# Beyond the Black Box

An Introduction to Algorithm Literacy and Classroom Considerations

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# Territorial Acknowledgement

"Colonization continues today through the appropriation and improper use of Indigenous knowledges, data, and intellectual property"

"Digital colonization through processes such as data mining without contextual understanding of each community can result in bias and harm a community"

The Canadian Institute for Advanced Research. (2025). I*ndigenous Data Sovereignty*. Indigenous Perspectives in AI – Post Graduate. https://cifar.ca/cifarnews/2024/06/18/indigenous-perspectives-in-ai/#topskipToContent

# A.I. Disclosure Statement

I do my best to use GenAI intentionally, sparingly, and critically, due to its environmental impacts, potential biases, and missteps. However, GenAI can be a wonderfully helpful tool, especially for neurodivergent folks like me, so I'd like to be transparent in my usage. Here are some of the ways I used GenAI to help shape this workshop:

- Preliminary outline generation
- Creating plain language definitions and examples
- Editing of my script
- Activity ideas

# Introduction

- Britt Dzioba, L&T Advisor, BCcampus
- She/her
- Why am I interested in this topic?
  - Digital literacy enthusiast
  - Social media skeptic
  - Former Project Coordinator at Digital Tattoo Project – UBC

# Overview

- What are algorithms
- Why algorithmic literacy matters
- Algorithmic bias
- Discussion
- Break
- Classroom considerations
- Activity: Survival of the Best Fit
- Discussion
- Wrap-up

# Padlet

- Contribute to the Padlet at any time!

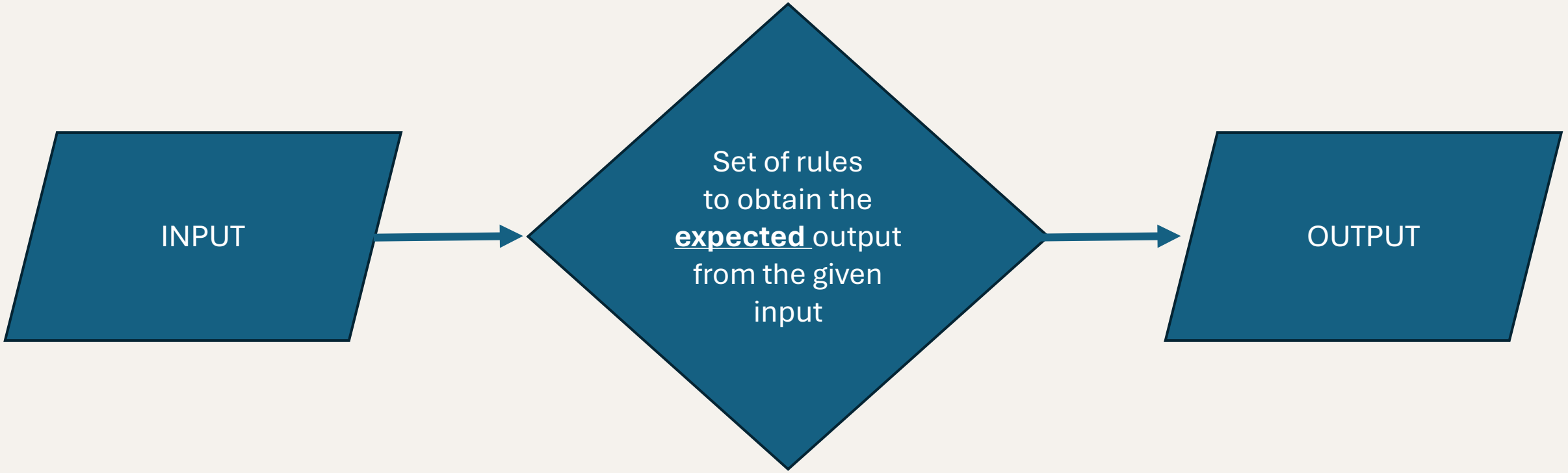
- If you do not want to join the breakout activities, please feel free to quietly reflect and use the Padlet to share some musing/questions if you wish

# What is an Algorithm?

- Simply put: A Recipe!

- Step-by-step procedures or rules designed to accomplish tasks or solve problems

- Not always done on a computer
  - i.e. writing out and solving a long division equation by hand


INPUT
Set of rules
to obtain the
**expected** output
from the given
input
OUTPUT

# Where Do We Find Algorithms?

- Everywhere and anywhere!
  - GPS, Google search results, facial recognition on your phone, YouTube/Netflix/Spotify recommendations, traffic lights, making a sandwich, chat bots

- ChatGPT/Claude/CoPilot
  - Examples of programs that use machine learning algorithms

# Question:

Where are algorithms most prominent in your daily life?

