Radio, Newspapers, Magazines, Social Media, Blogs, Web Media, Cable TV, podcasts, YouTube, Sirius Radio, and additional internet scrapeable media to intensify the offerings provided to clients
- Generate automated media analysis reports to make DigiClips more profitable by serving more clients and automating as opposed to increasing their labor force
- Improve results and detail pages to include graphical representations of data in a user friendly way that highlights the searched keywords and phrases by the client
- Improve email alerts setup page along with more field testing to ensure it is working properly, such as delivering correct links and clips
- Update help page with ability to email questions, suggestions, and surveys

Uses and Benefits of the Product:

DigiClips will be more profitable if they have the ability to serve more clients in the industry by automating as opposed to increasing their labor force. Improving the structure of the results in the automated email reports along with displaying graphical representations of data from the recorded results will benefit DigiClips by providing more efficient results for delivering correct information to their clients. This will further improve the contents of the reports which will result in positive feedback and positive survey results.

II) The clients and users of the DigiClips Media Search Engine -

The DigiClips Media Search Engine is a front-end application that will be operated by DigiClips customers and clients and will be utilizing data produced by the project system. Aside from the administrators of DigiClips, the intended clients are the ones who need to be kept informed on the latest breaking news stories of subjects of interest to them to keep management informed. There are many clients that use DigiClips such as governments, universities, hospitals, companies, public relations firms, advertising agencies, researchers, and many more. The clients and the users are the second set of intended users of this project, as the aspects of this project are directly related to the media search engine, and the user interaction on the DigiCips website.

Key Characteristics and Needs Relevant to the Project:

- Search keywords and phrases from a specific source of media for a specific amount of time
- Request a certain duration of the recorded media from DigiClips to support their research
- Target certain audiences based on their keywords and phrases
- Understand how the data related to their search is being perceived by their audience
- Be informed on the latest breaking news stories of subjects of interest to them

Uses and Benefits of the Product:

- Clients will benefit from receiving automated email reports which will include links and clips related to their search query from multiple sources of media
- Automated email reports that will include the results and be presented in a readable format that will benefit the clients for their research purposes, as the segments will appear in the order of the monitored recordings
- Clients will be provided with a wide range of results from multiple sources of media
- Clients will be able to evaluate the results of their search query by viewing the analytical reports which will include results of hit reports, viewership, audience numbers, length, and tone (negative, neutral, positive)

2.3 Requirements & Constraints

I) Automated Email Reports

This project will look into existing solutions and create efficient automated email modules that will present the findings from various media sources depending on the keywords and phrases of interest in these segment recordings. This project will focus on upgrading the email alerts setup page through extensive field testing, allowing customers to request certain sections of the recorded segments depending on their preferences.

The **functional requirements** for the automated email reports are as follows:

- Create an automated reporting tool that conducts automated searches on the DigiClip's database to alert their clients when important information regarding their queries is retrieved
- Collect all new media information regarding searched keyword and/or phrase and send all relevant information to the respective client
- Create a readable format for the email being sent, such that retrieved information is presented with correct links to respective media sources
- Allow for easy transitions when clients want different types of data displayed

- Improve the “help” functionality in the email reports by adding proactive and/or contextual help to provide help without having to go to the help tab
- Organize the retrieved information in a more user-friendly report

II) Graphical Representation of Data

This project will look at existing solutions and create effective graphical data representations for the DigiClips web dashboard, which will be available to DigiClips administrators and their clients. The analytical components of the results revealed from the search engine database when a customer searched for keywords or phrases from different sources of data will be included in these graphical representations of data.

The **functional requirements** for the graphical representations of data are as follows:

- Retrieve data from media segments being searched
- What type of data are we looking for?
    - Viewer ratings on certain keywords wanting to be searched by the client
    - Sentiment analysis on the positivity or negativity towards certain keywords
    - Length of the requested media segments (Videos & Audios)
    - Competitor / Current client ads

General Resource Requirements:

The resource requirements will be used for both the parts of the projects, as these requirements will give us access to the previous technical documentation. The general resource requirements are as follows:

- **Github access to current production code**
    - We will need access to DigiClip’s production code to integrate the changes from this project
    - We will need access to GitHub to update the technical documentation for this project
    - We will need access to GitHub to update the Angular version from Angular 12 to Angular 13 for their production code

- **Access to Company VPN**
    - We will need VPN access to allow us to access the company portal to access important information and tools to assist in completing the project
    - We will need this access to see the workings of DigiClips to improvise the email reports, and the options page accordingly

Physical Requirements:

The physical requirements will be used for both the parts of the projects, as these requirements will allow us to implement the technical requirements for this project. The physical requirements are as follows:

- Regular communication between our group, the client, and the advisor
- Maintain proper technical documentation throughout the semester, to avoid any miscommunications
- Update the Angular version to keep the production code up to date

Aesthetic Requirements:

The aesthetic requirements will be used for both the parts of the projects, as these requirements will allow us to work on the user interaction for this project. The aesthetic requirements are as follows:

- Create user-friendly automated email reports, to easily organize the retrieved information from the database based on the search criteria
- Follow the general layout of other pages completed during the previous projects
- Displaying email alerts in a clean, readable format for companies to use
    - This can help with clients to utilize information set to them in a much more easier way
- Displaying graphical information in an organized, easy to read format
    - Allows for clients to understand comparisons being made between data points
    - Allows us as administrators to keep a record of these data points in a much more efficient way, so as an administrator there can be additional features that can be implemented in the future regarding this data

Constraints:

- Must follow various copyright laws that might be relevant when displaying clips and snippets of different media types
- System should be built without utilizing any costly APIs / cloud resources
- System should be built with documentation to explain usage and integration
- The developed system should be computationally efficient and able to run on a relatively underpowered computer
- The program should be able to operate quickly enough for customers to query data within 24 hours of recording

2.4 Engineering Standards

In this project, all standards and practices will be software focused. Specifically, for this project we will be using practices such as object-oriented programming as well as the following IEEE standards for software development best practices:

- **IEEE 830-1998:** Recommended Practice for Software Requirements Specifications
    - This practice is broken down into five clauses
        - Clause 1 explains the scope of this recommended practice.
        - Clause 2 lists the references made to other standards.
        - Clause 3 provides definitions of specific terms used.
        - Clause 4 provides background information for writing a good SRS.
        - Clause 5 discusses each of the essential parts of an SRS.

- **IEEE 829-2008:** Standard for Software and System Test Documentation
    - The testing process is used to determine whether certain development products of a task follow requirements.
    - Also test whether the software satisfies given requirements of the user
    - The testing scope is really big
        - Software-based systems
        - Computer Software
        - Hardware
        - Interfaces
    - This process is used for software that is being developed, maintained or reused.

- **IEEE/ISO/IEC 26531-2015:** International Standard for Systems and software engineering -- Content management for product life-cycle, user, and service management documentation
    - This standard gives requirements for efficient development and management of content produced throughout a project.
    - Our contributions to this project will need to be organized and easily accessed by other teams, our clients, and each other.
    - Everyone needs to be able to easily understand any additions or changes that have been made.

- **IEEE 1063-1987:** Standard for Software User Documentation
    - This standard provides minimum requirements on the structure and information content of user documentation
    - It addresses editorial and stylistic considerations only when they impact structure and content
    - Editorial and stylistic considerations are addressed only when they impact structure and content

3 Project Plan

3.1 Project Management/Tracking Procedures

The project management style that our group decided to adopt is agile.

Working as a team is a crucial part of agile. As cooperation is the key to success in an Agile Team, this enables for a collaborative atmosphere and, as a result, a lot more efficient work way. We aim to create a collaborative atmosphere not only with our group members, but also with our customer and adviser. We will be able to work quicker and more adaptably since we will be working iteratively, accomplishing one job at a time. This will also help us to ensure that we remain on track with the project's baseline.

