Addressing safety and privacy concerns in the use of AI tools for students with learning challenges.

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https://tinyurl.com/594939pw

Abstract

- Modern AI tools show significant potential in enhancing the experience of students with learning challenges. These tools, some of which are already available, and others actively in development, leverage the power of AI to address a wide range of challenges.
- However, these also pose risks as such systems need to collect large amounts of student data to function and this, very personal data, can be misused without the student's knowledge or consent.
- AI systems are only as unbiased as the data they are trained on, and if this data is biased, it can lead to discriminatory outcomes for disabled students.
- After showing a few sample tools, we'll discuss current regulations in place to protect such knowledge and what future directions we must follow.
- A brief presentation will be followed by a group discussion on the limitless possibilities and associated risks.

Contents

Introduction and Motivation

- Students with varying degrees of learning disabilities face significant challenges throughout their education.
- However, with AI in general, and with the advent of Generative AI, new possibilities have emerged which can help bridge the gap for such students and allow for equitable access to education catered to each student's unique needs.
- Teachers and professors will be empowered to provide a higher quality education for their students regardless of whatever limitations they may have.

Age

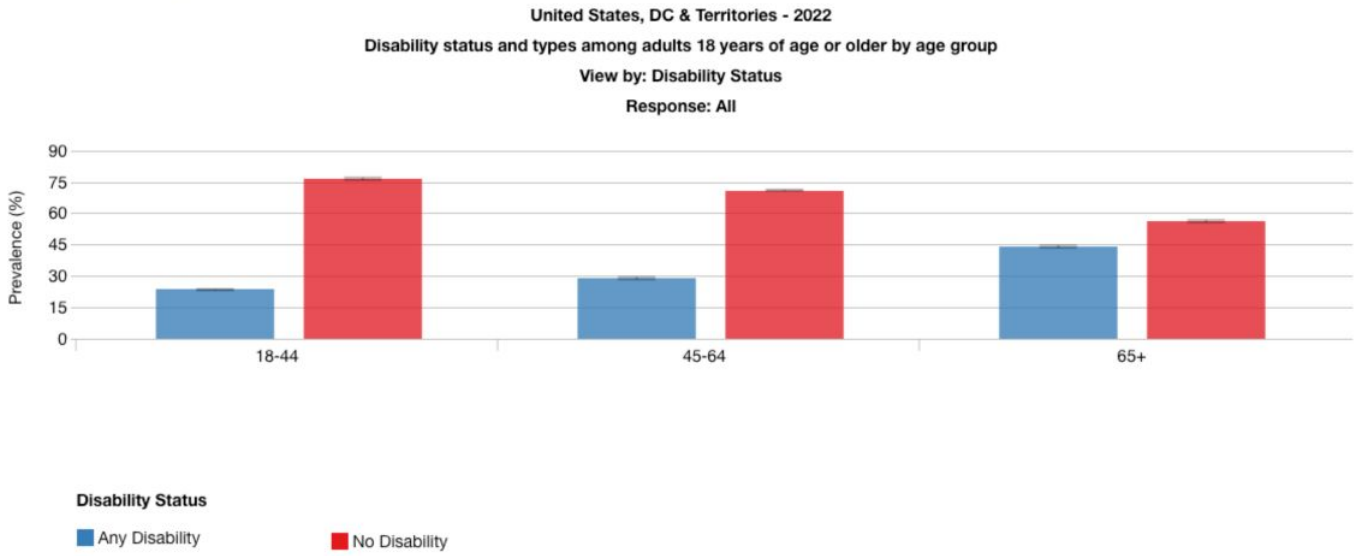
United States, DC & Territories

Chart | Table

Year: All available years | 2022

View by: Disability Status | All

