

What Should K-12 Students Know About Artificial Intelligence?

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#AI4K12

“Artificial Intelligence is such a part of every child’s life that learning about it in school is an entitlement of all children.”

Miles Berry
Roehampton University
AAAI Symposium,
K-12 Working Group Advisory Board



K-12 Computing Education

Worldwide, we are making progress on integrating **computing** into K-12:

- **Israel** started working on National standards in 1995
- **United Kingdom:**
 - Computing At School
 - **First country in the European Union to mandate computer science classes for all children** between the ages of 5 and 16.
- **18 European Countries**
France, Spain, Switzerland, Slovakia, Finland, Poland, Portugal, Scandinavia, Italy, Estonia, Bulgaria, Cyprus, Czech Republic, Denmark, Greece, Ireland, Lithuania
- In progress: **US, India, China, Japan, Australia**
 - In the US: CSTA Computing Standards, CSForAll, Code.org

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)

Carnegie Mellon University
School of Computer Science



- Develop national guidelines for teaching AI in K-12
 - Modeled after the CSTA standards for computing education.
 - 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



Steering Committee



Dave Touretzky
Carnegie Mellon
AI for K-12 Working Group
Chair



Christina Gardner-McCune
University of Florida
AI For K-12 Working
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MIT



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MIT



Matt Dawson
Google



Emily Reid
AI4ALL



Matthijs Spaan
TU Delft
AAAI



K-12 Teacher Working Group Members



Grades K-2

Vicky Sedgwick (Lead)

Susan Amsler-Akacem

Dr. April DeGennaro

Melissa Unger (New)

Grades 3-5

Kelly Powers (Lead)

Dr. Marlo Barnett

Dr. Phillip Eaglin

Alexis Cobo (New)

Grades 6-8

Sheena Vaidyanathan (Lead)

Padmaja Bandaru

Josh Caldwell

Charlotte Dungan

Rachael Smith (New)

Grades 9-12

Jared Amalong (Lead)

Dr. Smadar Bergman

Kate Lockwood

John Chapin (New)



Miles Berry, Roehampton University, UK

Amy Eguchi, University of California, San Diego

Laura Hintzman Schmidt, Milwaukee School of Eng University, Milwaukee, WI

Irene Lee, MIT, Cambridge, MA

Dahua Lin, Chinese University of Hong Kong, China

Maitreyee Joshi, Microsoft, Seattle, WA

Hari Raghavan, IBM, New York, NY

Joseph South, ISTE, Portland, OR

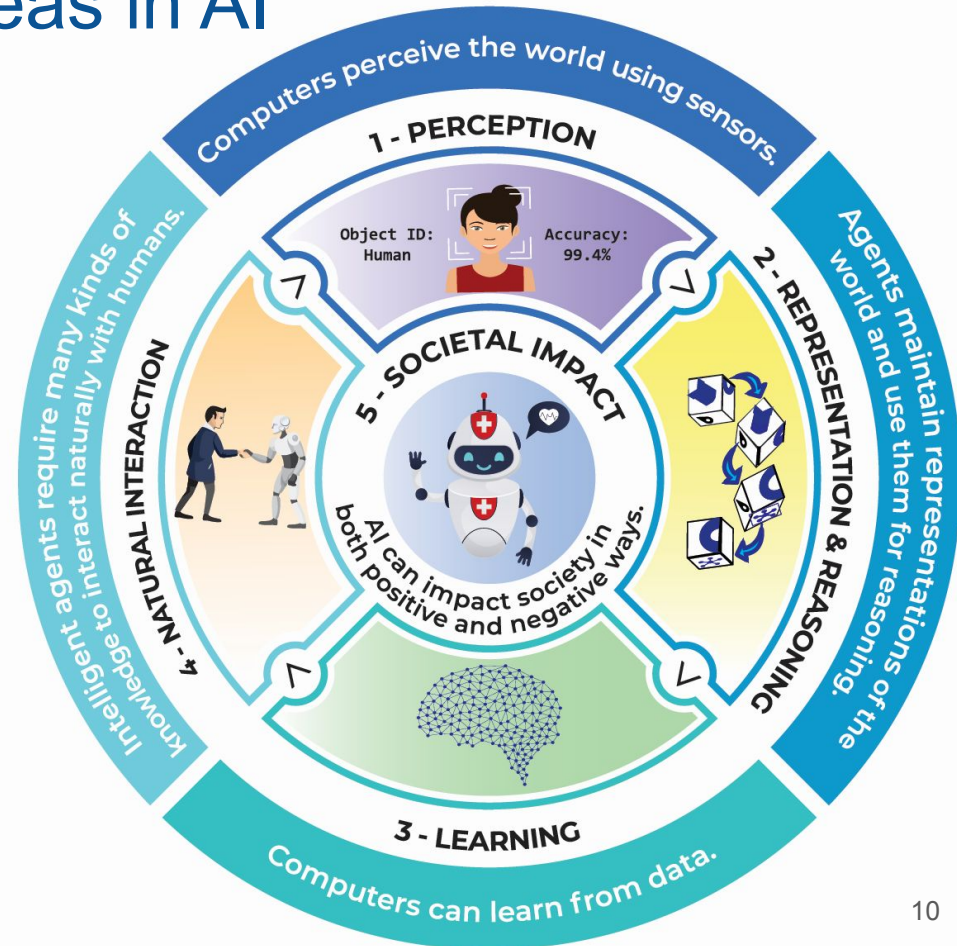
Tom Vander Ark, Getting Smart, Federal Way, WA

Joyce D. Williams, National Geospatial-Intelligence Agency, Springfield, VA

Wells Santo, Oakland, CA

Five Big Ideas in AI

- Organizing framework for the K-12 guidelines.
- 5 big ideas are enough to cover the richness of the field, but small enough to be manageable by teachers.
- CSTA experience shows 5 is a good number.
- Not necessarily the way AI practitioners view their field, but appropriate for the needs of the K-12 audience.



Five Big Ideas in Artificial Intelligence

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.

4. Natural Interaction

Humans are among the hardest things for AI agents to understand. Intelligent agents require many kinds of knowledge 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. Today's AI systems can use language to a limited extent, but lack the general reasoning and conversational capabilities of even a child.

