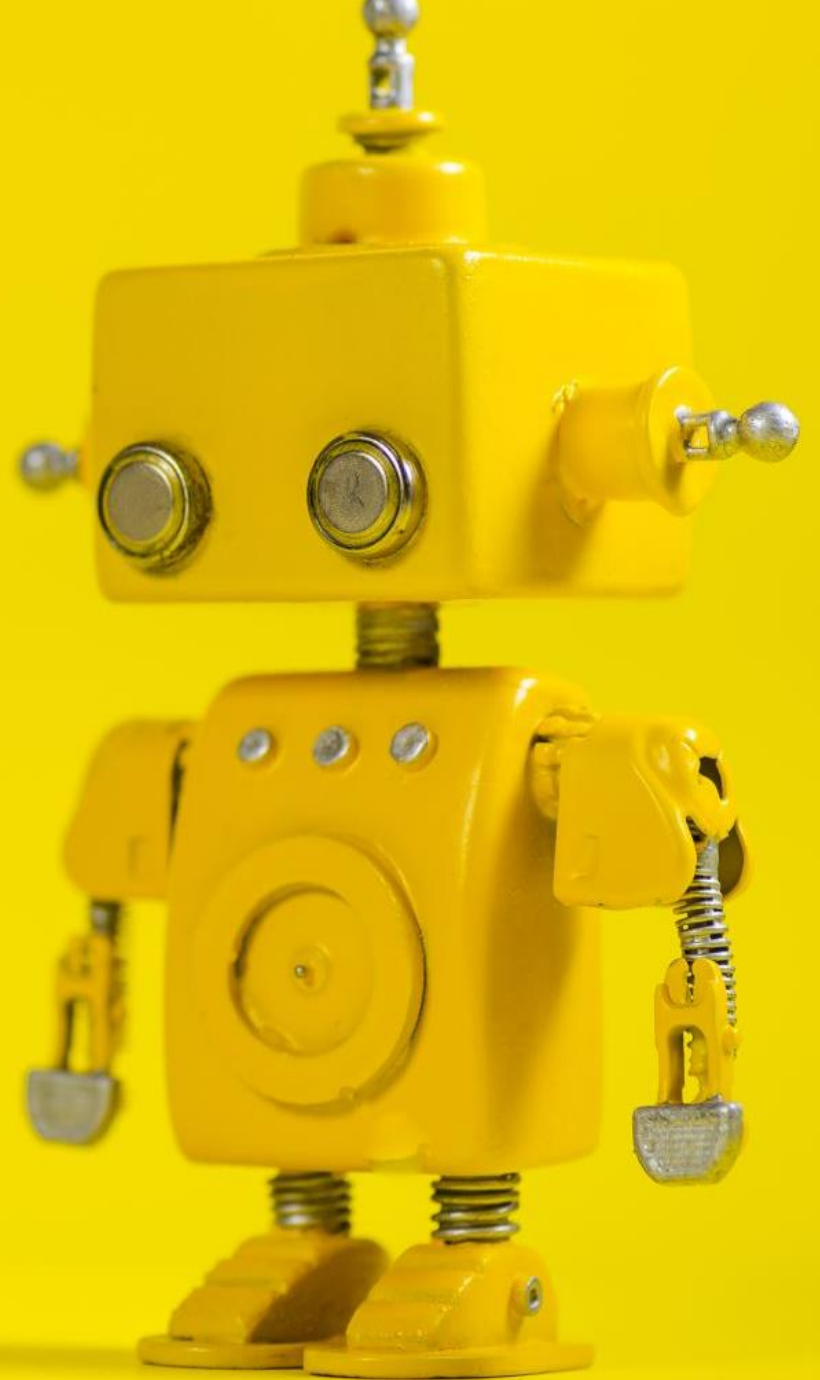




Machine Learning

Big Idea

- How do machines learn to
- recognize images?



