

CS6460 Project - Final: How to approach right, the regulation of Educational AI?

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Abstract—The purpose of this research is to find the right approach to regulate educational AI. First, I analyzed the existing AI initiatives, AI regulatory approaches and identified the core elements of AI regulations. Second, I conducted a survey and find out what values are important for regular students. And, finally, I summarized and formulated the approach for the regulation of Educational AI.

1 INTRODUCTION

New technologies often bring calls for new regulations. During the last decade, the development of AI in increasingly permeates every aspect of our society. Every step towards more strong technological progress and implementation like AI in robotics, use ML to improve economics or use smart teaching AI agents in educational field push for risk-free, accountable, transparent and fair AI implementation. The central question is what is the right and effective path or what is the right framework to complete this for education. Many authors discussed the educational landscape with AI-enabled tools and raise a concern of data privacy and transparency. Many digital services, AI-enabled education tools collect and store PII (Joyce, 2018), but there is no concrete way to control this. The ethical issues between humans and AI, force as to formulate for ourselves the goal of AI development, because “the potential for harm is too great for us to ignore” (Aiken, 2000).”

2 US FEDERAL GOVERNMENT AI INITIATIVE

Every day the progress to the superintelligence being created in front of our eyes. “When the global economy starts to feel the shift ushered in with mass-adoption of AI, the United States needs to be leading the charge” (Minevich, 2019).

2.1 Five pillars of Executive Order on Maintaining American Leadership in AI

The big step towards AI regulations made by present administration on February 11, 2019. The president signed an Executive Order on AI named “Maintaining

American Leadership in Artificial Intelligence”. The executive order layout “section and the timeline for developing federal policy around regulating AI” (Ghaffary, 2019). It describes the implementation of the strategy of collaboration between government, the private sector, public, academia, and international partners. The plan is created to improve and advance the following pillars

1. Investing in AI Research and Development (R&D). The initiative focuses on keeping the Nation strong and provide long-term emphasis on fundamentals of R&D by instructing Federal agencies to include and allocate AI investments for their R&D.
2. Unleashing AI Resources. The initiative instructs Federal agencies to release data, models, and computational resources for AI experts, researchers, and field experts to increase public trust while maintaining safety, civil liberties, and confidentiality.
3. Setting AI Governance Standards. The initiative set to help foster to establish instructions for AI development to foster public trust and create ways of trustworthy and safe adaptation of AI technologies. This initiative calls for NIST to guide and support the development of technical standards (Federal Register, 2019).
4. Building the AI Workforce. The American AI initiative calls for companies and Federal agencies to help prepare the workforce and build skills to use and thrive in the age of AI. Those skills are panned to gain via educational, computer science, and Science, Technology, Engineering, and Math (STEM) programs.
5. International Engagement and Protecting our AI Advantage. The last initiative is about collaboration with the international community. The Presidential Administration is committed to promoting an international environment that supports AI R&D and opens markets for American AI industries (Federal Register, 2019).

2.2 Conclusion

Each pillar provides great support and resources for AI R&D. The initiative is designed in mind to accelerate US Nation leadership in AI by helping with technological breakthroughs in AI, prepare the future workforce for the new jobs, while protecting National values, and improve people's lives.

3 NIST AI REGULATIONS APPROACH

The National Institute of Standards and Technology or NIST is a physical sciences laboratory and a non-regulatory agency of the United States Department of Commerce. The importance of artificial intelligence (AI) to the future of the U.S. economy and national security and Executive Order issued by President Trump on February 11, 2019 push NIST to create “A Plan for Federal Engagement in Developing Technical Standards and Related Tools” and support of reliable, robust, and trustworthy systems that leverage and use AI technologies. The document is divided into three main sections: Standards and Artificial Intelligence; U.S. government AI standards priorities; Recommended federal government standards actions to advance U.S. AI leadership with a focus to provide high-level recommendations for AI development.

3.1 NIST AI Standards priorities

The central idea of this part of the document is dedicated to one perspective on AI technical standards which described this way:

“Technical standards for AI can encompass a wide variety of issues, including safety, accuracy, usability, interoperability, security, reliability, data, and even ethics.... Flexible, robust, common technical standards for AI will be critical to successful development and deployment of the technology.” (NIST, 2019)

NIST’s plan encourages agencies to prioritize efforts that are “inclusive and accessible, open and transparent, consensus-based, globally relevant, and non-discriminatory” (Gallo, 2019). It’s also identified nine areas to guide efforts in the development of AI standards. Based on *Figure 1*, the standards efforts for AI systems recently have been initialized in all areas. The document includes a list of existing standards, which established by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC).

The Published Standards under ISO/IEC JTC 1/SC 42 Artificial Intelligence is chosen to work on Information Technology Standards, with a focus on AI terminology, interoperable frameworks, lifecycle, big data, and trustworthiness.

