You Know AI Has Arrived When We're Teaching It in Elementary School

AAAI/EAAI Outstanding Educator Award Talk
Sunday, February 27, 2022

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Overview

Introductions

History & motivation

The AI4K12 Initiative
- the team
- the “5 Big Ideas”
- progression charts
- curriculum resources

What’s next?
- teacher professional learning
- state-based adoption
- curriculum development
- More!

Q & A

Why is this the right time to be teaching AI in K-12?

Why teach AI to kids now?

Citizens of the modern world need to know AI's risks, biases, and opportunities

We need the next generation of AI creators to solve the world's problems

Everyone should have the AI skills they will need for their career

It is super fun to create systems using AI

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Why is this the right time to be teaching AI in K-12?

1. AI is increasingly prominent in society:
   - We all live with intelligent assistants (Alexa, Siri, etc.)
   - Advanced driver assistance is leading to self-driving cars, autonomous delivery vehicles
   - Autonomous robots in the workplace (and someday the home)
2. Informed citizens need to understand the basics of AI as our society faces important public policy decisions surrounding AI technologies.
3. AI technologies will cause job loss in some areas, and gains in other areas.
4. There is a growing need for AI-literate workers. Students should be prepared from a young age to work with AI technologies to solve societal problems.

CS Visions by Santo, Vogel, and Ching, `csforall.org/visions`

Personal Agency, Joy & Fulfillment

Economic & Workforce Development

Competencies & Literacies

School Reform & Improvement

Equity & Social Justice

Technological, Social & Scientific Innovation

Citizenship & Civic Engagement

World wide groups have been working on K-12 Computing Education for the past 30 years

K-12 AI Education

Which country has national standards for teaching AI to K-12?

- Canada
- China
- South Korea
- United Kingdom
- United States

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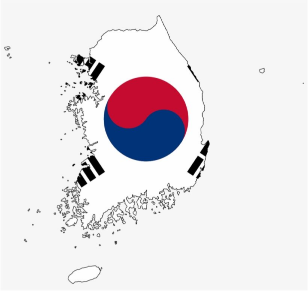
World-wide K-12 AI Education

- Many countries are developing K-12 AI standards and curricula: China, UK, Thailand, and EU Countries, Canada


- South Korea has launched AI standards nationally.



Launch of AI4K12 Initiative in May 2018

Back in 2017 CSTA Computing Standards contain just two sentences about AI.

- Both are for the 11-12 grade band. Nothing for younger students.

3B-AP-08	11-12	**Describe how artificial intelligence drives many software and physical systems.**	Algorithms & Programming	Algorithms	Communicating
3B-AP-09	11-12	**Implement an artificial intelligence algorithm to play a game against a human opponent or solve a problem.**	Algorithms & Programming	Algorithms	Creating

The AI4K12 Initiative, a joint project of:

AAAI (Association for the Advancement of Artificial Intelligence)

CSTA (Computer Science Teachers Association)

With funding from National Science Foundation ITEST Program (DRL-1846073)

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Grades 3-5
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AI4K12.org Mission

- Develop national guidelines for teaching AI in K-12
  - Modeled after the CSTA standards for computing education.
  - Progression Charts for four grade bands: K-2, 3-5, 6-8, and 9-12
  - What should students know?
  - What should students be able to do?

- Develop a curated AI resource directory for K-12 teachers

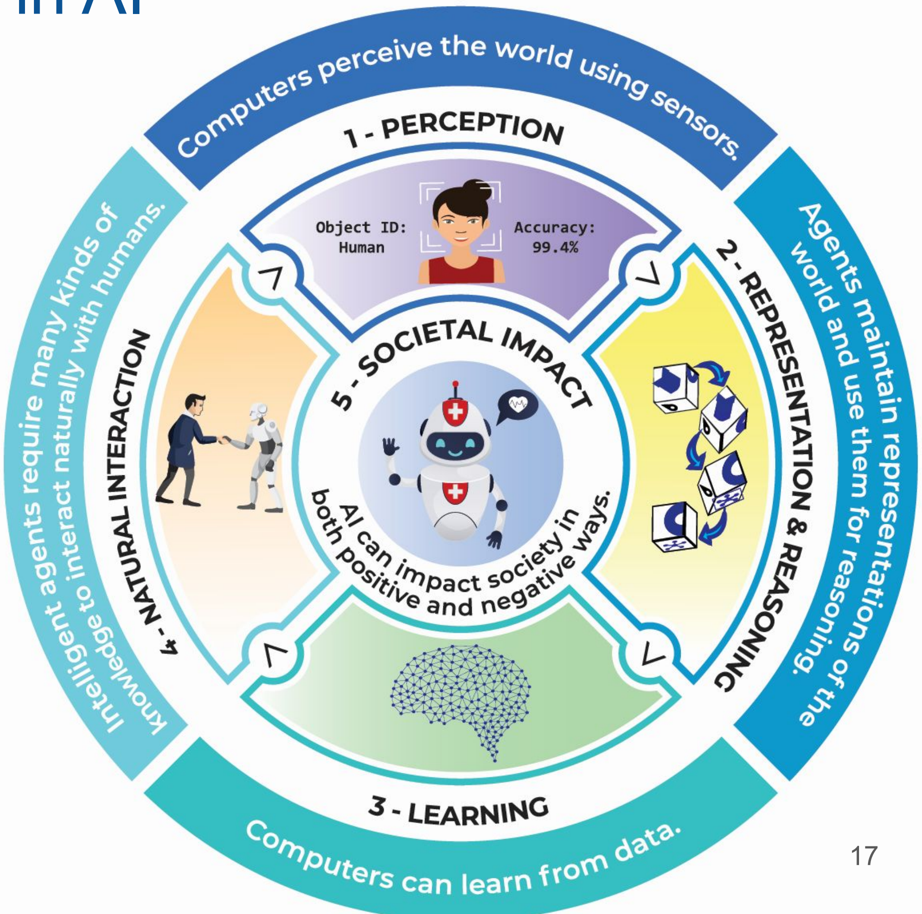
- Foster a community of K-12 AI educators, researchers, and resource developers

Five Big Ideas in AI

- Organizing framework for the K-12 guidelines.
- Widely adopted by curriculum developers in the US and elsewhere.

The Five Big Ideas:

1. Perception
2. Representation & Reasoning
3. Learning
4. Natural Interaction
5. Societal Impact



Five Big Ideas in Artificial Intelligence

1. Perception

Computers perceive the world using sensors. Perception is the process of extracting meaning from sensory signals. Making computers "see" and "hear" well enough for practical use is one of the most significant achievements of AI to date.

2. Representation & Reasoning

Agents maintain representations of the world and use them for reasoning. Representation is one of the fundamental problems of intelligence, both natural and artificial. Computers construct representations using data structures, and these representations support reasoning algorithms that derive new information from what is already known. While AI agents can reason about very complex problems, they do not think the way a human does.

3. Learning

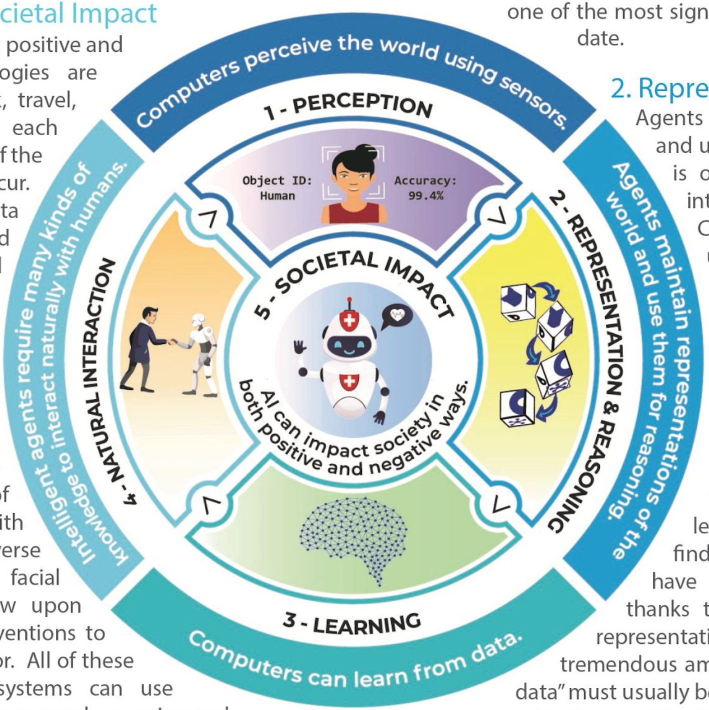
Computers can learn from data. Machine learning is a kind of statistical inference that finds patterns in data. Many areas of AI have progressed significantly in recent years thanks to learning algorithms that create new representations. For the approach to succeed, tremendous amounts of data are required. This "training data" must usually be supplied by people, but is sometimes acquired by the machine itself.

