ALGORITHMIC SYSTEMS IN EDUCATION

Incorporating Equity When Using Student Data

February 2021
Introduction to the Training Module

Welcome to the Center for Democracy & Technology’s Algorithmic Systems in Education training. The goal of this training is to equip state and local practitioners to navigate the concerns that arise when using algorithmic systems in an education context.

In this material, we will cover:

- What algorithmic systems are and how they are used in education.
- Some of the potential benefits and harms of using algorithmic systems in education.
- Best practices for using algorithmic systems responsibly and equitably in an education context.
WHAT ARE ALGORITHMIC SYSTEMS?
Algorithmic Systems in Education

What Are Algorithmic Systems?

- Algorithmic systems are tools that rely on algorithms, which are processes performed by a computer to answer a question, make a decision, or carry out a task.

- Algorithmic systems are often used in domains that would traditionally have been handled by humans, such as a dropout early warning system that aims to determine whether a student is off-track academically.

- Tools that use artificial intelligence (AI) or machine learning (ML) are examples of algorithmic systems.
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POTENTIAL BENEFITS AND HARMS OF USING ALGORITHMIC SYSTEMS IN EDUCATION
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Potential Benefits and Harms of Algorithmic Systems

- **Benefits**
  - Algorithmic systems can **improve efficiency** by freeing up educators’ and administrators’ time, allowing them to focus more deeply on the core components of their work.
  - These systems may **catch patterns** that humans may have missed, like determining a student is at risk of falling behind academically before the teacher or parent raises concerns.

- **Harms**
  - Algorithmic systems can result in **unaccountable decisions**. If it is not clear why the system produced a given outcome, parents and students may have difficulty seeking redress if they disagree with the decision.
  - Algorithmic systems may **miss signals** that a human would have noticed. This can result in students not receiving services or interventions they need.
  - The systems may **introduce bias** or **entrench existing biases**. This can result from biased data or bias in the design of the system itself.
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Algorithmic Systems in Education - Headlines

COVID-19 has spurred the development and adoption of algorithmic systems in education, some of which have demonstrated the issues that can arise when these systems are adopted without careful consideration.

UK ditches exam results generated by biased algorithm after student protests

COVID reopening: AI cameras may help businesses, schools maintain social distancing

When Algorithms Give Real Students Imaginary Grades

“UK ditches exam results generated by biased algorithm after student protests” - theVerge.com
“COVID reopening: AI cameras may help businesses, schools maintain social distancing” - abc7ny.com
“When Algorithms Give Real Students Imaginary Grades” - NYTimes.com
USING ALGORITHMIC SYSTEMS RESPONSIBLY AND EQUITABLY IN EDUCATION
Using Algorithmic Systems Responsibly

Building a structure around when, how, and whether algorithmic systems are incorporated into the educational context can help avoid harm to students and families. Some of the steps listed below can help establish that structure.

1. Consider the **effectiveness and potential impacts** of the system.

2. Govern and document **appropriate uses** of algorithmic systems.

3. **Engage stakeholders** early and throughout use.

4. Implement **data governance**.

5. **Examine input data** for bias.

6. Keep **humans in the loop**.

7. Conduct **regular audits**.

8. Create protocols for **accountability and redress**.

9. Ensure **legal compliance**.
Step 1: Consider the Effectiveness and Potential Impacts

Algorithmic systems will not be a good fit for every problem, so the first step is to determine whether an algorithmic system can even accomplish your goal. If so, consider the intended use of the system, and what outcomes you expect from the system.

- What are the risks of harm to students’ well-being and rights?
- What approaches need to be taken to mitigate or protect against that harm?
- Document any mitigation or protection approaches, and ensure that those approaches are maintained for as long as the system is in use.
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Step 2: Govern and Document Appropriate Uses of the System

Many algorithmic systems are only effective in the specific domain they were designed for.

- Avoid inaccurate or harmful results by ensuring the system is only used in the context for which it was developed.

- Document the intended use context to ensure that future managers and users of the system have the information they need to use the system safely.

- For vendor-provided systems, get information from the vendor about what contexts the system is designed to operate in and what its limitations are, and incorporate that information into your documentation.
Step 3: Engage Stakeholders Early and Throughout Use

Engaging stakeholders will help ensure any concerns about the system are raised and addressed before the system is put into use.

- Stakeholders should include users and managers of the system like teachers and administrators, as well as people whose data will be used, such as students and families.

- Ensure that stakeholder engagement is as easy as possible by offering information in all the necessary languages and through multiple channels (such as online and on paper).
Step 4: Implement Data Governance

Algorithmic systems typically consume and produce lots of data, such as the grades consumed by a dropout early warning system, or the assessment the system produces for a given student. All of this data can pose risks to students.