AI STANDARDS	AVAILABLE ⁹	BEING DEVELOPED ¹⁰
Concepts and terminology	●	●
Data ¹¹ and knowledge ¹²	●	●
Human interaction ¹³	●	●
Metrics	●	●
Networking ¹⁴	●	●
Performance testing and reporting methodology ¹⁵	●	●
Safety	●	●
Risk management ¹⁶	●	●
Trustworthiness		●

Figure 1— Status of AI standardization

Additionally, trustworthiness is emphasized by the NIST's plan as a new area of AI standards, which would require standards to include guidance and requirements for accuracy, resiliency, safety, and reliability (Gallo, 2019).

3.2 NIST recommendations for AI-related tools and government

In addition to guidance on AI standards, NIST also advises on the need for complementary AI-related tools to support the development of AI technologies. It includes Standardized datasets for training and testing of AI systems; Tools to promote consistent knowledge and reasoning in AI systems; Fully documented use cases to provide guidelines in the deployment of AI technologies; Benchmarks to promote advancement; Validation and evaluation testing methodologies; Metrics to assess AI technologies; AI testbeds for proper modeling and experimentation; Tools for accountability and auditing of AI systems. The government recommendations include active, long-term, and competitiveness participation of stakeholders in AI development. NIST categorized those guidances into monitoring, participating, influence, and leading as potential involvements, based on company participation in AI developments.

- Bolster AI standards-related knowledge leadership and coordination among federal agencies to maximize efficiency and effectiveness.

- Promote focused research on the “trustworthiness” of AI.
- Support and expand public-private partnerships to develop and use AI standards to constantly advance reliable, robust and trustworthy AI.
- Proactively and strategically engage with international parties to advance AI standards for U.S. national security and economic needs.

3.3 Conclusion

The plan calls for a set of standards, which should help to facilitate the advancement of AI. NIST provides a current overview of existing AI standards and discusses categories in which standards still needed, including data, metrics, safety, and trustworthiness. The approach layout several practical steps, which can be used by agencies and use them in AI development.

4 DEEPMIND AI REGULATION APPROACH

DeepMind Technologies is a subsidiary of Alphabet Inc. and was founded in 2011. The technology is also known as Google DeepMind. The goal of the company is to solve intelligence and use it to solve everything else.

4.1 DeepMind technology overview

DeepMind uses raw pixel data as input and learns from experience. AI uses a subset of machine learning, called deep learning on a convolutional neural network with a model-free reinforcement learning technique called Q-learning. DeepMind technology has been challenged to learn games on its own. The first was a library to defeat different Atari games, which overtime played more efficient than humans without changing the code. The next company creates AlphaGo based on supervised learning AI models and “beat Fan Hui, the European Go champion, five times out of five” (Gibney, 2016). The next iteration of this program called AlphaGo Zero, which in comparison to AlphaGo uses an unsupervised reinforcement learning approach, which constantly defeats itself. Today subsidiary has my other programs like AlphaGo & successors, AlphaFold, WaveNet, and AlphaStar. Besides playing games, DeepMind was used to improve power usage and optimize the cooling cost of Google data centers.

4.2 DeepMind safety and ethics

The company very seriously approaches safety and ethics when it comes to the development of AI and belief in the benefits of technology if used responsibly.

The team formalized the statement and questions which they think must be followed and answered in order to approach the AI development right

“AI can provide extraordinary benefits, but like all technology, it can have negative impacts unless it’s built and used responsibly. How can AI benefit society without reinforcing bias or unfairness? How can we build computer systems that invent new ideas, but also reliably behave in ways we want?” (DeepMind, 2019)

The DeepMind team approached technical safety and ethics by anticipating short and long-term risks, explored the ways to prevent those risks and if they do, how to address them. The ethics team worked with academics like Alan Turing Institute, companies like Google or OpenAI and explore the toughest issues.

4.3 DeepMind technical safety

At a high level, safety research at DeepMind focuses on designing a system that reliably functions. The DeepMind established an AI safety research forum at Medium.com “to contribute to the development of the field” (Ortega, 2018) and “advance our collective understanding of AI safety.” (Ortega, 2018). The first post was to discuss three different technical AI areas: specification, robustness, and assurance. Each of those areas highlights some representative challenges and approaches. Refer to “*Figure 2— Three AI safety problem areas.*” for details.

The specification “ensures that an AI system’s behavior aligns with the operator’s true intentions.” (Ortega, 2018). The DeepMind distinguishes three types: ideal specification, design specification, and revealed specification.

Robustness “ensures that the AI system continues to operate within safe limits upon perturbations.” (Ortega, 2018) AI systems must be smart to understand attacks, prevent or stop if needed. If robustness does not exist, the safety problems like unsafe exploration or distribution shift can be created as a result.

Assurance “ensures that we can understand and control AI systems during the operation.” (Ortega, 2018) The assurance can address two angles for AI safety.

4.4 Conclusion

By looking ahead DeepMind building the foundation of a technology that can be used in different future applications, like voice assistants and smart devices.

