

Integrating AI in the K-5 Classroom

The Future of CS: Emerging Concepts in CS Education

January 16, 2021

bit.ly/futureofcs-aik5

#FutureofCS



Who Are We & Who's Joining Us Today?

Vicky Sedgwick

AI4K12 K-2 Grade Band Lead

Kelly Powers

AI4K12 3-5 Grade Band Lead

Alexis Cobo

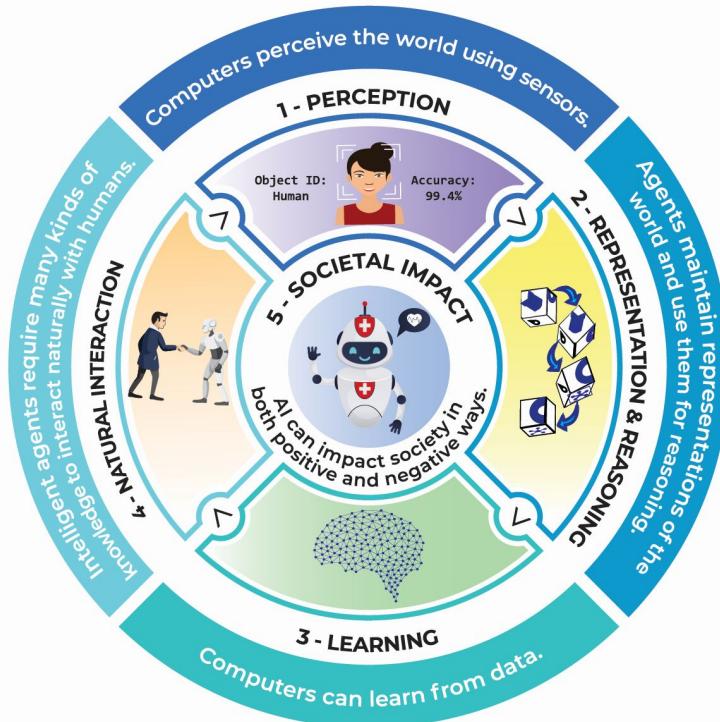
AI4K12 3-5 Working Group Member

Please take our poll and introduce yourself in the chat:

- Where you are joining us from
- What grade levels you work with
- Your Job Role



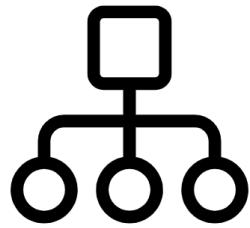
How the Five Big Ideas in AI can fit ...



Into teaching the 5 Concepts of CS



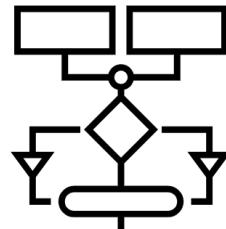
Computing
Systems



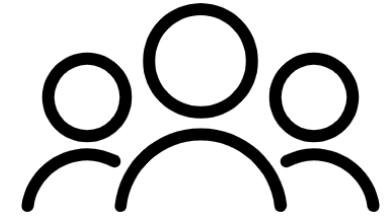
Networks
and the
Internet



Data and
Analysis

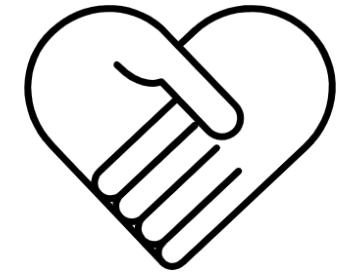
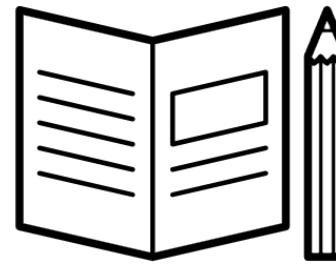
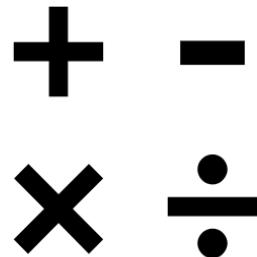
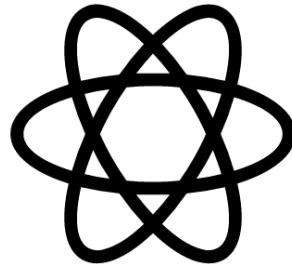


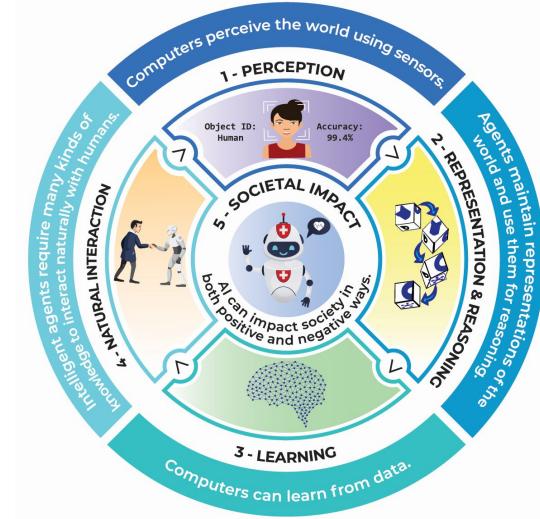
Algorithms
and
Programming



Impacts of
Computing

And even into teaching other subjects





Teaching AI With Computing Systems

bit.ly/futureofcs-aik5
#FutureofCS



K-2 Computing Systems + AI



Our 5 Senses

People use their 5 senses to understand the world around them.

Can you match the sense to the correct body part?

- Smell
- Sight
- Hearing
- Taste
- Touch



TASK 22 **MaKeS sENSE**

Humans learn about the world through our senses. You have ears to listen and eyes to see. You can smell and taste different things, and feel if someone touches you. The robot reacts to its surroundings with sensors.

Cut out the senses and sensors. First, match each human sense to its corresponding body part. Then, do the same for the robot.

With Ears **With Nose** **With Mouth** **With Motion Sensor**

With Eyes **With Camera**

With Touch **With Pressure Sensor**

With Microphone

NEW WORD! Sensors detect events or changes in their environment, and then react to them. Sensors can measure for example temperature, light or pressure.

