Towards More Accessible Open Source AI Platforms

Michael Murray
University of Washington
Seattle, Washington, USA
mmurr@cs.washington.edu

Tamanna Motahar
University of Washington
Seattle, Washington, USA
tmotahar@cs.washington.edu

Maya Cakmak
University of Washington
Seattle, Washington, USA
mcakmak@cs.washington.edu

Abstract

AI education is rapidly becoming essential as artificial intelligence transforms industries, yet students with disabilities often encounter significant barriers to learning and engagement. This paper examines accessibility challenges encountered by learners with visual, cognitive, and physical disabilities when using foundational tools for AI development. Using HuggingFace—an influential open-source platform—as a case study, we analyze barriers such as insufficient screen reader support, complex interfaces, and information overload. We propose design recommendations to promote equity and inclusivity in AI tools, aiming to empower diverse learners to thrive in AI education. Our work highlights the importance of inclusive design for CS educators, researchers, and policymakers.

CCS Concepts

• **Social and professional topics → Computing education**.

Keywords

AI education, CS education, inclusive design, accessibility, disability

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1 Introduction

Artificial Intelligence (AI) has emerged as one of the most transformative forces of the 21st century, reshaping industries and redefining the global workforce. According to the World Economic Forum, AI is expected to result in significant labor-market disruptions and *AI Specialist* tops the list of fastest growing jobs [7]. AI-exposed sectors are experiencing unprecedented productivity gains, with AI-intensive roles commanding a wage premium of up to 25% [15]. By 2032, the generative AI market is projected to surpass $1.3 trillion, underscoring the rapid adoption of AI technologies across domains ranging from healthcare to finance to education [17]. This growth creates high demand for skilled professionals and positions AI as a critical domain for fostering innovation and driving equitable economic growth. As AI rapidly transforms industries, AI education becomes a critical pathway to equitable participation in this emerging job market. Therefore, ensuring that individuals from diverse backgrounds can access and participate in its development is essential for both innovation and social equity.

AI education plays a pivotal role in equipping the next generation with the skills needed to navigate and contribute to this rapidly evolving landscape. Yet, despite the democratization of tools and resources, significant disparities persist in access to high-quality AI learning opportunities. In recent years, there has been increased attention to disability in Computer Science (CS) education [3, 4]. However, while efforts to expand AI education for underrepresented groups are increasing, students with disabilities remain largely excluded from these initiatives. Structural barriers—including inaccessible tools, documentation, and workflows—undermine learners with disabilities full participation in AI development, perpetuating inequities in education and career opportunities. Achieving equity in AI education requires targeted efforts to address these barriers and create inclusive learning environments for all.

A handful of tools and resources have emerged as critical entry points for AI education, bridging the gap between theoretical knowledge and practical application. Platforms like HuggingFace, PyTorch, and TensorFlow have become indispensable for building, training, and deploying AI models [1]. HuggingFace, in particular, has gained prominence as a leading open-source platform for natural language processing (NLP) and machine learning, offering pretrained models, datasets, and APIs that simplify AI development. The platform has had exponential growth and has become the de facto home for open source models [5, 10, 11]. These tools are not just technical frameworks; they represent ecosystems that define how learners and professionals alike interact with AI. For students entering the field, mastery of these tools is essential for academic success, research, and industry readiness. However, the accessibility of these platforms is often overlooked, leaving learners with disabilities at a disadvantage.

Accessibility challenges in these critical tools can take many forms. For instance, visually impaired learners may struggle with interfaces and diagrams that are not compatible with screen readers [2, 14]. Likewise, neurodivergent learners may find complex documentation overwhelming or poorly structured [13]. Similarly, individuals with physical disabilities may encounter difficulties navigating platforms that rely heavily on precise mouse interactions [9]. These challenges are not just inconveniences; they are systemic barriers that limit the participation of learners with disabilities in the AI field. Addressing these gaps requires a detailed analysis of where and how accessibility barriers arise, coupled with a commitment to designing inclusive tools by default. Without such

[1]The term "open-source AI" is itself contested. While some tools and models are released under open licenses, others restrict usage or model weights [19]. In this paper, we use "open-source AI" to refer to publicly accessible platforms, codebases, and educational resources—recognizing that openness exists on a spectrum.

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efforts, the AI community risks perpetuating inequities that exclude talented individuals from contributing to this transformative field.