Adaptability is another crucial project characteristic that our team desires. We may investigate the specified project objectives and devise a strategy to achieve them using an agile methodology. In the event of an impediment or possible deterrent, we may regroup our team and adjust to the situation. Taking changes into consideration in projects is critical, and with an agile project, this is especially crucial since it allows us to be more sensitive to change and flexible.

There are two subparts for our project, which are as follows:

I) Automated Email Reports:

The automated email reports might be built differently for each client using an agile strategy, as each client may have different preferences. As a result, we aim to address this topic with a broader viewpoint. To handle this challenge effectively, we'll need a variety of perspectives.

Thus, we are certain that we can overcome the hurdles presented by this assignment using an agile strategy. This also means that we will need to break down and reorganize the team assignments, as we progress through the semester.

II) Graphical Representation of Data:

These graphical representations of data might be structured differently for the clients or companies we deal with using an agile strategy. Again, from an adaptation standpoint, we must be prepared to account for this. When additional data becomes available in the future, this is another area where adaptation will be required. Because agile accommodates for adaptability, we feel we may adjust the project scope when we encounter certain instances. As a result, the overall project aim is only hampered a little.

We are aware that there would be several obstacles in the way of completing these difficult duties. As a group, we believe Agile is the best, and the most efficient way to approach software challenges like these.

Track Progress:

We plan to use multiple methods for tracking our project progress. Our main source of tracking progress will be GitHub, as that is where the current codebase resides. We also plan to use multiple communication platforms to ensure everyone is up to date with the current state of the project.

- **Git-** Git is an open source software of distributed version control such as tracking changes in any set of files. Our team plans to use Git to keep a track of the progress, as it is an important software development tool that will be used when we start implementing the code required for this project as a team. It will also allow us to coordinate work among ourselves collaboratively, while developing source code during software development.
- **GitHub-** GitHub is an internet hosting service for software development and version control, that is currently being used by our team and our client. DigiClips production code is stored in GitHub under multiple repositories, which will be accessed throughout the project. GitHub will also be used to track the progress of our team regularly.
- **Discord-** Discord is a VoIP and an instant messaging social platform that is currently being used by our team to maintain a direct communication line with our team members. It is used to communicate with team members about meeting schedules, project information, and other important information related to the year-long design project.
- **Outlook-** Outlook is a personal information manager web app from Microsoft consisting of webmail, calendaring, and tasks services. It is currently being used by our team as it allows us to communicate with our client and our advisor in an user-friendly manner via emails.
- **Trello-** Trello is a web-based, Kanban-style, list-making application, that will be used by our team, as it will allow us to make sure we are meeting deadlines in our project. It will also allow us to assign tasks to all the team members, and will keep track of the project requirements in an organized manner.

3.2 Task Decomposition

A task decomposition explains a specific job before decomposing it to characterize its aspects, such as the interface components utilized, length, errors, and feedback. Using the task decomposition approach, we will be able to divide the components of our project into smaller, more manageable aspects or sub-tasks for each team member. This procedure will allow us to conveniently allocate assignments while also assisting us with time management and workflow.

The subtasks generated by this decomposition process will be monitored on a regular basis and allocated to each team member on the Trello board accordingly. The sub-points that follow define the tasks that must be completed in order to finish the project.

- **Tasks in Automation Email Reporting:**
  - Scraping Web Data on text client want searched
  - Sentiment Analysis on Positivity of Media
  - Database connection to store media, or get client text information
  - Converting data found from the search engine, in a readable format to client
  - Figure out a way to automate email sending to client, once data is converted

- **Tasks in Graphical Representations of Data:**
  - Find APIs or libraries that can be used to create easy, readable graphs that the client can use for their own use
  - Store audio, and video clips pertaining to clients request to DigiClips' database
  - Develop graphs specific to the clients request, based on data obtained from media segments
  - Adapt for moving requests, when companies want different data points
  - Create a potential analytical report stating the trends that were found in the graphs

These two subtasks [Automated Email Reporting and Graphical Data Representations] are further subdivided into several tasks. When completed, all of these actions will contribute to our overall project completion goal. We will keep track of this information using software tools like Trello, but more importantly, we will create 2-week sprints of these activities ranging in complexity. This will allow us to graphically track our progress across the two semesters.

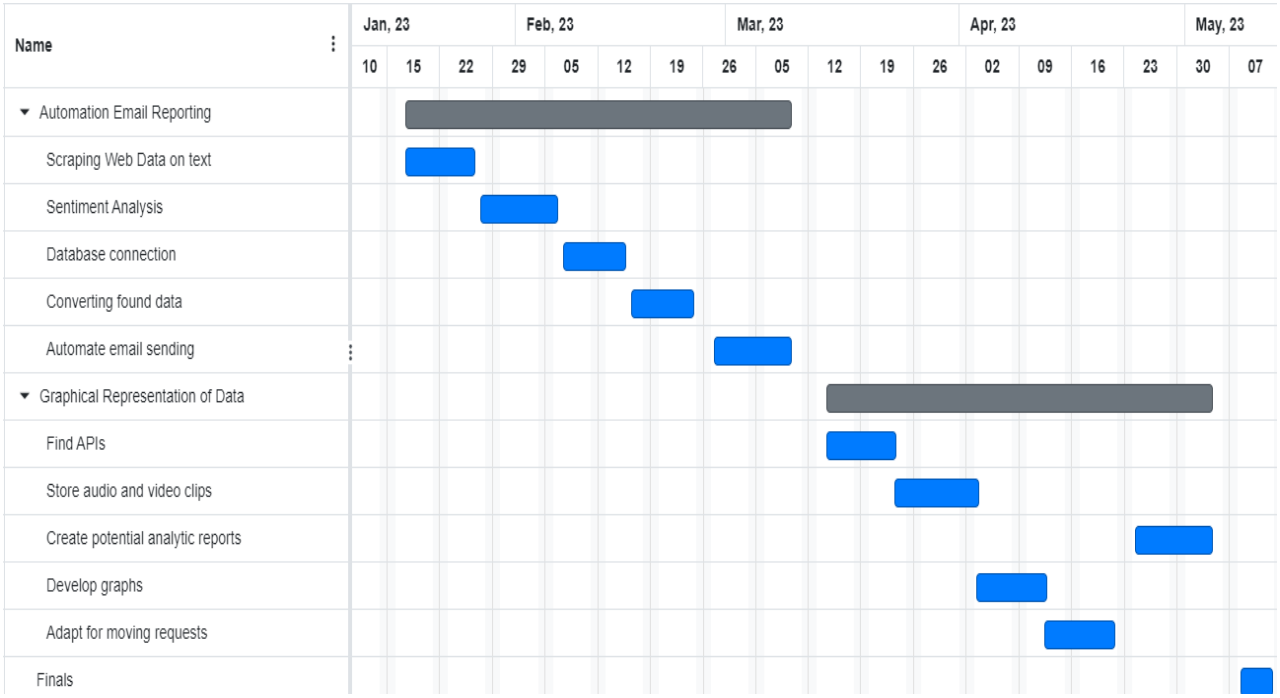
3.3 Project Proposed Milestones, Metrics, and Evaluation Criteria

Milestones/Completion Criteria:

- Segments taken from text hits will be parsed into readable formats.
- Segments taken from speech to text hits will be parsed into readable formats.
- All parsing algorithms will have 100% test coverage.
- Emails can be sent containing hit data to a customer.
- Emails will be automatically sent to a customer.
- Email automation script will have 100% test coverage.
- Hit data will be formatted to be consumable by graphing libraries.
- Clients will be able to use the front end's details page to select the data they want displayed.
- Details page will have 100% test coverage.
- Requested graphics will be displayed in automated emails.
- Graph creation scripts will have 100% test coverage.

