



07-131

Great Practical Ideas in Computer Science

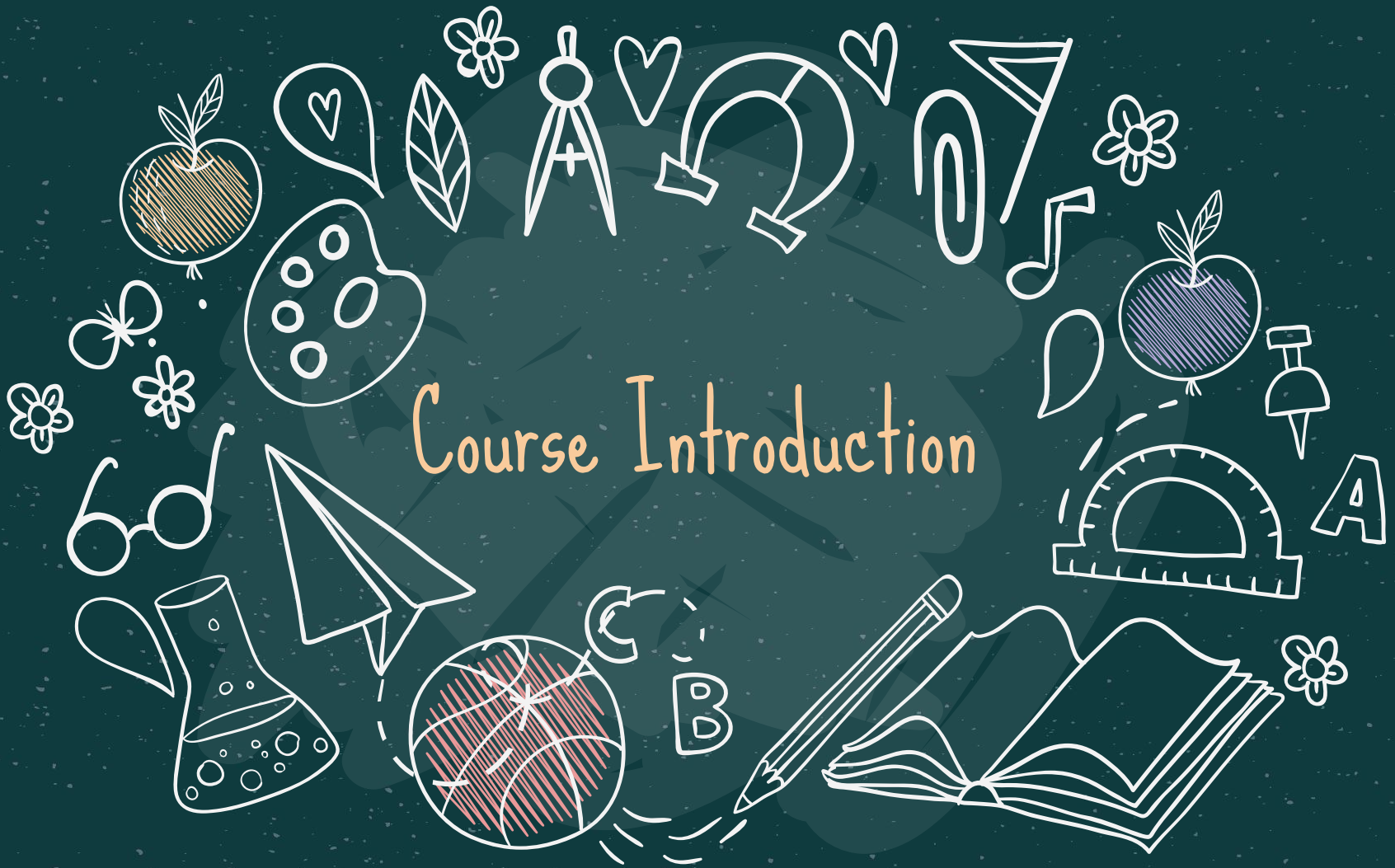
Lecture 1: intro + latex by Amy Liu and Jeremy Wang

Slides available on course website <https://www.cs.cmu.edu/~07131>

Pet tax (these are not my pets.. But one day...)



