INFO1111: Computing 1A Professionalism

2025 Semester 1

Skills: Team Project Report

Submission number: 1

Github link: https://github.com/Hilton-Naidu/SkillsProject1.git

Team Members: 4

Name	Student ID	Target * Foundation	Target * Advanced	Selected Major
Hilton, Naidu	550770402	S	A	Computer Science
Li, Yunheng	540101492	S	AW	Data Science
Donaldson, jake	550748788	AG	A	SW Development
Zhang, Andrew	540750773	A	NA	Cyber Security

* Use the following codes:

- NA = Not attempting in this submission
- A = Attempting (not previously attempting)
- AW = Attempting (achieved weak in a previous submission)
- AG = Attempting (achieved good in a previous submission)
- S = Already achieved strong in a previous submission

Contents

1. Task 1 (Foundation): Core Skills

Hello1 Throughout your Computing degree we will help you learn a range of new skills. Once you graduate however you will need to continue to learn new languages, new tools, new applications, etc. Task 1 focuses on core technical skills (related to LaTeX and Git) and the key technical skills used in different computing jobs. Each member of the team should individually complete their subsection below. You should begin by allocating to each team member a different major to focus on (i.e. one of: Computer Science; Data Science; Software Development; Cyber Security). If you have a fifth member, then your tutor will suggest a fifth topic to cover. This allocation should be specified above (see lines 37-56 in the LaTeX file).

Each member of your team is required to select one of the designated domains and collaboratively work on the scenario presented below. The primary objective is to reflect on the collaborative process and problem-solving strategies rather than solely focusing on the final solution.

The focus is on your team's collaborative process and problem solving skills rather than the solution itself.

You will need to integrate your information into this shared collaborative LaTeX document and compile the result.

Foundation is based on 3 components:

Scenario: Collaborative Disaster Response System Development

With devastating natural disasters, such as the 2025 LA wildfires, communication between emergency services, volunteers, and affected communities is chaotic and inefficient.

Develop an approach to streamline communication and optimise resource distribution during such crises.

ROLES:

- Computer Science (CS) domain develops the system infrastructure and applications to allow for integration between emergency services, databases, volunteers, and affected people. They will need to ensure this is automated and efficient in allocating resources.
- Software Engineering (SE) will ensure the infrastructure is scalable and robust to manage unpredictability of material disasters and amount of people affected. The system must have offline capabilities since natural disasters can disrupt telecommunications. They will make sure the infrastructure runs smoothly and ensures its user friendly.
- Cybersecurity protects communication channels from disruptions or hacks, protects personal data and ensures that access to confidential information is managed appropriately by authorised personnel. They will need to implement measures to mitigate false reporting or misinformation.
- Data Science (DS) will use analytics including data visualisation to forecast natural disasters from historical and real time data. They need to identify high risk areas from multiple sources of data to optimise resource allocation, routes and most urgent areas of need for emergency responders.

- If there is a 5th group member, Human-Computer Interaction (HCI) will ensure the system is intuitive and accessible for all users. This includes usability testing and refining the application and focusing on User Experience and Interaction (UI and UX) design.

Component 1 Project management / technical skills:
The team is required to create a project on GitHub and manage their tasks using GitHub's issue tracking system.

- Create a project within your GitHub repository
- Define tasks as issues and assign them to team members
- Track task progress throughout the project lifecycle
- Mark issues as resolved upon completion

For example, issue: 'research 2 technical skills for Data Science' and assign to John Applesmith.

Component 2 Group questions:

- Describe your team's collaborative process in developing a solution.
- How did you approach the problem as a team, and what challenges did you encounter in working together?
- Discuss how your team arrived at your final approach, including the decision-making process, compromises made, and key turning points.

Target: 300-500 words

Component 3 Individual questions:

- Reflect on the skills relevant to your domain that were essential for this project. What technical or professional skills have you identified were relevant to the project? Refer to the Skills Framework for the Information Age (SFIA) list of skills [1] and describe at least 2 skills per domain.
- How did working collaboratively on this project help you strengthen those skills?
- What professional or technical skills have you identified you need to develop or fine-tune?

Target: 300-400 words

OVERALL REQUIREMENTS:
To achieve an "OK" rating for this task you must individually accomplish the following:

- Each member of your team **has been** allocated a different major (Computer Science, Data Science, Software Development, Cyber Security (and Human-Computer Interaction for a fifth member).

- Submission Contribution section is completed with each subsequent submission
- Each member of your team **has identified** 2 key technical skills that you would need to be able to work in the industry of your allocated major.
  - Each skill must have an explanation on why it is a key skill required for the industry of the major (∼100 words per skill).
  - The 2 key tech skills must be identified from the skills framework for the information age SFIA.
- Github & LaTeX
  - Your team has created a team repository on Github for the project and put a copy of the LaTeX template, bib file, and image file into the team repository (only needs to be done by one member of your team).
  -
  - You have added your tutor to your git repository
  - Your team has created a GitHub project, created issues and allocated to each member, and closed issues upon completion
  - The information has been compiled into the shared collaborative LaTeX document using the template provided on Canvas with your team members sections - you have edited the LaTeX template to include your chosen major and responses to both the group discussion questions and individual questions.
  - You have cloned the team repository to your local machine.
  - Provide evidence that you can compile from the command line (provide screenshots of the command entered and output).
  - Provide evidence that you can commit to your local repo (provide screenshots of the steps taken to commit to their local repo).
- Referencing
  - You have provided in-text references (IEEE) to support your claims or where they gathered the information from.
  - You have a reference list following the IEEE referencing guidelines.
  - Some common things to look for to see whether your have correctly followed the referencing guide are:
    * The sources you have listed are only the sources that are present in-text.
    * All sources seen in-text are included in the reference list.
    * You followed the correct convention for references that don't have author's details or multiple sources have the same author and year of publication
    * You have included the required information for the source type as outlined in the guide.
    * Sources are not a list (i.e. dotpoints)

To achieve a "STRONG" rating, you must individually accomplish all of the above in addition to the following:
Demonstrate the following to your tutor during the tutorial:

- You are able to retrieve your team's shared repo

- You are able to make changes, recompile, commit changes, and push back to repo.
- Note: you should also provide screen-shots of relevant actions taken to make changes, recompile etc. does not require you to provide evidence of detailing conflicts.

1.1. Group response

For the creation of the solution, we decided to root our collaboration in clearly allocated jobs, allowing us to each act independently while having our work contribute to the progress of others. We concluded that to complete this project, we would need a combination of physical and digital interactions to effectively communicate and stay up to date on the progress.

Digital:

For digital communication, we decided to use a social media platform to communicate. We created an online group chat to allow us all to communicate quickly and easily. This medium also had the capability to facilitate group video calls, allowing us to conduct quick meetings when needed. If we were to take this project to full development, we would transition to a more professional medium of communication, such as Microsoft Teams, to allow for the same quick communication but in a platform designed for work.

We also shared collaborative work through the online source repository system, GitHub. Through the use of GitHub, we were able to allocate tasks for each other using the issues functionality, and we were also able to work on a single file together.

The main challenge we encountered in the development of this project was the speed of communication. While we had the capability for almost instantaneous communication, we all had individual lives and, thankfully, were not on our phones constantly. However, this did lead to slower and less effective communication.