Menti: **4431 7918**

# Machine Learning

- Computer systems learn patterns from data without being explicitly programmed. Instead of following specific instructions, these systems identify patterns and make decisions based on examples, improving their performance over time as they're exposed to more data
    - **Example**: CAPTCHA (Completely Automated Public Turing Test to tell Computers and Humans Apart)
- In simpler terms, rather than a programmer writing detailed rules for every situation, machine learning algorithms figure out the rules themselves by analyzing data and finding patterns

https://mitsloan.mit.edu/ideas-made-to-matter/machine-learning-explained

# Machine Learning

1. **Supervised Learning** = Task driven, trained on a data set

-Commonly used in fraud detection, weather analysis, risk assessment

**2. Unsupervised Learning** = Data driven, draws inferences from unlabeled datasets

-Pattern recognition and predictive modelling
-Recommendation systems (“Customers who bought this also bought…”)

3**. Reinforcement Learning** = Feedback driven

-Video games, programming robots to mimic human behaviour, when ChatGPT asks you to rate answer

https://www.ibm.com/think/topics/machine-learning-types

# Data and Algorithms

"Surveillance capitalism unilaterally claims human experience as free raw material for translation into behavioural data"

- Shoshana Zuboff, *The Age of Surveillance Capitalism*

- We are the product – our behaviour shapes the data
- Our lives become data points for the sake of other's control over us

# The "Black Box" Problem

- If Machine Learning is reliant on mass amounts of data, how do we know where it's pulling its data from?

- "[Disclosure policies] might be impossible, even for systems that seem relatively simple on the surface, such as the apps and websites that use deep learning to serve ads or recommend songs. The computers that run those services have programmed themselves, and they have done it in ways we cannot understand. Even the engineers who build these apps cannot fully explain their behavior"

https://www.technologyreview.com/2017/04/11/5113/the-dark-secret-at-the-heart-of-ai/

# Algorithmic Literacy Definition

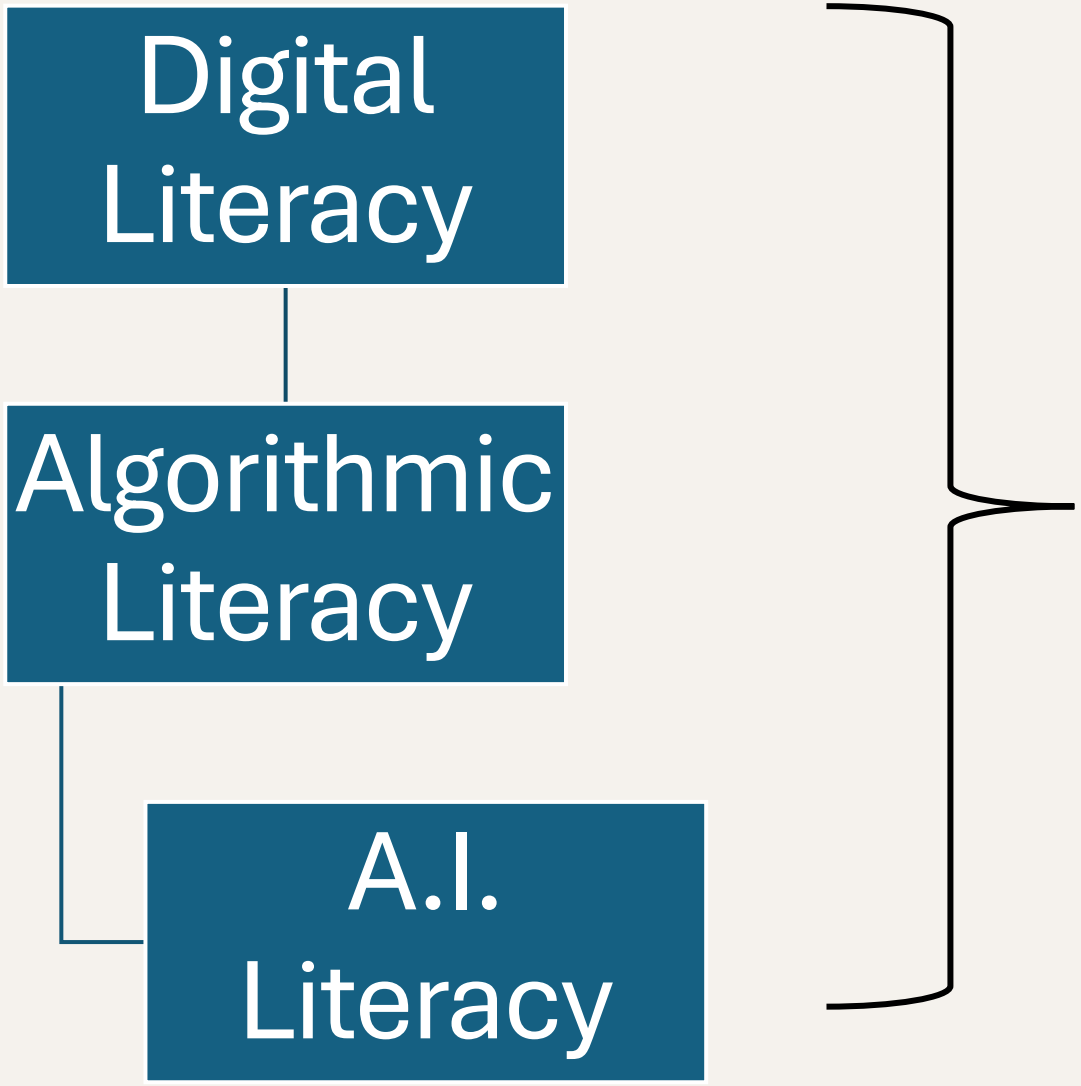
"Being **aware** of the use of algorithms in online applications, platforms, and services, **knowing** how algorithms work, being able to **critically evaluate** algorithmic decision-making as well as having the **skills to cope** with or even influence algorithmic operations."

