



**INNOVATIVE USE OF
AI IN EDUCATION**



AI Development Accelerator



Institute for Excellence in Teaching & Learning

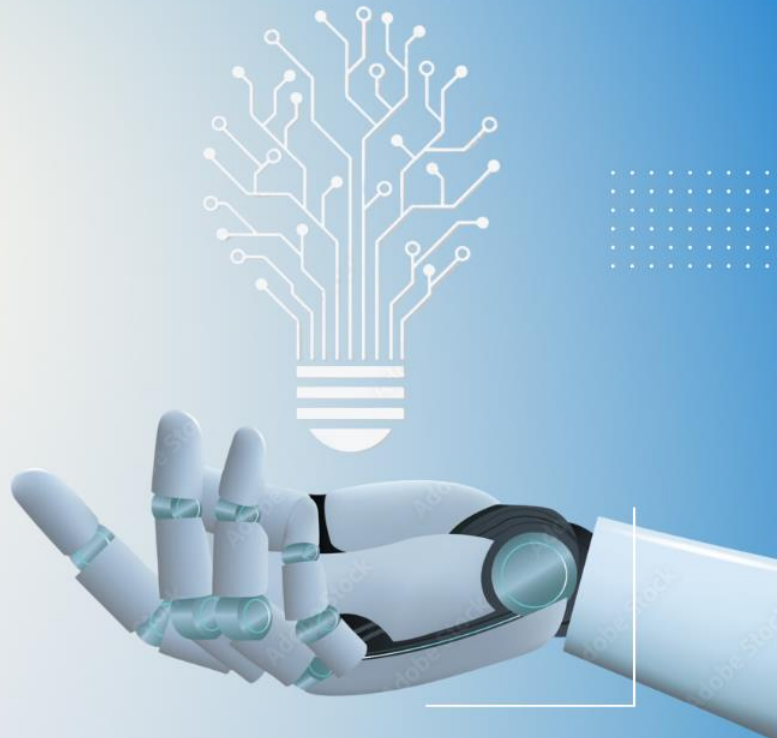
Innovative Use of AI in STEM-Related Courses

October 16, 2025





4:00 PM - 6:00 PM

CDS 1101

665 Commonwealth Ave



AIDA Core Team & Governance

	Name	Title	Organization
	AIDA Core Team		
	Ken Lutchen Interim Executive Director	Vice President for Research, Dean of Engineering, <i>Emeritus</i>	Strategy & Innovation
	 John Byers Co-Director, AI in Academics	Professor of Computer Science; Former Senior Associate Dean of Faculty for Mathematical & Computational Sciences	College and Graduate School of Arts & Sciences
	 Yannis Paschalidis Co-Director, AI in Academics	Distinguished Professor of Engineering; Director, Hariri Institute for Computing and Computational Science and Engineering	College of Engineering
	 Bob Graham Interim Chief AI Officer	Associate Vice President, Enterprise Architecture and Applications	Information Services & Technology

AIDA Core Team & Governance

Name	Title	Organization
AIDA Academic Advisory Council		
Joseph Bizup	Associate Dean Undergraduate Academic Programs & Policies	College of Arts & Sciences
Priya Garg	Associate Dean, Office of Medical Education, Chobanian & Avedisian School of Medicine	School of Medicine
Amie Grills	Associate Provost for Undergraduate Affairs	Undergraduate Affairs
Tal Gross	Professor, Markets, Public Policy, and Law	Questrom School of Business
Alexander Olshevsky	Professor (ECE, SE)	College of Engineering
Wesley Wildman	Professor of Philosophy, Theology, and Ethics, and of Computing and Data Sciences	School of Theology
AIDA Administrative Advisory Council		
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Marylou O'Donnell-Rundlett	Associate Vice President, Enrollment Service Operations	Enrollment and Student Administration
Kerri Saucier	Associate Vice President, Advancement Information Strategy	Development & Alumni Relations

What does AIDA do?

■ Mission

- catalyze the development, adoption, and governance of AI at BU
- advance AI literacy and competence
- comprehensive and coordinated approach across the University

■ Activities in 2025

- AIDA Symposia: learning/designing/sharing best practices with AI
- TerrierGPT: access to GenAI models for all faculty, staff, and students
- GenAI usage guidelines (but not **policies**)
- 4-hour online course for BU undergraduates (October release)

+ we seek your input

TerrierGPT. About that... Students/Faculty ask:

- *Q: Now we're training another AI model?! Why?*
- *A: It's not a model. It's a gateway to access existing & popular LLMs.*
- *Q: I use ChatGPT. Why would I need or want TerrierGPT?*
- *A: ChatGPT-4.1 is available through TerrierGPT. GPT-5 is coming soon. With ChatGPT, OpenAI is training on your queries. With TerrierGPT, your data is protected. It's also **free**.*
- *Q: Does BU see my queries or train on my data?*
- *A: No. TGPT has the same privacy guarantees as your BU email.*
- *Q: In this budget environment should BU be investing in AI?*
- *A: Yes, as BU continues to “build an ambitious vision for the future.” AI is here to stay and we have a responsibility to educate our students.*

Innovative Use of AI in STEM



Kevin Gold

Associate Professor of the Practice;
Preceptor for Instruction;
CDS



Jennifer Bhatnagar

Associate Professor of Biology;
Director, Biogeoscience Program;
CAS



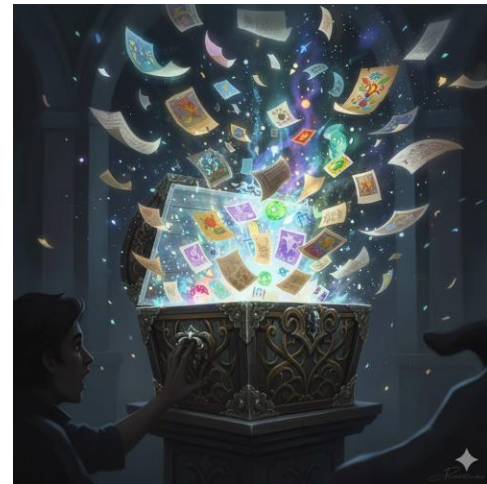
Keith Brown

Associate Professor (ME, MSE,
Physics);
Associate Chair for Graduate
Programs (ME);
ENG

The DS110 AI Problem Generator



Kevin Gold
Associate Professor of the Practice
Faculty of Computing and Data Sciences



An Endless Stream of Practice Problems

- Idea: Make an easy interface for students to request **novel practice problems before exams.**
 - Even before the availability of AI, some students have wanted more practice
 - But now especially, students may have relied on AI for homework too much - this is a last chance to learn!
 - Rather than just supplying the problems, the AI can give **constructive feedback on solutions** (F '25)
- Best-in-session award, AIET '25



What is this DS110 course?

