# Ethical Considerations

## Learning Analytics Section

# Agenda

- Attendance Check (Remember to check your attendance on EdX)
- Brainstorming
- Discussion 1: Platform design
- Discussion 2: Policy design
- Discussion 3: Algorithmic fairness
- Your first group project

# Brainstorming

- **Step 1.** Let's suppose you are an IT technician at Cornell. What kinds of student data do you collect and why?
    - Make a list of the data. Come up with as many as possible in your group!
- **Step 2.** What issues or concerns might emerge?

# Brainstorming

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    - Make a list of the data. Come up with as many as possible in your group!

- **Step 2.** What issues or concerns might emerge?

- Register data (Socio-demographic information)
- Transcript data (Grades, behavioral data)
- Canvas (Clickstream, web traffic)
- Health system, wifi  system, room access, etc
- Digital service (Gmail, google doc, etc)

# Brainstorming

- **Step 1.** Let's suppose you are an IT technician at Cornell. What kinds of student data do you collect and why?
  - Make a list of the data. Come up with as many as possible in your group!
- **Step 2.** What issues or concerns might emerge?

- **Information that is not available through a single dataset can be revealed by combining datasets.**
- **The potential for benefits & insights V.S. The potential of risks and violations.**

# Let's Discuss - Is this ethically designed?

## [Case 1] Platform Design:  Equality vs Equity

An edtech company is developing a math tutoring platform. Students will get practice questions from the platform. Some students have more prior knowledge, some don't. How should you design the tool for that?

**What questions should the tool be giving to students? Should they be different or the same?**

Split your group into half and pick each side. Discuss potential issues and concerns to strengthen your side. To do so, feel free to discuss from diverse stakeholders perspectives (e.g. students, instructors, developers, etc)

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**What questions should the tool be giving to students? Should they be different or the same?**

### Equality

Scalability, consistency, simplicity
Fairness in resource accessibility
Reducing potential negative bias
Self-reliance and independency

### Equity

Acknowledging diverse learning needs
Fairness in achieving learning outcome
(Closing achievement gaps)
Personalized support

# Let's Discuss - Is this ethically designed?

## [Case 2] Policy Design:  Academic integrity vs Too Much Surveillance

**A class is considering to adopt a ChatGPT detection algorithm when grading students' essay assignments. Should the class adopt the detection algorithm or not? What potential concerns and issues can emerge from the decision?**

Split your group into half and pick each side. Discuss potential issues and concerns to strengthen your side. To do so, feel free to discuss from diverse stakeholders perspectives (e.g. students, instructors, etc)

# Let's Discuss - Is this ethically designed?

## [Case 2] Policy Design:  Academic integrity vs Too Much Surveillance

**A class is considering to adopt a ChatGPT detection algorithm when grading students' essay assignments. Should the class adopt the detection algorithm or not? What potential concerns and issues can emerge from the decision?**

### Academic integrity

Necessity in the digital age
Prevents from committing acts of academic dishonesty (e.g. plagiarism)
Advanced technology enables less intrusive and more sophisticated methods to respect privacy while ensuring academic integrity - optimistic!

### Too Much Surveillance

Stress and anxiety
Privacy concerns
Trust between educators and students: a culture of integrity is more effective than policing behaviors
Potential bias or technical glitches could unfairly penalize honest students