Dogruel, L., Masur, P., & Joeckel, S. (2021). Development and validation of an algorithm literacy scale for internet users. Communication Methods and Measures, 16(2), 115–133. https://doi.org/10.1080/19312458.2021.1968361

# Algorithmic Literacy

| | |
|---|---|
| **L1:Awareness and Knowledge** | Define algorithms, general knowledge of their existence |
| **L2:Critical Evaluation** | Assess and analyse algorithmic output, understanding of algorithmic bias and digital echo chambers |
| **L3:Coping Strategies** | Protect oneself from harms of algorithms/data harvesting, as best as possible |
| **L4:Creation & Design Skills** | Creative engagement with algorithms, creation of algorithms |

# Digital Literacy, Algorithmic Literacy, A.I. Literacy




- All critical literacies for fostering effective digital citizenship
- All require more than just using tools – critical and creative engagement, analysis, and understanding of tools

# Algorithmic Bias

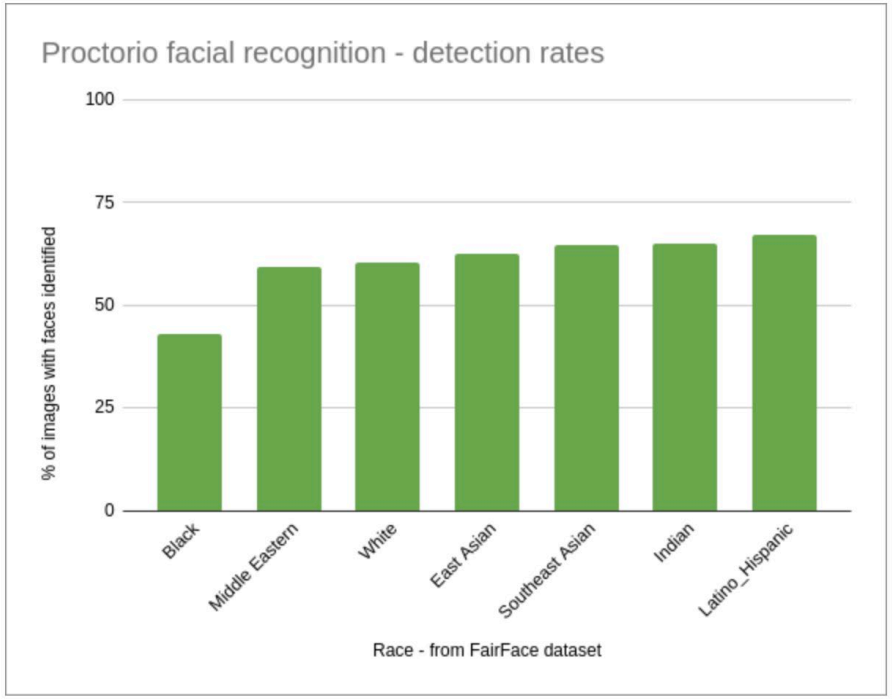
https://www.youtube.com/watch?v=162VzSzzoPs&t=2s

# Algorithmic Bias

## Proctorio's facial recognition is racist.

18 March 2021

Also, it kind of sucks in general.




