

Hi, I'm Emily!

CS/EECE 374 A

Instructors: Emily Fox & Ruta Mehta.

8 graduate TAs & 20 undergrad CAs

← Ruta

Coursework:

<https://courses.grainger.illinois.edu/cs374al1/sp2026/>

Grading: 35%

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

due → PrairieLearn written homework use 18
Tues

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 CM
homework party + explain use

Strings:

Σ : alphabet: finite collection of
characters/
- symbols -
x 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. \leftarrow such that

$a \in \Sigma$ and x is a string

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

Length $|w|$ of string w shorthand
for (a, x)

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

Concatenation of string w and z is

$w \circ z := \begin{cases} z & \text{if } w = \epsilon \\ \underset{\text{another } (a, x)}{a} \underset{\text{if } w = ax}{\underset{\rightarrow}{\underset{\rightarrow}{(x \circ z)}}} & \text{if } w = ax \end{cases}$

Induction

inductive
hypothesis



start with an arbitrary
string:
direct
proofs

↑
strong
hypothesis

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 $w = \epsilon$.



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
 $w \circ \epsilon = w$.

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

Suppose $w = \epsilon$. Then

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

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

$$w \circ \ell = ax \circ b \\ a \cdot (x \circ \ell)$$

$$w = ax \\ \text{def. } \circ$$

$$= ax \\ = w$$

$$IH$$

$$w = ax$$

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