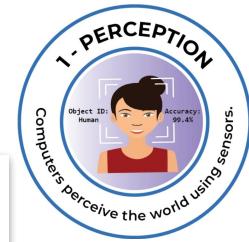
Discuss What senses do you need before leaving to school? What would a robot need to vacuum?

TASK 22 **MAKES SENSE**

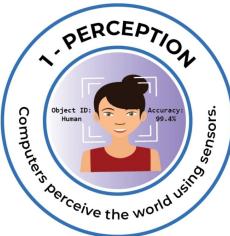
I FEEL WITH TOUCH I SEE WITH EYES I SENSE MOVEMENT WITH MOTION SENSOR I HEAR WITH EARS

I FEEL WITH CAMERA I SEE WITH EYES I TASTE WITH MOUTH I SENSE TOUCH WITH PRESSURE SENSOR

I HEAR WITH MICROPHONE



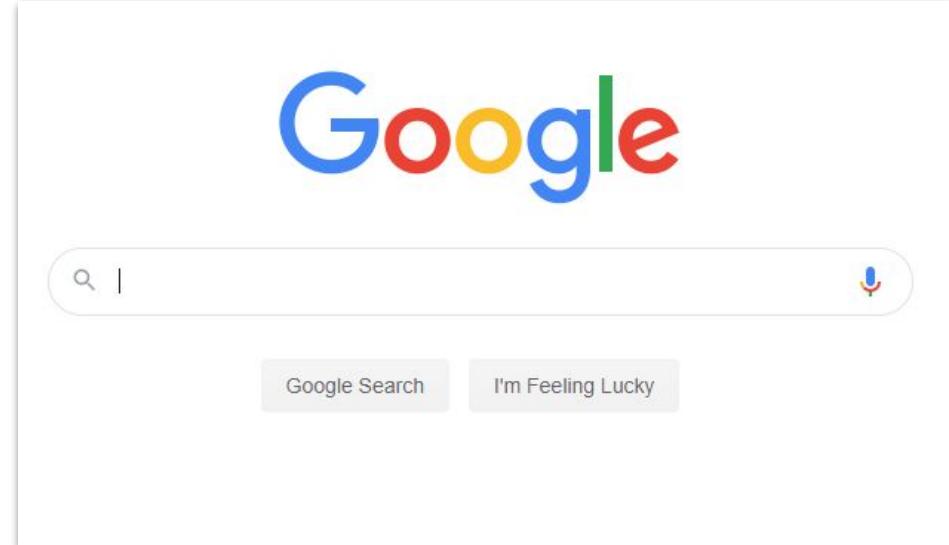
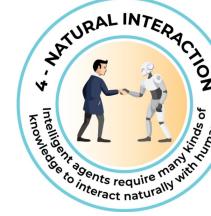
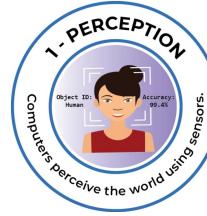
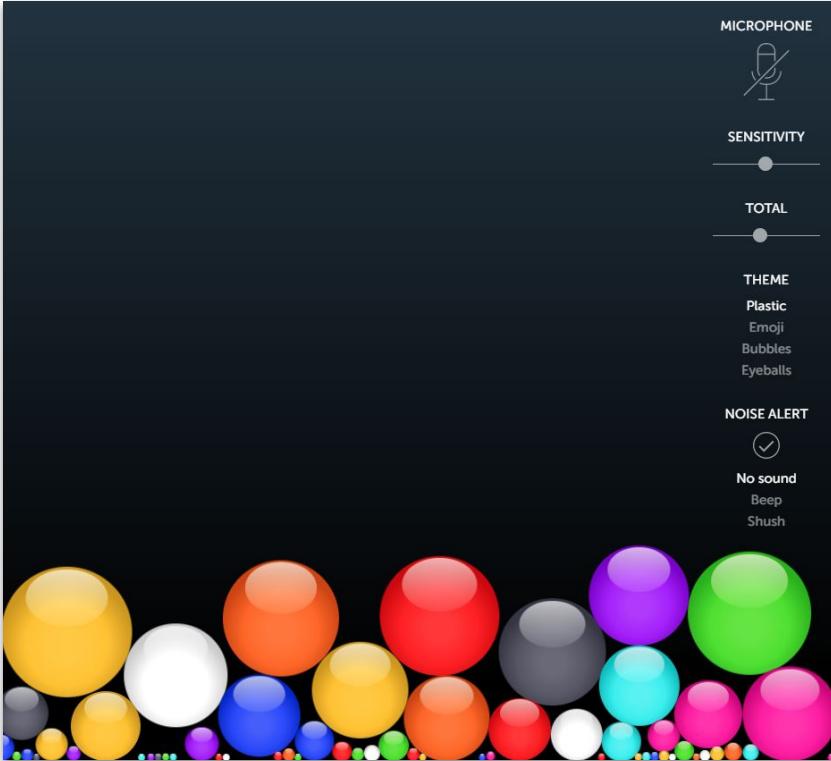
K-2 Computing Systems + AI