# Any questions?


**There is no right or wrong answer for these discussion topics!**
**It's always context dependent.**

**Depending on what kind of stakeholders you are, the standpoint can be changed**

# Let's Discuss - Algorithmic Fairness

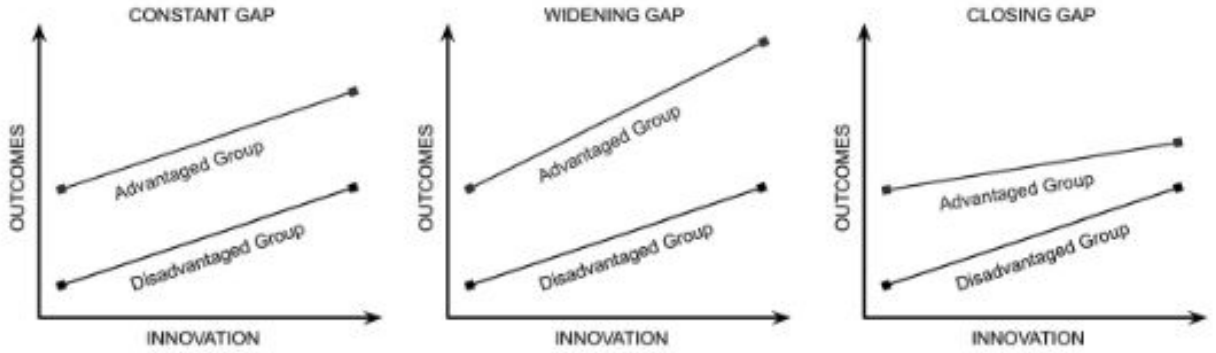


*Figure 7.1* Stylized representations of how a generally beneficial innovation can influence outcomes for members of an advantaged group and a disadvantaged group

**What could be the advantaged and disadvantaged groups in education?**

differential treatment and cues alluding to their abilities.

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**P06 (PhD candidate): "If a tutoring algorithm systematically underestimates female students' mastery levels and provides them with instructional sequences or feedback messages for struggling students, some female students might question their own abilities which could decrease their motivation. Eventually this might lead to a self-fulfilling prophecy."**

# Think, Pair, Share:  Algorithmic Fairness

## Assessment Scenario

INFO4100/5101  Learning Analytics class adopted an AI-driven grading system to grade students' assignments. We want to analyze if our algorithm is fairly grading.

Considering algorithmic fairness often starts from **defining groups of interest**. What kind of group membership can be addressed to measure algorithmic fairness?

**Discuss with your group members and list at least 5 types of group.**

# Think, Pair, Share - Algorithmic Fairness

**Protected groups**
**(under U.S. federal law)**

- Race/ethnicity
- Sex
- Age
- Disability
- Religion
- Sexual orientation
- Gender identity
- Genetic characteristics
- Marital status, etc

# Think, Pair, Share - Algorithmic Fairness

**Protected groups**
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+

**Additional groups**
**for education context**

- Socio-economic Status (SES)
- Immigration Status
- First-Generation College Status
- English as Second Language (ESL)
- Dialects, accents
- Fast/slow learner
- Reading ability
- And many more

# Discussion - Measuring Algorithmic Fairness

Let's suppose the grading system gives us binary values, GOOD or BAD

To measure algorithmic fairness, understanding the concepts of FP and FN is important!

| | | Model's Prediction $\hat{y} = 1$ | Model's Prediction $\hat{y} = 0$ |
|---|---|---|---|
| True Value | y=1 | True Positive | **False Positive** |
| True Value | y=0 | **False Negative** | True Negative |

- **False Positive**: The system classified as BAD but actually GOOD
- **False Negative**: The system classified as GOOD but actually it's BAD

**Which one is more important? and Why? Discuss with your group members :)**

# First Group Project

- Prepare your first group project for the remaining time
- Take a look at the next week's readings "How Learning Works"
- Pick a chapter and start brainstorming to create slides

# Remaining questions?

For those who didn’t have a group let me know!

# Discussion

- Brainstorm
  - Q: What kinds of student data does Cornell collect from you?
  - Make a list of the data. Come up with as many as possible in your group!

  Registrar system, transcript data, course enrollment records, ...
  learning management system, health system, digital service, ...
- How does it make you feel? (Take in mind different stakeholders: students, researchers, institutional leaders)
- **Information that is not available through a single dataset can be revealed by combining datasets.**
- **The potential for benefits & insights V.S. The potential of risks and violations.**

# Discussion

- Case Discussion: In face of the Pandemic, you, as leader of a learning analytics team, are asked by an institution to develop a “cheating prevention” system for exams.
- Split your group into half. Half the group play the role as the leader of a learning analytics team. Talk about the types of data you want to collect in this case. Half the group play the role as the student. Talk about how you feel about these data being collected.