In this paper, we propose a collaborative approach to address these accessibility challenges. Using HuggingFace as a case study, we analyze specific barriers faced by students with disabilities and offer actionable recommendations for creating more inclusive AI tools. By drawing on principles of inclusive design, we aim to foster a culture of accessibility that empowers learners of all abilities to thrive in AI education. This work is a call to action for educators, developers, and policymakers to prioritize accessibility as a cornerstone of equitable AI education.

2 Background

The principles of inclusive design emphasize creating environments and tools that accommodate diverse user needs from the outset, rather than as an afterthought. This approach recognizes disability as a mismatch between user needs and environmental design rather than an individual deficit [6]. Inclusive design aims to ensure equitable access by integrating flexibility into learning environments, enabling learners with different abilities to engage with content in ways that align with their strengths. In educational contexts, inclusive design principles have been shown to benefit all learners while being essential for those with disabilities [8]. For example, the Universal Design for Learning (UDL) framework encourages multiple means of representation, engagement, and expression to support diverse learning styles and abilities.

The shift toward digital learning environments has brought greater focus to accessibility in education. Research shows that inaccessible educational materials and tools create significant barriers to learning, particularly in STEM fields, where visual and interactive content is prevalent [16]. These barriers include the lack of alternative text for images, poor contrast in visualizations, and reliance on mouse-based interaction without keyboard-accessible alternatives. For students with disabilities, such obstacles can significantly hinder engagement with study material, highlighting the need for proactive accessibility considerations in digital education.

In computer science education, accessibility research has primarily focused on programming environments and fundamental computational tools [2, 14]. Many studies highlight the importance of designing programming environments that support screen readers, enable robust keyboard navigation, and offer clear, structured documentation to assist students with disabilities. However, emerging computing areas such as AI and machine learning (ML) introduce additional accessibility challenges. Unlike traditional programming tasks, AI education often involves interacting with complex datasets, interpreting large-scale model outputs, and working with intricate visualizations, all of which may present accessibility barriers.

The accessibility landscape in AI education presents unique challenges due to the field's rapid evolution and the complexity of its tools. Traditional accessibility guidelines, which have primarily focused on static web content and software applications, may not fully accommodate AI learning environments—involving dynamic visualizations, multi-modal interactions, and extensive computational resources. Furthermore, the prevalence of open-source AI tools creates both opportunities and challenges for accessibility. For insatnce, while open-source AI development tools foster innovation and collaboration, accessibility considerations can be inconsistent, varying based on the priorities of individual contributors or organizations. As AI continues to expand in education, ensuring that AI learning environments are accessible to all students—including those with disabilities—will be crucial for fostering equitable participation in the field.

3 Case Study

Hugging Face has emerged as a central hub for AI development and education, hosting models and datasets used by millions of developers worldwide [20]. The platform's extensive repository of pre-trained models, datasets, and educational resources has made it an invaluable tool for both researchers and practitioners in AI. Given its importance in AI education, ensuring the platform's accessibility is critical for ensuring equitable access to AI learning opportunities. As AI continues to shape various sectors of society, it is essential that educational resources remain accessible to all learners, including those with disabilities. Our analysis examines Hugging Face's accessibility in alignment with the Web Content Accessibility Guidelines (WCAG) 2.1 Level AA standards [21], focusing on key areas that impact learners with disabilities.

3.1 Methodology

We evaluate the accessibility of the Hugging Face platform using the Website Accessibility Conformance Evaluation Methodology (WCAG-EM) [18]. This structured approach allows a comprehensive assessment of web content accessibility across multiple dimensions, including perceivability, operability, understandability, and robustness. Our assessment includes a representative sample of six web pages from key sections of the Hugging Face website—documentation, model cards, and datasets—as well as two randomly selected pages.

Page selection for evaluation followed a stratified sampling approach to ensure diverse content representation and user interaction patterns. Documentation pages were chosen based on their popularity and importance to new users, while model cards and dataset pages were selected to represent both frequently accessed and less commonly visited content. This sampling strategy allows for a thorough accessibility evaluation across varying levels of content complexity and user engagement.

To complement our manual evaluation, we employ automated tools such as Google Chrome Lighthouse [1] to detect common compliance issues, including improper markup for screen readers, insufficient text contrast, and keyboard navigation barriers. By combining structured manual analysis with automated testing, we provide a comprehensive overview of the platform's accessibility strengths and shortcomings.