bit.ly/futureofcs-aik5
#FutureofCS

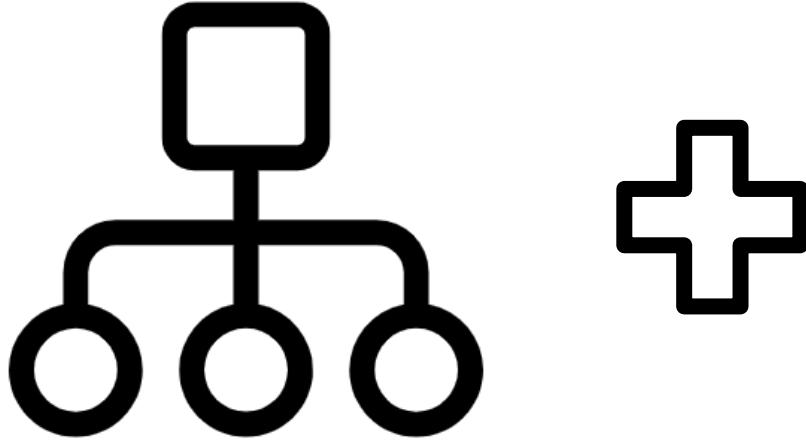


K-2 Computing Systems + AI

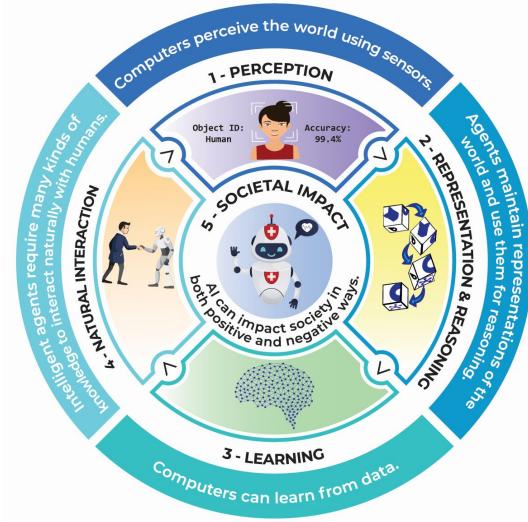


bit.ly/futureofcs-aik5
#FutureofCS





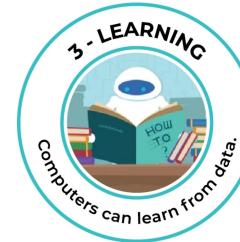
Teaching AI With Networks and the Internet



bit.ly/futureofcs-aik5
#FutureofCS

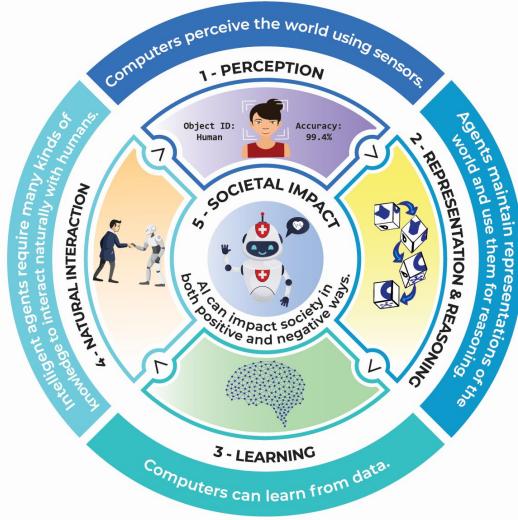


3-5 Networks & the Internet + AI





Teaching AI With Data and Analysis



bit.ly/futureofcs-aik5
#FutureofCS



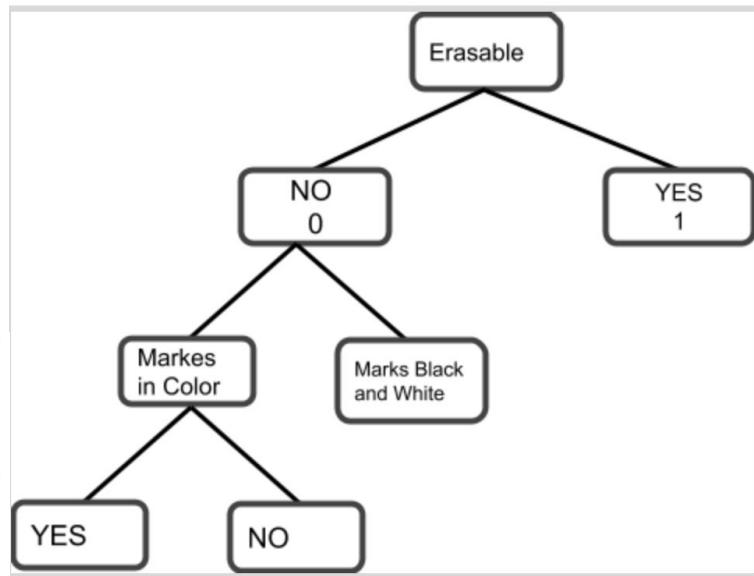
3-5 Data & Analysis + AI

20 Questions: Exploring Feature Vectors

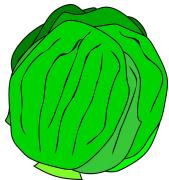
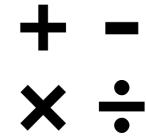
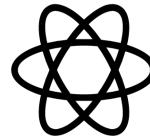
Explore how computers or computational systems recognize data patterns and make sense of information

	A	B	C	D	E	F
1	OBJECT NAME	ERASABLE	WRITES IN COLOR	FOR USE ON PAPER	WRITES IN RED	CODE
2	Blue sharpie	0	1	1	0	110
3	Red sharpie	0	1	1	1	111
4	Pencil	1	0	1	0	1010
5	Black Pen	0	0	1	0	0010

$$\begin{matrix} + \\ \times \end{matrix} \quad \begin{matrix} - \\ \div \end{matrix}$$

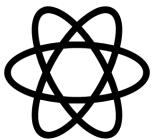


K-2 Data & Analysis + AI

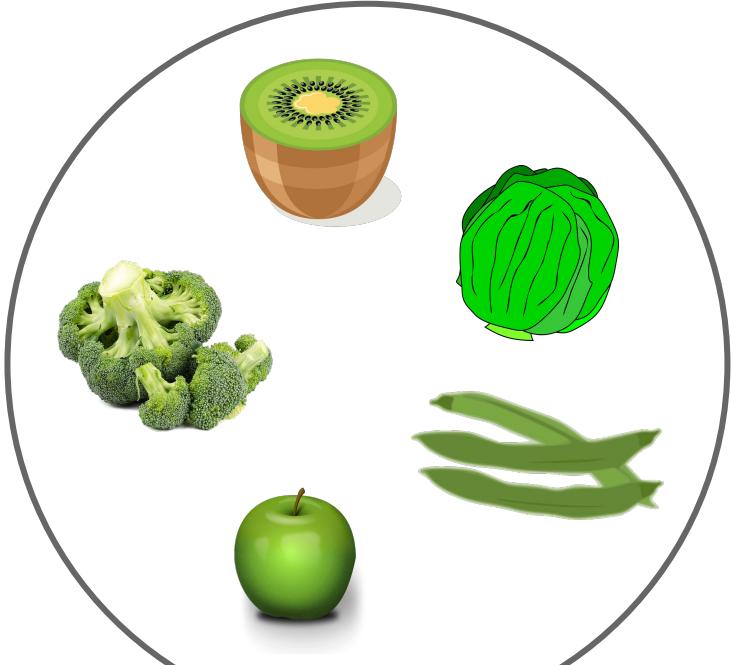
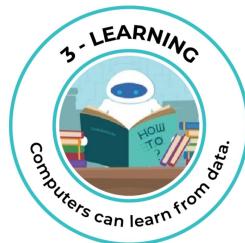


