Will Gillette

Dr. Mongan

CS-471: CS Pedagogy

20 November 2023

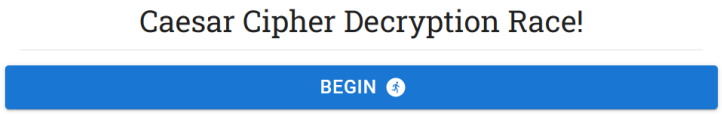
Technical Project: Caesar Cipher Decryption Race

To remain consistent with the lesson topic of cryptography, I developed a JavaScript web application using the React and Material UI frameworks that supplements my group's lesson on introductory cryptography. My inspiration for doing so was both to enhance my lesson portfolio that I have been developing over the course of the semester in addition to creating an engaging digital activity that enhances students' understanding of the Caesar Cipher cryptographic method. Therefore, my goal is that instructors can take advantage of this tool in the classroom to supplement their AP Computer Science Principles curriculums. My web application is published on: William Gillette Biography (williamcgillette.com).

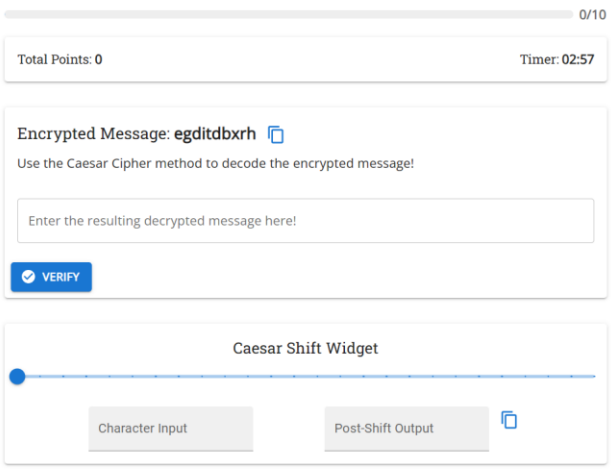
Essentially, this application allows students to partake in a three-minute game where they must apply the Caesar Cipher method to decode ten arbitrary English words. The game ends either when time runs out or the user successfully decodes all ten words. To facilitate the decryption process, I integrated a widget at the bottom of the application that essentially enables users to select a Caesar shift, input any word, and examine the shifted word in the output. It is then up to the user to use their best judgment to determine if the resulting word is an English word. There are instances where this aspect of the game can be challenging. To elaborate, occasionally the translated words may deceive students, causing them to incorrectly believe that they are English words. To make the game more challenging, I imported a library comprising of

thousands of English words, most which users may be unfamiliar with. At the start of each round, ten random words from this library are selected and encrypted via a random Caesar Cipher shift. Ultimately, I wish to showcase the beauty of the Caesar Cipher method by allowing users to efficiently observe all the possible Caesar shifts of every given English word. Here is a usage guide for this application:

Upon clicking the “Begin” button, the round will start, causing the timer to begin counting down.



The progress bar at the very top of the round screen indicates how many words a user has successfully decrypted, while the panel below shows the timer and how many points a user has achieved, computed as the product of sixty and the length of the encrypted message. The input section below displays the encrypted message, allowing users to copy it to their clipboard to paste into the widget. Users also must write their final decrypted message in the text field below, pressing the “Verify” button to submit their final answer. Finally, the Caesar Shift Widget at the bottom of the screen allows users to shift an inputted word by an inputted Caesar shift.



To develop this application, I leveraged my previous knowledge of React, observing that it would be ideal for this game as its “state” feature allows for the storage of information, such as the timer, a user’s input in the widget, and how many words a user has successfully decrypted. Furthermore, the Material UI framework features a variety of useful components, such as the slider, the progress bar, and the text field, ultimately reducing a lot of the total code. Finally, since my professional website uses these tools, the integration of this application into it was seamless.

I heavily enjoyed the development process of this application, as it enabled me to take advantage of my prior knowledge in web development and apply it to my progressing knowledge of cryptography. Moreover, I thought that this application would be an outstanding addition to my current lesson portfolio about cryptography. In the future, I hope to expand this application, creating a game for the random substitution cryptographic method as well.