# Tutorial Outline

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### **[Slide 1]** Introduction

What’s Behind a Web Search? Bias and Algorithms

Learning goals:

* Defining a broader context for algorithms
* Analyzing Google results for algorithmic bias
* Identifying actions for countering algorithmic bias

Inspired by and adapted from Acosta, Elisa. "Exploring Algorithmic Bias with a Summer Bridge Program." *CORA (Community of Online Research Assignments)*, 2018. <https://www.projectcora.org/assignment/exploring-algorithmic-bias-summer-bridge-program>.

### **[Slide 2]** Liaison librarians

Hi! We are [liaison librarians](https://apps.lib.jmu.edu/staffdir/liaisons.aspx) at JMU Libraries. We specialize in research for academic disciplines at JMU. We can help you find, evaluate, and use information for your assignments and projects.

### **[Slide 3]** Let me Google that for you...

How we engage with information informs our understanding. Using Google to learn about something is so common it has become a verb. (Yes, even librarians use Google!) To better understand our search results, let’s unpack how algorithms and Google work.

### **[Slide 4]** What is an algorithm?

Here we see the Merriam-Webster definition of an algorithm is "a procedure for solving a mathematical problem (as of finding the greatest common divisor) in a finite number of steps that frequently involves repetition of an operation.”

### **[Slide 5]** A Way to Think about Algorithms

A simple way to think about algorithms and this step-by-step procedure is to think about how you would provide i[nstructions](http://static.zerorobotics.mit.edu/docs/team-activities/ProgrammingPeanutButterAndJelly.pdf) to someone making a peanut butter and jelly sandwich. If they take each step provided literally and do not read between the lines, sandwich might not come out how you think it should.

GIF: <https://media.giphy.com/media/MOCFww5VVwRNt9gg0Y/giphy.gif>

### [Slide 6] The Truth About Algorithms: Cathy O'Neil

Now with an understanding of what an algorithm is, let’s learn more about how algorithms work with this video.

<https://www.youtube.com/watch?v=heQzqX35c9A>

**[QUESTION]** Algorithms are \_\_\_\_\_\_ embedded in math.

A. opinion (Correct)

B. fact (Incorrect)

C. numbers (Incorrect)

D. letters (Incorrect)

### **[Slide 7]** Algorithms Are Not Objective

Algorithms are not objective. They make things work for the builder of the algorithm. We have to inject ethics into building algorithms.

### **[Slide 8]** Algorithms applied

Watch this short video to learn about how the general idea of algorithms get put into practice with a Google search.

<https://youtu.be/4KokRySJ-xM>

When you are done, answer the following questions:

**[QUESTION]** Before we move on to the next step, what do you think makes a Google search successful for you? (Choose all that apply) [No correct or incorrect answers]

1. Quick response
2. Accurate results (factual)
3. Relevant results (addresses your specific information need)
4. Current information
5. Personalized information
6. Interpreting what you mean (ex: correcting spelling mistakes, automatic suggestions for searches, etc)
7. Other

**[QUESTION]** How many results do you typically review to see if your search was successful or not? [No correct or incorrect answers]

1. Only look at top results on first page of results
2. Look at full results on first page
3. Look at results on second page of results
4. Look at results on third page or beyond

### [Slide 9] Who defines an algorithm's success?

Given the huge amount of information available through the Internet, we use search engines, like Google, to help sift and rank the information. Each search engine has its own algorithm which is why Google and Bing can provide you slightly different results for the same topic.

<https://youtu.be/CjrG2BqQ_1g>

### [Slide 10] History of Google Algorithm Changes

Review this brief history of Google algorithm updates to see how things are continuously changed and updated. Answer the questions to see some key milestone changes.

<https://yoast.com/google-algorithm-updates/>

**[QUESTION]**: When did Google start customizing results based on your set location or IP address? (Choose one)

1. 2012 – Venice update (Correct)
2. 2014 – Pigeon update (Incorrect)
3. 2016 – Possum update (Incorrect)

Feedback: Correct/Incorrect - 2012 was the first time Google started considering a user’s location into how it would present results. As a Google user, you can set your location

**[QUESTION]**: How did the 2019 – BERT update impact search results? (Choose one)

1. It looks at the full context of a word by looking at the words that come before and after it. (Correct)
2. it aimed to protect users’ wellbeing from (what Google decided was) disreputable information (Incorrect)
3. It can make guesses about words it doesn’t know, to find words with similar meanings and then offer relevant results. (Incorrect)

### [Slide 11] Impact of Algorithm Changes

Watch this short video to learn about the impact of algorithm changes.

[**https://youtu.be/ZKWvE-hoSGk**](https://youtu.be/ZKWvE-hoSGk)

### [Slide 12] Bias in Algorithms

You have learned what an algorithm is, how they are used when you search Google, and how they have changed. Behind Google algorithms are real people creating them. There are also real people creating information on the web. Algorithms we use every day reflect the implicit values of the people who are involved in creating, collecting, selecting, or using the data.

### [Slide 13] Algorithms of Oppression: Safiya Umoja Noble

Let us now watch a video that better explains how platforms, like Google, amplify some voices while silences others and further marginalize people, creating bias in the search results we see.

**QUESTION:** What influences Google search results? Select all that apply. [All answers are correct]

1. **Economic context**
2. **Advertising**
3. **Social context**
4. **Historical context**

Answer feedback: If correct, Yes, all of these factors apply. If incorrect, Actually, all of these factors apply.

