Artificial Intelligence Powered Research: A survey of the current and planned usage of AI across research disciplines in a High Performance Computing community

RMACC HPC Symposium
21 May 2025

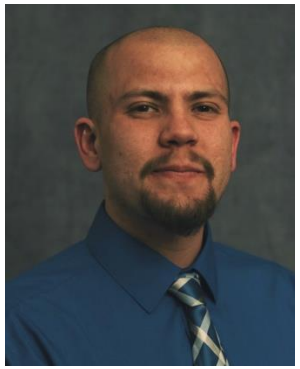
Michael J Schneider, Mohal Khandelwal, Layla Freeborn

Slides

https://github.com/ResearchComputing/rmacc_2025

Teamwork!

Layla Freeborn



Brandon Reyes

Andy Monaghan

Michael Schneider

John Reiland

Dylan Gottlieb

Mohal Khandelwal

Ragan Lee

Survey goals

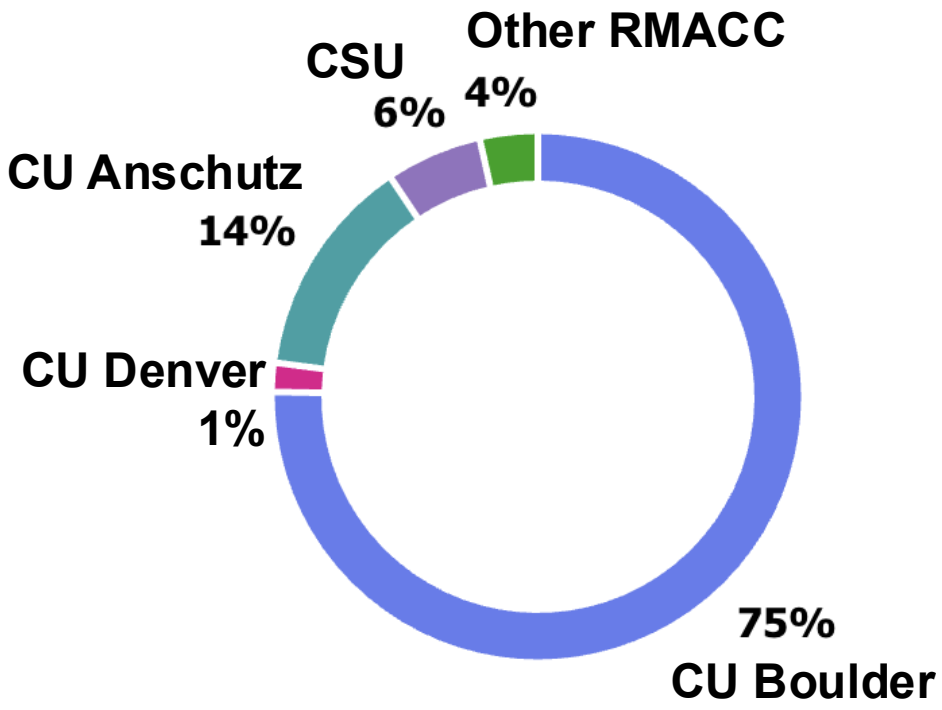
Understand CU Boulder and RMACC communities' current and planned uses of AI and ML in their research.

Survey development and circulation

- Reviewed by the CU Boulder Institutional Review Board (protocol number 24-0768). All participants provided their consent before participating in this study's survey.
- Questions based on an AI survey administered by the Center for High Performance Computing at Utah State University, a peer RMACC institution.
- Survey emailed to members of the CU Boulder and RMACC user communities (thousands) and shared through the CU Boulder AI Community of Practice (AI CoP) Microsoft Teams channel (390 members).
- Survey open for 6 weeks between February 10th - March 21st 2025.
- Consisted of 6-19 questions, depending on how they answered a key screening question — "What is the status of AI in your research?".

Survey respondents

Respondent Primary Institution



Survey screening question: What is the status of AI in your research?

