User Stories:

Story 1(Student): As a student learning about data structures and algorithms who learns best visually, this add on will help me visualize data structures from lecture or lab notes in an interactive way, allowing me to develop a more intuitive understanding of specific data structures, how they are interacted with, and the operations performed on them step by step. This add ons ability to automatically recognize structures of a specific type provides a very simple interface for detecting data structures in notes which are often lengthy and convoluted with little need for manual user action. The add-on also provides a very simple interface(add, remove, sort, etc buttons) for not just visualizing data structures but also performing simple but crucial operations which will allow me to manipulate the structures how I want as well as allow me to visualize how different operations affect the structure.

Story 2 (Teacher/Professor): I want to use this add-on to help visualize my lecture notes surrounding topics in Data Structures. With this add-on, I am able to write my lecture notes in the way I want to, without having to consistently track how well my students will be able to visualize it. It detects structures like queues and stacks, and on a click, a sidebar appears that shows a visual of what I am writing down. This sidebar can provide students an easy way to visualize data structures which can often be difficult to do from textual representations alone, this means I do not have to spend time making illustrations for data structures and their resultant state following operations. This add-on even allows for me to go through a step-by-step breakdown of how data structures change with each command using the buttons provided by the add-on like “sort” without having to make each illustration. It also means students are not limited to the notes I provide them, as they can play around with different data structures and their operations to test concepts or ideas they may have not fully understood from my notes alone. Time is crucial for me as a professor so this add-on was a great experience as it saved time and gave me the ability to focus on more important matters.

User Design Study:

- How many participants? How long will each session be?

Approximately 20 participants(will likely be done in groups of 5, 4 sessions); 10 minutes each session.

- Where and when to conduct the study (use the lab time, etc.)
  1:50 pm - 2:40 pm Monday/Wednesday
  (will visit, with permission, lab sessions in CSCE 120 or 221 if needed)

- What task will you give to your subject?
  The subjects will be provided with a set of DS+algo notes in plain textual form on a google doc, with the add-on installed and ready to use, it will be upon them to try and visualize the data structures and corresponding operations using the add-on without any previous knowledge or instruction from us, so as to gauge the user friendliness and utility of our application.
- What pre-study questions will you ask (about 5 questions)?
  1. What do you think of an add-on intended to visualize data structures and their operations automatically from text representations?
  2. At first glance, what looks appealing/user friendly about our add-on and what do you foresee yourself having trouble with its use?
  3. How important do you consider visual and graphical representations of DS+algo in gaining a deeper understanding of them?
  4. Before using the add-on, what instructions or knowledge do you think would be most valuable to your use of it?(we will not actually be providing any instruction, but will still want to assess what instruction would be helpful)
- What will you measure during the study? How will you collect this information?
  We will measure two metrics based on the user friendliness, ease, and helpfulness of our add-on. The first will be the number and type of questions asked by each group of 5(or individual) on how to use it, this will measure the user friendliness and ease that our add-on affords students as the less number of questions asked corresponds with an easier to use and more straightforward add-on. We will then categorize the questions asked based on what functionality they are asking about, which will help us assess the user friendliness of specific components of our add-on. We will also measure the number of visualizations and operations each subject is able to perform in the span of 10 minutes for each data structure(will help us understand which structures need more functionality etc), this will be done simply by adding in code that will keep track of successful visualizations. Finally, we will measure the perceived helpfulness of our application by asking post study questions.

- What post-study questions will you ask?
  1. If you were a student still learning DS+algo, how helpful would this add-on be in helping you gain a deeper, more intuitive understanding of DS+algo?
  2. What components or functionalities in our add-on did you have the most trouble using? Which components were the easiest and most straightforward?
  3. Which data structures were you able to visualize and manipulate easiest? Which ones were more difficult?
  4. What functionality do you think could be added to this add-on to make it even easier for students to understand DS+algo graphically?

- How will you analyze the data (about 5 questions)?

  The total number of questions asked will help us understand to what extent we need to specify and simply instruction given by the add-on itself to first time users. The category of questions asked will help us pinpoint the exact parts of our add-on which either need extra instruction or should be changed to be more user friendly. We will also use data on which data structures/operations were visualized less and more to improve on the UI and implementation for those specific structures which subjects had a harder time visualizing. The post study questions will give us an opportunity to reflect on the add-on as a whole, changing some of the broader, more general aspects of our program based on what subjects think would make it more helpful to use.