Introduction to CS & AI

Tao LIN

September 3, 2024

WESTLAKE UNIVERSITY | SCHOOL OF ENGINEERING

Table of Contents

Indeed “introduction to CS & AI” DOES NOT indicate that

we will go through all basic CS & AI materials step-by-step in this course!

If you are still unfamiliar with

[1] https://inst.eecs.berkeley.edu/~cs61a/sp22/

[2] https://sp23.datastructur.es/

[3] https://cs61c.org/fa23/

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- (Even) UC Berkeley, CS 61C: Great Ideas in Computer Architecture (Machine Structures)[3].

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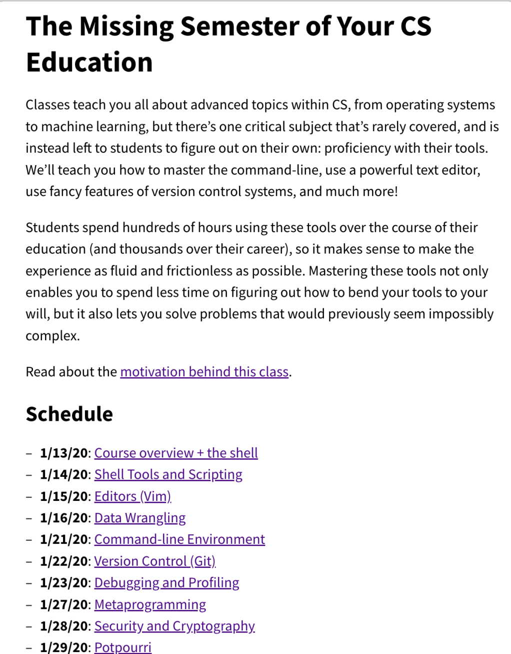

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Build your research weapons and wheels

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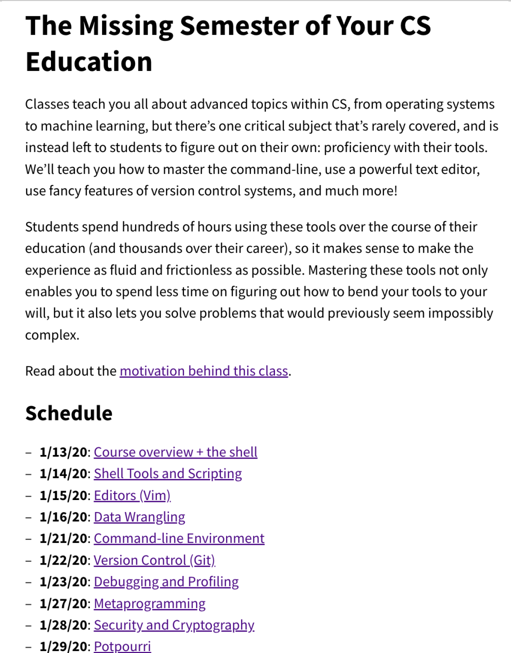

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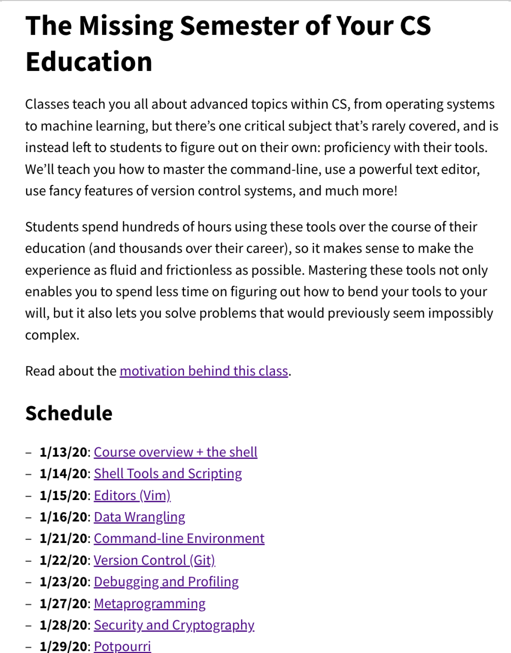

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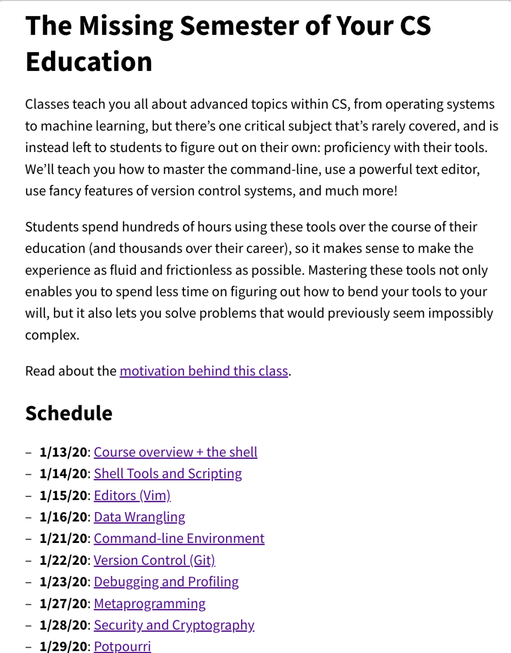

