APPENDICES

APPENDIX A: POTENTIAL FOUNDATIONAL LEARNING TOPICS IN AI

- What is AI?
  - including where Gen AI tools get their data from and privacy concerns that should be considered
- What is Information Literacy (and why does it matter)?
- What are the types of AI and how could/should they be used in higher education?
  - What are the key considerations for use of AI in educational settings?
  - What is informed use?
- How do you assess sources, authority, credibility? How are sources, authority, and credibility assessed?
  - How do you detect and mitigate hallucinations?
  - How do you detect and prevent bias and build in fairness and equity?
- How and when does it make sense to use AI vs. when a task should be performed by humans?
  - How do we meet requirements for transparency and fairness?
  - What are the considerations for human-machine teaming?
  - What are the dimensions of human accountability for AI use?
  - When do we need a human in the loop?
  - How do we assess risk: is risk assessed when incorporating or using AI?
  - How do you involve affected parties?
  - What is data vs. information vs. knowledge vs. insights?
  - What is metadata? What is Data Integrity (and why does it matter)? How can we form an information literacy and AI term glossary?
- What can we do to lower anxiety and change fatigue as we face another significant transition? How can anxiety and change fatigue be reduced in the face of significant transition?
- What are potential use cases? What are potential pitfalls?
- What are the responsible, trustworthy and ethical use considerations?
- What are the equity considerations?
  - How can bias be identified and avoided?
  - How does AI address the digital divide and access to technology for all student population?
- What are the safety, privacy and security considerations?
- How could AI affect the classroom?
  - How could AI enable more personalized instruction and learning pathways?
  - How could AI improve engagement, outcomes, assessments and evaluations?
- How do we develop, track and prioritize candidate AI use cases?
- What are the best methods and channels to deliver this new AI content to faculty, administrators, staff and students?
  - How can we share use cases and best practices?
- Can portions of this new content be built into other existing training programs and pathways?

- Should it be virtual? In person? Hybrid? Self-paced? Cohort-based? Workshops and roundtables? Office hours?
- What resources are available now?
- What resources need to be developed or acquired?
- What training aids and guides should be made available to faculty, staff and students?
- Do we need a "meta-guide"?
- When should we share draft content that is still in development?
- When do we need to curate/approve content before it is shared?
- What platforms, courses or events can be used to deliver this new content?
- Are there existing resources like the Vision Resources Center (VRC) and webinars, which can be leveraged to deliver initial content, enable collaboration, and offer pathways to more advanced content and interaction constructs?

- How can we enable a culture of experimentation and effective risk management to drive innovation forward while enabling responsible and ethical use of AI and other advanced technologies?
  - What role(s) does AI play in creating a culture of lifelong learning and upskilling?
  - How can AI be leveraged to create personalized learning pathways, and what support resources are needed?
- How do we identify early adopters and influencers in our community?
  - Can they develop potential use cases to be shared?
- What groups of stakeholders should be engaged and leveraged? Professional development? Instructional designers? Librarians? The California School Employees Association (CSEA)? Others?

APPENDIX B - GUIDELINES FOR STUDENT USE OF GENAI IN THE SYLLABUS

*From Academic Integrity Policies in the Age of Artificial Intelligence (AI) Resource Document ASCCC Educational Policies Committee 2023-2024

The Educational Policies Committee of the ASCCC reviewed a cross section of drafts and sample texts from faculty submitted syllabi. Sample syllabus language from this resource document are shared below. The committee shared syllabus language that demonstrated a range of comfort levels with GenAI from "open" to "conditional/restricted" to "closed".

Example of syllabus language that is "open"

Generative artificial intelligence (GenAI) tools like ChatGPT, DALL-E, or GitHub CoPilot, that generate output may be used in this course as you determine appropriate, as long as you do so honestly through proper documentation, citation, and acknowledgement. To demonstrate your honest use of these tools and your learning process, you must:

- *Keep histories of your chats and submit them when requested.*
- *Cite the content that came from GenAI tools using citations methods endorsed by the library.*

NOTE: GenAI is known to fabricate sources, facts, and give false information. It also perpetuates bias. You should also be aware that there are copyright and privacy concerns with these tools. You should exercise caution when using large portions of content from AI sources for these reasons. Also, you are accountable for the content and accuracy of all work you submit in this class, including any supported generative AI.

Example of syllabus language that is "conditional/restricted"

I expect you to generate your own work in this class. When you submit any kind of work (including projects, exams, quizzes, or discussions), you are asserting that you have generated and written the text unless you indicate otherwise by the use of quotation marks and proper attribution for the source. Submitting content that has been generated by someone other than you, or was created or assisted by a computer application or tool, including

artificial intelligence (AI) tools such as ChatGPT is cheating and constitutes a violation of the Student Conduct Code. You may use simple word processing tools to update spelling and grammar in your assignments, but you may not use AI tools to draft your work, even if you edit, revise, or paraphrase it. There may be opportunities for you to use AI tools in this class. Where they exist, I will clearly specify when and in what capacity it is permissible for you to use these tools.

Example of guidance on individual assignments:

I want to address the new AI-tools that you may be hearing about, such as ChatGPT, and their possible role in this project. I want you to be aware that ChatGPT is based on a large language model--it is basically crowdsourcing information and providing likely answers based on the vast amount of text in its database. While it can provide some helpful information, and may spur thinking in some areas, it is not a reliable source and cannot provide citations or references to reliable data or evidence. (If you ask it for a citation, be aware that it makes things up and the information it's giving you is likely garbage!)

So, can I use ChatGPT or other AI tools to help write this paper?

Things you can do: ask ChatGPT questions! I personally enjoy chatting with it about topics I'm interested in. For example, "What are some current issues related to sustainability in the airline industry?" When you read what it says, keep in mind that it's probably at least 60-70% correct, but perhaps not more than that. :-) Given that you're considering whatever it told you with a big grain of salt, you'll then need to do some research to find peer reviewed and reliable evidence that might corroborate (or disagree with!) what the AI tool told you. Use those articles to find other articles that consider the same question (review the citation list for other articles to read). Either before or after you ask ChatGPT a question, try a google search with the same sort of query and see what it turns up; also, try a search on the OSU library system. Review, compare, and investigate. Repeat this cycle, keeping in mind that what you're getting from AI is crowdsourced information, not the reliable product of research and assessment.

Things you cannot do: Do not use ChatGPT to draft your paper. Do not use ChatGPT to give you citations. I am saying this both for purposes of producing reliable evidence and also from an academic integrity (i.e, cheating) standpoint. If you didn't write it, don't put your name on it and claim that you wrote it. Don't modify a few words here and there and claim you wrote it either. Close the window before you start drafting and put the real evidence and articles you've found into your own words. Do your own analysis and critical thinking.

Example of syllabus language that is "closed"

Grammar, composition, and/or vocabulary are part of the learning outcomes of this course. Therefore, all assessments (writing assignments, oral compositions, presentations, summaries, etc.) must be your original work. The use of artificial intelligence (AI) tools, such as ChatGPT, is prohibited. The use of AI tools is considered plagiarism in this course, and disciplinary actions fall under the plagiarism guidelines. The instructor may follow up with the student with an oral conversation to assess the learning.

AI Guidance for Classroom policies from The Poorvu Center for Teaching and Learning

Crowd sourced google document summarizing syllabus policies around the nation

APPENDIX C – NATIONAL EDUCATION ASSOCIATION (NEA) PRINCIPLES[1]

Principles	Summary
1. Students And Educators Must Remain At The Center Of Education	Learning and knowledge construction depend on social engagement and collaboration, making student-educator interactions essential. AI should support, not replace, these connections.
2. Evidence-Based AI Technology Must Enhance The Educational Experience	The adoption of artificial intelligence (AI) in education should be supported by data demonstrating its appropriateness and efficacy, aligning with high-quality teaching standards. Ongoing reassessment by educators is crucial to ensure AI continues to benefit students' educational experiences.
3. Ethical Development and Use of AI Technology and Strong Data Protection Practices	Artificial intelligence requires human oversight due to concerns like algorithmic bias, data privacy violations, and environmental impacts. AI tools must be vetted and monitored to ensure compliance with laws and transparency in student and educator evaluations.
4. Equitable Access to and Use of AI tools is Ensured	Deploying AI tools risks widening the digital divide unless access, technical support, and infrastructure are provided to all students and educators. AI must be used equitably to ensure all students benefit from active learning and creative engagement, with policies ensuring high-need learners are not limited.
5. AI Literacy and Agency	AI literacy should be integrated across all subjects and educational levels, with developmentally appropriate and experiential learning experiences. Educators need ongoing professional development to increase their AI literacy, to understand pedagogically appropriate uses of AI and address AI bias and data privacy concerns.

APPENDIX D – EXPLORATION OF STATEWIDE SURVEY

Faculty – Statewide Survey Results and Faculty Quotes

The majority (84%) of faculty respondents work in instruction followed by student support (9%) and business/operations (17%).

Faculty Professional Development Interests - "I believe we need to educate faculty on how AI might be applied to their areas of expertise, then they can lead the way to educate their students in responsible use of AI technologies in their courses. AI is not going away."

Faculty expressed the greatest interest in instruction on ethical, responsible, and safe uses of AI, followed by using AI tools and the long-term impacts of AI. Their preferred mode of communication for professional development is through webinars, and online repositories for AI-related content communities of practice organized by discipline/ program area.

Faculty Uptake of AI - "Like every other facet of society, if we embrace and utilize AI as a tool, we will be successful. If we stick our head in the sand, we will become obsolete. As community colleges we have the ability and ingenuity to pivot in a way other organizations will have trouble doing. This is a golden opportunity for education, but if we don't take advantage, it will run over us like a steamroller."

1 Five Principles for the Use of Artificial Intelligence in Education. (2024). National Education Association. Retrieved from webpage https://www.nea.org/resource-library/artificial-intelligence-education/v-five-principles-use-artificial-intelligence-education

Most faculty have some level of familiarity with AI currently with the majority (37%) reporting they are moderately familiar with the capabilities of AI, although 34% report being less than moderately familiar compared to 30% being greater than moderately familiar with AI. The use of AI tools by faculty is low with 70% of faculty using AI tools less than once a week or never. Faculty

Opportunities and Concerns of Faculty - "Implementing AI is a choice, not an inevitability. We can choose people over AI, and I encourage us to do so - even as I know we almost certainly will not."