Course Introduction





Tom & Veronica



tcortina@andrew.cmu.edu



vpeet@andrew.cmu.edu



TA Introductions

Amy Liu (she/her)



jiachen5@andrew.cmu.edu

OH: Tuesdays @ 5pm

- CS Senior
- Japanese language minor
- Hobbies: drawing, baking, crocheting, valorant-ing, eating

Laura Yao (she/her)



ljyao@andrew.cmu.edu

OH: Mondays @ 4pm

- CS Sophomore
- Hobbies: taking walks, origami, puzzles
- Fun fact: I can pogo stick!

Yosef Alsuhaibani (He/Him)

yalsuhai@andrew.cmu.edu

OH: Wednesdays @ 5pm



- CS sophomore
- Hobbies: Photography, writing, riding buses/trains, and "gardening."
 - Left to right: Munira, Khadija



Arya Shah (he/him)



aryas@andrew.cmu.edu

OH: Fridays @ 5 pm

- AI Sophomore
- Hobbies: Rap music, Tennis, Watching Cricket, Working Out
- Fun Fact (?): Arya Stark in Game Of Thrones was named after me!

Keiffer Acoba (they/them)



kacoba@andrew.cmu.edu

OH: Sundays @ 3pm

- CS Senior, ML Concentration & Business Minor
- I really like music and music comp
- Nintendo games are neat
- doggo



Jules Yang (she/her)



jpyang@andrew.cmu.edu

OH: Fridays @ 2:30

- CS junior, HCI concentration
- Things I like: crossword puzzles, working out, cooking, thrifting, making Spotify playlists
- Fun fact: I was a harpist up until college!

Deepti Sunkara (she/her)



dsunkara@andrew.cmu.edu

OH: Mondays @ 3pm

- CS junior
- Hobbies: arts & crafts, reading and writing fiction

Kavya Tummalapalli (she/her)



ktummala@andrew.cmu.edu

OH:

- CS Junior
- Hobbies: running, dance, making jewelry, sewing
- Fun Fact: I run xc and track at CMU!

Jeremy Wang (he/him)

jwang7@andrew.cmu.edu

HMU whenever for questions :)



- CS Senior, HCI additional major
- I like drawing
- look at my cat!!!



GOALS

- To teach you about all the awesome things you can do with your computer.
- To make you super comfortable using Unix systems and the tools you'll use in future courses
- ...and in future internships
- To be a break from your other classes



CMU CS IS...
NON TRIVIAL



Class Time

- < 20 minute lectures (usually)
- Work on the labs with TA help!
- Labs are due in a week, but most people finish in class!

Labs

- Mostly unix interactive themed puzzles!
- Distributed through git (except the lab today)
- Each lab is released at class time
- Submitted on autolab **AUTO LAB**
- Late policy: make a private post on Piazza. We're extremely lenient.



Collaboration Policy

You may:

- use manual (man) pages for commands in question.
- use Google to learn how to use a command/solve a problem.
- ask TAs for help.
- post on Piazza
- ask neighbors for conceptual clarifications

You may not:

- Ask your neighbor how to do the (entire) lab

Exams

- TBD: Will let you know as we approach them
- They are during class time
- One midterm and a comprehensive final
- Forecasted dates:
 - Midterm Oct 7th
 - Final December 2nd

Extratations

- Extra lectures on weekends about miscellaneous topics
- Room and times will be posted on Piazza.
 - Most likely Saturdays at 1-2pm, however please check Piazza!
 - May be online or in-person
- If you attend at least three extratations, you can use your midterm grade as your final grade (or vice versa). This means you can get out of taking an extra final!



