

Slide deck link

<http://gg.gg/aiexplorer>

Middle School AI Explorers: Professional Development for Educators

Dec 2nd, 2023

School of Education, Indiana University Bloomington



INDIANA UNIVERSITY
BLOOMINGTON

Introductions

PD Overview

10:00-10:15-Introductions (project review, AIGR team)-Dr. Kwon

10:15-10:45-Icebreaker (Win Lose Draw) -Vanessa

10:45-11:30 PD1 ML with Tangible Tools -Keunjae

11:30-12:00 AIGR Teacher Presentation -Dr. Leftwich

12:00-12:30-Lunch

12:30-1:30 PD 2 Text and AI - NLP -Hyojung & Matt

1:30-2:00 Wrap-up -Dr. Kwon



Program Overview

- Build teacher capacity for AI Education in rural schools
- Develop integrated curricula in collaboration with middle school STEM teachers on Artificial Intelligence
- Develop learning activities students enjoy
- Apply ideas students have learned, as well as focusing on the real-world applications and ethical implications of AI





Program Activities

- Professional Development
- Co-design with teachers
- Summer camp (AI for Me) in 2022
- Summer camp (AI for Good) in 2023



**2023 SUMMER CAMP
AI FOR GOOD!**

Learn, Create, & Consider AI
Free Participation!

Middle School Students
June 5 - 9 (Register open during Apr 3-28)
School of Education, Indiana University Bloomington

ABOUT THE CAMP

- Selection limited to 20 participants. We will contact you within two weeks to confirm application status.
- We provide the option of after-care enrichment.
- Time arrangements: 8:30 - 9am for drop-off, 9am - 2pm for activities, 2 - 4pm for optional enrichment.

SCHOLARSHIP

A small scholarship is available to participants outside of Bloomington, Indiana to offset transportation costs.

OUR CONTACT

- Email: aiedu@iu.edu
- Website: AIgoesRural.iu.edu

ACTIVITIES

- Learning AI concepts and familiarizing essential terms for building AI-driven applications.
- Creating AI-based solutions to authentic problems with machine learning algorithms.
- Considering AI ethical implications by relating to AI applications in real life.

What Can AI Do to Improve Life and Influence the World?

Healthcare

Farming

Manufacturing

Dealing contract

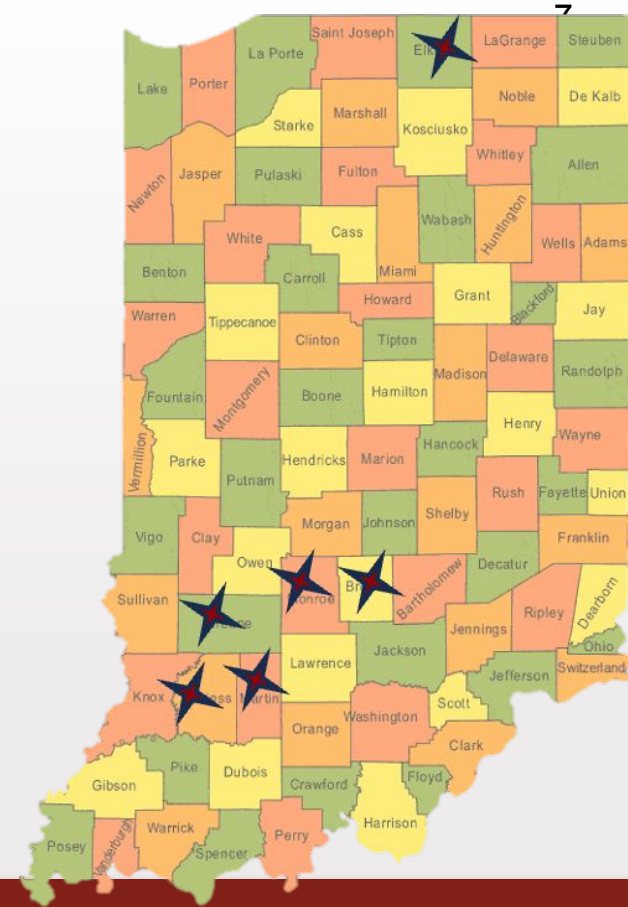
Register 2023 AI summer camp to discover this and MORE!





Program Activities

- Implementing curriculum by 6 Teachers from 6 Schools(18 classes), serving 382 students (22-23)
- 9 Teachers from 8 Schools in School Year (23-24)





Website

<https://aigoesrural.iu.edu/>



INDIANA UNIVERSITY



AI Goes Rural

[ABOUT](#) | [REGISTRATION](#) | [DESIGN AND DEVELOPMENT](#) | [IMPLEMENTATION & RESEARCH](#) | [PUBLICATIONS](#) | [TEAM](#) | [CONTACT](#)



**Win Lose Draw, Quick Draw,
and Auto Draw Icebreaker**



Quick Draw

Navigate on your laptops to:

- quickdraw.withgoogle.com
- Click on the “let’s draw” button to play the game.
- How is the Quick Draw platform able to guess what your drawings are?





Auto Draw

Navigate on your laptops to:

- [Autodraw.com](https://autodraw.com)
- Experiment with drawing in the Auto Draw platform to see if the neural network will recognize your drawings



PD 1. ML with Tangible tools



Overview of the activity

- Abstract and complicated features of AI → Difficult to understand
 - Training AI model with data + Programming + Export the AI model and the codes to tangible computing tools
- Experience how AI and ML work throughout Making artifacts

Teachable
Machine


micro:bit

MakeCode



A MICRO:BIT OF
AI





AI for Colorblindness

- Problem to solve
 - In 2023, the most common type of colorblindness in the United States, and globally, is **red-green colorblindness** (approximately 13,722,390, about 4.13% of the total U.S. population).
 - Traffic Lights and Road Signs / Warning and Safety Signals / Food Quality / Occupational Tasks
 - How can we help them with usage of AI?