4. Natural Interaction

Intelligent agents require many kinds of knowlege to interact naturally with humans. Agents must be able to converse in human languages, recognize facial expressions and emotions, and draw upon knowledge of culture and social conventions to infer intentions from observed behavior. All of these are difficult problems. Today's AI systems can use language to a limited extent, but lack the general reasoning and conversational capabilities of even a child.

5. Societal Impact

AI can impact society in both positive and negative ways. AI technologies are changing the ways we work, travel, communicate, and care for each other. But we must be mindful of the harms that can potentially occur. For example, biases in the data used to train an AI system could lead to some people being less well served than others. Thus, it is important to discuss the impacts that AI is having on our society and develop criteria for the ethical design and deployment of AI-based systems.



The AI for K-12 Initiative is a joint project of the Association for the Advancement of Artificial Intelligence (AAAI) and the Computer Science Teachers Association (CSTA), funded by National Science Foundation award DRL-1846073

AI4K12.org

Poster with translations available in 16 languages

Romance Languages: Spanish, French, German, Portuguese, Italian

Asian Languages: Chinese, Japanese, Korean, Thai, Hindi, Tamil.

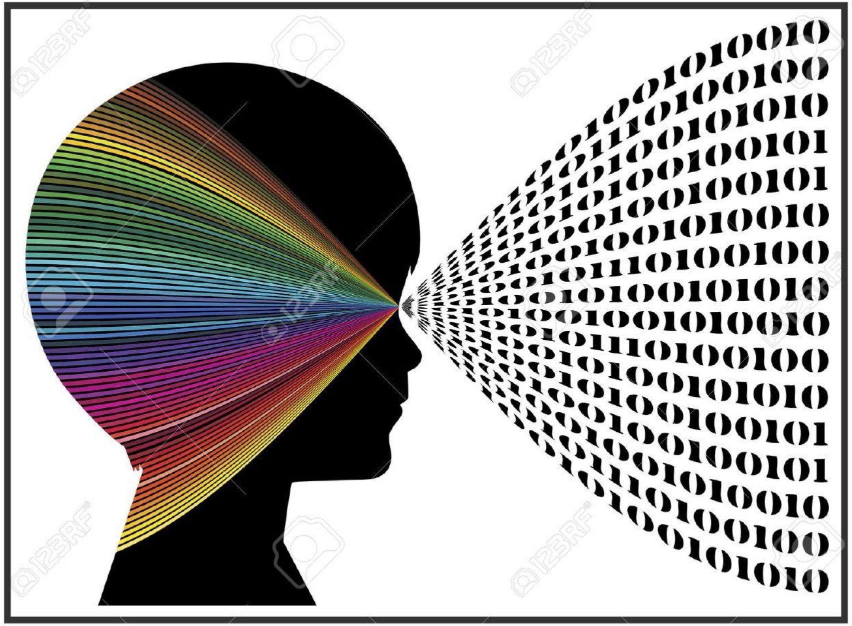
Middle East: Arabic, Hebrew, Turkish

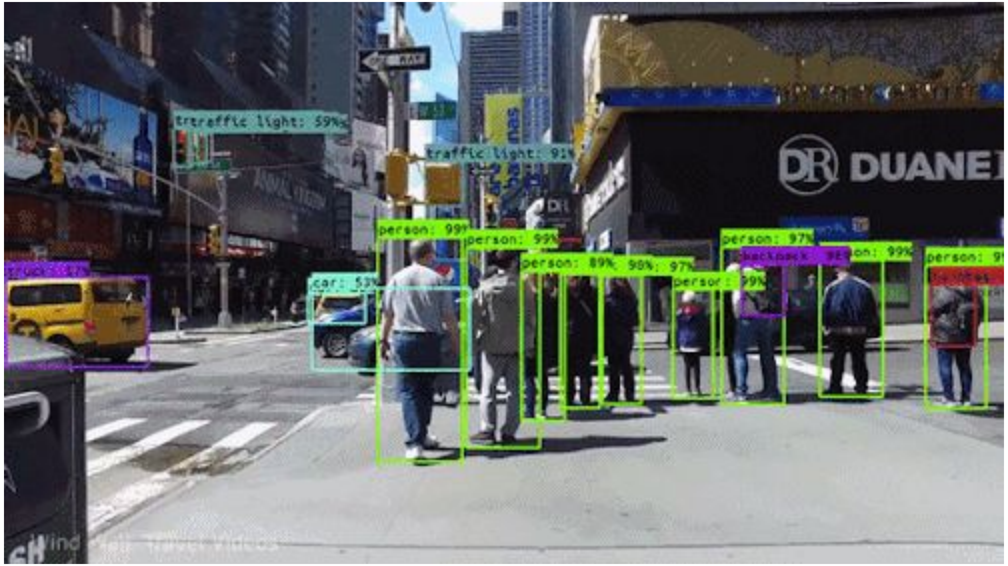
Slavic: Slovenian

11x14 Poster available for free download at AI4K12.org

Big Idea #1: Perception

Computers perceive the world using sensors.





Perception is the extraction of *meaning* from sensory signals, using knowledge.

Big Idea #1 – What should students be able to do?

Grades K-2:

- **Identify sensors on computers, robots, and intelligent appliances.**
- Give examples of intelligent vs. non-intelligent machines.

Grades 6-8:

- **Explain how sensor limitations affect computer perception.**
- Give examples of how intelligent agents combine information from multiple sensors.
- Illustrate the concept of feature extraction from images by simulating an edge detector.

Grades 3-5:

- Explain how images are represented digitally in a computer.
- **Illustrate how face detection works by extracting facial features.**
- Demonstrate how a text to speech system can resolve ambiguity based on context.

Grades 9-12:

- **Describe the domain knowledge underlying different forms of computer perception.**
- Describe the limitations and advanrtages of various types of computer sensors.

Teachable Machine

Train a computer to recognize your own images, sounds, & poses.

A fast, easy way to create machine learning models for your sites, apps, and more – no expertise or coding required.

Students as young as Kindergarten are training Deep Neural Nets

1 **Gather**

Gather and group your examples into classes, or categories, that you want the computer to learn.

2 **Train**

Train your model, then instantly test it out to see whether it can correctly classify new examples.

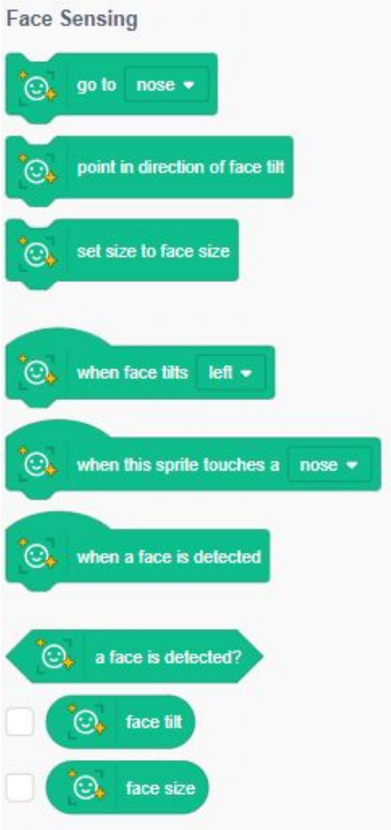
3 **Export**

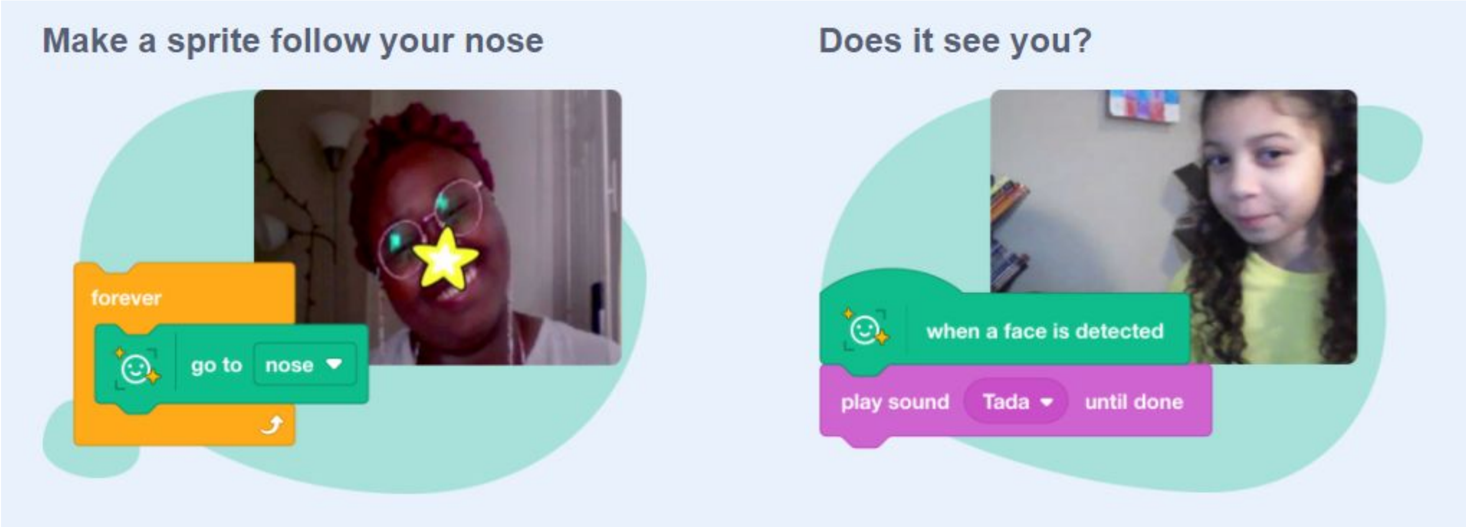
Export your model for your projects: sites, apps, and more. You can download your model or host it online for free.