Grading

- 80% labs (...which will be done in class)
 - Each lab includes several tasks
 - Complete all tasks to receive full points
 - No late work penalty, but must let us know beforehand!
 - Hard deadlines: before midterm and before final
- 10% midterm
- 10% final

Do the assignments!

- There will be around 8 assignments with equal weight, so each assignment is 10% of your total grade

Getting Help

- Ask TA or neighbor during lecture time
- Post on Piazza
- Course Website (<https://www.cs.cmu.edu/~07131>)
- Office hours - we don't bite!
 - OH calendar link: tinyurl.com/f21-gpi-oh-calendar

QUESTIONS?

Website and Autolab tour



LATEX

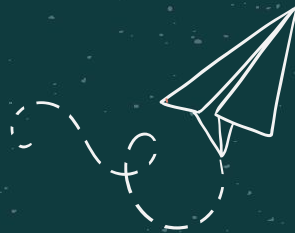
The only typesetting program you need.

01

INSTALLATION

02

WRITING MATH



03

WRITING CODE

04

MACRO MAGIC





INSTALLATION



The image features a dark teal background with a fine, white speckled texture. In the center, the word "INSTALLATION" is written in a bold, orange, hand-drawn font. This text is set against a larger, dark green, hand-drawn brushstroke background. Above the text, three white-outlined lightbulbs are hanging from thin white lines. Each lightbulb has a yellow glow and radiating lines around it, suggesting it is lit. Scattered throughout the background are several small, white, five-pointed stars.

TWO SCHOOLS OF THOUGHT



OVERLEAF

- An online LaTeX editor
- Grab and go
- Chrome + Overleaf = 🐱
- Need to be online
- Awesome for collaboration



LOCAL

- Edit using your favorite IDE
- Might be a pain to setup
- Much better performance
- Can do homework on a plane
- Need to use **git** or Live Share



WRITING MATH



Latex basics

```
\documentclass{article}
```

```
\usepackage{...}
```

```
\newcommand{...}
```

```
\author{...}
```

preamble

Import packages if needed

Defining your own commands, code styles, embedding your name, andrew, id, etc, etc.

```
\begin{document}
```

```
% most of your stuff goes here
```

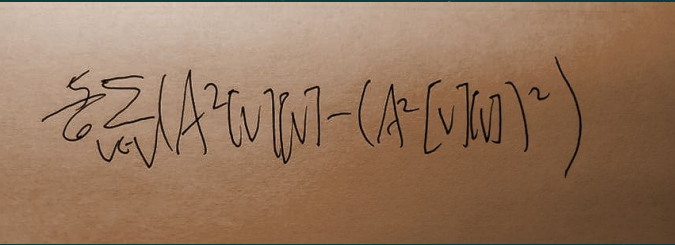
```
% in between \begin{document}...\end{document}
```

```
\end{document}
```

Everything inside
`\begin{document}...\end{document}` is what will actually be rendered

I WANNA MAKE MATH PRETTY

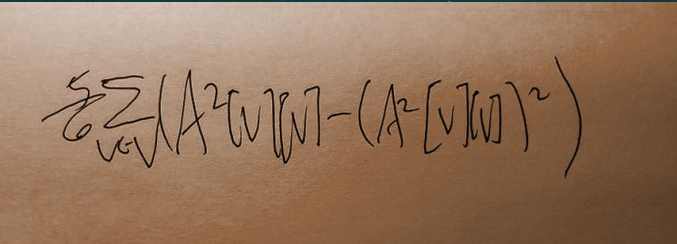
LaTeX's main purpose is to make typesetting easy for technical and scientific documents, most often math (e.g. **15-151 bonus**).


$$\sum_{v \in V} (A^2[v][v] - (A^2[v][v])^2)$$

$$(5/6)(\text{sum } v \text{ in } V (A^2[v][v] - (A^2[v][v])^2))$$

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$$\frac{5}{6} \sum_{v \in V} (A^2[v][v] - (A^2[v][v])^2)$$