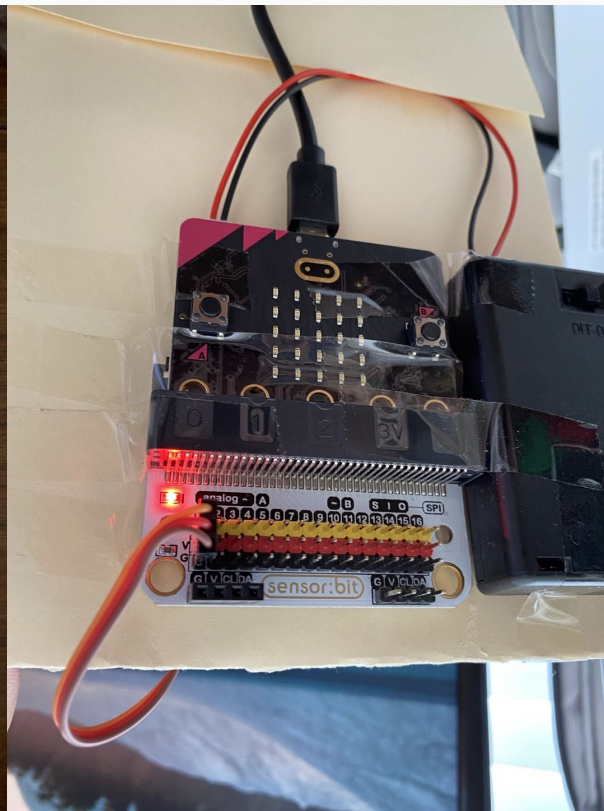
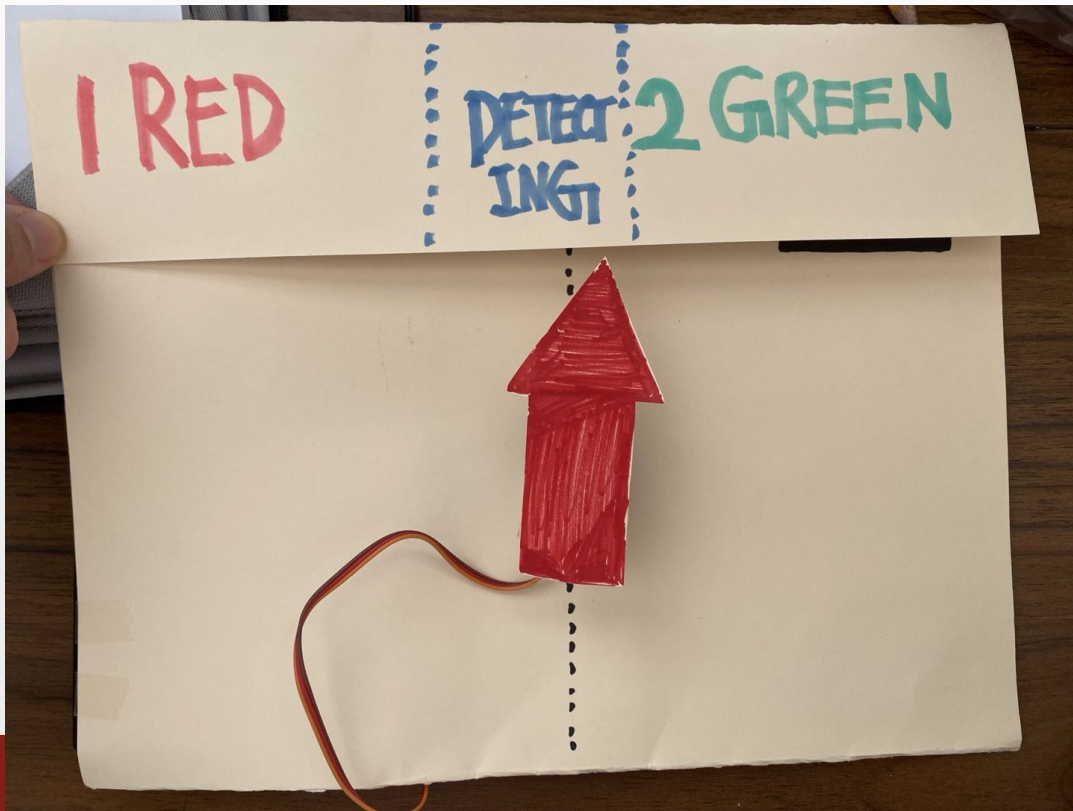
AI for Colorblindness making process

1. Train the AI model using ML with Google Teachable Machine (<https://teachablemachine.withgoogle.com/>)
2. Assemble the AI for Colorblindness artifacts with Microbit and servo motor
3. Programming with Makecode (<https://makecode.microbit.org/>) and connect it to the Microbit
4. Upload the AI model to Microbit:AI (<https://ai-training.glitch.me/>) and sync with the Microbit
5. Test the model and modify it