3.4 Project Timeline/Schedule

Figure 1: Project Schedule



3.5 Risks And Risk Management/Mitigation

- **Automated Email Reporting:**
  - Converting data found in search engine to a readable format, may not be extremely accurate, and may result into incorrect automated email reports
    - Probability: 0.3
  - System may misidentify words, making it too inaccurate to be useful for the automated email reports
    - Probability: 0.1
  - Graphical representations of data may not be displayed correctly in the email reports
    - Probability: 0.5
    - Risk Mitigation Plan:
      - To mitigate this risk, we will compare our system's output with a standardized output to detect the system's accuracy. This will give us a better look at how effective our automated email report system is, as the graphics may not be displayed efficiently.

- **Graphical Representations of Data:**
  - Our project may not interface with the DigiClips database to effectively search the provided data
    - Probability: 0.4
    - Risk Mitigation Plan:
      - In order to avoid this risk, we would need to familiarize ourselves with the current DigiClips database structure. This will help us to design a method of storing data recorded from various audio and video clips pertaining to clients requests to the database.
  - Developing graphics specific to the clients request may not be completely accurate, or the analysis may not be complete
    - Probability: 0.4
    - Risk Mitigation Plan:
      - In order to avoid this risk, we would need to familiarize ourselves with how information acquired from various media sources can be converted into graphical representations, as

this may not display the information accurately. We would also need to have proper test coverage in place, that would constantly check the graphical representations in regards to the recorded information

3.6 Personnel Effort Requirements

Table 4: Estimated Work Hours

Task	Sub-Tasks	Estimated person-hours required
Automated Email Reporting	Scraping Web Data on text client wants searched	70
	Sentiment Analysis on Positivity of Media	50
	Database connection to store media, or get client text information	20
	Converting data found from the search engine to a readable format for client	100
	Figure out a way to automate email sending to client once data is converted	60
Graphical Representation of Data	Find APIs or libraries that can be used to create easy, readable graphs that the client can use	40
	Store audio and video clips pertaining to clients request in DigiClips' database	80
	Develop graphs specific to the clients request based on data obtained from media segments	50
	Adapt for moving requests when companies want different data points	40
	Create potential analytic report stating the trends that were found in the graphs	30

3.7 Other Resource Requirements

We will not require any other physical resources to complete this project. In terms of the digital resources, we need access to the existing code that DigiCips has pertaining to automated email reports and front-end search engines. We will also need access to the DigiClips database, backend code, and company VPN, in order to ensure that we are able to integrate our solutions with the rest of the DigiClips Media Search Engine.

3.8 Financial Requirements

The only financial requirement we have for this project is that our application should not use paid libraries or APIs. Our project will make use of free and open-source software.

4 Design

4.1 Design Context

4.1.1 Broader Context

For this project, we will be creating for media-visible communities. Data will be collected depending on runtimes, viewership, and other factors. However, this is only done for individuals that contact DigiClips and request their services. These clientele include, but are not limited to, advertising and attorneys. DigiClips and this project as a whole might assist anyone who wants to better understand their appearance in various media applications. The social need that our initiative solves is ensuring that timely information is available to a broad audience for individuals with significant time sensitive announcements to make, such as government officials.

Public health, safety, and welfare:

- Increasing the number of those who are well informed of important topics (COVID, international affairs, etc).
- Increasing safety during emergencies such as natural disasters.

Global, cultural, and social:

- Project could add a new standard of practice when it comes to marketing.
- Values of participating communities are followed.

Economic:

- Product creates opportunities for economic advancement.
- Product will need to remain affordable for clients, which in turn should help clients improve their reach and make more money themselves.
- Low risk as there will always be potential users no matter how big or small.

4.1.2 Prior Work/Solutions

With DigiClips the sole purpose of the company is to provide clients with important information about them regarding all media outlets. Media outlets are videos, social media, articles, journals, and anything existing on the internet. Clients request certain information that they want searched over all media platforms. The searched information is then reported in an efficient, clean manner to the client so they can use this data for their company purposes.

An advantage of using this product is that it allows the client to realize how certain products, practices, or services are being perceived in the world. It allows them to realize potential improvements based on the consumer market, and really allow the company to make changes to improve the efficiency of their processes.

A similar product that might exist in the market is Google. Google is the biggest search engine in the world, and can be used to find all information existing on the internet. So their information scope is very big. It allows other companies to maybe utilize Google as their source to obtain important information about their company.

With DigiClips, though, the information that is gathered is not just articles, and journals from websites. Rather, they track tv shows and other video content. They take content shown from videos also, and track the sentiment analysis, ratings, and consumer reviews on the certain videos taking place. Thus, with DigiClips it is a far superior search engine in the perspective of getting the most accurate up-to-date information on clients request. It really broadens the scope of information that the client can get in requests compared to other search engines available to the public.

4.1.3 Technical Complexity

The project has many sufficient technical components that make for a challenging but attainable outcome. The entire project has multiple administrative frontends, a few backends, recording machines running 24/7, multiple repositories, and a large and complex MySQL database. While the backend is written in C, the frontend uses several different languages. DigiClips has the sole purpose to provide clients with important information about them regarding all media outlets. Media outlets from videos, social media, articles,

journals, and anything else found on the internet. We have to be ready to find specific information throughout a large database.

The problem we are working with is to create a product that utilizes the search engine and the results to generate email reports, such that it allows the clients to alter the duration of the requested audio and videos clips to the length that they desire. These reports will also include a graphical representation of analyzed data of the results, which will be displayed to the clients and DigiClips. Creating automated email reporting and graphical representation of the data will have multiple components that will contain many challenges.

There are several subtasks here that will require searching through the complex database. The technical complexity includes an algorithm that will use a keyword and get segments from the specific media. Keywords allocated to the database that is sent to the clients need to be built in a format that is clear and understandable. The reports need to be able to obtain specific information that will be useful to the clients such as viewership, audience, numbers, statistics, length, and overall tone. Each of the tasks in this project will include some sort of technical complexity. Mainly going through large amounts of data and creating a document that accurately and clearly states the information that the client wants to know.

4.2 Design Exploration

4.2.1 Design Decisions

Based on the weekly meetings conducted with the clients, we practiced decision making when considering and defining what kind of data DigiClips is currently missing from their Frontend Search Engine, that would improve the feasibility of the search engine for their clients and users. After discussing with Bob and Henry, who pointed out that their automated email reports are not user-friendly, as not every information retrieved from multiple sources of media is easily displayed in the reports. They also pointed out that their current reports do not allow the clients to select the specific duration from the recordings to further narrow down their research. Aside from these email reports, their search engine currently does not display any sort of graphical representations that would allow their clients to get insights based on their searched words or phrases. Hence we decided to work on the automated email reports to make them more user-friendly by organizing how the multiple recordings are displayed in the reports, and also decided to include the graphical representations from the recorded data analysis.

Another decision we made during our design thinking process was related to the programming languages, to understand which ones would benefit the tasks for our projects. During our weekly meetings with Henry and Bob, it was disclosed that they use Angular, and Python for their code. Initially, we thought their C language would be beneficial for use to be used as a language for their backend, but we decided to stick with Python, as it has the libraries that would allow us to work on their required tasks for the project.

Another decision we made during our design thinking process was related to selecting the tasks we would want to work on for this project, and the main two areas were either working on their backend processes or their frontend process. During the weekly meetings, Henry and Bob disclosed the fact that their backend processes needed a lot of work, including working on video-to-text and audio-to-text tasks, which were discussed to be irrelevant to our majors, as everyone in our team is from the Software Engineering background, and not Electrical engineering. Hence, we decided to work on their Frontend Search Engine, as it would allow us to utilize multiple softwares throughout the project, and will allow everyone to build their skills set. This decision is important for the success of the project because in order for the project to be feasible, everyone in the team should be able to work on something that aligns with their skills and knowledge.