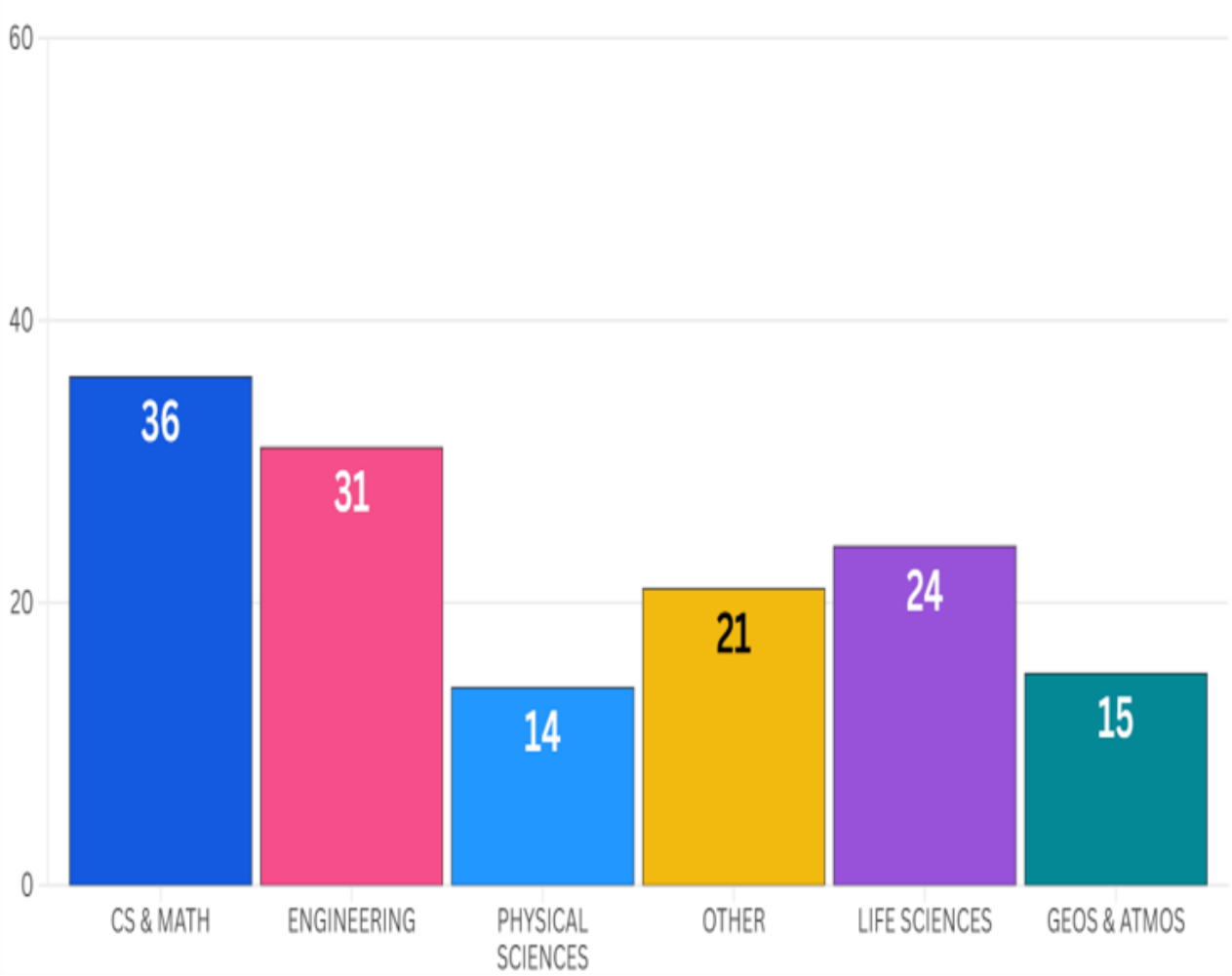
1. AI has no use in my research/teaching
   5 participants (3%)

2. Interested in AI but don't know where to start
   18 participants (12%)

3. Planning to use AI in the future (have some projects/ideas in the pipeline)
   18 participants (12%)

4. Already using AI in my research/teaching
   105 participants (72%)

Respondent Disciplines



CS & MATH	
Computer & Information Services	29
Mathematics and Statistics	7

OTHER	
Psychology	6
Other Sciences (not elsewhere classified)	5
Business Management and Business Administration	4
Humanities	2
Social Sciences	2
Communications, Communications Technologies, Journalism (Library Science is considered “Other Non-Science & Engineering Fields”)	1
Law	1

Survey analysis

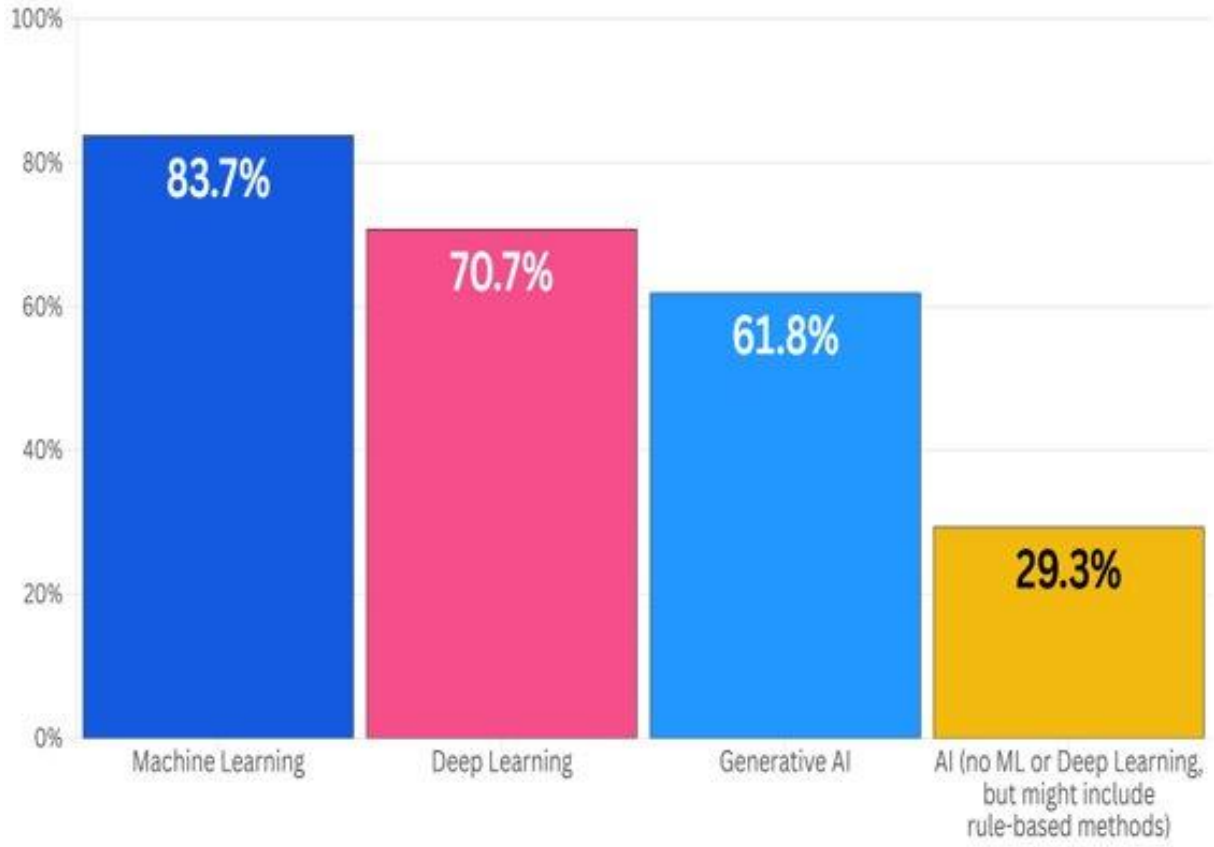
We looked at discipline-specific differences in three areas:

1. Applications of AI methods and resource use
2. Data, hardware, and storage needs
3. AI research challenges and training needs

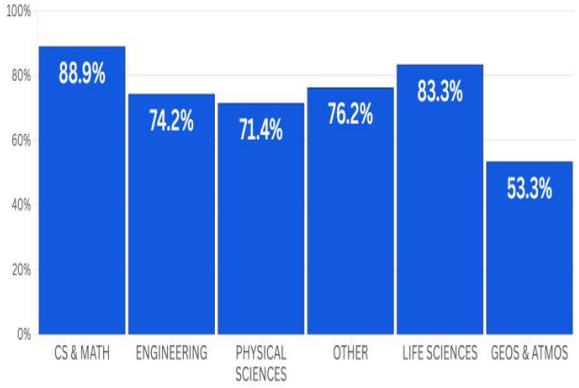
We hope to inform how best to support and engage professionals with varying backgrounds and usage patterns.

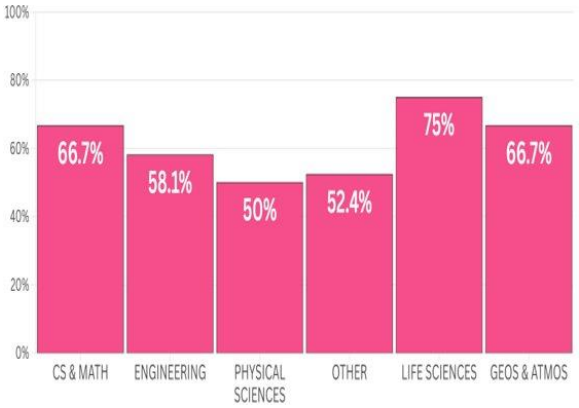
Applications of AI methods and resource use

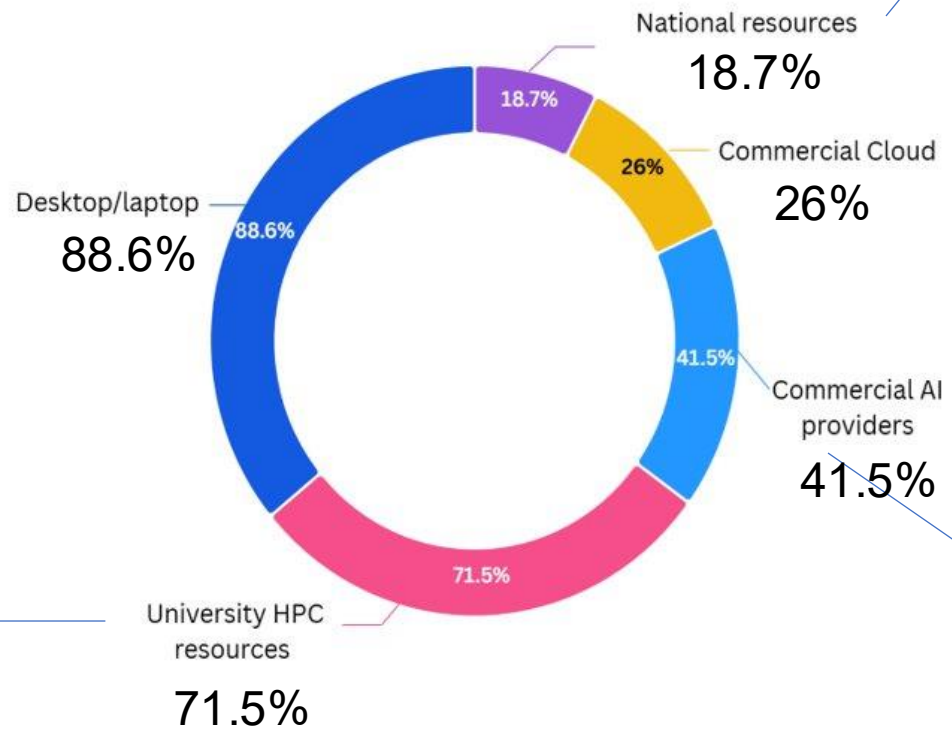
What type of AI are you using? (Select all that apply)

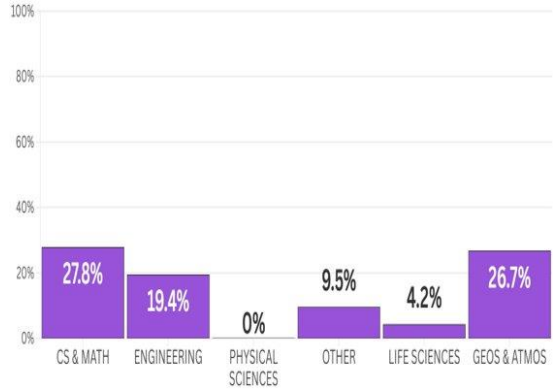


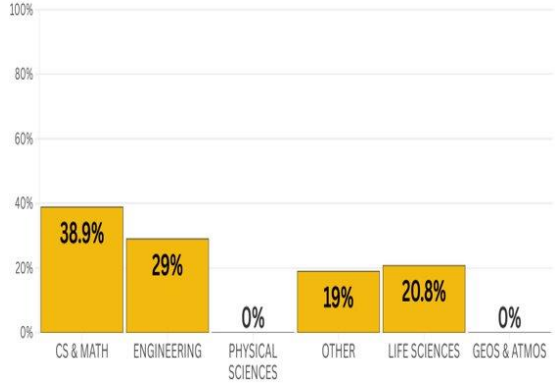
What computing resources do you use in your AI workflows? (Select all that apply)

