Link to the project website: https://hhachem001.github.io/CtL_Final/Welcome.html

Link to my GitHub repo: https://github.com/HHachem001/CtL_Final

1. **Framing**
    a. Problem to solve:
        i. The toolkit aims to simplify complex tax concepts, streamline the process of finding relevant information within course materials, and enhance practical understanding by providing a user-friendly capital gains calculator. The primary goal is to facilitate an improved learning experience for students navigating the intricacies of tax-related subjects.
    b. Users / Stakeholders:
        i. The primary users of the toolkit are students enrolled in tax courses, seeking clear explanations of tax concepts, easily accessible study materials, and practical application tools. Secondary users include instructors or educators in tax-related fields who require resources for teaching purposes.
    c. Detailed user personas for testing
        i. Other than myself, there is Tim Cavalli, a second-year student enrolled in a basic federal income tax course. His goals include understanding fundamental tax concepts, passing exams, and excelling in the course. He faces challenges related to comprehending complex tax regulations and navigating course materials. Professor Joe Geshelli, an experienced tax instructor, aims to provide effective teaching materials, assess student performance, and ensure students grasp key tax concepts.
2. **Research**
    a. Describes existing solutions in this space or notes absence of same:
        i. In my research for the tax toolkit website, I identified existing solutions in the educational space, with platforms like Quizlet offering resources for tax-related studies. However, a noteworthy observation was that these existing solutions often came with limitations, especially as some were behind a paywall. The presence of paywalls limited accessibility for students, potentially hindering their ability to benefit fully from these resources. This insight underscored the need for a free and comprehensive toolkit that offers a wide array of educational resources for students enrolled in basic federal income tax courses.
    b. Consulted with practitioners re. relevant solutions:
        i. As a solo project, I did not engage in direct consultations with practitioners. The decision to work independently stemmed from the project's scale and scope.
3. **Ideation and Prototyping**
    a. Considers and weighs the costs & benefits of multiple technical solutions or design configurations:

i. Initially, I explored the option of having a single, all-encompassing chatbot that could handle every function, including a capital gains calculator. However, after careful consideration, I shifted towards a toolbox approach, implementing independent tools for each specific function. This decision was driven by the recognition that managing separate tools would offer greater flexibility, ease of maintenance, and scalability.

b. Creates prototype only after considering at least three alternatives:
   i. I considered at least three alternatives, including the initial concept of a single chatbot handling all functions. However, through iterative prototyping, I discovered that other existing websites offering similar functionalities were not free to use. Many were not open source, and some required API keys that incurred additional costs (OpenAI). Taking these considerations into account, the final design of the tax toolkit emerged as a user-friendly and accessible platform, setting it apart from other tools that imposed financial barriers / login barriers on users. By prioritizing open-source solutions and avoiding any dependency on paid API keys, the toolkit became not only a functional but also an economically viable option for students.

4. User Testing

a. At least one tester other than themselves for each type of user in close to real-world conditions:
   i. Utilizing the personas that were identified earlier in this document, I was able to approach the website from a different point of view as opposed to just being the creator of the website. I was able to obtain feedback from family members on the design and functionality of the website.

b. Brief Summary of user feedback:
   i. Positive feedback from persona / self-eval / family members:
      1. A.I. chatbot did an “alright” job giving basic answers to our questions.
      2. Quizzes were engaging and relevant to the material at hand.
      3. The chatbot responses were personal and “life-like”.
   ii. Negative Feedback
      1. Page is slow in its response time?
      2. Some answers that it gave me were incomplete.
      3. Answers are incorrect.
      4. Confusing to navigate.

iii. Feedback from Tim Cavalli (Persona #1):

1. "*I visited the Tax Chatbot page on your website. The concept of an AI-assisted chatbot for income tax queries is innovative and could be very helpful. The disclaimer about the AI model's accuracy is a good touch, ensuring users have realistic expectations. However, the loading time for the AI model seems a bit long, which might deter some users. Simplifying the loading process or optimizing it for quicker interaction could enhance the user experience. Overall, it's a functional and promising tool that, with a few tweaks, could be even more user-friendly. Streamlining the AI's responses to be more specific to users' queries would enhance the overall effectiveness of the tool*."