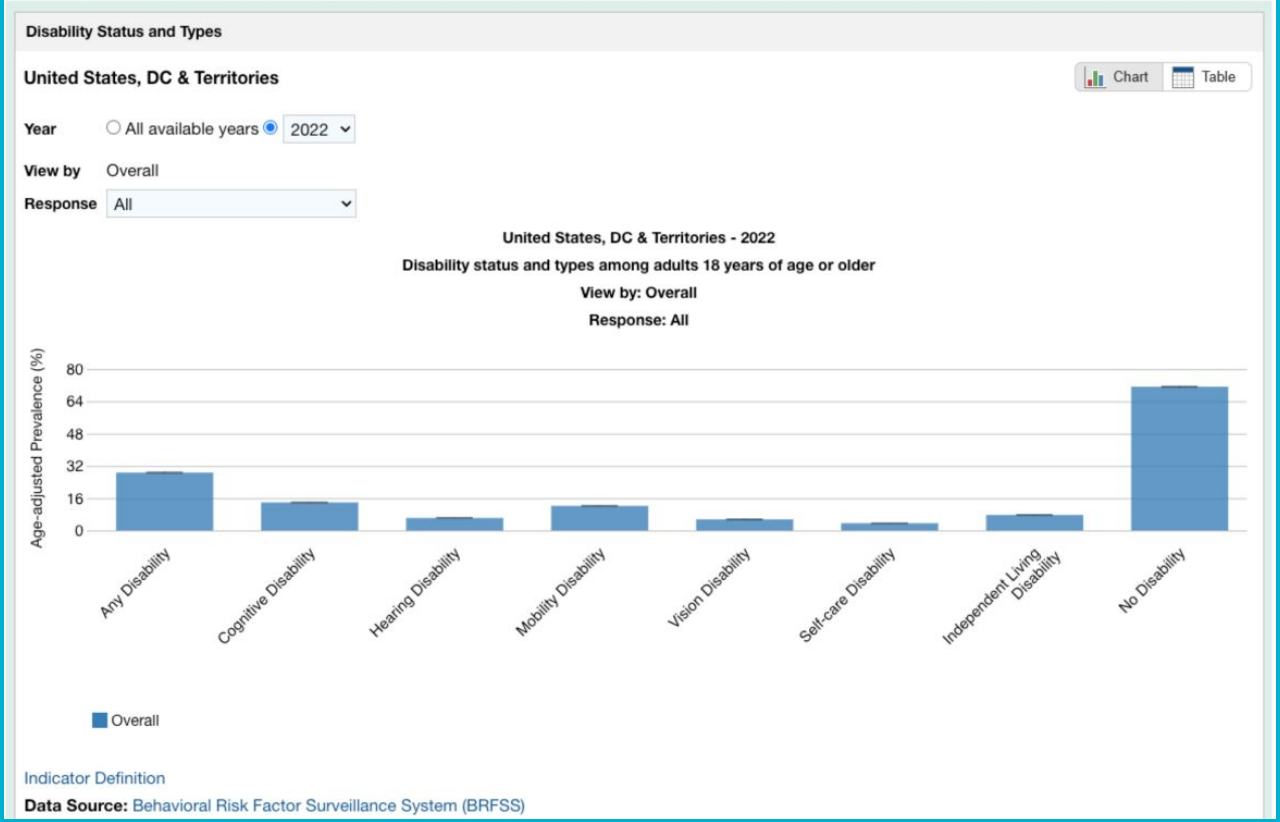
Response: All



Indicator Definition

Data Source: Behavioral Risk Factor Surveillance System (BRFSS)

BRFSS Data from https://dhds.cdc.gov/



BRFSS Data from https://dhds.cdc.gov/

Market Overview

Classification of AI Tools in Higher Education

Classification	Characteristic	Example	Main Outcome
Automate	**Streamline tasks:** AI tools use machine learning capabilities to automate tasks that are repetitive and standard in nature by learning from data patterns	• Automate generation of content and grading • Create AI-powered tutoring chatbots	**Drive Efficiency**
Discover	**Data Visualisation:** AI tools able to reveal patterns, trends, and relationships within the data, facilitating exploration and highlighting actionable insights	• Provide insights on the learning patterns of students • Recognise students' wellbeing and performance	**Provide Insights**
Personalise	**Dynamic Profiles:** AI tools gather data from various sources and build a dynamic user profile that evolves as user interacts with the system and as their preferences change	• Customise learning content and paths • Give personalised real-time feedback	**Boost Engagement**
Predict	**Forecasting Trends:** AI tools go beyond describing past or present data, and are able to analyse identified patterns and trends to make educated guesses of the future	• Identify at-risk students for early intervention • Predict jobs demand and skills for better employability	**Provide Insights**
Include	**Accessibility:** AI tools designed to support inclusivity and accessibility by offering dedicated interfaces and interactions that cater to varying levels of skills and abilities	• Improve accessibility to students with disabilities • Provide real-time language translation	**Augment Learning**