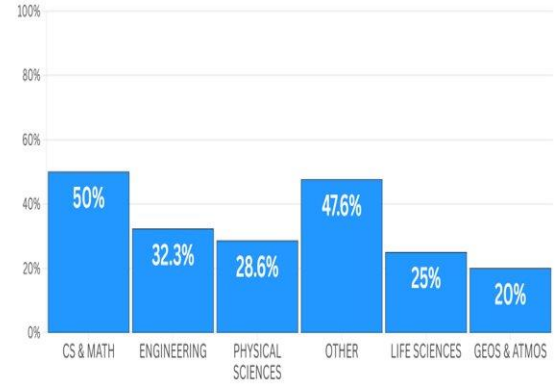




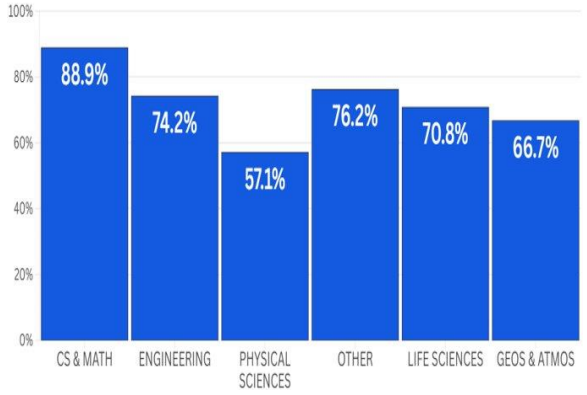


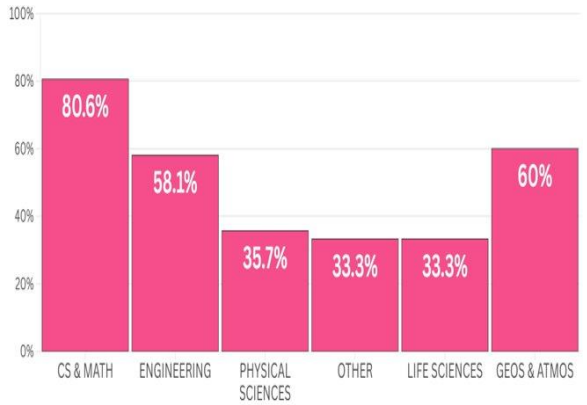


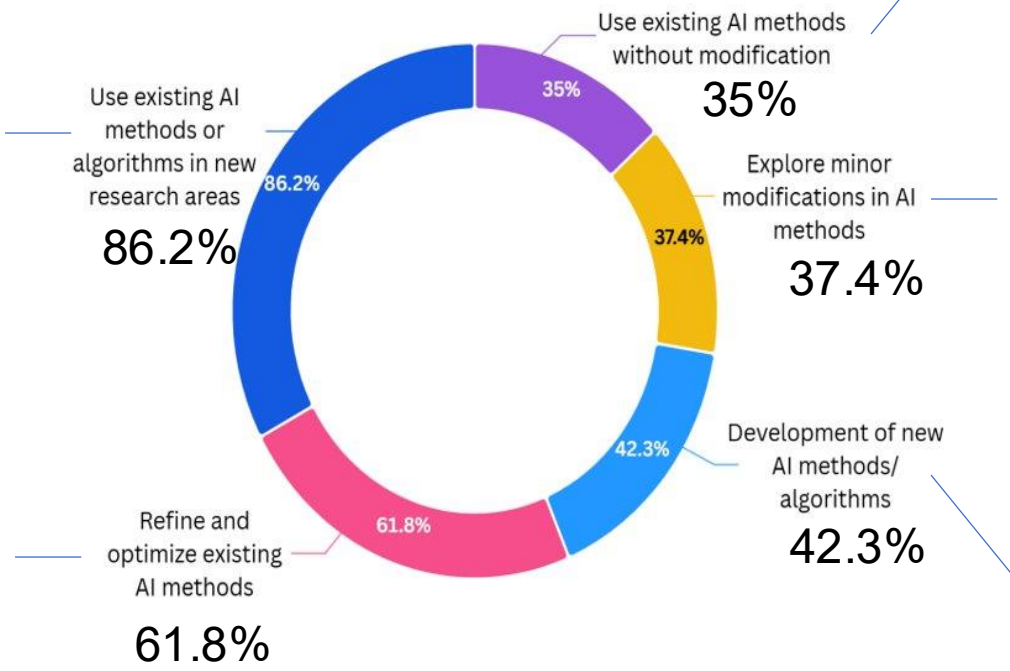


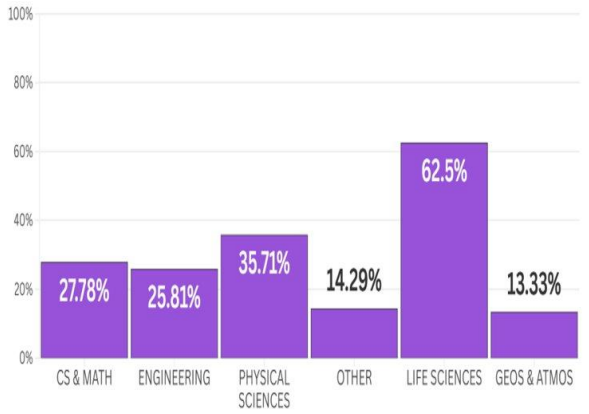


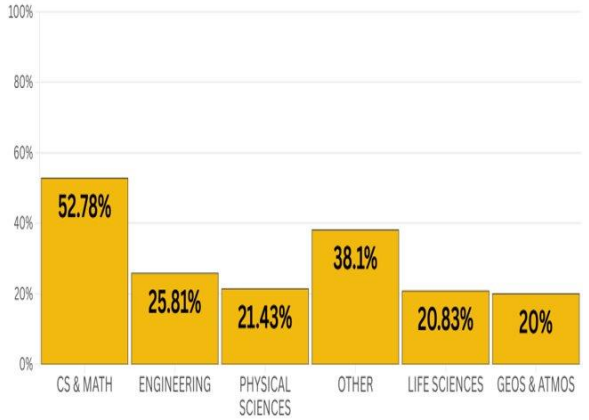
What is the level of AI use in your research? (Select all that apply)