https://teachablemachine.withgoogle.com/

Building Face Filter & Face Sensing Applications

https://lab.scratch.mit.edu/face/

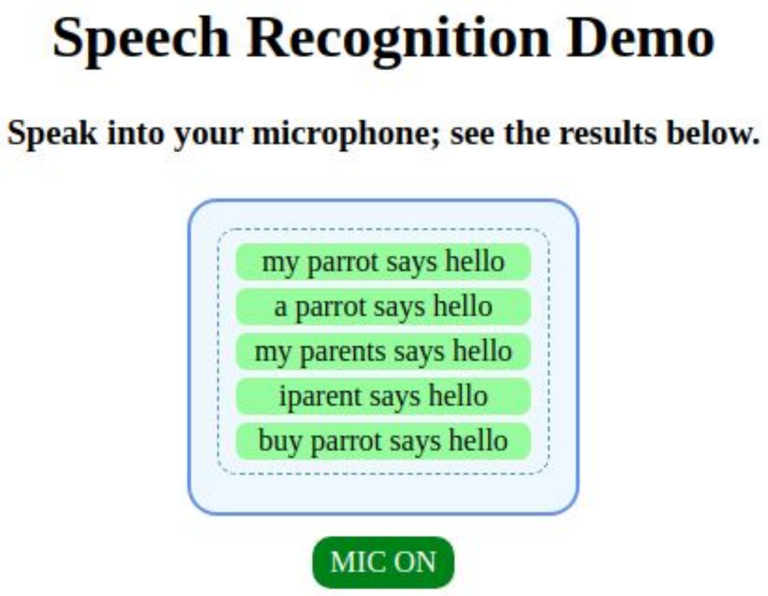




Speech Recognition: Speech to Text Demos

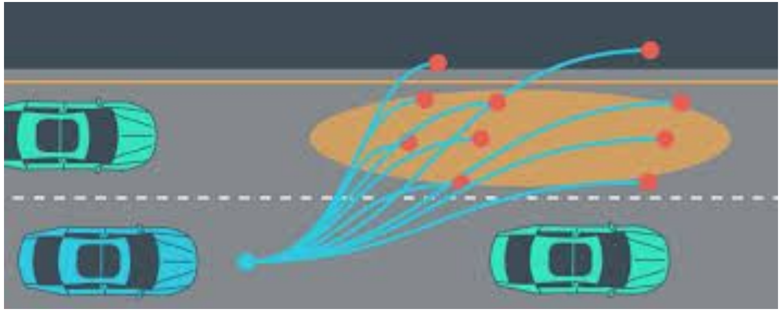
Demo shows alternative parses and can speak back what it heard.

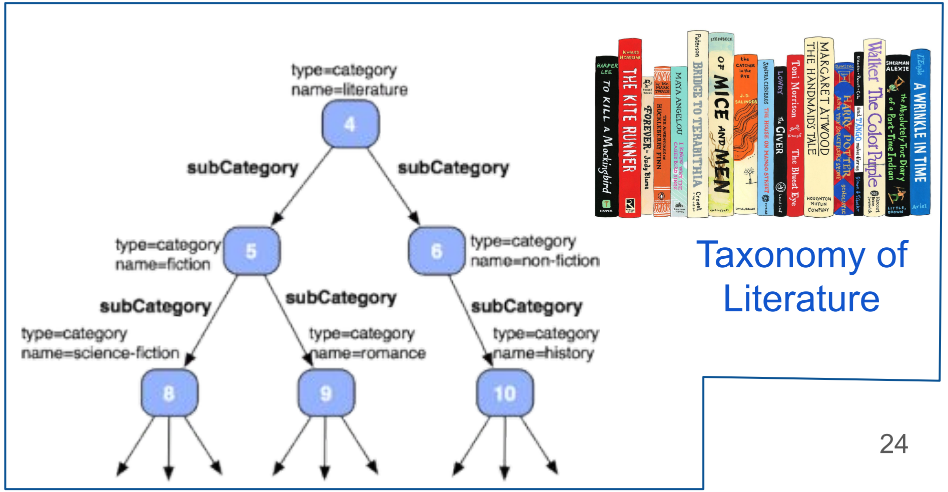
https://www.cs.cmu.edu/~dst/SpeechDemo/



Big Idea #2: Representation and Reasoning

Agents maintain representations of the world, and use them for reasoning.





Taxonomy of Literature

Big Idea #2 – What should students be able to do?

Grades K-2:

- **Construct a map of a home, school, or neighborhood.**
- Illustrate a next possible state in a game of tic-tac-toe.

Grades 3-5:

- **Give examples of tree structures commonly used by people and explain the relationships among the components.**
- Categorize problems as either classification problems or search problems.

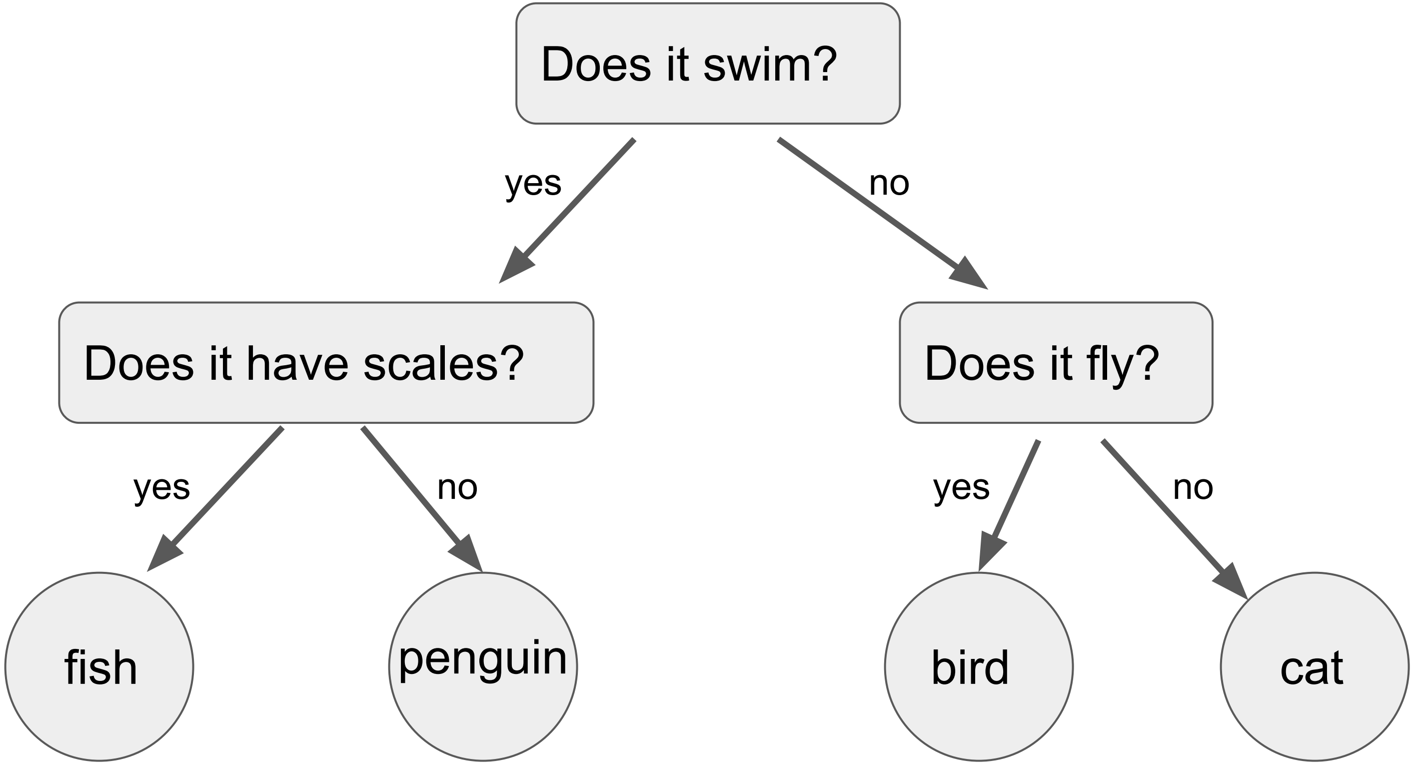
Grades 6-8:

- **Model the process of solving a graph search problem using breadth-first search to draw a search tree.**
- Explain how word embeddings (which are feature vectors) represent words as sequences of numbers.