- "Introduction to Data Science with Python"
- Learning to program combined with assorted data science topics
- Most challenging part of exams is coding on pen-and-paper
- 192 student in Spring '25



```
import re

pattern = '02143'
longstring = 'Somerville, MA 02143'
result = re.search(pattern, longstring)
if result: # (if it's not None)
    print(result.group())
```

User Interface, Fall '25

Midterm 2 Topics

☐ pandas☐ Regular Expressions☐ Files and Exceptions☒ Object-oriented Python☒ Recursion☐ Graphs

Generate Problem

Problem

Create a `Node` class to represent a node in a linked list of integers. Each node should contain an integer value (`number`) and a reference to the next node (`next`).

Add a method `sum_all` to the `Node` class that recursively computes and returns the sum of all integer values from the current node to the end of the list.

Write code to:

1. Create a linked list with the values `3`, `5`, `2`, and `8`.
2. Use the `sum_all` method to compute and print the sum of all values in the list.

Your Code Here

Try My Solution

Feedback

Thank you for your effort! However, the current program doesn't address the task requirements. Here's where it falls short and how you can improve it:

Implementation details

- "Give me a practice problem for an introductory course in python and data science that uses the following concepts:" [fill in based on tickyboxes]
- The backend is GPT-o1-mini, the fastest model that could reliably obey the instructions to *only use keywords and concepts covered in the course*
- All Python code covered in the course is dumped into the prompt!
- A solution is generated at the same time as the problem, but discarded - it's just for checking that it's feasible in the bounds of the course
- Feedback window has instructions to judge whether the program satisfies the prompt, and if not, explain what's wrong and explain any relevant Python concepts

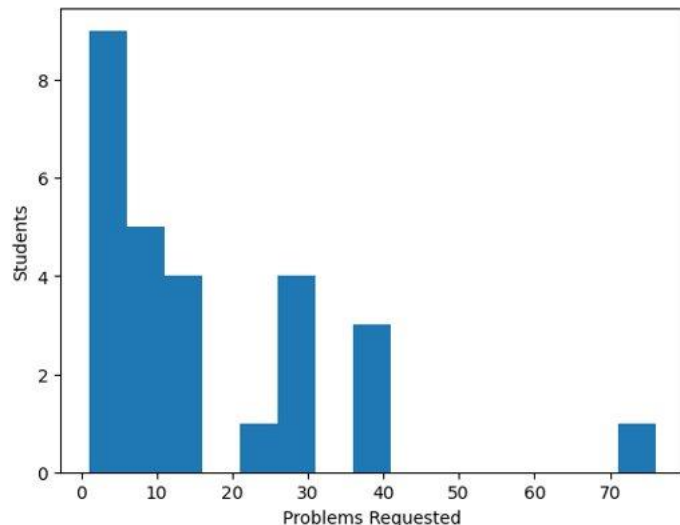
What does this add beyond GPT-5?

- The critical piece is that *the problems are limited to the course material*, which is something students could find challenging to achieve in their queries
- Interesting idea: *the interface focuses students on the most important topics*
- In short, it's more focused on relevant topics
- Still, you could emulate this without the special code and interface?
 - "Give this big file to GPT-5 and tell it to ..."
 - "Some topics you might ask for problems about are..."

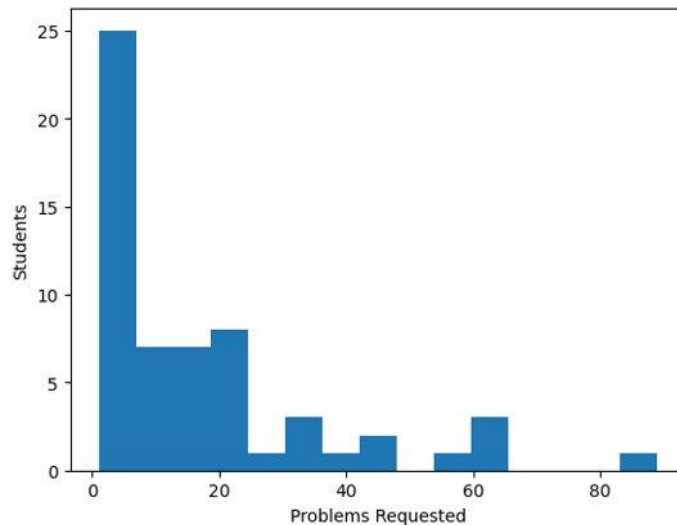


S '25: Who used it, how much?

Midterm 1



Midterm 2



- 27 (out of 192) unique students leading up to midterm 1, 59 leading up to midterm 2
- An average of 16-17 problems per student who used it

Does it improve grades?

- We didn't do a randomized controlled trial, so the lack of significant difference between user & non-user grades (S '25) is hard to interpret
 - Students seeking practice might be struggling more than those who think they don't need it
 - But they could be more conscientious, too
- Informally, students in office hours report getting a lot out of it