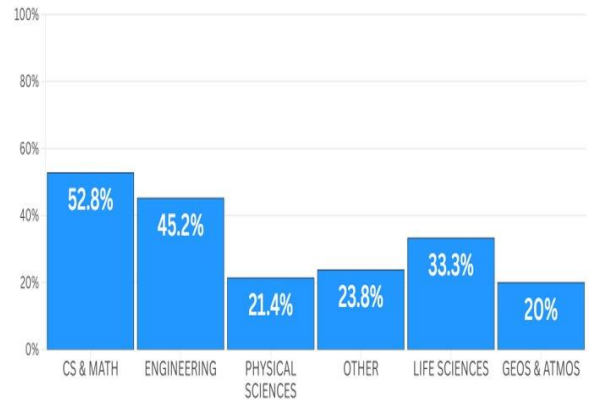






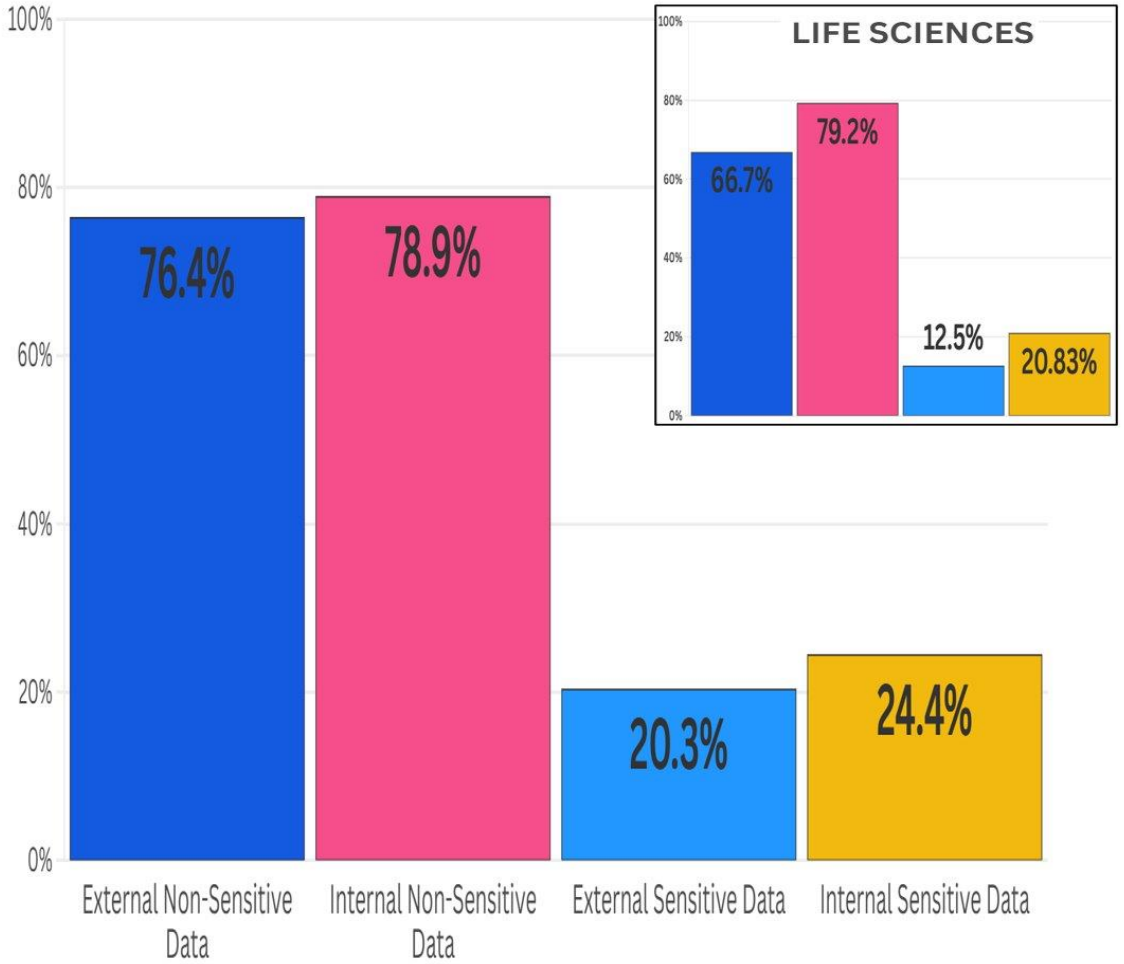




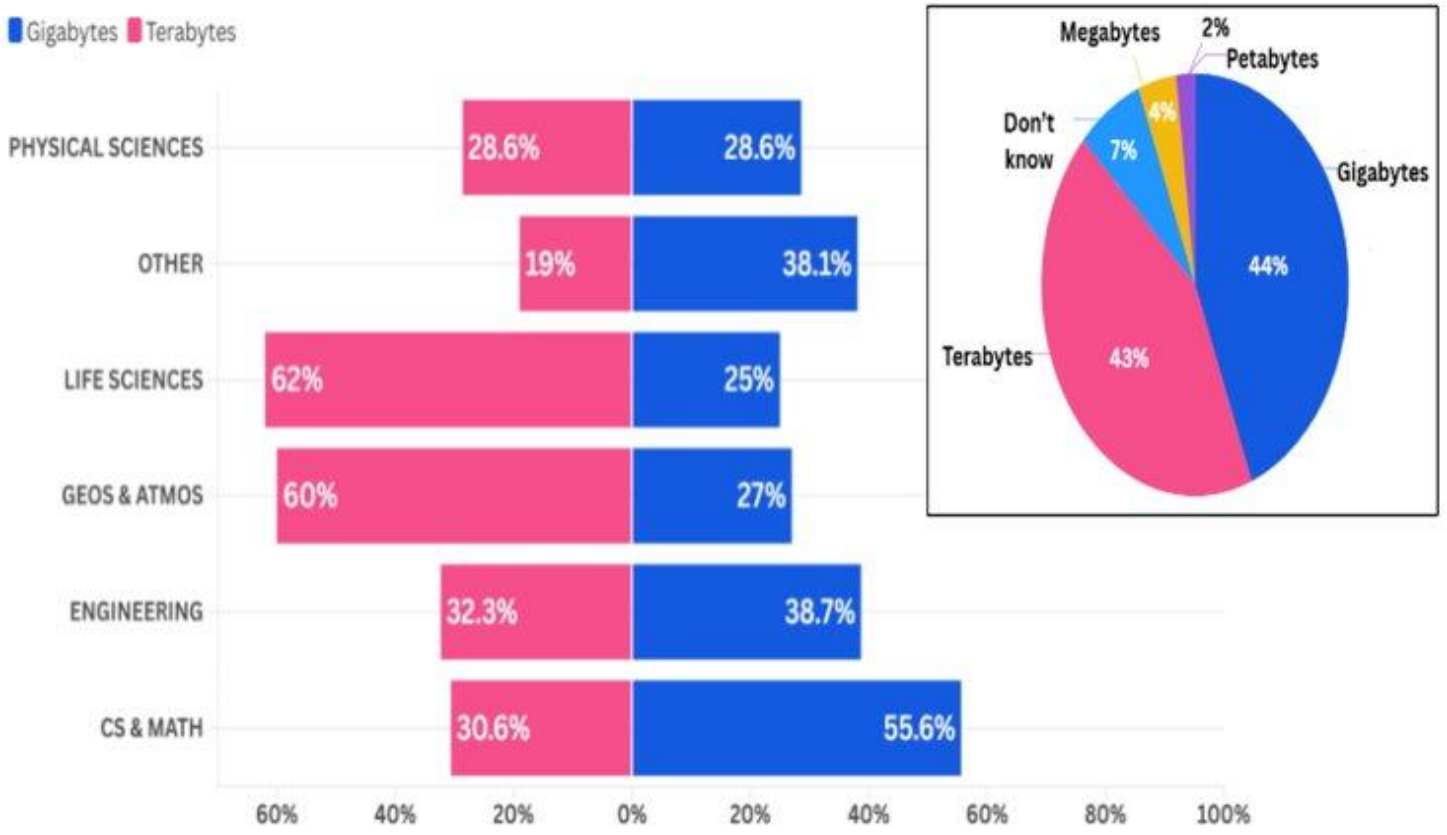


Data security, storage, and hardware needs for AI research

What types of data are you interested in using in your AI research? (Select all that apply)