Grades 9-12:

- Describe how to represent a concept as a schema.
- **Describe the differences between types of search algorithms.**

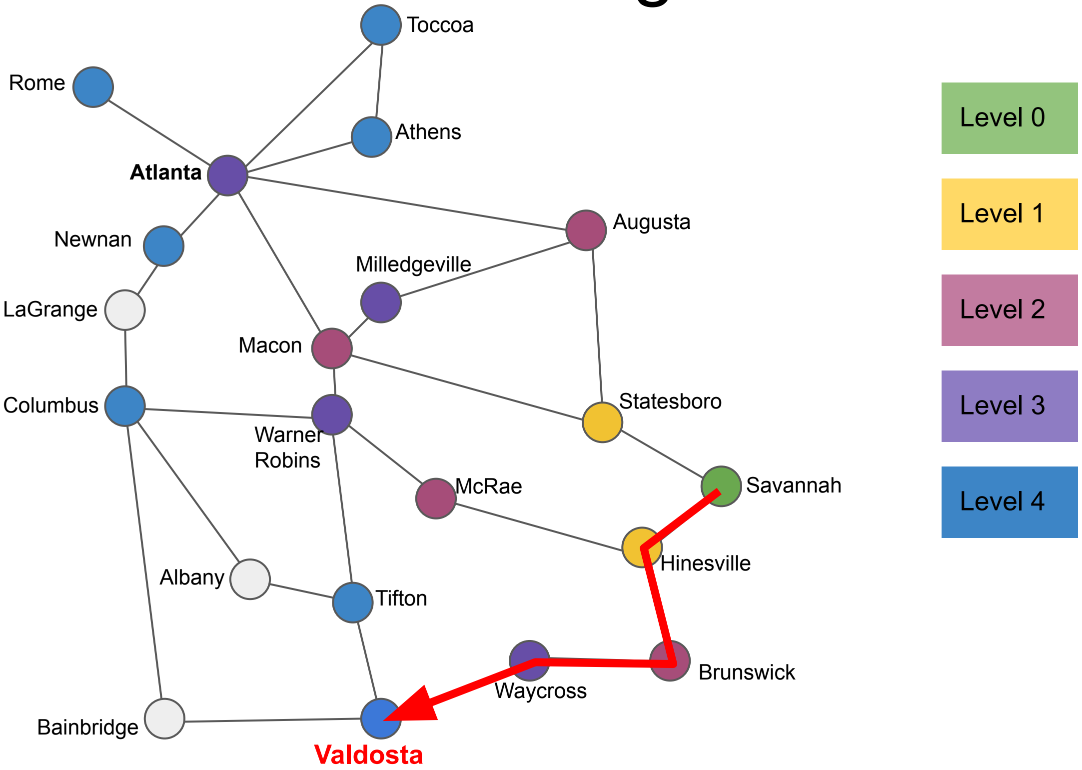
Discrimination Net: Guess the Animal



Middle School Students are learning breadth first search

New Arad to Bucharest!

Find route from Savannah to Valdosta



Big Idea #3: Learning

Computers can learn from data.

Big Idea #3 – What should students be able to do?

Grades K-2:

- **Identify patterns in labeled data and determine the features that predict the labels.**
- Demonstrate how to train a computer to recognize something.

Grades 3-5:

- **Train a classification model using machine learning, and then examine the accuracy of the model on new inputs.**
- Demonstrate how training data are labeled when using a machine learning tool.
- Explain how reinforcement learning allows a computer to learn from experience (i.e., trial and error).

Grades 6-8:

- **Explain how bias can be introduced into a reasoner if the training set is not properly balanced.**
- Illustrate the structure of a neural network and how its parts form a set of functions that compute an output.

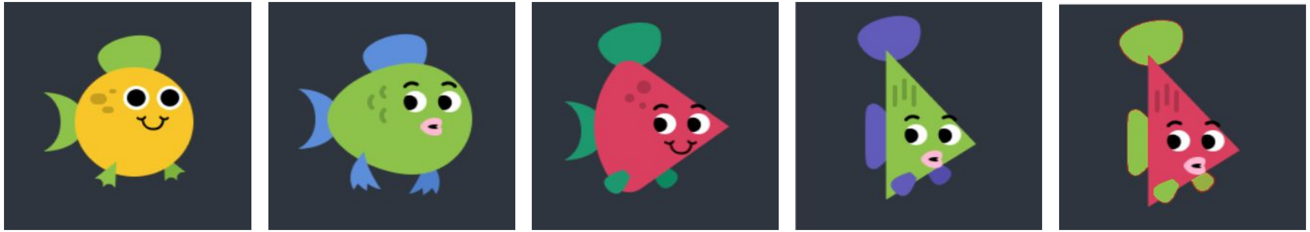
Grades 9-12:

- **Model how machine learning constructs a reasoner by adjusting the reasoner's internal representations.**
- Select the appropriate ML algorithm to solve a reasoning problem.

Student can create feature vectors and use tools to create decision trees

Body Type	Body Color	Tail Fin	Dorsal Fin	Pectoral Fins	Fin Color
1	4	1	1	1	5
5	3	3	2	2	2
2	1	2	1	3	6

Safe:



Poisonous:

What makes a fish poisonous?

