



IGNITE MY FUTURE

SUBJECTS

English/Language Arts
Math

COMPUTATIONAL THINKING PRACTICE

Collaborating Around Computing

COMPUTATIONAL THINKING STRATEGY

Finding Patterns

MATERIALS

Computers with Internet access and the ability to use the mind mapping application bubbl.us

Teacher Note: Computers are helpful but not necessary for this lesson. If you do not have access to computers, you can use large-format paper, white boards, sticky notes, or other supplies you might have handy to create an analog version of a mind map.

Data sources containing cyberbullying language (see [Data Resources](#) instructor reference for guidance on creating sources)

Note cards (20 per student)

LESSON TITLE

CyberDefender

Guiding Question: How can we connect with each other?

Ignite Curiosity

- Have you ever witnessed someone being bullied?
- How can we prevent people from using the Internet to bully others?
- Can computers help us put an end to cyberbullying?

Social media allows us to connect with our friends in new ways, but it also makes us vulnerable. Online harassment is a growing problem that social media platforms and technology stakeholders want to address. In this lesson, students will explore how computers use a strategy called deep learning—a form of programming that is modeled on the complex structure of the human brain— to scan social media networks for threatening and coded language. In **THINK**, students will assume the role of software engineers tasked with developing a deep learning algorithm that identifies subtle forms of online bullying. Students will learn how modern computing draws many concepts from biology and how artificial intelligence is used on social media platforms every day. In **SOLVE**, students will find patterns in common social media posts. They will write these common social media phrases on index cards and work as a team to group those phrases into categories. In **CREATE**, students will build a mind map that shows how the language in social media posts indicates certain sentiments or expressions of feeling. In **CONNECT**, students will identify how deep learning connects to careers in fields such as social media, software development, medicine, and psychology.

Students will be able to:

- Work in groups to **analyze** and decompose problems,
- **Apply** the computational thinking strategy of finding patterns to building an analog neural network, and
- **Create** a mind map to examine relationships between the patterns they discover.



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1 Read the following scenario to the class:

Imagine you are a software engineer who works with a social media company. The company has noticed a rise in user reports of cyberbullying, and it wants to find a way to stop this trend. Your team of engineers has built a program that can detect threatening language in social media posts, but you are facing a challenge—some words that are innocent in some posts can actually be bullying depending on how they're used. To solve this problem, you will work with your team to search for and analyze patterns in language used on social media. Then, you will use the patterns you have discovered to create a mind map that could be used to teach a computer how to recognize when cyberbullying is happening—and stop it!

2 Lead the class in a discussion using the following guiding questions:

- How do you recognize when cyberbullying is happening? What patterns do you see? (language used in the post, photos used in the post)
- Social media sites like Facebook collect a lot of data on the posts users make. How could you use these data to stop cyberbullying? (By examining the data and looking for patterns of usage related to bullying, we might be able to have computers spot bullying early enough to prevent it from being posted.)

3 Gauge students' familiarity with artificial intelligence (AI) by asking the following guiding questions.

Teacher Note: You can find an overview of neural nets, deep learning, and AI on the Neural Nets Background Information instructor reference sheet.

- Have you heard the term *artificial intelligence* before? If so, when did you hear it? What does the term make you think of? (Answers may vary; accept all relevant answers.)
- Our brain learns by finding patterns in things. Computer networks work this way, too. If you were going to teach a computer to understand words (which is a human skill), where would you start?

4 Summarize the discussion, highlighting the fact that humans and computers both make sense of large amounts of information by finding patterns in that information. Explain that we can teach computers how to operate like the human brain to understand meaning and context by giving it instructions on how to sort data into patterns.



Students will work in teams to analyze social media posts and compile a list of terms and phrases that are commonly used in cyberbullying. Then, they will group the terms and phrases into categories based on the patterns they discover.