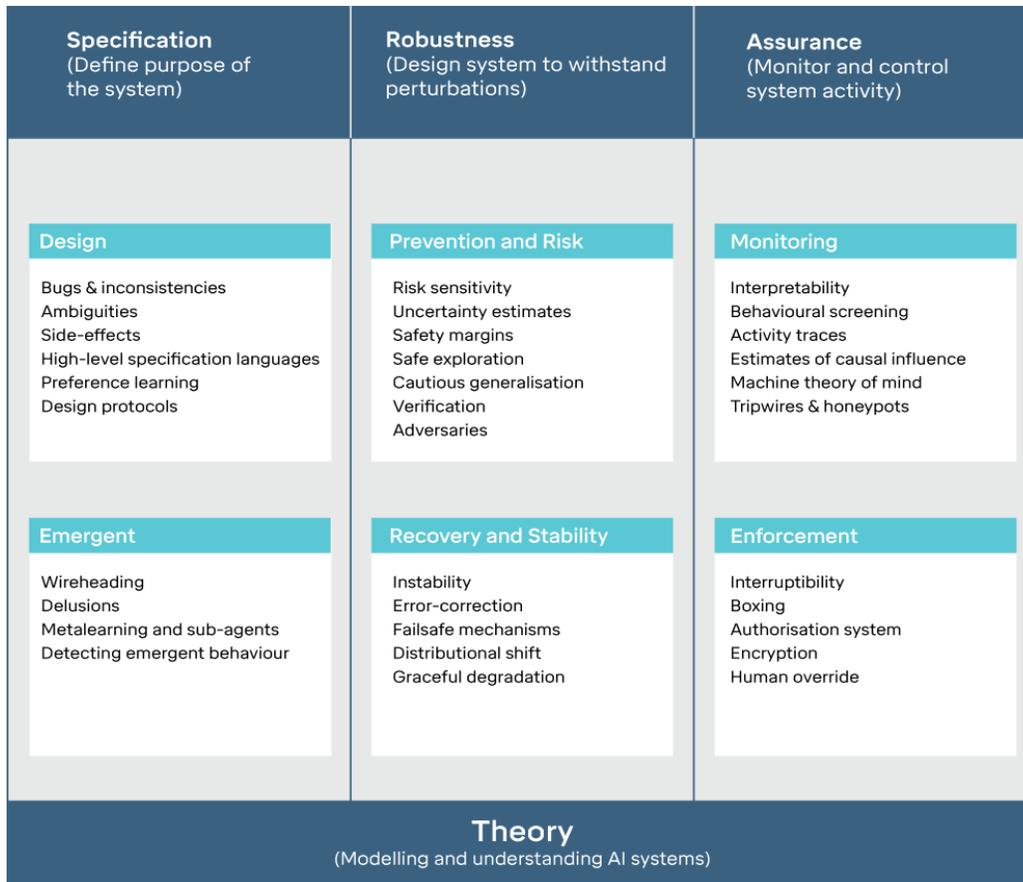


Figure 2— Three AI safety problem areas.

With careful thought and planning, DeepMind can avoid building dangerous intelligent systems and prevent accidental creation of AI vulnerabilities.

5 EXISTING EDUCATIONAL AI REGULATIONS

The question about AI regulations is very challenging and it was raised by many researchers. I found just a few papers that helped me to see how the latest development of intelligent systems creates new challenges in the educational landscape or starts conversations around the ethical guidance of AI in education. The paper “Ethical Guidelines for AI in Education: Starting a Conversation” explored ethical issues between humans and AI, Covers Asimovs’ Laws of Robotics, and talked about resources for fundamental principles development. Authors think that we are at a critical juncture and must clearly formulate for ourselves the goals for the AI development in the classroom, because “The potential for harm is too great for us to ignore” (Aiken, 2000). The author of

“Teaching AI, Ethics, Law, and Policy” helped me to see how the latest development of intelligent systems creates new challenges in cyberspace. The authors raised the question about the effectiveness of existing education about AI and “proposes a course named Computers, Ethics, Law, and Public Policy” (Wilk, 2019) with a curriculum for the course. To understand the root challenges within AI safety I reviewed a “Concrete Problems in AI Safety” paper. Authors raised the complex question of AI’s impact on society and discussed five practical research problems related to accident risk, categorized based on the different objective functions, suggested research based on focus cutting-edge AI systems to” (Amodei, 2016), and covered the idea of safe future AI development.

5.1 Conclusion

Each of the paper above is very strong with their opinion about educational AI regulations. It can create a great foundation for my research, which is to investigate the question of how to approach the regulation for educational AI. Based on existing research, it's very clear that the challenge of AI regulation exists and required additional attention and research, especially in education.