The Digital Education Council
https://www.digitaleducationcouncil.com/post/a-framework-to-understand-ai-classification-of-tools-and-impact

Some of the currently available tools

Art for the Visually Impaired

- AI-based apps such as “Pixel Eye” have allowed blind individuals to experience art.
  - Through the use of smart glasses, the app can immediately scan a painting and provide a verbal, vivid description for the viewer.
  - Such individuals can easily walk through an entire museum and receive verbal descriptions of the artwork around them in real-time, thanks to the capabilities of AI.

https://pixel-gallery.co.uk/

https://pixel-gallery.co.uk/blogs/pixelated-stories/ai-art-for-the-visually-impaired

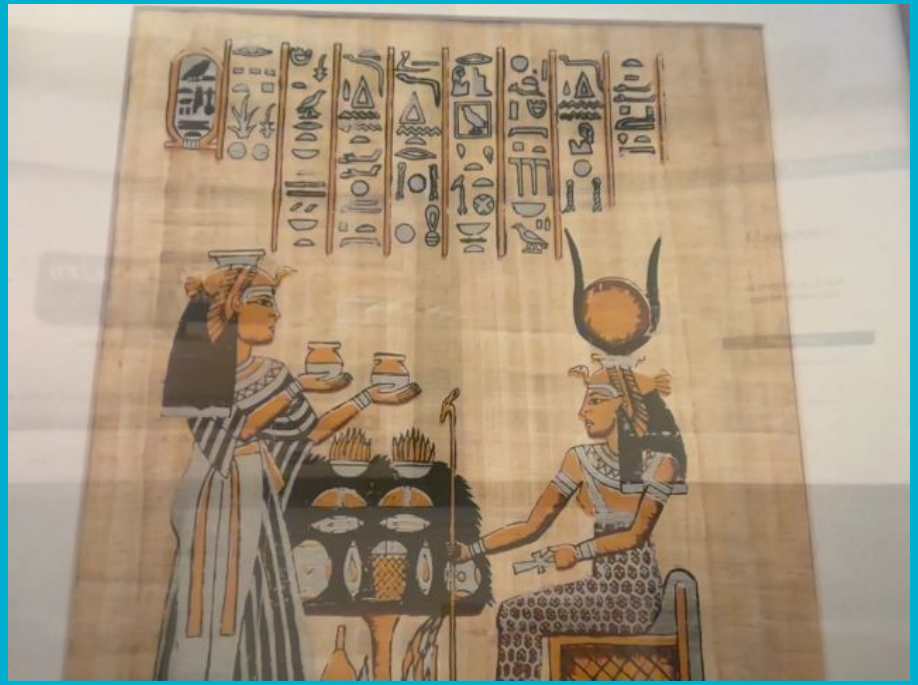
- For individuals who are blind, color-blind, or visually impaired in other ways, AI can also assist in the creation of art.
  - Generative AI art tools, through the use of audio interfaces and natural language prompts, can allow such individuals to create art that they otherwise would struggle to make. Ex: A11yBoard

https://create.uw.edu/a11yboard-seeks-to-make-digital-artboards-accessible-to-blind-and-low-vision-users/