1. Perception

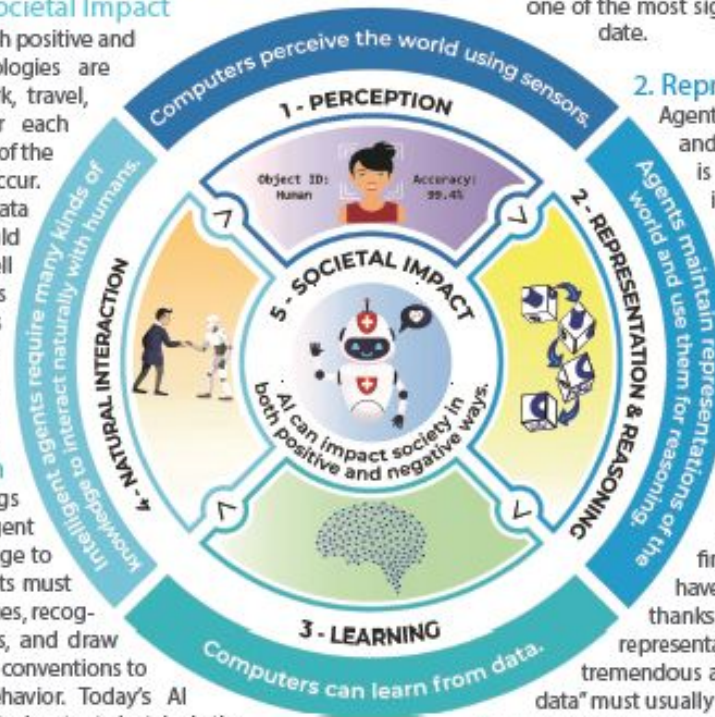
Computers perceive the world using sensors. Perception is the process of extracting meaning from sensory signals. Making computers "see" and "hear" well enough for practical use is one of the most significant achievements of AI to date.

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

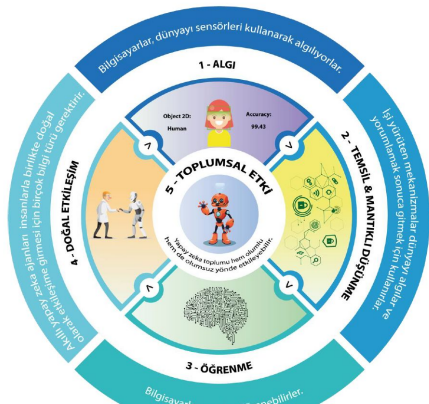
Computers can learn from data. Machine learning is a kind of statistical inference that finds patterns in data. Many areas of AI have progressed significantly in recent years thanks to learning algorithms that create new representations. For the approach to succeed, tremendous amounts of data are required.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



Adoption of the Big Ideas

- Now being adopted by curriculum developers in the US and elsewhere.
- Translations in Chinese, Korean, Turkish, Portugese

Turkish



Korean

Chinese

人工智能的五大理念

1. 感知

计算机使用传感器来感知世界。感知是从传感器信号中读取意义的过程。AI领域迄今为止最重要的成就之一，就是使计算机能够足够好地去“看”和“听”，以投入实际应用。

2. 表示与推理

智能代理（能够）保持对现实世界的表示，并用他们进行推理。表示是自然智能和人工智能的基本问题之一。计算机使用数据结构来构建表示。这些表示辅助推理算法。这些推理算法从而从已知信息中推导出新的信息。虽然智能代理可以推理非常复杂的问题，但他们并不像人类一样思考问题。

3. 机器学习

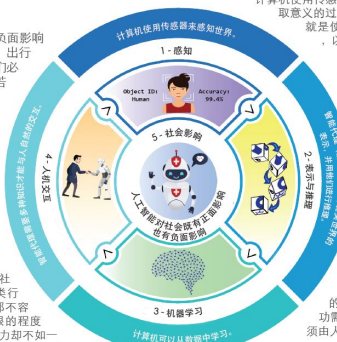
计算机可以从数据中学习。机器学习是一种在数据中找到规律的统计推断。近年来，由于一些学习算法创造了新的表示，AI的许多领域都取得了显著进步。这种方法的成功需要大量的数据。这些“训练数据”通常必须由人们提供，但有时也可以由机器自身获取。

5. 社会影响

AI的应用对社会既有正面影响也有负面影响。人工智能技术正在改变我们工作、出行、沟通、和相互照顾的方式。但我们必须注意其所带来的危害。例如，若用于训练人工智能系统的数据存在偏见，可能会导致部分人受到的服务质量低于其他人。因此，讨论AI对我们社会的影响，并根据相关系统在道德层面的设计以及应用来制定标准是重要的。

4. 人机交互

智能代理需要多种知识才能与人类自然交互。为了与人类自然地交互，智能代理必须能够用人类语言交谈，识别面部表情和情绪，并利用文化和社会习俗的知识来推断所观察到的人类行为的意图。所有这些问题想要解决都不容易。今天的人工智能系统可以在有限的程度上使用语言，但其综合推理和会话能力却不如一般的人类儿童。



인공지능에 관한 다섯 가지 빅 아이디어

1. 인식(Perception)

컴퓨터는 센서를 이용해 세상을 인식합니다. 인식은 센서에서 감지된 신호로부터 의미를 추출하는 과정입니다. 실제적인 사용을 할 수 있도록 컴퓨터가 충분히 “보고”, “듣고”, “인식”하는 것은 지금까지의 가장 중요한 성과 중 하나입니다.

5. 사회적 영향(Social Impact)

인공지능은 긍정적이고 부정적인 방식으로 사회에 영향을 미칠 수 있습니다. 인공지능 기술은 우리가 일하고, 여행하고, 의사소통하고, 서로를 돕는 방식을 변화시키고 있습니다. 그러나 우리는 잠재적으로 발생할 수 있는 위험을 유의해야 합니다. 예를 들어, 인공지능 시스템을 훈련하는 데 관련된 데이터를 이용하면 일부 사람들은 다른 사람들에 비해 더대로 된 지원을 받지 못하는 경우가 발생할 수 있습니다. 그러므로 인공지능이 우리 사회에 미치는 영향에 대한 논의할 필요가 있고 인공지능 기반 시스템의 윤리적 설계 및 배제에 관한 기준을 개발하는 것이 중요합니다.