Physical:

While we did meet once a week at our INFO1111 workshop to work on the project, this was not enough time to complete our group project. Because of this, we decided to have an in-person meeting on the 26th of March from 12:00 till 2:00 in a booked library meeting room. This was a key point in the development of our project and led to the unification of our roles into a single clear development plan.

This also allowed us to use an important medium for idea generation—whiteboards. By doing so, we were able to collaboratively create mind maps and flowcharts for development. If we were fully developing this solution for deployment, we would continue these meetings weekly as a full team while also having smaller pair meetings for different areas to work together on specific aspects, such as DS and CS discussing the efficiency of data communication and compilation.

The two main challenges we encountered with physical communication were absenteeism and personal life schedules. Throughout the period of this project, some people were away at various workshops. While not detrimental, this did significantly limit our ability to collaborate. The second challenge was that, because we are in university and not a work environment, we all have different schedules (work and class) to abide by. This made it difficult to organise in-person meetings, but we overcame this through compromise and early planning.

The following was our approach to breaking down the project and generating a plan for development (creative process):

- Identify all the parties involved (LAPD, LAFD, Medical Services, Volunteers, Public).
- The data scientist identified the parameters that would be provided and the types of data that would need to be communicated. We concluded that data from LAPD, LAFD, and Medical Services needed to be combined and unified, with the option to share it with Volunteers and/or the Public.
- The computer scientist then identified how the system infrastructure would need to be developed to unify the major systems in case of an emergency. He considered the operating system, programming languages, and the integration of backend and frontend logic.
- From this logic, the software developer identified that due to the unique nature of fire, many electrical (television) and physical methods of communication might be affected. Therefore, he identified how to build robust systems.
- From these three roles, we created data pathways as follows: (LAPD + LAFD + Medical) → Volunteers → Public.
- The cybersecurity specialist then identified the areas of data communication and how they might protect the data from a potential attack. While there is always a risk of attack on any digital platform, this project was identified as needing particular focus on cybersecurity due to the sensitive nature of the data being communicated within these systems (medical records, deaths, potential mass fear).
- After identifying these systems, we then allocated the jobs according to roles, and each person went off to work individually on their area.

1.2. Skills for Computer Science: Hilton, Naidu

The relevent skills for a computer scientist to "develops the system infrastructure and applications to allow for integration between emergency services, databases, volunteers, and affected people" according to SFIA 9 Skills are:

1. Infrastructure operations (ITOP): Addressing the intergration and operations between various Infrastructures to assure cohesive optimisation accross the project [2]. In this project, ITOP plays an important role in the linkage of virtual, physical and cloud-based environments. Using a strong technical understanding, I would be able to link the emergency services system, to databases of users, locations, and resources to ensure a optimised communication.
2. Solution Architecture (ARCH): Devloping the communication between systems for a multifacuted and multi dimentional solution [2]. For this project this would entail creating a colution whihc takes all existing components, e.g. the emergency systems communication systems made capable for expantion to volunteers. This role ultimatly generates a design for the solution, using technical skiils. .

Working collaboratively significantly helped me by allowing me to interact with my teammates, asking them how their roles behave and how they may contrast or compare with my own to help me get a greater understanding of what to do. For example, when considering one of my Infrastructure operations (ITOP) skill I asked the SW development team make about how my work on intrastructure might be different to his, ensuring we

had a significant variation in skills and actions. It also helped to ask what areas had already been covered, to greater ideintify what I needed to do, such as for my Solution Architecture (ARCH) skill, haveing heard all their roles, I was able to identify that a skill area lacking was a indervidual to create an overarching structure and plan for how to act. Ultimatly this allowed me to have a greater undertsanding of my own role, while also supporting my teammates in their own.

I have identified that I need to fine tune my Communication skills, and orginisational skills. While I have completed this project, and helped my group with the group aspect, I could have been more foward and active with the orginisational aspect of this project, leading the group meetings and encouraging more only checkups with each other. I could also improve my knowledge, growing my understanding of the more difficult aspects of LaTex and the specific details of how to create different designs.

The following is a brief summary of my jobs as part of the development of this project:

- Identify the operating system (or systems) to be used. Given this Project requires the unification of multiple systems, I need to consider whether creating a custom OS or using an existing one would be the most logical option. This would require consulting the rest of my group.
- I need to deal with creating the capability for the integration of various databases, while it is not my role to deal directly with the data, I should develop some of the mechanics and algorithms to read and write data.
- I need to focus on writing algorithms to automate the communication of data between the LAPD, LAFD, and Medical services. This would require working the DS to determine the type of data being used, and from the trends identified create an automated allocation system to efficiently use resources available.

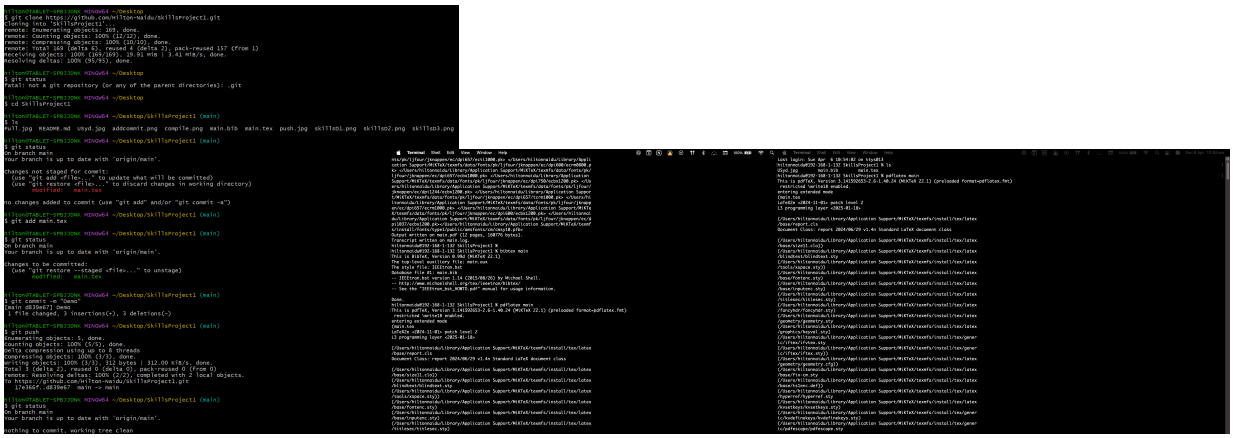


Figure 1: *
(a) Git

Figure 2: *
(b) LaTeX 1

Figure 3: *
(c) LaTeX 2

Figure 4: Git and Latex terminal

1.3. Skills for Data Science: Li, Yunheng

To visualize natural disaster forecasts using historical and real-time data, identify high-risk areas, optimize emergency responses, and collaborate with computing professionals, the relevant SFIA 9 skills are:

1. 1. Data analytics (DAAN): Enabling data-driven decision-making by extracting, analyzing, and communicating insights from structured and unstructured data [2]. In this project, DAAN plays an important role in predicting needs and providing the best solutions using past and real-time disaster data. It helps me analyze the given datasets, spot patterns, and share useful insights. Using data analytics, I can help decision-makers predict future trends, improve resource use, and make emergency responses more effective during natural disasters.