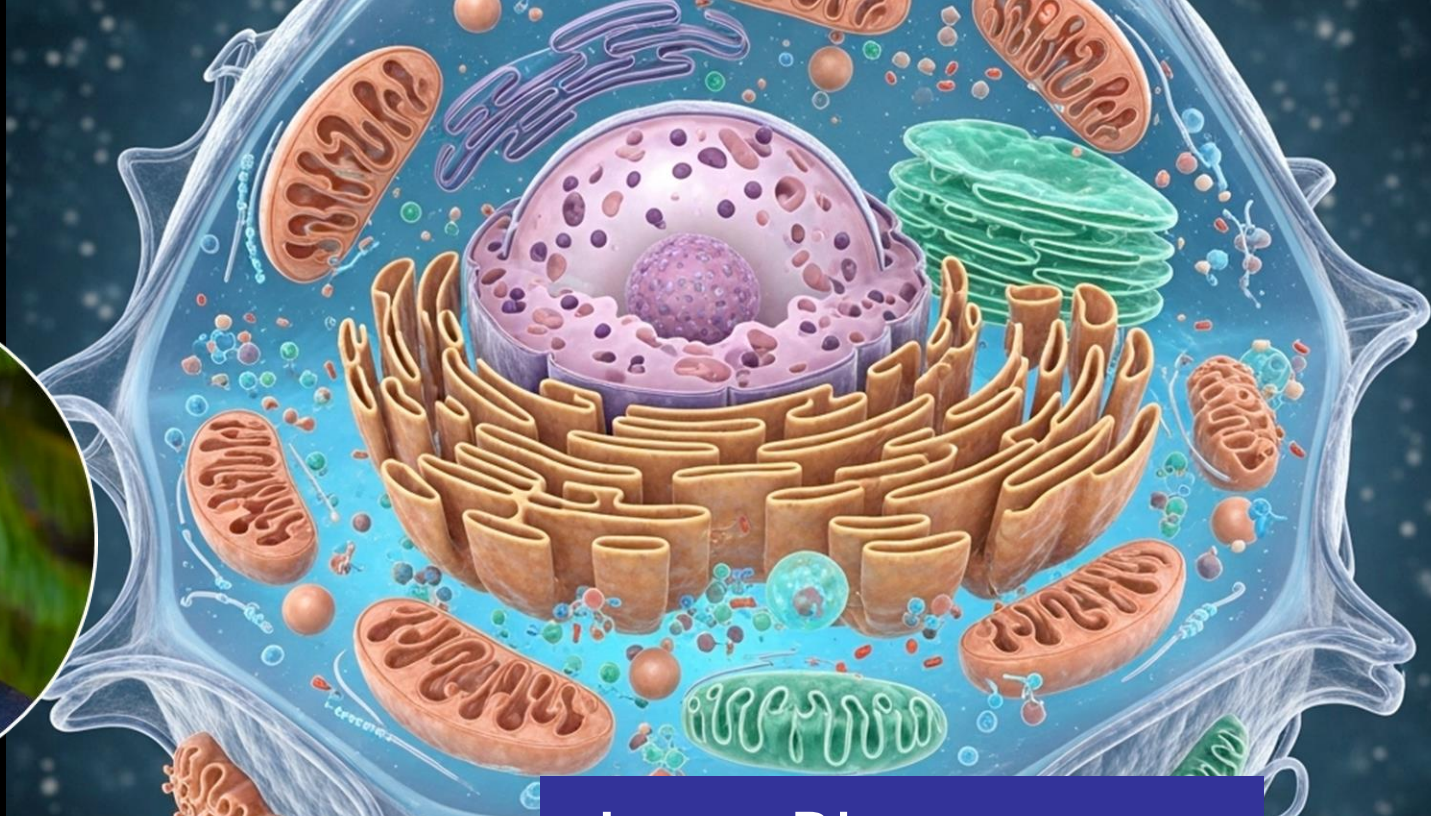
Conclusions

- AI has caused a shift toward in-class exams...
- ...which shifts student efforts to studying right *before* said exams...
- ...which increases demand for practice materials...
- ...which AI can not only provide, but also give feedback on, at a scale and timeliness that would be difficult for course staff to provide!





Any questions?



AI in Biology

Jenny Bhatnagar
Associate Professor
CAS/Biology



General Microbiology (BI 311)

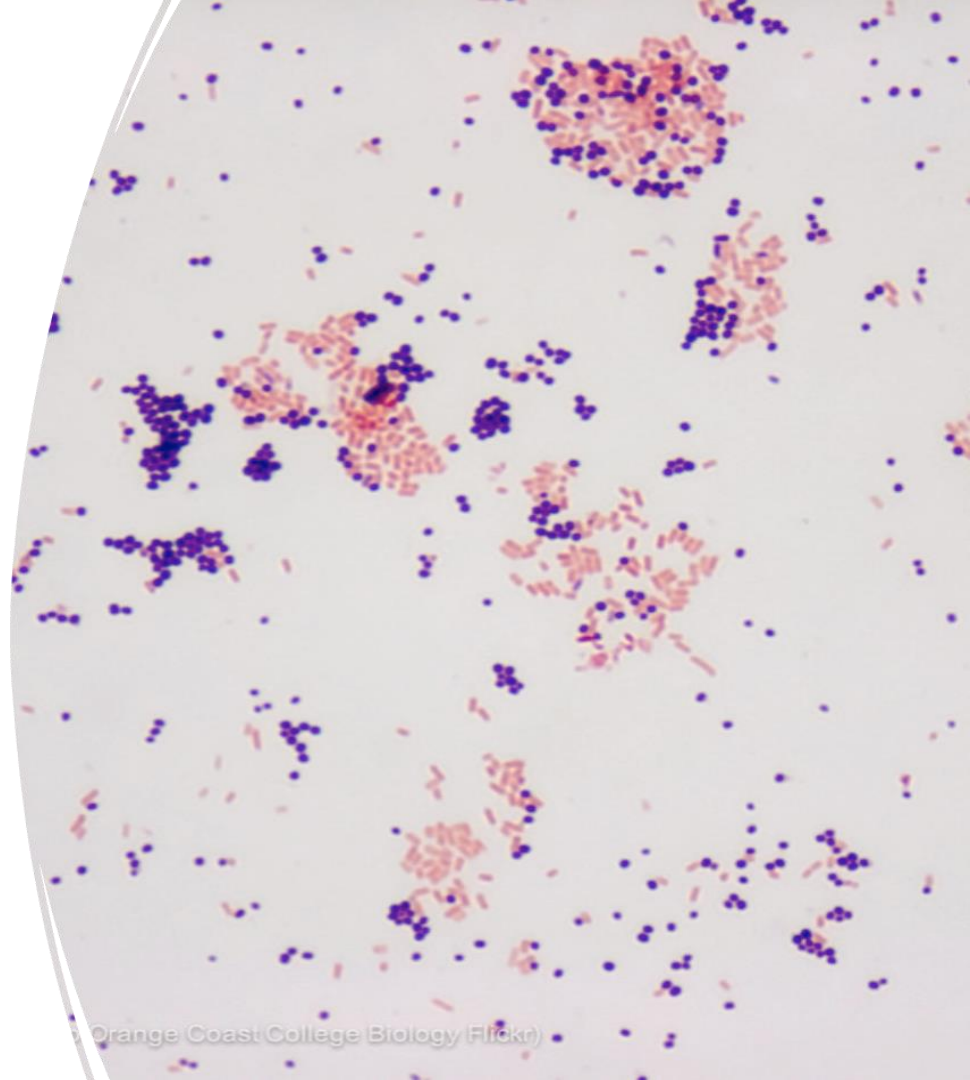
- 154 students
 - Junior/Senior Biology majors
 - Sargent College
 - SPH Master's
- Most are pre-health