Google Slides: bit.ly/ai4k12-3-k2food / Seesaw: bit.ly/ai3K-2foodsrt

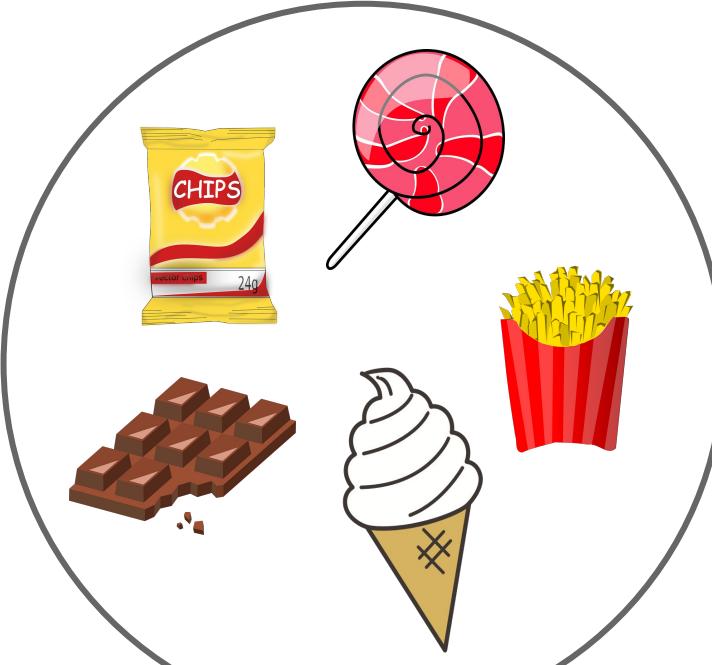
K-2 Data & Analysis + AI



+ -
× ÷

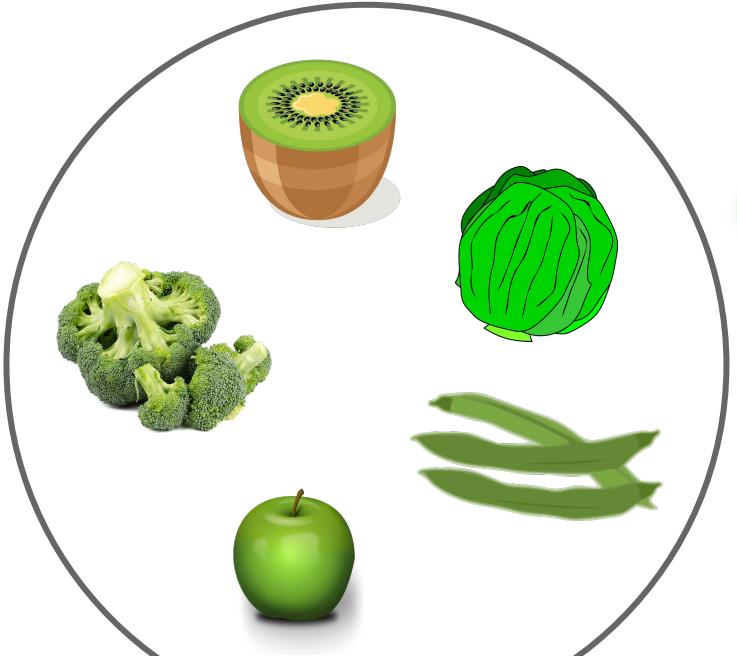


Healthy Foods

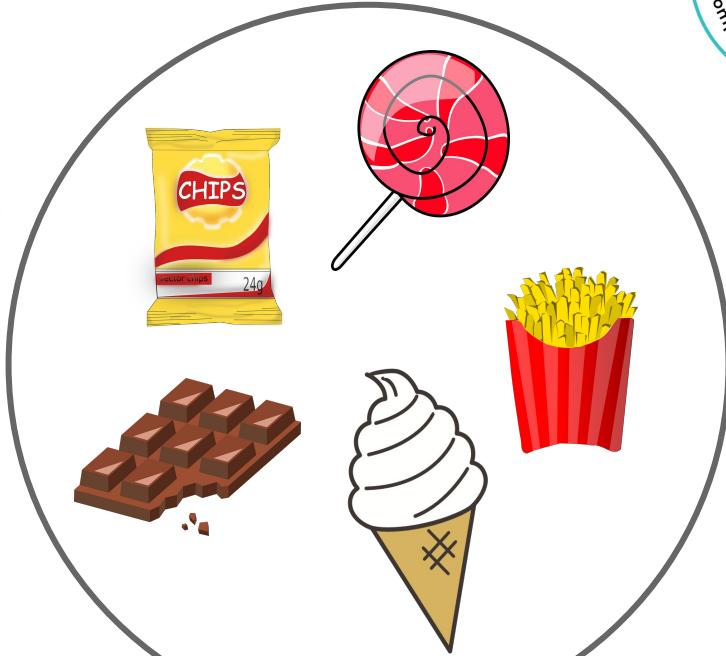


Unhealthy Foods

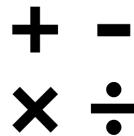
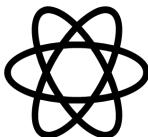
K-2 Data & Analysis + AI



Healthy Foods



Unhealthy Foods





K-2 Data & Analysis + AI

≡ Teachable Machine

The screenshot shows the Teachable Machine interface for training a machine learning model to identify healthy and unhealthy foods.

Training Data:

- Healthy Foods:** 5 Image Samples. Includes images of a kiwi, a watermelon, a green bell pepper, an apple, and a broccoli floret.
- Unhealthy Foods:** 5 Image Samples. Includes images of a bag of chips, a lollipop, a chocolate bar, an ice cream cone, and a box of popcorn.