2. 2. Data science (DATS): Applying mathematics, statistics, data mining, and predictive modeling techniques to gain insights, predict behaviors, and generate value from data [2]. In this project, DATS supports DAAN by using advanced methods, machine learning, and algorithms to analyze disaster-related data. As a data scientist, using DATS techniques helps me find deeper insights, create predictive models, and make decisions in real time that DAAN can use to improve forecasts and responses. DATS also helps build models that predict disaster patterns, which are important for planning needs and ensuring effective emergency responses. It is a key part of DAAN, as it provides the foundation for making data-driven decisions [3].

Collaborating with peers broadens my perspective and helps improve my DATS skills. Their feedback strengthens my coding, modeling, and analytical abilities. When I struggle with identifying relationships in the data or encounter errors I can't debug, explaining the issue to teammates often clarifies my thoughts. Sometimes, the explanation alone helps me gain new insights and solidify my understanding of the data. This collaborative process not only sharpens my skills but also enhances my ability to use DAAN for data-driven decision-making and problem-solving in complex situations by absorbing different opinions.

During the team project, I identified that the most important skill I need to develop is Data Science (DATS). Throughout the assignment, I faced challenges in applying mathematical solutions to the data, and it made forecasting particularly difficult for me. To address this, I plan to improve my mathematical skills and focus on solving data-related problems to enhance my ability to analyze and forecast effectively. Strengthening this skill will enable me to make better data-driven decisions and improve my overall performance in future data science projects. Strong Demo

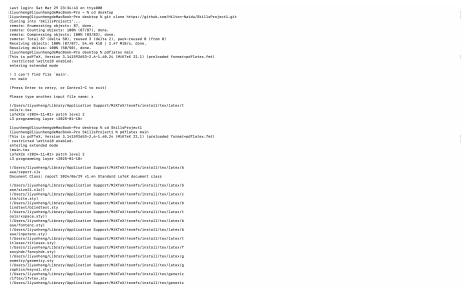


Figure 5: compile

Figure 6: pull

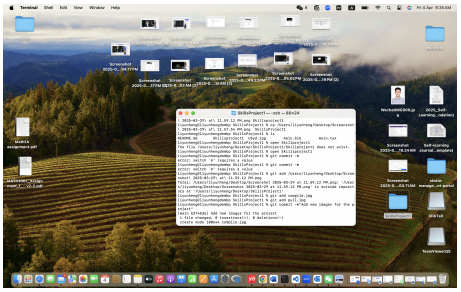


Figure 7: add and commit

Figure 8: push

1.4. Skills for SW Development: Donaldson, jake

The relevant skills of the Software Engineer are to "ensure a scalable, efficient, robust, user-friendly infrastructure with offline capabilities to manage disaster response and amount of people affected." The relevant SFIA areas are:

1. Infrastructure Design (IFDN): Designing technology infrastructure to meet business requirements, ensuring scalability, reliability, security and alignment with strategic objectives [2]. In this project, IFDN plays a primary role in ensuring an infrastructure that can manage the unpredictability of material disasters that are common occurrences during natural disasters. Therefore, designing offline capabilities is essential for the software engineer to maintain operations during telecommunication disruptions. Furthermore, a user-friendly design allows responders to interact with the system under pressure.

2. Systems Integration (SINT): This involves planning, implementing and controlling activities to integrate system elements, subsystems and interfaces to create operational systems, products or services [2]. Building on infrastructure design, system integration ensures that different system components, such as databases, emergency services, and communication networks—work together seamlessly. In this project, SINT is critical in highlighting how different subsystems (offline capabilities) would interact to ensure the system functions normally and without any bugs. This involved planning how different systems interacted (data systems, emergency responses, user interfaces) to form a cohesive structure. Since there was no coding, this is more about planning how the relationships in this system operate.

Working collaboratively on this project has strengthened my understanding of the core skills of a software engineer, Infrastructure Design (IFDN) and Systems Integration (SINT). Working in a group allowed us to share our own unique views on our differing roles and what we do, helping clarify what my title entails. It helped me improve my analytical skills, portraying how breaking down a large task into smaller subcomponents can help more clearly show how to best go about a project. For example, discussing how to approach offline capabilities with my group helped me see how the infrastructure needs to be designed to remain functional during disasters, reinforcing the importance of IFDN. Furthermore, our group meetings highlighted how different components—like data input, user interface, and response systems—must connect smoothly, underscoring the interconnectedness between various system components and how they must function together. This helped improve my understanding of SINT. The group's consistent feedback assisted in providing a unique understanding of the project, outlining how both infrastructure and integration must be correctly planned for a system to work effectively.

I recognised that communication was paramount in this group project and was an evident skill that I need to improve; this aspect extends to all group projects. While I actively participated in discussions and contributed to group collaboration, I recognised that I could have been more active within the group, helping organise meeting locations and times. Furthermore, doing more personal work before coming to group discussions helps with easily communicating our independent roles and thus allows us to best approach group issues.

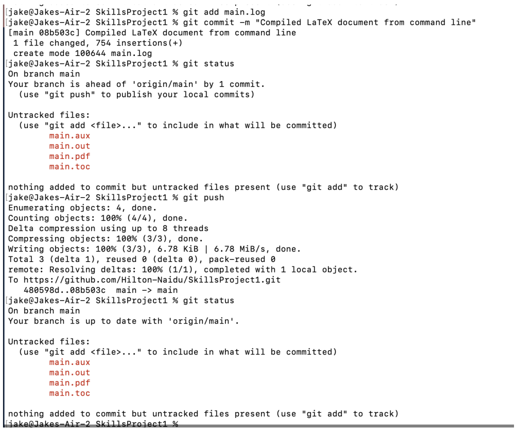


Figure 9: *
(a) Commit

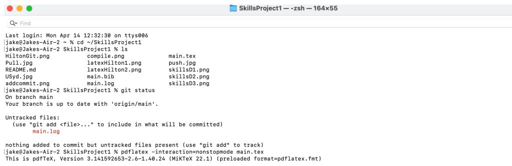


Figure 10: *
(b) Compile 1

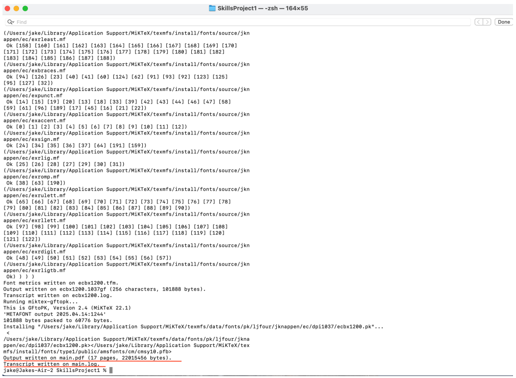


Figure 11: *
(c) Compile 2

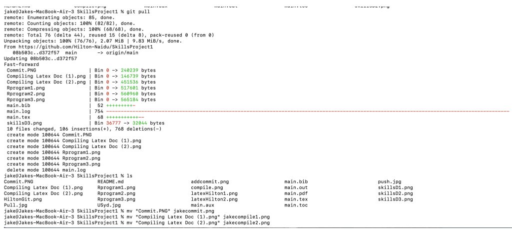


Figure 12: *
(d) Pull

Figure 13: My Git and LaTeX workflow steps

Strong Demo

1.5. Skills for Cyber Security: Zhang, Andrew

The 2 most relevant SFIA 9 skills [1] for a cybersecurity specialist working in the industry to protect the safety and privacy of digital systems and data is as follows:

1. Information Security (SCTY): This skill involves managing and developing security controls and management strategies [4]. The development and maintenance of an effective information security strategy that aligns with the organization's overall goals is a vital skill in the cybersecurity industry. A well-integrated security approach enhances the protection of data and infrastructure without impeding overall operations. In this project, SCTY is an important skill for developing security infrastructures and strategies ensure that communication lines are maintained and the data is protected.