AI in Biology

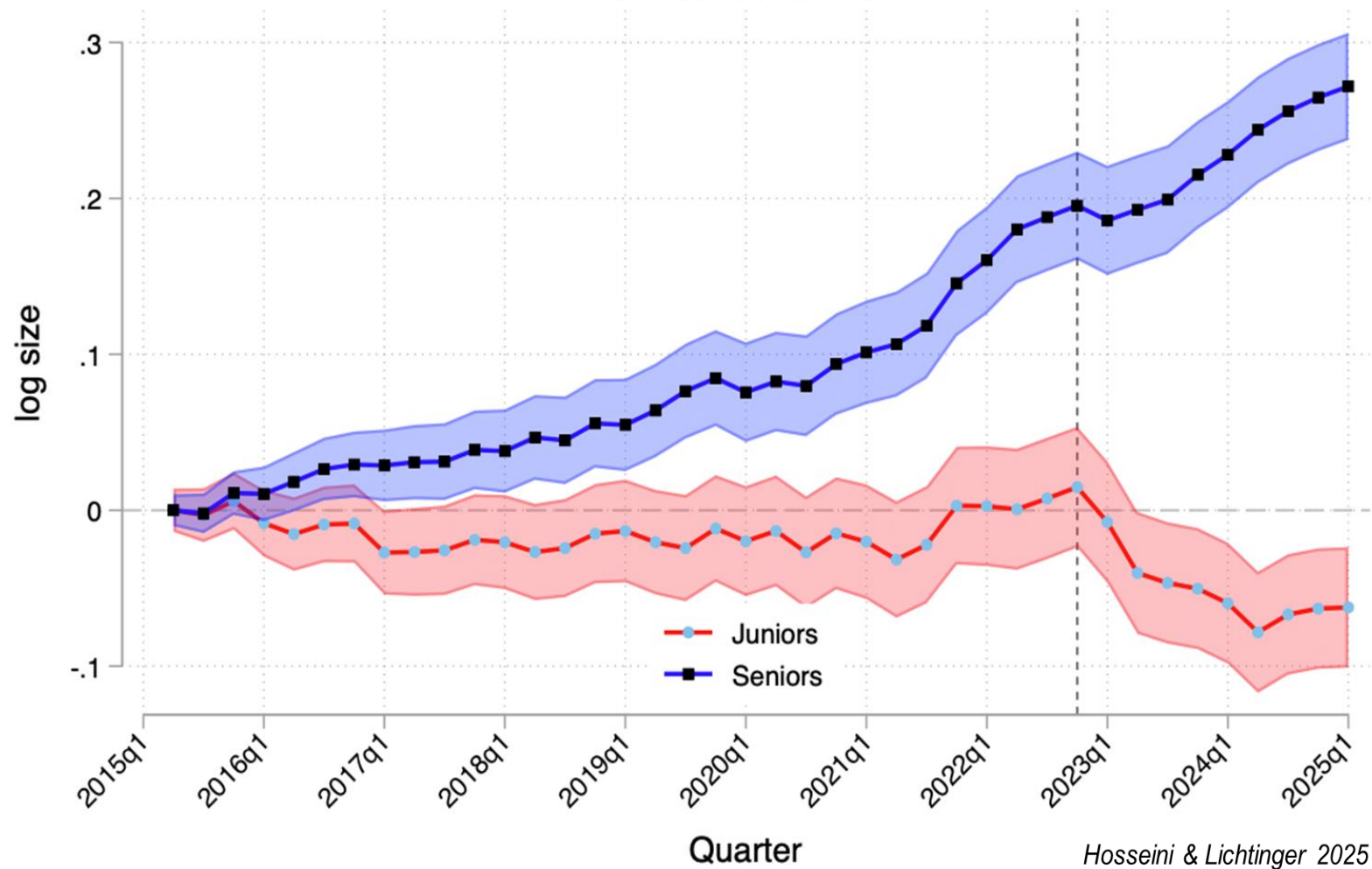
Jenny Bhatnagar
Associate Professor
CAS/Biology

Motivation

- 1) Students are using it profusely
- 2) No biology faculty have been teaching it
- 3) It's not going away



Juniors vs Seniors



Leaning into AI in Microbiology

1. Learn what LLMs and AI are and show students

A low-code way to learn AI

Learn how AI works from a real LLM implemented entirely in Excel

Watch the lessons

Subscribe

Watch the demo

Watch the 10 min demo from the Seattle AI Tinkerers meetup



Leaning into AI in Microbiology

1. Learn what LLMs and AI are and show students
2. Highlight the strengths and the weaknesses

Discuss biology-specific hallucinations

THE AMERICAN JOURNAL
of MEDICINE.
Official Journal of the Alliance for Academic Internal Medicine



For a recent experiment in my lab dealing with ticks and tick-borne disease ecology, we queried ChatGPT about engorged female hard ticks and where they might choose to lay their eggs. We were particularly interested in how far they travel while looking for an oviposition site. This was the generated response:

In one study, researchers found that engorged female *Amblyomma americanum* ticks can travel up to several hundred meters before selecting a suitable site for egg laying. However, the majority of the ticks tended to stay within a few meters of the location where they fed. The study also found that the distance traveled by the ticks was influenced by their physiological state, with ticks in better physiological condition being more likely to travel greater distances.

From many years' experience in tick ecology, we knew that engorged female ticks were unlikely to travel hundreds of meters, so we then asked ChatGPT to provide the scientific paper from which these statements were derived. Here's the response:

Goddard et al. 2023. Am J Med.

Leaning into AI in Microbiology

1. Learn what LLMs and AI are and show students
2. Highlight the strengths and the weaknesses
3. Get practice



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General Microbiology by Students of Jennifer Bhatnagar, Boston University



Jennifer Bhatnagar, Boston University. Photo credit: Jennifer Bhatnagar

Student Pages

[Acinetobacter lwoffii](#) by Jobelle Manuel, Lydia Mahan, Alisandra von Lichtenberg, Ann Marie Hannoush, and Mary Le

[Alphacoronavirus 1](#) by Keiddy Curiel, Lauren Guthrie, Rebecca Hyatt, Gabrielle Kim, and David Ruiz

[Aspergillus flavus](#) by Eric Cui, Jun Bai Park Chang, Jordan Newman, and Meiheng Liang

[Aspergillus tubingensis](#) by Rashi Purohit, Yara Manna, Dana Almberg, Nicole Porio, Danyang Li

[Candida auris](#) by William D. Denton, Sam Van Roy, Vanessa L. Stahl, Anna Bogursky, Kate M. Workman

[Candida parapsilosis](#) by Natalia Aneiros, Dominick Milano, Sharmetha Ramanan and Quintashia Wilson

Bibliography guidelines

Please prepare an annotated bibliography for at least 10 primary research articles (2 per group member) that you plan to cite in your MicrobeWiki article. You will work with your MicrobeWiki group to do this, and you will:

- (1) ask TerrierGPT to prepare an annotation for each article, then
- (2) prepare your own 200-300 word annotation for each article, using GPT output or not, and finally
- (3) report the things that TerrierGPT got wrong or missed about each article that you noticed with your exquisite human brain. Instructions on how to do this are below.