4.2.2 Ideation

During the decision making process, we held weekly meetings with Henry and Bob to discuss the potential tasks we could select for our project, to ensure that everyone in the team would get a chance to work on the project based on their experience and skills set being a software engineering student. Both Henry and Bob had disclosed various amounts of potential projects, which allowed us to select which project we wanted to work on.

The first method of solving this problem that was considered by our team members was to go through all the potential projects that were given to us by Henry, to narrow down our potential tasks. We initially thought that working on their backend processes would align with everyone's experience and skills set, as everyone in our team has had the opportunity to work on backend applications. But as we went through the list of projects under their backend processes, we realized that the majority of the tasks would be applicable for students majoring in Electrical Engineering, as it required certain technical skills and knowledge of hardware devices, that none of us had any experience with. Eventually, we discovered that many of the projects were not feasible for this project, and decided to further narrow down our list.

Once we realized that we needed to select certain projects that we feasible and valuable to our majors, we decided to have a meeting with Bob, Henry, and our advisor. This helped us to understand what kinds of projects we needed to select. It was disclosed that we could select multiple small projects, if we found them to be valuable to all our team members. We further discussed our options with Henry and Bob in regards to their backend applications, and decided to see how their backend actually works before we made any more decisions. After brainstorming all the possible options, we decided that working on their backend applications may not be productive for us, as it would have been impossible to get the project up and running by the end of this course.

At this point, we were already aware of the fact that we would not be working on any of their backend applications. So we began to consider working on their frontend search engine, as it proved to have a lot of potential, and aligned with everyone's experience. We participated in another brainstorming session and held a meeting with Henry and Bob, to discuss any potential projects for their Search Engine. We narrowed down our potential projects to automated email reports, graphical representations of data, editing recorded sources of media, and adjusting the time to monitor the media sources to include them in their email reports.

Now that we had our narrowed down list of potential projects, we planned to access DigiClips remote machine, to understand the working of their search engine, and asked them to send us an example of their email reports to have a better understanding. We further utilized multiple other online resources, to see how these email reports could potentially be more user-friendly, and how we could further organize the recorded information on the automated email reports. We also researched how we could include graphical representations of the data analyzed on these recordings to increase the user experience as well.

Now, finally, our design for the automated email reports will have more user-friendly features, such including many more sources of media recordings, integrating an extensive help page to allow the users or clients to easily access all the information, integrate a feature to allow the clients to listen or see specific portions of the recordings based on their search words and phrases, integrate graphical representations that would indicate the public response and reaction to the words and phrases they have searched. All these features will vastly improve the user experience for the clients that use DigiClips and will increase the amount of data that the search engine's users can access.

4.2.3 Decision-Making and Trade-Off

When tackling the decision of what projects to take on, we weighed our personal abilities and experiences. While Aashish's internship experience made him very familiar with managing backend, he wanted to work on something new. Elijah also wanted to gain new experience, with an emphasis on testing. Grace, Khushveen, and Matthew, all wanted to work with their frontend experience. This led us towards choosing frontend projects over backend projects. While we may not be utilizing Aashish's strengths, Elijah and him gain exposure to typescript and angular, while the other members will be able to further their skills and help the less experienced members along the way.

The next decision we had to weigh was which frontend projects to take on. After deciding to work on a frontend project, our options were to contribute to the automated emails, result options page, result details page, or creating the detailed reports. After discussing the workload of each option, we began to consider contributing to all of them, rather than selecting a singular option suggested to us. While doing individual parts would be less

work, we feared that only working on an individual feature would not be a sufficient challenge to the value that our team provides. After confirming with Bob and Henry, we decided to give ourselves the challenge of tackling everything on the frontend side.

4.3 Proposed Design

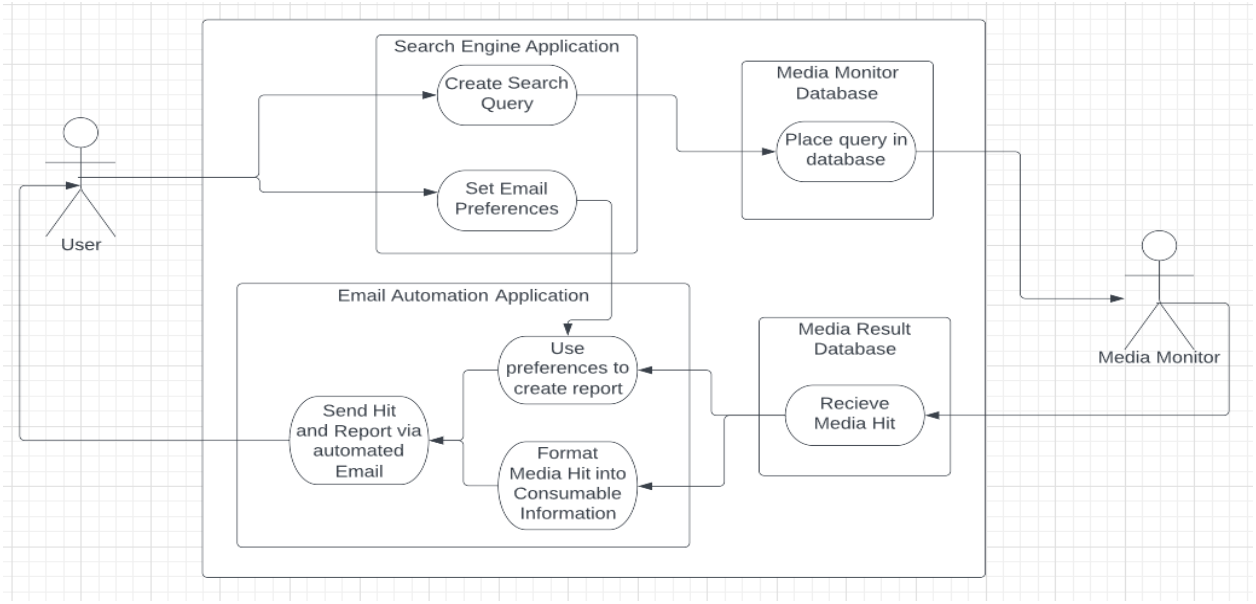
4.3.1 Overview

The design for our application will have four different services that will interact with one another: a central search engine, a media monitoring database, a media result database, and the automated emails application. First, the search engine will take a search query and email preferences from the user to process them as they come in, sending the query to the media monitor database which will run the query through the entire database to find matches for the query from multiple sources of media, which will then return the matches to the media result database as a “medit hit”. Once the database receives the media hits, it will automatically generate an email report that will utilize the email preferences that were set by the user, and will format the results in a user-friendly format with media links and graphical representations of that data analyzed based on the hits received. Lastly, the automated email report will be sent to the respective user. This cycle of processing the query will continuously generate everything a user submits a search query on the search engine application.

This project design will capture all the necessary processing in one single application to ensure that the search engine is capable of receiving and storing the search queries and the email preferences in the database. Then, once the data is stored in the database in a searchable manner, it will vastly increase the productivity of the result hits and the creation of the automated email reports.

4.3.2 Detailed Design and Visual(s)

Figure 2: Design and Visuals



Search Engine Application:

The search engine is a web application in which the user will interact with. The user is able to search for a specific query and set their email preferences. The application is written in TypeScript and runs on AWS (Amazon Web Services).

Create Search Query: The user will use this to search a specific topic for the media monitor to listen for. This query will be sent to the media monitor database.

Set Email Preferences: The user will be able to select various options pertaining to emails containing the results of their search query. This includes the frequency in which emails are sent and different details to be contained within the reports

Frequency Options:

- Receive email once a day.
- Receive email once a week.