Where do you currently and/or plan to store your data for AI research? (Select all that apply)

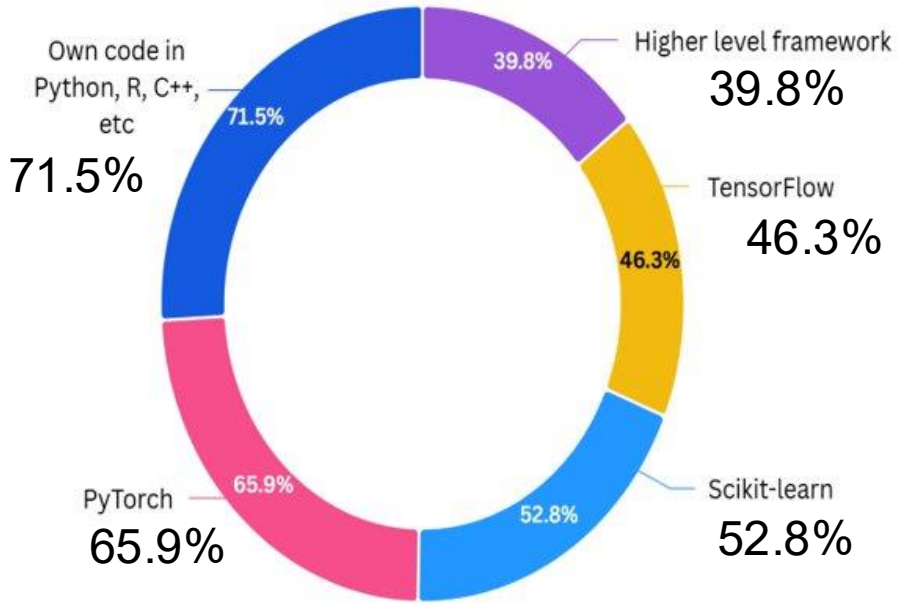


What type of hardware are you using for your AI work? (Select all that apply)