The primary concern of faculty with AI is its impact on academic integrity, with the majority of faculty (62%) extremely concerned about the use of AI in education. However, the majority of faculty (57%) expect the impact of AI to be a mix of positive and negative. On the negative side, many faculty expressed concern with how AI will impact critical thinking skills and literacy skills. Positively, some faculty saw opportunities to educate students on the ethical use of AI and developing AI skills that could be applied in the workplace.

Faculty Recommendations - "I believe we do not need to fear AI. Rather, we should educate ourselves, as instructors, on how this amazing technology can be an asset to our work. We can be aware of the downside but realize that the positive impact could also be beneficial to how we guide and instruct our students."

In line with both faculty concerns and professional development interests, a significant amount of faculty expresses a need for tools to detect plagiarism using AI. Some faculty report checking students' work already but expressed the need for this to be built into existing Learning Management Systems. Additionally, faculty expressed a pressing need for AI guidelines from either the CO, districts, institutions, or faculty senates.

Classified Professionals – Statewide Survey Results and Classified Professional Quotes

The majority (38%) of classified professional respondents work in student services followed by instruction (20%) and business/operations (17%).

Classified Professionals' Professional Development Interests - "The investment in professional development for Classified Staff is starkly trailing the academic side. These positions are highly vulnerable to AI and have not been given enough attention."

Classified staff express the greatest interest in using AI tools followed by instruction on ethical, responsible, and safe uses of AI and AI basics. Their preferred mode of communication is webinars, AI-related email lists, and conferences.

Classified Professionals' Uptake of AI - "I have not used AI because I really don't know what to use it for. I think I would like to learn but I just have not had time to open that door."

Of classified staff respondents, 50% are moderately to extremely familiar with the capabilities of AI, although the majority of respondents (41%) are slightly familiar with AI with the remaining 8% of respondents having no familiarity with the capabilities of AI. The majority (69%) of classified staff report using AI tools less than once a week or never, while 15% report using AI daily or multiple times a day.

Opportunities and Concerns of Classified Professionals - "There's anxiety that it [AI] would lead to job losses/cuts. Hopefully, there's also a recognition of the services classified staff provide which go beyond what even a highly trained AI system can do. Students we serve appreciate the humanity of services. Storytelling is a powerful tool in communities." The, "I'm a robot and I can help you," may not be something everyone can identify with when seeking support."

The primary concern of classified staff with AI is information trustworthiness, with 49% being extremely concerned. However, the majority (69%) expect the impact of AI on education and learning to be a mix of positive and negative. On the negative side, classified staff are concerned with AI's impact on faculty and students in relation to academic integrity in addition to the potential for AI to disrupt roles within colleges. Positively, classified staff view AI as a tool that can be harnessed in their roles to expedite tasks and mitigate issues such as fraud.

Classified Professionals' Recommendations – "We need to embrace AI and any other technology that can streamline processes, but it must not be seen as a panacea to budget issues by using it to justify the elimination of many positions."

As a significant portion of classified staff are only slightly familiar or not familiar with the capabilities of AI there is an expressed need for additional professional development on AI. While classified staff noted a number of areas in which AI could be applied, many expressed the need for understanding which specific tools could be used within their roles or for other roles within the institution. Of classified staff expressing interest in AI tools, a few noted the need for enterprise grade AI tools in addition to more resources (staff and otherwise) to train employees at all levels of the institution on these tools.

Administrator/Manager – Statewide Survey Results and Administrator/Manager Quotes

Administrators and managers work across a diverse range of college departments, 30% of survey respondents work in instruction, 20% in student services, 14% in business operations, 13% in overall college/district management, and 7% in institutional effectiveness/research.

Administrator/Manager Professional Development Interests - "I'm interested to know if AI can be used to streamline administrative tasks, such as class scheduling, resource allocation, and fleet management."

Administrators and managers expressed the greatest interest in using AI tools followed by instruction on ethical, responsible and safe uses of AI and uses of AI to support college operations. Their preferred mode of communication is webinars, conferences, and AI-related email lists.

Administrator/Manager Uptake of AI - "I would like to see examples of how AI tools have helped with general operations at the college level."

Most administrators and managers have some level of familiarity with AI currently with the majority (41%) reporting they are moderately familiar with the capabilities of AI, although 33% report being less than less than moderately familiar compared to 27% being greater than moderately familiar with AI. The majority (65%) of administrators and managers' report using AI tools less than once a week or never, while 13% report using AI daily or multiple times a day.

Opportunities and Concerns of Administrator/Managers - "AI is an extremely prevalent and accessible tool. I think it is essential to embrace it as a learning tool and reflect on its proper use at a business, teaching, and student level, and most importantly, to foster creativity, excitement and personal and professional growth in both students and employees."

The primary concern of administrators and managers with AI is information trustworthiness, with 47% of administrators and managers being slightly concerned about the use of AI in education and 42% being extremely concerned. Managers and administrators' primary concern is academic integrity and development of critical thinking skills of students. While administrators and managers see opportunities for AI adoption institution-wide, they see particular opportunities for AI to be used to enable faculty and staff by reducing repetitive tasks. Administrators and managers noted specific departments may benefit from the adoption of AI based technologies within institutional systems such as LMS, CRM and financial/accounting software.

Administrator/Manager Recommendations - "It is important for our equity work that we consider our disproportionately impacted students and their families and their access to AI tools. Without appropriate access, it may only widen the equity gaps."

Principally administrators and managers express the need for support on AI to provide guidance and support to faculty and staff. A number of administrators and managers expressed the need for policies, procedures and best practices regarding AI. This includes supporting faculty in assessment and supporting classified staff by incorporating AI into operations. As administrators and managers' view on AI's impact on education and learning is skewed positively there is interest in understanding how it may be adopted institution wide. From a macro perspective, administrators and managers are interested in how AI will impact the workforce and at a micro level how it could be incorporated into curriculum and instruction.

APPENDIX D - EXTENDED CONSIDERATION OF THE IMPACT OF AI ON THE CAMPUS WORKFORCE

Employment - Leveraging AI in Our Work: Identifying the opportunities and drawbacks of using AI to enhance effectiveness and ensure responsible implementation.

- Concern is that Generative AI could be used to replace faculty and other employees.
- Administrators/managers and classified staff see AI as a tool that can be leveraged to enhance productivity and student experience. Adoption across these groups remains variable as access to tools and professional development opportunities are a constraint.
- Administrators/managers and classified staff cited a broad range of institutional operations areas that could benefit from AI. Anticipation of the impact of AI is met with some apprehension towards the potential for AI to disrupt roles. Faculty cited AI as a tool that could be used to aid course design, increase productivity, and be valuable within specific disciplines.

Climate Implications: Understanding the environmental benefits and risks of GenAI integration, including its energy consumption and carbon footprint.

Policy and Procedures: Establishing policies and procedures for using AI in an equitable and uniform manner across departments, institutions, and among students.

- The role of elected boards of trustees and impact on understanding and informing policies and procedures.
- Faculty and administrators/managers cite the need for increased clarity and guidance as it relates to AI. Faculty see discrepant use in the monitoring of AI for plagiarism across institutions and departments and variation in efforts to address academic integrity across disciplines and modalities.
- The lack of policies and procedures prevents administrators/managers from providing faculty and staff guidance on AI.
- Acknowledgement of the impact AI may have on the future of work is leading to adoption of AI within course curriculum despite concerns on topics such as the ethical use of AI.

Academic Integrity, Pedagogy and Equity: Recognizing that students are already using AI, it is important to assess its impact on learning while maintaining academic integrity and ensuring the ethical use of AI.

Faculty, administrators/managers, and classified staff all express alarm at the perceived adoption of AI by students and how it impacts student learning. The development of critical thinking skills was often cited by respondents as a primary concern which relates to the underlying issue of plagiarism involving AI.

- The use of tools to detect AI was cited as a need for faculty, though there is concern around the veracity of these tools.
- Equity was broadly cited as both an opportunity and concern as it relates to AI, respondents noted inequitable impacts could arise if AI is not uniformly monitored.

Career Readiness and the Workforce: Assessing the skills students need for the future workforce and understanding how AI will impact their careers are essential for preparing them for success.

- Despite concern for the development of students' critical thinking skills, faculty and administrators/managers identified AI as a tool that could impact students within their careers as they cited employers' use of AI.
- Regard for how AI will impact the workforce is top of mind for both faculty and administrators/managers, as it affects how specific jobs could evolve and have disproportionate impacts on certain parts of the workforce. As a result, curriculum and programs need to be responsive to these shifts.

Ongoing Discovery and Evolution: Exploring the integration, use, and evaluation of GenAI, the community college system is in a phase of discovery. This process is iterative and evolving, reflecting the dynamic nature of AI technology and its applications in education, as well as its impact on the workforce.

Employment- Leveraging AI in Our Work

Human Expertise as an Essential Ingredient for Success: There is a widespread concern that GenAI is being perceived as a tool to replace employees. It is essential to recognize that GenAI's output is most effective when complemented by human intervention. Human expertise is crucial in guiding, interpreting, and refining AI-generated content, ensuring that it meets quality standards and ethical guidelines. This synergy between human skills and AI capabilities can lead to innovative solutions, increased productivity, and enhanced decision-making processes, ultimately benefiting both the workforce and the organization as a whole. Emphasizing collaboration rather than replacement and investments in AI awareness training and on-going professional development can help alleviate fears and promote a more positive and integrated approach to AI adoption.

Discipline-specific Needs Assessments: A comprehensive needs assessment, along with an evaluation of implications and potential solutions, should be conducted by department and by discipline-specific faculty, administrators, managers, and classified staff. This approach ensures that the insights and recommendations come from employees who are directly engaged in the work, leveraging their firsthand experience and expertise. Involving these professionals in the assessment process will lead to more accurate, practical, and effective strategies that are tailored to the actual needs and challenges of the job. This participatory method promotes ownership and buy-in from the workforce, facilitating smoother implementation and greater acceptance of AI-driven initiatives and their implications. The results of the discipline-specific analysis will then be shared with the AI Council as some outcomes will benefit other sectors of the community colleges.

Job Classification Reviews and Total Cost of Ownership: Questions regarding how GenAI will be used require thorough analysis with job classification reviews to assess the degree to which GenAI may support or enhance roles, responsibilities, and tasks. Integrating GenAI into campus work operations necessitates careful consideration of the true cost of ownership related to using GenAI, including real indicators such as cost savings, productivity improvements, error reduction, employee satisfaction, training and support needs.

