IGNITEMYFUTURE

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.

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)

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.

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 are 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? (Consider language used in the post as well as photos used in the post.)
- Social media sites like Facebook collect a lot of data on the posts that 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:

- 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.

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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 that 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, and 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 five 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.

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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 bubbl.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?

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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.

TATA Consultancy Services employee Aastha Sahni co-authored a study on the topic of using computational thinking to detect cyberbullying on social media. Read her abstract.

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Curriculum Connections

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

10 REDUCED INEQUALITIES

"For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and **people like you**."
—The United Nations

"The Sustainable Development Goals are the blueprint for a better future. And together we can reach them. By following the Good Life Goals, we can all help make tomorrow better than today. Let's do this! #GoodLifeGoals"

10 BE FAIR

GOODLIFE GOALS
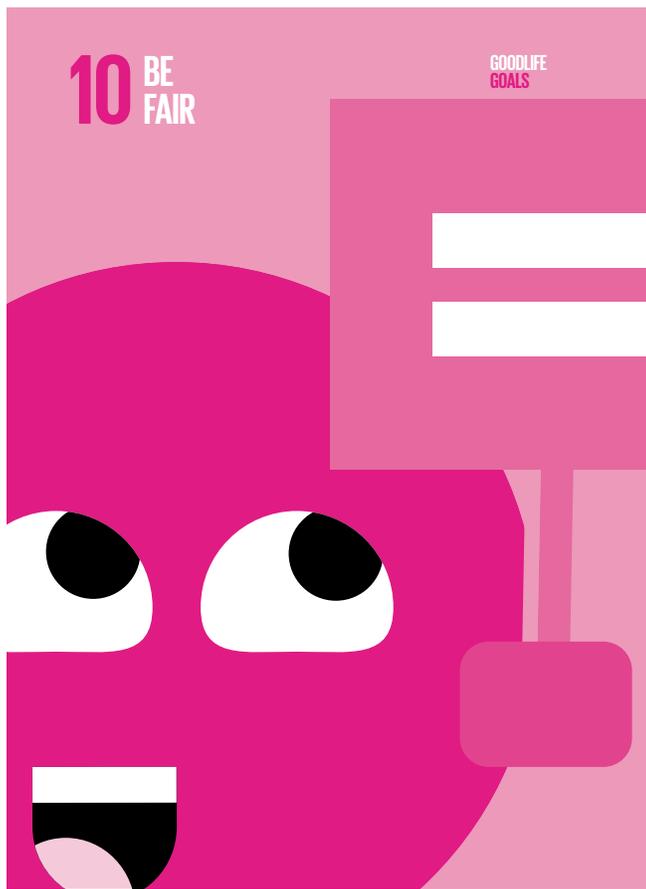
BE FAIR
Actions

10

1
Stay open-minded, listen and learn from others

4
Buy from companies that pay tax and treat people fairly

2
Support leaders who reduce inequality

5
Stand up for your rights, and the rights of others

3
Protect and welcome the vulnerable

10 REDUCED INEQUALITIES

Reduce inequality within and among countries.

SUSTAINABLE DEVELOPMENT GOALS

Source:
The Good Life Goals by Futerra Sustainability Communications Ltd and 10-Year Framework of Programmes on Sustainable Lifestyles and Education Programme is licenced under CC BY-ND 4.0.

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Global Competencies

CMEC (Council of Ministers of Education, Canada) Pan-Canadian Global Competencies Descriptions

Highlighted sections apply to this lesson

Global Competency	Definition	Student Descriptors
Collaboration	Collaboration involves the interplay of the cognitive (including thinking and reasoning), interpersonal, and intrapersonal competencies necessary to participate effectively and ethically in teams. Ever-increasing versatility and depth of skill are applied across diverse situations, roles, groups, and perspectives in order to co-construct knowledge, meaning, and content, and learn from, and with, others in physical and virtual environments.	Students participate in teams by establishing positive and respectful relationships, developing trust and acting co-operatively and with integrity. Students learn from and contribute to the learning of others by co-constructing knowledge, meaning, and content. Students assume various roles on the team, respect a diversity of perspectives, and address disagreements and manage conflict in a sensitive and constructive manner. Students network with a variety of communities/groups and use an array of technology appropriately to work with others.
Communication	Communication involves receiving and expressing meaning (e.g., reading and writing, viewing and creating, listening and speaking) in different contexts and with different audiences and purposes. Effective communication increasingly involves understanding both local and global perspectives, societal and cultural contexts, and adapting and changing using a variety of media appropriately, responsibly, safely, and with regard to one's digital footprint.	Students communicate effectively in different contexts in oral and written form in French and/or English through a variety of media. Students communicate using the appropriate digital tools and create a positive digital footprint. Students ask effective questions to acquire knowledge, listen to understand all points of view, voice their own opinions, and advocate for ideas. Students gain knowledge about a variety of languages and understand the cultural importance of language.