2. Vulnerability Assessment (VUAS): THis skill involves identifying, classifying, and managing vulnerabilities in a system [5]. Analyzing security vulnerabilities and business impact analysis to detect and mitigate the repercussions of security flaws ensures the solidity of data structures. In this project, VAUS plays a role in assisting SCTY by allowing security gaps to be fixed proactively to create a secure system that maintains its integrity even in critical situations by staying up to date with prevention strategies as well as keeping the team informed on threats and malicious actors [6].

Working collaboratively on this project has helped greatly in strengthening the aforementioned skills. In particular, collaborating on this project has imporved my SCTY skills. By working in a team, I am exposed to a broader range of perspectives from different roles, ranging from analysts, developers, etc. These perspectives contribute to creating a comprehensive security system that is more intergrated with the overall operation. Working with my teammates to plan and devlelop the solution helps me better understand the overall structure of the project, allowing me to develop a solution that aligns more with the technical goals.

While working on this project, a skill I have identified to be further developed is Threat Intelligence (THIN). While working under a stressful and volatile situation such as managing an evolving natural disaster situation, the gathering and processing of threat information to adapt to new security concerns is important so that current measures are always up to date. I could have communicated more with other fields such as emergency responders to get a more comprehensive idea of the security threats I might face. Implementing an effective way to obtain new threat information as well as communicate the response strategy to all relevant parties will be a fruitful effort for future endeavors.

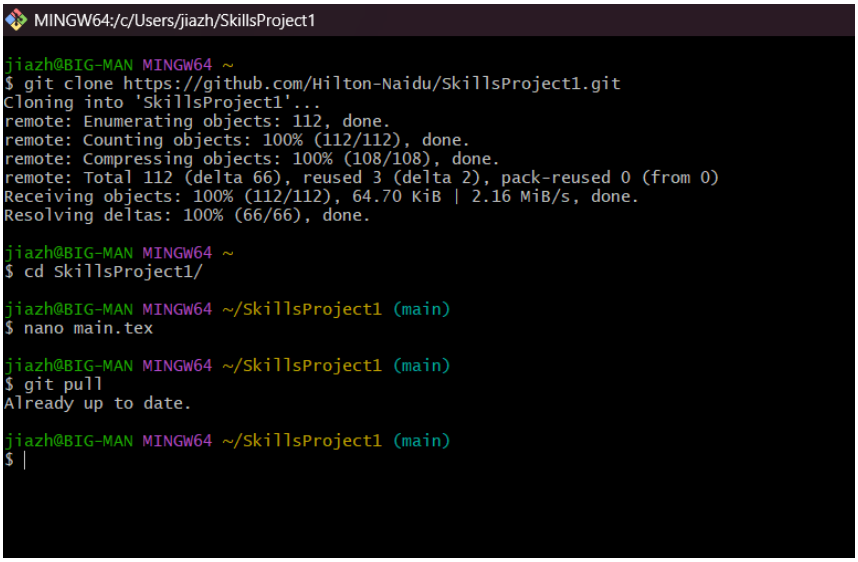


Figure 14: pulling from the git hub

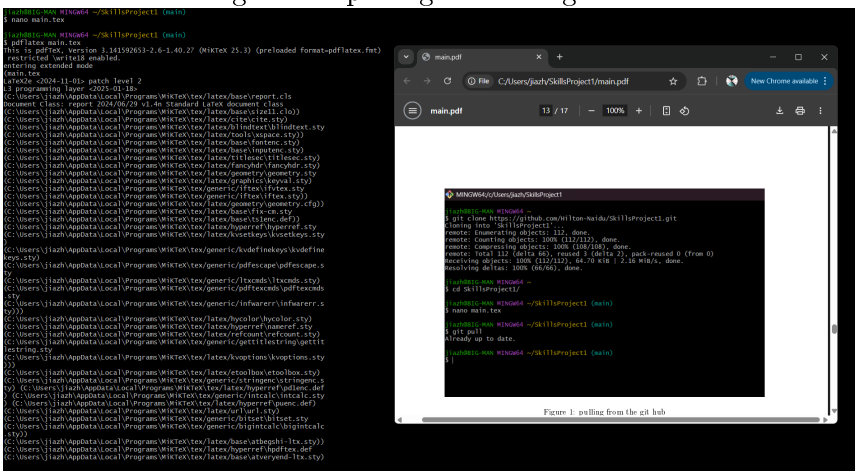


Figure 15: editing and recompiling the pdf

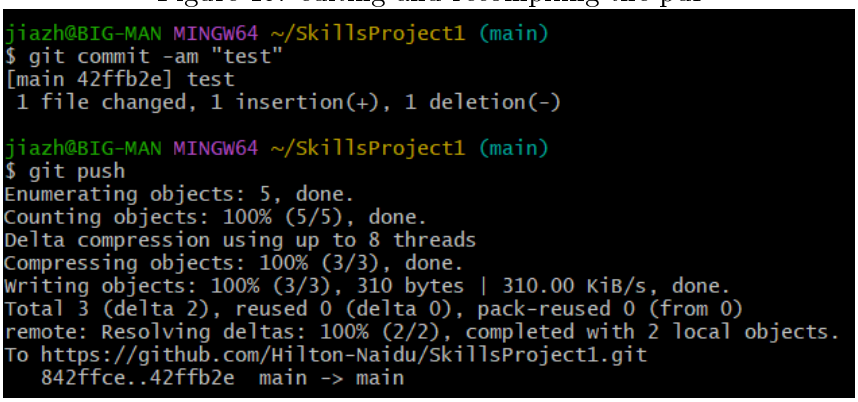


Figure 16: git commit and and git push

2. Task 2 (Advanced): Advanced Skills

Task 2 contains two components (both required).

Component 1: Project management
The team is required to extend on your project on GitHub.

- Add issues and assign as the project progresses
- Create parent issues and subdivide tasks into sub-issues
- Filter for fields in the project
- Create a line chart using GitHub project chart to represent project activity over time (see Figure 17).

Figure 17: Line chart showing the cumulative count of issues/PRs created over time, generated from GitHub project data.

Component 2: Exploration of Tech Tools
This component focuses on researching and exploring industry-relevant tools within each domain and is split into 2 parts.

Part A:

Each student must undertake an exploratory analysis of the below tool relevant to their domain. Each student is to take on an exploration and investigative research of tools below relevant to their major.

- Computer Science: Python Websockets package (API requests and system integration)
- Data Science: choose between Python NumPy or Pandas package (data analytics)
- Cybersecurity: choose between Wireshark or Burp Suite (network security analysis)
- Software Engineering: choose between Python Pytest or UnitTest (software testing)

If there is a fifth member:

- Human-Computer Interaction (HCI): Figma (UI & UX design)

You should then describe:

1. What are the main functionalities of the tool? Describe at least 3.
2. What is the importance of the tool in the relevant major (CS, SE, Cybersec, DS) and role in the given problem above?
3. What are the weaknesses or limitations of the tool? Describe at least 3.