TECH

## Students of color are getting flagged to their teachers because testing software can't see them

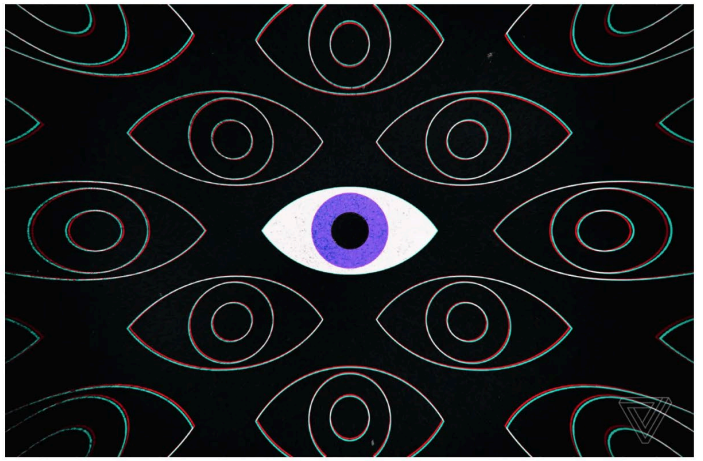


Illustration by Alex Castro / The Verge

/ Proctorio reportedly uses facial detection software that failed to recognize black faces over half the time

by Mitchell Clark
Apr 8, 2021, 5:34 PM PDT

0 Comments

https://www.theverge.com/2021/4/8/22374386/proctorio-racial-bias-issues-opencv-facial-detection-schools-tests-remote-learning

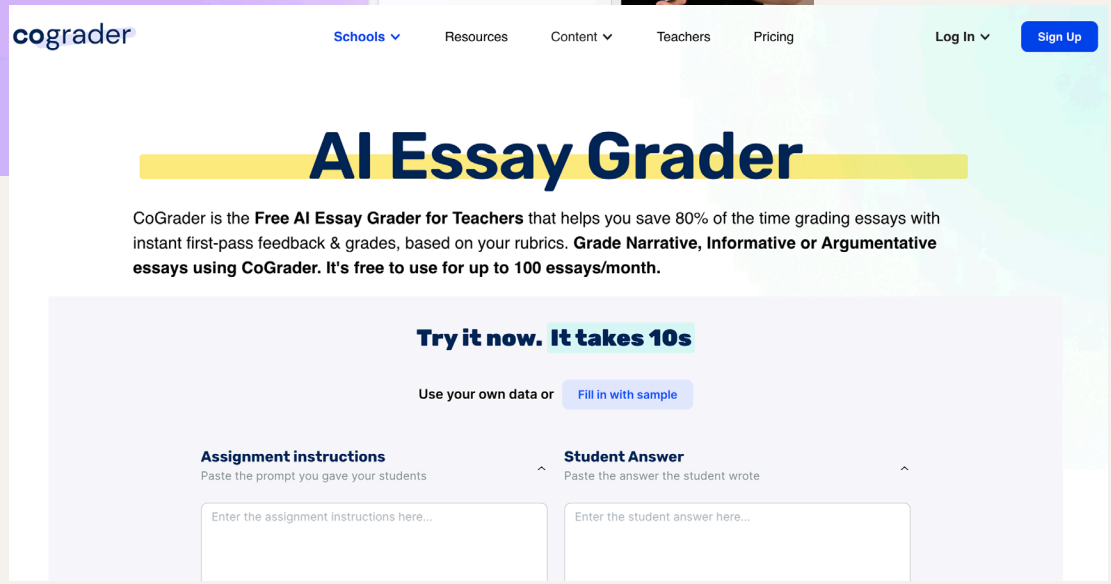
Lucy Satheesan: https://proctor.ninja/proctorios-facial-recognition-is-racist

# Algorithmic Bias

- Algorithms are not neutral, magic, or without error

- Informed by the data they draw input from
  - Self-perpetuating cycle: biased data input created biased output, that output is then used as input somewhere else, etc.