4. 자연스러운 상호작용(Natural Interaction)

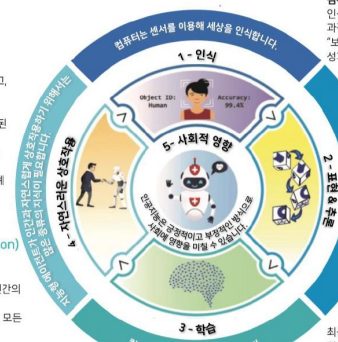
지능형 에이전트가 인간과 자연스럽게 상호작용하기 위해서는 많은 종류의 지식이 필요합니다. 에이전트가 관찰된 행동의 의미를 추론하기 위해서는 인간의 언어로 대화하고, 얼굴 표정과 감정을 인식하며, 사회적 관습과 문화를 자신의 활용할 수 있어야 합니다. 이 모든 것들은 매우 어려운 문제들입니다. 오늘날의 인공지능 시스템은 제한된 범위에서 언어를 사용할 수 있지만, 일반적인 주제를 대화 능력은 아이보다도 부족합니다.

2. 표현 & 추론(Representation & Reasoning)

에이전트는 세상에 대한 표현을 만들고 이를 추론에 사용합니다. 표현은 인공지능과 지능 모에서 근본적인 문제 중 하나입니다. 컴퓨터는 자료구조의 방식으로 표현을 구성하고, 이러한 표현은 이미 알려진 것으로부터 새로운 정보를 얻는 추론 알고리즘을 생성하는데 이용됩니다. 인공지능 에이전트는 매우 복잡한 문제를 추론할 수 있지만 인간의 추론 방법과는 다르게 진행합니다.

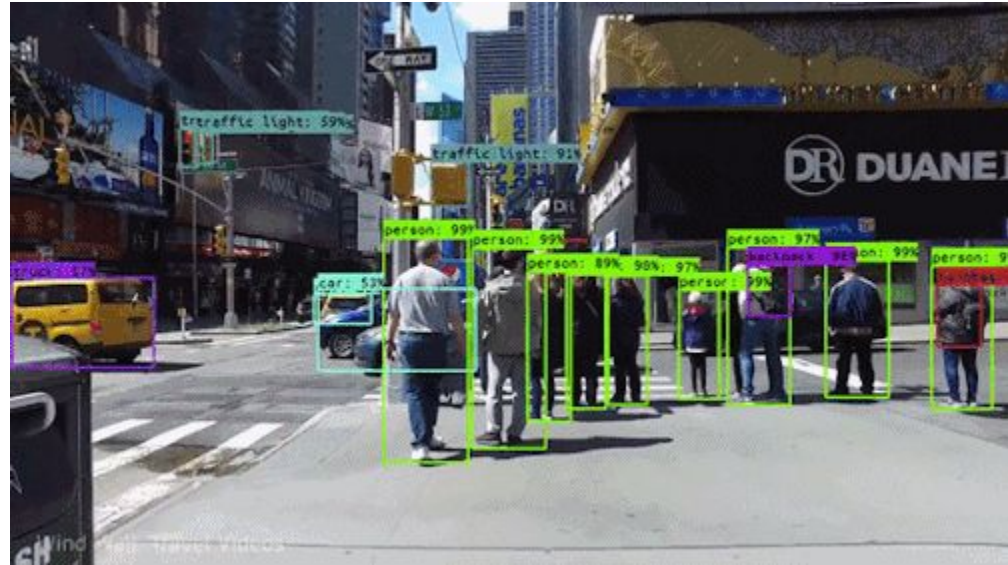
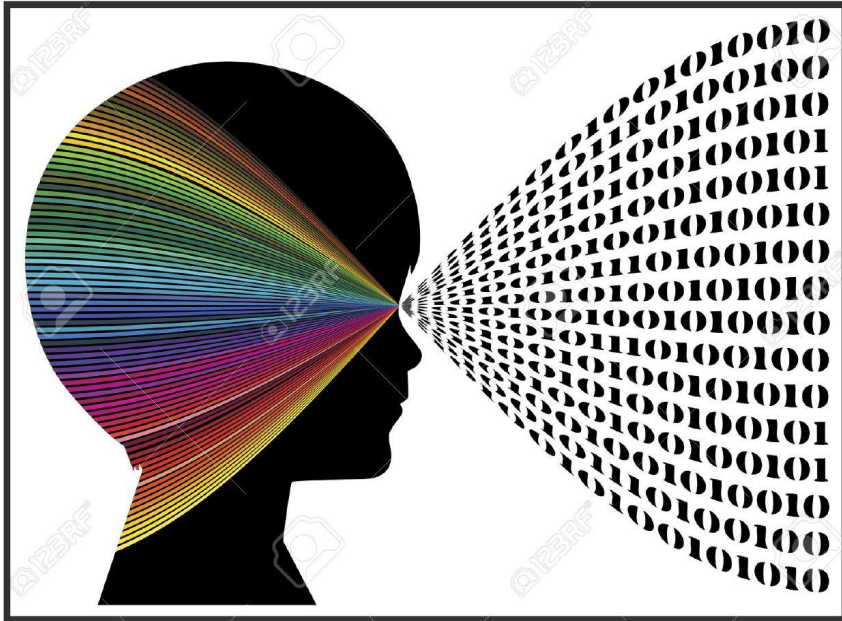
3. 학습(Learning)

컴퓨터는 데이터를 통해 학습합니다. 머신러닝은 데이터의 패턴을 찾는 일종의 통계적 추론입니다. 최근 몇 년 간 새로운 표현을 만들어내는 학습 알고리즘 덕분에 인공지능의 많은 영역이 크게 발전했습니다. 이러한 접근 방식이 성공하기 위해서는, 잘 훈련된 데이터가 필요하므로, 이러한 훈련용 데이터(training data)는 일반적으로 사람이 제공해야 하지만, 때로는 기계 스스로 수집하기도 합니다.