Report Detail Options:

- Include full media hits
- Choose type of media to monitor
- Include media statistics
- Include media connotation (positive, negative, or neutral)
- Include how many times the query was mentioned over a given time period

Media Monitor Database:

Queries put into the search engine will be put into a database for the media monitoring system to reference.

Media Result Database:

When the media monitor finds a result of a query, the segment and information about the segment will be put into the database. The information will include where the media came from, the time in which the hit was found, and how many viewers were consuming the segment.

Email Automation Application:

This application will run once every 24 hours to send emails requested by digiclips clients.

Report Creation: Based on what the user selected in their preferences, a custom report will be created detailing hit information.

Media Hit Format: The result of the media search will be put into a consumable format. The result will include context before and after the query was found.

Sending the Email: After all formatting is complete, the user will receive an email based on their set preferences.

4.3.3 Functionality

The goal of the overall design is to have a user, someone who may appear or expects to be seen in any media outlet, request that DigiClips helps monitor the user's involvement in any media. The user then gets a report on any specific media that they requested information on if that information was to appear in the media.

To begin with, the user has contacted DigiClips and has requested that they monitor specific information, otherwise known as the key. After contact with DigiClips, two things will immediately happen involving the search engine. The first is a database will have a query to store monitored key information to the specific user. The second is that the user sets their email preferences. They make requests for the format of key information.

The user can request many different ways to format the information based on the specific information they are looking for. The user can set the preferences of the email reports to be periodically or every time the media monitoring gets a hit on the key. The user can request that the report contains viewership, audience, numbers, statistics, length, and overall tone as well. The use of these email preferences is used later to help create the report.

After both the queries and preferences are set, the media monitoring will search all public media for the information until a hit is found. A hit means that the information has been found at some location in the media. Once the search engine application and media monitoring find a hit, a few different things happen. The email automation application will take the user's preferred email preferences and then format the information from the queries into consumable information. The report will then be sent to the user to allow them to do what they want with the information report given.

The entire design acts as a loop. The user interacts with the search engine application. The media monitoring application will receive information from the search engine application and use it to find specific hits from the many media outlets. A hit found from the media outlets will be put in the database and formatted to match the user preference and sent to the user. The cycle will then begin again.

4.3.4 Areas of Concern and Development

The current design satisfies all requirements and user needs as they are currently defined. However, there may be adaptations or changes that will need to be made along the way depending on any issues we encounter.

Our primary concern for delivering a product that addresses requirements and meets user and client needs is the connections that will need to be made between each teams' code. We will all essentially be working on the same code base at the same time, making it difficult to implement our portions with those that are being worked on simultaneously. This, in combination with only one full time software employee at DigiClips could definitely slow us down in some situations.

We will need to make sure that we keep an open line of communication between us and DigiClips as well as the other schools' teams we will be working closely with. We will need to be timely with our questions as they come up and persistent in getting answers as well.

4.4 Technology Considerations

With DigiClips, some technologies that we are working with are AngularJS, MySQL.

The strengths of using a language like Angular is that it has improved speed and performance compared to other javascript frameworks. It can also lead to a faster development process as there is detailed documentation, the code structure of angular is readable and testable, and is super efficient in the problem-solving patterns that programmers usually face.

With documentation, the angular developers made sure to give examples of many different coding scenarios when using the language Angular. This can help us out in many cases when we attempt to code this project.

With readable and testable code, Angular uses modules and component structures which break down your application in different layers. This can help in the development process, especially testing where you are able to test every code unit in an effective manner.

With problem-solving patterns Angular has dependency injections built in. This can allow us to create objects, dependent on other objects hence leading to the overall design pattern to be more simpler. It allows improvements in the modularity and efficiency of the software we are trying to write.

A negative aspect of using Angular is that no one in our group has had experience with it. Whether it was at Iowa State, or professional experience such as internships. So being able to have the eagerness to learn Angular, and study the differences that are included to other JavaScript frameworks such as NodeJS and React is absolutely vital if we want to find any sort of success with this project.

With MySQL, everyone in the group has had some sort of experience working with it. We as a group believe the strength of using mySQL is that it is a reliable database language we can use. We know how to create queries, connect to a database, and most importantly feed data that we find relevant to the database system.

A negative aspect of using mySQL might be performance issues. MySQL is saddled with high overhead, so this means that it cannot deliver optimal performance. But from the perspective of storing the data mySQL is probably the best database language to use in our scenario.

4.5 Design Analysis

For this project, our team has currently spent time working on understanding the logistics of Angular. We are understanding the syntax with Angular, and learning the different libraries and testing frameworks that are supported with the Angular functionality.

From the building and testing perspective there is still a lot of work to be done. Our client gave us access to the codebase we are using to build the software. We were able to access the current interface of the software, and explore all the different functionalities that are currently available. But, for our project of email reporting we still believe there is a little more planning needed before we start coding this project.

We are also working with multiple different schools, so having the patience of waiting and understanding when it is appropriate to develop our design is important. We believe that the design flow shown in 4.3 is the optimal flow we want to follow to solve the email reporting problem. Though the diagram is very simple to follow, there are many details hidden within the layers that we have to account for when building this email reporting software.

With the Search Engine application we want to make sure that every client sets up email preferences for when they want information sent. Also to what email addresses they want this information sent too. Also we need to create search queries that are optimal to retrieve the information the client wants.

With the media monitor database we store these queries, so that when media is being recorded and that data is being sent to another database these queries are waiting and will trigger hits when data starts piling on the query requests.

Once the queries retrieve hits of media information, we retrieve this information and develop a readable report that explains the information being found. This can allow the client to understand what is going on based on the queries they wanted to search and take their own action based on this information.

From a design flaw perspective, we haven't started coding for this project to know whether this whole design we created will follow a steady process. Some potential flaws that we can find are the performance of using SQL to retrieve, and send data to the database. This might take additional time which can reduce overall performance of the software.

Furthermore, the sentiment analysis to analyze the positivity of the information retrieved could be flawed. There could be times where certain articles that are found can be portrayed negatively by the AI, but actually be a positive article. So we would have misrepresentation of data being sent to the client.

Finally, one more design problem might be how to format the given media information to an easy, readable format if the information given is not quantitative. For example if we did a query on Google customer ratings, and one customer said "I love using the google search engine". How can we display this data to the client? We can tell the client that this customer was satisfied with the product, but is there any additional information we can draw from qualitative observations that can help the client

5 Testing

5.1 Unit Testing

For unit testing, we will divide the unit testing into four different units, depending on the different phases of the search engine frontend application. Specifically, for the search engine application, we will be utilizing Jest, a delightful Javascript Testing Framework with a focus on simplicity, which will reduce the issue of general unit tests that do not provide accurate results when run on the frontend side of any software, by allowing us to write faster, more effective front-end tests. This testing library, along with the necessary program models, will be the main parts of the unit tests. Since there are multiple aspects to look into with the search engine application, there are a few key areas where we will be primarily

implementing unit testing to ensure an accurate result. We will also be utilizing Cypress, a modern web automation test framework designed to simplify browser testing. Since it is more than just an end-to-end test automation tool, we will be to create a series of tests that will confirm the smaller and more testable individual functions, such as saving the information provided by the clients to set their preferences in regards to their automated email reports, which will be based on the keywords they have searched. Both of these testing libraries will simultaneously be used for the automated email reports that we will test by manually including the recorded results for the database, into the reports, to ensure that all the media sources are being represented in a user-friendly manner, with accurate links.

Alongside with this, we will be testing the automated email reports portion of our application through manually creating a small set of test cases for a small variety of media sources, which will be manually recorded and be stored in the search-engine backend, alongside with the responses received from the clients. Now, given that we are developing our project in an Agile sprint-style development cycle, we will be performing regression testing as part of our unit testing to ensure that as the features are being added to the frontend application, previous implementations, such as the advanced search options,and the help page, are not affected. To do this accurately, we will be able to keep a large set of test cases for the system as a whole, and continue to run these preliminary test cases as the new features are added.