Climate Implications

While GenAI may offer environmental benefits, it also presents significant challenges that necessitate cautious consideration. Implementing targeted mitigation strategies can maximize its positive impacts while addressing potential drawbacks.

Positive Implications: Research shows that GenAI can significantly benefit the environment by optimizing energy use across various industries, improving the efficiency of HVAC systems, logistics, and smart grids. It also plays a crucial role in advancing renewable energy sources by forecasting weather patterns for solar and wind energy, thereby enhancing their reliability and efficiency. GenAI aids in climate research by processing vast amounts of data to develop better climate models and predictions, and it promotes sustainable agriculture through optimized water use, crop yield predictions, and efficient resource management.

Negative Implications: Despite its benefits, GenAI poses several environmental challenges. The training and operation of large GenAI models demand substantial computational power, leading to high energy and water consumption and increased carbon emissions, especially if reliant on non-renewable energy sources. The production and disposal of the necessary hardware contributes to electronic waste, and the infrastructure's development requires significant natural resources, including rare earth metals. The cumulative carbon footprint from data storage, cooling, and processing can be substantial as GenAI usage scales up.

Mitigation Strategies: To address the challenges presented by utilizing GenAI, prioritizing the use of renewable energy sources for powering the AI infrastructure can significantly reduce GenAI's carbon footprint. Developing energy-efficient models, algorithms and hardware, along with sustainable practices for recycling and disposing of electronic components, can minimize environmental impacts. Implementing regulations and policies that encourage green energy use will promote

sustainable AI practices, ensuring that the positive impacts of GenAI are maximized while mitigating its negative environmental effects.

Policy and Procedures – Role of Elected Board of Trustees and Community Colleges

Elected boards of trustees should be actively engaged in overseeing and guiding the integration of AI and GenAI within their institutions, ensuring that policies, procedures, and practices align with policy, regulation, and ethical standards that promote student access, success and academic integrity. To be actively engaged requires that they spend time learning about AI and GenAI. Community colleges have a crucial role in educating their communities about GenAI, providing resources and training to help students, faculty, staff, administrators and local residents understand and effectively utilize AI technologies. Local districts need to establish thoughtful policies and procedures aligned with federal and state law to guide the use of GenAI and ensure consistent practices.

Union Perspective – Working Conditions Implications

From a union perspective, the integration of GenAI in academia raises important concerns regarding changes to jobs and implications for working conditions.

- Unions will advocate for clear policies that ensure GenAI is used to complement and enhance human work rather than replace employees.
- There should be safeguards in place to protect jobs, with a focus on growing digital, data and AI literacy and upskilling and reskilling employees to work effectively alongside AI technologies. Additionally, unions will emphasize the need for transparency in how GenAI is implemented and its impact on workloads and job roles.
- Ensuring that working conditions remain fair and that employees are not overburdened by new technologies is crucial.
- Policies should also include protections against any negative consequences arising from AI use, such as errors or biases and safeguarding privacy information, to safeguard employees' rights and maintain a positive working environment.

Reports indicate that tasks performed by Classified Professional staff, such as meeting notetaking and the translation of materials into other languages, are being transitioned to GenAI without consultation. As noted in the "Employer – Leveraging AI in Our Work" section, a comprehensive needs assessment, along with an evaluation of need, implications and potential solutions, should be conducted by department and by discipline-specific faculty, administrators, managers, and classified staff. This approach ensures that the insights and recommendations come from employees who are directly engaged in the work, leveraging their firsthand experience and expertise.

Academic Integrity, Pedagogy and Equity

There are significant concerns regarding academic integrity, the trustworthiness of information, and AI bias. Institutions should develop clear AI policies that specify how and to what extent employees and students can use AI tools. These policies should protect employees from liability for errors that occur while following the guidelines and should provide guidance as to acceptable uses of AI in educational settings.

Additionally, continuous monitoring and evaluation of AI systems are essential to ensure they function as intended and do not perpetuate biases. Regular training and professional development for staff and faculty are necessary to stay updated on best practices and ethical considerations in AI usage. Transparency and the involvement of diverse stakeholders in policy development can enhance fairness and trust.

The use of AI by students also raises important implications for the overall learning process with respect to critical thinking skills, writing and reading skills, information and media literacy, and the prospective inequitable impacts to students. Institutions need to address how AI tools are incorporated into student work, provide equitable access to AI-enabled tools and resources, and ensure that their use does not compromise educational goals or the fairness of assessments. Clear guidelines on student use of AI, along with educational programs to inform students about ethical AI practices, are essential.

Ongoing Discovery and Evolution

The community college system is in an exploratory phase concerning the assessment, integration and evaluation of GenAI. This review process is highly iterative and continuously evolving, reflecting the rapid advancements and dynamic nature of AI technology and its applications in education. Regular assessments, pilot programs, and feedback loops are essential to adapt and refine AI strategies, ensuring they align with educational goals and effectively address emerging challenges and opportunities. There is a critical need for ongoing professional development to equip faculty and staff with the necessary skills and knowledge to effectively leverage AI tools and methodologies in their teaching and administrative roles.

Moreover, it is crucial to continuously update and adapt the curriculum to ensure that current and former students are gaining the skills and knowledge that align with industry demands. This alignment will better prepare students for the evolving job market, ensuring they are competitive and capable of thriving in an AI-enhanced workforce

APPENDIX E - VENDOR VETTING RUBRIC

Vendor Vetting Considerations - DRAFT

The criteria below provide a basis for evaluating and comparing strengths and weaknesses across potential AI technology partners and AI tools for the California community colleges.

Rate each criterion with one of the following of 3 (strong); 2 (moderate); 1 (weak); 0 (unable to say); N/A

Technology Strengths	Description	Descriptive Response	Rating
Justification	Clear “why” for selecting this vendor and throughline to the benefits for students and colleges.		
AI Model & Tech Stack	Quality of AI technologies employed. Were these technologies designed with equity in mind?		
Training Dataset	Rate the vendor’s transparency on the training data their AI platform is built on. Does the vendor have a strategy to guard against bias and maintain quality of training data?		
Algorithmic Discrimination Protections	Systems are designed and used in an equitable way. Processes exist to evaluate and correct when tools are found to be discriminatory to avoid repeat incidents.		

Technology Strengths	Description	Descriptive Response	Rating
Managed Privacy Controls	Users have agency over how data about them is collected with built-in protections that shield them from abusive data practices. No use of student data beyond that which is needed to increase access and support.		

Adoption Strengths	Description	Descriptive Response	Rating
Simplicity of product	Is the product intuitive & easy to use? Are humans in-the-loop when capabilities are designed, tested and used to achieve successful outcomes?		
Implementation ease (permission to use, training on use)	Is the product well-documented and easy to implement and integrate with other systems?		
Customer support	Rate the level of customer support the vendor offers. Do customers have access to a person who can consider and remedy problems they encounter?		

Business Strengths	Description	Descriptive Response	Rating
Business Model	How does the vendor plan to make money off their product? Who purchases their product?		
Relationships	Quality of the vendor's relationships in business and technology.		
Market Positioning	Rate the strength of the vendor's position in the market relative to other vendors		
Financial funding / stability	How transparent is the vendor about their funders and funding? How stable is their funding?		

Business Strengths	Description	Descriptive Response	Rating
Sustainability	Is the vendor likely to be around for at least 5 years?		
Team	Strength and experience of the vendor's leadership team. Is the leadership team representative of the diversity of the public?		

Compliance strengths	Description	Descriptive Response	Rating
Notification and transparency	How are users of the vendor's services informed when an automated system is being used? Is there transparency around how and why those systems contribute to impactful outcomes? Where and how can users access this information?		
ADA compliance or plan	Level of ADA compliance or plan for compliance (e.g., WCAG compliant).		
Data security, access, sharing	Strength of vendor protection of the data they acquire (e.g., compliance with relevant state laws such as SOPIPA and CCPA; users can access their own data). What protections exist to prevent data breaches and other risks? How is the efficacy of the data system's security measured? Will any student data be used beyond that which is needed to increase access and support?		
FERPA compliance	Vendor's ability to comply with FERPA.		
Copyright issues	Vendor's clarity and indemnification on copyright issues.		

Compliance strengths	Description	Descriptive Response	Rating
Notification and transparency	How are users of the vendor's services informed when an automated system is being used? Is there transparency around how and why those systems contribute to impactful outcomes? Where and how can users access this information?		
ADA compliance or plan	Level of ADA compliance or plan for compliance (e.g., WCAG compliant).		
Data security, access, sharing	Strength of vendor protection of the data they acquire (e.g., compliance with relevant state laws such as SOPIPA and CCPA; users can access their own data). What protections exist to prevent data breaches and other risks? How is the efficacy of the data system's security measured? Will any student data be used beyond that which is needed to increase access and support?		
FERPA compliance	Vendor's ability to comply with FERPA.		
Copyright issues	Vendor's clarity and indemnification on copyright issues.		

Customer & Cost Effectiveness Strength	Description	Descriptive Response	Rating
Customer base	Size and diversity of the vendor's established customer base. Do customers have equitable access to the vendor's services?		
Capacity for users / scaling	Ability of the vendor to scale to meet our needs and provide equitable access and support to every user.		

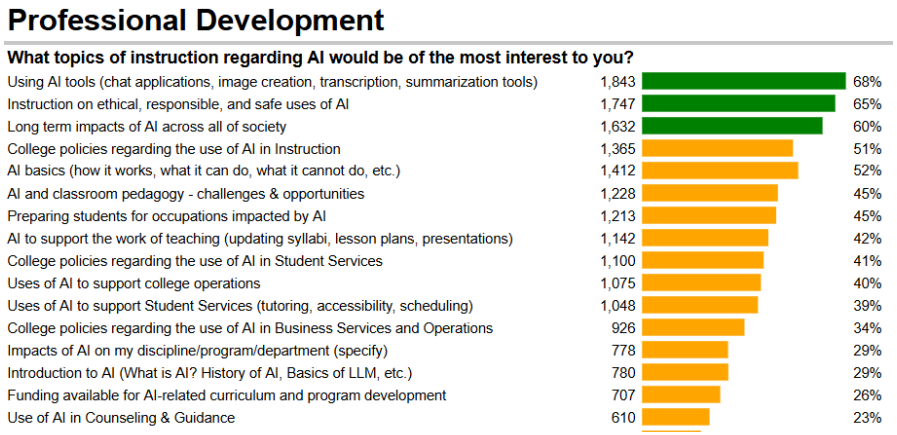
Customer & Cost Effectiveness Strength	Description	Descriptive Response	Rating
Customer satisfaction	Satisfaction of current and past customers.		
Cost effectiveness	Cost is reasonable relative to other options.		
Outcomes	Quality of evidence demonstrating positive outcomes for users.		