- Incorporate any data involved in the systems into planning and governance of the system, just like human-produced data.

- The governance plan should include limits on when and how the data is used, how long it will be kept before it is deleted or archived, and who has access to it.

- For systems from a vendor, data governance should also extend to vendor use of any data, and those restrictions should be clearly laid out in any vendor agreements.
Step 5: Examine Input Data for Bias

Ensure that any training data used to develop the system, or any data used by the system for decision-making, is evaluated for bias, since using biased or non-representative data will produce biased results.

- Data should be examined to see if there are differences in the data that might cause the system to reproduce biases.

- For instance, does the data show disproportionately more white students in enrichment programs than students of color? This data may be unsuitable for training a system to identify promising students for enrichment programs, since it may inadvertently “learn” that whiteness is a quality that makes a student a better candidate for these programs.

- An algorithmic tool can misinterpret correlation for causation. Make sure patterns in the data won’t inadvertently cause the tool to draw conclusions that aren’t accurate, or that perpetuate existing inequalities in your programs.

- For systems acquired from a vendor, ask them about their training data, and what they did to ensure that it was unbiased, representative, and appropriate for the task at hand. If they do not have a good answer, or do not think that bias in data is a concern for algorithmic systems, consider seeking out a different vendor.
Step 6: Keep Humans in the Loop

Keeping humans involved in algorithm-driven decision processes can help maintain nuance in decision-making when it is needed, and provide a channel for accountability.

- Make sure there are people who have the ability and expertise to view and understand the system’s decisions. For vendor systems, ensure that the school has continued access to system expertise through the vendor for as long as the system is in use.

- Ensure that decision-makers using the tools receive update-to-date training about how the tool works, and what context they need to understand its recommendations.

- Teach decision-makers who may use these tools to understand their limitations: for example, to understand that a “red flag” on a student’s record may not tell the whole story. Humans have been shown to overly defer to machine-generated decisions, in a phenomenon called “automation bias.” Train your decision-makers to know about this and avoid it.

- Where necessary, have a process for a human override of the system.
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Step 7: Conduct Regular Audits

Because many algorithmic systems evolve over time, as does the data that they use, it is important to audit the system regularly.

- Audit for bias to ensure the system is not causing disparate impacts on vulnerable populations.
- Audit for accuracy to ensure the system is behaving as expected and producing correct and useful results.
- For vendor systems, request to see results of any bias audits they conduct internally (in addition to performing your own audits on decisions you receive from the system).
Step 8: Create Protocols for Accountability and Redress

Because students will be affected by algorithmic systems, it is important to have structures in place for students to seek redress if they feel a decision is unfair or wrong.

- Ensure that there is a human who is ultimately responsible for the system’s decision and has the ability to alter the decision if necessary.
- If the system is provided by a vendor, there should still be an accountability chain within the school for parents and families to engage with.
- Accountability structures should be accessible to students and families. They should be simple to find and use and should not raise barriers like financial costs or excessive time on families’ part.
Step 9: Ensure Legal Compliance

Of course, systems will need to comply with any applicable laws. Discuss these systems with your legal counsel before deploying them.

- Relevant laws may include the Family Educational Rights and Privacy Act (FERPA), the Children's Online Privacy Protection Act (COPPA), civil rights law such as Title VI, Title IX, and the Americans with Disabilities Act (ADA), and state student privacy laws.

- When considering the legal implications, the data consumed and produced by the system should be considered as well.
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WRAP-UP
Wrap-Up

Thank you for participating in this training. We hope that this is helpful in providing an overview of the importance of equitable and accurate algorithmic systems and the steps that you can take to ensure you use algorithmic systems responsibly.

To help build on this training, we’ve included resources from organizations working to make algorithmic systems more equitable and accurate.

Please send us feedback on how we can improve this training and feel free to reach out with additional questions.
Resources for Using Algorithms Responsibly


- **Engaging Stakeholders and Assessing an AI system**: The AI Now Institute offers a framework for engaging public comment during the process of building or procuring an algorithmic system [https://ainowinstitute.org/aiareport2018.pdf](https://ainowinstitute.org/aiareport2018.pdf)

- **Data Governance**: NCES has an issue brief discussing the value of data governance and providing tips and resources about implementing a governance program [https://nces.grads360.org/services/PDCService.svc/GetPDCDocumentFile?fileId=28771](https://nces.grads360.org/services/PDCService.svc/GetPDCDocumentFile?fileId=28771)

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CDT’s Student Privacy Project

• Provide **balanced advocacy** that promotes the responsible use of data and technology while protecting the privacy rights of students and their families.

• Create **solutions-oriented policy resources** that are grounded in the problems that currently confront education practitioners and technology providers who work with them.

• Offer **technical guidance** that can be adapted and implemented by education practitioners and the technology providers who support them.

Contact Us

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