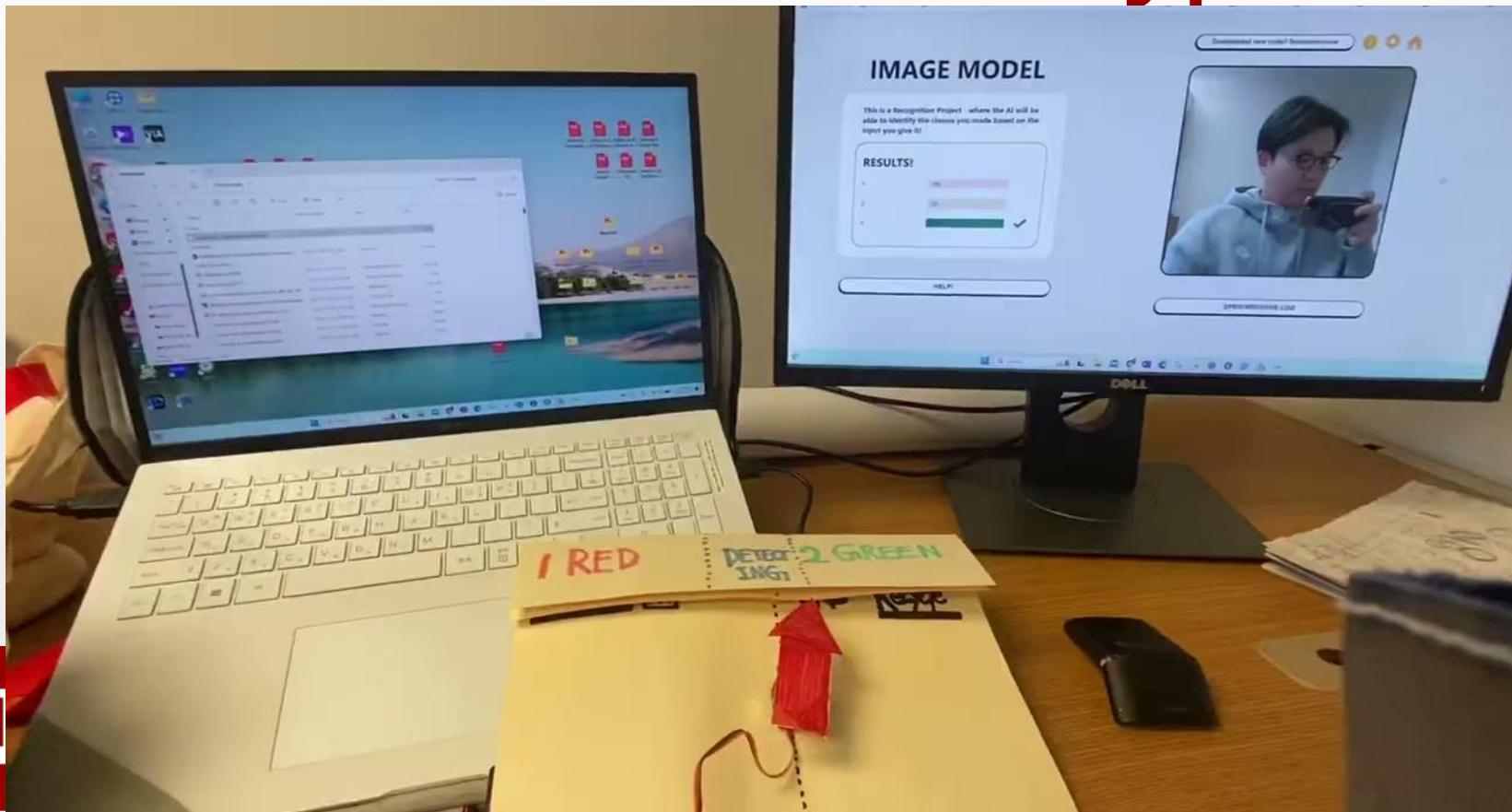


AI for Colorblindness making process





AI for Colorblindness making process





AI for Colorblindness (Modeling)

- Go to Google Teachable Machine (<https://teachablemachine.withgoogle.com/>) and choose Image project

Teachable Machine

New Project

Open an existing project from Drive. Open an existing project from a file.

Image Project
Teach based on images, from files or your webcam.

Audio Project
Teach based on one-second-long sounds, from files or your microphone.

Pose Project
Teach based on images, from files or your webcam.

More coming soon
More models will appear here as they're developed.





AI for Colorblindness (Modeling)

- Create 3 labels (**1: Red**, **2: Green**, and **3: Background**) and train the AI model by inputting the data using a webcam. The label's name should be a number instead of using characters.

The screenshot displays the Teachable Machine web interface. At the top left, there is a hamburger menu icon followed by the text "Teachable Machine". The main workspace contains three class cards on the left, each with a title, an edit icon, and a delete icon. The first two cards are labeled "1" and "2". Each card has an "Add Image Samples:" section with "Webcam" and "Upload" buttons. Below these is a dashed box labeled "Add a class". To the right of the class cards is a "Training" panel with a "Train Model" button and a dropdown menu currently set to "Advanced". Further right is a "Preview" panel with an "Export Model" button and a message: "You must train a model on the left before you can preview it here." At the bottom right, there is a language dropdown set to "English" and a version number "release-2.4.0 - 2.4.0@150701".





AI for Colorblindness (Modeling)

- Train the AI model with the objects and test the results by using accuracy.
- Add more data if it is necessary.

The screenshot displays the Teachable Machine interface. On the left, three classes are shown with their respective image samples:

- Class 1: 1033 Image Samples (Red objects)
- Class 2: 1040 Image Samples (Green objects)
- Class 3: 411 Image Samples (Human faces)

Each class has a 'Webcam' and 'Upload' button. Below the classes is an 'Add a class' button. In the center, the 'Training' panel shows 'Model Trained' and various settings:

- Advanced: Epochs: 50, Batch Size: 32, Learning Rate: 0.001
- Buttons: Reset Defaults, Under the hood

On the right, the 'Preview' panel shows the model's output for a webcam input. The input image shows a hand holding a green object against a red background. The output shows three bars representing the model's classification probabilities:

- Class 1: 100% (Orange bar)
- Class 2: (Light pink bar)
- Class 3: (Light purple bar)





AI for Colorblindness (Modeling)

Teachable Machine

1

1033 Image Samples

2

1040 Image Samples

3

411 Image Samples

Add a class

Training

Advanced

Epochs: 50

Batch Size: 32

Learning Rate: 0.001

Reset Defaults

Under the hood

Preview

Input ON Webcam

Output

1

2

3



AI for Colorblindness (Modeling)

- Click export model and choose upload (shareable link)
- Copy the shareable link

(e.g., <https://teachablemachine.withgoogle.com/models/q0eSaPcOZ/>)

The screenshot shows the Teachable Machine interface with a modal dialog for exporting a model. The dialog has the following content:

- Export your model to use it in projects.** (Close button)
- Tensorflow.js
- Export your model:
 - Upload (shareable link)
 - Download
 - Upload my model (highlighted with a red box)
- Your shareable link:
 - <https://teachablemachine.withgoogle.com/models/...>
- When you upload your model, Teachable Machine hosts it at this link. (FAQ: Who can use my model?)
- Code snippets to use your model:
 - JavaScript [Contribute on GitHub](#)
- Learn more about how to use the code snippet on [GitHub](#).
- Code snippet:

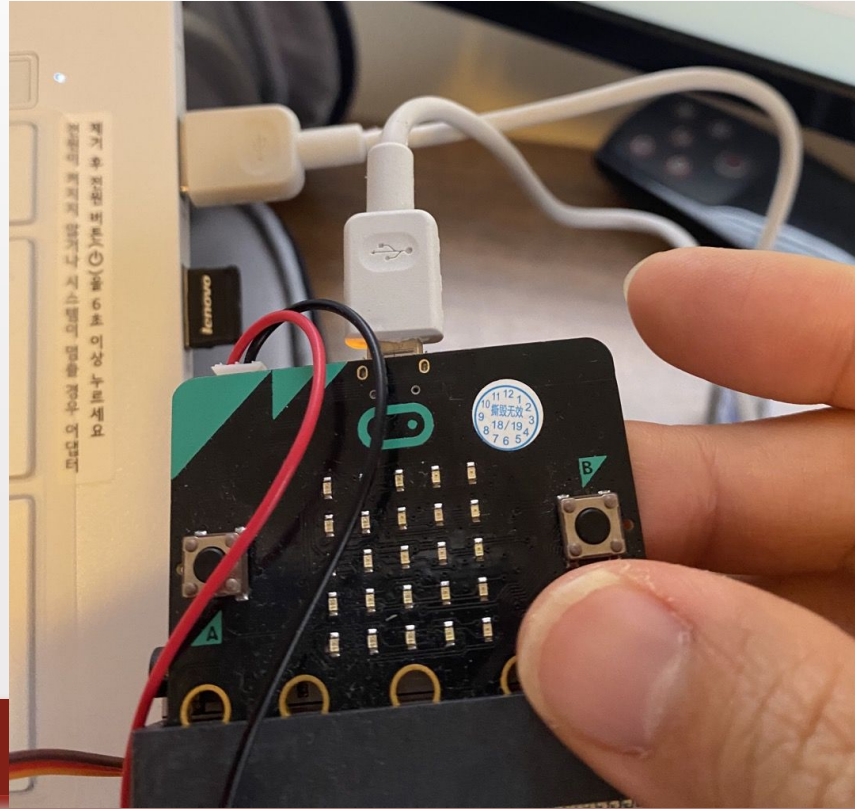

```
<div>Teachable Machine Pose Model</div>
<button type="button" onclick="init()">Start</button>
<div>Canvas</div>
<div id="label-container"></div>
<script src="https://cdn.jsdelivr.net/npm/@tensorflow/tfjs@1.3.1/dist/tf.min.js"></script>
<script src="https://cdn.jsdelivr.net/npm/@teachablemachine/pose@0.8/dist/teachablemachine-pose.min.js"></script>
<script type="text/javascript">
// Here are TensorFlow.js docs:
// https://github.com/googlecreativelab/teachablemachine-community/tree/master/libraries/pose
// the link to your model provided by Teachable Machine export panel
const URL = "your_model";
```





AI for Colorblindness (Making)

- Connect the Microbit with the laptop using USB cable.
- Click Okay when you see a pop-up.
- Turn on the battery pack!
- Do some craft to make arrows and background





AI for Colorblindness (Programming)

- Go to Makecode
(<https://makecode.microbit.org/>)
- [Download the hexfile](#)
- Drag and drop the hexfile to Makecode

```

on start
  serial
  redirect to
  TX USB_TX
  RX USB_RX
  at baud rate 9600

Click on the...

forever
  set SerialData to serial read string
  if SerialData = "1" then
    continuous servo P1 run at 100 %
    pause (ms) 1000
    stop servo P1
  else if SerialData = "2" then
    continuous servo P1 run at -100 %
    pause (ms) 1000
    stop servo P1
  else if SerialData = "3" then
    pause (ms) 1000
    stop servo P1
    continuous servo P1 run at -25 %
  
```

MakeCode





AI for Colorblindness (Programming)

Remix the code

on start

```

serial
redirect to
TX USB_TX
RX USB_RX
at baud rate 9600

```

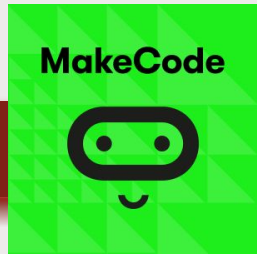
Click on the...

forever

```

set SerialData to serial read string
if SerialData = 1 then
  continuous servo P1 run at 100 %
  pause (ms) 1000
  stop servo P1
else if SerialData = "2" then
  continuous servo P1 run at -100 %
  pause (ms) 1000
  stop servo P1
else if SerialData = 3 then
  pause (ms) 1000
  stop servo P1
  continuous servo P1 run at -25 %

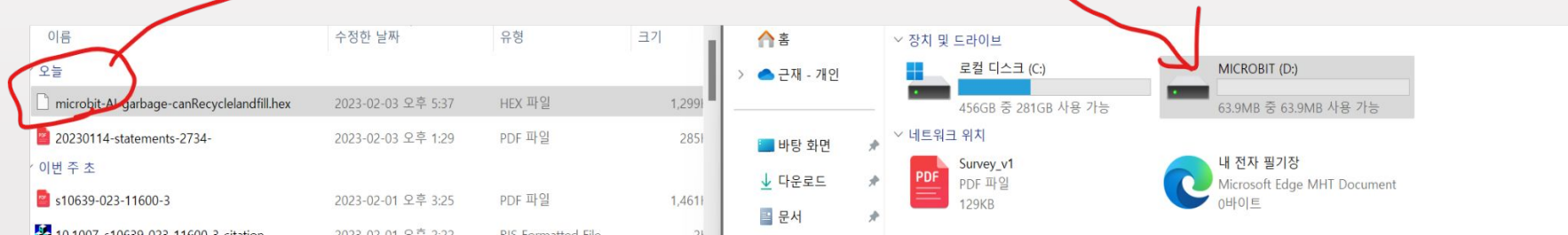
```





AI for Colorblindness (Programming)

- Make sure to drag and drop the hex file into Microbit (D:) folder.
- Then, the yellow light on the microbit will be blinking.



MakeCode





AI for Colorblindness (Test & Modify)

- Go to Microbit: AI (<https://ai-training.glitch.me/>) and click “Pair Microbit” to sync with the Microbit
- Paste the trained AI model from the Google Teachable Machine and click “Ready!”

Not sure what to do?