# Algorithmic Bias


- What issues could you see arising with these types of technologies, particularly around bias?

# Why Algorithmic Literacy Matters

- Informed digital citizenship – own our privacy, hold system accountable
- Moving from consumer to creator (or informed, critical consumer)
- Respond to the complex, rapidly-changing digital landscape
- Improved algorithmic literacy = improved digital literacy
  - Job-ready skillset

# 10-minute break!

# Classroom Considerations

1. Start with the "why"
2. Layer the learning
3. Focus on the ethics
    - Critical Questioning Framework
4. Discipline-specific examples

# Classroom Considerations

## 1. Start with the "why"

- Connect algorithms to daily life: GPS navigation, social media feeds, online shopping recommendations, etc.

- Discuss how algorithms influence decisions in society—bias in algorithms, data privacy, etc.

# Classroom Considerations

## 2. Layer the learning

**Level 1**: What is an algorithm? (Define + real-world examples)

**Level 2**: How do they influence our lives? (Experiment, compare results, show evidence of bias)

**Level 3**: How do we cope and create?

# Classroom Considerations

## 3. Ethics

- Related to Level 2 on last slide
- Algorithmic bias in research search engine results

Critical Questioning Framework:

- Who created this algorithm and for what purpose?
- What data was used to train it?
- Who benefits and who might be harmed?
- What values are encoded in its design?
- What alternatives exist?

# Classroom Considerations

## 4. Discipline-specific examples

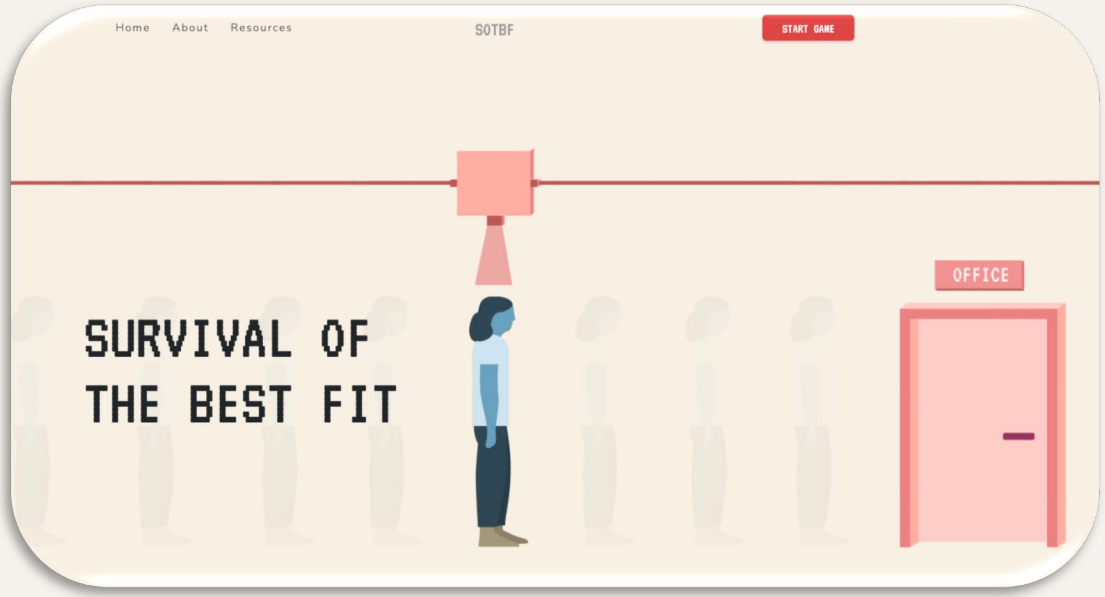
**1. Social Sciences Example:**
•Analyze predictive policing algorithms or facial recognition tools in the context of systemic bias and surveillance.
**Class Activity:**
•Compare arrest rate data with algorithmic policing heatmaps. Ask students to assess how bias in data affects outcomes and reinforces stereotypes.

**2. Media & Communications**
**Example:**
•Explore how recommendation algorithms on platforms like Goodreads or Netflix shape cultural consumption and reinforce dominant narratives.
**Class Activity:**
•Compare recommended reading lists for different user profiles. Reflect on what perspectives are prioritized or missing.

