

Teacher: Ms. Goldstein	Date: Tuesday, November 12th
Class Type: Senior Science Research	Grade: 12th Grade
Time Frame: 45 min period	

Lesson Overview

Unit/ Overarching Focus of Lesson:

How well can image recognition models identify everyday household items from all over the world?

Objectives/Aims: Students will demonstrate understanding/learning around the following Big Ideas:

- AI Models are only as good as their training model
- Some models are better at detecting certain objects more than others

Aligned Standards:

NGSS :

HS-ETS1-3 Engineering Design

- Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

NYS Computer Science Standards

9-12.IC.5 Describe ways that complex computer systems can be designed for inclusivity and to mitigate unintended consequences.

Key Vocabulary and Concepts:

- Bias in training AI
- Computer vision

Materials & Resources:

- Computer with access to internet to access two AI image recognition models:
 - https://mediapipe-studio.webapps.google.com/studio/demo/object_detector
 - <https://keremturkcan.com/zeroshot/>

Context for this lesson: This lesson was developed during the summer when I was selected to attend [Research Experience for Teachers \(RET\) | Columbia Engineering Outreach Programs](#). This was a four week experience for STEM teachers to work with an AI Scientist and a Social Scientist to learn more in-depth about the science and social implications of AI technology on society. The culmination of this experience was to develop this lesson that combined ***both the science and social implications of this technology using culturally relevant pedagogy.***

Cultural context within which the lesson will be grounded, and specific ideas/practices to be included in the lesson: Students will have an opportunity to look up objects from their country of origin and run it through object recognition models to determine how well these models identify these objects.

Pre-Lesson Homework:

Students will complete a series of short edpuzzles to catch them up to speed on some the topics we are discussing in this unit:

[Edpuzzle #1: What is AI?](#)

[Edpuzzle #2: Training Data and Bias](#)

[Edpuzzle #3: How Computer Vision Works](#)


Survey: [Pre- Lesson Survey AI and Computer Vision](#)

Time	Activity	Materials	Rationale
Before Lesson	<ul style="list-style-type: none"> Students were asked to complete three edpuzzle assignments to get them familiar with the basic concepts of computer vision and AI Heterogeneous grouping: students were placed into groups based on their performance on <i>these 3 edpuzzles and the pre-lesson survey</i> 	3 Edpuzzles and Pre-lesson survey	<ul style="list-style-type: none"> The three edpuzzles will get student acclimated to the vocabulary and concepts of AI, computer vision and image recognition The pre-lesson survey allows students to self-evaluate their own knowledge and to provide a brief summary in their own words about concepts they learned in the edpuzzles
1:55-2:00	Do Now: <i>Did AI models do a better job of recognizing the items from Nepal or the UK? How do you know?</i>		<ul style="list-style-type: none"> Students will look at a model to begin to get the idea that AI models might have bias depending on where in the world items are from
2:00-2:05	Demo how the activity works and where images come from		<ul style="list-style-type: none"> Show the students the mechanics of how it works to upload the pictures etc.

2:05-2:15	Work time - up to and including optional extension questions		<ul style="list-style-type: none"> Students will work together to find images and answer questions about them
2:15-2:25	Post to shared canva and answer questions		<ul style="list-style-type: none"> The canva is used to be able to share out with the whole class in an efficient way Some pictures won't produce a pattern in AI recognition as well as others that why picture from all over the world help to develop patterns students can see
2:25-2:45	Practical Implications of false image identification <ul style="list-style-type: none"> Self-driving cars Optional Extension: <ul style="list-style-type: none"> Facial Recognition and Arrests and/or train your own AI model 		<ul style="list-style-type: none"> This is important because students have to understand why we care about this topic - how does it affect our everyday lives

Assessments

Methods of Assessment:

- Students will complete
 - 3 Edpuzzles assignments to introduce them to AI and Computer vision
 -  Common Household Object Detection from all over the World

Differentiation:

- Students will do three pre-lesson edpuzzles. They will also do a pre-lesson survey that will both ask students to **self-evaluate** their own comprehension of the topic and will have a few questions that asks them to **summarize their knowledge**
- Students will get placed in heterogeneous groups and **differentiated where:**
 - Weaker student: serve as the **manager** for the group. They will receive a hints sheet only for their eyes. They will direct group with these hint sheets if they are needed
 - Weaker student: serve as **presenter** for group. They will have to explain the rationale for the group - thus enhancing the student's understanding of the topic because they will need to explain it to the group
 - Stronger student: will serve as the **editor**. This student will make sure all the images go into the google doc and shared canva. They will help explain the material to make sure the other group members understand the impacts of different images
 - Stronger Student: will serve as **timekeeper**. Student will make sure students keep on track in terms of time. They will help explain the material to make sure the other group members understand the impacts of different images
- 📅 Grouping for AI Lesson 10/12/24

Professional Contributions

- Submitted Grant to Society for Science (1K -5K possibility) Emailed confirmation to Ms. Kornaker (November 4, 2024)
- Completed my second course for the [Regeneron STEM Teaching Fellowship](#) on November 6th 2024 (The Course I took was "The E in STEM: Meaningful Content for Engineering" I will be taking a few more courses and this summer I will do a two week research experience at the Tarrytown, NY offices of Regeneron

Bibliography

De Vries, T., Misra, I., Wang, C., & Van der Maaten, L. (2019). Does object recognition work for everyone?. In *Proceedings of the IEEE/CVF conference on computer vision and pattern recognition workshops* (pp. 52-59).