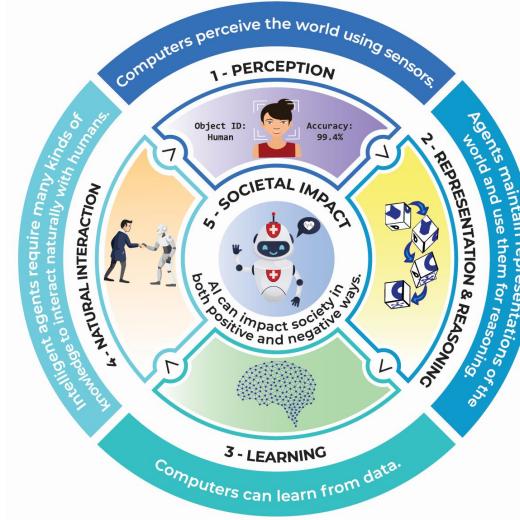
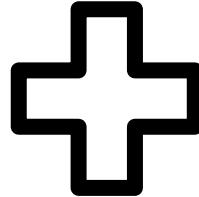
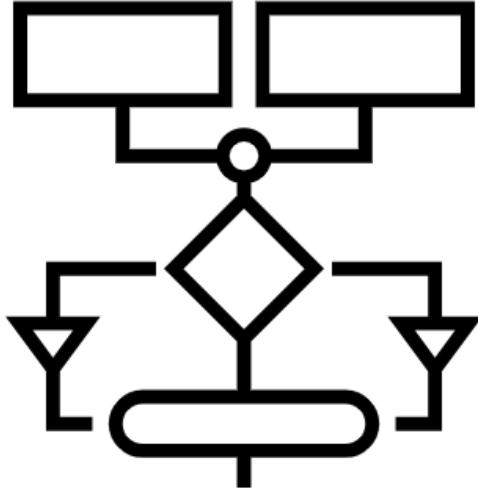
Training Status: Model Trained

Output:

- Healthy Foods: 100%
- Unheal... Foods: (partially visible)

bit.ly/futureofcs-aik5
#FutureofCS





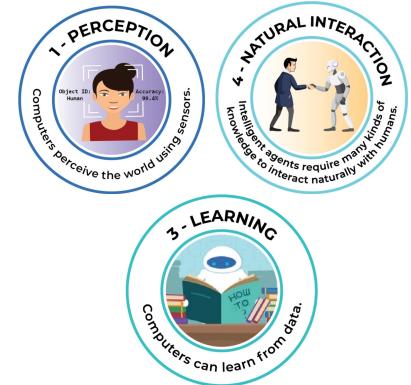
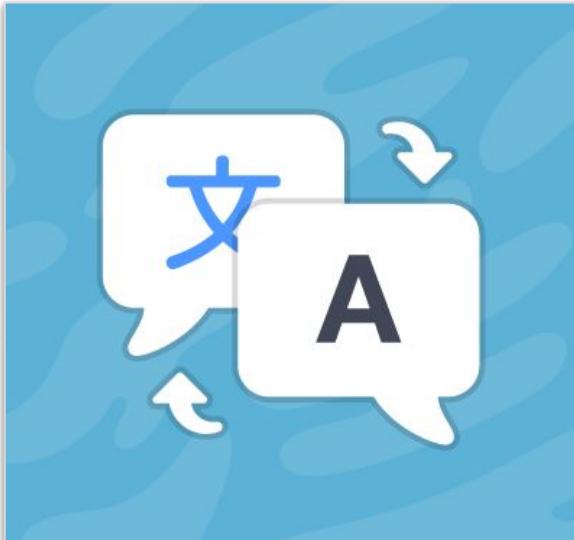
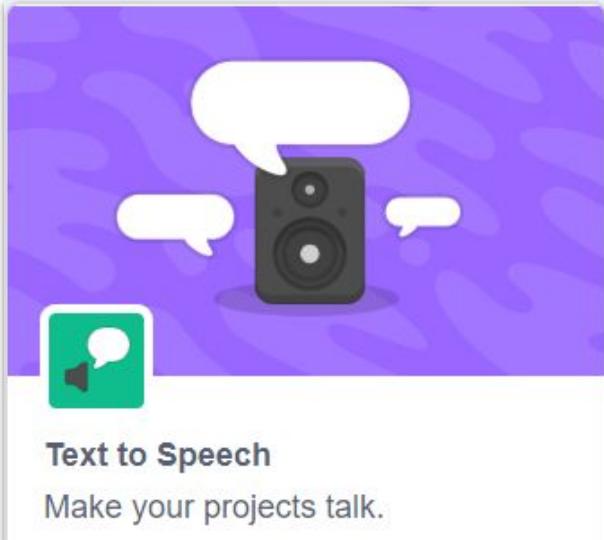
Teaching AI With Algorithms and Programming

bit.ly/futureofcs-aik5
#FutureofCS



3-5 Algorithms & Programming + AI

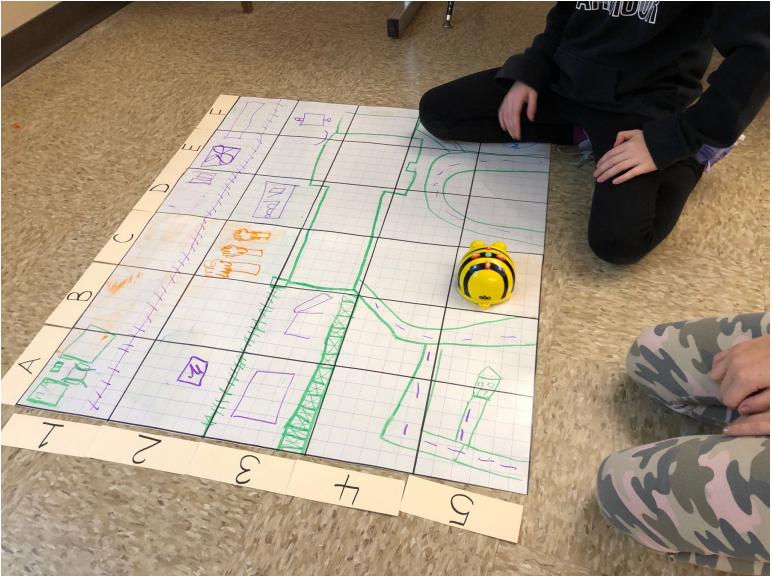
SCRATCH



Scratch + Extensions From MIT



K-2 Algorithms & Programming + AI

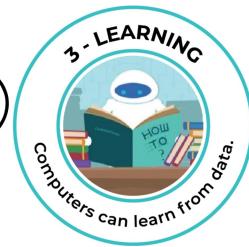


bit.ly/futureofcs-aik5
#FutureofCS



3-5 Algorithms & Programming + AI

Mood Meter: How do I feel?