Source 7: Weng, S.-C., Chou, C.-J., Lin, L.-C., Tsai, W.-J., & Kuo, Y.-C. (2002). Immunomodulatory functions of extracts from the Chinese medicinal fungus *Cordyceps cicadae*. *Journal of Ethnopharmacology*, 83(1-2), 79–85. [https://doi.org/10.1016/s0378-8741\(02\)00212-x](https://doi.org/10.1016/s0378-8741(02)00212-x)

Our Annotation:

This study by Weng et. al examined whether the medicinal fungus *Cordyceps cicadae* can affect the human immune system. The fungus was divided into its fruiting body (ascocarps) and insect body, and extracts from each were tested on immune cells from healthy volunteers. One ascocarp extract, CC-1-2, strongly boosted immune activity. It increased cell growth and raised levels of IL-2 and IFN- γ , two key signals that help T cells multiply and fight infections. The insect-body extract CC-2-1 suppressed these same responses, slowing immune cell proliferation and lowering

TerrierGPT's Annotation:

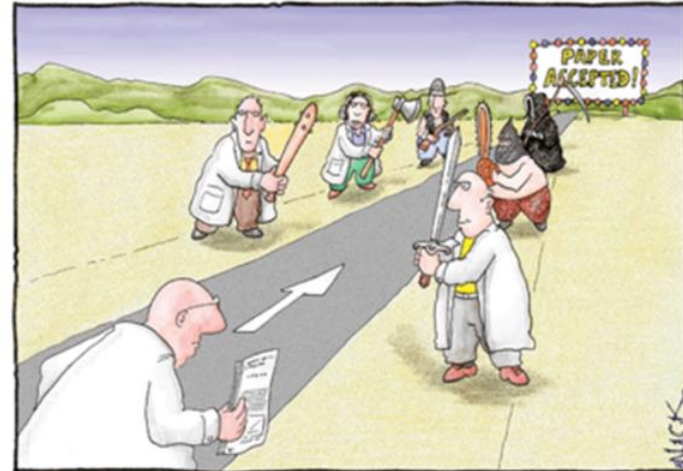
This study explored the effects of extracts from different parts of the fungus *Cordyceps cicadae* on human immune cells called mononuclear cells. Researchers tested two main extracts: one from the fungus's fruiting body (CC-1-2) and one from the insect it grows on (CC-2-1). The CC-1-2 extract helped immune cells grow and increased the production of key immune signaling

Critique of TerrierGPT:

TerrierGPT gave a good overview but left out some important details. It didn't mention that this was the first report showing immunomodulatory activity in *Cordyceps cicadae*, which is a key reason the study matters. It also skipped over the fact that the opposite effects of CC-1-2 and

Leaning into AI in Microbiology

1. Learn what LLMs and AI are and show students
2. Highlight the strengths and the weaknesses
3. Get practice
4. Use it to teach the primary literature



Most scientists regarded the new streamlined peer-review process as "quite an improvement."

3. Organism(s) – Key Points

a. Genome Structure

The entire genome of Bathyarchaeia has been sequenced. Initially, the microbe's genome was sequenced via metagenomic assembly from environmental samples. However, a few recent studies have been able to successfully cultivate representatives of Bathyarchaeia and sequence its genomes in its entirety. These studies collectively demonstrate that genome sizes vary but fall within 0.76-3.63Mbp (Khomyakova et al., 2023) (Jiang et al., 2025) (Yi et al., 2024). The same studies demonstrate a GC content of anywhere from 38% up to 60% depending on strain/subgroup. ~~Whole genomes of Bathyarchaeia species have been sequenced primarily via metagenomic assembly from environmental samples and, recently, a few cultivated representatives such as *Bathyarchaeum tardum* have had detailed genomic characterization.~~ Additionally, Bathyarchaeia genomes have specific protein-coding genes that allow for the synthesis of proteins that enable metabolic processes like carbon metabolism, methane cycling, and arsenic resistance. For example, this microbe encodes for enzymes for the Wood-Ljungdahl pathway, in which CO₂ is fixed as acetyl CoA, resulting in acetogenesis (Khomyakova et al., 2023) (He et al., 2016). ~~Typical Bathyarchaeia genomes range in size but commonly exhibit complex metabolic gene repertoires related to carbon metabolism, methane cycling, and arsenic resistance.~~ Their genomes encode:

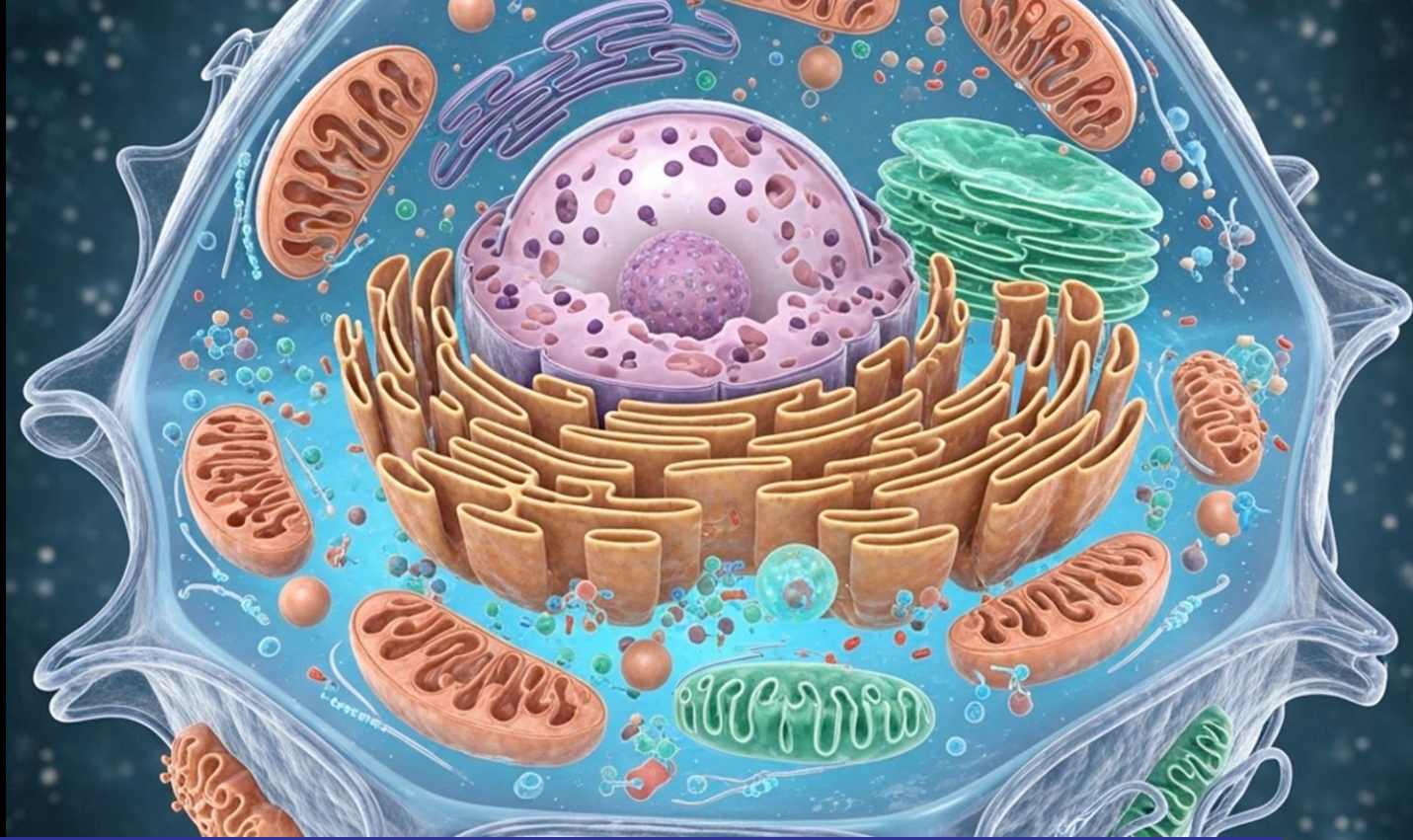
- Genes for methane metabolism, including the methyl-coenzyme M reductase gene (*mcrA*), indicating capability for methanogenesis or methane oxidation.
- Genetic pathways for acetogenesis, including the acetate kinase (*ack*) gene enabling acetate production.
- Metabolic enzymes to degrade lignin-derived methoxylated aromatic compounds and complex organic matter.
- Numerous arsenic resistance genes (e.g., *arsR1*, *arsC2*, *arsM*, *acr3*) supporting their role in arsenic transformation and mobilization.
- DNA encoding unique membrane lipid biosynthesis pathways involving butanetriol dialkyl glycerol tetraethers (BDGTs), a rare lipid class among microbes.