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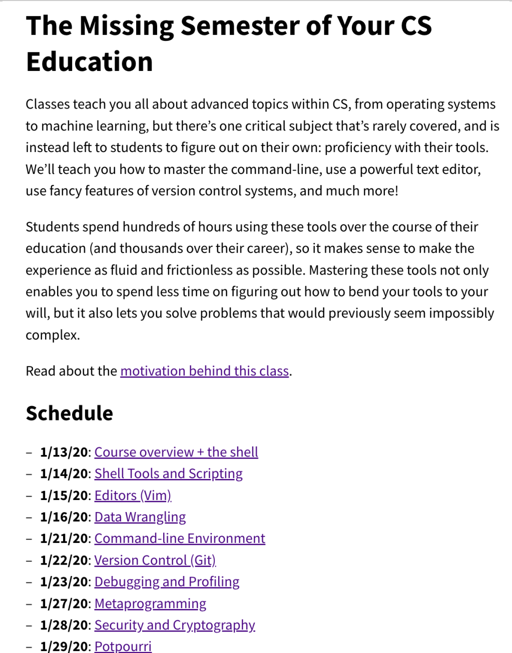

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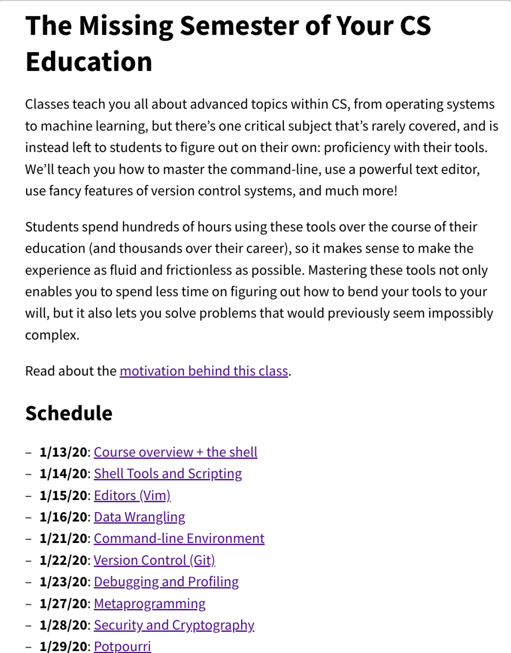

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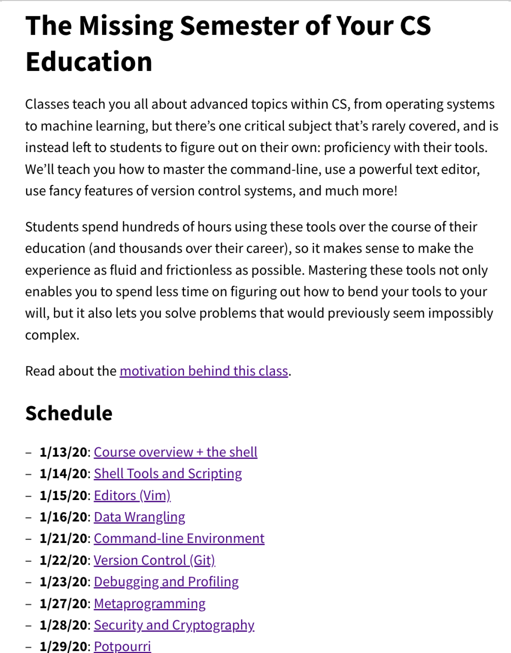

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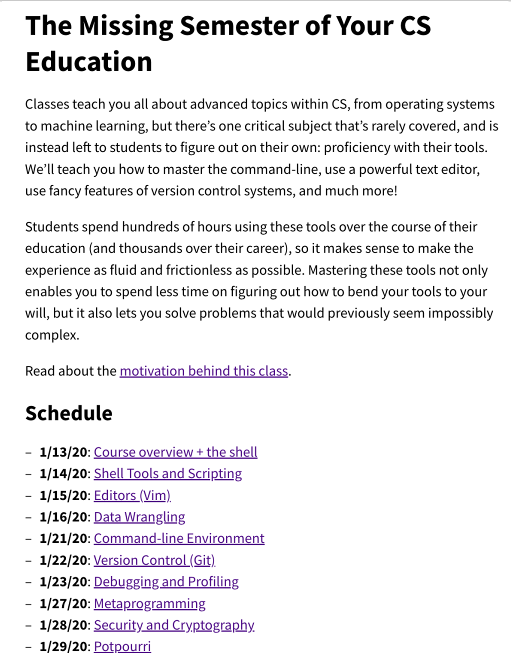