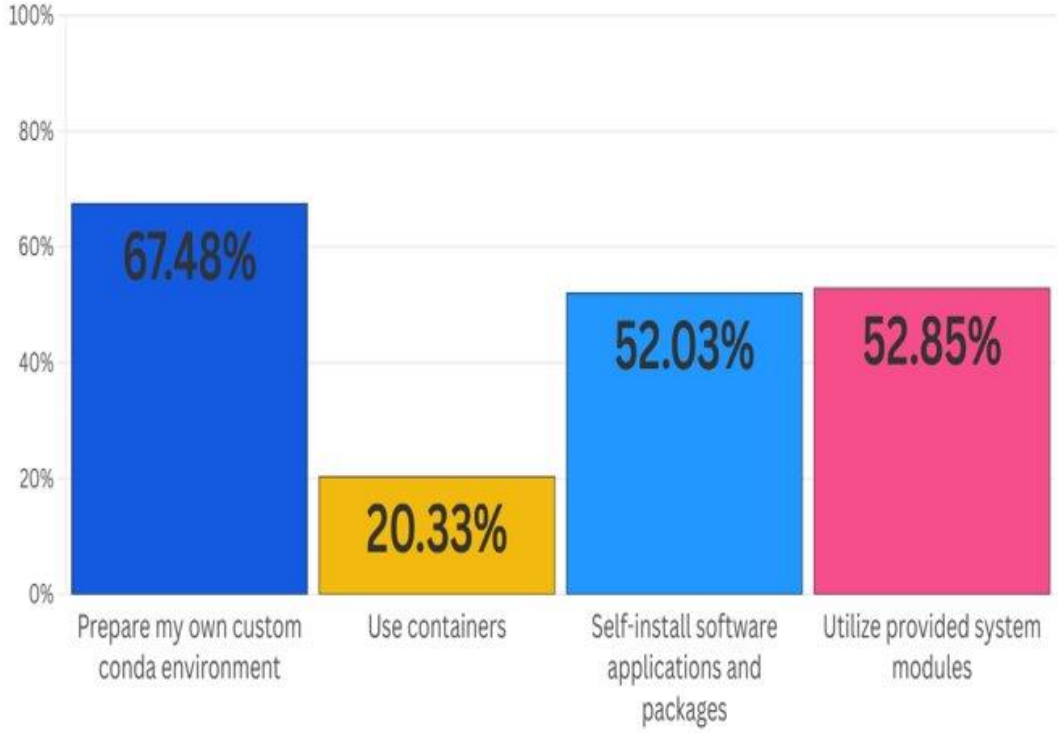
- 73% of respondents said they use one or more GPUs
- Specialized AI accelerators (e.g. Google TPU, Intel Gaudi) were used by a small portion of respondents (~14%), except in GEOS & ATMOS (36%)

Software needs for AI research (bonus, not by discipline)

What type of software do you use in your AI work? (Select all that apply)

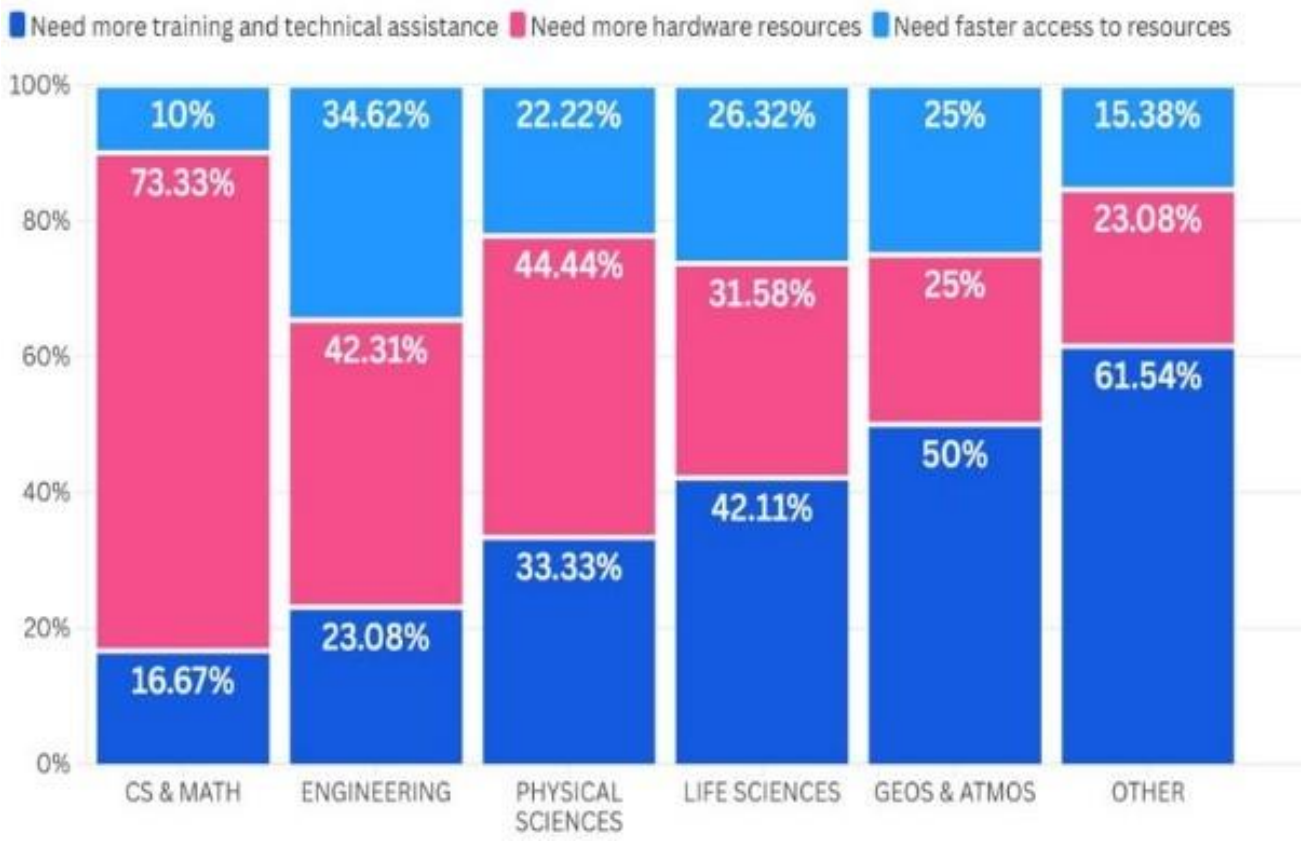


How do you install/use AI programs? (Select all that apply)