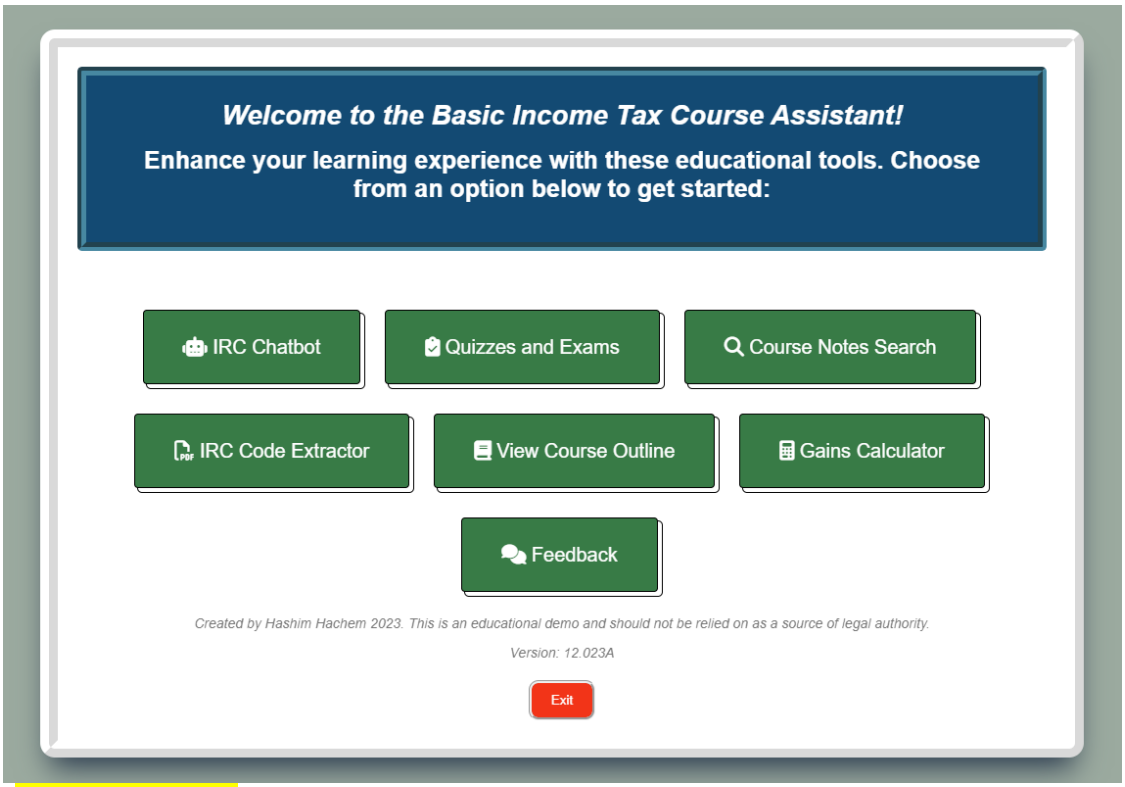
iv. Feedback from Professor Joe Geshelli (Persona #2)

1. "*I've taken a thorough look at your Basic Income Tax Course Assistant website. While the concept is promising, there are several areas that need improvement. The Tax Chatbot, though a novel feature, often provides responses that aren't as informative or practical as they could be. I suggest refining its knowledge base or programming to offer more detailed and applicable answers. Regarding the website's theme, it feels a bit too simplistic and lacks engagement. A more dynamic design with interactive elements could enhance the user experience significantly. Also, the content arrangement seems a bit disjointed, making it challenging to follow a logical learning path. In summary, while the foundation of your website is solid, it would benefit greatly from a more user-friendly design and enhanced functionality of features like the Tax Chatbot*."