APPENDIX F – OVERVIEW OF AI PROFESSIONAL DEVELOPMENT (PD) NEEDS FROM STATEWIDE SURVEY

The statewide AI survey provides us with valuable insights into the current interests and concerns of faculty and staff regarding generative AI. The majority of respondents (59%) indicated that they expected AI to have a significant or very significant impact on their work in the future. Additionally, 88% of respondents were somewhat or extremely concerned about the impact of AI on academic integrity and 92% were somewhat or extremely concerned about the impact of AI on information trustworthiness. Underlying these concerns are reports and experiences of AI models making up or "hallucinating" information in response to questions as well as an awareness of the widespread use of generative AI tools among students and an uncertainty and lack of clarity regarding what constitutes appropriate usage.

Interest in **professional development opportunities** is similarly high among survey respondents across a variety of domain areas. The high level of concern with AI is reflected in the **interest of faculty and staff in having access to and adequate time to engage in professional development** that provides training in how to use AI tools (68%) and more particularly on the ethical, responsible, and safe uses of AI (65%). There is also a high level of interest in studying the long-term impacts of AI on society (60%), as well as AI basics (52%), college policies regarding the use of AI in instruction (51%), and classroom pedagogy and AI (45%).

Figure 1. Overall response to Areas of interest



To obtain a finer-grained understanding of professional development needs, we further disaggregated the data from the statewide AI survey by respondent role: faculty (n = 1,380); classified professionals (n = 791); and administrators/managers (n = 429). Of note, all three groups have highlighted "**Instruction on ethical, safe uses of AI", "Using AI tools", and "Long-term impacts of AI on society**" as among their top 5 areas of interest (see figures below).

Some useful findings emerge when we disaggregate the professional development interest areas of faculty, staff (classified professionals) and managers. Staff and managers share the same top five areas of interest, though there is variability in how those items are ranked within the top five.

For instance, staff express a greater level of interest in "AI basics" training relative to managers (63% and 57%, respectively). Both staff and managers agree that "Using AI tools" is their number one area of professional development interest (73% and 82%, respectively). They are also in alignment that "Uses of AI to support college operations" is a top training and professional development priority. Faculty do not include "AI basics" or "Uses of AI to support college operations" in their top five areas of interest for professional development (58% and 61%, respectively). Instead of those two areas, faculty are (understandably enough) more interested in the **applications of AI to the classroom environment, including "AI and classroom pedagogy - challenges & opportunities" (56%) and "College policies regarding the use of AI in instruction**" (54%).

Figure 2. Top Five Areas of Interest for Classified Professionals (Staff)

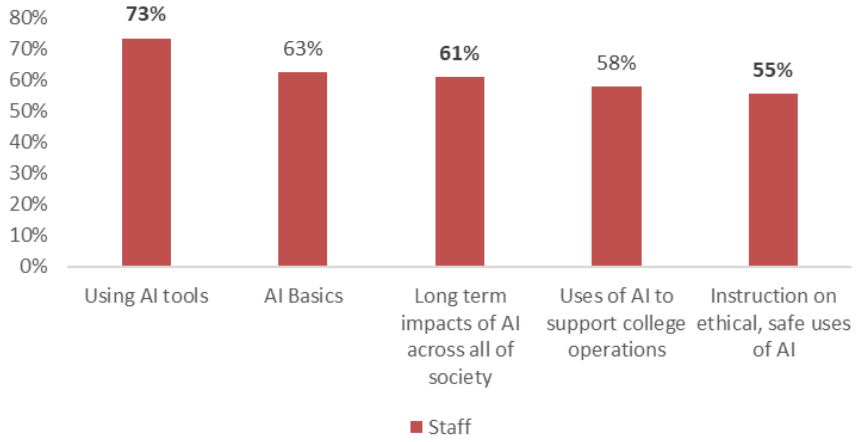


Figure 3. Top Five Areas of Interest for Managers

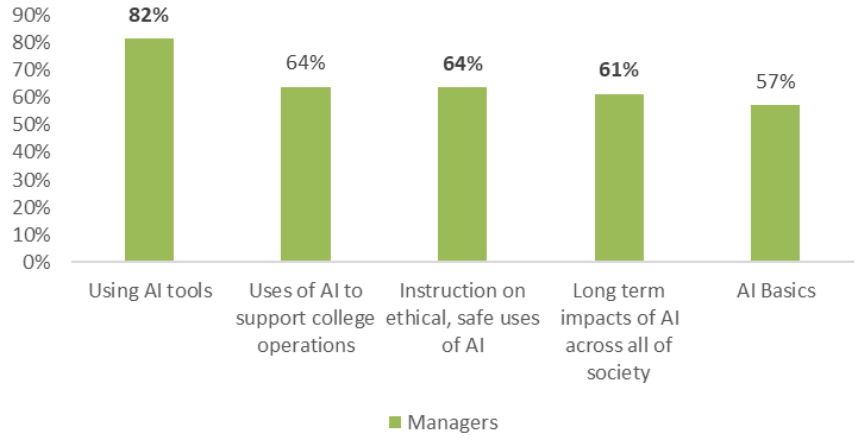
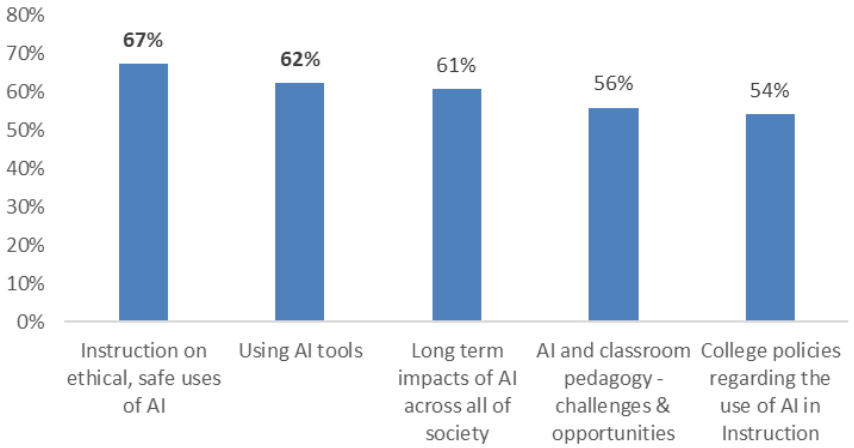


Figure 4. Top Five Areas of Interest for Faculty



Given these interests and needs identified for professional development across the system, as well as those emergent through strategic partnerships, the California Community Colleges Chancellor's Office (Chancellor's Office) is collaborating with constituent groups to plan and provide ongoing AI professional development that will support colleges and our workforce needs. The section entitled "Professional Development and AI" provides an overview of these efforts and lists some of the resources already available for California community colleges.

APPENDIX G – IMPACT OF AI ON THE WORKFORCE: VISION 2030 ALIGNED INDUSTRY SECTORS

Healthcare - #1 Fastest Rising CA Industry Sector: AI has emerged as a powerful catalyst for innovation, unlocking new healthcare products and services that were once beyond our imagination. For instance, AI-driven diagnostics have significantly improved patient outcomes and streamlined operations, marking a new era in medical care. Public health organizations can responsibly use generative AI to improve service delivery, bolster outbreak preparedness, accelerate R&D and enhance health outcomes for communities.[1] The stakes are high in healthcare, where AI's impact is profound. These technologies complement the knowledge of doctors. Ideally, by bringing together direct care and data analysis, AI cardiology allows doctors to spend more time with their patients and improves the shared decision-making process. Innovations such as the development of an artificial heart pump illustrate how AI can transform medical treatments.[2] This technology optimizes blood flow without damaging cells, a challenge previously hampered by complex computational demands and unpredictable variables like changing blood pressure. Through the use of machine learning, advanced data analytics, and high-performance virtual simulations, the design process has been significantly accelerated, allowing for rapid testing of design variations and vastly improving patient outcomes.[3,4]

One of the significant impacts of AI in the healthcare workforce is its ability to free up time for various healthcare positions, allowing professionals to spend more time with patients. This benefit extends across a range of roles, including nurses, certified nursing assistants (CNAs) and other frontline staff. AI can streamline administrative tasks, such as data entry, appointment scheduling and medical coding, enabling healthcare workers to focus more on direct patient care and improving patient outcomes

Furthermore, AI-powered tools can enhance diagnostic accuracy, assist in developing personalized treatment plans, and support remote monitoring, which can improve efficiency and effectiveness in patient care. These advancements allow healthcare professionals to dedicate more time to building meaningful patient relationships, which is crucial for patient satisfaction and recovery.[5] (American Hospital Association) (EITH Think Tank).

