



**Markkula Center**  
for Applied Ethics  
*at Santa Clara University*

## **Applied Ethics in Computer Science Curricula**

### **Suggested Class Activities**

*Tiana Nguyen '21 and Irina Raicu*

#### **Activities:**

In order for students to get a general introduction to ethics in computer science, here are some activities you can assign or walk through with them. (Also see the suggested reading section at the end of this document.)

**Activity 1 - Conduct an Informational Interview with Industry:** It's important to learn from people in the industry what they do to incorporate ethics into their day to day work.

1. Schedule an informational interview with an industry professional in computer science at any company to discuss situations in which they had to make ethical decisions.
2. Here are a few questions to ask:
  - a. What is your daily routine? What role does ethics play in this routine?
  - b. What are examples of ethical and unethical behaviors in the workplace?
  - c. When you've had ethical issues arise at work, whom did you consult and what steps did you take to solve this?
  - d. What ethical qualities and behaviors do you feel are essential in this industry?

**Activity 2 - Analyze the Product:** It's not always an everyday thing for technologists to think about the ethical issues and concerns behind a product. However, it's important to be exposed and get used to this ethical way of thinking.

1. Select any technology of your choice.
2. Analyze what you perceive as the ethical concerns related to the device, and see whether you can identify how the engineers and/or product managers addressed those problems.
  - a. To help analyze these concerns, first familiarize yourself with the [framework for ethical decision making](#).

**Activity 3 - Change Code for Better:** Society has come a long way and changed a lot since the internet was first invented. As a result, there are more things we have to keep in mind while developing new technology— like our word choice. An example of this is wording in applications.

1. Select any online application.
2. Use your developer tools to inspect the application and change the code in a way that better suits how society uses language today. This can relate to gender (eg if the app only displays male or female) or race (if there is a limited ethnicity selection).

**Activity 4 - Step Into Another Perspective (I):** Some individuals don't have the ability to navigate through the web and use a mouse, and not all websites are easily navigable. In most cases, you can't get to every button on the website.

1. Pull up any website.
2. Navigate through the website solely with the up and down arrows.
3. Observe what buttons can be hovered over and whether or not you could tell where you are on the website.
4. Go through the activity again but on Google Calendar. This seems to be one of the more accessible websites and is nice to navigate through.
5. Analyze the differences between the first website and Google Calendar.

**Activity 5 - Step Into Another Perspective (II):** People with sight impairment often find it difficult to navigate through a website. As a result, they use a page reader, but not all websites have the best ones.

1. Pull up any website.
2. Put on the Page Reader.
3. Observe what exactly it captures.
4. Redo steps 1-3, but this time using the Google Calendar. This website provides good and understandable text for a page reader to pick up.
5. Record the differences between the first website and Google Calendar.

**Activity 6 - Step Into Another Perspective (III):** Some websites use the color green for “good” and red for “bad,” but solely use color and no text. Colorblind individuals are significantly impacted by this.

1. Pull up any website.
2. Make the website monochrome.
3. Observe how different things appear and how much is still understandable.
4. Use your developer tools to inspect the website and change the code in a way that makes the website more accessible. For example, if websites simply use colors and no text to indicate things without any context, add text.

5. Go through steps 1-3 again but with Google Calendar. Google Calendar implements a good visual focus indicator that doesn't solely focus on color.
6. Analyze the differences between the first website and Google Calendar.

**Activity 7 - Discuss What's New In Tech (I)**: Ethics is everywhere, so it's important to get exposed to the ways in which ethics relates to everyday lives and technology.

1. Your professor will create a discussion post that will allow you to post about a specified topic.
2. Student:
  - a. Find a recent news article relating to ethics and technology and post it in the discussion post created by your professor.
  - b. Write about the following:
    - i. Include a brief summary of your article
    - ii. What did you learn from the article?
    - iii. What are some of the ethical concerns mentioned in the article?
    - iv. Who are the stakeholders impacted by the technology?

**Activity 8 - Discuss What's New In Tech (II)**: There are always news articles that focus on technology.

1. Your professor will present a recent news article related to a topic addressed in your class.
2. Read the article. Then, in groups, discuss the following:
  - a. What did you learn from the article?
  - b. What are some of the ethical concerns you note mentioned in the article?
  - c. Who are the stakeholders impacted by the technology?
  - d. How does this relate to the material you are covering in the class?
  - e. What is a possible way to reduce one ethical concern?

**Activity 9 - Analyze the Privacy of Datasets**: It's important to protect the identities of all individuals, especially when you may have a lot of private information about them.

1. Professor:
  - a. Create a dataset with information about famous individuals.
  - b. After the activity is done, relate this to bigger cases when this was an issue like the 2006 Netflix Recommendations Contest case. You can also mention how differential privacy can help solve this data privacy problem.
2. Student:
  - a. Take a look at the dataset given to you.
  - b. Try to identify individuals in the dataset using the information given and any other information you may know about famous individuals.