- 1 Hand out** 20 notecards to each student.
- 2 Distribute** the [Data Sources](#) handout.
- 3 Explain** to students that this exercise is focused on identifying words that are not typically vulgar or offensive, but are used on social media to bully another person. During the activities in this lesson, there should not be any profane, vulgar, or inappropriate language used. Individually, students should identify words and phrases from the examples on the [Data Sources](#) handout that relate to cyberbullying. Possible terms include: go away, alien, the way you look, hate, beat me up/beat up. Students should add at least 10 of their own words to notecards.
- 4 After students have identified** words related to cyberbullying from the [Data Sources](#) handout, regroup as a class. Decompose the types of words related to cyberbullying by eliciting examples of words students came up with and having students categorize them. Remind students that there should not be any inappropriate or vulgar words.
- 5 Once you have decomposed** cyberbullying vocabulary into 5 to 10 categories of words, write each of the categories on the board in a horizontal list. Give students 5 minutes to organize their note cards according to the categories, then have each student place his or her cards under the corresponding category on the board.
- 6 Divide** students into as many groups as there are categories. Assign each group a category of cyberbullying terms and give them the corresponding stack of notecards.
- 7 In their groups**, students should work on a large surface or floor space to categorize their words further. Instruct groups to put related note cards together to make a visual pattern, then analyze the data and organize the groupings of notecards according to which have the most in common.
- 8 Check for understanding** by asking students to explain their thought process as they sorted their cards. Ask them what is happening to the categories—are they becoming more specific and precise? Then, ask why it is important to keep putting these cards into smaller and smaller categories. Explain that this activity is a simulation of a computational process called neural networking, where a computer sorts data into increasingly precise categories. The more data the computer sorts, the better it is as “learning” by identifying patterns in the information.



Once students have worked with a group to organize the index cards for one category, they will collaborate with a team of other students made up of members of different groups to categorize the language and themes. They will then create a mind map that shows how the language in the posts indicates certain sentiments or expressions of feeling.

- 1 Create** new groups of students so that each new group (Group 2s) is comprised of at least one member from each of the previous groups (Group 1s).
- 2 Students should each present** their original group's words and groupings of words to Group 2, reading their explanatory paragraph as they show their groupings.
- 3 Group 2s** should then look for overlap between Group 1s' words and groupings. For example, words about characteristics that make people different may overlap with words about the way people look. Groups should ask all members to contribute their opinions about whether words that fall into more than one category should be classified in only one category, in more than one category, or in all categories.
- 4 Group 2s should then** work on a "rating" system for each category. Using the numerical scale of their choice, they should classify how likely each group of words is to indicate bullying by discussing the word groupings and collaborating to arrive at a consensus. If a group cannot reach a consensus, it might consider creating a new subgroup of words in that category.
- 5 Guide groups** through the steps of creating a mind map, using either classroom materials or bubble.us, that incorporates each category of words, as well as the subgroupings and words themselves. They should use colors to indicate where each word and group of words falls on their scale of how likely the words are to indicate bullying and then create a key for their rating scale.
- 6 Instruct** students to expand their mind maps using the [Visual Thesaurus](#).
- 7 Share the mind maps.** Have each team present its mind map to the rest of the class and explain how they organized the information from the Group 1s, which words were more difficult than others to categorize (and how they navigated categorizing these words), and what new words—or even new groups of words—they were able to identify and add to their maps using the Visual Thesaurus.
- 8 Wrap up** your discussion by discussing the following guiding questions with your students:
 - How does decomposing stories about cyberbullying help us recognize patterns?
 - How could decomposing stories about cyberbullying help computers recognize patterns without "reading" every word, as a human has to?
 - What could we do with a computer program that could recognize word patterns associated with cyberbullying?



Students will explore how deep learning and AI connect to careers and to problems of tomorrow.

Select one of the strategies listed below to help students answer these questions:

- **How do this problem and solution connect to me?**
- **How do this problem and solution connect to real-world careers?**
- **How do this problem and solution connect to our world?**

- 1 Write** the three questions on PowerPoint or flip chart slides and invite students to share out responses.
- 2 Display** pieces of chart paper around the room, each with one question written on it. Ask students to write down their ideas related to the questions on each sheet.
- 3 Assign** one of the questions to three different student groups to brainstorm or research, and then share out responses.
- 4 Invite** students to write down responses to each question on a sticky note, and collect them to create an affinity diagram of ideas.

How does this connect to students?

Many students will be familiar with cyberbullying by having experienced it directly, knowing someone who has, or reading stories about it. Students who experience cyberbullying can struggle with schoolwork, self-esteem, and relationships with others.

It is critical that students understand the drawbacks and dangers of the social media apps that can be a platform for positive interactions, connections, and learning.

How does this connect to careers?

Computer and Information Research Scientists invent and design new approaches to computing technology and find innovative uses for existing technology, such as using AI to fight cyberbullying. They study and solve complex problems in many fields.

Social Media Specialists use social media to communicate to the public, create conversation around a topic, and market goods and events.

Neurologists study the workings of the human brain to treat illnesses and apply that learning to other areas such as computer science.

How does this connect to our world?

Preventing cyberbullying would make going to school a safer and more pleasant experience. The technologies used to stop cyberbullying could be applied to other challenges, such as preventing crimes that are planned using social media platforms and digital communication.

