



Data Bias Lesson Plan

Grade: 3rd-5th

Overview

This lesson is intended to provide student awareness of bias and their relationship with data.

As a demonstration, this lesson allows the teacher and the students to explore and experiment with data bias. The teacher will explain why data is important, how to collect data, what is bias and its relationship with data. The lesson will conclude by asking students to imagine practical, real-life implications of data bias.

Instructor level of expertise: Beginner

Approximate running time: 90 minutes (or 2 sessions of 45 minute each)

- Session #1: Warm-up and Activity #1
- Session #2: Activity #2 and Wrap-up

Background

In this lesson, students will understand what data is and how to represent data as pictures, symbols, and diagrams. Students will also be able to understand what bias is and its relationship to data.

While collecting data, students will understand what data bias is and how to avoid data bias.

Data bias arises when you are simply using too small a dataset to get an accurate picture or solution for the problem.

CSTA K-12 Standards & AI4K12 Big Ideas

- 3A-IC-24 – Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
- Big Idea #2: Agents maintain representations of the world & use them for reasoning.
- Big Idea #3: Computers can learn from data.

Objectives

Students should be able to:

- Understand what is data
- Collect, record, and interpret data
- Learn to represent data they collected in tables
- Understand how data and bias are related
- Consider the consequences of data bias

Agenda

- Warm Up (10 minutes)
- Activity 1: Candy-Stand (35 minutes)
- Activity 2: Selecting Pet for the Family (35 minutes)
- Wrap Up (10 minutes)



Teaching Guide

Warm-Up (10 minutes)

Watch Videos:

- [What is Bias?](#)
- [AI: Training Data & Bias](#)

Assessments

- Ask the students what they think about bias? Is bias in data good or bad?
- Assess students on how well they can represent data using tables or charts.
- Complete activity worksheet and assess whether students can create data representations.

Activity #1 Candy-Stand (35 minutes)

Have the students imagine starting a business just like Clara. After they brainstorm business ideas, have them consider starting a Candy Stand. Have the students make a list of candy they would sell and another list of questions they would ask to gain more information.

1. Collect data from students directly then create a class graph to show the results.
2. Use data to create an infographic. Infographics are visual representations of data and can help make complicated information easier to understand.
3. Review [All City Candy Infographic Series](#) with students as an example of creative ways we can visually represent data.
4. Students will decide how they would like to visually represent their data, then sketch out a design.
5. *Optional:* Using google docs you can also create a simple pie graph so students can see a computer generated visualization of their data in a short amount of time. To do this:
 - Open Google Docs, select “file” then “new spreadsheet”
 - Label column A “Types of Candy” and list ideas from class in rows below
 - Label column B “Students Favorite Candy”
 - Have students vote and tally results
 - Record results as numbers of students who chose each type of candy in column B
 - Highlight all information you have added to column A and B
 - Select “Insert”, then choose “Chart”.
6. The final sketch or chart students create should be informative, simple and interesting in design.
7. Discuss which way of looking at the data is more interesting or easier to understand.
8. Explain bias as it relates to the story. You may ask questions to different groups like adults and young people. If you miss out on any group you may not be able to sell candies.
9. Encourage students to ask their grown-ups at home what their favorite candy is. Make predictions if it will be similar or different from class results. Explain that collecting data from just one class is too small a data set and can create bias.

Activity #2 Selecting Pet for the Family (35 minutes)

Suppose you want to choose a Pet For Your Family. Can data help you decide a pet for your family? You may think you can have a cat or a dog or a fish or a bird.

- Collect data:
 - Ask your friends, neighbours or family if they have pets. If yes, which kind?
 - Make a list of animals which can be pets?
 - Discuss different types of pets. Using labels and grouping, create a decision tree using the worksheet and instructions provided to decide which pet to get.