Global Competencies cont.

Global Competency	Definition	Student Descriptors
Global Citizenship and Sustainability	Global citizenship and sustainability involve reflecting on diverse worldviews and perspectives and understanding and addressing ecological, social, and economic issues that are crucial to living in a contemporary, connected, interdependent, and sustainable world. It also includes the acquisition of knowledge, motivation, dispositions, and skills required for an ethos of engaged citizenship, with an appreciation for the diversity of people, perspectives, and the ability to envision and work toward a better and more sustainable future for all.	Students understand the ecological, economic, and social forces, their interconnectedness, and how they affect individuals, societies, and countries. Students take actions and responsible decisions that support quality of life for all, now and in the future. Students recognize discrimination and promote principles of equity, human rights, and democratic participation. Students understand Indigenous traditions and knowledge and its place in Canada, learn from and with diverse people, develop cross-cultural understanding, and understand the forces that affect individuals, societies, and nations. Students engage in local, national, and global initiatives to make a positive difference. Students contribute to society and to the culture of local, national, global, and virtual communities in a responsible, inclusive, accountable, sustainable, and ethical manner. Students as citizens participate in networks in a safe and socially responsible manner.

Global Competencies cont.

Highlighted sections apply to this lesson

Global Competency	Definition	Student Descriptors
Critical Thinking and Problem Solving	Critical thinking and problem solving involve addressing complex issues and problems by acquiring, processing, analysing, and interpreting information to make informed judgments and decisions. The capacity to engage in cognitive processes to understand and resolve problems includes the willingness to achieve one's potential as a constructive and reflective citizen. Learning is deepened when situated in meaningful, real-world, authentic experiences.	Students will solve meaningful, real-life, complex problems by taking concrete steps to address issues and design and manage projects.
		Students will engage in an inquiry process to solve problems as well as acquire, process, interpret, synthesize, and critically analyse information to make informed decisions (i.e., critical and digital literacy).
		Students will see patterns, make connections, and transfer what they have learned from one situation to another, including in real world applications.
		Students will construct, relate, and apply knowledge to all domains of life such as school, home, work, friends, and community.
		Students will analyze the functions and interconnections of social, economic, and ecological systems.
Innovation, Creativity and Entrepreneurship	Innovation, creativity, and entrepreneurship involve the ability to turn ideas into action to meet the needs of a community. The capacity to enhance concepts, ideas, or products to contribute new-to- the-world solutions to complex economic, social, and environmental problems involves leadership, taking risks, independent/unconventional thinking and experimenting with new strategies, techniques, or perspectives, through inquiry research. Entrepreneurial mindsets and skills involve a focus on building and scaling an idea sustainably.	Students formulate and express insightful questions and opinions to generate novel ideas.
		Students contribute solutions to complex economic, social, and environmental problems or to meet a need in a community in a number of ways including; enhancing concepts, ideas, or products through a creative process, taking risks in their thinking and creating, making discoveries through inquiry research, and by hypothesizing and experimenting with new strategies or techniques.
		Students demonstrate leadership, initiative, imagination, creativity, spontaneity, and ingenuity in a range of creative processes and motivate others with an ethical entrepreneurial spirit.

Global Competencies cont.

Highlighted sections apply to this lesson

Global Competency	Definition	Student Descriptors
Learning to learn and to be self-directed and self-aware	Learning to learn and to be self-directed and self-aware, means: becoming aware and demonstrating agency in one's process of learning, including the development of dispositions that support motivation, perseverance, resilience, and self-regulation. Belief in one's ability to learn (growth mindset), combined with strategies for planning, monitoring and reflecting on one's past, present, and future goals, potential actions and strategies, and results. Self-reflection and thinking about thinking (metacognition) promote lifelong learning, adaptive capacity, well-being, and transfer of learning in an ever-changing world.	Students learn the process of learning (metacognition) (e.g., independence, goal-setting, motivation) and believe in their ability to learn and grow (growth mindset). Students self-regulate in order to become lifelong learners and reflect on their thinking, experience, values, and critical feedback to enhance their learning. They also monitor the progress of their own learning. Students develop their identity in the Canadian context (e.g., origin and diversity) and consider their connection to the environment. They cultivate emotional intelligence to understand themselves and others. They take the past into account to understand the present and approach the future. Students develop personal, educational, and career goals and persevere to overcome challenges to reach these goals. They adapt to change and show resilience to adversity. Students manage various aspects of their lives: physical, emotional (relationships, self-awareness), spiritual, and mental well-being.