6 SUMMARY ON ANALYSIS OF EXISTING AI REGULATIONS

Prior to this point I read and analyzed multiple resources. The executive order within the US Federal initiative outlines five main directives in the context of AI R&D. The NIST plan recommends that the Federal government committed to deeper, long-term collaboration for AI R&D. DeepMind’s primary focus to solve intelligence and use it to solve everything else by measure safe behavior (Leike, 2017). Regulations are hard, but all chosen approaches trying to address a common challenge of growing and sustain the following characteristics, which I can formulate as follows

- Ethics. It includes public trust while maintaining safety, civil liberties, confidentiality while preserving open, public regulations and legality.
- Technical safety. Data, metrics, models, computational resources must be stored, protected, utilized within recommend standardization, and R&D must be monitored and operated within safe limits.
- Trustworthiness. This characteristic includes explainability, integrity, and guidance. Explainability help with AI utilization and transparency. Integrity ensures a safe output based on predefined input. Guidance help

with accuracy, explainability, resiliency, safety, reliability, objectivity, and security.

Every characteristic above is difficult and complex, but achievable. To reach this, the collaboration between the government and the public must exist in order to create an ethical, technically safe and trustworthy approach for AI regulations.

7 SURVEY

In addition to the research, I conducted a survey with quantitative analysis to understand what aspects are important to students in educational AI regulations. The survey was taken by forty participants. The answers were collected by using PeerSurvey Web-based tool at <http://peersurvey.cc.gatech.edu>. Each participant had no time limit because the survey can be delivered asynchronously. The survey contains two blocks of questions: demographics and AI understanding with a focus on what to regulate. Refer to “*Appendix 11.1: Survey structure & questions*” for the survey questions. The survey went very well and the results have great feedback about the understanding of AI technology and what values are students looking forward to seeking educational AI regulations.

7.1 Summary of raw survey results: demographics.

The 1st block of questions is related directly to user and demographics (age, gender, occupation, etc). The raw results available in “*Appendix 11.2: Survey Raw Results.*” Below is a summary of demographics

- What is your age? 8-29 and 30-39 which represented 80% of participants. The rest of 20% includes age above 40 years old.
- Would you describe yourself as? 40% Asians, 40% White/Caucasian.
- What is your gender? 70% male and 30 female.
- What is your marital status? 60 married and 40% never married.
- What is the highest level of education you have received? 80% of participants have a Bachelor’s, 17% had a Master’s, the other is a Ph.D.
- What is your employment status? 75% is working 40 hours per week, ~20% working less than 40 hours per week, and the rest is not employed.
- What is your occupation? 90% of responses were IT/Software/Data Engineering roles. 10% specified army, and management positions.
- How much total combined money did all members of your household earn last year? 60% makes above \$100000, 25% makes a range of \$75000 to \$100000, and the other 5% less than \$7500.

7.2 Summary of raw Survey Results: AI understanding and what to regulate

The 2nd block of questions is related to an understanding of AI and what values are what AI aspects need to be regulated. The raw results available in “Appendix 11.2: Survey Raw Results.” Below is a summary of the first question

- What is your understanding of educational Artificial Intelligence (AI)?
The answers were very broad but can be split into three categories: a strong understanding of AI, no understanding, and some understanding.

The next few questions designed to quantitative analyze how AI must be regulated with three options to choose from: Yes, No, or Maybe. Refer to “Figure 3— Column chart: what aspects of AI must be regulated vs. what not vs. maybe” for results. The following five questions were asked

- Can harm be made to the educational landscape, students, or teachers by unregulated AI?
- Do the ethical aspects of educational AI must be regulated?
- Do the legal aspects of educational AI must be regulated?
- Do the technical aspects of educational AI must be regulated?
- Do the trustworthiness aspects of educational AI must be regulated?

What aspects of AI must be regulated vs. not vs. maybe?

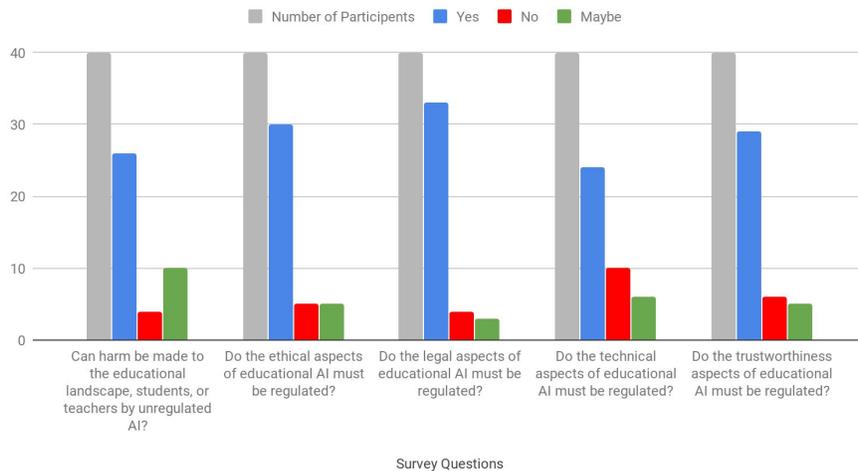


Figure 3— Column chart: what aspects of AI must be regulated vs. not vs. maybe.

The last questions have an option for the participant to express their thoughts

- What other aspects by your opinion of educational AI must be regulated?
The winner was a data collection. The responses include concerns from training and discrimination to racial bias and intellectual property.