Visit the Teachable Machine to train an AI project:

[Google Teachable Machine](#)

New to Google Teachable Machine? Follow these guidelines to learn more: [Guide to Teachable Machine](#)

When you have finished training your model, follow these 4 simple steps:

1. Click "Export Model"

Paste your Google Teachable machine model link here:

Choose Camera:

Choose Audio:

[Ready!](#)





AI for Colorblindness (Test & Modify)

- Test the results of the AI-based artifact and modify them if necessary.

IMAGE MODEL

This is a Recognition Project - where the AI will be able to identify the classes you made based on the input you give it!

RESULTS!

1	95%	✓
2	0%	
3	0%	

HELP!

Downloaded new code? Reconnect now

OPEN MESSAGE LOG



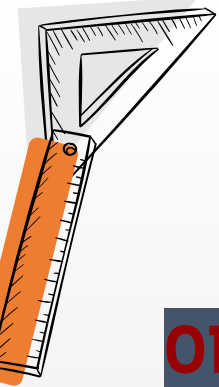


Discussion

- How can we integrate or re-design this hands-on activity into the school curriculum?
- What should we consider before we integrate this activity into the curriculum?
- What are the main challenges during the activity?



AIGR Teacher presentation



Center Grove

01

What is AI?

- How AI works
- Machine Learning Demo



02

NLP

- Apply NLP to school-based survey results

03

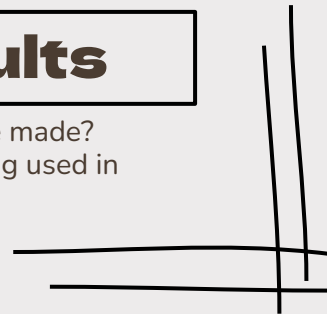
Generative AI

- Generative AI vs. Google search
- Take a stance: should schools allow students to use generative AI?

04

Share Results

- What rules could be made?
- AI technologies being used in STEM fields.

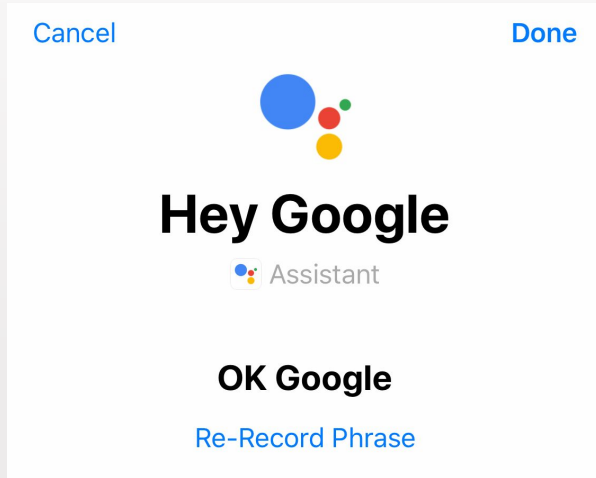


PD 2. Language and AI – NLP



NLP, Natural Language Processing

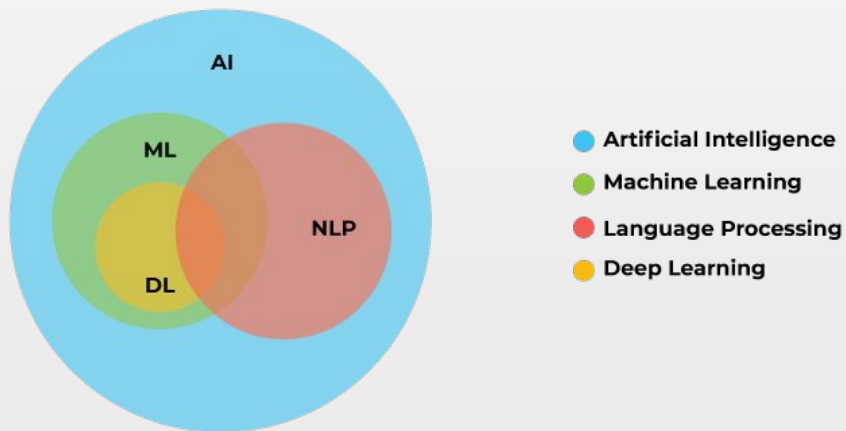
- What is NLP?





NLP, Natural Language Processing

- What is NLP?
 - NLP (Natural Language Processing) is a branch of computer science that gives computers the ability to understand the way humans write and speak.





What can NLP do?

- Recognize speech
- Translate
- Check grammar
- Autocomplete sentences
- Filter spam
- Summarize text
- Sentiment analysis
- Chatbots





Word Cloud Activity

- Go to 'free word cloud generator
- <https://www.freewordcloudgenerator.com/generatewordcloud>

Paste/Type Text

Paste or type your text to generate your free word cloud

Paste/Type Import CSV

Quick and Easy Data Visualization
You don't have to be a data scientist to transform text into data insights using our free word cloud generator.

Transform Any Text into Powerful Word Cloud Visualizations
Type, paste or upload any text, including social media posts, comments, online reviews, feedback, polls, etc. to generate a beautiful word cloud.