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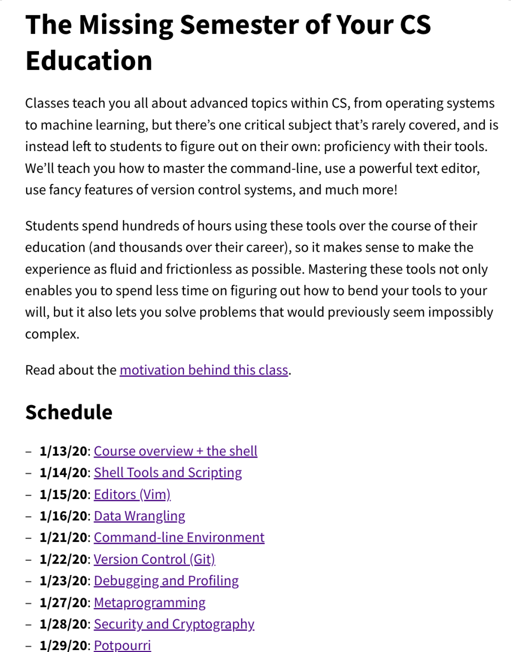

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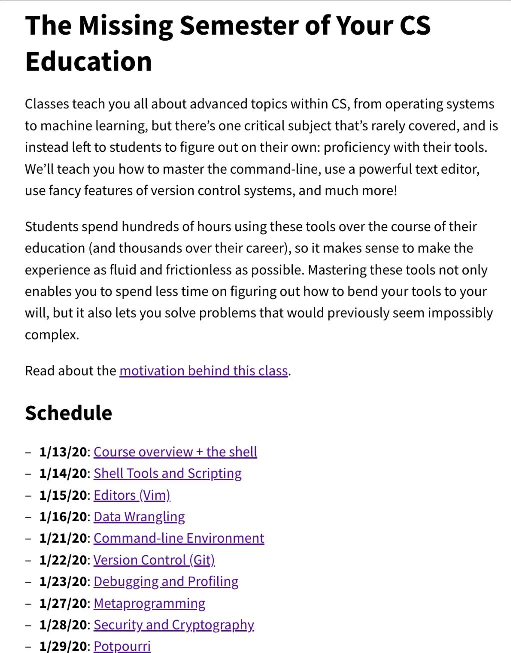

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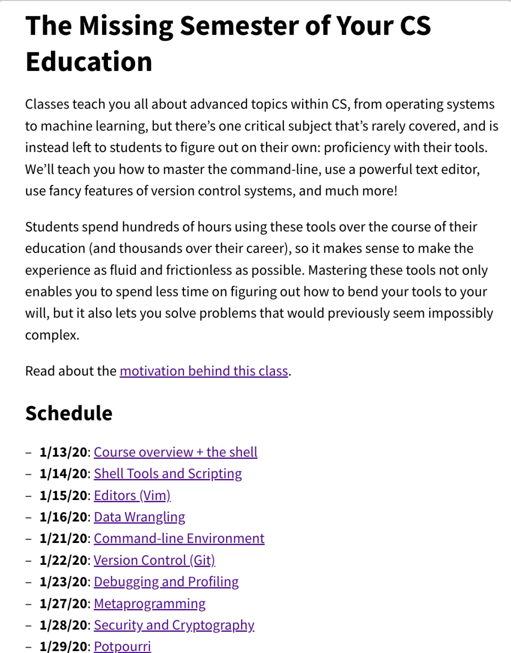

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System

- Computer systems

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- Embedded systems

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- System-on-chip

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Advanced CS: System, Theory, and AI

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Dive into AI

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  3. In contrast to strong AI, **weak AI** is any program that is designed to solve exactly one problem.

Early Success (1952 - 1959)

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Underwhelming Results:

The report by the Automatic Language Processing Advisory Committee (ALPAC) in 1966 resulted in the government funding cut for Machine Translation (MT), causing the first AI winter.

Knowledge-base System (1970s - 1980s)

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- AI industry boosts: from a few million dollars in 1980 to about two billion dollars in 1988.

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- End of symbolic AI domination for multiple decades.

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- The history of neural AI dates back to 1943.