In recent years, the healthcare sector has witnessed a transformative wave, propelled by the rapid integration of artificial intelligence (AI). This technological evolution extends beyond mere automation; it redefines diagnosis, treatment, and patient care paradigms. AI's capabilities, from analyzing complex medical data to predicting patient outcomes, are modernizing and revolutionizing medical practices. However, alongside its numerous benefits, AI presents a unique set of ethical challenges. At this technological crossroads, a fundamental debate emerges: Is AI in healthcare a revolutionary ally driving unprecedented advancements, or is it an ethical dilemma wrapped in digital sophistication? This editorial delves into this dichotomy, exploring both the groundbreaking potential of AI in improving healthcare outcomes and the ethical intricacies it reveals, thus shaping the future landscape of medical practice.[6]

Mental healthcare professionals can employ AI-driven client engagement strategies to effectively guide the recovery journey for individuals with mental health issues. For example, AI technologies integrated into mobile apps can send timely reminders for medication schedules,

1 Steve Davis, Saumya Singh, Nikhil Srinidhi, Matt Wilson. (2024 February 28). Public health's inflection point with generative AI. McKinsey & Company. Retrieved from https://www.mckinsey.com/industries/social-sector/our-insights/public-healths-inflection-point-with-generative-ai

2 Artificial Intelligence (AI) in Cardiovascular Medicine. (2024 March 16). Mayo Clinic. Retrieved from webpage https://www.mayoclinic.org/departments-centers/ai-cardiology/overview/ovc-20486648

3 Retrieved from https://www.mckinsey.com/industries/healthcare/our-insights/transforming-healthcare-with-ai

4 Retrieved from https://www.himss.org/resources/impact-ai-healthcare-workforce-balancing-opportunities-and-challenges

5 Retrieved from https://www.aha.org/center/emerging-issues/market-insights/ai/ai-and-health-care-workforce

6 Korkmaz S. (2024). Artificial Intelligence in Healthcare: A Revolutionary Ally or an Ethical Dilemma?. Balkan medical journal, 41(2), 87–88. https://doi.org/10.4274/balkanmedj.galenos.2024.2024-250124

track side effects, monitor medication responses, enhance adherence and facilitate collaboration between individuals and their healthcare providers. These apps can also monitor mood fluctuations and offer insights into potential triggers, helping individuals identify patterns and make informed decisions about self-care. Personal sensing, or digital phenotyping, involves using digital information to assess an individual's mental well-being. AI can analyze content shared on social media, medical records, and other sources to identify significant behavior shifts correlated with mental health conditions. For instance, AI might detect a potential indicator of depression if a smartwatch user transitions from high activity levels to a sedentary state, reflecting reduced energy and motivation. Platforms like Facebook use AI to identify concerning posts and offer assistance. Additionally, AI can connect individuals facing similar challenges through online support groups and communities, where they can share experiences and strategies. AI-based applications that track progress over time and provide feedback can also promote sustained motivation for enhanced recovery.[1]

Agriculture: As reported in the California Review Management report, [2]according to a Markets and Markets Report (2019)[3] the agricultural AI market in 2019 was valued at around $519 million and is projected to grow to $2.6 billion by 2025. There are several successful cases that demonstrate the value of AI in farming and agriculture. For example, Nature Sweet when growing their tomatoes uses AI for pest control and disease study. Their AI architecture and cameras monitor plants 24/7 and provide instant feedback.[4] An AI app called Climate Basic identifies the optimal location to plant corn based on temperature, erosion, precipitation and soil quality in order to optimize yield.[5]

Advances in AI and related technologies lead to smart farms or farming models with high cognitive ability. This terrain is now characterized by enhancements such as: Extensive data capture and analysis, automation and robotics, and predictive analytics.[6]

John Deere's transformation showcases the impact of AI in agriculture. Starting more than a decade ago, John Deere recognized the potential of real-time data for farming efficiency. Since then, the company's products have evolved from pure hardware into integrated hardware and software platforms, creating an "Internet of Farming Things." Over 130,000 interconnected farming systems collect more than 15 million measurements every second, all uploaded to a cloud platform. These capabilities allow for precise management of agricultural tasks, enhancing efficiency by enabling equipment to identify weeds and accurately apply herbicides, thus reducing waste and doubling crop yields.[7]

While traditional AI development involves scientists making tools and delivering them to end-users, the AgAID Institute will involve the people who will use the AI solutions — from farmers and workers to policy makers — in their development. This "adopt-adapt-amplify" approach ensures

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1 Anoushka Thakkar, Ankita Gupta, Avinash De Sousa (2024 March 18). Artificial intelligence in positive mental health: a narrative review. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10982476/

2 . Mark Munoz. (2020 March 30). AI in Agriculture: Is the Grass Greener? UC Berkeley Insight Frontier. California Review Management. Retrieved from https://cmr.berkeley.edu/2020/03/ai-agriculture/ (Dr. J. Mark Munoz is a tenured Full Professor of Management at Millikin University, and a former Visiting Fellow at the Kennedy School of Government at Harvard University.)

3 Artificial Intelligence in Agriculture Market Size, Industry Research Report, Trends & Growth Drivers. (2023 February). Market Research Report. Markets and Markets. Retrieved from https://www.marketsandmarkets.com/Market-Reports/ai-in-agriculture-market-159957009.html?gclid=Cj0KCQiA7aPyBRChARIsAJfWCgJDCiWL0OB1Bojg8sgeeCEZr_vskSN5cnlAAd_jZLoLgFW5O5D71icaArzAEALw_wcB

4 Matt McFarland. (2017 July 26). Farmers turn to artificial intelligence to grow better crops. CNN Business. Retrieved from https://money.cnn.com/2017/07/26/technology/future/farming-ai-tomatoes/index.html

5 Anand Rao. (2017 May 10). A Strategist's Guide to Artificial Intelligence. PWC Publication, Issue 87. Retrieved from https://www.strategy-business.com/article/A-Strategists-Guide-to-Artificial-Intelligence

6 J. Mark Munoz. (2020 March 30). AI in Agriculture: Is the Grass Greener? UC Berkeley Insight Frontier. California Review Management. Retrieved from https://cmr.berkeley.edu/2020/03/ai-agriculture/ (Dr. J. Mark Munoz is a tenured Full Professor of Management at Millikin University, and a former Visiting Fellow at the Kennedy School of Government at Harvard University.)

7 Kimberly Borden, Mark Huntington, Mithun Kamat, Will Roper (2024 April 8). The AI Revolution will be "virtualized". McKinsey & Company. Retrieved from https://www.mckinsey.com/capabilities/operations/our-insights/the-ai-revolution-will-be-virtualized

solutions are practical and more likely to be adopted. The researchers will also work to create solutions that can adapt to changing environments and that amplify productivity by combining human skills and machine capabilities to be more effective than either would be alone.[1]

Systems that monitor grain harvesting now autonomously adjust cutting patterns to maximize efficiency and repurpose organic waste as fertilizer. Farmers can monitor real-time performance, weather, and costs, and subscribe to predictive algorithms that enable precise management of planting, watering, and harvesting—essentially creating a farming digital twin. AI-based advances allow equipment to detect weeds and precisely deploy herbicides, reducing waste by up to 80% while doubling yields. Another system monitors grain harvesting to autonomously adjust cut patterns, increase efficiency and recycle organic waste as fertilizer.

Education, child development and family services: In California's education, child development and family services sectors, AI is playing an increasingly significant role, particularly in enhancing teaching and learning experiences. For example, AI technologies are being used to support teachers by providing personalized feedback, aiding in lesson planning, and even simulating student interactions to help new teachers gain experience. These AI tools help to optimize teaching methods and improve engagement with students by offering real-time feedback and generating post-lesson reports to enhance classroom dynamics.[2]

Moreover, AI is crucial in addressing the broad spectrum of student needs, including learning differences and the development of critical thinking and problem-solving skills. For instance, AI systems are applied in personalized learning, which adjusts the educational content based on the individual learner's pace and understanding, thereby supporting a more tailored educational experience that can adapt to the diverse needs of students.[3]

Furthermore, the integration of AI in education is also seen as a way to prepare students for future workforce demands. By fostering skills that are less likely to be automated, such as critical thinking and creativity, AI is viewed not just as a tool for automation, but as a support system that enhances the educational process and prepares students for the complexities of modern career landscapes.[4]

Many people choose teaching for the personal gratification of seeing students understand and succeed, but there are concerns that AI will dehumanize the profession. However, generative AI can actually enhance education by freeing up instructors' time from administrative tasks, allowing them to focus more on building relationships with students. AI tools can assist in planning lessons and activities, analyze student work to identify common issues, and group students for targeted help, saving instructors significant preparation time. By using AI as a teaching assistant, instructors can spend more time interacting with students, improving educational outcomes and fostering meaningful connections. This approach enhances the quality of life for instructors and benefits students, especially those at risk, as positive teacher-student relationships are crucial for student learning. AI has the potential to support equity and enable unprecedented learning opportunities for all students.[5]

Interest in AI has surged among K-12 and college educators, but its application in early childhood education is still emerging. Isabelle Hau, executive director of Stanford Accelerator for Learning, highlights both the potential benefits and challenges of AI in early learning. Innovations in AI are addressing assessment challenges, with tools like FIND which serves to improve efficiency in analyzing child-adult interactions. AI technologies,

1 Lorena Anderson, Sara Zaske. (2021 July 29). New AI Institute Expands UC Merced's Smart, Sustainable Agriculture Effort. University of California Merced. Retrieved from https://news.ucmerced.edu/news/2021/new-ai-institute-expands-uc-merced%E2%80%99s-smart-sustainable-agriculture-effort

2 Claire Chen. (2023 March 9). AI Will Transform Teaching and Learning. Let's Get it Right. Stanford University, Human-Centered Artificial Intelligence. Retrieved from https://hai.stanford.edu/news/ai-will-transform-teaching-and-learning-lets-get-it-right

3 Wendy Kopp, Bo Stjerne Thomsen. (2023 May 1). How AI can accelerate students' holistic development and make teaching more fulfilling. World Economic Forum. Retrieved from https://www.weforum.org/agenda/2023/05/ai-accelerate-students-holistic-development-teaching-fulfilling/#:~:text=URL%3A%20https%3A%2F%2Fwww.weforum.org%2Fagenda%2F2023%2F05%2Fai

4 Elizabeth Mann Levesque. (2018 October 18). The role of AI in education and the changing US workforce. Brookings Institution. Retrieved from https://www.brookings.edu/articles/the-role-of-ai-in-education-and-the-changing-u-s-workforce/

5 David Wiley. (2024 May 13). How AI can humanize the teaching experience at universities. Retrieved from https://edscoop.com/ai-universities-humanize-instruction-2024/

such as Smart Glasses, assist children in recognizing emotions, while AI language support helps multilingual learners in classrooms and via distance learning. However, Hau stresses the importance of addressing privacy, bias, and equity issues associated with AI use in early childhood. She also notes the need for better technology solutions to connect parents with care providers. For educators interested in AI, resources from EdSAFE AI Alliance, TeachAI, AIEdu and AI for Education offer valuable guidance on safe and effective use.[1]

These developments underscore the transformative potential of AI in education and child development, reflecting a shift towards more integrated, personalized, and effective educational practices that can significantly benefit educators and students alike.