Hit "enter" to visualize

Options

Customize your free word cloud with the options below

Word List ▶ Lato ▼

Colors ▶ Download ↓

50

CLEAR ↻ **SAVE WORDCLOUD** 📄

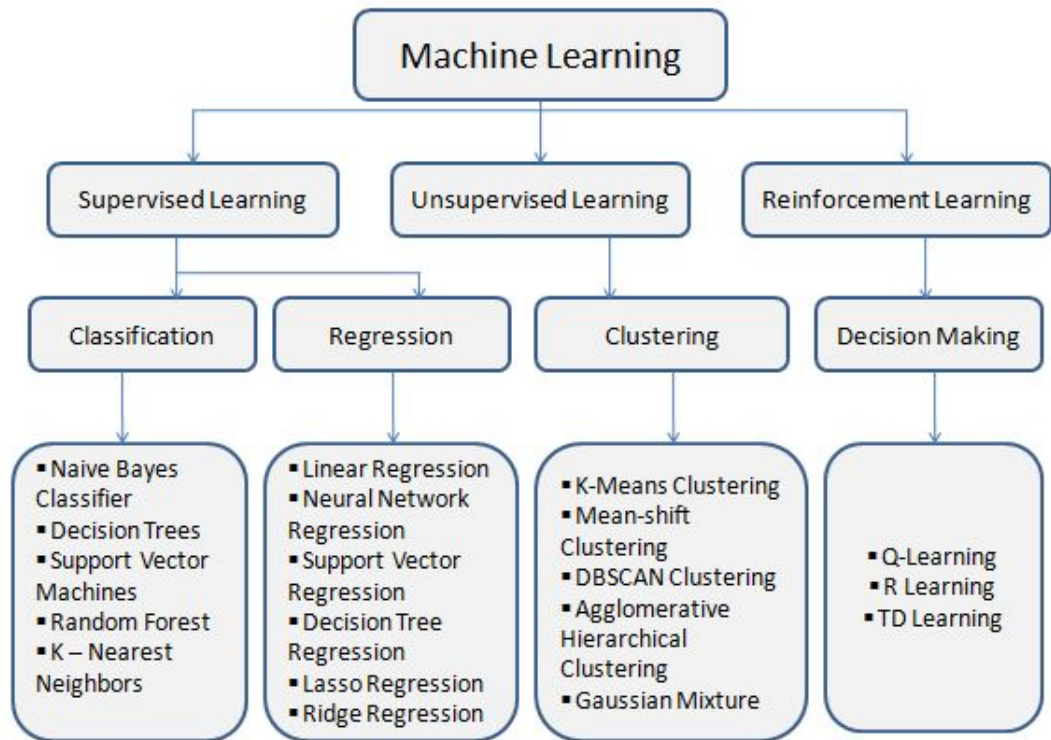




Sentiment Analysis

- What is Sentiment Analysis?
 - Natural Language processing technique that analyzes the emotional tone of text data to determine if it is positive, negative, or neutral
 - **Supervised machine learning algorithm** is used to train a text classifier to detect its tone
 - It is frequently used in business to monitor customer feedback and understand customer needs







Sentiment Analysis

- Steps for doing a Sentiment Analysis
 - Gather text data
 - Cleaning the text by removing special characters and numbers
 - Tokenization by breaking down the text into smaller chunks, mostly individual words or short sentence
 - Removing stop words (but, have, we, he into ...)
 - Train a **classifier model**





Sentiment Analysis Activity

- Go to 'text2data.com'
 - <https://text2data.com/Demo>

The screenshot shows the top navigation bar of the text2data.com website with links for Products, Demo, Services, Pricing, Blog, and Contact. There are also LOGIN and SIGN UP buttons. The main heading reads "Free sentiment analysis demo". Below this is a purple informational box stating that the demo uses generic models and that specific results require a custom-trained model. A text input field contains a sample review about a TV with a broken screen. Below the input field are checkboxes for "Twitter-like content" and "SHARE THIS ANALYSIS", and a yellow "RUN ANALYSIS" button.

Products - Demo - Services - Pricing Blog Contact - LOGIN SIGN UP

Free sentiment analysis demo

Our demo service uses generic models trained on real user's comments, product, service opinions. In order to get specific results that are tailored to your domain, please consider training your own sentiment model.

Please enter your text in **english*** for analysis or leave default one.

I purchased a larger one for bedroom and it arrived with a busted screen, so I ordered a replacement and got it on Friday. Took it out and set it up. NO picture - only static with a BLACK screen. It was hooked to Direct TV so we knew there was a problem when there was no picture and only static. It wouldn't respond to remote buttons or the buttons on the TV itself - definitely a problem. I called LG customer service and we performed a couple of their tests recommendations

Twitter-like content





Sentiment Analysis activity

- Go to 'machinelearning for kids'
 - <https://machinelearningforkids.co.uk/>

The screenshot shows the Machine Learning for Kids website. At the top, there is a navigation bar with links for 'About', 'Projects', 'Worksheets', 'Pretrained', 'Stories', 'Book', 'News', 'Help', 'Log Out', and 'Language'. The main content area features a large heading 'Teach a computer to play a game' and a blue button labeled 'Go to your Projects'. Below this, there is a numbered list of three steps:

- 1 Collect examples of things you want to be able to recognise
- 2 Use the examples to train a computer to be able to recognise them
- 3 Make a game in Scratch that uses the computer's ability to recognise them





Sentiment Analysis Activity

Get started with machine learning

First time here?

[Sign up](#)

[Why register?](#)

Already registered?

[Log in](#)

[Forgot your details?](#)

Try without registering

[Try it now](#)





Sentiment Analysis Activity

- Click on 'Get Started'
- Click on 'Try it now' -> 'Add a new project'
- Name your project '**make me happy**' and set it to learn how to recognize '**text**' and set the language to '**English**'

The screenshot shows a web interface for creating a new machine learning project. At the top, there is a navigation bar with links for 'About', 'Projects', 'Worksheets', 'News', 'Help', and 'Log Out', and a 'Language' dropdown. The main heading is 'Start a new machine learning project'. Below this, there are three input fields: 'Project Name' with the value 'make me happy', 'Recognizing' with the value 'text', and 'Language' with the value 'English'. A tooltip is visible over the 'Recognizing' field, providing instructions: 'What type of thing do you want to teach the computer to recognize? For words, sentences or paragraphs, choose "text". For photos, diagrams and pictures, choose "images". For sets of numbers or multiple choices, choose "numbers". For voices and sounds, choose "sounds"'. At the bottom right, there are 'CREATE' and 'CANCEL' buttons.