Standards Covered

Automation Technology

4.8.1 Identify different identification and vision systems used in automation systems

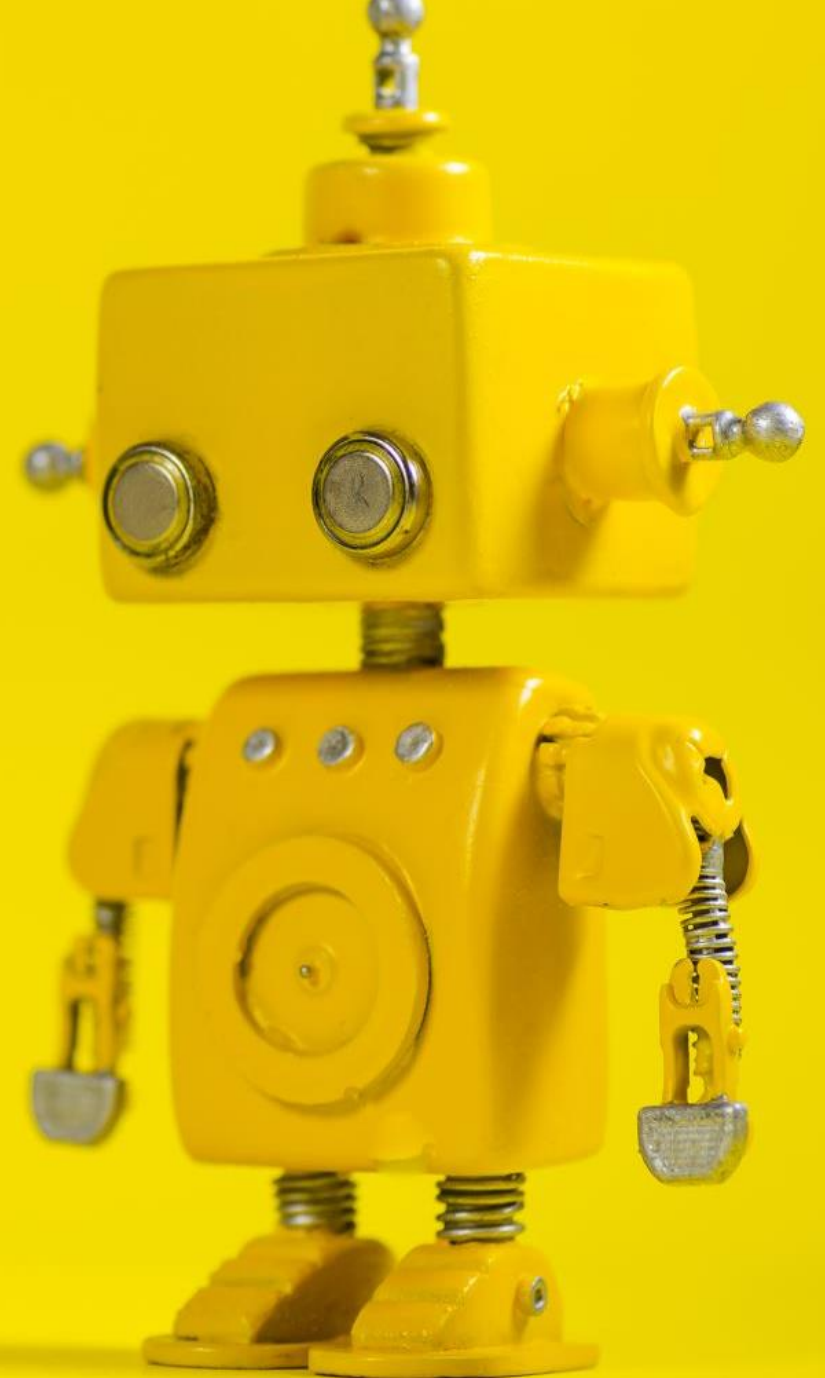
4.8.2 Investigate the applications of different identification and vision systems

