Equity, diversity, inclusion, and artificial intelligence: Issues for mathematicians to consider

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Reports have brought considerable attention to and alarm about risks of artificial intelligence – for example, development of biological weaponry, initiation of cyber attacks, override of human control – that can adversely affect all people. But numerous concerns are also raised about adverse effects of AI, whether due to intentionality or carelessness, on some people. These concerns are the basis for our consideration of equity, diversity, and inclusion as AI becomes more prominent in our discipline and our profession.

New research and outreach opportunities for mathematicians.

Fairness and equity in machine learning are subjects of great social concern on an array of matters – predictive policing, hiring and selection algorithms, medical diagnoses, grant or denial of bail, etc. Mathematicians can solve problems and contribute to the discourse around these matters of racial, gender, and other biases that are endemic to or arise in some algorithms.

On the one hand, there is much mathematical research activity in this direction. For example these topics were the basis for a recent semester program at the Simons Laufer Mathematical Sciences Institute (SLMath), where scholars gathered to conduct research on ways to address issues of fairness and equity in the context of machine learning algorithms.

On the other hand, mathematicians also have a role in communicating about these topics to the general public – translating between the mathematical abstractions of algorithms and our day-to-day experience using these tools. An example of such an exposition is the essay “Understanding social media recommendation algorithms” by Narayanan.

Large data sets: ethical issues and equity.

The use of large data sets in the training of large models raises many questions. How was the data obtained? Who controls it, and who can use it?

For example, the work of artists has been used without their permission to train models that produce art; similarly, publicly available mathematical papers are already being used to train models specifically to do mathematics.

Individuals should have agency in how their data and their work is used and made accessible. Repositories of papers, such as the arXiv and the Public Access Repository of the National
Science Foundation, should be encouraged to have transparent policies about these issues so that authors can make informed decisions.

Ethical implications abound regarding data sources upon which AI systems are trained – harvesting, privacy protection, ingrained bias, etc. Usage of these systems may further compound these issues. Ensuring broad and equitable access to such training sets may become an important issue.

Use of large language models for selection and hiring in mathematics.

It seems almost inevitable that large language models will be used, or already are being used, to ease the human burden of very time consuming tasks, like those of finding and evaluating people, including: hiring and promotion; identification of speakers; selection of undergraduates for opportunities; reading applications for graduate schools. This raises both privacy concerns and legal issues (for example, as discussed in this EEOC document; see also an article about admission algorithms at U. Texas and an article evaluating the use of machine learning in graduate school admissions). The possibilities call for thoughtfulness in our evaluation tools, such as the Boyer model of scholarship, for decision making, and in selection of AI systems.

The National Science Foundation adopted a policy in mid-2023 on the use of generative AI in its merit review process. Reviewers are now “prohibited from uploading any content from proposals, review information and related records to non-approved generative AI tools.” A key consideration for the NSF policy is maintaining privacy for proposers, which may not be an issue in other situations.

The AMS should consider implementing appropriate policies or offering recommendations around these issues.

Increasing access to mathematics?

There are specific tasks which may be within, or near, the capability of modern AI that could broaden access to research-level mathematics. For example, automated transcription of mathematical talks, or automated effective translation of mathematical texts between languages. In both cases, it may be helpful to develop tools that are specialized for mathematics, and the AMS may have a role to play in facilitating this.

Artificial intelligence can be expected to affect mathematics instruction, both what is taught and how. As these adaptations are made to instruction, we must do so broadly and equitably so that some students are not left behind from contemporary tools and expectations.