Big Idea #1: Perception

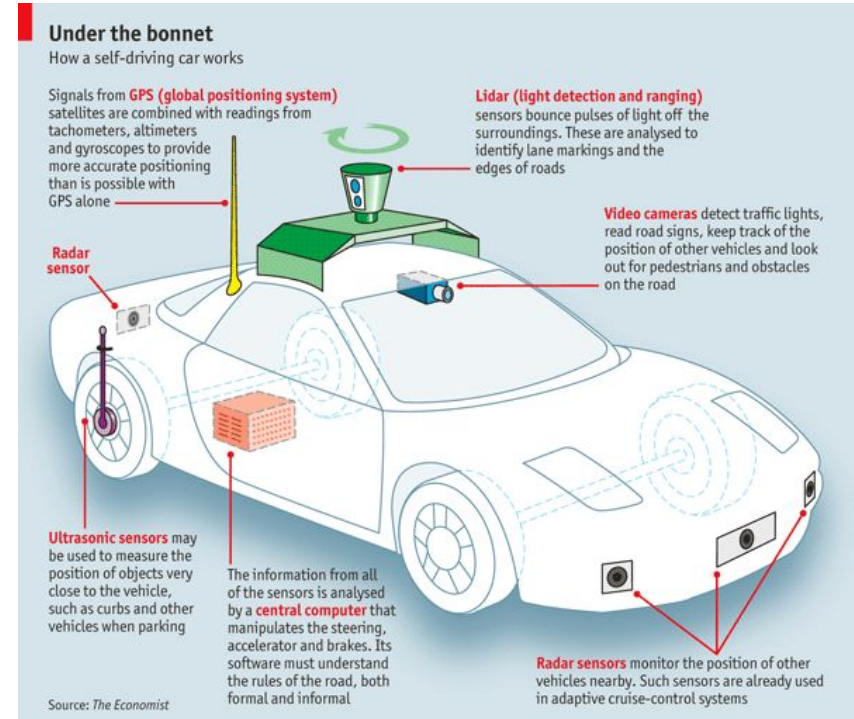
Computers perceive the world using sensors.



Perception is the extraction of *meaning* from sensory signals.

Big Idea #1 – Examples of Perception

- Speech recognition
- Computer vision:
 - object recognition
 - face recognition
 - license plate readers
 - scene understanding
- Other forms of perception e.g., music recognition, or interpreting sonar, radar, or LIDAR data



Big Idea #1 – Major Concepts

- Human senses vs. computer sensors
- Going from sensing to perception
- Types of perception: vision, speech recognition etc.
- How perception works: algorithms
- Limitations of computer perception
- Intelligent vs. non-intelligent machines

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

Grades K-2:

- Identify sensors on computers, robots, and intelligent appliances.
- Interact with intelligent agents such as Alexa or Siri.

Grades 6-8:

- Explain how sensor limitations affect computer perception.
- Explain that perception systems may draw on multiple algorithms as well as multiple sensors.
- Build an application using multiple sensors and types of perception (possibly with Scratch plugins, or Calypso).

Grades 3-5:

- Describe how sensor inputs are used in perception.
- Demonstrate a limitation of computer perception.
- Build an application using perception (possibly with Scratch plugins, or Calypso).

Grades 9-12:

- Describe the domain knowledge underlying different forms of computer perception.
- Demonstrate speech recognition difficulty in handling homophones and other types of ambiguity.

Big Idea #1 Activities



Can Cozmo perceive a face and remember it?

Teach Cozmo to recognize your face.

Explore facial recognition using Cozmo's Explorer mode.

Teach Cozmo to recognize your face.

Test Cozmo to determine how well he uses AI for facial recognition.

Tinker with Cozmo in different lighting and facial accessories to explore the limits of Cozmo's perception.



Can Cozmo perceive a happy or sad face?

“Perception is more than seeing”

Write a program using Cozmo to respond if Cozmo perceives that a face is happy or sad?

Create an event such that Cozmo's backpack turns a color if the student is sad.

Create an event so that Cozmo turns a color if the student is happy.

Extend the challenge to have Cozmo perform an animation that matches the student's mood.

Big Idea #2 – Examples of Representation & Reasoning

- Path planning for self-driving cars
 - Map of the city; description of the scene around car;
goal: find best path to the destination
- Internet Search
 - Representations - content of web pages
 - Reasoning - choosing which pages to return in response to a query
- Playing chess, checkers, backgammon, go
 - Representations - board state
 - Reasoning - finding the best move
- Designing a school bus route
 - Representations - list of students and where they live; list of buses and seating capacities
 - Reasoning - assigning students to buses and deciding the order in which the stops are made



Big Idea #2 – Major Concepts

- Types of representations
- Types of reasoning algorithms
- Representation supports reasoning: algorithms operate on representations
- Families of algorithms and the work they do
- Limitations of common reasoning algorithms

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

Grades K-2:

- Draw a map of the classroom or school and compare the map to the actual room or school building and grounds.
- Use a decision tree to make a decision

Grades 6-8:

- Design a graph model of their home or locations in their community and apply reasoning to determine the shortest path to key locations on their map
- Create/design a representation of an (animal) classification system using a tree structure.