**Activity 10 - Test the Fairness of Algorithms:** Since machine learning models are trained on data sets created by people, some models may reflect bias. It's important to acknowledge and mitigate those biases.

1. Test [Google Vision AI API](#) with an image.
2. Keep on changing the image slightly and see how the system reacts to it and whether the outcome becomes different.
3. This activity can be done with any decision-making algorithm in general. For example, you can test a resume decision making algorithm with slight adjustments of resumes.

**Activity 11 - Build Ethics-Related Timelines:** As companies rush to develop products for users, they sometimes don't spend enough time on thinking through the implementation of every feature. This often leads the companies to fall in both technical and ethical debt.

1. Pick a company and make a timeline with links to news articles that address ethical issues that the company has faced and the ways in which the company responded to them. If there are many big issues, you can focus on one specific controversy surrounding the company.
2. Analyze what you see:
  - a. Are there any patterns in the timing or types of issues?
  - b. Was the company able to resolve every issue? If so, how long did it generally take to resolve issues?
  - c. How did the company respond to the backlash?

**Activity 12 - Catch the Vulnerabilities:** It's important to carefully think through every decision when designing a product, focusing in particular on possible vulnerabilities.

1. Your professor will create a program that is clearly or subtly vulnerable in terms of security.
  1. Go through the code and find out what the security vulnerability is.
  2. Fix the vulnerability yourself.
  3. Reflect or write about the following:
    - a. What could have been done in the first place to ensure there would be no security vulnerability?
    - b. What harm or damage could this vulnerability have done, if not fixed? To whom?
    - c. What type of attacks could have been performed on this program?
    - d. Is there a real life example in which a company made this type of mistake? What did they do to fix it?

**Activity 13 - Identify Problematic Dark Patterns:** Dark patterns are an unfair and deceptive way for companies to trick users into doing something that helps profit the company, but does not benefit the user. Without many people even realizing, these dark patterns are scattered throughout the internet.

1. If you have an Amazon account, go to Amazon.com and try closing your account.
  - a. Do this without searching up the process.
  - b. Reflect or write about the following:
    - i. What was your first intuition for finding where to close your account?
    - ii. How long did it take for you to find where to close your account? Was it inconvenient?
    - iii. What were the steps you took to finally find where to close your account?
2. If you have a New York Times account, go to nytimes.com and try cancelling it.
  - a. Reflect or write about the following:
    - i. How long did it take for you to find where to close your account? Was it inconvenient?
    - ii. If you tried the chat feature, what was your experience like?
    - iii. If you tried the call feature, what was your experience like?

#### **Activity 14 - Identify and Mitigate Privacy Concerns**

Ask students to break up into small groups (3-4). Then ask them to come up with the most privacy-invasive device or tool they could think of. Present them with the following questions to help them in that effort:

1. Where does the device “live” or reside?
2. What kind of information does it collect?
3. From/about whom?
4. What does it do with the collected data?
5. Who has access to the data collected?
6. Where is the data stored? Is it encrypted?
7. How long is the data stored for?
8. What purpose does the device aim (claim) to serve? Why?

After 20 minutes or so, invite a representative from each group to present their project. Then ask them what the exercise shows about which contexts are most sensitive, which people are most vulnerable, which data-related processes are most problematic, etc. Ask them to consider, also, what they learned from other members of their group, and whether those other perspectives changed their own.

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#### **Conclusion:**

These are all fairly simple activities, but they allow computer science students to expand their understanding of the impact that their future actions can have. They also give students an

introduction to practical, applied ethics as something they can start noticing in their day to day lives.

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### **Extra Steps:**

If your students are interested in this topic, or you want them to dive deeper, here are some good extra steps to take:

1. Go over a case study to show students that there are ethical concerns in many products.
  - a. Here are some [case studies](#) you can use.
2. Read over the [Web Content Accessibility Guidelines](#).
3. Listen to the podcast [Building a culture of accessibility from step zero with Ayesha Mazumdar](#) for a better understanding of how to incorporate accessibility in industry.
4. Introduce students to organizations that make accessible products.
5. Direct students to learn more about dark patterns; one resource is this [website](#) created by the individual who coined the term.

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### **Suggested Readings to Assign Before the Activities:**

1. [Why Software Engineering Courses Should Include Ethics Coverage](#)
2. [A Framework for Ethical Decision Making](#)
3. [ACM's Software Engineering Code of Ethics and Professional Practice](#)

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*Irina Raicu is the Director of the Internet Ethics Program at the Markkula Center for Applied Ethics at Santa Clara University.*

*Tiana Nguyen '21 is an undergraduate Computer Science major and served as Vice President of Santa Clara University's Association for Computing Machinery (ACM) chapter. In 2019-20, as a [Hackworth Fellow](#) at the Ethics Center, she participated in multiple ways in the Responsible CS implementation efforts, including as liaison with the student community.*