- Do you have any other comments about educational AI regulations? Over 90% don't add anything. The best answer was: "Should put human preservation as a priority as long as it does not end up determining a judgment day".

7.3 Summary

The majority of the survey audience has an average age of 30 to 40. Almost all participants have a background as an IT/Software/Data Engineering. Most of the people interested in the regulation of legal, ethical, and trustworthiness aspects of educational AI. The technical aspect has less support, but have more than 50% of participants. Many participants said that data privacy collection, including AI training, must be regulated, which can be included in technical AI regulations.

8 APPROACH FOR THE REGULATION OF EDUCATIONAL AI

8.1 Combination of ai initiatives analysis of with survey results

To better combine two independent values, let's review the core elements of each, by emphasizing important characteristic for AI initializers and finding for survey

- The research and analysis of existing AI initiatives, three main pieces of regulation were identified. Ethics covers public trust while maintaining safety, civil liberties, confidentiality, open public regulations. Technical safety helps to regulate data collection, metrics, models, and utilization that must be monitored and used within limits. Trustworthiness is the most complex aspect and it's not fully developed as standardization, but it's covers topics of explainability, integrity, and transparency.
- The survey was built on top of the findings of the research, but also provided an ability to provide an extra opinion. The majority of participants have education or experience in a computer-related field. The legal aspect of regulation got the highest support, followed by ethical and trustworthiness. The technical aspect surprisingly got lower support with above 50% and data collection with protection was an interest of many.

Based on previous summary it's fair to say that research and survey results are mously support each other, rather than separate. The ethical, technical safety,

trustworthiness can be defined as core elements for AI regulations and required strong regulation of data collection, utilization, storage, while legally supported.

8.2 Formulation of the approach

The approach for regulation of educational AI is right, and can be achieved by using easy, transparent steps to regulate the following aspects for AI development, implementation, and use

- The legal aspect is related to law. The US federal government AI initiative designed five pillars to support development, and use on the federal level including education, especially a few pillars called “Unleashing AI Resources” and “Setting AI Governance Standards”.
- The ethical aspect is the second most important element of educational AI regulation. It provides support to establish a set of moral principles and define what is right and what is wrong for AI. The DeepMind company defined many rules to control AI ethics. It’s also sought by students.
- The technical safety aspect will help to develop or use of technology while preserving the safety conditions. The US government, NIST and DeepMind support safety on a high level and developed many standards, recommendations on how to develop and utilize such systems.
- The trustworthiness aspect is the most difficult, but also very important, because the ability to be relied on as honest or truthful. The work in the right direction was already started by the US government. The US federal government AI initiative covers this characteristic in “Unleashing AI Resources” and “Setting AI Governance Standards” pillars and NIST actively working on standards to guide and support the development of appropriate technical standards.

9 CONCLUSION

Each of the aspects above is very big and great work completed in order to follow those characteristics. Aspects like legal, ethical, and technical safety already have great fundamental knowledge. The trustworthiness aspect is very fresh and required additional work in order to make transparency and clarity better than it is right now.

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11 APPENDICES

Appendix 11.1: Survey Raw Results

11.1.1 *The 1st block of questions is related directly to user and demographics*

- What is your age?
 - 18-29
 - 30-39
 - 40-49
 - 50-64
 - 65 +
- Would you describe yourself as
 - American Indian/Native American
 - Asian
 - Black/African American
 - Hispanic/Latino
 - White/Caucasian
 - Pacific Islander
 - Other
- What is your gender?
 - Female
 - Male
 - Other
- What is your marital status?
 - Married
 - Widowed
 - Divorced
 - Separated
 - Never married
- What is the highest level of education you have received?
 - Less than a high school degree
 - High school degree (e.g., GED)
 - Associate degree
 - Bachelor degree
 - Master degree
 - PhD

- What is your employment status?
 - Employed, working less than 40 hours per week
 - Employed, working more than 40 hours per week
 - Not employed
 - Retired
 - Disabled
 - Not able to work
- What is your occupation?
 - Open-ended response.
- How much total combined money did all members of your household earn last year?
 - Under \$10000
 - \$30000 to \$50000
 - \$50000 to \$75000
 - 75000 to \$100000
 - Above \$100000

11.1.2 *The 2nd block of questions is related to the understanding of AI technology and what values are people looking forward to seeking in educational AI regulations.*

- What is your understanding of educational Artificial Intelligence?
 - Open-ended response.
- Can harm be made to the educational landscape, students, or teachers by unregulated AI?
 - Yes
 - No
 - Maybe
- Do the ethical aspects of educational AI must be regulated?
 - Yes
 - No
 - Maybe
- Do the legal aspects of educational AI must be regulated?
 - Yes
 - No
 - Maybe
- Do the technical aspects of educational AI must be regulated?
 - Yes
 - No

- Maybe
- Do the trustworthiness aspects of educational AI must be regulated?
 - Yes
 - No
 - Maybe
- What other aspects by your opinion of educational AI must be regulated?
 - Open-ended response.
- Do you have any other comments about educational AI regulations?
 - Open-ended response.