3.2 Results

Our WCAG-EM analysis reveals that the Hugging Face platform does not fully comply with WCAG Level AA guidelines, highlighting a range of accessibility challenges and opportunities for improvement. We identified several accessibility barriers across different interfaces, including inconsistent support for screen readers, insufficient color contrast in text elements, and uncaptioned visual

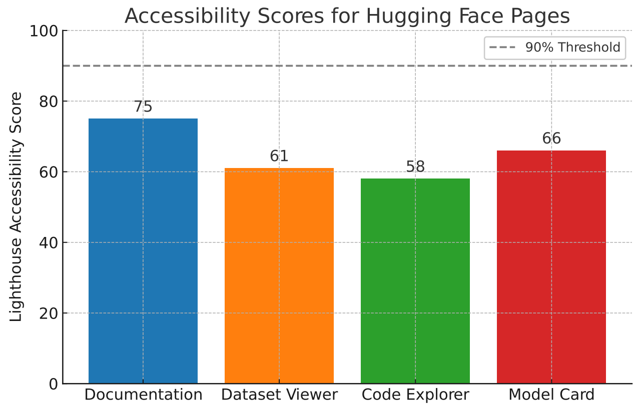

Figure 1: Lighthouse accessibility scores for four of the sampled Hugging Face pages. Lighthouse scores range from 0 to 100, with 90+ considered "good," indicating a high level of accessibility. The Lighthouse score is a weighted aggregate of multiple accessibility audits, with issues ranked based on their impact on users.

content. These issues vary in severity, and impact, with some presenting significant obstacles for users with disabilities, while others represent minor inconveniences that could be readily addressed.

The automated Lighthouse accessibility analysis, summarized in Figure 1, yielded an average score of 65 across the sampled pages, suggesting significant room for improvement. Lighthouse scores range from 0 to 100, with scores above 90 considered "good," reflecting a high level of accessibility. The Lighthouse score is a weighted aggregate of multiple accessibility audits, ranking issues based on their impact on users. Common issues identified include the lack of accessible labels for interactive elements such as buttons, touch targets with insufficient sizes or spacing, and insufficient contrast between text and background elements.

Notably, our analysis revealed that accessibility scores varied significantly across different content types, with documentation pages generally performing better than user-generated content such as model cards and dataset descriptions. This disparity highlights the challenges of maintaining consistent accessibility standards within a community-driven platform.

While many of the identified compliance issues are common across web platforms, we highlight several factors that uniquely contribute to accessibility challenges on the Hugging Face platform. We discuss the factors below:

Community-Generated Content: As a largely open-source and community-driven platform, Hugging Face hosts a vast repository of user-generated content, which varies significantly in both quality and accessibility. Many model cards and dataset descriptions lack structured formatting, alternative text for images, and proper semantic markup. This variability poses particular challenges in maintaining consistent accessibility standards across the platform. While the community-driven nature of content creation fosters valuable knowledge sharing and collaboration, it also leads to inconsistent implementation of accessibility best practices.

AI-Specific Interfaces: The platform introduces novel UI elements, such as interactive model cards and dataset explorers, which are not always designed with accessibility in mind. As shown in Figure 2, the interfaces are very rich and interactive, offering sophisticated functionality for model exploration and dataset analysis. However, these interactive UI components can exhibit inconsistent screen reader support and keyboard navigation limitations. The complexity of these interfaces, while beneficial for advanced users, can create significant barriers for users relying on assistive technologies. Additionally, many of these interfaces implement custom controls and widgets that may not properly expose their functionality to assistive technologies, such as screen readers, through ARIA (Accessible Rich Internet Applications) [22] roles and properties, which define how elements should be interpreted by assistive tools.

Complex Technical Topics: The platform's documentation covers advanced technical concepts, which can be challenging for students to comprehend, particularly when accessibility barriers further compound the inherent complexity of the material. To aid comprehension, content creators often rely on intricate diagrams and video explanations, which require thoughtful design to ensure accessibility for all users. Uncaptioned videos, complex diagrams without alternative text, and code examples with syntax highlighting that reduces text contrast (as shown in Figure 3) can all create accessibility barriers. Furthermore, the inherently visual or mathematical nature of the ML and AI concepts presents unique challenges in providing equivalent alternatives for non-visual learners.