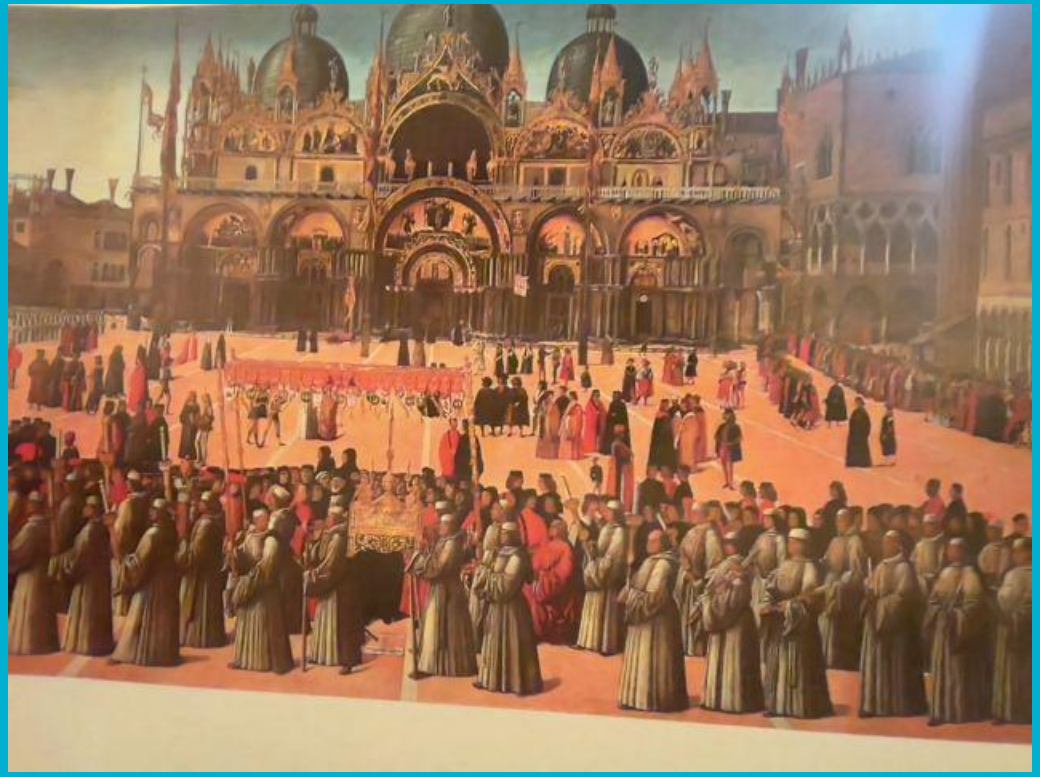
Blind Eye

The image depicts a spacious library or a personal study room. The walls are lined with multiple shelves filled with a large collection of books, suggesting a robust interest in reading or collecting texts. The shelf layouts and the titles visible hint at a diverse collection possibly covering various genres and subjects. A ceiling fan is mounted above, providing ventilation. The room appears to be a comfortable, personal space designed for reading, studying, or working.

https://colab.research.google.com/drive/13b2by9Q7_ZlUhzmlfNpbw1BvShZQ2cqO?usp=sharing



The image depicts an ancient Egyptian scene, styled similar to paintings and artworks found in tombs and monuments from that civilization. It shows two figures, likely representing nobles or deities, engaged in a ritual or a domestic activity involving food and drink. The character on the left is standing and offering vessels that could contain offerings such as wine or beer to the seated figure, who is accepting these offerings. Above, there are hieroglyphs, which might specify details related to the scene, perhaps identifying the figures, narrating a story, or invoking blessings. The use of vivid colors and the portrayal of the figures illustrate the distinctive artistic style of ancient Egypt, characterized by the detailed depiction of clothing, accessories, and ceremonial objects. This use of art was essential for religious and cultural purposes, often designed to provide for the afterlife or represent divine interactions.



The image depicts a historical or ceremonial scene set in front of a grand, ornate building that closely resembles the architecture of St. Mark’s Basilica in Venice, Italy. The scene is bustling with figures clad in traditional or ceremonial attire, suggesting it could be depicting a significant event, perhaps a religious or state ceremony typical of the Renaissance or medieval period. The level of detail in both the architectural elements and the attire of the figures emphasizes the formality and importance of the event. The intricate patterns and colors used in the clothes, along with the orderly arrangement of the figures, enhance the grandeur and solemnity of the scene.