Appendix 11.2: Survey Raw Results

The 1st block of questions is related directly to user and demographics.

What is your age?

1. 40-49
2. 30-39
3. 30-39
4. 8-29
5. 30-39
6. 30-39
7. 30-39
8. 8-29
9. 30-39
10. 30-39
11. 8-29
12. 30-39
13. 8-29
14. 30-39
15. 8-29
16. 8-29
17. 40-49
18. 30-39
19. 30-39
20. 30-39
21. 30-39
22. 8-29
23. 8-29

24. 8-29
25. 50-64
26. 30-39
27. 30-39
28. 8-29
29. 8-29
30. 8-29
31. 40-49
32. 30-39
33. 50-64
34. 8-29
35. 30-39
36. 30-39
37. 30-39
38. 30-39
39. 30-39
40. 8-29

Would you describe yourself as?

1. Asian
2. Asian
3. Asian
4. White/Caucasian
5. Asian
6. Asian
7. Asian
8. Asian
9. Hispanic/Latino
10. Asian
11. White/Caucasian
12. White/Caucasian
13. White/Caucasian
14. Asian
15. White/Caucasian
16. White/Caucasian
17. Asian
18. White/Caucasian

19. Hispanic/Latino
20. Black/African American
21. White/Caucasian
22. Black/African American
23. Asian
24. Asian
25. White/Caucasian
26. Hispanic/Latino
27. White/Caucasian
28. White/Caucasian
29. Hispanic/Latino
30. Asian
31. Black/African American
32. White/Caucasian
33. White/Caucasian
34. Hispanic/Latino
35. White/Caucasian
36. Asian
37. White/Caucasian
38. White/Caucasian
39. Black/African American
40. White/Caucasian

What is your gender?

1. Female
2. Male
3. Male
4. Female
5. Female
6. Female
7. Male
8. Male
9. Male
10. Female
11. Male
12. Male
13. Male

14. Male
15. Male
16. Male
17. Male
18. Male
19. Female
20. Male
21. Male
22. Female
23. Male
24. Male
25. Male
26. Male
27. Male
28. Male
29. Female
30. Male
31. Male
32. Male
33. Male
34. Female
35. Male
36. Female
37. Male
38. Male
39. Female
40. Male

What is your marital status?

1. Married
2. Never married
3. Never married
4. Married
5. Married
6. Married
7. Married
8. Never married

9. Married
10. Never married
11. Never married
12. Married
13. Never married
14. Married
15. Married
16. Never married
17. Married
18. Married
19. Married
20. Never married
21. Married
22. Married
23. Never married
24. Never married
25. Never married
26. Never married
27. Married
28. Never married
29. Married
30. Never married
31. Married
32. Never married
33. Married
34. Never married
35. Married
36. Married
37. Married
38. Married
39. Never married
40. Married

What is the highest level of education you have received?

1. Bachelor degree
2. Master degree
3. Master degree

4. Bachelor degree
5. Bachelor degree
6. Master degree
7. Bachelor degree
8. Bachelor degree
9. Bachelor degree
10. Bachelor degree
11. Bachelor degree
12. Bachelor degree
13. Ph.D.
14. Master degree
15. Bachelor degree
16. Bachelor degree
17. Bachelor degree
18. Bachelor degree
19. Bachelor degree
20. Bachelor degree
21. Bachelor degree
22. Bachelor degree
23. Bachelor degree
24. Bachelor degree
25. Master degree
26. Bachelor degree
27. Bachelor degree
28. Bachelor degree
29. Master degree
30. Bachelor degree
31. Ph.D.
32. Bachelor degree
33. Master degree
34. Bachelor degree
35. Bachelor degree
36. Bachelor degree
37. Master degree
38. Associate degree
39. Bachelor degree

40. Bachelor degree

What is your employment status?

1. Employed, working less than 40 hpw
2. Employed, working more than 40 hpw
3. Employed, working more than 40 hpw
4. Employed, working more than 40 hpw
5. Employed, working more than 40 hpw
6. Not employed
7. Employed, working more than 40 hpw
8. Employed, working less than 40 hpw
9. Employed, working more than 40 hpw
10. Employed, working more than 40 hpw
11. Employed, working more than 40 hpw
12. Employed, working more than 40 hpw
13. Employed, working less than 40 hpw
14. Employed, working more than 40 hpw
15. Employed, working less than 40 hpw
16. Employed, working more than 40 hpw
17. Employed, working more than 40 hpw
18. Employed, working more than 40 hpw
19. Not employed
20. Employed, working more than 40 hpw
21. Employed, working more than 40 hpw
22. Not employed
23. Employed, working more than 40 hpw
24. Employed, working more than 40 hpw
25. Employed, working more than 40 hpw
26. Employed, working more than 40 hpw
27. Employed, working more than 40 hpw
28. Employed, working less than 40 hpw
29. Employed, working more than 40 hpw
30. Employed, working more than 40 hpw
31. Employed, working less than 40 hpw
32. Employed, working more than 40 hpw
33. Employed, working more than 40 hpw
34. Employed, working more than 40 hpw

35. Employed, working more than 40 hpw
36. Employed, working more than 40 hpw
37. Employed, working more than 40 hpw
38. Employed, working less than 40 hpw
39. Employed, working more than 40 hpw
40. Employed, working more than 40 hpw

What is your occupation?