Our findings suggest that while Hugging Face has made efforts to support accessibility, significant work remains to ensure the platform is fully accessible to all users. The combination of community-generated content, specialized AI interfaces, and complex technical material creates unique challenges that require targeted solutions and ongoing attention to accessibility improvements.

3.3 Recommendations

The findings from our case study highlight the unique accessibility challenges posed by AI platforms and open-source ecosystems, emphasizing the need for targeted improvements in both design practices and community guidelines. Addressing these challenges will require a combination of policy updates, improved technical implementations, and direct engagement with affected users to create a more inclusive experience.

1. Implement WCAG 2.1 Level AA Compliance. The analysis above indicates that Hugging Face documentation does not yet fully compliant with WCAG 2.1 Level AA standards. Achieving compliance should be a priority to ensure that all users, including those with disabilities, can effectively access the platform's resources. We recommend systematic review and update of all existing content to align with WCAG 2.1 Level AA guidelines, including:

(1) Providing alternative text for all images and multimedia content to support screen reader users.
(2) Ensuring that all interactive elements, such as buttons and dropdowns, are fully accessible via keyboard navigation.
(3) Implementing proper semantic HTML markup to enhance screen reader compatibility.

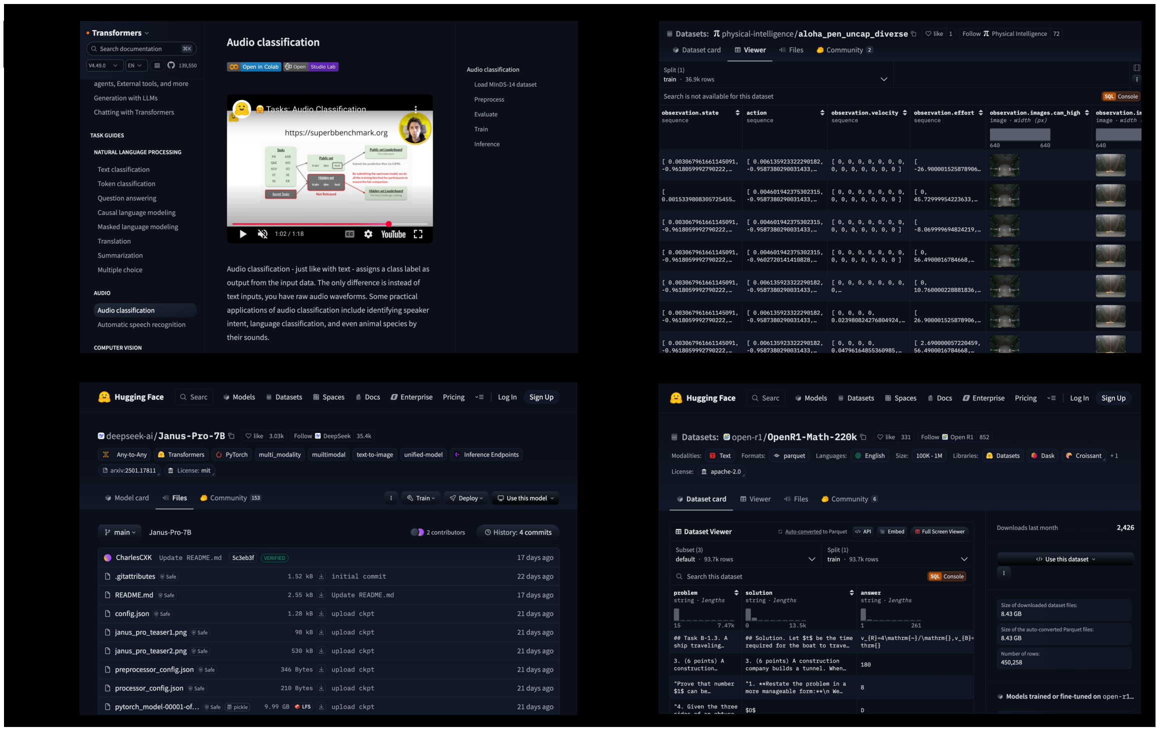

Figure 2: Screenshots of the Hugging Face website illustrating how emerging paradigms for interfacing with state-of-the-art AI tools pose new challenges for accessibility. (a) Documentation containing uncaptioned videos, complex diagrams, and code blocks. (b) A data exploration interface containing many interactive elements. (c) A code exploration interface. (d) A model card interface containing many interactive elements and a wide variety of information.

