



Integrating AI Large Language Models into PubMed Searching for a Medical Student Grand Rounds Course

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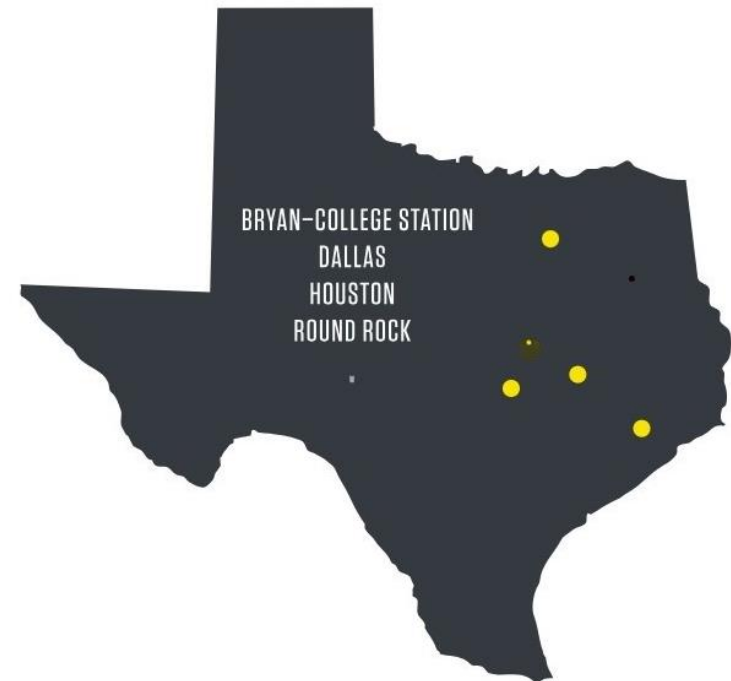
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Texas A&M University School of Medicine

- Enrolls 200 students per year
- All students participate in an 18-month pre-clerkship phase of education before clerkship training in one of four campus tracks in Bryan-College Station, Dallas, Houston or Round Rock.
- The *Medical Student Grand Rounds* Course takes place during the 2nd semester of the pre-clerkship phase and is generally the students' first exposure to formal PubMed search instruction in the curriculum.



Purpose & Goal of the Medical Student Grand Rounds (MSGR) Course

- To critically apply new or emerging approaches arising from current research for disease prevention, diagnosis, prognosis, and treatment, medical students must develop adaptive expertise skills for:
 - ❖ Finding
 - ❖ Critically assessing
 - ❖ Synthesizing
 - ❖ Translating clinically relevant basic research literature.
- MSGR—employs basic research faculty mentors to train first-year medical students to attain these adaptive learning skills.
- Students are required to find, interpret, critically assess, and present basic research literature about self-selected clinically relevant topics.
- Training students early in their education with these skills will promote adaptive self-regulated, self-directed learning.



Length: 15.5 weeks

MSGR Process

Capstone: 15 min
PowerPoint
Presentation and 500
word Abstract

Training in Searching Literature

Choosing of a Clinical Subject Area for Study

Development of "Background and Clinical Significance" Outline

Development of "Focused Mechanistic Research and Translation" Outline

Development of Research PowerPoint Presentations and Written Abstract

*Grand Rounds Day
15-minute Presentations & Publication of Abstracts*

43 clinical subject groups based on mentor expertise

Choose 3 review articles and 1 basic science research article as a focus topic for further study

Find 4 new primary research articles in the focus topic area

Basic Science Research Faculty Mentoring

LCME Elements:

- 6.3 - Self-directed learning
- 7.3 - Scientific method
- 7.4 - Critical thinking
Problem solving
- 7.8 - Communication skills

Zoom Format



Librarian role in MSGR

Training in Searching Literature

➔ Milestone 1 of 8



- 1st class of course
- 50m
- PubMed
- Citing Sources



- Exercise



- Librarians grade & give feedback
- 5% of course grade



- 2 consults offered

Exercise....Pre-2024



8 steps

Learning Objectives

1. Access PubMed through the Medical Sciences Library (MSL) website to connect to the library's subscriptions.
2. Apply MeSH subheadings to get more relevant results.
3. Apply search filters and additional keywords to narrow results.
4. Get the full-text of articles.