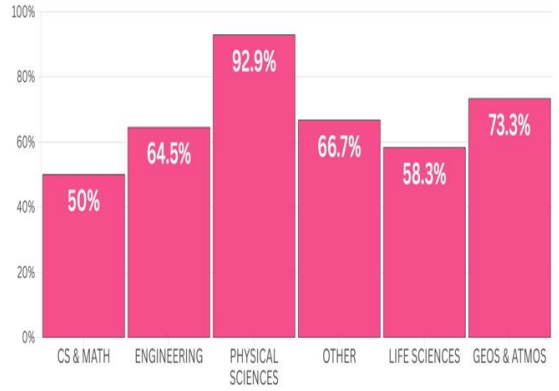


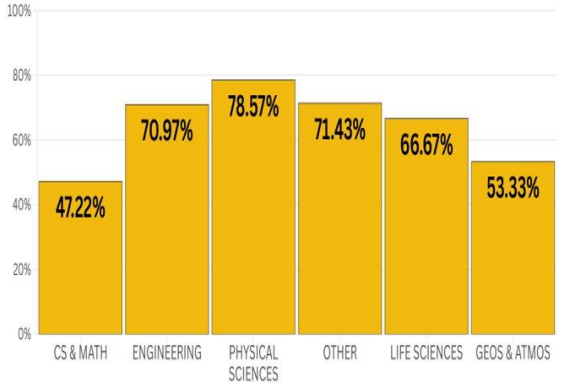
AI research challenges and researcher training needs

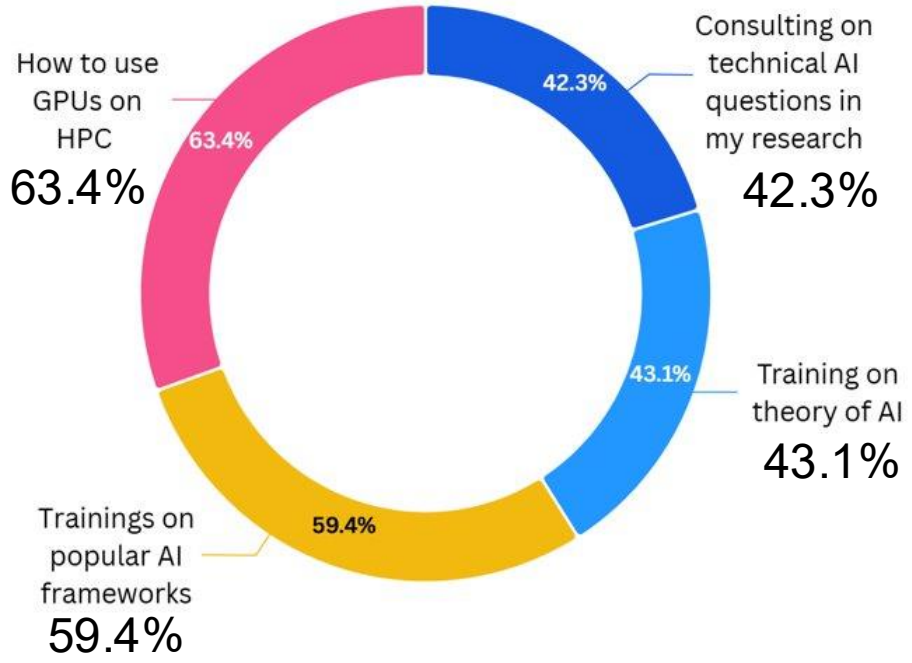
Of the AI research challenges, which is the single most important?

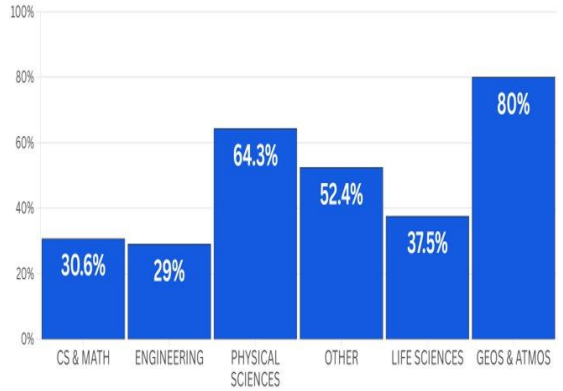


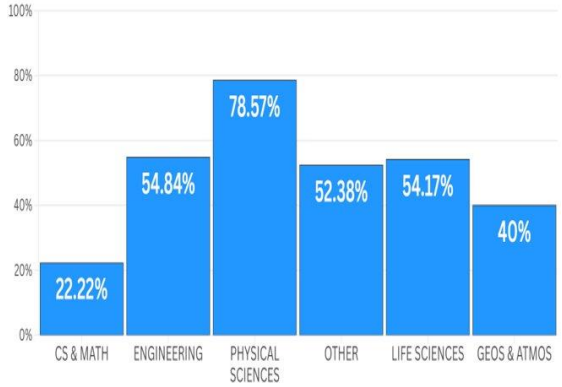
Are you interested in any of the following AI-focused workshops or events? (Select all that apply)











Conclusion

It is important to consider discipline-specific needs when designing systems, building new services, and developing training opportunities for AI research.

Examples:

- CS & Mathematics researchers likely possess technical expertise to use advanced computing resources; identify access to hardware as their top challenge, have a greater gigabyte-level storage need than other disciplines → additional investments in AI-focused hardware or facilitating access to commercial cloud resources
- Life Sciences researchers often use existing AI methods without modification, use Alpine (HPC) more than other disciplines, have terabyte-level storage needs, and an appetite for training and technical assistance → benefit from increased awareness of national HPC resources and training opportunities provided via ACCESS and NAIRR Pilot

Thank you.