Train

Collect examples of what you want the computer to recognise

Train

Learn & Test

Use the examples to train the computer to recognise numbers

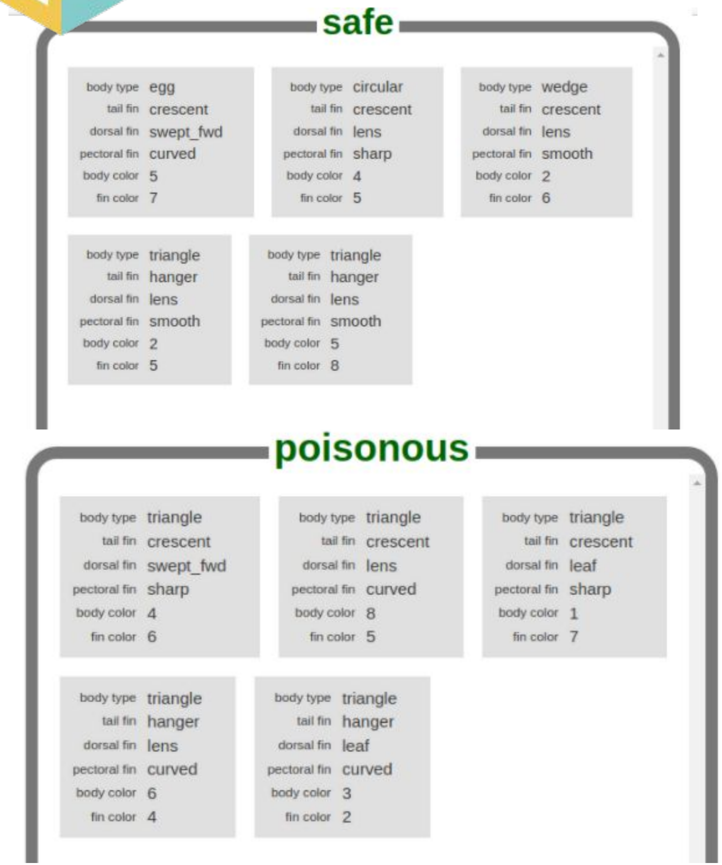
Learn & Test

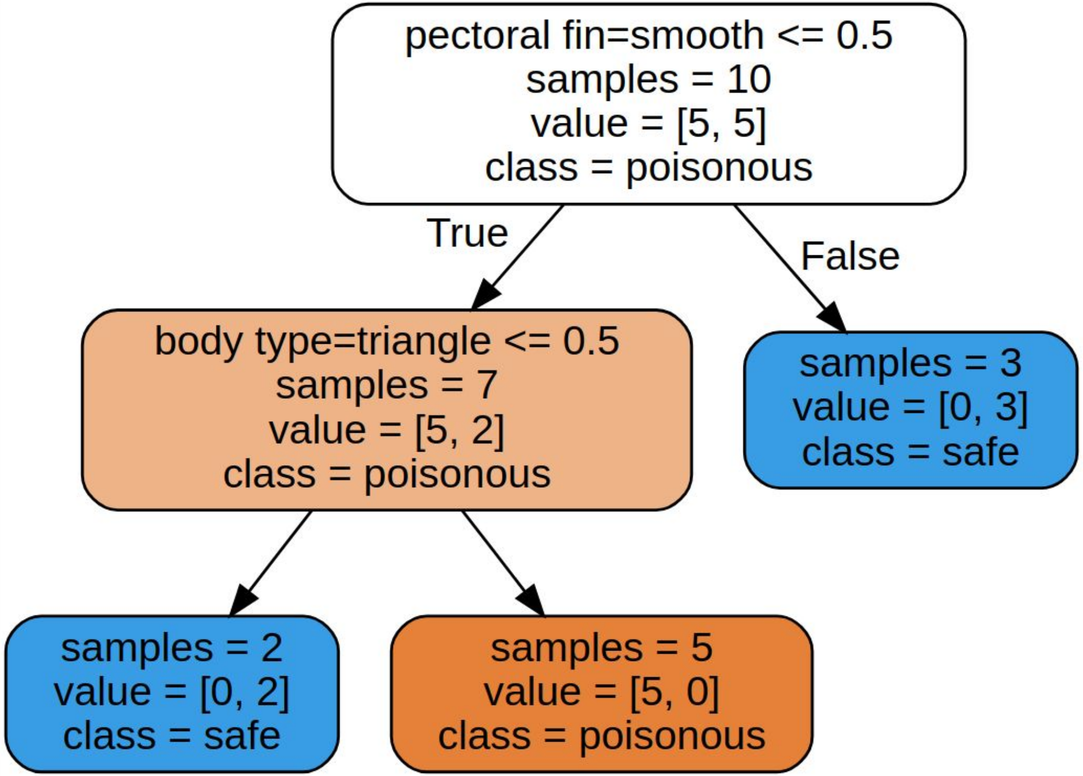
Make

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

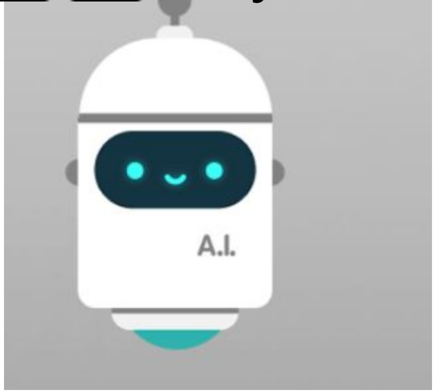
Make

Using Machine Learning for Kids

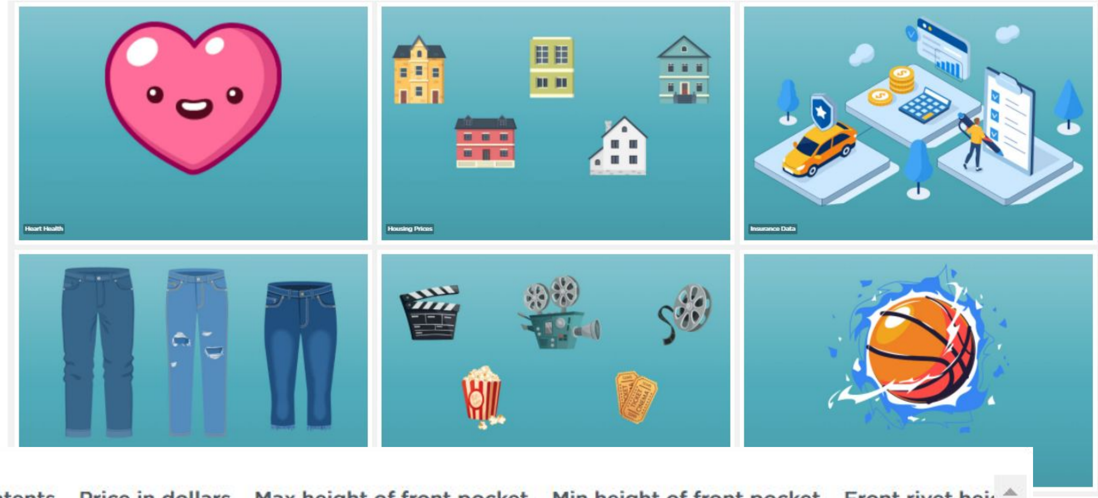




AI Lab
By Code.org



Work with real datasets, train models, evaluate accuracy, export model, and create a mobile app.



Brand	Style	Mens or womens	Cotton contents	Price in dollars	Max height of front pocket	Min height of front pocket	Front rivet hei
Arizona	skinny	women	0.78	42	14.5	15	
Arizona	straight	women	0.78	42	14.5	14	
Ralph Lauren	skinny	women	0.92	89.5	13	13.5	
Ralph Lauren	straight	women	0.92	89.5	13	13.5	
Uniqlo	skinny	women	0.87	39.9	13	13	
Uniqlo	straight	women	0.98	39.9	15.5	12	
Calvin Klein	skinny	women	0.98	79.5	12	12	
Calvin Klein	straight	women	0.85	69.5	14	11.2	
Lucky	skinny	women	0.69	99	13	14.5	

There are 80 rows of data.

Big Idea #4: Natural Interaction

Intelligent agents require many types of knowledge to interact naturally with humans.

Child images courtesy of Cynthia Breazeal, MIT Media Lab

Humans are among the hardest things for AI agents to understand.

Big Idea #4 – What should students be able to do?

Grades K-2:

- **Demonstrate the kinds of tasks an intelligent assistant can and cannot perform.**
- Demonstrate how computers recognize emotion in faces.
- Demonstrate some ways that intelligent agents don’t understand things the way people do.

Grades 3-5:

- **Illustrate how computers can judge the emotional tone of text.**
- Explain what knowledge would be required for a computer to understand a story.
- Experiment with a speech to text system to see how it resolves alternative word choices.

Grades 6-8:

- Explain the knowledge a computer would need to solve a naive physics reasoning problem.
- **Illustrate how word embeddings can be used to reason about the meaning of words.**
- Use a parser to display the syntactic structure of a sentence and explain the node labels.

Grades 9-12:

- **Describe how a context-free grammar can parse simple sentences.**
- Identify ways AI applications can respond to human emotional states.
- **Debate alternative perspectives on human vs. artificial intelligence**

Question Answering Using a BERT Scratch Plug-In

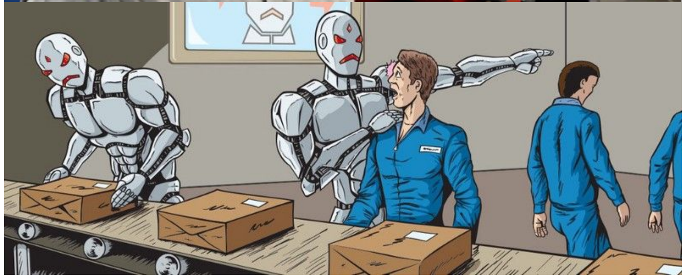
Input Text:
“While driving to work, John saw a purple cow by the side of the road.”

Q: What color was the cow?
A: purple

Q2: Where was the cow?
A2: by the side of the road

Big Idea #5: Societal Impact

"Artificial Intelligence can impact society in both positive and negative ways."



- Economic impact of AI
- Fairness, transparency, accountabiity
- Cultural impacts of AI

Big Idea #5 – What should students be able to do?

Grades K-2:

- **Identify common AI applications encountered in their daily lives**
- Discuss whether common uses of AI technology are a good or bad thing

Grades 3-5:

- **Explore how behavior is influenced by bias and how it affects decision making**
- Describe ways that AI systems can be designed for inclusivity