(4) Improving contrast ratios in text and UI elements to support users with visual impairments.
(5) Enhancing captioning and transcription for video-based educational content to assist users who are deaf or hard of hearing (DHH).

2. Enhance Content Guidelines and Develop Accessibility Documentation. Hugging Face has established content guidelines that primarily focus on various aspects of content moderation (https://huggingface.co/content-guidelines). However, these guidelines lack explicit accessibility considerations. To create a more inclusive experience, we recommend the following measures:

(1) Expanding content guidelines to include explicit accessibility requirements, such as proper use of alternative text (alt text), structured headings, and accessible markdown formatting.
(2) Providing repository owners with clear, detailed documentation on creating accessible content, including step-by-step guides and checklists.
(3) Developing standardized templates for README files, model cards, and dataset descriptions that encourage best practices for accessibility.
(4) Encouraging community contributors to self-audit their content using accessibility testing tools before publishing.

By embedding accessibility principles into content creation workflows, Hugging Face can cultivate a culture of inclusivity, ensuring that all users, regardless of ability, can engage with AI tools and educational resources effectively.

3. Implement Automated Accessibility Testing Tools. To ensure ongoing compliance and accessibility, we recommend integrating automated accessibility testing tools into the development workflow. These tools can help identify and resolve accessibility barriers early in the content creation and UI development cycle. Specifically, we suggest the following steps:

(1) Incorporating automated WCAG compliance checks into the continuous integration (CI) pipeline using tools such as IBM's Equal Access guidelines https://github.com/IBMa/equal-access.
(2) Utilizing browser extensions and developer tools, such as Google Lighthouse and Axe DevTools, to conduct accessibility audits on web pages before deployment.
(3) Performing periodic accessibility audits that combine both automated tools and manual testing to identify issues that only automated tools may overlook.
(4) Providing contributors with a built-in validation tool that flags accessibility concerns when submitting new content.

Thus, proactive accessibility testing will help detect and mitigate issues before they impact users, reducing the need for extensive post-release corrections.

Figure 3: Code blocks in documentation often use syntax highlighting with insufficient contrast between text and background elements.

4. Empower People with Disabilities as Contributors. A key strategy for improving accessibility is to go beyond soliciting feedback and actively include people with disabilities in the creation process. This means not only gathering input from users who rely on accessibility features but also working to empower students with disabilities, researchers, and developers to contribute to AI tools, documentation, and platforms. This approach aligns with Ladner's "design for user empowerment" framework [12], which emphasizes enabling users to shape the technologies they depend on.

Hugging Face can take several steps to ensure meaningful participation and contribution from people with disabilities:

(1) Establishing an accessibility advisory board composed of users with disabilities, accessibility experts, and AI practitioners.
(2) Creating dedicated mentorship and training initiatives to support CS/AI/ML students and researchers with disabilities in becoming active contributors to open-source projects.
(3) Ensuring that accessibility considerations are integrated into developer documentation, so contributors with disabilities can engage with the platform effectively.
(4) Conducting periodic user testing sessions with diverse participants, ensuring that individuals with disabilities are directly involved in the evaluation and improvement of tools.
(5) Hosting accessibility-focused hackathons, research collaborations, and funding opportunities to encourage innovation from contributors with disabilities.

By fostering an inclusive development environment, Hugging Face can ensure that accessibility is not just an afterthought but a core principle shaped by those who need it most. This shift from passive feedback collection to active participation will lead to a more equitable, innovative, and user-driven AI ecosystem.

While many of these recommendations focus on upstream design and policy changes within open-source AI platforms and industry ecosystems, they must be complemented by downstream interventions in educational settings. CS educators, program designers, and instructional support staff can adopt these same accessibility principles when incorporating AI tools into curricula. Equitable AI education requires shared responsibility across the technical and educational stack, from inclusive interface design to inclusive pedagogy.

4 Discussion

The accessibility challenges identified in our case study of Hugging Face reflect broader issues in AI education, highlighting the need for systematic changes across multiple stakeholders in the AI education ecosystem. As AI becomes increasingly central to various academic and professional disciplines, ensuring equitable access to AI educational resources becomes crucial for fostering inclusive educational environments.