The GC content, coding density, and regulatory gene diversity show adaptation to anoxic, energy-limited environments.

Motivation

A way to make
great thinkers





Jenny Bhatnagar jmbhat@bu.edu



Any questions?

AI in Additive Manufacturing Crossing the Cyber-Physical Divide

Keith A. Brown

Associate Professor, Mechanical Engineering,
Physics, and Materials Science & Engineering,
Boston University

Innovative Use of AI in STEM-related Courses
Innovative Use of AI in Education Symposium Series
BU Institute for Excellence in Teaching and Learning

October 16, 2025

**BOSTON
UNIVERSITY**

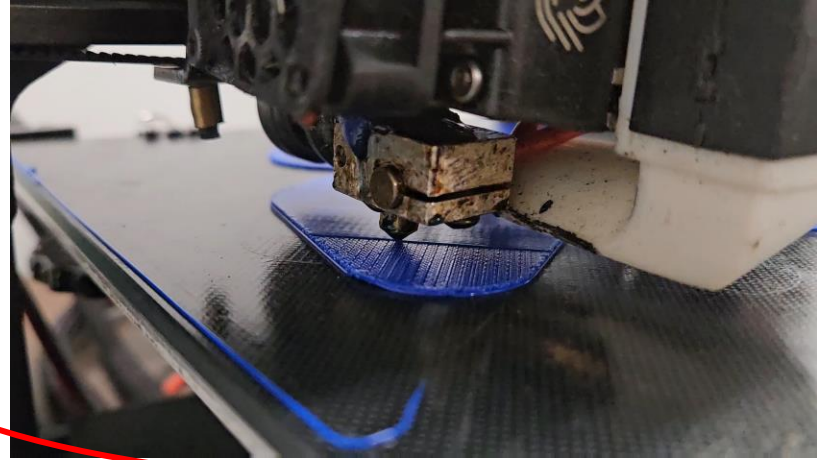
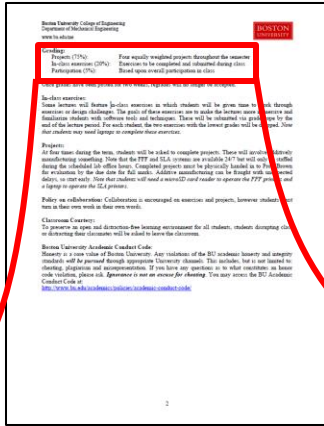
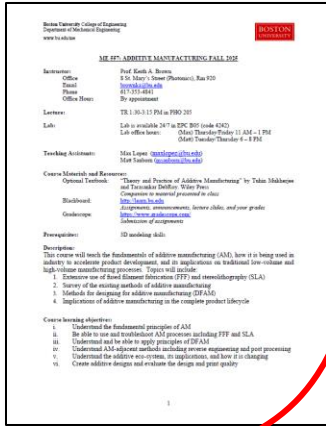


kablalab.org



[@KABrownLab](https://www.linkedin.com/company/KABrownLab)

The Story of ME 557: Additive Manufacturing



Grading:

Projects (75%):

In-class exercises (20%):

Participation (5%):