Target: 300 words

Part B: More advanced technical skills

Each member attempting to undertake Advanced Strong component are to undertake self-learning of the selected tool for their allocated major and provide a practical example.

- Develop a simple example using the tool.
- Provide evidence in the form of screenshots showcasing implementation of the tool and results.
- Please provide a reflective paragraph detailing how you undertook learning this tool, barriers you encountered and how you overcame it. What did you realise about the relevance of this tool in your respective major?
- Assess the importance of this tool in addressing the disaster response scenario above.

Target: 250 words

OVERALL REQUIREMENTS:
To achieve an "OK" rating for this task you must individually accomplish the following:

- **Component 1**

  - Created a project in your Github repository to track and manage progress of the project. Issues are allocated to respective members and closed when completed. Tasks are not too broad and have a clear goal.

- **Component 2**
  - Select tools relevant to your chosen major.
    * Answer the following questions in Part A and B
    * Describe the main functionalities of the identified tools
    * The ways in which those tools are used in the industry of your chosen major;
    * At least 3 weaknesses or limitations of each of the tools

- Referencing
  - You have provided in-text references (IEEE) to support your claims or where they gathered the information from.
  - You have a reference list following the IEEE referencing guidelines.
    * Some common things to look for to see whether your have correctly followed the referencing guide are:
    * Sources are listed in alphabetical order
    * The sources you have listed are only the sources that are present in-text.
    * All sources seen in-text are included in the reference list.
    * You followed the correct convention for references that don't have author's details or multiple sources have the same author and year of publication
    * You have included the required information for the source type as outlined in the guide.
    * Sources are not a list (i.e. dotpoints)

To achieve a STRONG rating you must accomplish all of the above in addition to the following:

- You have demonstrated the use of your selected items either through activity in Git, or through including items in this report.
- You have added your tutor to your git repository and when they view it they are able to see your activity that demonstrates the use of your selected tool
- You have included screenshots and annotations (where necessary) in your report and provided an explanation of your undertaking of advanced technical skills
- Reflective response in component 2B shows a deep understanding of the learning process and the tool

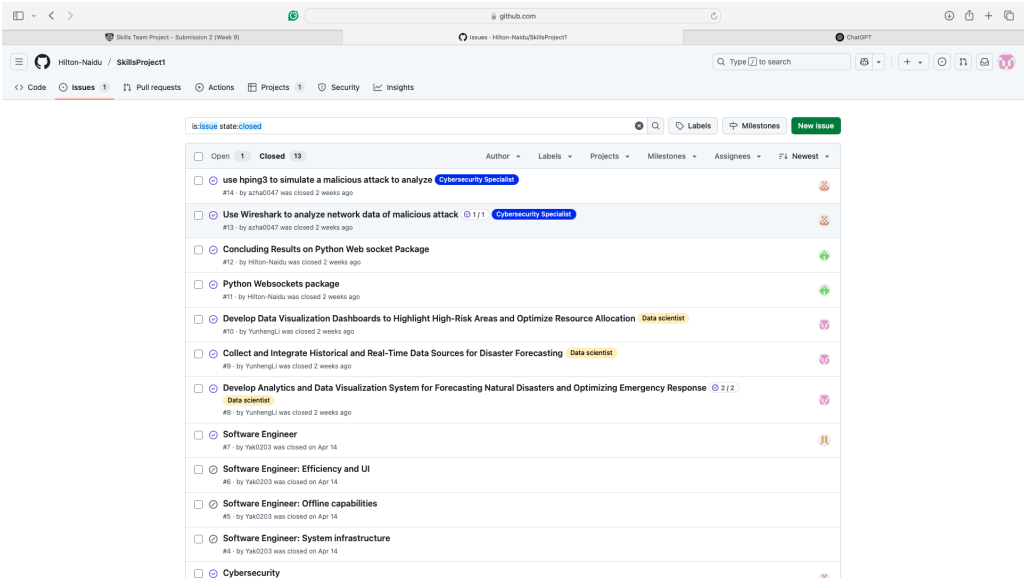


Figure 18: Filtering for fields

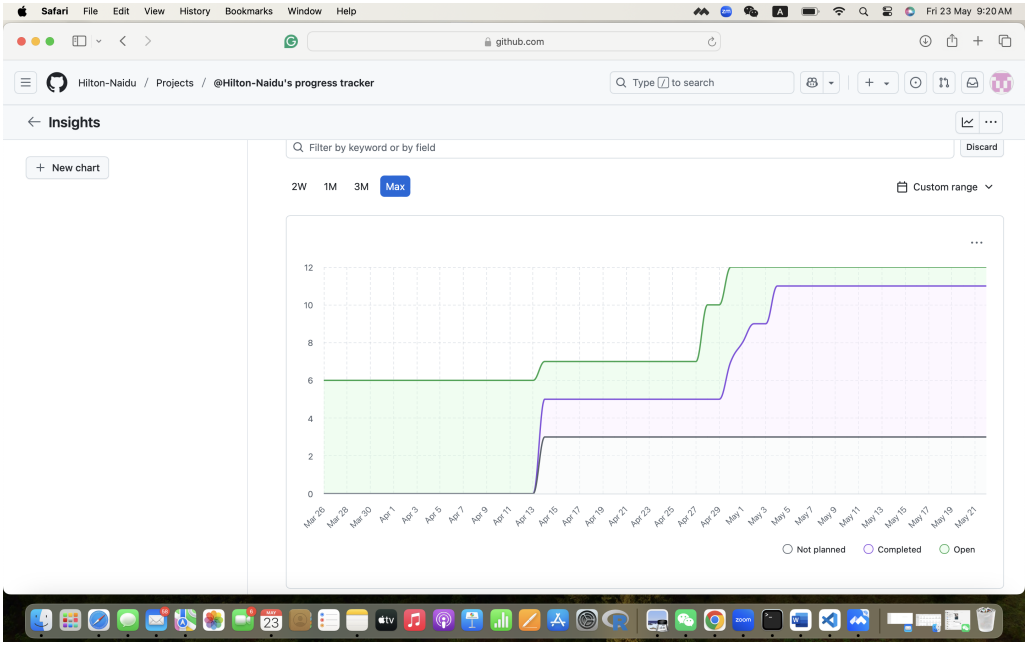


Figure 19: Line chart

2.1. Tools and Skills for Computer Science: Hilton, Naidu

Part A: Exploration of tech tools

NumPy (Numerical Python) Python Websockets is a library (or package) which allow for performant and robust api communication for servers, based off the traditional HTTPS protocol of websockets which is widely used for its reliability and speed, some of it's key features include:

1. **Asynchronous WebSocket Server and Client Support**: Asynchronous programming is a incredibly powerful tool which allows for a system to act in response to events, rather than following a linear pattern. The package supports programming with the package asyncio which facilitates, allowing for non blocking communication, his is crucial for its scalability.

2. **Full-Duplex Communication**: It enables simultaneous two way communication, allowing for a client to pull updates while simultaneously pushing new data to a server. This for example is highly useful for a live data system, such as an online game, where a client requires server updates, and other clients require server updates from different clients. Websockets maintain an open connection, unlike HTTP, which is request based.