Excerpt

- Type in the disease name you are researching. For my search example, I typed in *diabetes*. Click Search. The system tries to locate the appropriate MeSH terms and provides definitions for the term. There may be many options returned, so read through the definitions for the exact disease you want. If you get no results, try more general terms for the disease. This is an example:

[Diabetes Mellitus](#)

1. A heterogeneous group of disorders characterized by HYPERGLYCEMIA and GLUCOSE INTOLERANCE.

4. Did you find a MeSH term for your topic? If so, **screenshot and then paste the MeSH term with its definition here** (DO NOT simply type the MeSH term below—you need to screenshot the MeSH term with its definition). If you do not find an appropriate MeSH term, **explain the terms you tried**, and, for the rest of the exercise, use the search results you got for question 2, searching your topic as a keyword.

- Click on the link to the MeSH term and you'll see associated subheadings, such as *Diagnosis, Genetics, Mortality, Prevention and Control*, etc. Select the subheadings you want and select the *Restrict to Major Topic* box below. This ensures that the subheadings of your topic are the main topic of the articles retrieved. Then click on the "Add to search builder" button with "OR" selected in the drop-down (see example screenshot below).

The screenshot shows the MeSH search interface. At the top, there is a search bar with 'MeSH' selected and a 'Search' button. Below the search bar, there are links for 'Limits' and 'Advanced'. The main content area displays the MeSH term 'Diabetes Mellitus' and its definition: 'A heterogeneous group of disorders characterized by HYPERGLYCEMIA and GLUCOSE INTOLERANCE.' Below the definition, there are 'PubMed search builder options' and a list of 'Subheadings'. The subheadings are organized into three columns, each with a checkbox. The 'etiology' subheading is checked. To the right of the subheadings, there is a 'PubMed Search Builder' window. This window contains a search query: '("Diabetes Mellitus/etiology"[MeSH] OR "Diabetes Mellitus/genetics"[MeSH])'. Below the query, there are buttons for 'Add to search builder' and 'Search PubMed'. The 'Add to search builder' button has a dropdown menu set to 'OR'. At the bottom right of the search builder, there is a 'YouTube Tutorial' link. Below the search builder, there is a 'Related information' section with a 'PubMed' link and a 'PubMed - Major Topic' link.



And then came ChatGPT

By Fall 2023, news media and general knowledge abounded that students were using generative AI tools, many times incorrectly.

We, as educators, needed to get in front of that issue as soon as possible.

Address in the Context of PubMed Searching

- Proposed to MSGR course leadership:
 - Review how AI is used in PubMed to give context for varying tools and uses as part of the lecture.
 - Condense PubMed searching instruction and exercise to focus on keyword vs. MeSH searching, subheadings, and filters.
 - Address challenges, misconceptions, and opportunities with Large Language Models (LLMs) for searching.
 - Invite the students to experiment with an LLM in a PubMed searching context and share experiences.
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Sample slide from lecture

AI/Machine Learning in PubMed

- Best match sorting
 - Single citation matching and computed author clustering
 - Assigning Medical Subject Headings (MeSH)
 - Cataloguing team reviews 20% for quality assurance
 - It still has some learning to do...
 - Article including the British term "mummy" for "mother" in the abstract mapped to MeSH for "Bodies preserved either by the ancient Egyptian technique or due to chance under favorable climatic conditions."
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Sample slide from lecture

AI for Literature Searching

- Access and rights to the literature
 - Biases
 - Consistency issues
 - Hallucinations – both false citations AND MeSH terms
 - A general [AI Guide from the Libraries](#)
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Sample slide from lecture

BingChat/Copilot example

Prompt: Suggest MeSH terms and a search string to use in PubMed to search for immunology concepts of diabetes.