Training the Model

Train

Collect examples of what you want the computer to recognise

Train

Learn & Test

Use the examples to train the computer to recognise text

Learn & Test

Make

Use the machine learning model you've trained to make a game or app, in Scratch, Python, EduBlocks, or App Inventor

Make





Training the Model

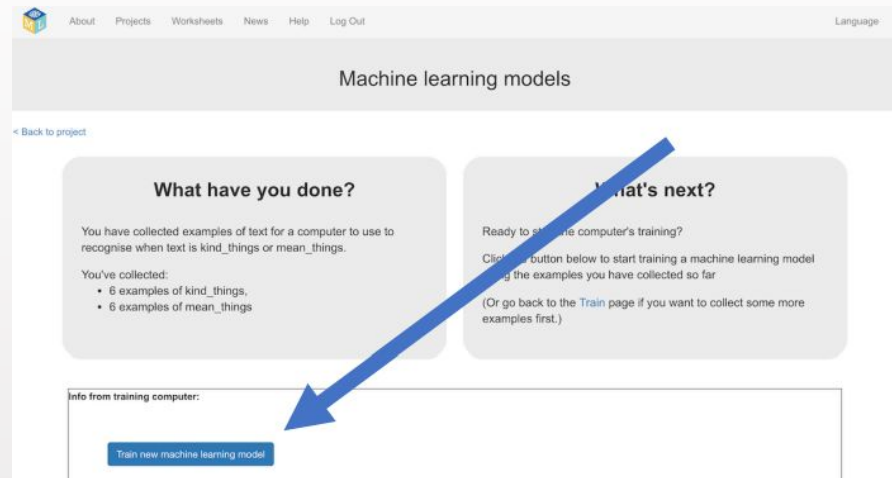
The screenshot shows a web interface for training a model. At the top, there is a navigation bar with links for "About", "Projects", "Worksheets", "News", "Help", and "Log Out", along with a "Language" dropdown. The main heading reads "Recognising **text** as **kind_things** or **mean_things**". Below this, there is a link "< Back to project" and a button "+ Add new label". The interface is divided into two large, empty rounded rectangular boxes. The left box is labeled "kind_things" and has a "+ Add example" button at the bottom. The right box is labeled "mean_things" and also has a "+ Add example" button at the bottom.





Training the Model

- Click on 'back to project'
- Click on 'learn and test'
- Click on 'Train new machine learning model'



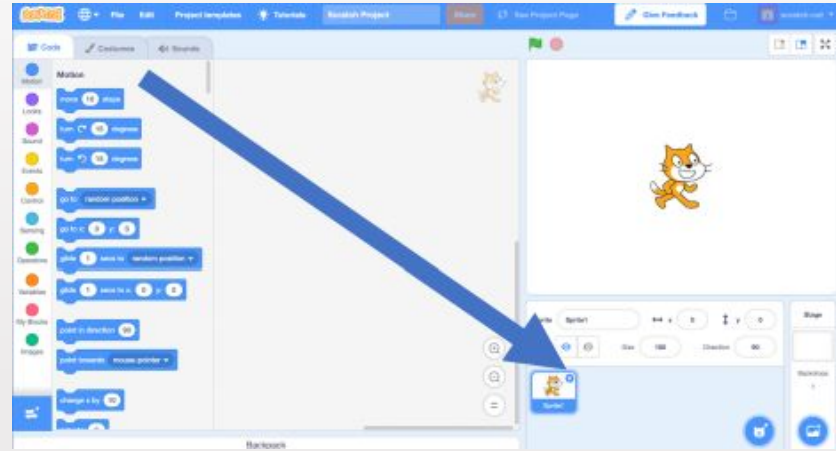
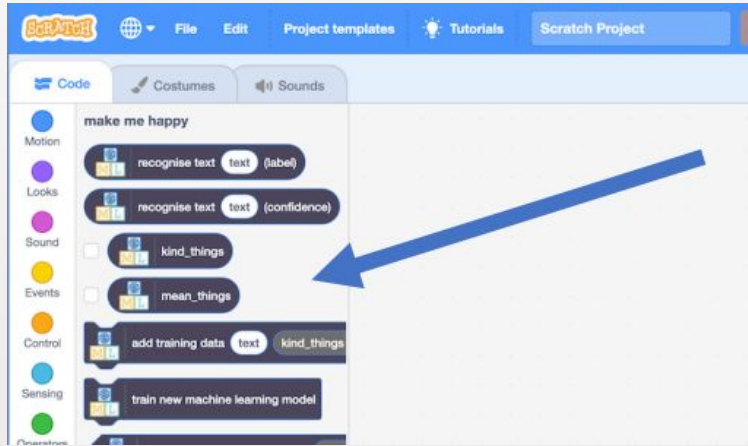
The screenshot shows a web interface for training machine learning models. At the top, there is a navigation bar with links for 'About', 'Projects', 'Worksheets', 'News', 'Help', and 'Log Out', along with a 'Language' dropdown. The main heading is 'Machine learning models'. Below this, there is a '< Back to project' link. The interface is divided into two main sections: 'What have you done?' and 'What's next?'. The 'What have you done?' section states: 'You have collected examples of text for a computer to use to recognise when text is kind_things or mean_things. You've collected: 6 examples of kind_things, 6 examples of mean_things'. The 'What's next?' section asks: 'Ready to start the computer's training? Click the button below to start training a machine learning model using the examples you have collected so far. (Or go back to the Train page if you want to collect some more examples first.)'. At the bottom, there is a section titled 'Info from training computer:' containing a blue button labeled 'Train new machine learning model'. A large blue arrow points from the 'What's next?' section down to the 'Train new machine learning model' button.