3. **Protocol Compliance and Error Handling**: The package also has compliance with RFC 6455 WebSocket protocol, which allows for the managing of handshakes, control frames, pings/pongs, and connection closing. It also has robust distributed systems, and mechanisms which ensure a graceful failure.

This tool is important to the role of a Computer Scientist as it enables integration and development of real-time systems capable of sending and receiving online data. Python WebSocket supports real-time data feeds and low-latency communication, allowing experimentation with live user data. It also enables the design and testing of custom communication protocols over TCP. Async paradigms allow handling multiple clients from a central server and provide a lightweight mechanism to scale. This tool supports backend development for web applications using Python and async paradigms.

However, there are a few significant limitations or weaknesses of:

1. **Single thread**: Python Websockets is a single threaded and Event-Loop Dependant. Since the library is designed around asyncio (single event loop) and does not support multithread processing, there is significant reduction in it's capabilities to easily scale.

2. **Lack of features**: It lacks some significant high level features without extra work, such as broadcasting to multiple clients, session management, rooms, and automatic reconnection logic for clients.

3. **Security and privacy**: Security, while the package is capable of supporting secure websockets, it falls short in multiple other important areas, such as authentication layers (Jet, oAuth), Rate limiting, and message validation or encryption beyond TLS.

Part B: Technical Skills and Analysis

The following example is a simple python script I wrote, which uses the server.py file to create and run a basic WebSocket server, upon which the client.py file can be run, which using that server, can echo back text.

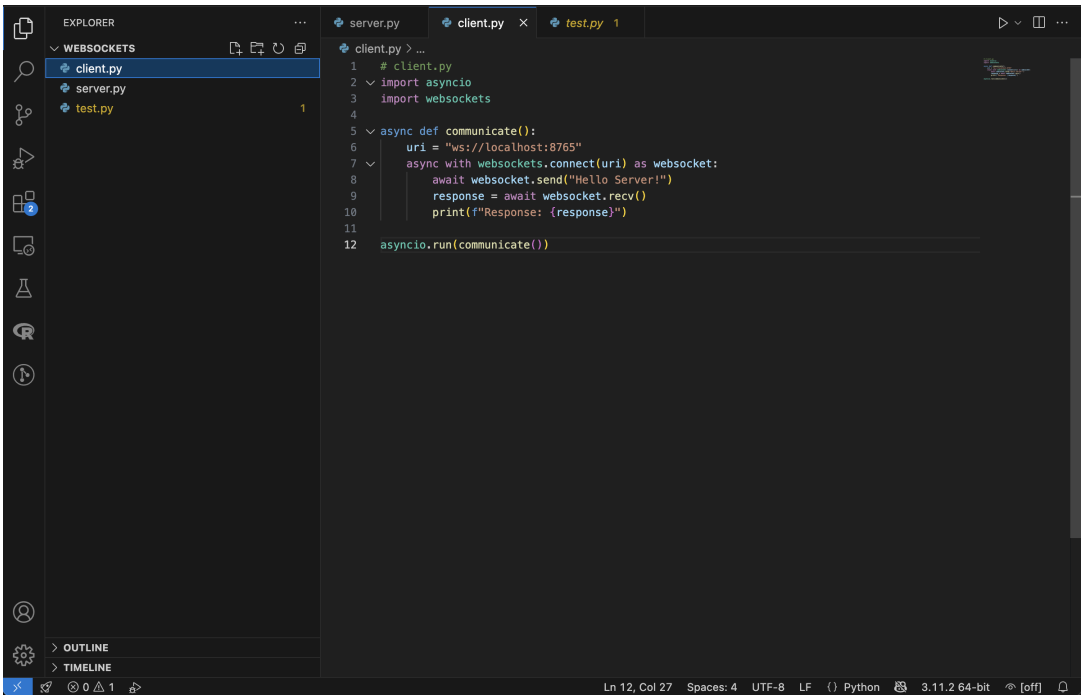


Figure 20: server.py

There were two main tools I used which undertaking the learning of this tool, those being AI to support my learning, and website outlining how to use python websockets which contained an example of it's use. Using AI I was able to supplement any gaps in my learning. A key issue I encountered was the fact that I had never significantly developed any async code, nor had I ever dealt with server communication, so that became the main object of my self learning. The largest hurdle I encountered was trying to run the program, after producing the code I was not familiar with how to run a server and client code on the same device, I eventually settled on the fact that the server had to be run first, not on debug, and then while it was running, the client file must be executed. This took multiple attempts and reading of error messages printed in the terminal.

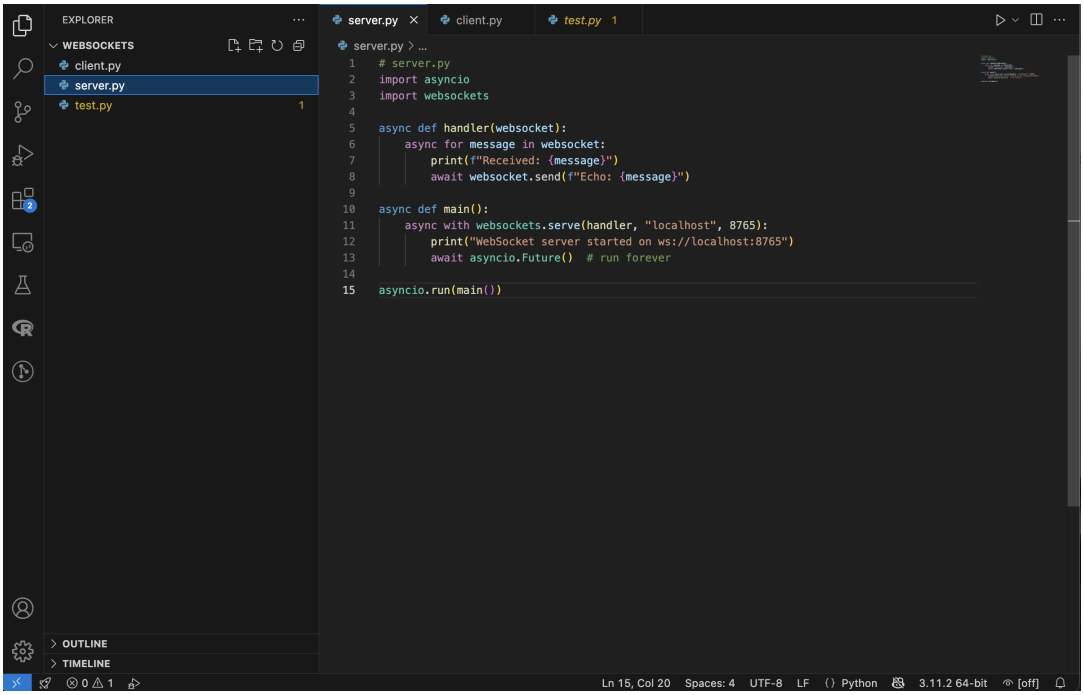


Figure 21: Client.py

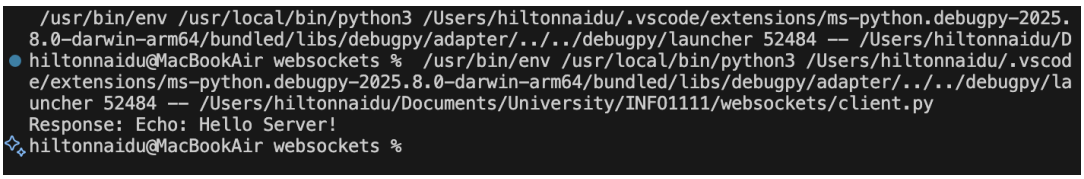


Figure 22: Terminal

2.2. Tools and Skills for Data Science: Li, Yunheng

Part A: Exploration of tech tools

NumPy: Tool Description and Importance

NumPy (Numerical Python) is a popular library in Python used for working with numbers and large sets of data [7]. Its main features include:

1. **Multi-dimensional arrays**: NumPy makes it easy to create and work with arrays that have many rows and columns. It is much more effective than regular Python lists [7].