### [Slide 14] Google's Advertising Revenue

When we think about what results appear on those first few pages, we must understand how Google makes most of their money. In 2019, Google’s advertising revenue was [134.81 billion dollars,](https://www-statista-com.eu1.proxy.openathens.net/statistics/266249/advertising-revenue-of-google/) making up a little more than [70%](https://www.investopedia.com/articles/investing/061115/how-does-google-maps-makes-money.asp) of Google’s total revenue of 160.74 billion dollars. Advertising influences Google search results due to the ability for companies to pay to have their results on the coveted first page of a search.

Alphabet. (February 4, 2021). Advertising revenue of Google from 2001 to 2020 (in billion U.S. dollars) [Graph]. In *Statista*. Retrieved from <https://www.statista.com/statistics/266249/advertising-revenue-of-google/>

Investopedia. (2019, November 14). How Google Map makes money. <https://www.investopedia.com/articles/investing/061115/how-does-google-maps-makes-money.asp>

### [Slide 15] Automated Decisions

Noble says algorithms are about automated decisions and there are influences on the results we see even though these decisions appear to be objective and neutral.

**QUESTION**: Thinking about what you have learned so far, do you think the results that show up in your Google search are credible, fair, and objective ideas? [No right or wrong answer]

Yes

No

**QUESTION**: Why do you think that?

Photo by [Luca Bravo](http://unsplash.com/@lucabravo?utm_source=unsplash&utm_medium=referral&utm_content=creditCopyText) on Unsplash

### [Slide 16] Example: Professors

Now let’s look at an example so we can intentionally consider the context for our results. Here’s what happens in a Google image search for “professor style.”

**QUESTION**: What are the results? What does this information tell you about professor style?

**QUESTION**: How can the information provided by these images influence you?

**QUESTION**: How might this population be represented or misrepresented?

### [Slide 17] Example: Librarians

And here’s an example of autocomplete suggestions when you Google “librarians are.”

**QUESTION**: What are the results? What does this information tell you about librarians?

**QUESTION**: How can the information provided by these autocomplete suggestions influence you?

**QUESTION**: How might this population be represented or misrepresented?

### [Slide 18] Example: College Students

Now let’s turn to an example that should be familiar to you. Open a new tab for Google, and...

Search for “college students” using image search

Search “college students are...” for autocomplete suggestions

**QUESTION**: What are the results for these searches? Who do you see? What does this information tell you about college students?

**QUESTION**: How can the information provided by these autocomplete suggestions influence someone?

**QUESTION**: How might this population be represented or misrepresented? How do the results compare with your actual experience?

### [Slide 19] Actionable Steps You Can Take

Now that we have examined algorithmic bias and examples, here’s what you can do!

Know how to manage what information you do and don’t want to share with Google

[How to manage your location information in Google](https://support.google.com/websearch/answer/179386)

[How to block content or track the trackers](https://guides.lib.jmu.edu/c.php?g=938555&p=6763843)

Consider other tools for searching, such as [DuckDuckGo](https://duckduckgo.com/)

### [Slide 20] Learn More

Want to learn more about implicit bias?

* Read the article “[How to Think about ‘Implicit Bias’](https://www.scientificamerican.com/article/how-to-think-about-implicit-bias/)” from *Scientific American*
* Take an [Implicit Association Test (IAT)](https://implicit.harvard.edu/implicit/takeatest.html) to see what biases might be reinforcing with your search behavior

### [Slide 21] Read More

Here are some further readings you might explore:

* JMU Libraries’ [Online Privacy and Security Toolkit](https://guides.lib.jmu.edu/c.php?g=938555&p=6763841)
* *[Algorithms of Oppression: How Search Engines Reinforce Racism](https://search.lib.jmu.edu/permalink/01JMU_INST/15ej0d6/alma991000229009706271" \t "_blank)* by Safiya Noble
* [*The Filter Bubble: What the Internet is Hiding from You*](https://search.lib.jmu.edu/permalink/01JMU_INST/1jlet4m/alma991007861839706271) by Eli Parser
* “[How Google Interferes with Its Search Algorithms and Changes Your Results](https://www.wsj.com/articles/how-google-interferes-with-its-search-algorithms-and-changes-your-results-11573823753)” by Kirsten Grind, Sam Schechner, Robert McMillan, and John West (*Wall Street Journal* article)
* [*The Joy of Search: A Google Insider’s Guide to Going Beyond the Basics*](https://search.lib.jmu.edu/permalink/01JMU_INST/1jlet4m/alma991004304279706271) by Daniel Russell
* [*Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*](https://search.lib.jmu.edu/permalink/01JMU_INST/1enspei/alma991004819029706271) by Cathy O’Neil
* [*Data Feminism*](https://search.lib.jmu.edu/permalink/01JMU_INST/15ej0d6/alma991016306899706271) by Catherine D'Ignazio and Lauren F. Klein
* “[A New Study Finds a Potential Risk with Self-driving Cars: Failure to Detect Dark-skinned Pedestrians](https://www.vox.com/future-perfect/2019/3/5/18251924/self-driving-car-racial-bias-study-autonomous-vehicle-dark-skin)” by Sigal Samuel (*Vox* article)
* “[Twitter Apologises for 'Racist' Image-Cropping Algorithm](https://www.theguardian.com/technology/2020/sep/21/twitter-apologises-for-racist-image-cropping-algorithm)” by Alex Hern (*The Guardian* article)

### [Slide 22] Contact Us