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:

"I went to check my e-mail and there was a message from some people in my old school sent these threatening e-mails some saying "we'll hunt you down at your NEW school and you'll never know what hit you" I felt very scared and at the same time i wondered how they knew my e-mail address. So i told a teacher at that school ...." **—13 year-old girl from Canada**

"I've never been bullied online, and I've never bullied anyone else online. People chose to use the internet for this because they're too cowardly to say it in front of you so they do it anonymously. If someone's going out of their way to do this, it's because something about you or something you have that they don't is making them so angry that they can't stand to see you happy, they're just compensating for something they don't have by trying to destroy it. E-mail addresses can be changed. Web site administrators can track IP addresses which can be used to locate the computer used to post that message. Keep log files of their offenses as evidence, report it to someone (parent, teacher, police), nobody will just stand by and allow this to happen and these people can be found and will be dealt with seriously. Don't let yourself just be a victim thinking nobody can do anything because it's online, don't do nothing in hopes it will go away. Don't give them the satisfaction of getting upset and yelling at them. Solve the problem in the real world, don't give them the satisfaction by responding to what they say." **—17 year-old boy from Canada**

"… I know how it feels to be bullied i have all my life but now I've became a peer mentor its where u give information out to people younger than u that needs your advice I'm aged 15 I wanted to help people like other people helped me i love what i do because I've experienced it myself" **—15 year-old girl from Canada**

"I never realized how dangerous the internet could be...It was foolish of me to put that…picture of me…up. One day a guy sent me a message saying that he wanted to "do it" with me, and if I didn't he would tell everyone at school...I called the police after crying all day and talking to my parents." **—15 year-old girl from Canada**

"Whenever I speak my mind on the internet I am bullied for it. I have many hobbies that I like to share and I am put down for them. It makes me want to throw those hobbies away because it has been happening ever since I started posting my work on the internet. I get bullied for the way I look and for what I like to do. Just because I am not as good as some people out there at my hobby doesn't mean you have to bug me about it until I give up." **—22 year-old girl from Canada**

"I am a 12 year old boy from Canada being bullied it makes me feel really sad and mad they call me names I need help I don't know what to do any more." **—12 year-old boy from Canada**

"I've had my social media accounts for 3 or so years. I woke up one morning and someone had clearly hacked it. …The internet is a clear target for someone to get hurt. It's clearly very easy to access your information. I don't use social media anymore and I'm starting to appreciate it. I never want to go through that again." **—16 year-old girl from Canada**

"When i first joined social media i went on an app called bathroom wall... I honestly thought it was just a place where people talked about random stuff, but boy was i wrong. It turns out it is a app designed specifically for gossip. I figured that out when i went on once and there was a chat group about me. It said up to 30 mean and hateful things, and at some points i just cried and cried, wondering what in the world i had ever done. The worst part was that it was all from "anonymous" senders. I remember quite clearly feeling horribly alone and i hope it'll never happen again." **—12 year-old girl from Canada**

Data Resources (cont.)

"When i first got a social media account my friend helped me get it. She already had it and told me a good password i used it. Big mistake. The first year of middle school. She told the guy she liked my password and he went on my account and wrote…hurtful things my mom checked my profile and saw someone wrote that, knowing that i would never would do that she told me and i changed my password and about a week later i found out it was her. She convinced my other friend that they weren't going to be my friend anymore. They turned almost everyone against me and i am having a hard time." **—11 year-old girl from Canada**

"Someone sent me numerous emails with like two words in the email like … 'your dumb' and that kind of stuff. When I am bullied…it still hurts." **—14 year-old boy from Canada**

"One of my friends started hassling me on messenger. She was sending me nasty messages and text messages and this carried on at school. I told my parents, my friends, and a teacher. She was spoken to a few times but it still carries on a bit now but not as bad because I have blocked her online. This really affected me at home and at school. I couldn't concentrate on school work and I was always upset and down. Now I just ignore it and get on with it. I have plenty more friends and I don't need her anymore. Maybe one day she will give up and grow up." **—15 year-old girl from Canada**

"I was online in a chatroom and this guy was…harassing me by saying stuff to me and wouldn't leave me alone. I had to exit the chat room and my email." **—14 year-old girl from Canada**

"The last time I was bullied online, I was…talking to some people from school. Someone from my class who doesn't like me started telling lies about me to everyone else. And a bunch of people that she had been talking to came and started harassing me. They were talking about how I had bad grades in math and how I bite my fingernails and other stupid stuff like that. They still say stuff about me at school and make things up about me and tell everyone." **—13 year-old girl from Canada**

"Sometimes I get insulted for no reason because i said my mind so then I get into a fight and feel good when i convince the person/change their perspective/prove I'm right because it shows I have an impact on people. Once I got into a huge fight because these girls were bullying one of my friends and I tried to tell them to stop resulting in them insulting me very badly but me getting insulting them all the same. They made threats to beat her up, what else could I do? They printed out what I said but not what they said and showed the principal. I got in a lot of trouble but talked my way out of it telling the TRUTH (something THEY didn't do) and got let off with a warning." **—15 year old girl from Canada**

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