6.3.2 Identify path control techniques used by robots

Unit Overview

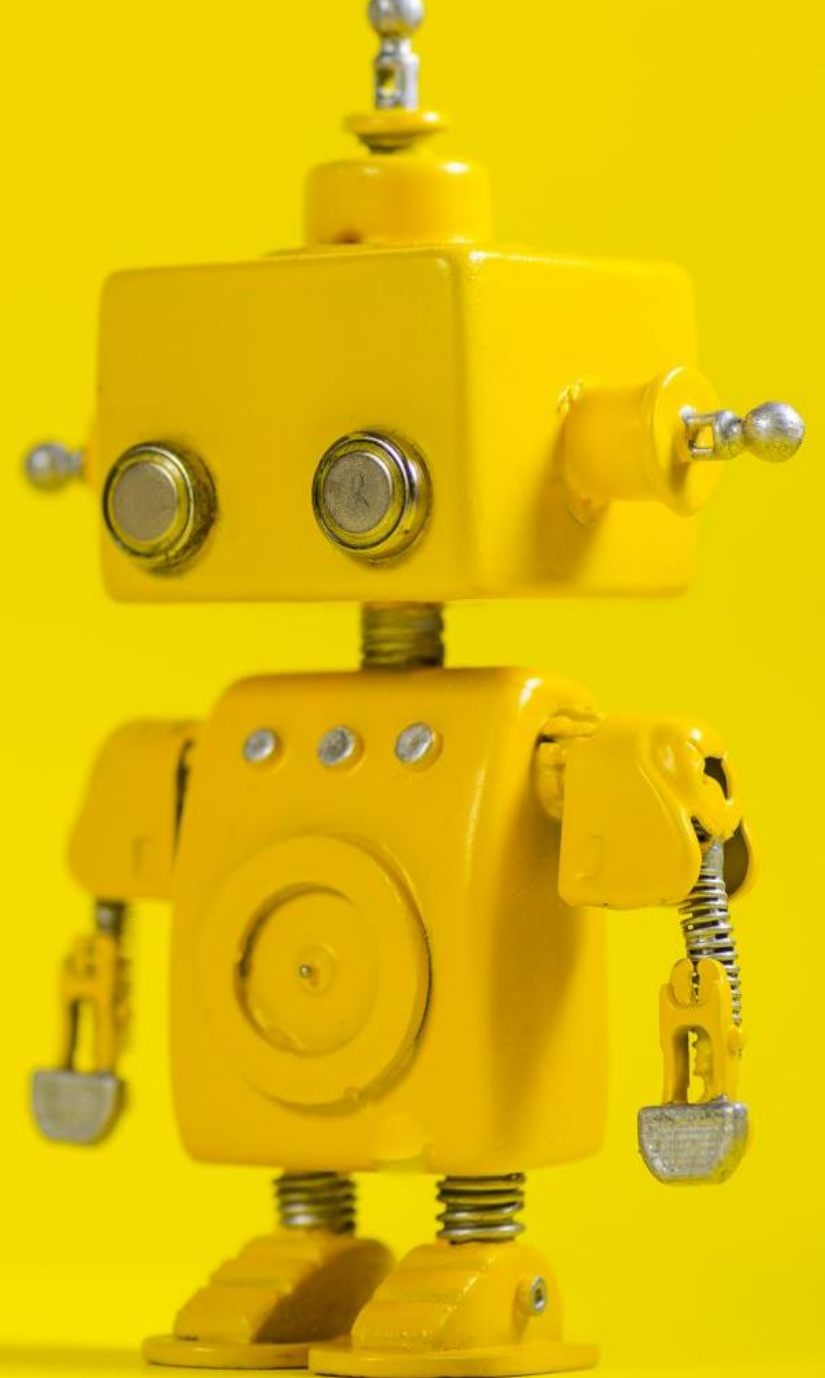
- Students will experience various activities such as
- videos, interactive, research, and class discussions
- to develop a basic understanding of AI, Neural
- Networks, and Machine Learning.

- Students will also investigate and discuss why AI is the
- future and will also discuss wide applications and
- various implications of this growing technology.



Unit Anticipatory Set

- 1. Students play around with an interactive machine learning
- experience using Quick, Draw! as an anticipatory set for the
- unit.
- 2. Followed a discussion on hypothesizing how images are
- recognized so well given students input drawing.
- <https://quickdraw.withgoogle.com/>



Lesson 1a: Image Recognition

Lesson Overview:

Students will learn how machine image recognition process works through PowerPoint, video, class discussions, and interactive activities.

Lesson Objectives:

1. SWBAT compare /contrast biological and Machine Learning
2. SWBAT demonstrate how an image recognition model is trained and tested.

Activity 1a:

1. Human Image Training- One at a time, show students six pictures of famous people but difficult to identify.
2. Ask the class to try to identify each of the pictures. After they have tried, announce to the class the name
3. of this famous personality. Shuffle and repeat 2 more times. After student's second guess repeat the name
4. and add a related image with its significance to the images, i.e., an apple image with Isaac Newton and the
5. story of how he discovered an explanation for gravity.

Record outcomes for each trial on the board for discussion at the end of the activity to be used for a class discussion after Activity 1b.

Lesson 1b: Image Recognition

Lesson Overview: Students observe / record image features of a Superhero, which is compared/contrasted with recorded features of the other six unseen images. The likelihood of a positive match between the observed and the unseen images is calculated using similarity score / # feature questions.

