

Algorithmic foundations and ethics in AI: from theory to practice course

Toolkit for synchronous sessions

CU4 | Data fairness and bias
Case study

Case study



Case study

Description for trainers

	Description	Comments
Task description	This session aims to help students understand the fundamentals of privacy and convenience, especially in daily life activities such as smart home devices, mobile apps, and online shopping. It will involve interactive discussions, reflections, and activities to reinforce the learning.	
Description of how to do the task	Present the case study.	See the instructions and guidelines on the next pages.
Estimated time to do the task	30-40 minutes.	
Suggestion of sources for doing the task	Web search on incidents related to privacy breach or data leaks.	
Detailed description of how to deliver the task	Group discussion + Google forms.	Please see the suggested questions for Google forms in the document: CU4_CaseStudy_Tentative_questions_for_google_forms.docx
Information on the deadline for the task delivery	During the synchronous session.	
Contact information or how to clarify doubts	The teacher must provide a form of contact (it could be an email address, a telephone number...)	

Case study

Fictional case for students

Case Study: AI fairness and bias in educational systems

A large public school district implemented an AI-driven tool to help with student assessments, which included predicting student performance, identifying students who might need additional help, and even contributing to decisions about college admissions. The tool analyzed a wide range of data, including past academic performance, attendance records, socio-economic background, and extracurricular involvement.

After a year of implementation, it was discovered that the AI system disproportionately flagged students from certain demographic backgrounds (e.g., students from lower socio-economic status or certain racial and ethnic minorities) as being at risk of underperformance, even when their actual performance was on par with or better than their peers. These students were often recommended for remedial programs or denied opportunities for advanced courses and extracurricular activities, which had long-term implications for their academic trajectories and college admissions prospects.

Discussion Points

- Should the benefits of AI in education outweigh the risks of bias? How do we find the right balance?
- How does data bias affect AI outcomes for students? What steps can schools take to reduce bias?
- Why is it crucial for AI decisions in education to be transparent? How can schools make AI more understandable?
- Should human educators always have the final say in AI-driven decisions? What are the risks of full automation?



IMAGE SOURCE
<https://plat.ai/blog/bias-and-fairness-in-ai-algorithms/>

Case study

Tips for teacher

AI has increasingly permeated the education sector, from personalized learning platforms to admission systems and student assessments. While AI has the potential to enhance educational outcomes, there are growing concerns about fairness and bias, especially in relation to how these technologies impact young people and students. This case study will explore a scenario where an AI-driven system in an educational context was found to be biased, the consequences of this bias, and the steps taken to address it.

1

Key Issues

- **Data bias:** the AI system was trained on historical data that reflected existing biases in the education system, such as the overrepresentation of certain demographics in remedial programs.
- **Lack of transparency:** teachers and administrators could not understand or challenge the AI's recommendations because the decision-making process was opaque.
- **Impact on students:** students who were wrongly assessed as underperforming faced stigmatization and missed opportunities for growth, affecting their confidence and prospects.
- **Ethical concerns:** the use of biased AI systems raised ethical questions about fairness, equality of opportunity, and the responsibility of educational institutions.

2

Actions taken

Once the bias was identified, the school district took the following steps:

- **Audit and retrain the model:** the AI system was audited to identify and remove biased data and retrain the model with a more balanced dataset that better reflected the diverse student population.
- **Human oversight:** human educators were reintroduced into the decision-making loop, with the AI system providing recommendations rather than determinations. This allowed teachers to use their judgment and knowledge of students to make final decisions.
- **Transparency and explainability:** the school district worked with AI experts to improve the transparency of the AI system, ensuring that teachers and administrators could understand how decisions were made and providing students and parents with explanations for assessments and recommendations.
- **Continuous monitoring:** a system was established for ongoing monitoring of the AI's performance to ensure that biases did not re-emerge, and that the system continued to serve all students fairly.

Conclusion

The retrained AI system, combined with human oversight, significantly reduced the number of students being unfairly categorized. Over time, this led to more equitable educational outcomes, with more students being allowed to excel. The case also sparked a broader conversation within the district about the responsible use of AI in education and the importance of fairness and transparency in algorithmic decision-making.

Case study

Instructor's guide for teaching case study

Objective

This session aims to help students understand the fundamentals of privacy and convenience, especially in daily life activities such as smart home devices, mobile apps, and online shopping. It will involve interactive discussions, reflections, and activities to reinforce the learning.

General tips for teachers

- **Engage students:** keep the session interactive and encourage participation.
- **Relate to real life:** use real-life examples and scenarios students can relate to.
- **Be adaptive:** adjust the session based on students' responses and engagement levels.
- **Encourage critical thinking:** prompt students to think critically about the trade-offs between privacy and convenience.
- **Stay updated:** keep yourself informed about the latest trends and issues in privacy and technology (latest incident)

Case study

Instructor's guide for teaching case study

1 Preparation

- Materials needed:
 - Presentation slides with the case study
 - Handouts of case study scenarios
 - Google Forms link with activity/assessment questions
- Setup:
 - Arrange seating to facilitate group discussions.
 - Share the Google Forms link with the students before/during the session starts.

2 Session Outline

- Explain the session's objective: to explore how technology impacts our privacy and how we can balance convenience with privacy protection.
- Icebreaker: ask students to share one piece of technology they use daily and how it makes their lives easier.
- Present the Case Study and discuss the convenience and the privacy issues faced.
- Explain John's experience with personalized shopping and targeted ads, and the privacy concerns it raised.
- Split students into small groups of 3-4 and ask each group to identify the main privacy concerns in the assigned case study.
 - Have them discuss potential solutions or actions to mitigate these privacy risks.
 - Encourage them to think about the balance between convenience and privacy.
- Share the Google Forms link with the students.
 - Have students complete the questions individually or in pairs.
 - Questions will include fill in the blank, multiple choice, multiple correct answers, and self-reflection prompts.
- Scenario-based discussions:
 - Present short scenarios and ask students to reflect on what they would do.
 - Examples: "What steps would you take if you found out your smart device was listening to private conversations?" or "How would you handle a data breach notification from a fitness app you use?"

Case study

Instructor's guide for teaching case study

3

Reflection and Conclusion

- **Self-reflection**

- Ask students to write a short paragraph on how they can balance privacy and convenience in their daily lives.

- **Key takeaways**

- Summarize the main points discussed during the session.
- Emphasize the importance of protecting privacy while enjoying technological conveniences.

THANK YOU

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