

Hi, I'm Emily!

CS/ECE 374 A

Instructors: Emily Fox & Rata Mehta.

8 graduate TAs & 20 undergrad CAs

↙ Rata

Course work:

<https://courses.grainger.illinois.edu/cs374a1/sp2026/>

Grading: 35%

due
Mons → guided problem sets (GPSs) use
top 9

PrairieLearn

due
Tues → written homework use 18

65% exams

two midterms + a final

5 questions
each

7 questions

Resources:

Textbook / notes by Jeff Erickson.

Lectures

also Ed + Discord

Labs

Office hours (attend these)!

Homework parties:

Homework submission groups (up to 3)

ANYTHING ELSE (with citation)

in your own
words

at end of each ULM
homework part + explain use

Strings:

Σ : alphabet: finite collection of characters / symbols -
 ^{\nearrow}
sigma ex. $\Sigma = \{A, B, \dots, Z\}$
 $\Sigma = \{0, 1\}$ \leftarrow typical

A string is a finite sequence of symbols from Σ

A string w over Σ is defined recursively as one of the following:

ϵ : the empty string

(a, x) s.t. ^{such that} $a \in \Sigma$ and x is a string

$$\begin{aligned}
 \text{STRING} &= (S, \text{TRING}) \\
 &= (S, T, (\text{RING})) \dots \\
 &= (S, (T, (R, (I, (N, (G, \epsilon))))))
 \end{aligned}$$

Length $|w|$ of string w

$$|w| := \begin{cases} 0 & \text{if } w = \epsilon \\ 1 + |x| & \text{if } w = ax \end{cases}$$

shorthand
for (a, x)

↙

Concatenation of string w and z is

$$w \bullet z := \begin{cases} z & \text{if } w = \epsilon \\ a \bullet (x \bullet z) & \text{if } w = ax \end{cases}$$

another (a, x) ↗

Induction

inductive
hypothesis

strong
hypothesis

← start with an arbitrary string:
direct proofs

Proof: Let w be an arbitrary string.

Assume, for every string x such that $|x| < |w|$, that x is perfectly cromulent.

There are two cases to consider.

- Suppose $w = \varepsilon$.

Therefore, w is perfectly cromulent.

- Suppose $w = ax$ for some symbol a and string x .

The induction hypothesis implies that x is perfectly cromulent.

Therefore, w is perfectly cromulent.

In both cases, we conclude that w is perfectly cromulent.



Lemma: For every string w , we have
 $w \bullet \epsilon = w$.

Proof: Let w be an arbitrary string.
Assume $x \bullet \epsilon = x$ for every string x
such that $|x| < |w|$.

Suppose $w = \epsilon$. Then

$$\begin{aligned} w \bullet \epsilon &= \epsilon \bullet \epsilon \\ &= \epsilon \\ &= w \end{aligned}$$

$$\begin{aligned} w &= \epsilon \\ \text{def. } \bullet & \\ w &= \epsilon \end{aligned}$$

Suppose $w = ax$ for some symbol a +
string x

$$w \circ e = ax \circ e$$

$$a \cdot (x \circ e)$$

$$w = ax$$

$$\text{def. } \circ$$

$$= ax$$

$$= w$$

I H

$$w = ax$$

In all cases, $w \circ e = w$.