The image inside the envelope with highest score should match the “Unnamed Superhero.” Using a process that a computer goes through, they matched images without relying purely on sight using a similar but simplified Machine Learning process.

Reinforcement of Lesson: Show video- Human vs Machine Learning
[https://pythonmachinelearning.pro/image-recognition-guide/#How do Machines Interpret Images](https://pythonmachinelearning.pro/image-recognition-guide/#How_do_Machines_Interpret_Images)

Use video to discuss the two activities with respect to human vs machine learning.

Lesson 2: Machine Learning

Lesson Overview: Students come to a basic understanding of Machine Learning via a video presentation then experience this knowledge with an interactive activity demonstrating this concepts. Undertraining and overtraining is an additional focus in the activity as well as the resulting bias, which reinforced in a follow up class discussion.

Objectives:

SWBAT explain how Machine Learning process happens

SWBAT identify issues with undertraining and overtraining as they relate to bias.

Show Video before starting Activity- <https://studio.code.org/s/csp9-2021/lessons/6/levels/1>

Activity 1:

1. Students complete each of the activity levels (2-4) twice. <https://studio.code.org/s/csp9-2021/lessons/6/levels/2>
First with 10 samples and then repeat with 30 samples. Record your observed differences between the two trials to be discussed following the activities in terms of undertraining and overtraining in Machine Learning Write each question posed in the activities and record your responses with complete sentences on a piece of paper.
2. Class discussion on the result of each pair of trials per activity in terms of the quality and quantity of the data / training (see teacher notes).
3. Class discussion on the result of each pair of trials per activity in terms of undertraining & overtraining (see teacher notes).

Lesson 3: Analog to Digital Machine Imaging

Students explore how images are represented and processed by computers. Students use the pixelation widget to represent each pixel of an image. They learn how to sample an analog image using small squares of uniform size and reflect on the pros and cons of choosing a smaller or larger square size when sampling.

Lesson Objectives:

1. Explain how bits can be used to represent the individual pixels of a black and white image
2. Demonstrate how sampling is used to create a digital form of an analog image
3. Explain how machines interpret and learn to recognize images from analog images

Resources:

Show video- Show video “How Computer Vision Works”- <https://youtu.be/2hXG8v8p0KM>

1. Students will watch the Pixilation Widget tutorial: <https://www.youtube.com/watch?v=rJOa5Q5a1WM>

2. Students will “make a copy” of version google doc, then save it to their google drive:

<https://docs.google.com/document/d/1-W0LMRihs84dIlC6VwKowq3FcTE3hCZGes8Duda1TqM/edit>

Students are to go to and use the Pixilation Widget to complete exercises Level 3, Challenges A and B, and complete activity sheet. <https://studio.code.org/s/csp1-2021/lessons/7/levels/2>

Teacher Guide: Computer image Coding Activity- <https://curriculum.code.org/csp-20/unit1/7/>

Lesson 4a: Bias in Artificial Intelligence

Lesson Overview:

Students will experience different aspects of legal and ethical dilemmas in AI through a video and interactive activities.

Lesson Objectives:

SWBAT Identify and explain legal and ethical aspects of Artificial Intelligence

Activities:

Introduction: Think about examples of Machine Learning you may have encountered in the past such as a website that recommends what video you may be interested in watching next. Are the recommendations ever wrong or unfair? Give an example and explain how this could be addressed.

1. Show related video- <https://studio.code.org/s/csp9-2021/lessons/6/levels/5>
2. Computer interactive AI Bias- Have student complete levels 7 in this activity <https://studio.code.org/s/csp9-2021/lessons/6/levels/7> Write down and respond to each question posed in the activity on separate piece of paper.

1. Show Bias Video https://www.youtube.com/watch?v=TRzBk_KulaM

Lesson 4b: Bias in Artificial Intelligence

Lesson Overview: Using Scratch Block programming, students coding with towards programming a bias Machine Learning through an overtraining and undertraining algorithm.

Objectives:

SWBAT Identify and explain legal and ethical aspects of Artificial Intelligence

SWBAT identify issues with undertraining and overtraining as they relate to bias.

Activity 4b:

Fooled! Scratch program to create a bias machine learning algorithm

Teacher Notes: <file:///C:/Users/Mcalhoun/Downloads/teachersnotes-fooled.pdf>

Student Guide: <file:///C:/Users/Mcalhoun/Downloads/worksheet-fooled.pdf>

AI Video Series

Applications of AI

<https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/artificial-intelligence-applications>