5.2 Interface Testing

Our interface testing will primarily consist of confirming that the microservices are working as expected across various inputs presented by the client using the search engine application. In order to test all of these microservices, such as the user interacting with the search engine application, and the application recording the users' preferences for the automated email reports, we will be performing API testing using the endpoints. This will require performing HTTP requests with various input parameters, similar to the ones in the search engine application, and checking for accurate responses and error reporting, as all of this will solely be responsible for presenting the results on the automated email reports.

Once we have completed development on combining the automatic email reports and the graphical representation of data into one system for the search engine frontend application, we will do a significant amount of interface testing. At this stage, we will verify not only the accuracy and functionality of the features, but also the accuracy with which the captured data is stored in the database. Because our system will be writing output data to multiple distinct database tables, we will need to perform testing to ensure that the data format for table columns is correct, as well as checking to ensure that the content for each column is accurate based on the raw output from the multiple recorded media sources.

5.3 Integration Testing

Some of the critical integration paths include but will not be limited to:

-users can search within the search engine portion of the website

-users can set their preferences for email alerts (ex. where they are sent, how often)

-search engine can send search queries to the database

-search engine can send email preferences to email alert system

-email alert system can access the database

-email alert system can receive the search engine data

-email alert system can send an accurate report to user

We should be able to stick to using Protractor and Cypress for integration testing.

For frontend Angular work, Protractor should help us out with testing by making sure our web pages work correctly for users in their browsers.

For the email alert systems, Cypress should be able to help us make sure that emails are being sent at the correct times with accurate information included in them.

5.4 System Testing

For system testing, the focus will be set on the users' interaction with the system itself. As mentioned above, the work done within the search engine can mainly be tested using Protractor since the web application is Angular based.

The user needs to be able to easily understand and interact with the search engine interface. This mainly includes the ability to search and the ability to set user/email preferences.

Because of the nature of user interaction, we may also recruit some kind of test users that can give us feedback on the user experience and related ideas. This would be much more beneficial to our project instead of trying to manually test on our own. If we develop the application, we will already know how everything works and is laid out, making it not very beneficial to act as though we are new users. We would definitely not catch everything.

5.5 Regression Testing

We strongly believe that with regression testing, at least the tests that we write, should successfully identify breaks in the code whenever new integrations are introduced. This will allow for effective software development procedures to be used in the future.

Since one of the main testing libraries we are using is Cypress, we can use this testing software to ensure that breaks in codes are announced in a loud manner. With Cypress

testing it allows you to write the functional tests, but also visual tests so you can test for regressions in two perspectives.

With functional tests we can test for inputs such as SQL statements, making sure data is being set properly to the database, ensuring email structures are being built properly, and also testing the process of how graph visualizations are built. These are some of the main components of the functional, that we can easily test with a library like Cypress.

With the visual tests we can test different parameters on what the user is seeing. We can redirect to different sites, or locations that the client can see and make sure the information that is displayed to them is correct. Whether it is seeing if their email is in the correct location and format, or the graphs being displayed in a readable manner - we are able to write tests that make sure that when new integrations are in place that no changes are made to the visual design of the application.

5.6 Acceptance Testing

When we talked with our client, and groupmates about the acceptance testing, what we realized is the importance of meeting requirements. In the functional design document where we listed the functionalities and core compatibilities we think are important in making sure that functional and non-functional requirements are met.

How we thought of meeting these requirements is by testing each component we implement individually. Another testing idea we had was to write tests before we actually implement the functionalities. This way we know what requirements we are forced to cover when we code this project, and it really will allow us to follow the path of achieving the functional and non-functional requirements that the client gave to us.

The four main requirements that we have with our client are as follows:

- **Search Engine Application**
    - Develop Search Queries
    - Set Email Preferences
- **Media Monitor Database**
    - Place queries into database
- **Email Automation**
    - Gather data from database that is relevant for client
    - Format emails in a proper, readable format
    - Send the automated emails to the given clients
- **Media Result Database**
    - Create appropriate scanners that scan through all media platforms used by DigiClips to gather media hits

We involve the client with our acceptance testing by listing the criteria that we implemented based on the previous meetings we had discussing the requirements. We show the tests that we implemented mock the key components of the requirements. This would mean showing the functional, and visual tests that really demonstrate the key functionalities needed for this project.

5.7 Security Testing

DigiClip's front-end search engine is accessible to clients outside of the administrators, which is why measures to prevent SQL injection and data leaks are essential. Multiple tests will be enacted to ensure that our security measures are properly functioning.

The first level of security testing will be in the form of unit tests. The tests will attempt to exploit the following security vulnerabilities:

- The use of malicious statements in the search engine to gain access to unauthorized information
- The use of viewing API result calls to get information that is not necessary.

This will ensure that the application will continuously not fall victim to these attacks.

The next level of security tests our team will be performing is penetration testing. We will request that security experts attempt to gain sensitive information from the search engine page. If vulnerabilities are revealed, our team will secure these vulnerabilities and add unit tests to ensure they continue to work. This will ensure the safety of DigiClips data.

5.8 Results

Our tests will be considered successful if our results match the diagram shown below. The goal of our tests is to have each component interact with each other and work all the way through the cycle. First, the results we expect from the unit testing is to successfully have the applications working. The result will be that search queries are created, email preferences can be set, and automatic emails. The interface results should result in the emails being formatted correctly. The integration and system testing should result in showing that each component works together. For example, if the user makes a search query then they will get an email. If the components communicate and all the correct information is sent between applications, then the results will be a success. Regression testing will result in any new functionality identifying breaks and are easy to see. The acceptance testing will ensure that our tests have allowed us to meet the requirements we have discussed with our group and with the client. And lastly, the security testing will result in showing any vulnerabilities in the applications so that we can fix those issues and prevent many other vulnerabilities.

6 Implementation

Table 5: Tentative Schedule

Task	Implement By
Parse text hits into usable format	2/3/2023
Parse audio hits into usable format	2/17/2023
100% test coverage of parsing algorithms	2/17/2023
Send emails to customers containing hit data	3/3/2023
Automate sending of emails to customer	3/10/2023
100% test coverage of email automation script	3/10/2023
Hit data automatically graphed into useful metrics	4/7/2023
100% test coverage of graph creation scripts	4/7/2023
Details page allows clients to select what metrics they would like on their requested hit	4/28/2023
100% test coverage of details page	4/28/2023
Requested graphs and other data requested by the client will be displayed in automated emails	5/5/2020

7 Professional Responsibility

This discussion is with respect to the paper titled "Contextualizing Professionalism in Capstone Projects Using the IDEALS Professional Responsibility Assessment", *International Journal of Engineering Education* Vol. 28, No. 2, pp. 416–424, 2012