Response:

Sure, here are some MeSH (Medical Subject Headings) terms related to the immunology concepts of diabetes:

1. Diabetes Mellitus
2. Immunology ← Not a MeSH term
3. Autoimmunity
4. Insulin Resistance
5. Inflammation

You can use these terms to construct a search string for PubMed. Here's an example:

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```("Diabetes Mellitus"[MeSH Terms] OR "diabetes"[All Fields]) AND ("Immunology"[MeSH Terms] OR "immunology"[All Fields]) AND ("Autoimmunity"[MeSH Terms] OR "autoimmunity"[All Fields]) AND ("Insulin Resistance"[MeSH Terms] OR "insulin resistance"[All Fields]) AND ("Inflammation"[MeSH Terms] OR "inflammation"[All Fields])```
```

This search string will return articles that have been tagged with these MeSH terms, which should give you a comprehensive view of the current research on the immunology concepts of diabetes. Remember to adjust the search string according to your specific research needs.

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# Discussion Board prompt summary

- Select a disease and search PubMed using keywords, MeSH terms, subheadings, and filters. Do this yourself to understand the process. Post results/thoughts.
  - Using a large language model (LLM) tool of your choice, prompt for help selecting MeSH terms, search strings or search ideas. Post which tool you used, your prompt, and the results from the LLM.
  - Thoughtfully critique the results (i.e., hallucination, relevance, etc.) and discuss how you might use LLMs going forward for help with search terms.
  - You may opt out of using the LLM, but you must explain why.
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# Why we made certain decisions

- No deep instruction about AI or LLMs
    - Limited class time
    - Anticipated student knowledge level would be too varied for a lecture format
    - Linked to the University Libraries LibGuide - [AI Guide from the Libraries](#)
  - Discussion Board within the Learning Management System
    - Responses would be seen by peers, encouraging thoughtful participation
    - Students could learn from each others' experiences
    - Librarian could use public feedback discussion as teaching moments for all the students, but still comment privately with any corrections during grading
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# What happened...

- Most students used an LLM, some opted out
  - Variety of student experience with the LLMs, ranging from daily help with studying to first-timers to those not interested until the technology improves
  - Engaged and thoughtful responses
  - Students' self-created searches were generally more accurate
  - Grading was VERY time consuming for the librarian
    - 20 hours vs. 12 hours with prior format
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# Student Comments

Don't think I will often use LLMs going forward in literature searches. I think that, with a little bit of relevant background knowledge, I can come up with search strings that are adequate.

However, if I don't have much background knowledge on what I am trying to find and don't have the vocab needed, using chatGPT might be useful in articulating my search terms for me.

I think ChatGPT definitely has a role in narrowing research in the future. Even without specifically following the MeSH search terms, it did come up with really good searches to find interesting PubMed articles. In the future, it seems as though ChatGPT could even find good research topics by cross-referencing those that already exist with the current gaps or discrepancies in research.

It can also more easily return trends in literature that would take longer for a person searching to discover. With this expedited literature search thanks to ChatGPT, the brain power of humans can be used to design and conduct experiments to actually answer these research questions and make impactful scientific discoveries.



# What we hope the class learned

## Course Announcement: Tips if you're considering using LLMs for the next round of MSGR PubMed searches

The discussion board is still open for you to review, but I wanted to share a few insights from Milestone I as many of you experimented with LLMs like ChatGPT or Bing Copilot.

Although you can ask LLMs questions, they are not search engines (yet). Responses are based on next likely words (like autocomplete), so can contain incorrect responses. This will make them most useful for “discussing” ideas on a search topic or gleaning terms to use as keywords for either PubMed searching or lookup in the MeSH Database, but not for actual searches.

The LLM knowledge base is limited by its training data. Most of the free tools have “learned” on very general datasets, so their specialized medical knowledge is limited. You’ll see from some of the discussions that they have a lot of ideas and content for common disorders like Alzheimer’s Disease or cardiovascular conditions and very little about rare diseases. This may be a limiter for using the LLMs for your MSGR topic.

LLM results are not consistent. Some of you received useful search strings from the LLM you tried. Others had terrible results. Unless you are well-versed in troubleshooting Boolean logic, I suggest building your own searches in PubMed. Librarians can always help you with this and any other searching challenges, so feel free to reach out.

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# What we're asking students

## Course evaluation questions

- Did the librarian lecture provide a clear understanding of how to navigate PubMed effectively?
  - Were you able to apply the acquired skills to find relevant scientific literature using PubMed?
  - **Did the Discussion Board assignment help you to understand the strengths and limitations of LLMs like ChatGPT in the literature searching context?**
  - Were you able to apply information about citing sources and citation management tools effectively in this course?
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# Next Steps

- Review course evaluations and adjust.
  - Revise as we learn more and as the tools change.
  - Look for ways to spread the wealth for discussion responses and grading.
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**Thank you!**