

15-110 Hw6 - General Guide

For the last three assignments of the course, instead of working on a set of written and programming problems, you will code a **programming project** from start to finish. This project will guide you through the process of building a CS tool for a specific domain. It will also allow you to make an in-depth study of either data analysis, simulation, or machine learning.

Hw6 has two check-ins and a full assignment. These are broken down as follows:

Hw6 Check-in 1: complete by **Monday 11/18**

- [45] complete a short online assignment on week12 content via Gradescope
- [55] complete Step 1 of your project, which will focus on **data organization**

Hw6 Check-in 2: complete by **Monday 11/25**

- [45] complete a short online assignment on week13 content via Gradescope
- [55] complete Step 2 of your project, which will focus on **data processing**

Hw6: complete by **Wednesday 12/04**

- [20] complete Step 1, as mentioned above
- [20] complete Step 2, as mentioned above
- [60] complete Step 3 of your project, which will focus on **data presentation**

You may choose one of five different projects to work on for this assignment. Each project covers a different topic and a different CS-as-a-tool focus, but all have been standardized to be the same level of difficulty. The projects are included with short descriptions below; for more information, check each project's official writeup.

Once you have chosen a project, you will not be allowed to switch to a different project (except in extreme circumstances, with permission from the course instructors). You must select a project by **Thursday 11/14 at 6pm**. Notify the instructors about your project selection by filling out the following form: <http://bit.ly/110-hw6-project>

Project: Battleship Game

CS Focus: Simulation

Description: implement an interactive game of Battleship using tkinter and the 15-110 simulation framework. In Battleship, you place ships on a two-dimensional grid, then try to guess where your opponent has placed their ships on their own grid. Your goal is to find and sink all of your opponent's ships.

Requirements: tkinter, event-based simulation, and 2D lists

Project: Circuit Simulator

CS Focus: Simulation

Description: make a basic circuit simulator (like logic.ly/demo/) that supports AND, OR, NOT, and XOR gates. Users will enter their circuits in text form as boolean expressions, which will be parsed into a circuit tree. Users can then generate a truth table for the circuit, and interact directly with a graphical circuit.

Requirements: tkinter, event-based simulation, trees, and recursion

Project: Language Modelling

CS Focus: Data Analysis / Machine Learning

Description: given a collection of written texts (like classic fairy tales or the Harry Potter series), learn which words are most commonly used by different authors, and chart the frequencies of different texts to compare them. Models can also be used to generate new text based on the writing style of the old text.

Requirements: matplotlib, 2D lists, dictionaries, and File I/O

Project: Protein Sequencing

CS Focus: Data Analysis

Description: given a DNA sequence (as a text file), generate the sequence of proteins encoded in that sequence. Then compare proteins across similar DNA sequences (such as the p53 genes for humans vs. elephants) to find the biggest similarities and differences among the amino acids that are produced.

Requirements: matplotlib, dictionaries, 2D lists, and File I/O

Project: Tweet Analytics

CS Focus: Data Analysis / Machine Learning

Description: given a dataset containing the text tweets of politicians, analyze the positive or negative sentiment of tweets based on different factors (political party, message type, etc.). Visualize the results of the analysis to help users note interesting trends and outliers.

Requirements: pandas, matplotlib, nltk, dictionaries, 2D lists, and File I/O