7.1 Areas of Responsibility

Table 6: Areas of Responsibility

Area of Responsibility	NSPE Canon	IEEE-CS/ASM Code of Ethics (SE)	Difference
Work Competence	Perform services only in areas of their competence; Avoid deceptive acts	Software engineers must participate in lifelong learning regarding the practise of their profession	The SE code of ethics for work competence does not differ greatly from the NSPE except for the fact that they state that engineers should participate in lifelong learning in regards to their practise
Financial Responsibility	Act for each employer or client as faithful agents or trustees	Software engineers must be fair and supportive of their colleagues and must act consistently with the public interest	The SE code of ethics for financial responsibility is slightly different from NSPE in regards to the fact that they should also be fair and supportive of their colleagues
Communication Honesty	Issue public statements only in an objective and truthful manner; Avoid deceptive acts	Software engineers must maintain integrity and independence in their professional judgment while promoting an ethical approach	The SE code of ethics for communication honesty is not that different from NSPE as they also state that they should be honest in their work, and should honestly commit to their work
Health, Safety, Well-Being	Hold paramount the safety, health, and welfare of the public	Software Engineers must take an ethical approach in accordance with their commitment to the health, safety and welfare of the public	The SE code of ethics for health, safety, and well-being in not at all different from that of NSPE
Property Ownership	Act for each employer or client as faithful agents or trustees	Software engineers must ensure that their products meet the highest professional	The SE code of ethics states that software engineers should ensure that the respect others

		standards while being fair and supportive of their colleagues	ownership but should also work on their own products with the highest professional standard
Sustainability		Software engineers must subscribe to and promote an ethical approach to the management of software development and maintenance	The SE code of ethics for sustainability states that they need to be true in their practise, and should continue to maintain their practise
Social Responsibility	Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession	Software engineers should act in the best interests for their client and employer consistent with the public interest	The SE code of ethics for social responsibility is not that different from NSPE as it also states that need to continue their practise in regards to the public interest

7.2 Project Specific Professional Responsibility Areas

Table 7: Professional Responsibilities

Area of responsibility	**Level of Importance**
Work Competence	Medium: Because we have not been able to work much on this project yet, we are not performing as well in this area. However, we are doing our best to keep this up when it comes to our class assignments and team meetings.
Communication Honesty	High: We meet with our clients every week and make sure that we are always transparent with them and keep them updated with where we are at. In turn we get the same from them.
Property Ownership	Medium: Not all of our team members have signed our agreement with DigiClips. However, we are and will continue to follow the statements included in it.
Social Responsibility	High: Because this is the basis of our project as a whole, it is very easy to always be working towards social responsibility no matter what kind of work we are doing.

7.3 Most Applicable Professional Responsibility Area

Table 8: Applicable professional responsibilities

Area of responsibility	Level of Importance
Work Competence	Medium/High: We need to deliver high quality work that will be able to be used by the clients of DigiClips. They will not want to work with slow and buggy software or inaccurate data.
Financial Responsibility	Currently Low: We as a team are not responsible for any financial aspects of the project and our work will most likely not affect/increase the costs that DigiClips encounters either.
Communication Honesty	High: We must communicate honestly with each other and our client in order to stay on the same page when it comes to tasks, roadblocks, information being shared, etc.
Health, Safety, Well-Being	Medium/Low: The project needs to keep the information of DigiClips and their clients safe. It also should be easy to use and not affect users safety or well-being in any way.
Property Ownership	Medium/High: We must keep DigiClips' source code, passwords, work flows, etc private. We have signed a specific agreement for this and it is always best practice when working with companies.
Sustainability	Currently Low: Right now, this project is pretty small and is not used by too many in production. If DigiClips has any significant growth, then the sustainability and scalability would need to be more closely monitored.
Social Responsibility	High: The whole point of our project is to benefit different communities that are visible in the media. By receiving data from DigiClips, they are able to look at it and adjust their marketing strategies as needed.

8 Closing Material

8.1 Conclusion

Our team has worked closely with DigiClips to create and develop an initial plan to complete the project we have been assigned. Our goal is to create an element of automated email reports and user friendly graphical representations of data that will use self-developed and open-source software, which in the end will be incorporated in the DigiClips overall system, allowing them to monitor the automated email reports which will be sent to the clients on a regular basis, based on their set preferences of how frequently they want to receive the automated email reports. The graphical representations of data will be

incorporated into the automated email reports, and into the media search engine, that will be utilized by the clients and their users. Currently, after conducting thorough research and regular meetings with the client, the best plan of action that we currently have is to develop each element individually, test the element, and then incorporate them into one product which can be used by the system in place at DigiClips. This solution, using Angular and SQL with different open-source software will be the most reliable option with the given requirements.

8.3 References

Bock, Tim. "Automatically Write and Email Reports with R, Sendgrid, & Displayr." *GreenBook*, 4 Dec. 2020, https://www.greenbook.org/mr/market-research-technology/automatically-write-and-email-reports-with-r-sendgrid-displayr/.

Tu, Xiaoyun. "Data Reporting: How to Create a High-Quality Data Report." *Venngage*, 24 Feb. 2022, https://venngage.com/blog/data-report/.

"Contextualizing Professionalism in Capstone Projects Using the IDEALS Professional Responsibility Assessment", *International Journal of Engineering Education* Vol. 28, No. 2, pp. 416–424, 2012

"The Code Affirms an Obligation of Computing Professionals to Use Their Skills for the Benefit of Society." *Code of Ethics*, https://www.acm.org/code-of-ethics.

8.4 Appendices

Appendix A: Helpful links

Here are some links that provide more reading on the technology that we are utilizing in our project:

I. Angular v15: https://angular.io/guide/update-to-version-15
II. About DigiClips: https://sourceforge.net/software/product/DigiClips/
III. Database Management (SQL): https://datacarpentry.org/sql-ecology-lesson/
IV. Angular APIs: https://angular.io/api
V. Backend Communication: https://angular.io/guide/http

8.4.1 Team Contract

Team Procedures:

1. Day, time, and location (face-to-face or virtual) for regular team meetings:

    - **Team meetings** - Team meetings will be held weekly on Thursdays from 1-2PM.
    - **Client meetings** - Client meetings will be held weekly on Tuesdays from 2-3PM virtually through Google Meets.
    - **Advisor meetings** - Advisor will attend team meetings on Thursdays from 1-1:30pm virtually through Zoom.

2. Preferred method of communication updates, reminders, issues, and scheduling (e.g., e-mail, phone, app, face-to-face):

    - **Within the team** - The preferred method of communication within the team is “Discord”. Although, we will also have face-to-face meetings whenever required.
    - **With the client and advisor** - The preferred method of communication with the advisor and the client is through email, as well as our virtual meetings.

3. Decision-making policy (e.g., consensus, majority vote):

    - Everyone on the team is welcome to propose ideas. Based on these ideas, we will have a vote within the team, and if the majority agree with the proposition then we follow through. This is to ensure that everyone on the team is on the same page, to avoid any future conflicts.

4. Procedures for record keeping (i.e., who will keep meeting minutes, how will minutes be shared/archived):

    - We will be using google sheets within our shared google drive to monitor the meeting minutes. Team members with this responsibility will rotate. All of the necessary documents required for this design project are saved in our Google Drive. When it comes to technical requirements such as code, the DigiClips Github will be our primary storage system.

Participation Expectations:

1. Expected individual attendance, punctuality, and participation at all team meetings:

    Everyone is expected to be in attendance, and participate at team meetings.

    - If someone cannot make it, it is that person’s responsibility to notify the team and make up for any work missed. If someone is unable to attend the meeting

in-person, they should make sure that they stay in contact with the team members through Discord and reference team meeting minutes, to ensure they know what was discussed during the meeting.

2. Expected level of responsibility for fulfilling team assignments, timelines, and deadlines:

   Everyone is expected to finish their parts of team assignments, and follow strict deadlines.

   - If this rule is broken, we will reiterate this expectation to the person guilty. We will also make sure to talk to the person to understand the reason behind their negligence, to ensure that there aren't any excruciating circumstances.
   - If this becomes a common occurrence even after communicating with the person, the team will go to the advisor for further consequences, and to come to a conclusion as to what needs to be done.

3. Expected level of communication with other team members:

   Everyone is expected to be actively communicating in Discord, as this creates a very helpful and collaborative environment.

   - If this rule is broken, we will make sure that we initially try to use other methods of communication with that person, to see the reasoning behind their missing participation. If there is no response, we will make sure to talk to the person during the class, to remind them of how important it is to actively communicate with team members.
   - If this habit continues during the semester, we will make sure that the higher authorities are informed, to ensure that the person faces the right consequences, for not actively communicating and collaborating with the team.