Machine Learning for Kids

machinelearningforkids.co.uk

Collect examples of text to train a computer

Train a ML Model

Evaluate the model in labeling text

Build a Scratch Project



3-5 Algorithms & Programming + AI

< Back to project

Red

Mean	Scream	Irritated
Frustrated	Worried	Scared
Furious	Bothered	Angry
Aggressive	Explode	Betrayed
Let Down	Grumpy	Yelling
Hostile	Provoked	

Green

open minded	comfortable	
included	Calm	Happy
Focused	Ready	Interested
Peaceful	Pleasant	Mellow
Chill	relaxed	Okay

Blue

Unpleasant	Bully	tired
depressed	down	Blue
lonely	bored	cry
unhappy	Deflated	sad
Guilty	Sleepy	

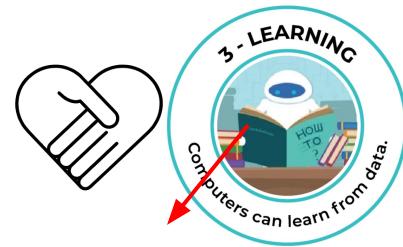
Yellow

Joyful	Pleased	Enthusiastic	Brave	Amazed
Energy	Confident	excited	brave	pumped
Awesome	Jumping	happy	smiling	Proud

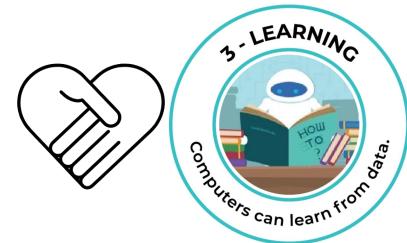
Add new label

+ Add example

17 14 14



3-5 Algorithms & Programming + AI



You have trained a machine learning model to recognise when text is Red, Green or 2 other classes.

You created the model on Friday, January 15, 2021 5:26 PM.

You have collected:

- 17 examples of Red,
- 14 examples of Green,
- 14 examples of Blue,
- 15 examples of Yellow

Try putting in some text to see how it is recognised based on your training.

I am angry

Recognised as **Red**
with 94% confidence

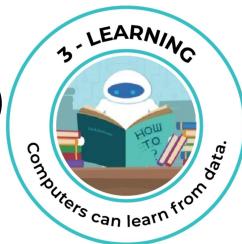
Test the ML model.

Evaluate it! Retrain?

Satisfied? Create an interactive Scratch project to predict your mood!



3-5 Algorithms & Programming + AI



How am I feeling?

- Motion
- Looks
- Sound
- Events
- Control
- Sensing
- Operators
- Variables
- Blocks
- Images

How am I feeling?

```
when green flag clicked
  wait (1) seconds
  switch costume to ballerina-start
  ask [Hmm.. I guess... and wait]
  if [ML recognise text answer (label) = Red] then
    say [I am upset for 3 seconds]
    say [ML recognise text Red (confidence) for 2 seconds]
    switch costume to ballerina-greencalm
  end
  if [ML recognise text answer (label) = Green] then
    say [I feel calm for 3 seconds]
    switch costume to ballerina-greencalm
  end
  if [ML recognise text answer (label) = Blue] then
    say [I am feeling sad for 3 seconds]
    switch costume to ballerina-sad
  end
  if [ML recognise text answer (label) = Yellow] then
    say [I am so excited for 3 seconds]
    switch costume to ballerina-yellowexcited
  end
```

when green flag clicked

```
wait (1) seconds
switch costume to ballerina-start
ask [Hmm.. I guess... and wait]
if [ML recognise text answer (label) = Red] then
  say [I am upset for 3 seconds]
  say [ML recognise text Red (confidence) for 2 seconds]
  switch costume to ballerina-greencalm
end
if [ML recognise text answer (label) = Green] then
  say [I feel calm for 3 seconds]
  switch costume to ballerina-greencalm
end
if [ML recognise text answer (label) = Blue] then
  say [I am feeling sad for 3 seconds]
  switch costume to ballerina-sad
end
if [ML recognise text answer (label) = Yellow] then
  say [I am so excited for 3 seconds]
  switch costume to ballerina-yellowexcited
end
```

Scratch Project: MoodMeter- SCRATCHML

Code tab:

```
when green flag clicked
  wait (1) seconds
  switch costume to ballerina-start
  ask [Hmm.. I guess... and wait]
  if [ML recognise text answer (label) = Red] then
    say [I am upset for 3 seconds]
    say [ML recognise text Red (confidence) for 2 seconds]
    switch costume to ballerina-greencalm
  end
  if [ML recognise text answer (label) = Green] then
    say [I feel calm for 3 seconds]
    switch costume to ballerina-greencalm
  end
  if [ML recognise text answer (label) = Blue] then
    say [I am feeling sad for 3 seconds]
    switch costume to ballerina-sad
  end
  if [ML recognise text answer (label) = Yellow] then
    say [I am so excited for 3 seconds]
    switch costume to ballerina-yellowexcited
  end
```

Costumes tab:

Sounds tab:

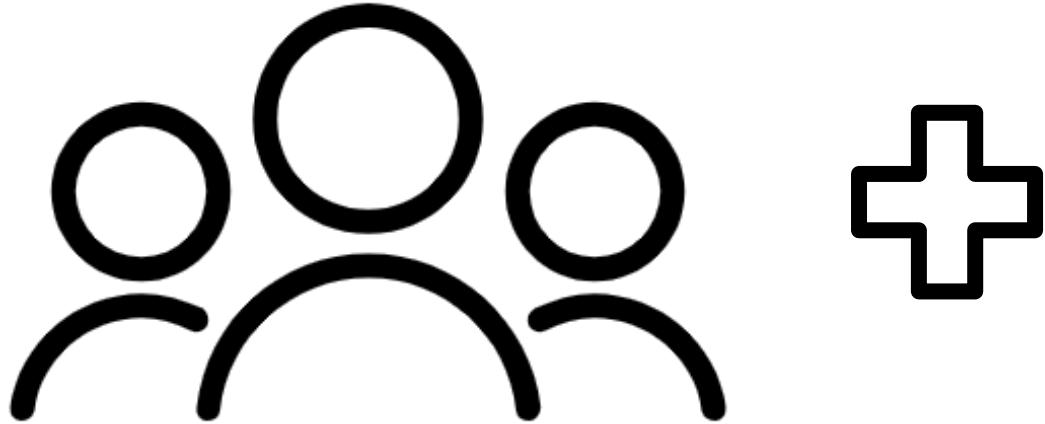
Scratch Stage:

- Legend:
 - Red
 - Green
 - Blue
 - Yellow
- Emotions:
 - Mad
 - Worried
 - Bored
 - Proud
 - Sad
 - Calm
 - Relaxed
 - Hopeful
 - Depressed
 - Excited
- Environment:
 - Pleasantness

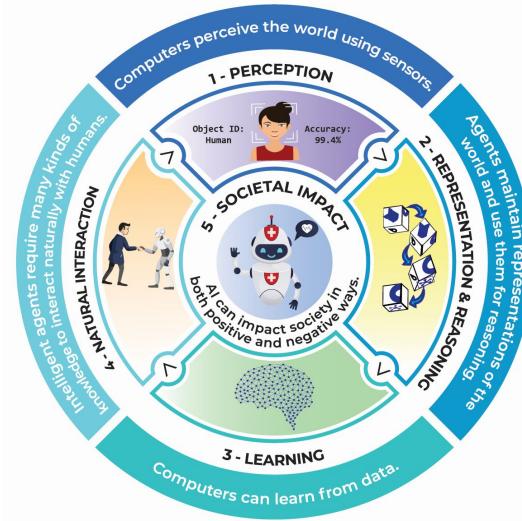
A Scratch stage showing two ballerina costumes: one in a pink tutu and one in dark clothing. A speech bubble from the dark-costumed ballerina says "I feel calm".

bit.ly/futureofcs-aik5
#FutureofCS





Teaching AI With Impacts of Computing



3-5 Impacts of Computing + AI

(also, Algorithms and Programming)



Minecraft AI for Good

The new Minecraft Hour of Code tutorial is now available in Minecraft: Education Edition for Windows, Mac, and iPad. Learn the basics of coding and explore AI with your students!

Access free resources including a lesson plan, videos, computer science curriculum, and teacher trainings.

Get started

A large image of two Minecraft characters, Steve and Alex, standing in a grassy field. Steve is on the left, wearing his signature blue shirt and brown pants. Alex is on the right, wearing a green shirt and blue pants. They are surrounded by floating transparent cubes containing various items like a sword, a shield, and a map. To the right of the characters is a dark blue rectangular box containing text about the Minecraft AI for Good tutorial. At the bottom right of the image is a 'Get started' button.

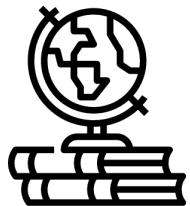
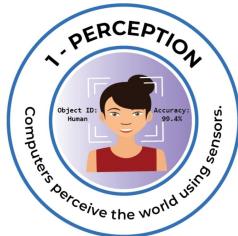
K-5 Impacts of Computing + AI



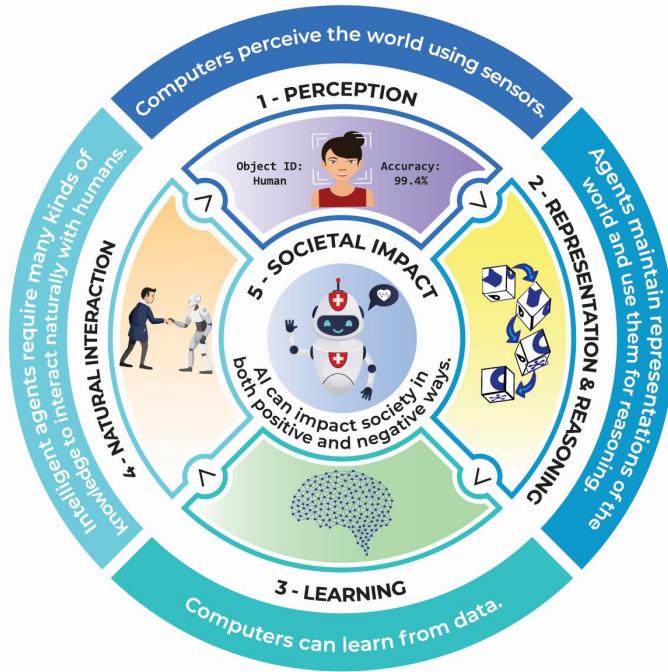
Scroobly
Scrooble a doodle. Bring it to life.

Scroobly logo featuring a stylized orange blob with a face and a 'Start' button.

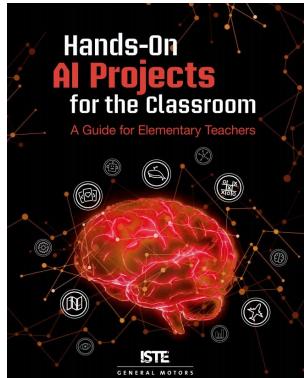
3-5 Impacts of Computing + AI



What if I want more activities or curriculum resources?