Grades 3-5:

- Create/design a representation of an (animal) classification system using a tree structure.
- Describe how AI representations support reasoning to answer questions

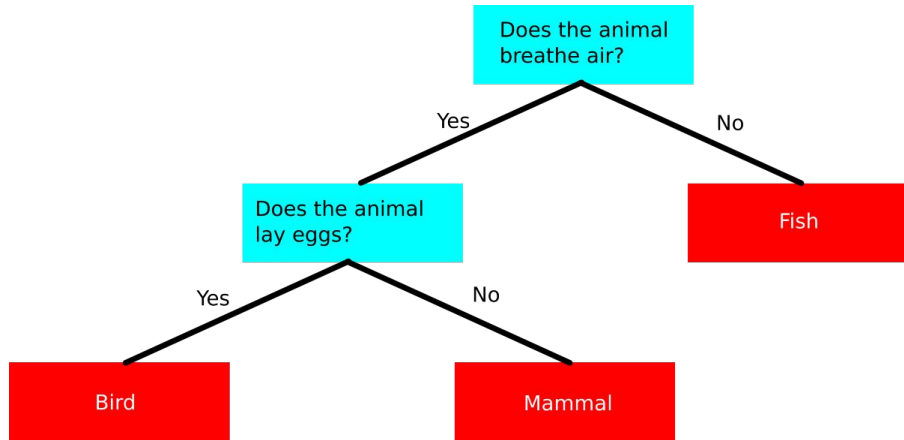
Grades 9-12:

- Draw a search tree for tic-tac-toe
- Describe the differences between types of search algorithms

Big Idea #2 Activities

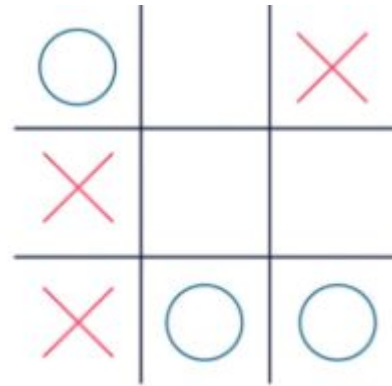
Build a decision tree to classify a set of animals.

(grades 3-5 or 6-8)



<https://aca.edu.au/resources/decision-trees-classifying-animals/>
with [trading cards](#)

Complete the representation of a game and trace a minimax algorithm to determine a strategy to win.



<https://towardsdatascience.com/tic-tac-toe-creating-unbeatable-ai-with-minimax-algorithm-8af9e52c1e7d>

Big Idea #3: Learning

Computers can learn from data.



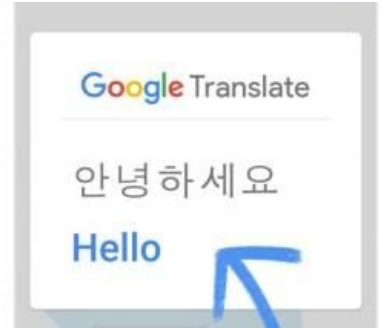
Big Idea #3 – Examples of Machine Learning

Personal experience:

- Training your phone to recognize your face.
- Netflix learning what movies you like.

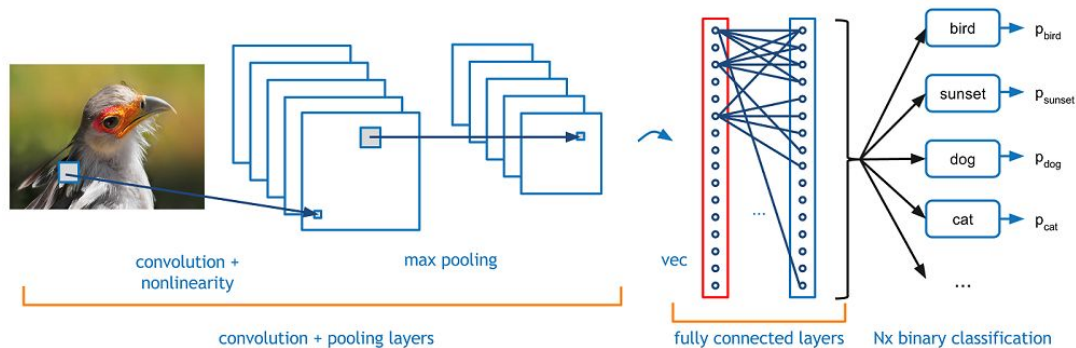
Industrial applications:

- Training a speech recognition system.
- Training a machine translation system: Google can translate between more than 100 different languages.
- Image search: training a classifier to recognize pictures of people, animals, vehicles, etc.



Big Idea #3 – Major Concepts in Machine Learning

- Machine learning vs human learning?
- Different types of machine learning
- Fundamentals of neural networks
- How training data influences learning (discuss bias in training data)
- Limitations of machine learning



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

Grades K-2:

- Learn from patterns in data with “unplugged” activities
- Use a classifier that recognizes drawings. Use Google Autodraw or Cognimates Train Doodle to investigate how training sets work to identify images and discuss how the program knows what they are drawing

Grades 6-8:

- Identify bias in a training data set and extend the training set to address the bias
- Simulate the training of a simple neural network

Grades 3-5:

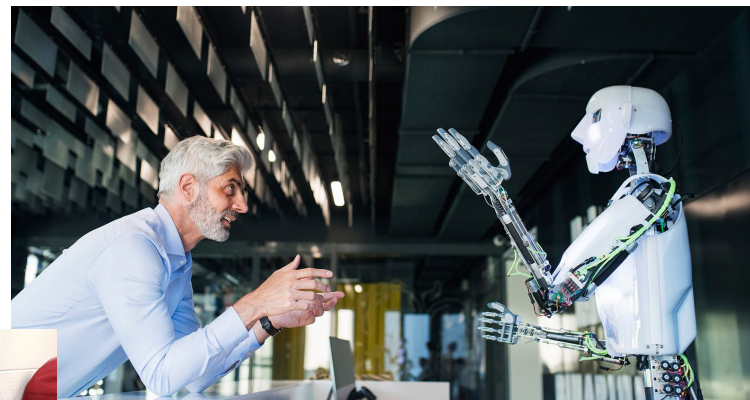
- Describe and compare the three different machine learning approaches: supervised, unsupervised and reinforcement learning.
- Modify an interactive machine learning project by training its model.
- Describe how algorithms and machine learning can exhibit biases.