Teachable Machines Activity

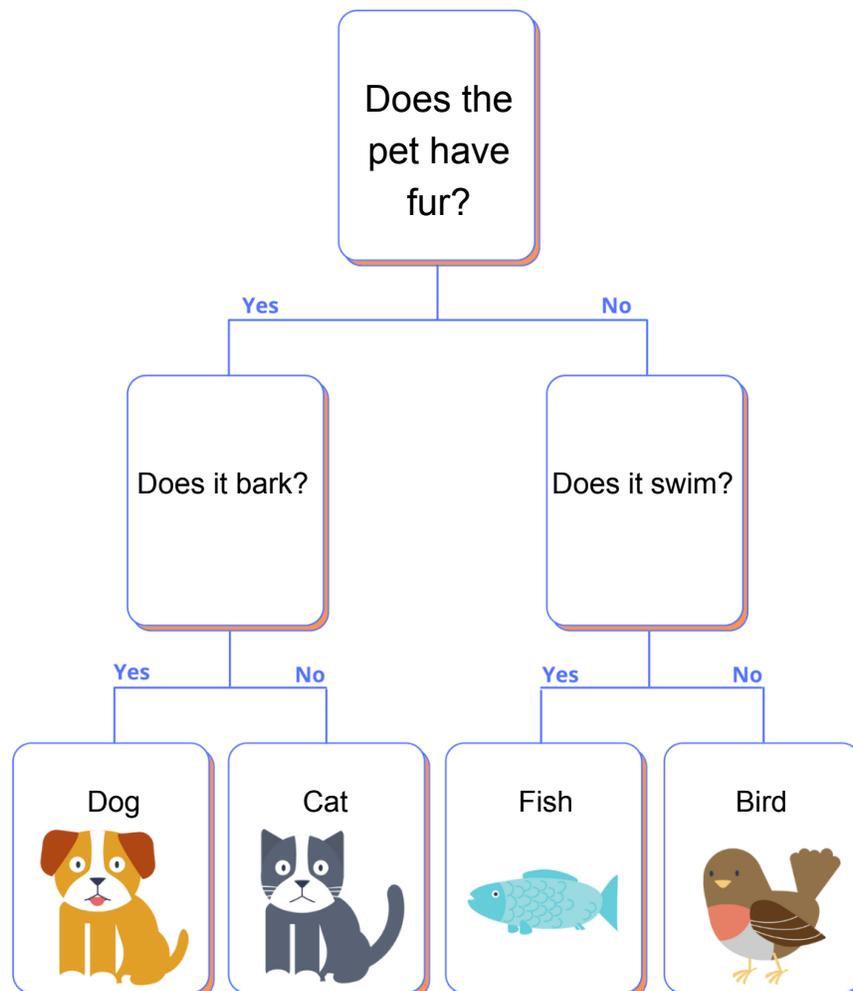
1. Teach a machine to recognize different types of pets using machine learning.
2. Go to Teachable Machine at: <https://teachablemachine.withgoogle.com/train>
3. Select “image project”.
4. Select “standard image model”.
5. Label Class 1 “Cats” and Class 2 “Dogs” (You can also add more groups and different kinds of animals).
6. Search google images for both cats and dogs, then select and save at least five images each of cats and five images of dogs. You can also use google drive and the webcam to upload images. The more data the better.
7. “Upload” images of cats to “Cat” group and images of dogs to “Dog” group from “pictures”.
8. Select “Choose images from your files or drag and drop here”.
9. From your saved photos add at least five images each to both cat and dog groups by double clicking the image.
10. Select “Train Model”
11. For “input” on the right side of the screen select “file” to turn off the webcam and select the saved cat and dog images you collected earlier from your computer. .
12. Upload images of cats and dogs and see if the machine can correctly identify if a pet is a cat or a dog. The computer will display a percentage that shows how confident it is correct.
13. What happens if you add a new photo that the machine was not trained on? Does it always answer correctly?

Wrap Up (5 minutes)