APPENDIX H – A BRIEF HISTORY OF AI

Appendix H.1 - Highlights from the Timeline of Machine Learning and Artificial Intelligence

In the 1950s, computing machines essentially functioned as large-scale calculators. In fact, human "computers" were still in wide usage as portrayed in the film, "Hidden Figures", about the unsung contribution of women and particularly women of color to the space race. Also during this decade Alan Turing, the British mathematician who conceptualized many of the features of modern digital computers, developed the Turing Test–a challenge to design a computer that responded so naturally that people believed they were interacting with a human.

During the summer of 1956, Dartmouth mathematics professor John McCarthy invited a small group of researchers from various disciplines to participate in the Dartmouth Conference, a summer-long workshop focused on investigating the possibility of "thinking machines." During the conference McCarthy conceived of the term that would forever come to define the practice of human-like machines, "artificial intelligence."

The early excitement that came out of the Dartmouth Conference grew over the next two decades, with early signs of progress coming in the form of a realistic chatbot and other inventions. In 1966, MIT computer scientist Joseph Weizenbaum developed ELIZA. ELIZA is widely considered the first chatbot and was intended to simulate therapy by repurposing the answers users gave into questions that prompted further conversation. It was so effective at simulating a therapy session that most users came to believe it was actually a real therapist or at least a sentient machine, challenging the Turing Test and giving rise to a new term–the ELIZA effect, a tendency to attribute human-like emotions and understanding to computers.

Between 1966 and 1972, the Artificial Intelligence Center at the Stanford Research Initiative developed Shakey the Robot, a mobile robot system equipped with sensors and a TV camera, which it used to navigate different environments. While Shakey's abilities were rather crude compared to today's technology, the robot helped advance the core AI fields of visual analysis, route finding, and object manipulation.

In 1974, the applied mathematician Sir James Lighthill published a critical report on academic AI research, claiming that researchers had essentially over-promised and under-delivered when it came to the potential of AI. His condemnation and a dearth of new results resulted in devastating funding cuts. The period between the late 1970s and early 1990s became known as the "AI winter"—a term first used in 1984—a period of stagnation and reduced interest in funding AI research and technology.

A few bright spots in AI research did emerge during the long AI winter. Ernst Dickmanns, a German scientist, outfitted a Mercedes van with a computer system and sensors, pioneering the first self-driving car, although it could only navigate roads without cars and pedestrians. In 1996, IBM's Deep Blue program competed against world chess champion and grandmaster Gary Kasparov in a six-game match-up. Deep Blue won only one of the six games, but in 1997 it won the rematch, generating reactions of amazement and disbelief in the chess world.

1 Ariel Gilreath. (2024 April 4). Is early childhood education ready for AI?. Hechinger Report interview of Isabelle Hau, the executive director of Stanford Accelerator for Learning. Retrieved from https://hechingerreport.org/is-early-childhood-education-ready-for-ai/

With new computing capabilities, new approaches, and renewed investment, the field of AI experienced a renaissance around the turn of the century. NASA powered two of their most successful and famous rovers—Spirit and Opportunity—with AI that helped them traverse Mars' difficult, rocky terrain, allowing them to make decisions in real-time rather than rely exclusively on human assistance to do so. In 2011, IBM followed up its conquest of chess with a foray into high-level trivia gamesmanship. Watson DeepQA, a competitive computer system that would go on to play the popular quiz show Jeopardy, ingested data from encyclopedias and across the internet and was tuned by its human programmers to perform independently at a high level by receiving natural language questions and then responding accordingly. In the end, it was able to beat two of the show's most formidable all-time champions, Ken Jennings and Brad Rutter. In that same year, Apple showcased a new feature: a virtual assistant named Siri. Three years later, Amazon released its proprietary virtual assistant named Alexa. Both had natural language processing capabilities that could understand a spoken question and respond with an answer. While AI was used to process natural language requests, the ability of these assistants was limited to more mundane lookup functions and thus they were not yet true AI agents.

The computer scientist Geoffrey Hinton began exploring the idea of neural networks (an AI system built to process data in a manner similar to the human brain) while working on his PhD in the 1970s. In 2012, when Geoffrey Hinton and his two graduate students displayed their research the tech industry became excited about neural networks' promise to realize the potential of AI. Hinton's work on neural networks and deep learning—the process by which an AI system learns to process a vast amount of data and make accurate predictions—is foundational to AI processes such as natural language processing and speech recognition.

2016 was an important year for AI. In that year Hanson Robotics created Sophia, a robot capable of facial expressions and jokes. Thanks to her innovative AI and ability to interface with humans, Sophia became a media sensation and a regular feature on talk shows. In 2017 Saudi Arabia granted Sophia citizenship, making her the first AI entity to be given that right.

The ancient game of Go is considered straightforward to learn but incredibly difficult—bordering on impossible—for any computer system to play given the vast number of potential positions. It's "a googol times more complex than chess" [7]. Despite that, AlphaGO, an artificial intelligence program created by the AI research lab Google DeepMind, went on to beat Lee Sedol, one of the best players in the world, in 2016.

Also in 2016, AlphaGO, an artificial intelligence program created by the AI research lab Google DeepMind, beat one of the best Go players in the world, despite the fact that beating top-level Go players had long been considered an insurmountable challenge for computers due to the staggeringly vast number of potential positions. AlphaGO is a combination of neural networks and advanced search algorithms and was trained to play Go using a method called reinforcement learning, which strengthened its abilities over the millions of games that it played against itself. When it vanquished Sedol, it proved that AI could tackle once insurmountable problems.

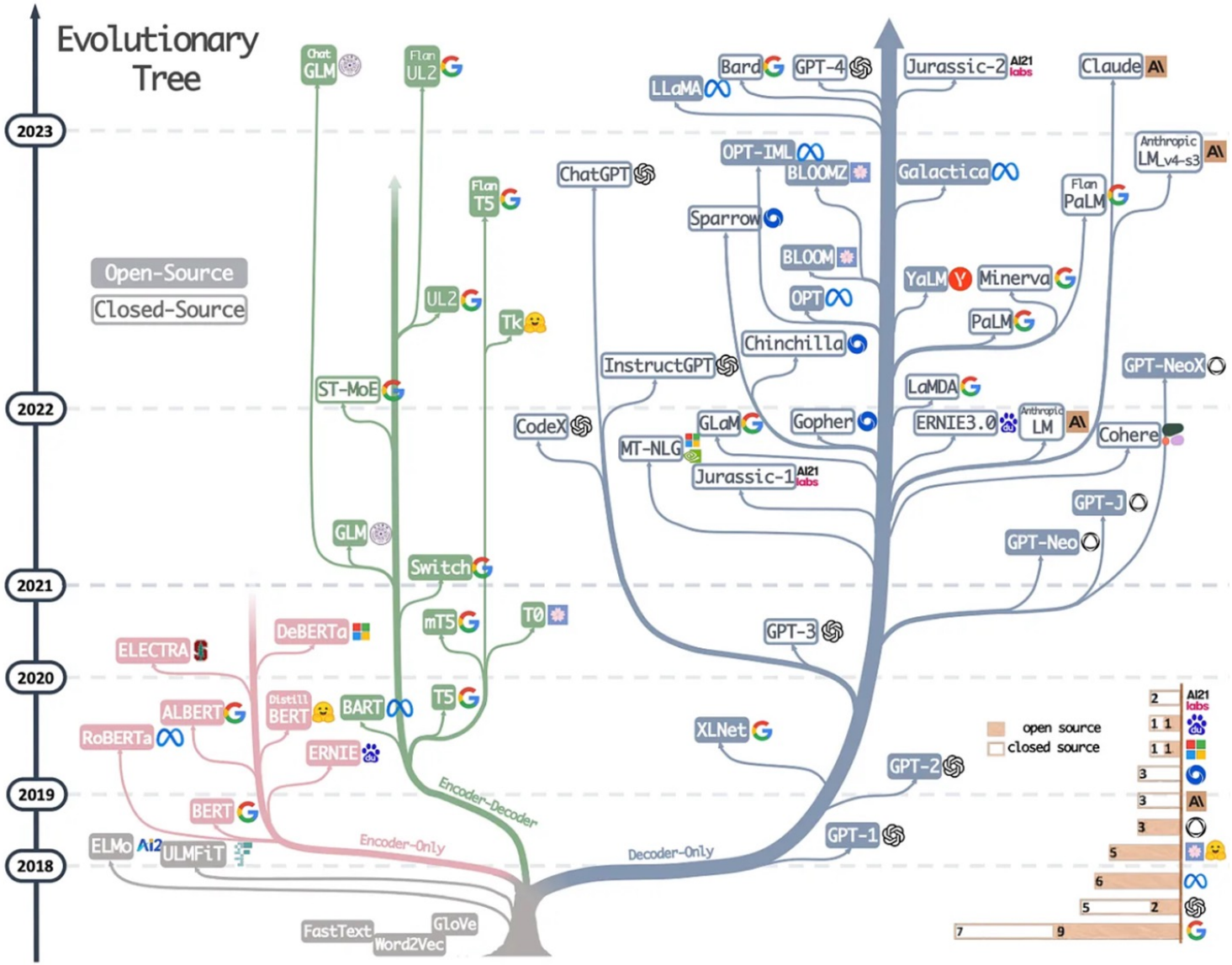
The AI surge in recent years has largely come about thanks to developments in generative AI and its ability to generate text, images, and videos in response to text prompts. Unlike past systems that were coded to respond to a set inquiry, generative AI continues to learn from materials (documents, photos, and more) from across the internet. The large language model GPT-3 created a buzz when it was released in 2020 and signaled a major development in AI. GPT-3 was trained on 175 billion parameters, which far exceeded the number of parameters of earlier generations of LLMs. In 2022, OpenAI released the AI chatbot ChatGPT, which interacted with users in a far more realistic way than previous chatbots thanks to its GPT-3 foundation. 2023 was a milestone year in terms of generative AI. Not only did OpenAI release GPT-4, which again built on its predecessor's power, but Microsoft integrated ChatGPT into its search engine Bing and Google released its GPT chatbot Bard. Generative AI is increasingly prevalent across a variety of platforms and has a diverse and ever-growing list of applications and capabilities.

