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AI-BASED ASSESSMENT SYSTEMS IN ELIMINATING GENDER AND ETHNIC BIAS: THE CASE OF UZBEKISTAN UNIVERSITIES

Annotation. *Artificial intelligence (AI) based assessment systems are widely used in education, but gender and ethnic biases can undermine fairness. This article analyzes biases in AI assessment at Uzbekistan universities and proposes fair algorithms. The study is based on surveys and AI model analyses, with results indicating gender and ethnic bias. Recommendations are provided considering ethics and local context.*

Keywords: *AI assessment, gender bias, ethnic bias, fair algorithms, Uzbekistan universities, AI ethics, educational fairness.*

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SUN'IY INTELLEKT ASOSIDAGI BAHOLASH TIZIMLARIDA GENDER VA ETNIK TARAFKASHLIKNI BARTARAF ETISH: O'ZBEKISTON UNIVERSITETLARI MISOLIDA

Annotatsiya. *Sun'iy intellekt (AI) asosidagi baholash tizimlari ta'limda keng qo'llanilmoqda, ammo gender va etnik tarafkashliklar adolatni buzishi mumkin. Ushbu maqola O'zbekiston universitetlarida AI baholashidagi tarafkashliklarni tahlil qiladi va adolatli algoritmlarni taklif etadi. Tadqiqot so'rovlar va AI modellari tahliliga asoslangan bo'lib, natijalar gender va etnik biasni ko'rsatadi. Takliflar etika va mahalliy kontekstni hisobga olgan holda berilgan.*

Kalit so'zlar: *AI baholash, gender tarafkashligi, etnik tarafkashligi, adolatli algoritmlar, O'zbekiston universitetlari, AI etikasi, ta'lim adolati.*

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СИСТЕМЫ ОЦЕНКИ НА ОСНОВЕ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В УСТРАНЕНИИ ГЕНДЕРНОГО И ЭТНИЧЕСКОГО ПРЕДВЗЯТИЯ: СЛУЧАЙ УНИВЕРСИТЕТОВ УЗБЕКИСТАНА

Аннотация. *Системы оценки на основе искусственного интеллекта (ИИ) широко используются в образовании, но гендерные и этнические предвзятости могут подрывать справедливость. В этой статье анализируются предвзятости в оценке ИИ в университетах Узбекистана и предлагаются справедливые алгоритмы. Исследование основано на опросах и анализе моделей ИИ, результаты которого указывают на гендерные и этнические предвзятости. Рекомендации предоставлены с учетом этики и местного контекста.*

Ключевые слова: *оценка ИИ, гендерная предвзятость, этническая предвзятость, справедливые алгоритмы, университеты Узбекистана, этика ИИ, справедливость в образовании.*

Introduction. Artificial intelligence (AI) enhances efficiency in the education sector by automating assessment processes. For example, AI systems quickly evaluate student work and provide individual feedback. However, gender (male-female) and ethnic (national) biases in AI algorithms can exist, disrupting fairness and exacerbating inequalities in education. This issue is new in the field of ethics, particularly unexplored in local contexts like Uzbekistan.

From an ethical perspective, AI assessment systems in education can be examined through the lenses of algorithmic justice, equity, and responsible AI. According to principles of distributive justice, educational technologies should provide equal opportunities and outcomes regardless of gender or ethnicity. However, biased AI systems violate these principles by systematically disadvantaging certain groups. In the Uzbekistani context, where higher education plays a crucial role in social mobility, such biases may reinforce existing structural inequalities rather than reduce them. Moreover, the ethical concept of procedural fairness is particularly relevant. Students must trust that assessment systems are neutral and transparent. When AI-generated grades are perceived as biased - especially against ethnic minorities or women - trust in educational institutions may decline. This highlights the importance of explainable AI (XAI), which allows educators and students to understand how assessment decisions are made.

Uzbekistan's higher education system is characterized by linguistic diversity and multiculturalism, with Uzbek as the state language and Russian widely used in academia. Additionally, ethnic minorities such as Tajik and Kazakh students often use mixed linguistic forms influenced by accent and regional grammar. Most global AI assessment tools are trained primarily on English or Russian datasets, making them poorly adapted to this multilingual environment.