4. Expected level of commitment to team decisions and tasks:

   Everyone is expected to show commitment towards team decisions, and team assignments.

   - If someone in the group is not showing commitment towards team decisions, and team assignments, we will initially try to communicate with the individual to understand the reasoning behind their lack of commitment.
   - If we are not able to resolve the issue after thorough discussion, we will make sure to involve the advisor and the professor, to make sure that the necessary actions are taken and to ensure that the project is still successfully completed.

Leadership:

1. Leadership roles for each team member (e.g., team organization, client interaction, individual component design, testing, etc.):

Aashish Komaragiri- Team engagement officer
Elijah Shelby- Testing
Grace Rasmussen - Team organization
Khushveen Umra - Advisor interaction, and Individual component design
Matthew Karmelich- Client interaction

2. Strategies for supporting and guiding the work of all team members:

- The Team Engagement Officer's main role is to assist the team, and assign roles whenever deemed necessary.
    i. When someone has numerous tasks on hand, and another person has no responsibilities, the Team Engagement Officer will move tasks to make sure the workload is equally divided amongst each individual.
- We will also assign tasks based on the strengths of individuals, so we accomplish assignments in a more efficient manner.
- Team members will also be responsible for actively communicating with the team to let them know about their progress on the assigned work.
- If someone in the team is unable to complete their assigned task due to sickness or any other circumstances, once they communicate with the team, everyone will try to help them if possible, to ensure that the assignment is completed before the due date.

3. Strategies for recognizing the contributions of all team members:

- Spreading positive feedback when individuals in the group perform beyond expectations or complete their work on-time to the best of their ability. Team members will make sure that everyone receives credit for their contributions and work.
- When seeing work done poorly, it is our job as a group to talk to the specified team member and give them constructive criticism, without degrading their work.

Collaboration and Inclusion:

1. Describe the skills, expertise, and unique perspectives each team member brings to the team.

Aashish Komaragiri - I have worked with backend development, using Java, Spring Boot, mySQL. From the front end perspective, I have a little experience with react, javascript and css. Some external knowledge I have is using linux, and project management tools such as

JIRA or Trello. From a group working perspective, I have had two internships, and have done two group related software project classes so I am familiar with the group expectations that are required for me. I'm someone that is motivated, and engaging in a group atmosphere, so I am definitely super excited to work on this team project the next two semesters.

Elijah Shelby - I have worked with both frontend using Javascript, react, and css and backend using Java, Spring Boot, and mySQL. When it comes to group projects, I have worked with three different groups in three different classes. I have great time management, planning, and communication skills and my drive to have complete work has helped motivate me to turn in work that I can take pride in.

Grace Rasmussen - I have been able to work quite extensively with front end development, specifically with react, javascript, and css. I have a little bit of experience with various other skills including mySQL, embedded programming, linux work, etc. However, I am nowhere near as comfortable in these areas. I am a very organized, responsible, and detail oriented person. This should help the group stay on track and give them some insights to problems that they may not think about initially.

Khushveen Kaur Umra - I have worked with Fronted Development, using JavaScript, React.js, C, Android Studio and Visual Studio. I have also worked on projects where I used Java, C++, HTML, mySQL, JSX, and Unix/Linux. From a group working perspective, I have had an internship where we used Github, JIRA, and Teams to actively participate with team members, and know how group expectations work. I have worked with different groups of people for my team-based classes, and have had the opportunity to grow my skill set. I have great communication skills, and time management skills.

Matthew Karmelich - In addition to my college education, I bring a year and a half of professional development experience from John Deere Financial, in which I gained experience in Node.js, Typescript, React, and their respective testing libraries. I also have gained soft leadership skills through coaching fencing and leading group projects.

2. Strategies for encouraging and support contributions and ideas from all team members:

- All communication within the team is publicly accessible to all team members.
- Making sure that every question is answered. If team members are unsure how to respond, they should clarify that as a response. Furthermore, the person asking a question should be sure to specify who the question is directed towards (the entire group, an individual, multiple individuals)

- When a new idea is proposed that affects the entire team, the entire team will be consulted. If thoughts are not shared by an individual, those proposing the idea are responsible for seeking that individual's feedback.
- Let meeting times be known, even if the meeting is not relevant to all individuals in the case that they would like to be involved.

3. Procedures for identifying and resolving collaboration or inclusion issues (e.g., how will a team member inform the team that the team environment is obstructing their opportunity or ability to contribute?)

- If someone in the team is not able to contribute to the team due to any circumstance, they should make sure that they inform the team well in advance to ensure that the work is completed before the due date.
- Everyone in the team should have assigned tasks in a given week. The team engagement officer will be assigned with the task of ensuring this. If a team member does not have an assigned task, the team engagement officer will inform the team so that a task for that person can be found
- Team members should do their best to self assign themselves. If they are unsure about what to do, the team should be notified well in advance, to avoid missing the deadlines.
- If a team member is struggling with a task, they are encouraged to reach out to the rest of the team for assistance.
- If a team member notices that another team member seems to be struggling, they should do whatever they can to help that team member within reason.
- If task assignment is perceived as unfair by a team member, the issue should be brought up to the rest of the team. This is assuming all members want to do an equal part. If that is not the case, the advisor will be contacted.
- Discord will be used as the primary method of communication for identifying and resolving collaboration or inclusion issues, before any other measures are needed to be taken.

Goal-Setting, Planning, and Execution:

1. Team goals for this semester:

- Equally divide work amongst team members
- Learn new technical and soft leadership skills
- Create a working and innovative product for DigiClips Digital Monitoring
- Learn team-work techniques that will and can be used in future projects

2. Strategies for planning and assigning individual and team work:

- Most work will be self assigned, and each team member will make sure that all the responsibilities are equally distributed within the team.

- All the requirements and work of the assignment will be equally distributed amongst the team members to ensure that everyone contributes towards the project.
- To ensure that the work is assigned to everyone in the team, weekly meetings will be held.
- Discord will be used to actively communicate with each other throughout the project

3. Strategies for keeping on task:

- The team will regularly communicate with each other on Discord to see if everyone is on the same page and is able to adhere to their responsibilities. This strategy will ensure that everyone is on track.
- Minutes of meetings will be regularly maintained to keep a track of everyone's task.
- The Team Contract will keep the team members accountable, and knowledgeable about the consequences, if they fail to actively participate in the project.
- The Team engagement officer will ensure tasks are equally assigned to each member and will ensure that the assignment is completed by the due date.
- If a member is underperforming, see **Consequences for Not Adhering to Team Contract** section, to avoid any further consequences.

Consequences for Not Adhering to Team Contract:

1. How will you handle infractions of any of the obligations of this team contract?

- Our team members will communicate this issue with the following person that is guilty, to make sure that there aren't any excruciating circumstances behind their lack of commitment.
- If a similar situation occurs again, we as a team will set up a meeting with this person, and discuss how we can resolve this issue, before we escalate the issue to the advisor and the professor, to ensure that everyone in the team receives a fair chance.

2. What will your team do if the infractions continue?

- Contact our professor and advisor to make sure that they are aware of the issue and ask for any necessary guidance, to ensure that the senior design project stays on track as required.

****

a) I participated in formulating the standards, roles, and procedures as stated in this contract.

b) I understand that I am obligated to abide by these terms and conditions.

c) I understand that if I do not abide by these terms and conditions, I will suffer the consequences as stated in this contract.

1) Aashish Komaragiri	DATE: 09/15/2022
2) Elijah Shelby	DATE: 09/15/2022
3) Grace Rasmussen	DATE: 09/15/2022
4) Khushveen Kaur Umra	DATE: 09/18/2022
5) Matthew Karmelich	DATE: 09/15/2022