Individual Report: Sean

Project Title

"Touch-Based Morse Code Password System: Development and Data Visualization"

Role and Responsibilities

In this project, my primary focus was **analyzing and visualizing real-world data** collected from participants. While Heju concentrated on developing the Morse Code Password System, I ensured the data we gathered could be effectively processed and visualized to draw meaningful conclusions. I contributed to the design of the data collection methodology and provided input to refine the system for usability and consistency.

Key Contributions

1. **Data Collection and Organization**
    - Collected interaction data from 10 participants, primarily friends and family, as part of the project's testing phase.
    - Coordinated the process to ensure data was recorded consistently, focusing on touch durations and input patterns. Success/failure rates were derived during the analysis phase based on logged interaction data.
2. **Data Processing and Cleaning**
    - Transformed raw data into a structured format for analysis, addressing any inconsistencies or gaps.
    - Ensured compatibility of the data with Python tools like Pandas for efficient handling.
3. **Data Visualization**
    - Designed and implemented visualizations to highlight trends and patterns in participant interactions, including:
        - Bar charts showcasing short vs. long touch usage and success/failure rates.
        - Pie charts representing success rate proportions.
        - Histograms illustrating the distribution of touch durations across participants.
    - Focused on creating visuals that were not only informative but also intuitive for a general audience.
4. **Collaboration with Heju**
    - Worked closely with Heju to ensure the system's data logging functionality aligned with analysis needs.
    - Provided usability feedback to refine the system and improve the data collection process.

Challenges and Solutions

1. **Challenge: Cleaning inconsistent data**
    - **Issue**: Some participants' interaction data contained incomplete records or outliers.
    - **Solution**: Applied data cleaning techniques to address missing values and normalized outliers for consistent analysis.
2. **Challenge: Communicating findings effectively**
    - **Issue**: Visualizations needed to be both detailed and easy to understand.

    - **Solution**: Iterated chart designs, incorporating feedback from Heju and others to improve clarity.
3. **Challenge: Aligning data with system functionality**
    - Ensured the logged data was structured in a CSV format that captured touch durations, input types, and timestamps, allowing for seamless analysis and visualization.
    - Maintained constant communication with Heju to ensure the data logging met analysis requirements.

Key Insights and Observations

Through this project, I discovered valuable insights about how participants interacted with the system:

1. **Touch Durations Matter:** Participants adjusted to short and long touch durations after several trials, but initial errors were linked to unfamiliarity with the system and Morse Code.
2. **Learning Curve:** Error rates decreased significantly after participants had completed their first two passwords, demonstrating the system's intuitive design. The average failure rate decreased significantly after participants had completed a few attempts, indicating the system was natural with practice.
3. **Error Patterns**: Frequent errors were linked to transitions between dots and dashes, which can inform future improvements in system design.

Reflection and Learning

This project allowed me to grow in several ways:

1. **Visualization as a Communication Tool**: I learned how to transform raw data into meaningful insights through visualizations.
2. **The Power of Collaboration**: Working with Heju demonstrated the importance of aligning technical development with analytical goals.
3. **Real-World Data Challenges**: Handling data from real participants required flexibility and problem-solving skills to address inconsistencies.

Future Directions

Looking forward, I see several ways to enhance this work:

1. Incorporate **interactive visualizations** to allow stakeholders to explore the data dynamically.
2. Expand the scope of data analysis to include more advanced metrics, such as error frequency per specific touch duration ranges.
3. Use participant feedback to design a training phase within the system, minimizing initial errors.

Conclusion

In this project, I attempted to bridge the gap between raw user interaction data and actionable insights. By focusing on data analysis and visualization, I helped transform participant behavior into meaningful trends that tested our hypothesis. Working alongside Heju was an amazing experience, as our collaboration

ensured the system and analysis complemented each other effectively. This project not only enhanced my technical skills but also deepened my understanding of how data can shape system improvements.