CS 4124
Homework Assignment 2

Given: January 30, 2024　　　　　　**Due:** February 16, 2024

General directions. The point value of each problem is shown in [ ]. Each solution must include all details and an explanation of why the given solution is correct. **In particular, write complete sentences. A correct answer without an explanation is worth no credit.** The completed assignment must be submitted on Canvas as a PDF by 5:00 PM on February 16, 2024. **No late homework will be accepted.**

Digital preparation of your solutions is mandatory. This includes digital preparation of any drawings; see syllabus concerning neat drawings included in LATEX solutions. Use of LATEX is required. Also, please include your name.

Use of LATEX (required).

- Retrieve this LATEX source file, named `homework2.tex`, from the course web site.

- Rename the file *<Your VT PID>*`_solvehw2.tex`, For example, for the instructor, the file name would be `heath_solvehw2.tex`.

- Use a **text editor** (such as `vi`, `emacs`, or `pico`) to accomplish the next three steps. Alternately, use Overleaf as your LATEX platform.

- Uncomment the line

  `% \setboolean{solutions}{True}`

  in the document preamble by deleting the `%`.

- Find the line

  `\renewcommand{\author}{Lenwood S. Heath}`

  and replace the instructor's name with your name.

- Enter your solutions where you find the LATEX comments

  `% PUT YOUR SOLUTION HERE`

- Generate a PDF and turn it in on Canvas by 5:00 PM on February 16, 2024.

[50] 1. For each of the languages L_1 and L_2 below, decide whether the language is Regular or not Regular. If Regular, give an FA that recognizes the language. If not Regular, use a fooling set argument to demonstrate that there is no FA that recognizes the language.

$$
\begin{aligned}
L_1 &= \{0^i 0^j \mid i, j \geq 0 \text{ and } i = j\} \\
L_2 &= \{0^i 1^j 0^k \mid i, j, k \geq 0 \text{ and } i = k\}
\end{aligned}
$$

---

[50] 2. Textbook Problem 20, on Page 525, parts (a) and (b).
   Prove or disprove:
   (a) Every subset of a Regular language is Regular.
   (b) There exists a non-Regular language L such that L^* is Regular.