**3. Business & Marketing**
**Example:**
•Study algorithmic pricing, targeted advertising, or credit scoring systems.
**Class Activity:**
•Run a simulation where students create mock ad campaigns and tweak demographics to see how algorithmic ad targeting responds.

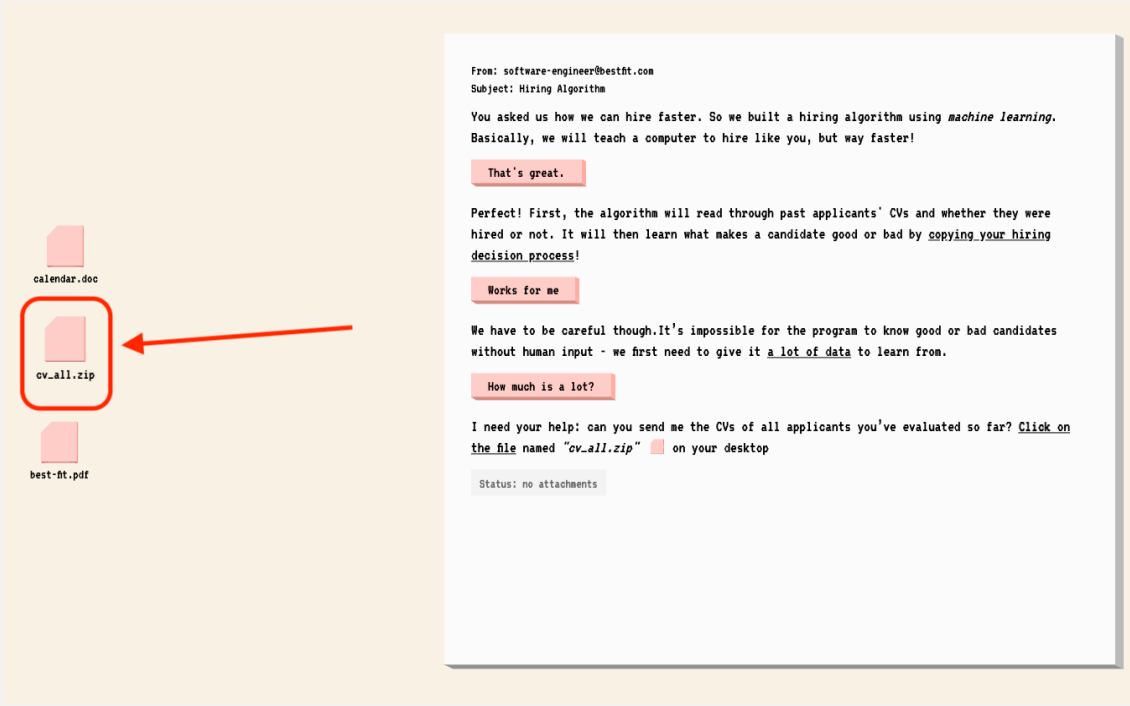
**4. STEM**
**Example:**
•Go beyond how algorithms function technically to include ethical concerns.
**Class Activity:**
•Pair a lesson on machine learning with a discussion on dataset bias. Use examples like biased medical algorithms or resume screeners.

# Activity: Survival of the Best Fit




- Go to survivalofthebestfit.com
- Click "Start Game"
- Take 10 minutes to play through the game
- Make mental note of your feelings, thoughts, actions

# Activity: Survival of the Best Fit




- Sound can be on or off
- Clicking game: you will only need to click through by selecting resumes, choosing between responses, or clicking on objects
  - Only your resume selection has an impact on the game so don't worry too much about which responses to choose when asked questions

# Activity: Survival of the Best Fit

Small group discussion

1. Which traits did you prioritize while selecting candidates?
2. What influences your decisions as the game progress?
3. How did your behaviour change as the game progressed?
4. Where might processes like the one in the game show up in higher education?

# Final Reflection

What’s one small way you might incorporate algorithmic literacy into your teaching practice?

*or*

What element of algorithmic literacy sparked your interest today and is something you want to explore more?

# Further Resources

- https://pressbooks.bccampus.ca/algorithmicawarenesstoolkit/
- https://digitaltattoo.ubc.ca/
- https://www.aimyths.org/
- https://cifar.ca/cifarnews/2024/06/18/indigenous-perspectives-in-ai/
- https://www.moralmachine.net/
- https://algorithmliteracy.org/
- https://unbias.wp.horizon.ac.uk/
- Book: Weapons of Math Destruction, Cathy O’Neil