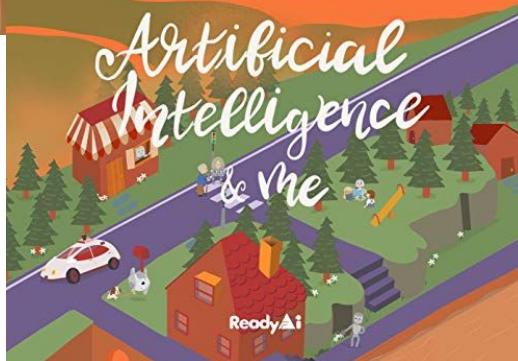
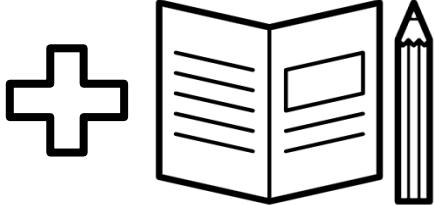
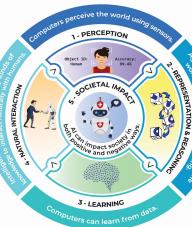
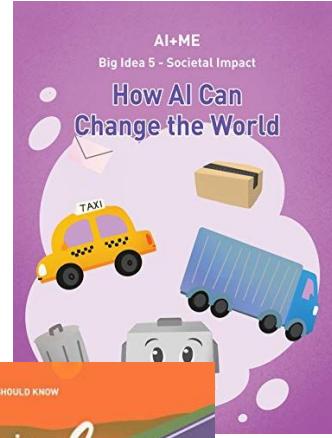
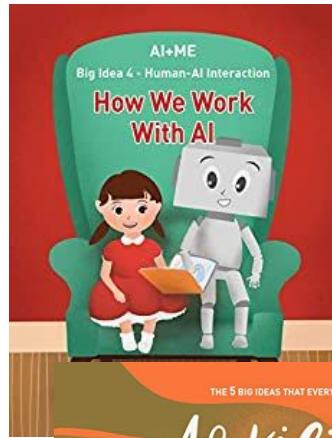
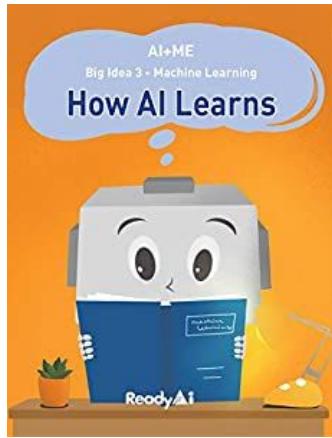
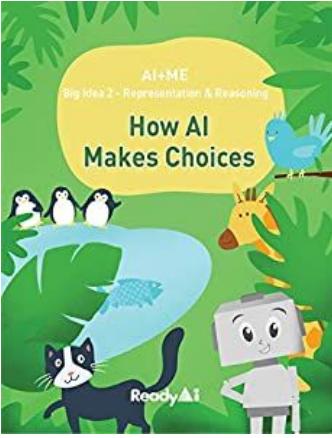
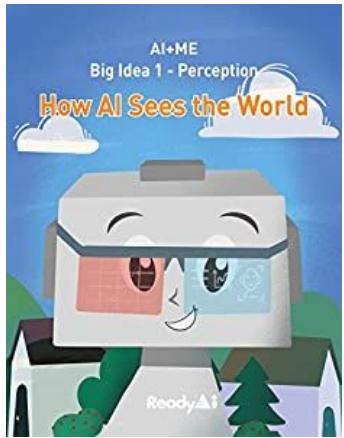
Curriculum, Lesson Plans, Support Network



bit.ly/futureofcs-aik5
#FutureofCS

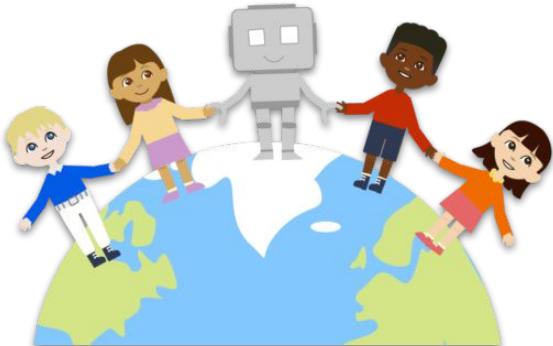
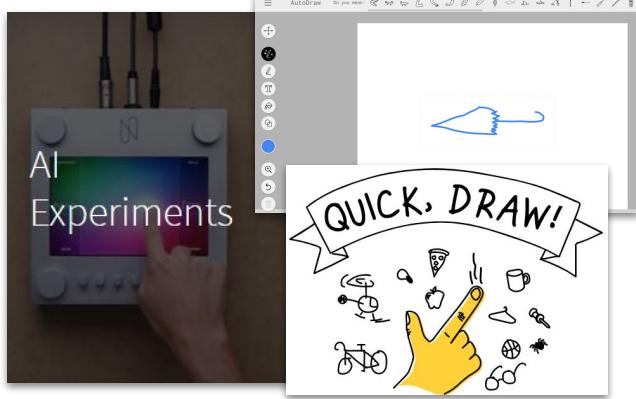
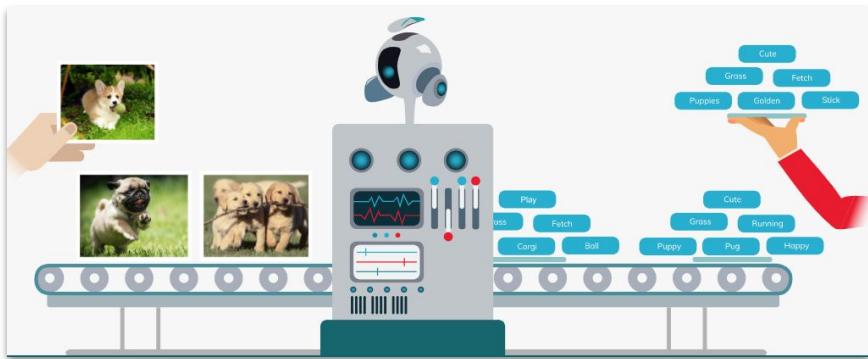


K-2 Books



bit.ly/futureofcs-aik5
#FutureofCS

Other Activities/Links of Interest



bit.ly/futureofcs-aik5
#FutureofCS

Additional K-5 AI Instructional Resources

Find more Learning Activities
for Teaching AI in K-5
on the AI4K12 website: www.ai4k12.org

Thank you for your time!