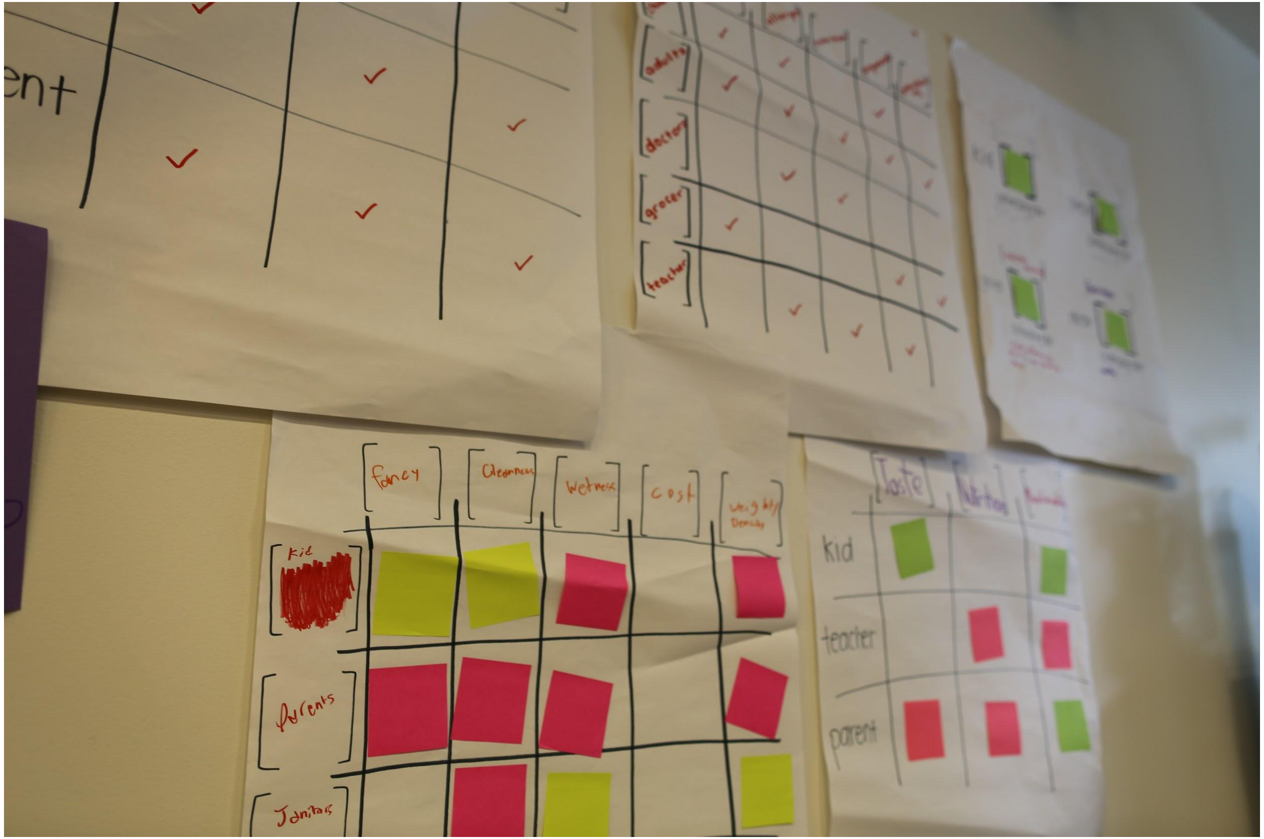
Grades 6-8:

- Explain potential sources of bias in AI decision making
- **Understand tradeoffs in the design of AI systems and how decisions can have unintended consequences in the function of a system**

Grades 9-12:

- **Critically explore the positive and negative impacts of an AI system**
- **Design an AI system to address social issues (or explain how AI could be used to address a social issue)**

Learning a framework for ethical thinking



Blakely Payne's AI + Ethics Middle School Curriculum (MIT)

Example of students' ethical matrices for a peanut butter and jelly sandwich algorithm.

WAICY

World Artificial Intelligence Competition for Youth

Envisioning AI for Social Good

waicy.org

WAICY 2021 Stats:

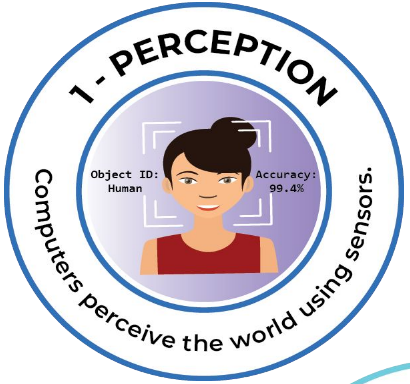
300+ Projects

1000+ Students

30+ Countries

AI4K12.org Grade Band Progression Charts

Drafts open for Public Review on the AI4K12.org Website - https://ai4k12.org/gradeband-progression-charts/



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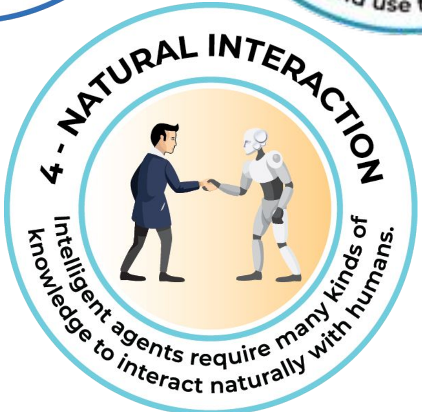
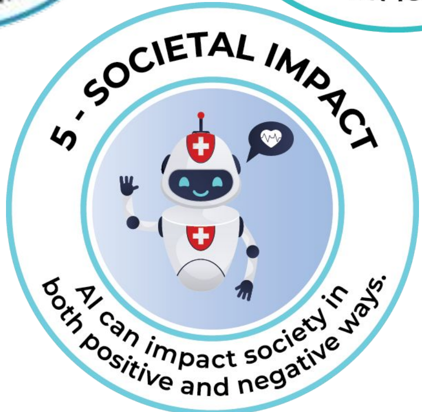




Expected in March 2022

Big Idea #1: Perception	*Computers perceive the world using sensors.*	**Perception is the extraction of meaning from sensory information using knowledge.**	**The transformation from signal to meaning takes place in stages, with increasingly abstract features and higher level knowledge applied at each stage.**	**LO** = Learning Objective: what students should be able to do. **EU** = Enduring Understanding: what students should know.
Concept	**K-2**	**3-5**	**6-8**	**9-12**
Processing (Sensing vs. Perception) **1-B-i**	**LO:** Give examples of intelligent vs. non-intelligent machines and discuss what makes a machine intelligent. **EU:** Many machines use sensors, but not all use them intelligently. Non-intelligent machines are limited to simple sensing. Intelligent machines demonstrate perception. **Unpacked:** Cameras and phones can record and play back images and sounds, but extracting meaning from these signals requires a computer with artificial intelligence.	**LO:** Use a software tool such as a speech transcription or visual object recognition demo to demonstrate machine perception, and explain why this is perception rather than mere sensing. **EU:** Perception is the extraction of meaning from sensory signals. **Unpacked:** speech recognition and face detection are examples of perception. An automatic door activated by a pressure pad or ultrasonic sensor does not exhibit perception because it is just reacting to the raw signal rather than using kowledge to extract meaning from the signal.	**LO:** Give examples of different types of computer perception that can extract meaning from sensory signals. **EU:** There are many specialized algorithms for perceptual tasks, such as face detection, facial expression recognition, object recognition, obstacle detection, speech recognition, vocal stress measurement, music recognition, etc.	**LO:** Explain perception algorithms and how they are used in real-world applications. **EU:** Many devices and services rely on specialized perception algorithms, e.g., license plate readers, zip code readers, face-based phone unlocking, tagging people in Facebook posts, object identification (e.g., Google Lens), or voice-based customer service.
Processing (Feature Extraction) **1-B-ii**	**LO:** Give examples of features one would look for if one wanted to recognize a certain class of objects (e.g., cats) in an image. **EU:** The visual features of an object include its subparts, textures, and colors. **Unpacked:** to recognize cats one would look for ears, paws, whiskers, and a cat-shaped nose and tail; for textures that look like fur; and for coloration patterns typical of cats.	**LO:** Illustrate how face detection works by extracting facial features. **EU:** Face detectors use special algorithms to look for eyes, noses, mouths, and jaw lines. **Unpacked:** Facial recognition goes one step further and tries to determine whose face has been detected. Recognition is based on quantifiable properties such as distance between the eyes or shape of the jaw line.	**LO:** Illustrate the concept of feature extraction from images by simulating an edge detector. **EU:** Locations and orientations of edges in an image are features that can be detected by looking for specific arrangements of light and dark pixels in a small (local) area.	**LO:** Explain how features are extracted from waveforms and images. **EU:** A speech spectrogram shows the energy present in a waveform in various frequency bands. Formants are auditory features defined as regions of concentrated energy in the spectrogram. Feature extraction from images begins with detecting edges in the image, or intensity gradients at multiple scales. **Unpacked:** Different formant patterns are associated with different speech sounds, i.e., different vowels and consonants.
Processing (Abstraction Pipeline: Language) **1-B-iii**	**LO:** Describe the different sounds that make up one's spoken language, and for every vowel sound, give a word containing that sound. **EU:** In order for a computer to understand speech, it has to be able to recognize the sounds from which words are constructed. **Unpacked:** There are 15 vowel sounds in American English: 5 short, 5 long, and 5 "other". Words for the 5 short vowels are: bid, bed, bad, bog, and bug.	**LO:** Illustrate how sequences of sounds can be recognized as candidate words, even if some sounds are unclear. **EU:** Going from sounds to words is one step in the abstraction pipeline for speech understanding. **Unpacked:** consider the problem of guessing a four letter word given only partial information about the sound in each position, e.g., the first sound is either "f" or "d", and the second sound is either "l" or "n". Knowledge about the constraints between adjacent sounds in a word can be used to narrow down the possibilities. In this case, only "fl" is a valid word-initial sequence in English.	**LO:** Illustrate how sequences of words can be recognized as phrases, even if some of the words are unclear, by looking at how the words fit together. **EU:** Information at higher levels of representation can be used to resolve ambiguities in lower levels of the language abstraction pipeline. **Unpacked:** in a three-word phrase, if the first word might be "seat" or "sea" or "see", the second word might be "the" or "a" or "of", and the third word might be "moody" or "movie", then the most likely phrase is "see the movie" because it's both grammatical and statistically common. Alternatives such as "seat a moody" sound similar, but are neither grammatical nor statistically common.	**LO:** Illustrate the abstraction hierarchy for speech understanding, from waveforms to sentences, showing how knowledge at each level is used to resolve ambiguities in the levels below. **EU:** The spoken language hierarchy is: waveforms -> articulatory gestures -> sounds -> morphemes -> words -> phrases -> sentences. **Unpacked:** To go from noisy, ambiguous signals to meaning requires recognizing structure and applying domain knowledge at multiple levels of abstraction. A classic example: the sentences "How to recognize speech" and "How to wreck a nice beach" are virtually identical at the waveform level.

