

Theory of Computation

CS 378, Fall 2022

Smaller Assignment 5

Due **BY THE BEGINNING OF CLASS** Thursday, October 13

- Standard file naming and HW submission conventions apply: Please submit your type-written answers in a PDF file named

CS378_SA5_<userid>.pdf

where <userid> is replaced by your Colby userid—for example, my file would be called CS378_SA5_eaaron.pdf. Please use your full userid, including your class year. Place the properly named file in your **Private** directory in your CS378 filespace on **filer**.

- As usual for small assignments in CS378 this semester, this is due by the beginning of the next class meeting, and it will be marked on a ✓ + /✓/✓ − /0 scale.
- When using the Pumping Lemma to prove that a language is not regular, be careful with the “there exist” ($\exists$) and “for all” ($\forall$) quantifiers: Whenever there is a $\exists$, you may choose strings arbitrarily. Whenever there is a $\forall$, you must show that the step works for any choice of strings. (Recall the *adversary* argument presented in class.)
- *A general note for CS378:* As always, please present answers cleanly and **explain them clearly and thoroughly**, giving all details needed to make your answers easy to understand; typed-up (rather than handwritten) answers are required, and using L^AT_EX to typeset your answers is appreciated. (Feel free to talk with your Prof. about using L^AT_EX!) Graders may not award full credit to incomplete or illegible solutions. Clear communication *is* the point, on every assignment.

In general in CS378, unless explicitly specified otherwise, answers should be accompanied by explanations. Answers without explanations may not receive full credit. Please feel free to ask me any questions about explanations that might come up!

Exercises

1. **Hans und Franz und Nonregular Languages!** Prove that the language below is not regular, using the Pumping Lemma. Your proof must be clear, complete, and rigorous.

- $L = \{0^i 1^{2i} \mid i \geq 0\}.$