1. Software Development Manager
2. N/A
3. Software Engineer
4. EE
5. Data Analyst
6. Student
7. data engineer
8. data scientist
9. Software Developer
10. Software developer
11. Sr. Software Engineer
12. Manager, Software Development
13. SWE
14. Consultant
15. Machine Learning Engineer
16. Engineer
17. tech job
18. Software Engineer
19. Student
20. Software engineer
21. Machine Learning Engineer
22. Stay at home mom (formerly an engineer in 2018)
23. army
24. Software Engineer
25. system engineer
26. Software Engineer
27. Data Analyst and Business Consultant
28. Consultant
29. Researcher / Designer

30. Software engineer
31. Travel Agent
32. Software Engineer
33. Director of Engineering
34. software engineer
35. Software Engineer
36. Engineer
37. Product Manager
38. eng
39. IT professional
40. Software Engineer

How much total combined money did all members of your household earn last year?

1. 75000 to \$100000
2. Above \$10000
3. Above \$10000
4. Above \$10000
5. Above \$10000
6. Above \$10000
7. 75000 to \$100000
8. \$30000 to \$50000
9. 75000 to \$100000
10. 75000 to \$100000
11. 75000 to \$100000
12. Above \$10000
13. Under \$10000
14. Above \$10000
15. Above \$10000
16. 75000 to \$100000
17. Above \$10000
18. Above \$10000
19. 75000 to \$100000
20. 75000 to \$100000
21. Above \$10000
22. Above \$10000
23. 75000 to \$100000

24. \$50000 to \$75000
25. Above \$10000
26. Above \$10000
27. Above \$10000
28. Above \$10000
29. 75000 to \$100000
30. \$50000 to \$75000
31. Above \$10000
32. Above \$10000
33. Above \$10000
34. Above \$10000
35. Above \$10000
36. Above \$10000
37. Above \$10000
38. Under \$10000
39. Above \$10000
40. Above \$10000

What is your understanding of educational Artificial Intelligence (AI)?

1. AI technology used in education, could be used in learning, teaching, test administration, evaluation, performance prediction etc.
2. N/A
3. AI that helps people learn
4. Human response by a computer
5. personalized tutor
6. Cool but boring if it has a lot of writing part.
7. need more details on which part of AI
8. I have no concept
9. to summarize it google home or Alexa are AI devices for the home.
10. I took KBAI
11. I'm not sure how it differs from normal AI.
12. I know what it is and how to use it.
13. Very strong
14. Programming logic or algorithms to learn some task
15. It can be used to enhance educational outcomes
16. It's can be helpful is utilized correctly (such as AiTA)
17. good

18. I don't know anything
19. It's education related to algorithms and techniques to develop artificial intelligence.
20. Moderately understand it
21. ability to tailor or suggest relevant materials or learn from queries to assist in making a better platform tailored to the student
22. Decent understanding. The numbers in the above question aren't going to give useful results. I think you meant above 100K for the last option, but it says 10K. To clarify My household made above 100K USD.
23. none
24. Low to low-mid
25. The sytem will guide you based on your answeres and other peoples privious answer through the learning process.
26. Not much.
27. Do not have much background other than I know some capabilities of AI
28. Have a general background/understanding of AI but not much as it's specifically focused on education.
29. Expert
30. Not too much
31. Intimate understanding.
32. very limited
33. Advanced
34. not much
35. It can be very useful for generating questions or determine best methods.
36. I'm new to this space, but I'm excited about the personalized learning that will be possible via educational AI
37. Moderate
38. na
39. I understand educational AI to mean practical application of AI and AI methods to improve educational goals
40. Using artificial intelligence techniques to support the facilitation of learning material in an efficient and effective manner.

Can harm be made to the educational landscape, students, or teachers by unregulated AI?

1. Yes
2. Yes

3. Yes
4. No
5. Yes
6. Maybe
7. No
8. Maybe
9. Yes
10. Yes
11. Yes
12. Maybe
13. Yes
14. Yes
15. Yes
16. Yes
17. Yes
18. No
19. Yes
20. Maybe
21. Yes
22. Yes
23. Yes
24. Yes
25. Yes
26. Yes
27. Yes
28. Maybe
29. Yes
30. Maybe
31. Yes
32. Yes
33. No
34. Maybe
35. Maybe
36. Yes
37. Maybe
38. Yes
39. Maybe

40. Yes

Do the ethical aspects of educational AI must be regulated?