Grades 9-12:

- Train a neural net (1-3 layers)
TensorFlow Playground
- Trace and experiment with a simple ML algorithm

Big Idea #4: Natural Interaction

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



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

Big Idea #4 – Examples of Natural Interaction

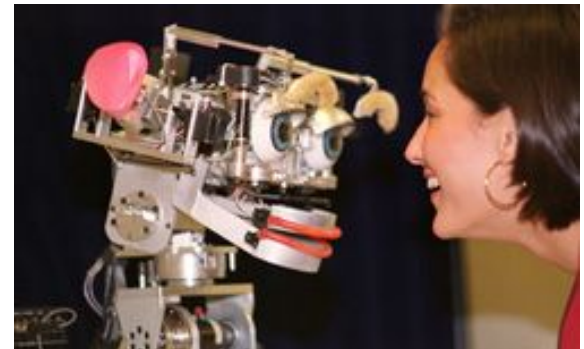
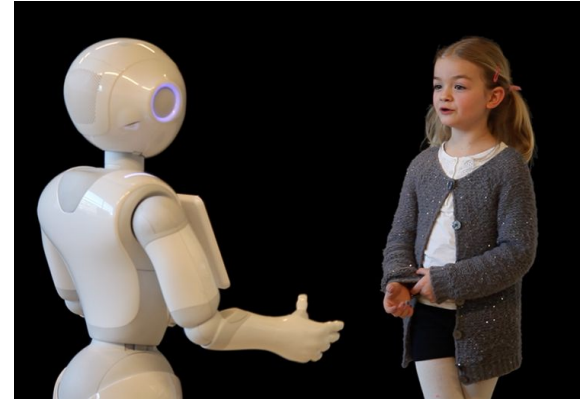
- Intelligent assistants such as Alexa and Siri
- Conversational agents (chatbots)
- Intelligent tutoring systems that provide for adaptive education
- Gesture and facial expression recognition

Pressing questions about the capabilities of AI for natural interaction:

- Can computers exhibit common sense reasoning comparable to people?
- Can a computer ever be conscious or self-aware?

Big Idea #4 – Major Concepts in Natural Interaction

- Natural language understanding
- Common sense reasoning
- Consciousness and philosophy of mind
- Natural interaction applications
- Human-robot interaction
- Limitations of AI for natural interaction



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

Grades K-2:

- Identify words in stories that have positive and negative connotations.
- Recognize and label facial expressions into appropriate emotions (happiness, sadness, anger) and explain why they are labeled the way they are.
- Experiment with software that recognizes emotions in facial expressions and in words.

Grades 6-8:

- Construct a simple chatbot.
- Explain and give examples of how language can be ambiguous.
- Reason about the nature of intelligence, and identify approaches to determining whether an agent is or is not intelligent.

Grades 3-5:

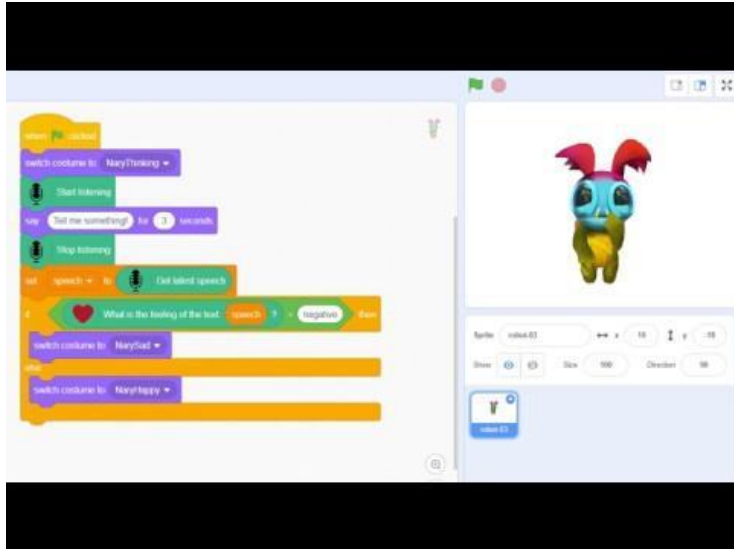
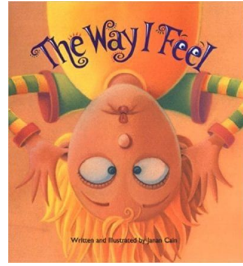
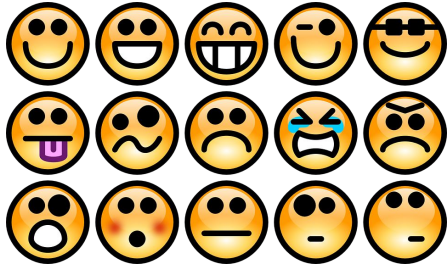
- Identify how humans combine multiple inputs (tone, facial expressions, posture, etc) in order to understand communication.
- Describe some tasks where AI outperforms humans, and tasks where it does not.

Grades 9-12:

- Demonstrate how sentence parsers handle ambiguity.
- Explore the Google Knowledge Graph
- Identify and debate the issues of AI and consciousness.

Big Idea #4 – Activities

K-2: Facial Expressions & Natural Language



Grades 6-8 & Above: Chatbots / Smart Assistants

Chatbots

Create a chatbot that can answer questions about a topic of your choice.

Teach a computer to recognise questions

Difficulty: Intermediate

Recognising: **text**



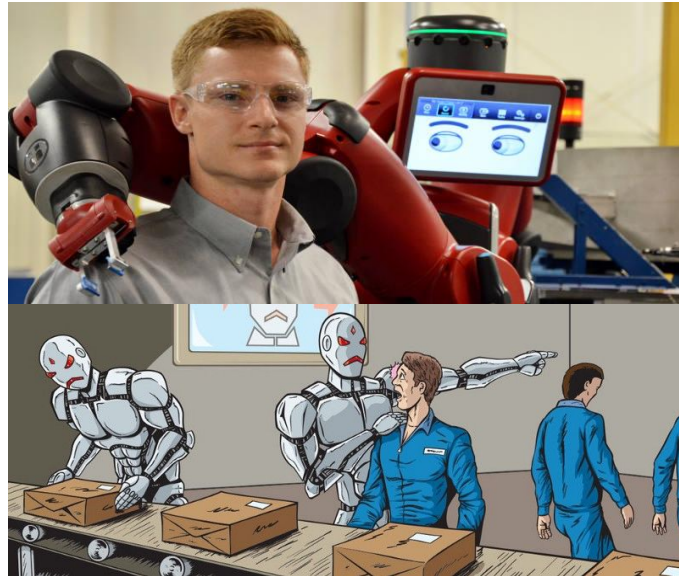
Tags: sentiment analysis, supervised learning

[Download](#)



Big Idea #5: Societal Impact

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



Big Idea #5 – Examples of Societal Impact of AI

- Ethics: what sorts of applications are desirable/permisible?
 - Transparency and accountability of AI systems
 - Competing definitions of “fairness”
 - Values tradeoffs, e.g., privacy vs. security; who should own your data?
- Effects: what are the likely impacts of AI technology on society?
 - Robot servants, rescuers, and companions
 - Economic disruption; changes in the nature of work
 - Effects of unintended biases in decision systems
- AI and Culture
 - How will our culture change when we live with Intelligent machines?