Grade band progression chart

bit.ly/36InJgi

Big Idea 1: Perception Progression Chart

1-B-i.3-5: Processing > Sensing vs. Perception

Key Insight: Perception is the extraction of meaning from sensory information using knowledge.

Perception is the extraction of meaning from sensory information using knowledge.

Learning Objective (LO): Use a software tool such as speech transcription to demonstrate machine perception and how this goes beyond mere sensing.

Enduring Understanding (EU): Perception is the extraction of meaning from sensory signals.

Unpacked Explanation: Speech recognition and face detection are examples of perception. An automatic door activated by a pressure pad is just reacting to the raw signal rather than extracting meaning.

3-5

LO: Use a software tool such as a speech transcription or visual object recognition demo to demonstrate machine perception, and explain why this is perception rather than mere sensing.

EU: Perception is the extraction of meaning from sensory signals.

Unpacked: speech recognition and face detection are examples of perception. An automatic door activated by a pressure pad or ultrasonic sensor does not exhibit perception because it is just reacting to the raw signal rather than using kowledge to extract meaning from the signal.

AI4K12 Guidelines, Not Standards

We aim to provide:

- Guidance to teachers, educators, curriculum developers, professional development providers
- Recommendations, not requirements
- Addresses a diversity of learners and implementations
- Meant to be revised—a living document

Guidelines define:

- What students should know (Enduring Understanding - Knowledge)
- What students should be able to do (Learning Objective - Skill)

How will
K-12 AI Education
be possible?

Making K-12 AI Education a reality will require:

- Building Teacher Capacity
- Providing Ongoing Teacher Professional Development
- Developing AI Curriculum & Resources
- Building a community of teachers to share experiences and effective practices
- Exploring cross-curricular connections between AI and other disciplines
- Fostering School, Industry, and Community Partnerships

AI4K12 Resource Directory [ai4k12.org](ai4k12.org)

Includes

- Books and Reports (Adults)
- Children's Books
- Competitions
- Curriculum Materials
- Demos

- Online Professional Development Courses
- Online Courses for K-12 Students
- Reference Sources & Tutorials
- Resource Directories
- Software Tools & IDEs
- Videos

Please send us resources you want to share with teachers!

Integration into the existing K-12 curriculum

Elementary school

Activities integrated into core classes

Middle & High School

(1) Integrated into computing electives

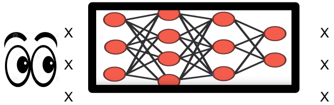
Middle - Intro to programming, intro to IT courses, computing survey courses, IOT, robotics

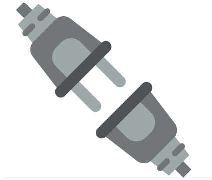
High School - CS Principles, AP CS, computing survey courses, intro programming projects

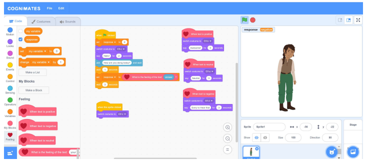
(2) Standalone electives/specials courses, and CTE pathways

(3) Activities, units, projects integrated into core classes

Supporting Students’ AI Exploration







- **Use transparent AI demonstrations** *that help students see what is going on inside the black box: it’s not magic!*
- **Help students build mental models** of *what is happening under the hood in AI applications.*
- **Experiment with AI agents** to investigate their behavior
- **Hand simulate** AI algorithms
- **Explore case studies of AI-related societal issues** from multiple perspectives
- Encourage students to **build their own AI applications**

These activities promote understanding of:

- How AI works
- Limitations of AI
- Systems thinking (AI systems are built from smaller components)
- Sources of bias in AI
- Societal impacts of AI systems

Equity of Access to AI Education

Geographic
Socio-economic
Racial and Ethnic Groups
Differently-Abled Learners
High and Low Resourced Schools & Communities
Formal & informal learning

Diversity & Inclusion of Voices and Representation

Ensuring Everyone has:

- **a seat at the table**
  (e.g., students, teachers, community, administrators, parents, decision-makers)
- **empowerment to evaluate and make decisions** about the use of AI-enabled technologies for personal, educational, professional, and decision-making purposes
- **skills to develop AI-enabled technologies**

HOW

Diverse, Equitable, & Inclusive AI Education Content & Pedagogy

- Strength-based
- Culturally-relevant and responsive pedagogies & teaching
- Low floors and high ceilings
- Knowledge and Skill-building
- CS as well as STEM, Literacy, and Humanities connections
- Range of course and integration unit offerings

Legislative Priority: Federal & State Levels

AI is an *economic driver* for our national economies.

Nearly every sector of the economy and society has been affected by the capabilities and potential of AI.

US National AI Initiative Act of 2020

Accelerate AI research and application for the

- nation's economic prosperity and
- national security

Training an AI-Ready Workforce

- **Align education to future workforce needs**
- Leverage research to improve educational quality and opportunity

A number of states are looking at how to build an AI ready workforce to draw employers to their states, including

- Maryland, Florida, & California

16 states and US Territories are integrating AI into their K-12 Curricula, including

- Georgia, FL, CA, MD, and VA

The State of K-12 AI Education in Your State: A Planning Workshop

January 28-29, 2021

Funded by National Science Foundation award DRL-1846073. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

The State of K-12 AI Education in Your State: A Planning Workshop

David Touretzky, CMU & Christina Gardner-McCune, UF

Funded by National Science Foundation award DRL-1846073.

141 Participants

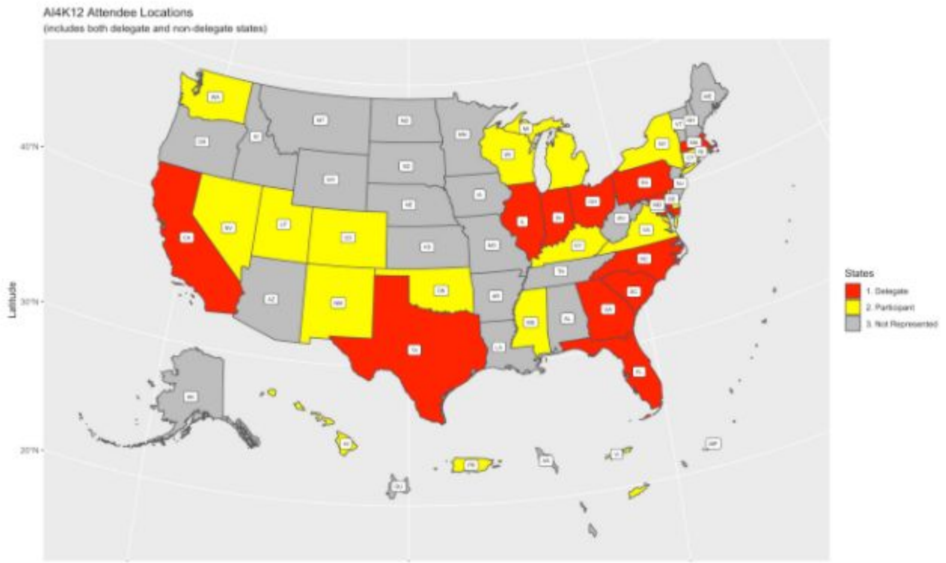
27 States
3 Territories

15 State Completed Plans (Jan)

CA, CT, FL, GA, HI, IL, IN, MD, MA, MS, NC, OH, PA, SC, TX,

2 New State & Territories Completed Plans

NM, VA
Puerto Rico, Virgin Islands



With funding from National Science Foundation ITEST Program (DRL-1846073)