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Modes

Math has to be written within a "math-mode" to differentiate from regular text.

a. **Inline:** Write math-formatted text inline

i. `$\frac{x + y}{12}$`

b. **Labeled Equation:** Centered equation on newline

i. `$\begin{equation} \label{ezmath} 1 + 1 = 2 \end{equation}$`

ii. Labels can later be linked to: `$\hyperref[ezmath]{yourDisplayTextHere}$`

c. **Unlabeled Equation:** Centered equation on newline

i. `$[1 + 1 = 2]$`

BUT I RAN OUT OF SPACE

Alignment

Math can be split over multiple lines and better styled with alignment;

- `&` is the alignment keyword and sets the points where equations are vertically aligned
- **Numbered Equation:** Centered equations aligned at `&`
 - `\begin{align} a \&= b \\ \&= c \end{align}`
 - **Protip:** You can suppress the line numbers with `\begin{align*}` instead
 - **Protip:** Use `\tag{...}` to cite your lines!
- **Multline Equation:** Centered equations with no alignment points
 - e.g. `\begin{multline} a + b + c + d \\ e + f + g + h \end{multline}`
- `~` for space in math mode

`\usepackage{amsmath}`

 **ALWAYS** close any `\begin{...}` with an `\end{...}` 

USEFUL FEATURES

EQUATIONS

- `\begin{equation}`
...
`\end{equation}`
- More:
 - `\begin{multline*}`
 - `\begin{align*}`
 - `\begin{gather*}`
 - `\begin{cases}`

MATRICES

- `\begin{matrix}`
`1 & 2 & 3 \\`
`4 & 5 & 6`
`\end{matrix}`
- More:
 - `pmatrix`, `bmatrix`,
`Bmatrix`, `vmatrix`,
`Vmatrix`

PROOFS

- `\newtheorem{...}`
- `\begin{proof}... \end{proof}`
- More:
 - Induction (templated)
 - QED stylings (templated)

RELATION & BINARY OPERATORS

- General
 - `+`, `-`, `\div`, `\times`, `\pm`, `\ge`,
`\leq`
- Trigonometric
 - `\sin`, `\cos`, `\tan`
- Set
 - `\in`, `\subset`, `\subseteq`
- Calculus (templated)

LETTERS & SYMBOLS



- Greek letters
 - `\SYMBOL_NAME` (e.g. `\mu`)
- Arrows
 - `\DIR_ARROW` (e.g.
`\rightarrow`)
- `\infty`, `\nabla`, `\emptyset`, `\neg`

PROBABILITY



- `$P(A \binom B) \rightarrow P(A|B)`
- `\binom{n}{k}`
- `\bar`
- `\hat`
- `A \perp B`
- Probability, combinations,
expectation, variance
(templated)

DON'T FALL INTO A PIT



Quotations

-  Two backticks start, two single quotations end: ``...``
-  This will not work: "..."

Math Mode

-  `$$...$$` is no longer supported by LaTeX
-  Use `\[...]` instead.

Parentheses

-  Do not use parenthesis like $(5 * f(x))$
-  Instead use `\left(` and `\right)` every time for correct sizing

Special Characters

- When using the letter L as a variable name, use `\ell` so it looks like ℓ instead of l
- A number of special characters exist in LaTeX. To show up in output, the character must be escaped:
 - `&, %, $, #, _, {, }` → `\&, \% , \$, _, \#, \{, \}`
 - `~, ^, \` → `\textasciitilde, \textasciicircum, \textbackslash`

Newline

- `\\` should NOT be used for text newlines
 - This command has different meanings under different environments. Be explicit with using `\newline`, `\linebreak`, or `\par` instead.
 - `\\` is usually used for alignment or line break *inside* modes like `align`, `matrix`, etc



WRITING CODE

BUT MACKEY, I JUST WANNA CODE

VERBATIM

It's the 1980s guys. People have **typewriters**.
With LaTeX, you have typewriters on your computer:

- `\begin{verbatim}... \end{verbatim}`
- Will type out exactly what you type in, as if you were writing on a typewriter
- By default will turn text into monospace text (i.e. code style)

Special commands:

- Emphasize whitespace
 - `\begin{verbatim*}`
 - ...
 - `\end{verbatim*}`
- Verbatim environment
 - `\verb|...|`

LISTINGS

```
\usepackage{listings}
```

Aight LaTeX moved to the **21st century** now.
Way more bells and whistles to play around with:

- `\begin{lstlisting}[options=...]`
...
- `\end{lstlisting}`
- Will also create monospace text, but way more configuration options:
 - **Language:** `[options]`
 - **Syntax highlighting:**
 - `[keywordstyle, stringstyle, commentstyle, morecomment]`

Special commands:

- Listings environment inline
 - `\lstinline{...}`
- Import code from file
 - `\begin{lstlisting}{path_to_file}`



MACRO MAGIC



FACTS OF LIFE

LaTeX is noice.

- It makes math look pretty.
- You can type complicated symbols.
- It makes code look pretty.

LaTeX is a good to know.

- You get bonus points in 15-151.
- Pretty is better than ugly.


LaTeX is a need to know.

- Some classes will require your homework to be typeset.
- Some classes will require your homework to be typeset. x2
- Conferences will require a .tex source of your paper.
- Collaboration on large papers for non-LaTeX mediums is almost impossible.

BUT AT WHAT COST?

- Everything has **tradeoffs**.
- Typesetting is **glorious** but **time-consuming**.
- But it doesn't have to be!
- You can create your **own commands** to template out commonly used things in your homework workflow for the rest of your college career.
- The sooner you start, the more time you'll save!

COMMAND CENTER

- `\newcommand{\NAME}[#]{...}`
 - `\newcommand{\R}{\mathbb{R}}`
 - `\newcommand{\dotseparated}[2]{#1 \cdot #2}`
-  Be cautious of whether your command will be used in math mode or not.
- You might need to use `\renewcommand` if a preexisting command has the same name.
- You can use these for titles, problems, common proof templates (induction), etc.
- In fact you can use our own LaTeX template for homeworks at CMU!!!

Closing Thoughts

- **Practice, Practice, Practice**
- Template
- LaTeX Cheat Sheet might be useful for lab ;);)
- Overleaf documentation
- Ask **Questions**
 - StackOverflow
 - LaTeX Community
- **Make** Things!

LAB PRO TIPS

- Please go through the writeup before starting this week!
- Each task has a header describing what you will do in the file!
- Remember to uncomment the task in main.tex to work on it!
- There may be hints at the bottom of each lab to help you along :)
- You can zip files together by highlighting them and right clicking
You are handing in the final pdf **AND** the source tex files!!!
- You can rename a project in Overleaf by selecting the project, going to “More”, and then applying rename!
- The Makefile will only work if you have a LaTeX installation!

~~Extration~~ Extended OH this weekend!

- Need preparation ahead of time for week 2: terminal!
 - Link to [Initial Setup Tutorial](#)
- Extended OH this weekend! **Saturday @ 1:00 - 2:00pm in GHC 5th floor Carrel 3**
 - Come get help on set up or hangout with TAs~

Please give us feedback!

- Lecture pacing too slow/fast? Are there broken links or typos? Let us know through the feedback form!
- Link will also be available on the course website
- Form:
tinycloud.com/f21-gpi-feedback

- Please go through the writeup on Autolab before starting this week!
 - Each task has a header describing what you will do in the file!
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Set up + OH this weekend

- Link to [Initial Setup Tutorial](#)
- Extended OH this weekend! **Saturday @ 1:00 - 2:00pm in GHC 5th floor Carrel 3**

Feedback

- Form: tinyurl.com/f21-gpi-feedback

OH throughout the week!

- OH Calendar: tinyurl.com/f21-gpi-oh-calendar