Appendix H.1 - Timeline of the Evolution of AI[1]

Decade	Summary
pre-1950	Statistical methods are discovered and refined.
1950s	Pioneering machine learning research is conducted using simple algorithms.
1960s	Bayesian methods are introduced for probabilistic inference in machine learning.[1]
1970s	'AI winter' caused by pessimism about machine learning effectiveness.
1980s	Rediscovery of backpropagation in neural networks causes a resurgence in machine learning research.
1990s	Work on machine learning shifts from a knowledge-driven approach to a data-driven approach. Scientists begin creating programs for computers to analyze large amounts of data and draw conclusions – or "learn" – from the results.
2000s	Support-Vector Clustering and other kernel methods and unsupervised machine learning methods become widespread.
2010s	Deep learning becomes feasible, which leads to machine learning becoming integral to many widely used software services and applications. Deep learning spurs huge advances in vision and text processing.
2020s	Generative AI leads to revolutionary models, creating a proliferation of foundation models both proprietary and open source, notably enabling products such as ChatGPT (text-based) and Stable Diffusion (image based). Machine learning and AI enter the wider public consciousness. The commercial potential of AI based on machine learning causes large increases in valuations of some companies.

1 Wikipedia contributors. (2024, July 5). Timeline of machine learning. In Wikipedia, The Free Encyclopedia. Retrieved from webpage https://en.wikipedia.org/w/index.php?title=Timeline_of_machine_learning&oldid=1232776477

Figure 5. The evolutionary tree of modern LLMs traces the development of language models in recent years and highlights some of the most well-known models.[1]



1 https://www.interconnects.ai/p/llm-development-paths

Appendix H.2 - AI is no Longer Emerging

In December 2020, the "Work of the Future" brief from MIT[1] offered an unusually optimistic view for the time of AI's role in the workplace, emphasizing its complex yet promising development while cautioning against premature expectations of broad expansion of general AI. Just four years later, today's rapidly evolving technological landscape shows that artificial intelligence is no longer a distant dream but a present reality with far-reaching implications. The swift advancements in AI since the brief's release have surpassed the cautionary tone, highlighting the technology's potential for rapid and profound impacts— a testament to the current era of disruptive innovations. AI is on track to achieve human-level task performance within the next three years, a development with significant and far-reaching implications for workforce development faculty and practitioners. This acceleration of AI advancements and power underlines the importance of leveraging AI to enhance human users' work capacity and efficiency, necessitating agile integration strategies for substantial industry, workforce, and educational improvements.

On July 3rd, 2024, a New York Times article titled "Investors Pour $27.1 Billion Into A.I. Start-Ups, Defying a Downturn"[2] reported that funding for AI firms accounted for nearly half of the $56 billion in U.S. start-up financing from April to June. According to the latest insights from the McKinsey & Company Global Survey of AI, detailed in the article "The State of AI in Early 2024: Gen AI Adoption Spikes and Starts to Generate Value,"[3] The survey revealed that nearly two-thirds (65%) of respondents use generative AI in at least one business function, double the percentage from the previous year. Offering a glimpse into a near future where AI will be a cornerstone of innovation and economic growth.

Such rapid advancement warrants dramatic shifts in how California Community Colleges implement practice and process changes. College educators should start integrating AI into their curriculum and operations now to ensure they are preparing traditional students, returning learners (including small business owners), and adult students to thrive in current and future workplaces and bridge the AI skills gap. Academic decision-making bodies can no longer rely on long, methodical processes to address these shifts—iterative planning is now essential, even while maintaining a commitment to shared governance.

Appendix H.3 - Efficiency, Productivity and Impact

If California were a country, it would possess the fifth-largest economy globally, with a GDP of approximately $3.89 trillion, positioning it between Germany and the United Kingdom. The state's major economic drivers include healthcare, agriculture, technology, education, tourism and construction. AI's capabilities to enhance efficiency, generate new market opportunities, spur innovation, and address disparities in equity, education, and economic access, could fundamentally transform these sectors, firmly securing California as a frontrunner in the global digital economy.

The ongoing AI revolution is poised to transform various industry sectors by enhancing workplace efficiency and automating routine tasks. This transition will enable human workers to concentrate on more complex and creative activities, thereby driving economic growth and improving the quality of life in areas such as healthcare, education, and environmental management. Additionally, it will create new job categories. The shift towards an AI-integrated workplace necessitates a concerted focus on reskilling and upskilling the workforce.[4]

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1 David Autor, David Mindell, Elisabeth Reynolds. (2020 November 17). The Work of the Future: Building Better Jobs in an Age of Intelligent Machines. MIT Work of the Future. Retrieved from webpage, https://workofthefuture-taskforce.mit.edu/research-post/the-work-of-the-future-building-better-jobs-in-an-age-of-intelligent-machines/

2 Erin Griffith. (2024 July 3). Investors Pour $27.1 Billion Into A.I. Start-Ups, Defying a Downturn. The New York Times. Retrieved from https://www.nytimes.com/2024/07/03/technology/ai-startups-funding.html

3 Alex Singla, Alexander Sukharevsky, Lareina Yee, Michael Chui, Bryce Hall. (2024 May 30). The state of AI in early 2024: Gen AI adoption spikes and starts to generate value. McKinsey & Company. Retrieved from https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai

4 Michael Chui, Lareina Yee, Bryce Hall, Alex Singla, Alexander Sukharevsky. (2023 August 1). The state of AI in 2023: Generative AI's breakout year. McKinsey & Company. Retrieved from https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-in-2023-generative-ais-breakout-year

APPENDIX I - GLOSSARY OF AI TERMS

Algorithm — A clearly specified mathematical process for computation; a set of logical rules used to organize and act on a body of data to solve a problem or to accomplish a goal that is usually carried out by a machine. An algorithm is typically modeled, trained on a body of data, and then adjusted as the results are examined. Because algorithms are generally processed by computers and follow logical instructions, people often think of them as neutral or value-free, but the decisions made by humans as they design and tweak an algorithm and the data on which an algorithm is trained can introduce human biases that can be compounded at scale. Humans who interact with an algorithm may also find ways to influence the outcomes, as when a marketer finds ways to push a website up in the results of a search through search engine optimization (SEO).[1]

Algorithmic justice — the application of principles of social justice and applied ethics to the design, deployment, regulation, and ongoing use of algorithmic systems so that the potential for harm is reduced. Algorithmic justice promotes awareness and sensitivity among coders and the general public about how data collection practices, machine learning, AI, and algorithms may encode and exacerbate inequality and discrimination.[2]

Algorithmic literacy — a subset of information literacy, algorithmic literacy is a critical awareness of what algorithms are, how they interact with human behavioral data information systems, and an understanding of the social and ethical issues related to their use.[3]

Artificial Intelligence (AI) — (1) A machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations, or decisions influencing real or virtual environments. Artificial intelligence systems use machine- and human-based inputs to perceive real and virtual environments; abstract such perceptions into models through analysis in an automated manner; and use model inference to formulate options for information or action.[4]

(2) a branch of computer science that develops ways for computers to simulate human-like intelligent behavior, able to interpret and absorb new information for improved problem-solving and recognize patterns. Examples include training robots, speech recognition, facial recognition, and identifying objects such as traffic signs, trees, and human beings necessary for self-driving cars. AI relies on machine learning capabilities and training data. Humans are involved in creating or collecting sets of training data (e.g., employing low-wage workers abroad to identify objects on computer screens to provide data for autonomous vehicle navigation). Bias may be built into machine learning (e.g., by using criminal justice data sets for risk assessment in predictive policing). Machines can be trained to learn from experience but common sense and recognizing context are difficult, thus limiting the ability of computer programs to perform tasks such as distinguishing hate speech from colloquial humor or sarcasm.[5]

Artificial Intelligence as a Service (AIaaS) — Cloud-based AI services providing higher education institutions with access to AI tools, algorithms, and infrastructure, facilitating the development of AI-driven applications and research projects without significant upfront investments.[6]

Artificial Intelligence Augmentation (AI Augmentation) — The integration of AI technologies to enhance human capabilities in higher education, empowering educators and researchers with AI-driven tools for

1 A.J. Head, B. Fister, and M. MacMillan (2020 15 January) Information literacy in the age of algorithms: Student experiences with news and information, and the need for change. Project Information Research Institute; Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence.(2023).White House.

2 A.J. Head, B. Fister, and M. MacMillan, Information Literacy Publication

3 A.J. Head, B. Fister, and M. MacMillan, Information Literacy Publication

4 White House, Executive Order

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personalized learning, data analysis, and administrative decision-making.[1]

Artificial Intelligence Bias Mitigation (AI Bias Mitigation) — Strategies and policies for identifying, mitigating, and preventing biases in AI systems, critical in higher education for ensuring fairness, equity, and diversity in student assessment, admissions, and educational opportunities.[2]

Artificial Intelligence Chipsets (AI Chipsets) — Specialized hardware accelerating AI computations, utilized in higher education for research in AI algorithms, training large- scale models, and deploying AI applications with improved performance and energy efficiency.[3]

Artificial Intelligence Ethics (AI Ethics) — The development and deployment of AI systems in alignment with ethical principles and societal values, crucial in higher education for ensuring fairness, equity, and accountability in student assessment, admissions, and decision-making processes.[4]

Artificial Intelligence Explainability (AI Explainability) — Techniques ensuring transparency and interpretability of AI models, vital in higher education for explaining grading decisions, student feedback, and adaptive learning recommendations to students, instructors, and stakeholders.[5]

Artificial Intelligence Governance (AI Governance) — Policies and regulations governing the development, deployment, and use of AI technologies in higher education, ensuring ethical and responsible AI practices, data security, and compliance with legal requirements.[6]

Artificial Intelligence Model (AI Model) — A component of an information system that implements AI technology and uses computational, statistical, or machine-learning techniques to produce outputs from a given set of inputs.[7]

Artificial Intelligence Safety (AI Safety) — Concerns and measures addressing potential risks and harms associated with AI technologies, guiding higher education institutions in the responsible development and deployment of AI systems to ensure student and staff well-being, data security, and regulatory compliance.[8]

Artificial Intelligence System (AI System) — Any data system, software, hardware, application, tool, or utility that operates in whole or in part using AI.[9]

Attention economy — since our attention is a limited resource and every person only has so much of it, companies (both platforms and people who use the platforms to sell, entertain, or persuade) try to engage and keep people's attention. This rewards clickbait and influences the design of algorithms and platforms to maximize time spent online.[10]

Automation — The use of technology to perform tasks where human

1 Christopher J. Howerton, Erik Reese, Tamara Cheshire, Howard Eskew, Taneisha Hellon, Kandace Knudson, Chantal Lamourelle. (2024). Academic Integrity Policies in the Age of Artificial Intelligence (AI) Resource Document. ASCCC Educational Policies Committee 2023-2024.