Institutional and Industry Responsibilities. The rapid proliferation of AI tools and platforms in educational settings has often outpaced careful consideration of accessibility requirements. Educational institutions, in their eagerness to incorporate cutting-edge AI technologies into their curricula, may inadvertently create barriers for students with disabilities. Implementing formal policies that require AI-related course materials to adhere to accessibility guidelines would promote a standardized approach across departments and programs. These policies should address traditional course materials as well as interactive notebooks, model demonstrations, and technical visualizations. Institutions must also invest in faculty training, support staff, and necessary accommodations to support the development of accessible AI educational content.

Industry partners also play a crucial role in shaping accessible AI education. Companies developing AI tools and platforms should prioritize accessibility in their design processes, recognizing that accessible tools benefit all users through improved usability and clearer documentation. Industry-academic partnerships could provide valuable resources for improving the accessibility of AI educational materials, combining industry expertise in tool development with academic understanding of educational needs.

Community and Professional Standards. While community-driven development can lead to inconsistent accessibility standards, it also offers the potential for collaborative improvement of accessibility features. Open-source platforms should leverage their community structures to systematically address accessibility concerns. This may include implementing accessibility-focused code review processes, appointing dedicated accessibility maintainers, and creating working groups focused on accessibility improvements. The success of similar initiatives in other open-source communities, such as Mozilla's accessibility team, provides valuable models for the AI education ecosystem.

Professional organizations and standards bodies can also play a crucial role in promoting accessible AI education. Organizations such as the Association for Computing Machinery (ACM) and IEEE could develop specific guidelines for accessible AI education, incorporating accessibility requirements into curriculum recommendations and accreditation standards. Such guidelines would provide a unified framework for educational institutions and content creators, ensuring consistency across the field.

Technical and Global Considerations. The global expansion of AI education adds another layer of complexity to accessibility considerations. As AI tools and educational resources spread globally, accessibility guidelines must account for different cultural contexts, languages, and assistive technology ecosystems. This necessitates the development of flexible accessibility guidelines that can be adapted into various cultural and technological contexts while maintaining high standards of accessibility.

Looking forward, the emergence of AI-powered accessibility tools presents promising opportunities for improving access to AI education. Machine learning models could generate alternative text for technical diagrams, create accessible versions of mathematical notation, or provide real-time accessibility improvements to educational content. However, it is crucial that such tools complement, rather than replace, human judgment in accessibility decision-making.

Economic and Long-Term Implications. The economic implications of implementing comprehensive accessibility measures cannot be ignored. While initial investments in accessibility improvements may be substantial, the long-term benefits of inclusive education and broader participation in AI development likely outweigh these costs. Furthermore, proactive implementation of accessibility features often proves more cost-effective than retrofitting existing systems to meet accessibility requirements.

Taken together, these various stakeholders and considerations form an interconnected ecosystem that must work in concert to achieve truly accessible AI education. Success depends not only on technical solutions but also on a cultural shift in how the AI community views and prioritizes accessibility in educational and professional practices.

5 Positionality Statement

As AI researchers, we acknowledge our position in advocating for accessibility in AI education. We bring diverse experiences as researchers, educators, and members of the computing community. Our perspectives are shaped by lived experiences with disability, international and cross-cultural academic trajectories, and engagement in human-centered and accessible computing. We recognize that our positions, within academia and as users and designers of AI technologies, influence how we frame accessibility challenges and the types of solutions we prioritize. This work reflects our commitment to equitable computing education and our belief that accessibility must be addressed not only through technical design but also through structural and pedagogical change. We view this paper as a contribution toward inclusive AI education, grounded in both professional expertise and a broader understanding of systemic barriers faced by marginalized learners.

6 Conclusion

Our analysis of the Hugging Face platform reveals significant accessibility challenges in AI education content and tools while also highlighting opportunities for improvement through technical solutions and community engagement. The recommendations we outlined, ranging from WCAG compliance to community-driven accessibility initiatives, provide a structured framework for enhancing accessibility in AI education platforms. This proposed framework has broader implications for educational institutions, open-source communities, and industry partners as they underscore the need for systematic changes in how accessibility is approached in AI education. Overall, to maintain inclusive educational environments and fostering diverse participation in AI development, our proposed guidelines can be a stepping stone with the scope of further exploration.

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