Big Idea #5 – Major Concepts around Societal Impact

- AI technologies are changing business, healthcare, education, and government
- Use of AI is an economic driver that makes new services possible and businesses more efficient
- Humans make numerous technical and ethical decisions when developing AI applications
- AI technologies impact communities and people in different ways
- Ethical standards are needed for AI systems that make decisions about people
- AI and robotics will change the way people work, create new jobs, and eliminate some jobs

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 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 3-5:

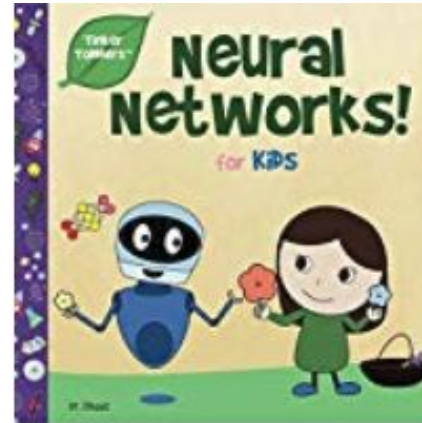
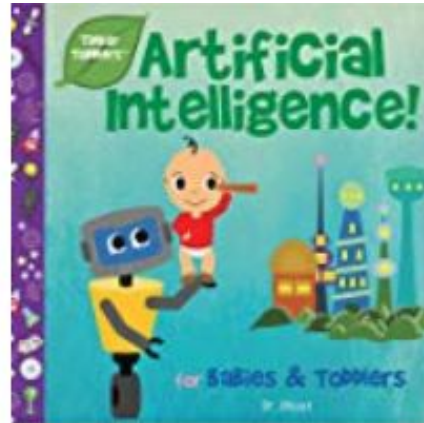
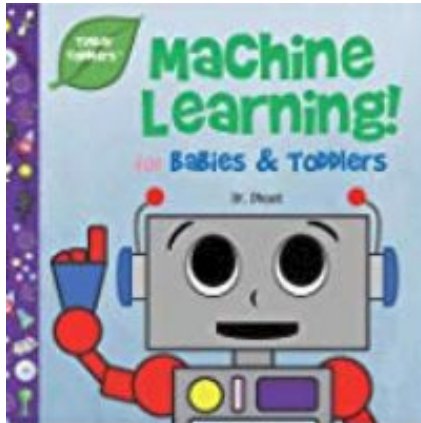
- Explore how behavior is influenced by bias and how it affects decision making
- Describe ways that AI systems can be designed for inclusivity

Grades 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)

Resources

AI Books for Toddlers



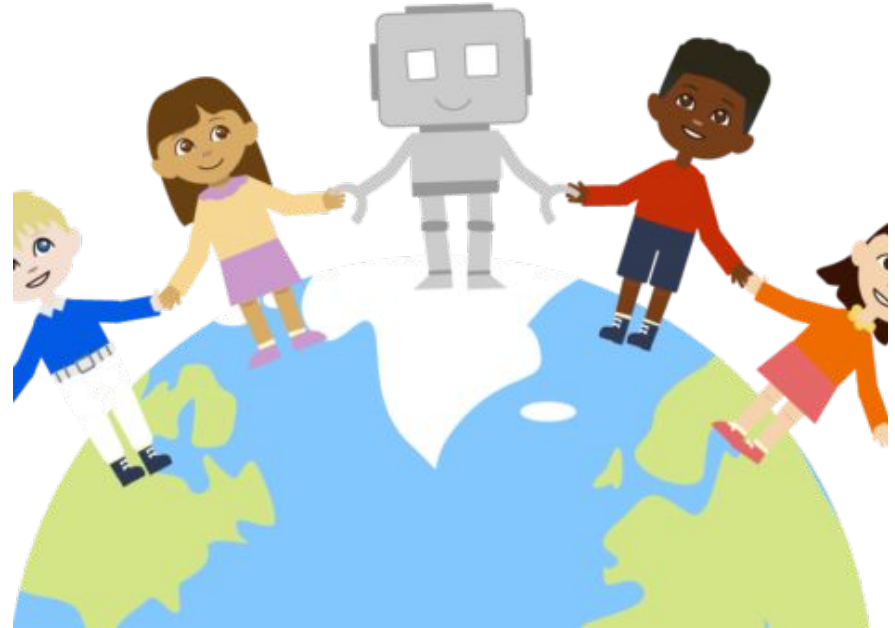
Tinker Toddler Books by Dr. Handeep Dhoot

AI + ME (AI and Me) -- grades K-5

edu.readyai.org/courses/aime/

“AI+ME” is an online experience intended to provide young learners with the basics of AI. The lesson takes about one hour to complete. This is the first publicly available course introducing students to the “Five Big Ideas in AI” as defined by the AI4K12 Initiative.

