3. COMPUTER PROGRAMMING USING PYTHON

Python is a powerful programming language that is easy to learn, and it is rapidly growing in popularity both as a first language and as a language in which to accomplish complex tasks. We encourage two kinds of students to choose this project. First, if you have never programmed before, this introductory course is for you! We will spend the first few days doing classroom and lab instruction on the basics of Python programming, aimed at students with little or no programming experience. Second, if you already know another programming language, but your high school doesn't offer Python, this would be a great opportunity to learn this language; you may work at a faster pace than the beginning programmers if you wish. Any of the following programs are feasible to implement in Python, or you can propose your own.

If you sign up for the Python programming project, it is okay to delay the choice of the specific kind of program your team will write after you have learned more about Python's capabilities. You may even delay team selection if you wish. Once our project sessions begin and everyone is learning Python, you'll be able to team up with other students whose interests and programming experience (or lack of it) are similar to yours. Note that all of the software tools we will use are free, so it will be easy for you to take your project home and continue to enhance it after Catapult ends.

- Strategy Game — Build a computer program that allows users to play your favorite board game, such as Connect 4, Boggle, or Scrabble. Then add a computer player who is good enough to defeat most human players. Perhaps we can have multiple computer players battling each other.
- Action Game — This is the most common Catapult computer programming project. Build a computer program that implements a classic game like Asteroids, PacMan, Frogger, or Space Invaders. Or make up your own game! Students with prior programming experience may want to incorporate networking so that multiple players can participate remotely.
- Puzzle Solver — Write a program to aid someone playing a game or solving a common puzzle, such as Scrabble, Jumble, Sudoku, or Cryptoquip.
- Search Engine — Explore the strategies that various web search engines use to index a large number of web pages so that rapid searches can be done. Write your search engine to incorporate one or more of these strategies.
- File Compression Techniques — When sending large amounts of information across the internet, it is crucial to be able to compress a file before sending it, and then to uncompress it at the other end. This project will explore file compression techniques and produce a computer program that implements one or more of these techniques.
- Simulation of Random Processes — Many processes in nature follow certain patterns, but with enough seemingly random elements so that the behavior is unpredictable while remaining within certain constraints. The Markov chain algorithm provides a fascinating simulation of this mechanism, allowing us to generate random sentences in the style of some work of literature.
- Auction Site — Write a client-server program that allows people to advertise items for sale, to bid on items, to provide feedback on good and bad transactions with other users, etc.
- Database Application — Learn to write a Python program to create and maintain a database. Examples might include cataloguing your CD collection, organizing major league baseball statistics, managing your "little black book" of romantic interests or your school's grade information for current students, or perhaps simulating an "on-line store" or an on-line catalog of information about your favorite subject.
- Spelling Checker / Suggester — When your document contains a misspelled word, many spell checkers provide suggestions of alternate words. Do you ever get frustrated when your misspelling is very simple (you left out a letter, added an extra letter, or transposed two adjacent letters) but the computer's list of suggestions does not include the word that you meant to use? Perhaps your checker/suggester can do better!
- Make up your own program — Design and write an imaginative, exciting computer application that may dazzle your friends back home. It can fit one of the above categories, or be something entirely different that you'd like to explore.