Inspiration from Neuroscience

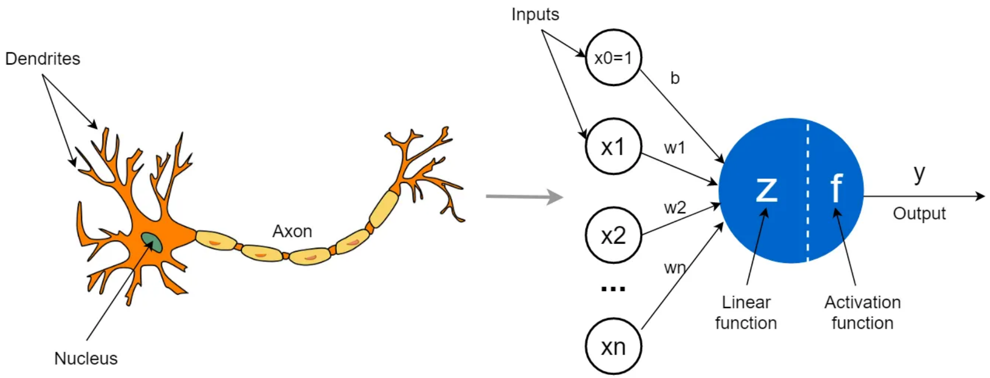

Figure: Human neurons (left) and artificial neurons in ANN (right). Image from towardsdatascience.com.

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- Many (2022):

  large language model and generative pre-trained transformer (GPT)
  greatly improve the performance of the generative model. e.g. ChatGPT, GPT-4.

Ideas from Outside AI: Algebra and Statistics

- Carl F. Gauss (1801): linear regression.
- Ronald Fisher (1936): linear classification.
- Richard Bellman (1953): dynamic programming, Markov decision processes.
- Judea Pearl (1985): Bayesian networks.
- Corinna Cortes & Vladimir Vapnik (1995): support vector machine (SVM).

AI is Multi-disciplinary

- Mathematics (Algebra & Statistics)
- Optimization
- Neuroscience
- Computer Software
- Computer System

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How to Become a Good AI Researcher

- Master math and CS skills

If you are not ready, please check

- the materials listed before
- `https://csdiy.wiki/`
- books e.g., Algebra, Topology, Differential Calculus, and Optimization Theory For CS and ML

- Some implicit skills (what we will introduce in this lecture: **A Survival Guide to a Ph.D.**)
  - effective communication strategy
  - how to do research
  - how to give a great research talk
  - etc
- Practice these skills and make steady progress in your research

Course Schedule

Week	Date	Topics
1	2024. Sep. 03	Introduction to CS & AI
2	2024. Sep. 10	How to communicate
3	2024. Sep. 17	How to do presentation
4	2024. Sep. 24	How to be a good AI researcher (I): doing research I
5	2024. Oct. 07	How to be a good AI researcher (II): productivity and career
6	2024. Oct. 15	How to be a good AI researcher (III): academic paper writing and peer reviews
7	2024. Oct. 22	Sharing the experience of writing excellent academic papers and rebuttal
8	2024. Oct. 29	Practice course

How to communicate

How to do presentation

How to be a good AI researcher (I): doing research I

How to be a good AI researcher (II): productivity and career

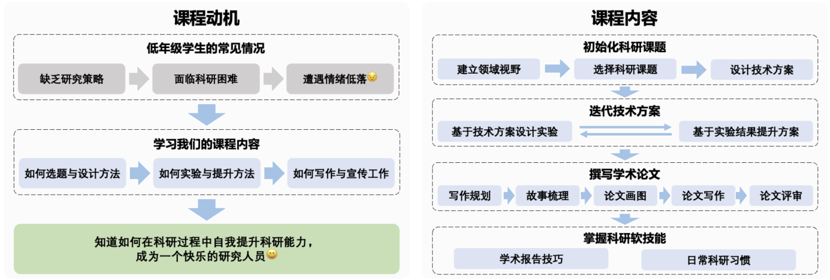
How to be a good AI researcher (III): academic paper writing and peer reviews

Parallel course

GAMES003: 科研基本素养

2024 年秋季学期（在线直播）

课程介绍



本课程为初学者展示了一条全面的学术研究路径，旨在引领大家以系统性的方法探索计算机视觉和图形学领域的科学前沿。我们将指导大家从建立领域视野，到选择科研课题、设计技术方案，再到设计实验、优化方案、管理论文投稿、设计论文图表、撰写论文、自我评审与rebuttal，以及学习做学术报告的技巧，覆盖了科研过程中的每一个关键步骤。课程中，我们将结合具体案例，分享科研经验，同时鼓励学生提出问题，以实现具象的科研素养教学。

具体课程内容请参见课程大纲。

https://pengsida.net/games003/

Thanks & Question Time!