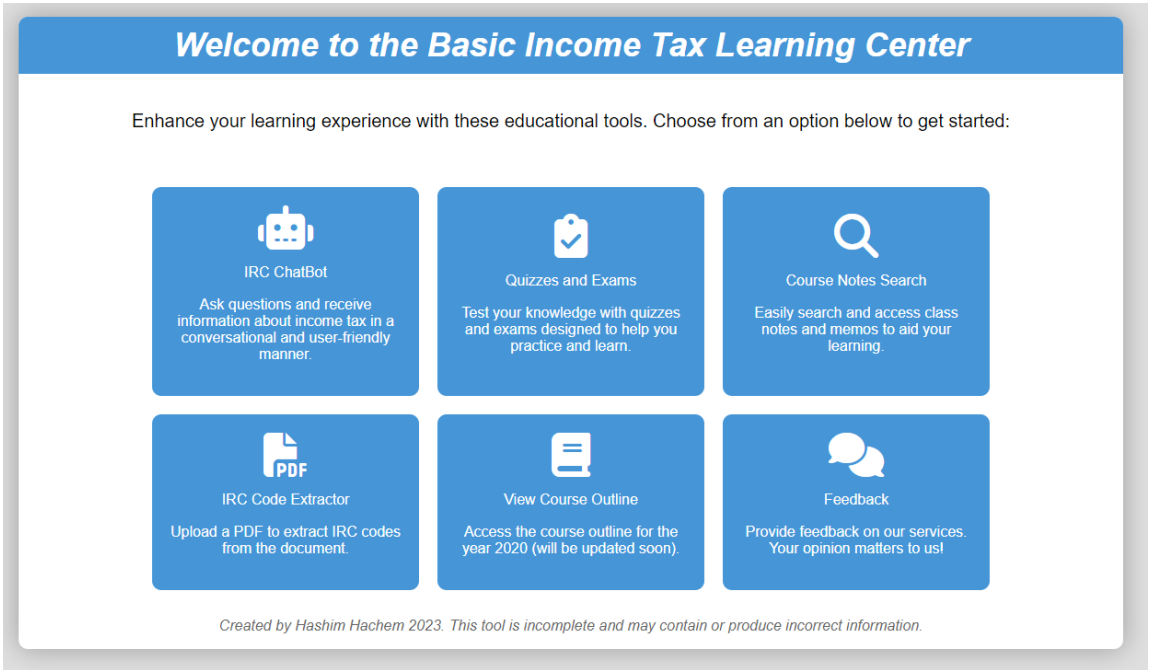
5. Refinement

a. Final version is not the same as the original version:

i. Current Version:



ii. First Version:



6. **Complexity / Robustness**
    a. In developing my tax toolkit project, I leveraged the power of Regular Expressions (regex) for document scraping, particularly in extracting IRC codes from uploaded documents. I created regex patterns to match both common IRC code formats, and non-standard formats. Integrating these patterns into my JavaScript code, I could scan the content of uploaded documents, applying regex to capture and extract relevant IRC codes. Regularly refining and testing the regex patterns ensured robust handling of different variations in IRC code formats in any given document.
    b. In implementing the AI-powered chatbot for user interactions within my tax toolkit, I integrated the transformers.js library. This library, functioning with pre-trained large language models, served as a crucial component for natural language understanding and generating responses to user queries. As a solo developer on this project, integrating the transformers.js library was instrumental in processing user inputs, tokenizing and encoding text. Other implementations offer greater response accuracy at the cost of having to use an API key. The library enabled seamless communication between users and the AI model, with little to no effort required by the end user beyond just typing a question.
7. **Impact & Effectiveness**
    a. Implementing regex for IRC code extraction proved to be a game-changer in terms of time spent reviewing documents. Instead of manually sifting through documents to identify and link IRC codes to their respective definitions, the regex-based solution automated the entire process. It saved me considerable time that would otherwise be spent on manual data extraction. Moreover, the time-saving benefits extended beyond mere extraction. The toolkit automatically linked each extracted IRC code to its corresponding definition. There is no need to look up each revenue code separately on google. It is linked automatically. This not only reduced the time spent by the end user, but also ensured that users could easily access comprehensive explanations without having to navigate through the documents themselves.
    b. Integrating a capital gains calculator into the tax toolkit was a decision that significantly optimized efficiency for end users. Instead of relying on external calculators or manual computations, users could instantly access and utilize the calculator within the toolkit.
    c. By developing a dedicated quiz tool, I created an environment where users could practice and assess their knowledge without the need for external platforms. This not only saved time for users who could practice directly within the toolkit but also eliminated the hassle of managing quizzes across multiple platforms.
8. **Fit / Completeness**
    a. The decision to keep the UI design basic was intentional. Rather than overwhelming users with unnecessary elements, the design focused on delivering a straightforward and user-friendly experience. The simplicity of the UI aligns with the toolkit's educational purpose, such that users can navigate through the

various tools and features without wasting any time. The buttons on the webpage were designed to be simple and intuitive. The emphasis was on creating a user interface that is approachable for individuals with varying levels of technical proficiency. The simplicity of the buttons enhances usability and contributes to a visually clean and organized layout, allowing users to focus on the content and tools provided. Consistency in design elements, such as color schemes, fonts, and button styles, ensures that users encounter a seamless transition between different sections of the toolkit.

b. In a digital environment where many websites prioritize monetization through ads and product placements, the tax toolkit is the complete opposite. The intentional avoidance of clutter enhances the user experience, creating a space where users can focus on learning, practicing quizzes, and utilizing tools without the distractions prevalent on other platforms.

9. Documentation

a. There is a help button on the main page that contains FAQs to common questions, and disclaimers of responsibility are placed across the site. The website is relatively straight forward to use and does not require any prior knowledge.

10. Real World Viability / Sustainability

a. For the product to be viable in the real world, there needs to be an alternative to the current A.I. LLM implementation. Using transformers.js allows me to bypass the OpenAI paywall, which means the LLM runs on the end user's machine. The downside to this is 1) the inferencing speed, and 2) the fact that the language model currently utilized is trained on the web and is quite broad and not specific to taxes. The ultimate goal would be to train a language model on tax material, or even the course textbook, and to have the A.I. retrieve its answers from it.