Four equally weighted projects throughout the semester

Exercises to be completed and submitted during class

Based upon overall participation in class

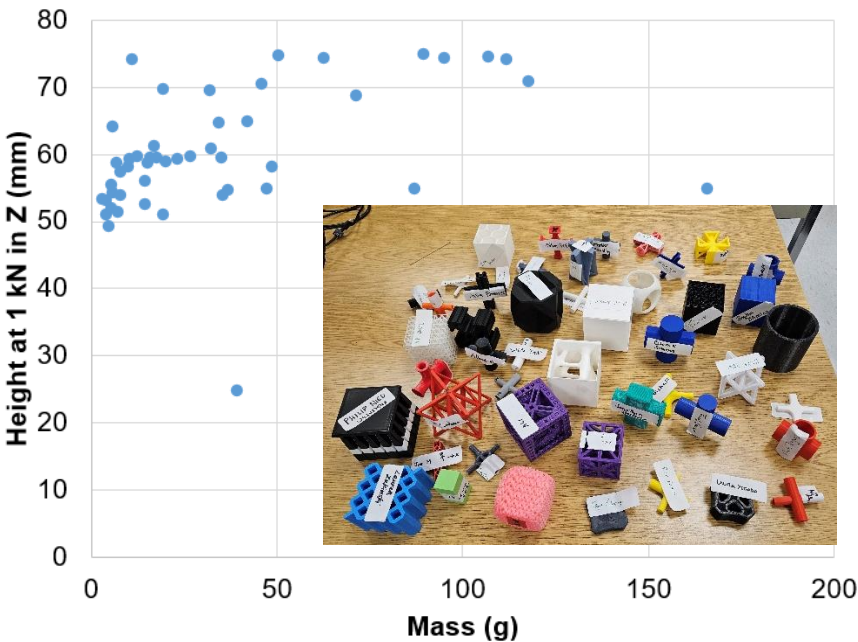
Project 1: Intro to FFF



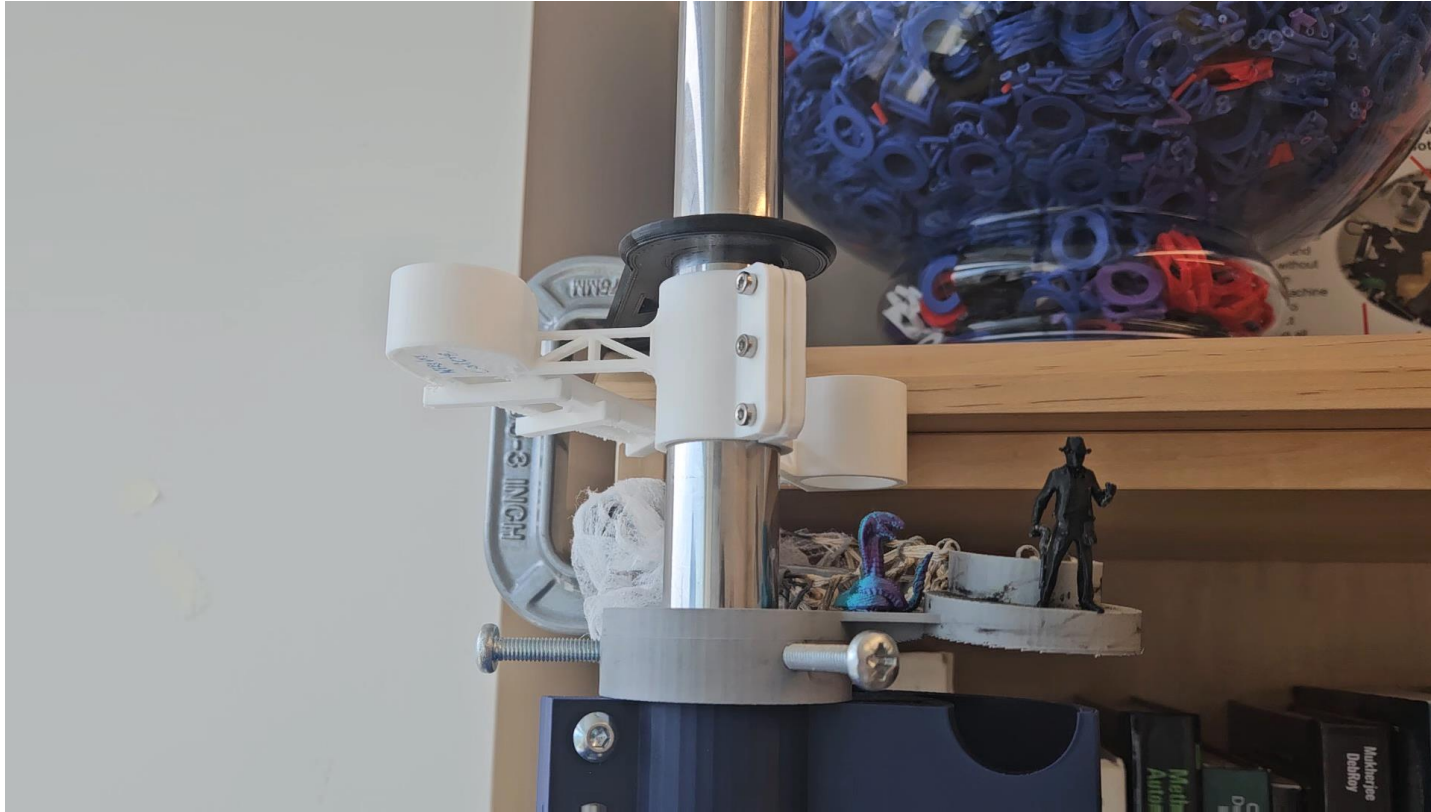
Project 2: Intro to SLA



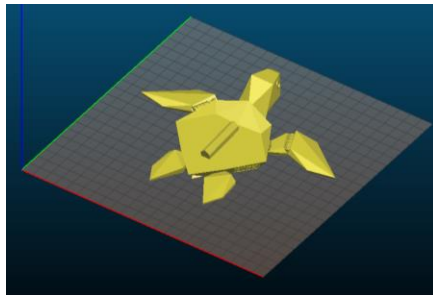
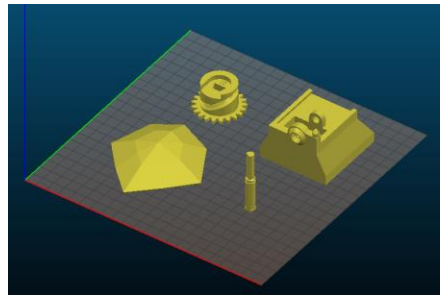
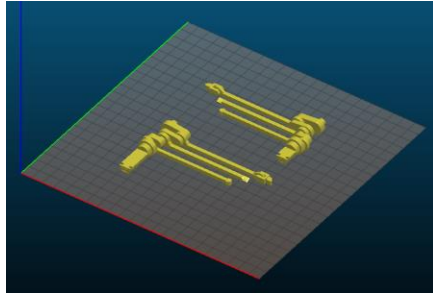
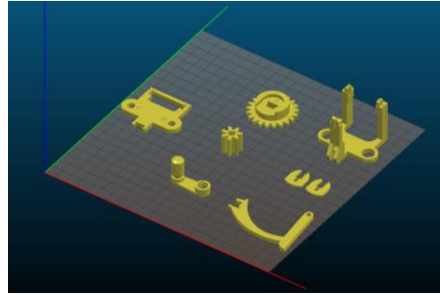
Project 3: Functional Design