- **Data and systems are embedded with values and ideologies.**

# R Practice

Use the asm dataset from last week's homework. Suppose an instructor hired you as a learning analytics scientist.

She would like to know: Do students spend more time on each attempt of a question when they got a question right on the first attempt compared to when they did not? What statistics and illustrations can you show her?

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Compute the average time that a student spent on each attempt of a question respectively for questions that were answered correctly on the first attempt and questions that were not.

# R Practice

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```
asm %>%
  filter(attempts > 0) %>%
  mutate(seconds_attempt = seconds/attempts) %>%
  group_by(correctonfirstattempt) %>%
  summarise(
    mean_seconds_attempt = mean(seconds_attempt)
  )
```

A tibble: 2 × 2

| correctonfirstattempt <int> | mean_seconds_attempt <dbl> |
|---|---|
| 0 | 35.23991 |
| 1 | 32.98322 |

# R Practice

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She would like to know: Do students spend more time on each attempt of a question when they got a question right on the first attempt compared to when they did not? What statistics and illustrations can you show her?

Draw a boxplot that compares the distribution of time spent on attempts for questions that students got right on the first attempt and questions that students did not get right on the first attempt.

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Draw a boxplot that compa
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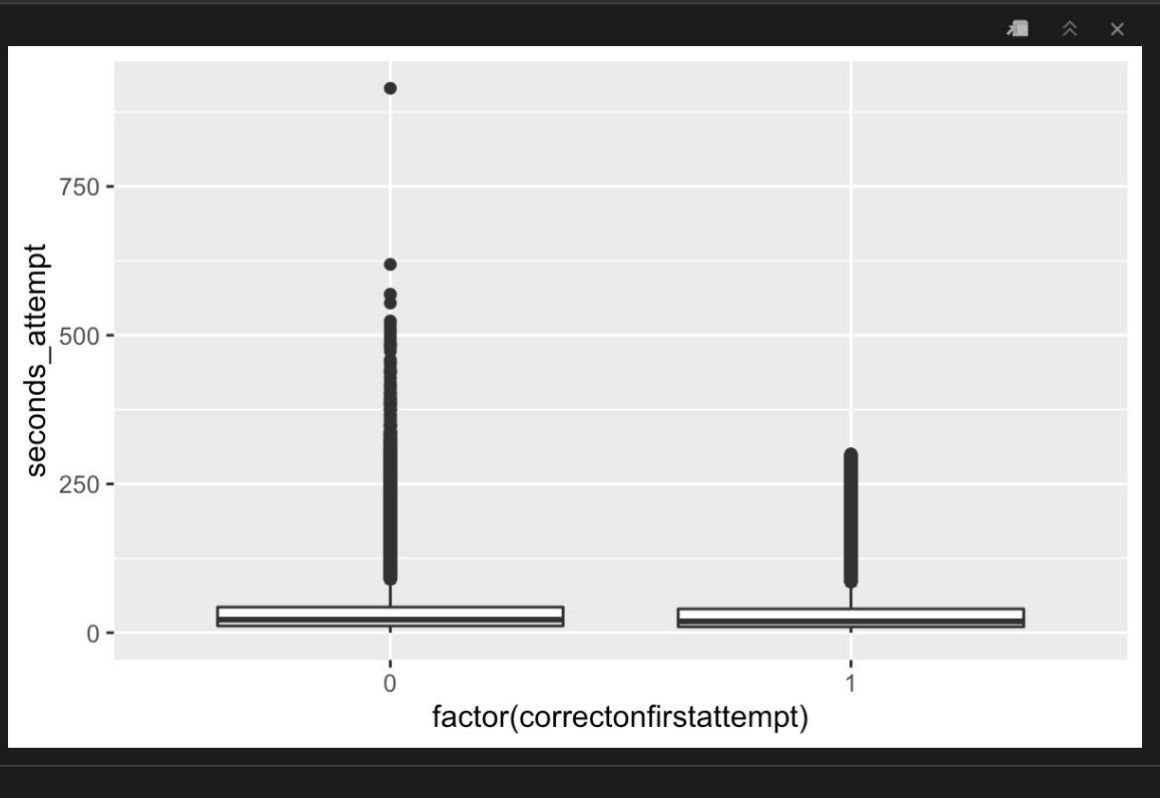
```
asm %>%
  filter(attempts > 0) %>%
  mutate(seconds_attempt = seconds/attempts) %>%
  ggplot() +
    geom_boxplot(aes(x = factor(correctonfirstattempt), y = seconds_attempt))
```