Workshop Objectives

Raise States' Awareness of existing national & state K-12 AI Education

- Efforts
- Resources

Provide opportunity for states

- Form an initial leadership team

Collaboratively develop

- AI Vision & Implementation Implications

A draft AI Implementation plan (3, 6, 12 mo goals)

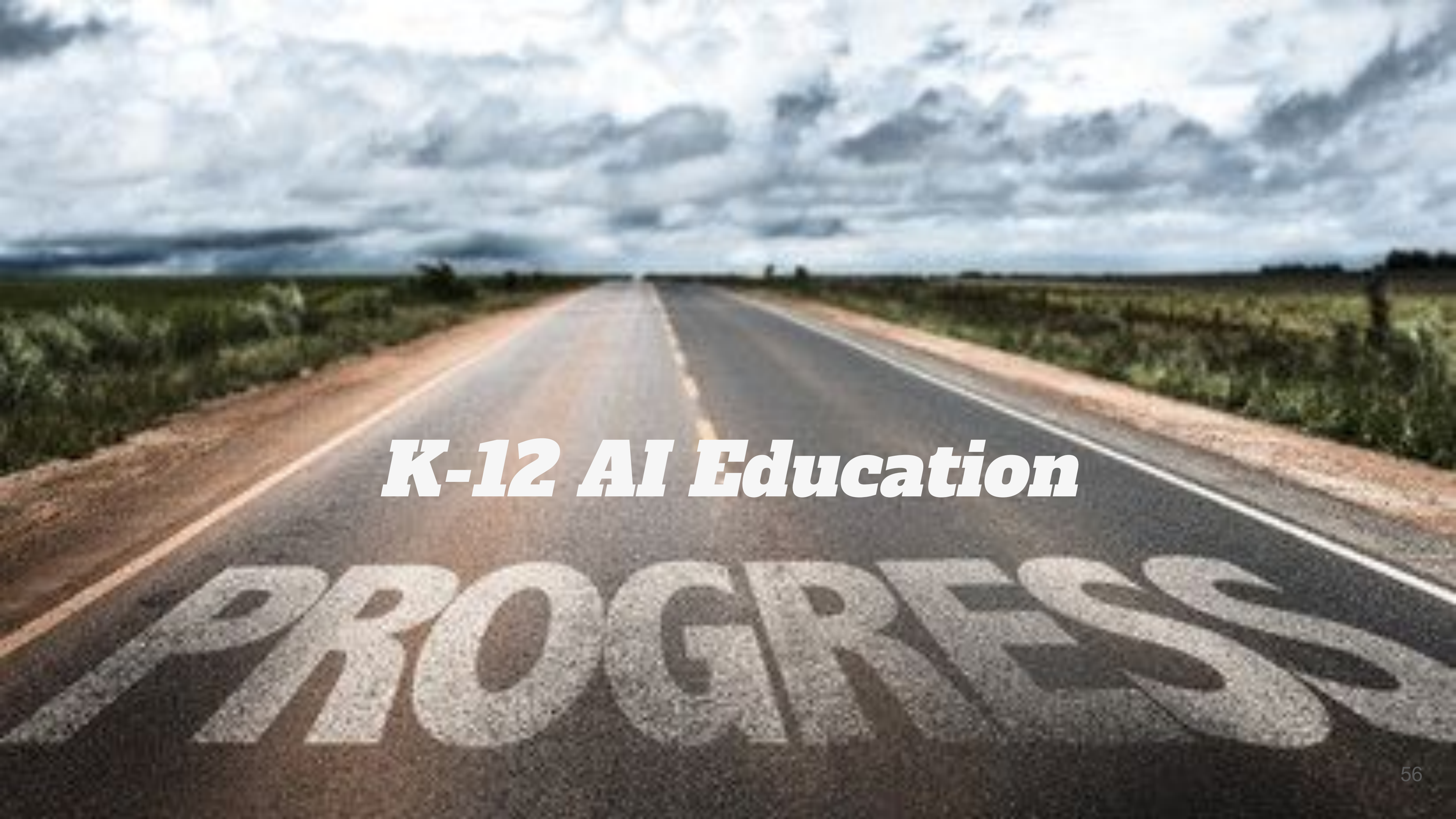
- Next Steps Action Plan

Learn from & network with other states

&

Quarterly Check-ins

K-12 AI Education



Progress to Date - Student Impacts

Student AI Conference

NC
Future: FL, IL,VA

6 CTE Frameworks

GA, FL, AR, MD, NM, NC
Future - Hawaii, SC, IN

Elementary, Middle, & High School AI Course Pilots

MD - Fall 2021 - middle school pilots
GA - Spring 2021 - Middle School
OH - 9th Grade Curriculum
IN - elementary school AI integration

450 Summer Camps

48 states, 53% Offered in 8 states
CA, NY, TX, CO, PA, MA, WA, and VA.

AI State Standards

NC
Future: FL, IL,VA

ELA, SS, STEM, Art Integration of AI

MD & CA, NSF Grantees

Progress to Date - Building Infrastructure

16

States

Actively Working on Bringing K-12 AI ED

Building Infrastructure

- **Stakeholder surveys** (FL)
- **State Team & Partnership building** (all)
- **Community Engagement & Awareness** (NC)
  - E.g., Hawaii - Presented AI4K12 Initiative to the fifteen (15) complex area Computer Science Teams.
  - CA - Inspirit AI gave a CSTA presentation in July on teaching algorithmic bias

Course Development & Resource Gathering

- MD - Video Playlist
- MA - Developed the first AI & Ethics curriculum for Middle School
- Developed the first AI curriculum for MA STEM Week
- Developing a comprehensive middle school curriculum on Responsible AI for Computational Action
- NC - Online teacher PD & student curriculum

Progress to Date - Teacher Capacity

- **Stakeholder surveys** (FL)
- **State Team & Partnership building** (all)
- **Community Engagement & Awareness** (NC)
  - E.g., Hawaii - Presented AI4K12 Initiative to the fifteen (15) complex area Computer Science Teams.
  - CA - Inspirit AI gave a CSTA presentation in July on teaching algorithmic bias
- **Course Development & Resource Gathering**

Broader K-12 AI Education Community

- **AI4K12** (662 Mailing list subscribers as of Jan. 2021, 475 Twitter Followers)
- **Researchers** (CS, AI, STEM Education, & Policy, NSF ITEST, DRK-12, AISL, RETTL, CSforAll)
- **State & District Administrators** (E.g., department of educations, STEM coordinators)
- **K-12 Educators**
- **Curriculum & Professional Development Providers** *(e.g., AI4ALL, ECS, AI in Schools, MIT RAISE, research projects, AI Education Project, commercial vendors, state)*
- **Tool Developers** *(e.g., Google, Microsoft, MIT, ML4K, Microsoft, Code.org)*
- **Professional organizations & Standards & PD** *(CSTA, ISTE)*
- **Partnerships** - University, Community Colleges, Workforce Development & Industry
- **Informal Learning providers**
- **Policy** *(e.g., AI Education project, Code.org)*
- **Broader CS Education Movement** *(e.g., CSForAll, ECEP)*
- **Governmental agencies** (e.g., OSTP, DOD, National Academies)
- **State & Federal Workforce Development**
- **International efforts**

AI4K12 Community Updates

Certiport High School AI Exam

The AI exam will be included with our IT Specialist Certification program.
The full Objective Domains are available when you click on the AI menu choice.

https://certiport.pearsonvue.com/Certifications/ITSpecialist/Certification/Overview

Day of AI - dayofai.org
May 13, 2022
MIT & i2Learning

- **Modeled after Hour of Code**
- **Free teacher training for a 4 hr AI Literacy curriculum in 3 grade bands (**upper elementary, middle school, high school) provided by i2Learning.
- **Year 1** - MIT is providing the initial curriculum & US focused audience
- **Year 2** - Open to other contributors starting next year & Global audience

Future of the AI4K12 Initiative

2022

- Release: State Workshop Report March 2022
- Developing Activity Resource Guides (NEOM)
- 2022 State Workshop & Quarterly State Webinars
- Guidelines Workshop
  - States
  - Teachers
  - Resource Providers
- Standards Crosswalk Jam Session
  - CSTA
  - NGSS
  - Common Core
  - State Standards

Aspirational Goals

K-12 AI Ed Conference

- Tracks: States
- Tracks:Teachers & Resources Providers
- Tracks: Research

Expansion of the AI4K12 Initiative Leadership Team

How can you get involved?

- **Join** our mailing list and become part of the AI4K12 Community
- **Review** the draft Grade Band Progression Charts & provide feedback
- **Find out** what is happening in your state
- **Volunteer** to help your local school district learn about AI
- **Make** your research accessible to K-12 students

It's time for all of us to think about AI in K-12.

Join the mailing list:
https://aaai.org/Organization/mailing-lists.php

Visit us:
https://AI4K12.org

Email us:
info@ai4k12.org

Follow Us

#AI4K12