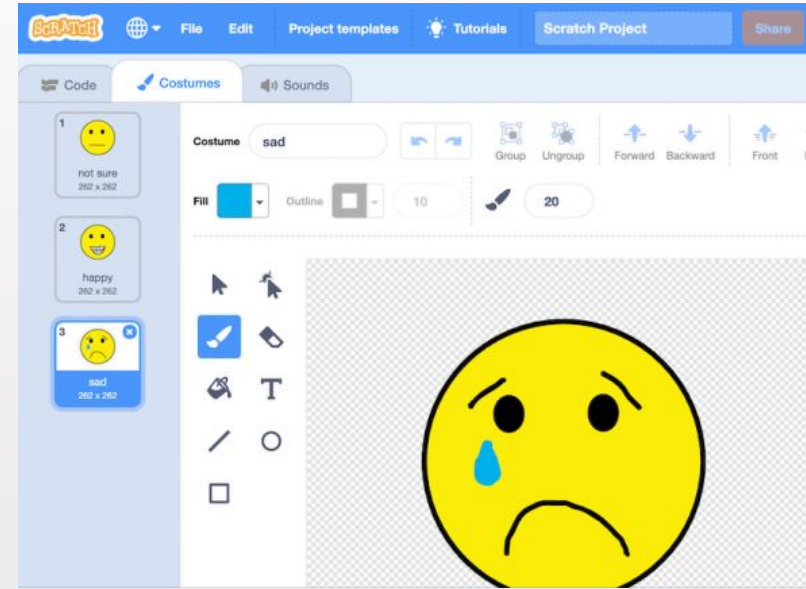
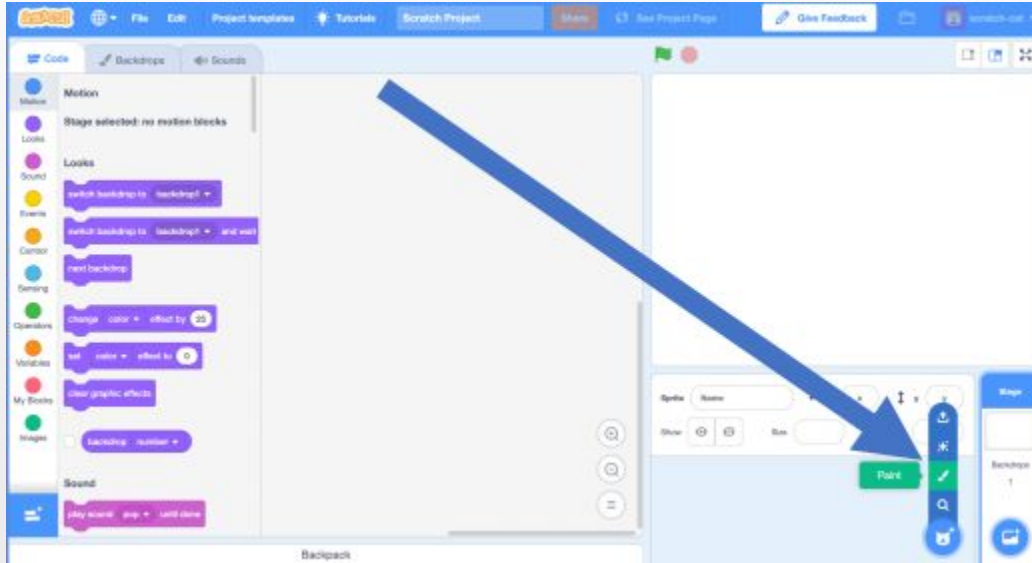
Building the Algorithm

- Click on 'open in scratch'
- Delete the cat



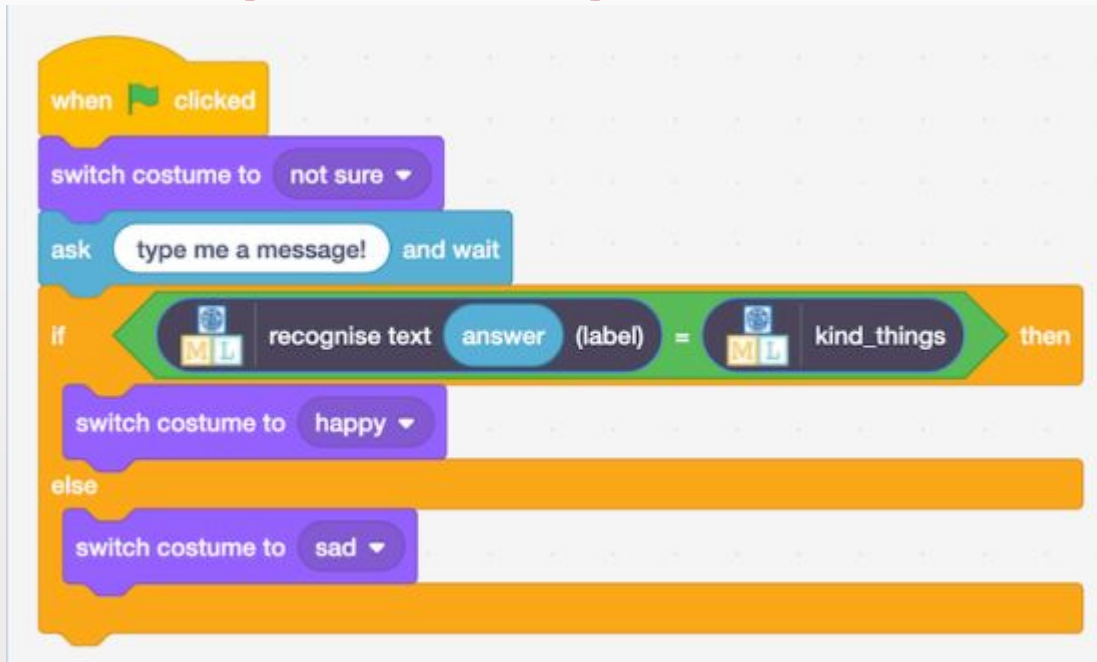


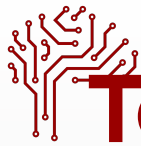
Building the Algorithm





Building the Algorithm





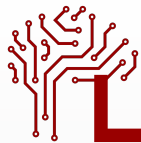
Testing the Model

The screenshot shows a Scratch project titled "make me happy" with a script designed to test a machine learning model. The script is as follows:

```
when clicked
  switch costume to not sure
  ask type me a message! and wait
  if recognise text answer (label)
    switch costume to happy
  else
    switch costume to sad
```

The project features a yellow "not sure" emoji character with a speech bubble that says "type me a message!". A blue arrow points from the "ask" block in the script to the speech bubble. The interface includes a "Code" tab, a "Costumes" tab, and a "Sounds" tab. The "Code" tab is active, showing the script. The "Costumes" tab shows a "make me happy" costume. The "Sounds" tab is empty. The "Stage" area shows the yellow emoji character and a text input field with a checkmark. The "Sprite" area shows the "Sprite1" sprite with a yellow emoji costume.





Let's pitch some ideas!

- How do you imagine to use **Word Cloud**, **Sentiment Analysis** activities in your teaching?
 - classroom activities?
 - at home activities?
 - in what subject domain?





ML4KIDS ID & PW

- [ml4kids_idpw.xlsx](#)
- Teacher ID: keundol88@naver.com / PW: 2022aiedu
- Students ID: aigood_# / PW: but.farms
(e.g., aigood_1, aigood_2, ... aigood_25).