```
```



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Now, suppose that you believe whether students ask for hints in a question is also related to the time that students spend on each attempt of a question. How would you add this comparison (asking for hints vs not asking for hints in a question) to the original comparison (correct on first attempt vs not correct on first attempt) in the box plot?

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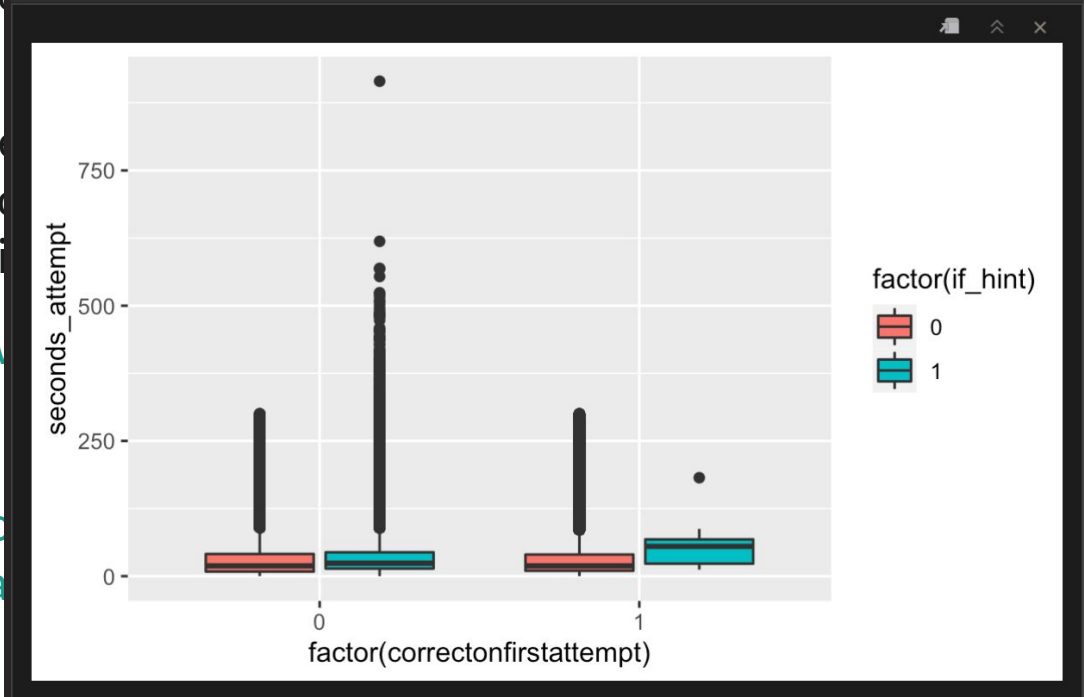
```
asm %>%
  filter(attempts > 0) %>%
  mutate(
    seconds_attempt = seconds/attempts,
    if_hint = if_else(hints > 0, 1, 0)
    ) %>%
  ggplot() +
    geom_boxplot(aes(x = factor(correctonfirstattempt), y = seconds_attempt,
fill = factor(if_hint)))

```



# R Practice

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How would you interpret this plot? How would you make the boxplot more readable?

```
asm %>%
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  ggplot() +
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fill = factor(if_hint)))

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