Hearing Impairments & Language Barriers

- AI-based tools can help translate text or audio into sign language.
  - “Hand Talk Sign Language Translator” can accomplish this in real-time, thus allowing hearing impaired students to actively learn in a classroom setting with minimal barriers.
    https://www.handtalk.me/en/app/

    Echo/Fisk https://www.youtube.com/watch?v=nWSCpymdIL8

Dyslexia & Dysgraphia

- For individuals with Dyslexia, Dysgraphia, or executive functioning issues, AI-based voice assistants have been shown to significantly enhance learning experiences.
  - Writing tools which can convert text-to-speech have the potential to aid in assignments such as writing long-form essays as AI can correct for errors caused by dyslexia.
    https://www.ldrfa.org/ai-tools-dyslexia-adhd-assessment/

Ethics and Privacy Concerns

While AI tools offer significant benefits, they also raise important ethical and privacy concerns. The collection and analysis of student data are central to the functionality of many AI applications, leading to questions about data security, consent, and potential misuse.

If the algorithms are trained on unrepresentative data, they may perpetuate existing inequalities and fail to provide equitable support for all students [Holstein et al. (2019)].

Benefits of AI Tools

The benefits of AI tools in education are manifold, significantly transforming the learning experience for students. One of the most prominent advantages is the enhancement of personalized learning experiences.

AI tools can adapt to individual student needs, allowing them to progress at their own pace and receive immediate feedback on their performance.

Research by Zhang et al. (2020) demonstrates that such adaptability not only fosters engagement but also promotes a sense of autonomy among learners, empowering them to take control of their educational journey.

Data Collection and Misuse

The collection of sensitive information poses several risks. Unauthorized access to student data can lead to identity theft or exploitation, causing harm to students and their families.

Additionally, the continuous collection of data can result in profiling, where students are categorized based on their learning behaviors or disabilities. This profiling may inadvertently lead to discriminatory practices where certain students receive less favorable treatment based on biased data interpretations.

Research by O'Neil (2016) highlights how algorithmic bias can perpetuate existing inequalities and impact student opportunities negatively. Moreover, many students and parents may not fully understand the extent of data collection practices, raising ethical concerns about informed consent and the right to privacy.

A study by Regan (2017) emphasizes the importance of transparency in data collection to foster trust and ensure that stakeholders are aware of how their information is being used.

Regulatory Framework

The Family Educational Rights and Privacy Act (FERPA) in the United States

General Data Protection Regulation (GDPR) provides comprehensive guidelines for data protection within the European Union.

Regulatory Framework

The ACA Section 1557 Final Rule (https://www.federalregister.gov/documents/2024/05/06/2024-08711/nondiscrimination-in-health-programs-and-activities), which went into effect in June 2024, prohibiting discrimination in medical AI algorithms based on race, color, national origin, gender, age, or disability.

The HTI-1 Final Rule (https://www.govinfo.gov/content/pkg/FR-2024-01-09/pdf/2023-28857.pdf) on transparency in medical decision support systems, in effect since January 2024, requires companies to show how they've trained and tested their models.

Gaps in Current Regulations

Despite the presence of significant regulations, there are notable gaps that fail to address the unique challenges posed by current technologies.

For instance, existing regulations may not fully encompass the implications of AI-driven data collection and analysis, particularly concerning the rights of students with disabilities.

The lack of comprehensive guidelines specifically addressing these rights raises ethical concerns about equity and access in educational settings (Luckin et al., 2016).

On-going work at the Laboratory for Healthcare Engineering

http://www.cs.umbc.edu/~maliyou1/

- Train a model (or fine-tune an existing one. For example, Whisper by OpenAI) on samples of unclear voice (features X), and the actual text spoken (label y).
- The speaker can tell exactly what they are saying. Once the model is trained, convert the voice to text.
- Additionally, that text can be read back using a professional voice to make the person more easily understood by others.

https://openai.com/research/whisper

Bill Gates famously once said, "We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten."

Questions?

- Can you think of any other learning disability whose educational challenges can be mitigated with the use of AI?
- What kind of issues students report when they come to a library in terms of accessibility?
- Are there any possible downsides to utilizing AI in such settings or challenges which should be considered?

Conclusion and Discussion

- Not only can AI theoretically bring down the barriers between individuals with learning disabilities, it's practical uses have already been shown to bridge the gap for such individuals.
- Implementing such AI-based tools will allow for continuing increased educational accessibility for all.

Further Readings

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