1. Yes
2. Yes
3. Yes
4. Yes
5. Yes
6. Yes
7. No
8. Yes
9. Yes
10. Yes
11. Yes
12. Maybe
13. Maybe
14. Yes
15. Yes
16. Yes
17. Yes
18. Maybe
19. Yes
20. Yes
21. Yes
22. No
23. Yes
24. Yes
25. Yes
26. Yes
27. Yes
28. Yes
29. Yes
30. Maybe
31. Yes
32. Yes
33. No
34. Yes

35. Maybe
36. Yes
37. No
38. No
39. Yes
40. Yes

Do the legal aspects of educational AI must be regulated?

1. Yes
2. Yes
3. Yes
4. Yes
5. Yes
6. Yes
7. No
8. Yes
9. Yes
10. Yes
11. Yes
12. Maybe
13. Maybe
14. Yes
15. Yes
16. Yes
17. Yes
18. Yes
19. Yes
20. Yes
21. Yes
22. Yes
23. Yes
24. Yes
25. Yes
26. Yes
27. Yes
28. Yes
29. Yes

30. Maybe
31. Yes
32. Yes
33. No
34. Yes
35. No
36. Yes
37. No
38. Yes
39. Yes
40. Yes

Do the technical aspects of educational AI must be regulated?

1. Yes
2. Yes
3. Yes
4. Yes
5. Yes
6. Yes
7. No
8. No
9. Yes
10. Yes
11. No
12. No
13. Maybe
14. Yes
15. Maybe
16. Yes
17. Yes
18. No
19. Yes
20. Yes
21. Yes
22. Yes
23. Yes
24. Yes

25. No
26. Yes
27. Maybe
28. Maybe
29. Maybe
30. Maybe
31. Yes
32. Yes
33. No
34. Yes
35. No
36. Yes
37. No
38. Yes
39. Yes
40. No

Do the trustworthiness aspects of educational AI must be regulated?

1. Yes
2. Yes
3. Yes
4. Yes
5. Maybe
6. Yes
7. No
8. Yes
9. Yes
10. Yes
11. No
12. Maybe
13. Maybe
14. Yes
15. No
16. Yes
17. Yes
18. Yes
19. Yes

20. Yes
21. Yes
22. No
23. Yes
24. Yes
25. Yes
26. Yes
27. Yes
28. Yes
29. Yes
30. Maybe
31. Yes
32. Yes
33. Yes
34. Yes
35. No
36. Yes
37. No
38. Yes
39. Yes
40. Maybe

What other aspects by your opinion of educational AI must be regulated?

1. Training data that is used for the AI agents should be scrutinised and regulated to remove any bias.
2. N/A
3. Data privacy
4. None
5. na
6. All you mentioned.
7. no
8. Where to use
9. Privacy
10. I think you covered all the important aspects with the questions above
11. I don't know what it is or how it differs from normal AI. You never told me.
12. Use of AI in machines that can harm or kill a human.

13. compute costs
14. Access to educational AI
15. none
16. Privacy should be protected when coding and using AI
17. n/a
18. Identifiable content storage must be regulated
19. n/a
20. I believe the issue of personal data
21. data collection and data use is very important to regulate
22. You can't regulate abstract things like trustworthiness or ethics. You can regulate laws, security, bias (in things that have legal or other implications), etc.
23. n/a
24. Most aspects, AI is a black box when it comes to complex problems so we need to understand how the AI is coming up with it's conclusions
25. social aspects - AI should not replace teachers as primary source of teaching.
26. Not educated enough of educational AI.
27. Perhaps ties into legal/technical but Intellectual Property and Copywrite concerns need to be concerned. College professors lecture material is IP and may be copyrighted - something to consider with who owns AI generated material etc.
28. N/A
29. Knowledge base acquisition and maintenance. Bias testing.
30. N/A
31. Teacher compensation, Class/Track assignment
32. none
33. It's not the AI, it is what is done with it
34. racial bias in teaching
35. Potentially discrimination
36. content of material that is delivered will be important to regulate
37. None
38. na
39. N/A
40. N/A

Do you have any other comments about educational AI regulations?

1. Once regulations are in place, it should be promoted and actively used.
2. N/A
3. They may be difficult to enforce
4. No
5. na
6. NA
7. no
8. I think it needs to be regulated considering the context the AI use.
9. None other than it provides a-lot of potential for making our lives even more simple if and when we consider user privacy is addressed.
10. N/A
11. No.
12. No comment.
13. no
14. It is an exciting area, but also has risks.
15. no
16. NA
17. no
18. N/A
19. Should put human preservation as a priority as long as it does not end up determining a judgment day is necessary
20. We should carefully look into aspect of AI that would resolve biases
21. no
22. Nope
23. no
24. none
25. In my prespective all aspect of AI should be regulated.
26. None.
27. See prior question
28. N/A
29. Not particularly!
30. N/A
31. No
32. no
33. No
34. no
35. No, but it looks like there's a typo in your last salary range question.

- 36. N/A
- 37. No
- 38. na
- 39. N/A
- 40. Data is very important to artificial intelligence; however, with that comes data privacy -- need to make sure people and basic human rights are protected.