The rapid digitalization of education in Uzbekistan since 2020, accelerated by online learning reforms, has led universities to adopt AI tools faster than ethical guidelines can be developed. As a result, AI systems are often implemented without sufficient local testing, increasing the risk of unintended bias. This study is therefore significant as one of the first empirical investigations addressing AI ethics specifically within the Uzbekistani higher education context.

Methods. The study is based on mixed methods (quantitative and qualitative). Sample: 500 students and 100 teachers from 5 universities in Uzbekistan (TSU, NUzU, SamSU, Ferghana SU, Andijan SU). By gender: 250 female, 250 male; by ethnicity: 60% Uzbek, 20% Russian, 10% Tajik, 10% Kazakh. *Data collection:*

- Survey: Opinions of students and teachers on AI assessment (Likert scale, 1-5 points). - AI model analysis: Testing open-source BERT and GPT-3.5 models in the Uzbekistan context. Training data: 1000 student essays (balanced by gender and ethnicity). *Examples: Analysis of anonymized grades from university databases.*

Analysis: Statistical tests via SPSS (chi-square, ANOVA) and AI fairness metrics (Equalized Odds, Demographic Parity). Ethically: Participant consent obtained, data anonymized. In addition to statistical testing, qualitative interviews with 20 teachers and 30 students were conducted to better understand perceptions of AI fairness. Teachers reported relying heavily on AI-generated scores due to workload pressures, while students expressed concerns about the lack of appeal mechanisms for AI-based grades. The AI model evaluation process also included error analysis, where misclassified or unusually low-scoring essays were manually reviewed. This analysis revealed that essays containing culturally specific examples, local idioms, or non-standard Uzbek grammar were more likely to be penalized by AI systems, despite being academically sound.

Results. Survey results: 65% of students consider AI assessment fair, but women (55%) and ethnic minorities (48%) complained of lower scores. ANOVA analysis showed MSG (Mean Score Gap) of 0.8 points by gender (women lower), 1.2 points by ethnicity (Tajik and Kazakh students lower).

In AI model testing: Standard BERT model showed gender bias in Uzbek-language essays – male students' essays averaged 4.2 points, females 3.7 points. Ethnic bias: Russian-language essays scored higher (4.5), Uzbek (3.9).

Examples: At TSU in the 2025 exam, AI-assessed math assignments gave Kazakh students 15% lower scores because the algorithm did not account for local accents. - At NUzU, gender bias: Female students' essays were rated as "emotional" and received lower scores, while males were "analytical," stemming from stereotypes in training data. In fair algorithm testing: With balanced training data, MSG dropped to 0.2 points, EO metric reached 0.95.

Discussion. The results indicate that gender and ethnic biases in AI assessment are a real problem in Uzbekistan universities. These are new issues in the ethics field, as they have not yet been written about in the local context (Uzbek language, multi-ethnic society). Biases arise from imbalances in training data and algorithm design. The findings of this study have implications beyond Uzbekistan. Many developing and multilingual countries face similar challenges when adopting AI technologies developed in different cultural and linguistic contexts. Without localization, AI systems risk becoming tools of exclusion rather than inclusion. For policymakers, the results suggest the need for national guidelines on AI use in education,

including mandatory bias audits and regular monitoring. For universities, combining AI assessment with human oversight can help mitigate bias while retaining efficiency.

Conclusion and Recommendations: 1) Training with local data (balance of Uzbek, Russian languages). 2) Introduce fairness metrics (EO, DP). 3) Training for teachers. Limitations: Sample only from urban universities, future research should include rural areas. This study contributes to making AI in education fair and opens a new direction in the Uzbekistan context. Overall, this study demonstrates that while AI has strong potential to improve efficiency in educational assessment, unchecked implementation can lead to gender and ethnic bias. By grounding AI development in local data, ethical frameworks, and fairness metrics, Uzbekistani universities can harness AI responsibly. This research not only contributes to the global discussion on AI ethics in education but also lays the foundation for context-aware, fair, and inclusive AI systems in Uzbekistan.

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