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10 A.J. Head, B. Fister, and M. MacMillan (2020 15 January) Information literacy in the age of algorithms: Student experiences with news and information, and the need for change. Project Information Research Institute

input is minimized.[1]

Automated Decision System — A computational process derived from machine learning, statistical modeling, data analytics, or artificial intelligence that issues simplified output, including a score, classification, or recommendation, which is used to assist or replace human discretionary decision making and materially impacts natural persons.

Bias in AI — Systematic favoritism or prejudice in AI systems, posing challenges in higher education such as biased admissions algorithms and unfair grading systems, necessitating policies for bias detection, mitigation, and transparency. State Administrative Manual (SAM) 4819.2: Policy. (n.d.). California Department of General Services.[2]

Big data — a set of technological capabilities developed in recent years which, when used in combination, allows for the continuous gathering and processing of large volumes of fine-grained and exhaustive data drawn from multiple sources to be combined and analyzed continuously.[3]

Chatbot — Computer programs that simulate and process human conversation, either written or spoken, to allow humans to interact with digital devices as if they were communicating with a real person.[4]

Cloud Computing — A model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.[5]

Computer Vision — (1) a field of artificial intelligence (AI) that uses machine learning and neural networks to teach computers and systems to derive meaningful information from digital images, videos and other visual inputs—and to make recommendations or take actions when they see defects or issues.[6]

(2) An AI discipline enabling computers to interpret and analyze visual information, utilized in higher education for tasks such as facial recognition for campus security, content accessibility, and augmented reality applications.[7]

Data exhaust — information incidentally generated as people use computers, carry cell phones, or have their behavior captured through surveillance which becomes valuable when acquired, combined, and analyzed in great detail at high velocity.[8]

Deep Learning — A branch of machine learning involving neural networks with multiple layers, used in higher education for tasks such as personalized learning, predictive analytics, and natural language processing.[9]

Edge AI — The deployment of AI algorithms on edge devices, enabling real-time processing and inference in higher education applications such

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1 State Administrative Manual (SAM) 4819.2: Policy. (n.d.). California Department of General Services.

2 State Administrative Manual (SAM) 4819.2: Policy. (n.d.). California Department of General Services.

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as IoT-based campus management, personalized learning tools, and mobile educational apps.[1]

Edge Computing — Decentralized processing of data near the source of generation, beneficial in higher education for low-latency AI applications, real-time analytics in remote locations, and efficient utilization of computing resources.[2]

Embedding — A vector that captures the semantic meaning of words, sentences or even entire documents. The process of converting text into embeddings allows LLMs to perform various natural language processing tasks, such as text generation, sentiment analysis and more.[3]

Ethical AI — The development and deployment of AI systems in alignment with ethical principles and societal values, crucial in higher education for ensuring fairness, equity, and accountability in student assessment, admissions, and decision-making processes.[4]

Explainable AI (XAI) — Techniques and methods ensuring transparency and interpretability of AI models and decisions, essential in higher education for maintaining trust, accountability, and regulatory compliance in academic and administrative AI systems.[5]

Foundation Models (FMs) — Trained on massive datasets, FMs are large deep learning neural networks that have changed the way data scientists approach machine learning (ML). Rather than develop artificial intelligence from scratch, data scientists use a foundation model as a starting point to develop ML models that power new applications more quickly and cost-effectively. Researchers coined the term to describe ML models trained on a broad spectrum of generalized and unlabeled data and capable of performing a wide variety of general tasks such as understanding language, generating text and images, and conversing in natural language.[6]

Generative AI — A field of AI that uses deep learning trained on large datasets to create new content, such as written text, code, images, music, simulations and videos. Unlike discriminative models, Generative AI makes predictions on existing data rather than new data. These models are capable of generating novel outputs based on input data or user prompts.[7]

Generative Adversarial Networks (GANs) — AI frameworks where two neural networks compete to generate realistic data, utilized in higher education for creating synthetic datasets, generating educational content, and improving data privacy.

Human in the Loop — A system comprising a human and an artificial intelligence component, in which the human can intervene in some significant way, e.g. by training, tuning or testing the system's algorithm so that it produces more useful results. It is a way of combining human and machine intelligence, helping to make up for the shortcomings of both.[8]

Hyperparameters — Parameters defining the configuration and behavior of AI models, requiring optimization and tuning in higher education applications for achieving optimal performance, reliability, and scalability.

Large Language Model (LLM) — A specialized type of artificial intelligence (AI) that has been trained on vast amounts of text to understand existing content and generate original content.[9]

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1 Academic Integrity Policies in the Age of AI Resource Document

2 Academic Integrity Policies in the Age of AI Resource Document

3 Janakiram MSV. (2024 February 8). The Building Blocks of LLMs: Vectors, Tokens and Embeddings. The New Stack

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Machine Learning (ML) — (1) A set of techniques that can be used to train AI algorithms to improve performance at a task based on data.[1]

(2) A subset of AI focusing on algorithms and techniques that enable computers to learn from data and improve their performance over time without being explicitly programmed. Also, the use of algorithms, data sets, and statistical modeling to build models that can recognize patterns to make predictions and interpret new data. The purpose of machine learning is to enable computers to automate analytical model-building so computers can learn from data with little human intervention.[2]

Metadata — Information about a dataset that makes it easier to find, understand and use. Metadata may describe the dataset's structure, elements, creation, access, format, and content. Metadata may also include the title and description, method of collection, limitations, author, publisher, area and time period covered, license, date and frequency of release.[3]

Model Interpretability — The ability to explain and understand AI models and their decisions, essential in higher education for transparent student assessment, research reproducibility, and accountability in automated decision-making systems.[4]

Model Robustness — The capability of AI models to maintain high performance and reliability under varying conditions and inputs, critical in higher education for ensuring accurate student assessment, research findings, and administrative decision-making.[5]

Natural Language Processing (NLP) — (1) Takes communications by humans and transforms the information into something more suitable for computer use and analysis.[6] (2) The field of AI concerned with enabling computers to understand, interpret, and generate human language, utilized in higher education for automated grading, language learning support, and virtual assistants.

Neural Network — A computational model inspired by the human brain's structure, employed in higher education for various applications including student performance prediction, adaptive learning systems, and data analysis.[7]

Outperforming the data — In the context of Large Language Models (LLMs), "outperforming data" refers to a model's ability to surpass or exceed the performance of other existing models in specific tasks or benchmarks. This could include achieving higher accuracy, faster processing speeds, or improved results in various applications. Essentially, it means that the LLM performs better than expected based on the available training data and other models in comparison.[8]

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8 Leticia Fernandes. (2023 December 14). Decoding 'Outperform' In LLm Comparisons. Deeper Insights.

Personalization — the process of displaying search results or modifying the behavior of an online platform to match an individual's expressed or presumed preferences, established through creating digital profiles and using that data to predict whether and how an individual will act on algorithmically selected information. This process drives targeted digital advertising and has been blamed for exacerbating information silos, contributing to political polarization and the flow of disinformation. Ironically, to consider information "personal" implies it is private, but personalization systematically strips its targets of privacy.[1]

Privacy-Enhancing Technology (PET) — Any software or hardware solution, technical process, technique, or other technological means of mitigating privacy risks arising from data processing, including by enhancing predictability, manageability, disassociability, storage, security, and confidentiality.[2]

Platform — an ambiguous term that means both software used on personal computers and software deployed online to provide a service, such as web search, video sharing, shopping, or social interaction. Often these systems use proprietary algorithms to mediate the flow of information while enabling third parties to develop apps, advertising, and content, thus becoming digital spaces for the individual performance of identity online, data-driven persuasion (commercial as well as political), and group formation through social interaction. In this report, we use the term to refer to "internet giants" such as Google, YouTube, Instagram, and Facebook and others mentioned by students in our focus group sessions.[3]

Reinforcement Learning — An AI paradigm where algorithms learn by interacting with an environment and receiving feedback, applicable in higher education for adaptive learning environments and personalized feedback systems.[4]

RLHF Reinforcement learning from human feedback (RLHF) combines human guidance with machine learning algorithms to refine the behavior of an AI algorithm or LLM. In a typical scenario, the AI agent or algorithm initially learns a function to guide its behavior, that model is then fine-tuned via supervised learning. At this point a human provides input on the decisions the model is making by indicating if a decision (or output) in a certain case is preferred (thumbs up) or not preferred (thumbs down). Finally, the AI agent incorporates this human feedback with its other training to optimize its decisions and output. The goal is to leverage human preferences to optimize AI models and make them more aligned with our preferences.[5]

Semi-Supervised Learning — A combination of supervised and unsupervised learning techniques, employed in higher education for tasks such as student performance prediction with limited labeled data and large-scale data analysis.[6]

Supervised Learning — A machine learning approach where models are trained on labeled data, used in higher education for predictive modeling, recommendation systems, and intelligent tutoring systems.[7]

Synthetic Content — Information, such as images, videos, audio clips, and text, which has been significantly modified or generated by algorithms, including by AI.[8]

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Testbed — A facility or mechanism equipped for conducting rigorous, transparent, and replicable testing of tools and technologies, including AI and PETs, to help evaluate the functionality, usability, and performance of those tools or technologies.[1]

Token — Tokens are the basic units of data processed by LLMs. In the context of text, a token can be a word, part of a word (subword), or even a character — depending on the tokenization process.[2]

Transfer Learning — A machine learning technique where models trained on one task are adapted to perform related tasks, valuable in higher education for leveraging pre-trained models in educational content creation, student support systems, and academic research.[3]

Unsupervised Learning — A machine learning approach where models uncover patterns and structures from unlabeled data, relevant in higher education for clustering similar student cohorts, curriculum optimization, and anomaly detection.[4]

Vector — A representation of quantities that can't be fully described by a single number — such as force, velocity or displacement — and which have both magnitude and direction. In the realm of LLMs, vectors are used to represent text or data in a numerical form that the model can understand and process. This representation is known as an embedding.[5]

Watermarking — The act of embedding information, which is typically difficult to remove, into outputs created by AI — including into outputs such as photos, videos, audio clips, or text — for the purposes of verifying the authenticity of the output or the identity or characteristics of its provenance, modifications, or conveyance.[6]

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