2. **Math operations**: It provides built-in ways to handling calculations like adding, multiplying, finding averages, or working with matrices effectively [7].

3. **Broadcasting and vectorization**: These features allow users to apply operations to the entire arrays at once, without writing complicated loops. By doing this, the code can become faster and cleaner [7].

NumPy is very important in fields like **Data Science (DS)**. In DS, it is the foundation for other tools like Pandas and SciPy, and helps with handling and analyzing big datasets. NumPy would help us quickly process large amounts of real-time and historical data, find high-risk areas, and help emergency teams plan better routes [8].

However, even though NumPy is powerful, it has some limitations:

1. **High memory use**: It can use a lot of memory when working with very large datasets, which may cause performance delays [9].

2. **No direct GPU support**: NumPy mainly runs on the CPU and cannot automatically use a GPU for faster calculations without other tools [9].

3. **Harder for beginners**: Some of the advanced features, like broadcasting, can be confusing if users are new to it [9].

In short, as a first-year data science student, I find NumPy to be an essential tool for building my skills in data analysis and problem-solving. Although I am still new to the field, using NumPy allows me to work with large datasets more easily and perform complex calculations than basic Python. In projects like forecasting natural disasters, NumPy provides me with a useful tool to handle real-world data effectively and accurately. Despite some difficulties mentioned above, like high memory use, which is challenging for beginners, I still believe that learning NumPy is an essential step toward becoming a strong data scientist who can contribute to solving complex problems.

Part B: Technical Skills and Analysis

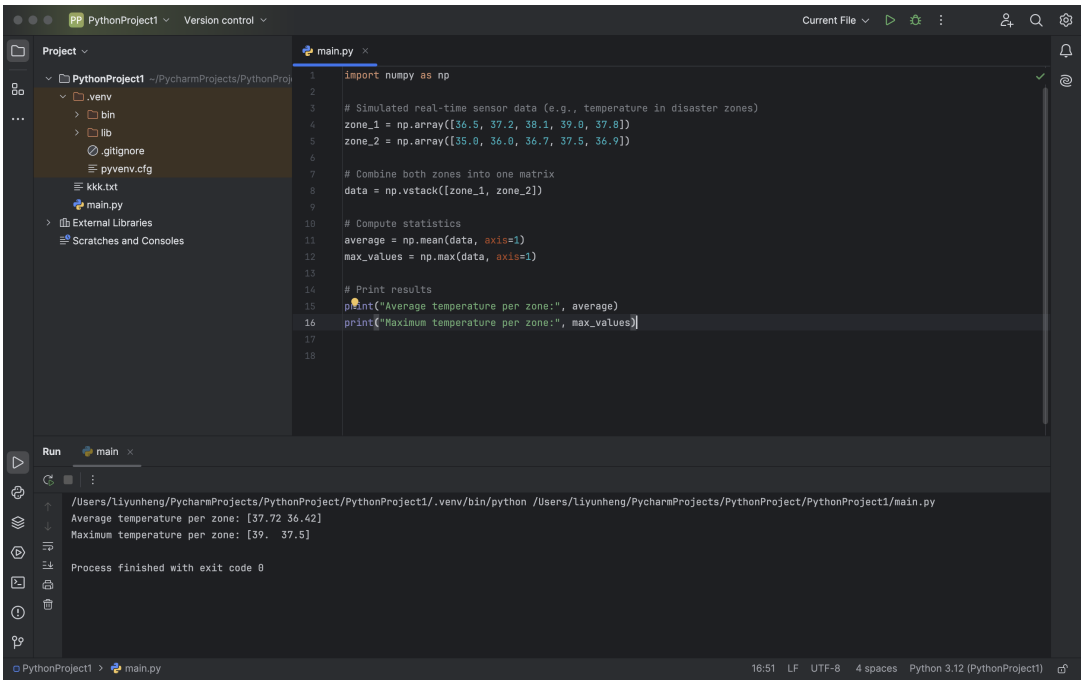


Figure 23: Numpy

Tool Implementation and Reflection

As part of the advanced component of our skills project, I explored NumPy, a Python-based library essential for numerical computing. I began by reviewing official documentation and experimenting with basic array manipulation. For the disaster response scenario, I simulated temperature readings from two affected zones and used NumPy to compute averages and peak temperatures. Initially, I struggled with understanding how multi-dimensional arrays worked in NumPy, especially using functions like vstack() and axis-based calculations. However, through practice and debugging, I overcame these challenges and became more confident with slicing, aggregating, and reshaping arrays.

One major insight I gained was how efficient NumPy is compared to regular Python loops — especially in time-critical applications like real-time disaster monitoring. This is highly relevant to my data science major, where large datasets must often be processed quickly and reliably. Learning NumPy has improved my ability to perform such tasks in a structured and optimized way.

In the context of disaster response, this tool becomes indispensable. Whether it's processing historical climate data, integrating live sensor streams, or modeling resource allocation, NumPy empowers responders to make timely, data-driven decisions. It can support early warning systems, hotspot detection, and even forecasting, making it a core part of any analytics pipeline in emergency situations. Ultimately, I realized that mastering such libraries is not only an academic requirement but a practical necessity for building intelligent, real-world solutions.

2.3. Tools and Skills for SW Development: Donaldson, jake

Part A: Exploration of tech tools

Pytest is a Python full-featured testing framework, going beyond just running basic tests and instead supporting large, complex testing needs in software projects. Specific features include simple testing, compatibility with existing tests, rewriting, and plugin-based architecture [10]. Pytest was developed by a third party to address the failures of Python's built-in module and unittests. Software engineers widely adopted it because it is easy to use, rich in features, has more flexible fixture configuration, and is compatible with existing Python tools. Key functioanlaties include:

1. **Simple Syntax**: Pytest allows writing tests with minimal boilerplate, furthermore, its easy approach makes it accessible to beginners [10]. Test functions are easily written using Python assert statements.
2. **Compatibility**: PyTest seamlessly integrates with existing 'unittest '- based tests, allowing users to migrate to Pytest without rewriting old code [10]. This lowers the barrier for adoption in ongoing projects.
3. **Auto-Discovery**: The framework automatically discovers files and functions based on naming conventions [11]. This encourages rapid development and supports Test-Driven Development (TDD) [11].

This tool is important to the role of a **Software Engineer** because testing is paramount in delivering reliable, robust, scalable, and bug-free systems. This is particularly prominent in high-stakes environments like disaster response. For this project, Pytest would be valuable in validating offline capabilities, simulating network failures, and ensuring subsystems like data handling operate correctly under high-stress cases [12].