Project 4: Integration

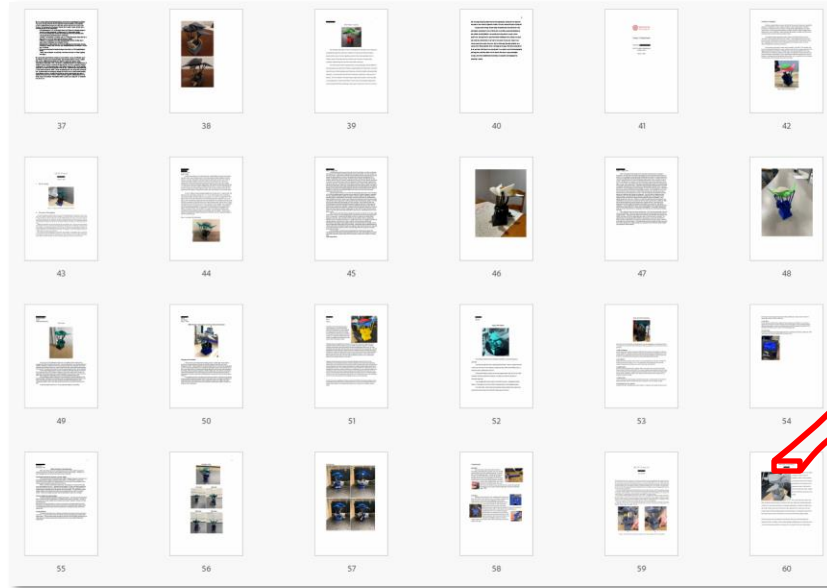


The Challenge of the Flying Turtle



Overcoming Printing Challenges with Experience

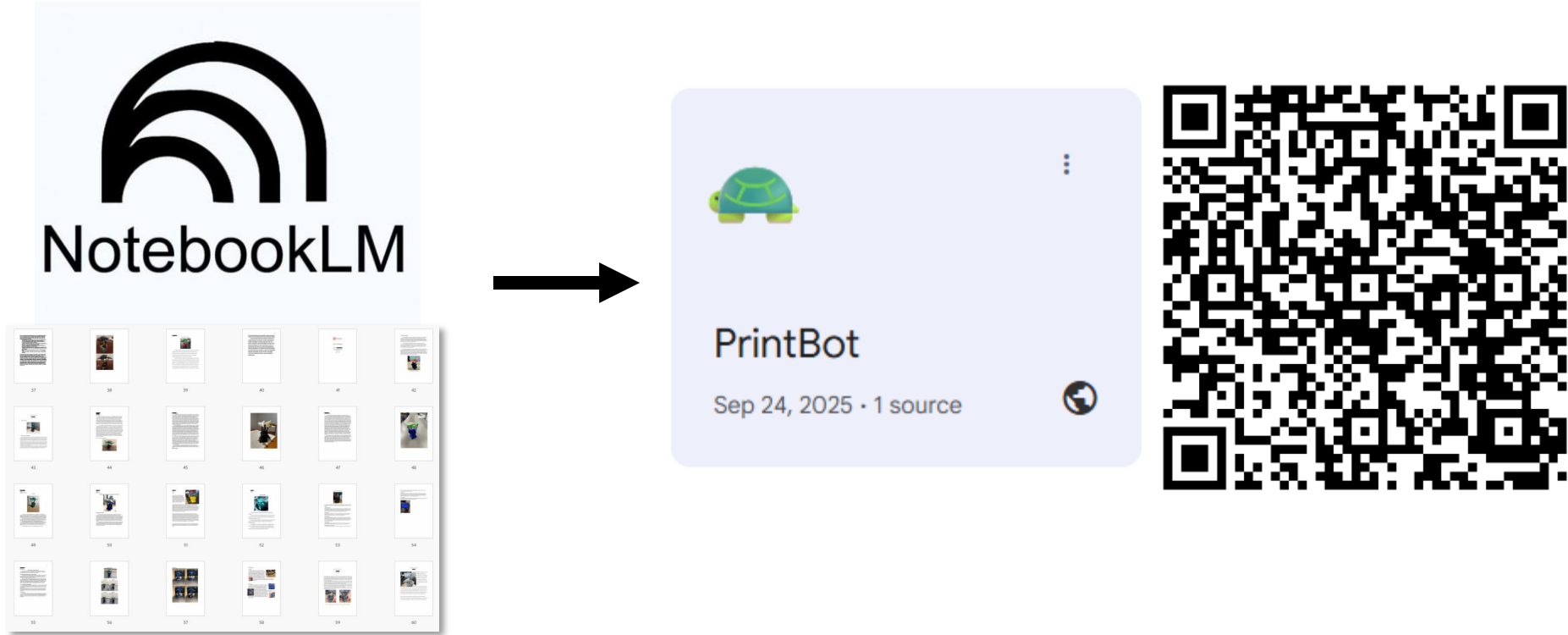
1) Submit a one page summary with photograph of your print on gradescope. This should include a brief description of any debugging that was necessary to successfully print the turtle.



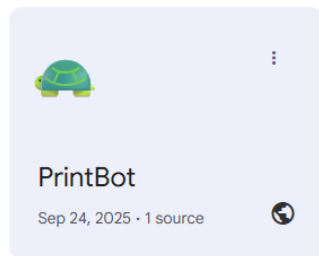
ME557 Project 1 Issues Summary



Retrieval Augmentation Generation (RAG) to the Rescue



Using PrintBot (execerpts)



Should I use a raft for the turtle shell?

Based on the sources, **most students successfully printed the turtle shell (or the turtle assembly) without a raft**, often opting for methods like brims or skirts, or relying on improved bed leveling and temperature settings to achieve adhesion ⁷ One user explicitly stated they did not use a raft for the shell ³ . However, if you are experiencing severe bed adhesion issues (parts curling up or slipping off), one report suggests a raft may be a necessary component ¹² .

what is the most common nozzle temperature?

Based on the information provided in the sources, the nozzle temperatures used by students varied, but the most frequently cited specific temperature for successful prints was **215°C**.

how fast should I print the difficult parts?

Based on the experiences detailed in the sources, the recommended speed for printing the "difficult parts" (which include the **turtle base** or full turtle assembly, and the **crankshafts** ¹ ²) tends to be **slower** than general print speeds, particularly the speed used for the initial layers.

Here are the specific speeds and recommendations provided for challenging prints:

1. **20 mm/s**: One student determined that their ideal speed for **larger parts (like the turtle and crankshafts)** was **20 mm/s** ² . This specific, slower speed was noted as being **key for making sure the hinges didn't melt together** ² . Another student who had successful prints of the challenging components ("Part C prints well") utilized a **20 mm/s initial layer speed** ³ .

Feedback From Students (F25)

- Very useful for feedback on printing
- Would be useful if chatbot had memory
- Would be useful if pictures could be uploaded
- Include more working conditions in the training data





Any questions?

Upcoming Events

Innovative Use of AI in STEM-related courses

Wednesday, November 12

4 pm – 6 pm

Innovative Use of AI in Business, Education and Communication

Thursday, December 4

4 pm – 6 pm

Register Today!



<https://www.bu.edu/aida/newsandevents/town-hall-symposiums/>