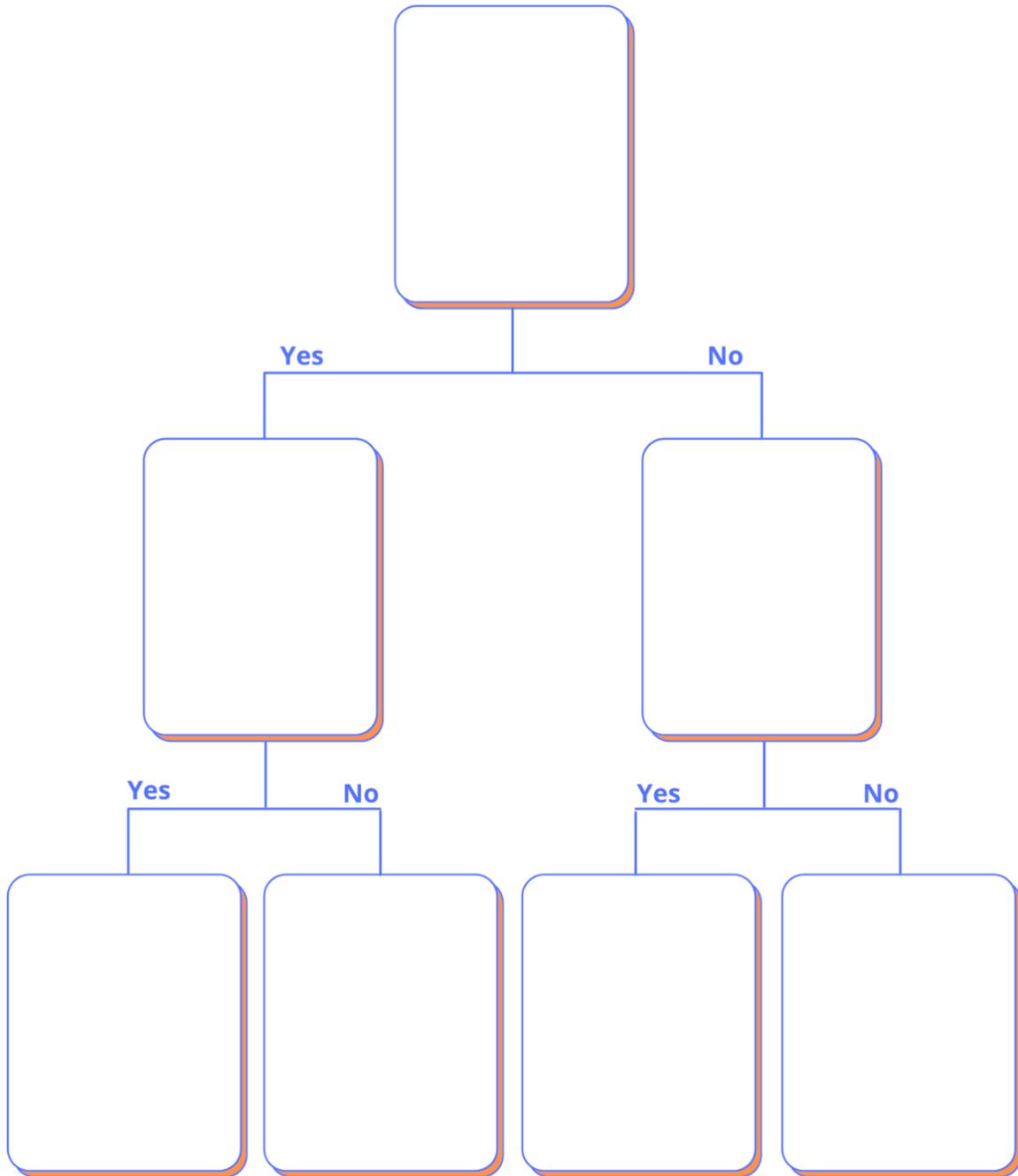
- Wrap up discussion and review the lesson objectives.
- Quiz students to assess understanding using the questions at the end of “A Fresh Squeeze on Data”.

“What Pet?” Decision Tree Worksheet (Instructions)

- You have decided to get a new pet. You can choose between a dog, cat, bird or fish. Use a “Decision Tree” to decide which pet you will get.
- Each box has a line for a yes or no path to the next question or answer, like an upside down tree. In this decision tree we can repeat the process of answering just a few yes/no questions until the answer is solved.
- Using grouping, we narrow down which type of pet you would like. Machine learning programs can use much more complicated decision trees to solve problems and answer questions.
- Do you see any “bias” in this decision tree? Try making your own decision tree to identify other pets, such as ones with scales, that hop, that have shells, etc. using new questions to find the answer.



“What Pet?” Decision Tree Worksheet



What Pet Did You Get? _____