However, PyTest also presents weaknesses:

1. **Steep Learning Curve for Advanced Features**: While simple tests are user-friendly, such as custom fixtures and plugins, they can be complex for beginners [12].
2. **Integration Complexity**: Configuring custom fixtures, plugins, or hooks can be trivial, it can be challenging for new users [12].
3. **Overhead for Small Projects**: For small projects, setting up and using 'pytest' might introduce a bit of overhead, introducing unnecessary complexity. Instead, simpler tools would be sufficient [12].

Overall, Pytest is a valuable tool that enables Software Engineers to ensure the robustness of systems through flexible, scalable testing strategies.

Part B: Technical Skills and Analysis

Your text goes here

2.4. Tools and Skills for Cyber Security: Zhang, Andrew

Part A: Exploration of tech tools

Wireshark is an open–source application used for analysing network traffic [13]. It enables the user to capture and inspect the packets from a network so they can troubleshoot and analyse the network in real time:

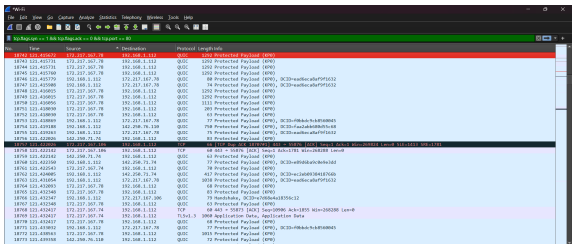
- Wireshark provides tools to dissect packets for detailed network analysis, for diagnosing security threats and optimising network communications [13].
- Real time network analysis using Wireshark can assist analysts in assessing trends and methodologies of attacks and create proactive response strategies and allow for faster detection of future attacks [13].
- Wireshark provides extensive tools for capturing and logging network traffic with capture filters and display filters as well as logging traffic and specific intervals [14]. These features provide a lot of flexibility for users

Wireshark is widely used in the cybersecurity industry for the analysis of network security [13]. Specifically, it allows security analysts to perform detailed live analysis of network data at a packet level, allowing them to detect malicious activity, troubleshoot problems, and optimize network protocols [14]. Despite these upsides, there are some downsides to using wireshark:

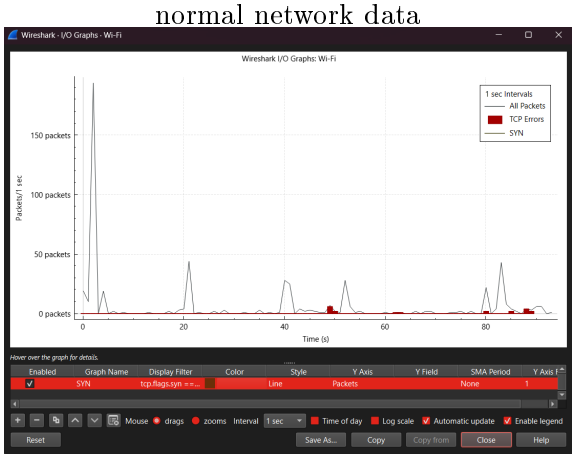
- While Wireshark can be used to detect suspicious activity on a network, it does not have the capability to automatically detect and create an alert when suspicious activity is detected [15].
- Real time packet capture can be resource intensive to perform, particularly on busy networks with high traffic [16].
- Wireshark is limited to monitoring the traffic on networks that pass through the network interfaces of the machine that it is being used on, making remote monitoring more difficult [16].

In summary, Wireshark is a powerful network analysis tool that is a staple in the cybersecurity industry, and will be an important tool for me as I develop the skills to solve future cybersecurity challenges.

Part B: Technical Skills and Analysis

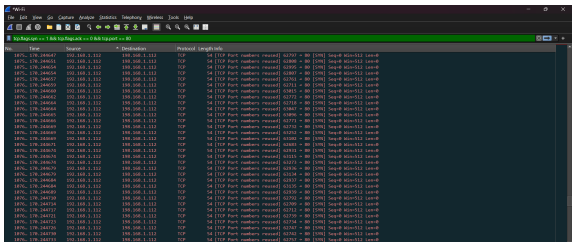


normal network data

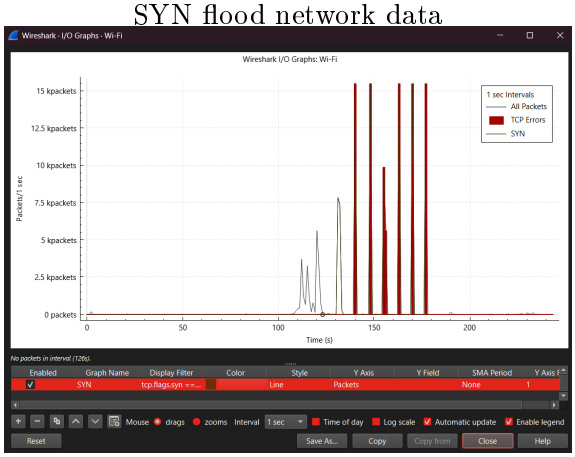


normal network graph

As part of my investigation of Wireshark, I simulated the detection process of a malicious attack using Wireshark. To do this, I used hping3, a network tool that can be used to send custom TCP/IP packets, and I used this to simulate a DoS attack by sending a large amount of SYN packets to my test machine. I ran the command `sudo hping3 -S -p 80 -flood [ip]` to send a flood of SYN packets to my test machine. I filtered for the packets from the attack using `tcp.flags.syn == 1 && tcp.flags.ack == 0` then I monitored the change in activity in Wireshark using an I/O graph.



SYN flood network data



SYN flood graph

In learning Wireshark, I first familiarised myself with basic network concepts such as packet structure and network protocols before learning the intricacies of Wireshark and how to use it. Initially, I found the interface overwhelming and struggled to isolate the relevant packets within the large volume of captured data. To overcome this, I relied heavily on online resources, including video tutorials, official documentation, and user forums. Through this process, I learned how to effectively use Wireshark to filter and interpret network traffic and represent it visually in graphs. This hands-on experience reinforced how essential tools like Wireshark are for diagnosing complex problems and maintaining secure systems in professional cybersecurity settings.

In a disaster response scenario, Wireshark could be used to monitor critical networks so that they can be proactively protected from any issues and malicious attacks that could happen. By identifying unusual patterns or unauthorized activity on the network, cybersecurity analysts could respond quickly to potential threats, ensuring that vital information reaches the right people without interruption. It could also be used during the development of a disaster response network as a tool to analyse and optimize network traffic so it can handle high traffic scenarios [13].

3. Submission contribution overview

For each submission, outline the approach taken to your teamwork, how you combined the various contributions, and whether there were any significant variations in the levels of involvement. (Target = ∼100-300 words).

3.1. Submission 1 contribution overview

For the completion of this submission, we all worked on our indervidual parts, and we all also attended the the group meeting where we collaberativly worked to come up with a plan and design our solution. The group response was written by Hilton Naidu. We all indervidually used Git and LaTex MikTex, we also all indervidually assigned ourselves tasks to complete. The final compilation and submission was done by Li Yunheng. This responses was written by Hilton Naidu.

3.2. Submission 2 contribution overview

For Submission 2, we primarily worked independently due to the individual nature of the assigned tasks and the differing aims of team members. While we maintained communication to ensure overall alignment, each member was responsible for their own contribution. The Git chart was created by Hilton Naidu. The response was written by Li Yunheng, who also managed the final submission process.

3.3. Submission 3 contribution overview

As above, for submission 3

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