Furthermore, deep learning advances are allowing scientists and engineers to create technologies that are increasingly accurate at identifying images and speech recognition, which have in turn permitted developments in AI that will impact students' lives. Technologies such as Siri and Alexa are already part of many students' day-to-day lives; with increasingly complex AI, the future may bring scientists the ability to re-create a human brain's processes.

 Find more easy-to-implement resources to integrate computational thinking practices into your classroom by visiting ignitemyfutureinschool.org

National Standards

COMMON CORE STATE STANDARDS CONNECTIONS

[CCSS.MATH.CONTENT.8.SP.A.1](#) Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

[CCSS.ELA-LITERACY.L.7.4.A](#) Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

[CCSS.ELA-LITERACY.L.7.5](#) Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

K-12 COMPUTER SCIENCE FRAMEWORK

Practice 2: Collaborating Around Computing

Collaborative computing is the process of performing a computational task by working in pairs and on teams. Because it involves asking for the contributions and feedback of others, effective collaboration can lead to better outcomes than working independently. Collaboration requires individuals to navigate and incorporate diverse perspectives, conflicting ideas, disparate skills, and distinct personalities. Students should use collaborative tools to effectively work together and to create complex artifacts.

Data Resources

Note to instructors: You may wish to edit the following data set based on the history and composition of your group of students. Further stories are available at <https://cyberbullying.org/stories>.

Students have told the following stories about their experiences with cyberbullying:

"A boy in my sixth grade math class called me mean names like four eyes, alien and more just for wearing glasses. It made me very upset. I don't think that kids who wear glasses should get made fun of. It's not someone's fault for wearing glasses." – **11-year-old boy from MI**

"There's a game called habbo.com. Now there's a certain room in there called chromide club where the kids go to make fun of people. It's bad because they get your Facebook and make fun of the way u look. They spam your Facebook throughout the game and it hurts people's feelings." – **13-year-old girl from USA**

"I stopped being friends with this girl who was just a bad influence on me, and she got a couple of her friends to hate me. On MSN they had a group chat room, and it was the two girls, and they were threatening to bully me at school, and I got scared about it. (The first girl) said if I came to school she would beat me up during recess, so during that day I hid in the bathroom at lunch." – **12-year-old girl from AL**

"I was the new girl in school and everyone just had to be mean to me. The girls in my class wrote my name on the bathroom stall saying i like two boys when i did not even like one of them. i had trusted two of the girls and they let me down. In the bathroom stall every single girl could see it. Luckily i told my mom and then she told my teacher and they got detention with the principal for a week." – **12-year-old girl from Ontario**

"I have been friends with this person for 3 years now. Well best friends. I never thought she could do this to me. She's lying and getting our friends on her side. All i can do is watch. She's called me "Ugly RagDoll, Useless, Babied all my life, Jealous, I need to grow up, unpopular, I can go and rot under a rock! Who says these kinds of things? Only someone who is heartless and that has never been bullied before. They don't know how it feels i guess." – **12-year-old girl from MI**

"When I was thirteen, a friend of a friend, whom I had previously contacted on good terms, decided that in the absence of my physical self, the bullying that used to go on in elementary school (I had become home schooled since) should start anew online. Whenever I thought I'd seen the last of her, out of the blue she would instant message me again just to share her opinion. I hadn't seen her in almost a year, but she still entertained herself by telling me how horrible I was. It was like she was conjuring up the school situation which I had tried so hard to overcome." – **15-year-old girl from CA**

"I have been made fun of for most my childhood. It hurts me so much when people pick on me and hardly ever think before they speak. They gossip and say whatever they want to without asking themselves if they will be rude to someone else by saying it. I have grown up quite a bit and wish they could understand, but they don't. My heart breaks from this pain inside me and they don't care at all." – **17-year-old girl from WA**

"2 or 3 years back, when I used YouTube as my social network, I was cyberbullied by a person I didn't know. After a while, I just blocked him and reported him to the site. He was gone, but later on he came back, and the same thing happened. When he returned months later, I was already fed up with it and blocked him fast. Happened one more time after that, but I learned that I should just ignore it because whoever the person is, he doesn't know anything about me. Right now, nothing recent has happened, and I don't use YouTube anymore, and I hope that kids know never to let someone get to you because if they have to insult you through the computer, then they aren't worth the second thought." – **15-year-old girl from NY**

"When I was very young, in about 4th grade, I remember this group of girls made a website about me. I was devastated when it happened, but when I look back I just laugh. Cyberbullying is a problem because the Internet and technology give people a sense of security. People are much more likely to send a threatening text to someone then say something to someone's face these days." – **19-year-old girl from MN**



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