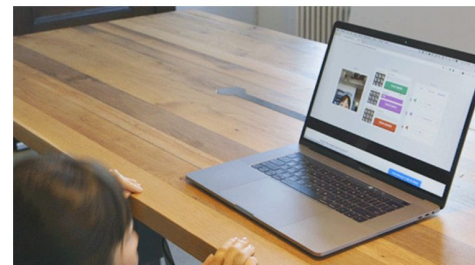
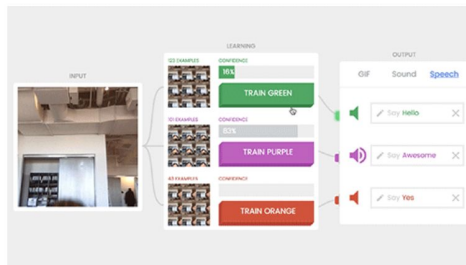
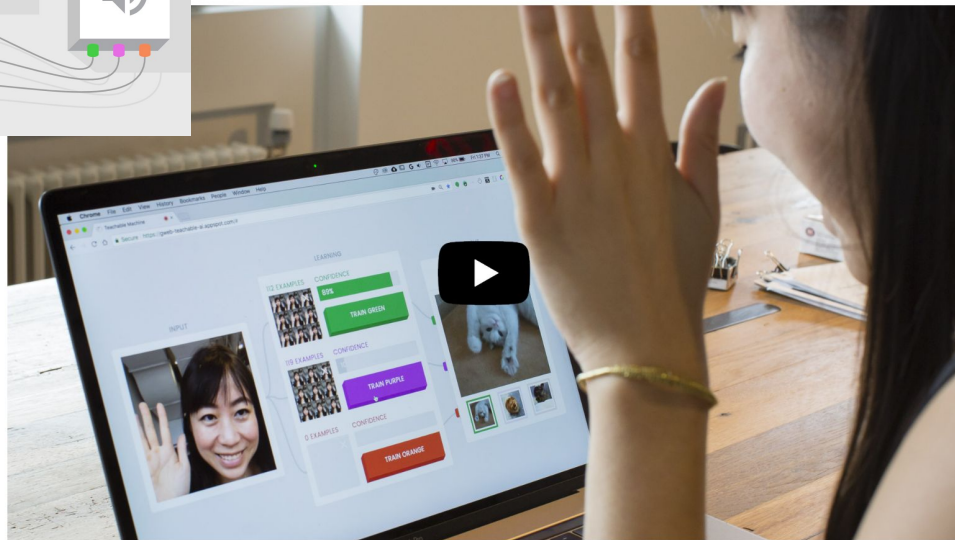
Target Audience: Elementary School



TEACHABLE MACHINE

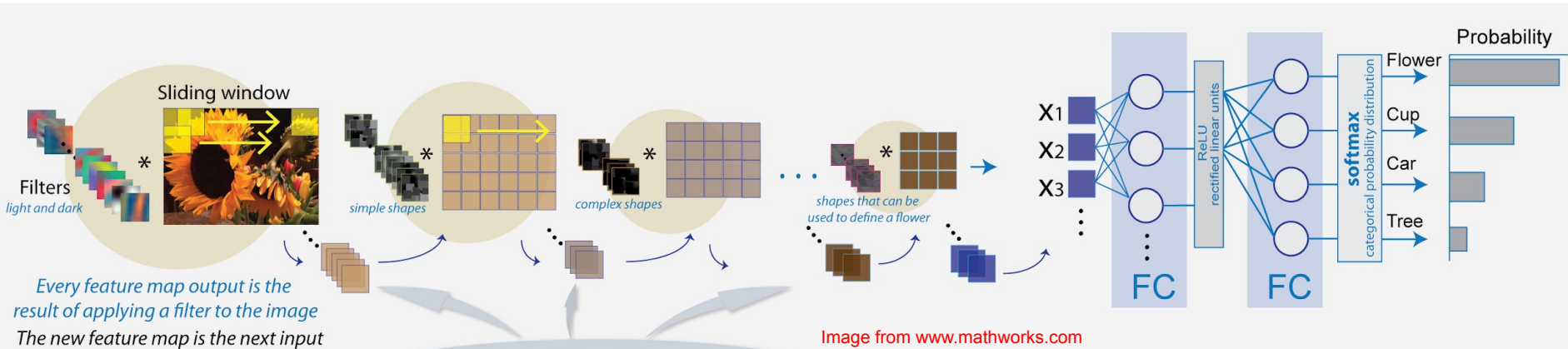
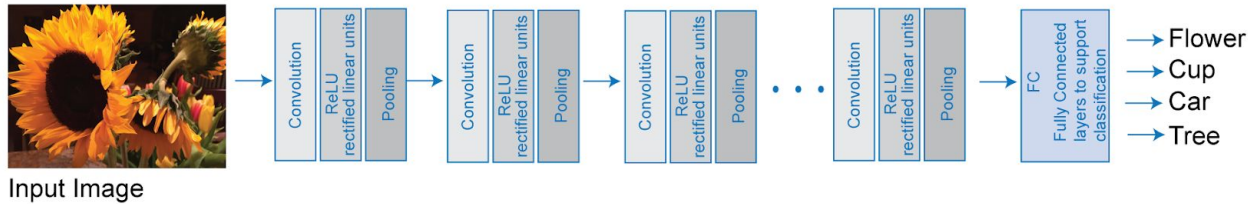
Built with TensorFlow

- Teach a machine using your camera.
- Live, in the browser.
- No coding required.



What's A Deep Neural Network?

The network has tens of millions of parameters, called “weights”.





Machine Learning for Kids

<https://machinelearningforkids.co.uk>

- 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

School Library

Create a school librarian in Scratch that suggests who a reading book might be suitable for.

Teach a computer to make recommendations

Difficulty: Intermediate

Recognising: **numbers**



Tags: predictive model, recommendations, supervised learning

Download

Back to project

Recognising **numbers** as **beginner, Intermediate or advanced**

beginner	Intermediate	advanced
pages 10 lines 10 pictures 10	pages 20 lines 40 pictures 10	pages 150 lines 1200 pictures 0
pages 5 lines 5 pictures 10	pages 50 lines 100 pictures 0	pages 300 lines 6000 pictures 0
pages 10 lines 0 pictures 10	pages 80 lines 120 pictures 8	pages 180 lines 1980 pictures 18
pages 8 lines 4 pictures 4	pages 30 lines 75 pictures 5	pages 140 lines 2100 pictures 0
pages 20 lines 40 pictures 10	pages 60 lines 240 pictures 0	pages 200 lines 3000 pictures 0
pages 40 lines 16 pictures 8	pages 70 lines 350 pictures 0	pages 250 lines 3300 pictures 0

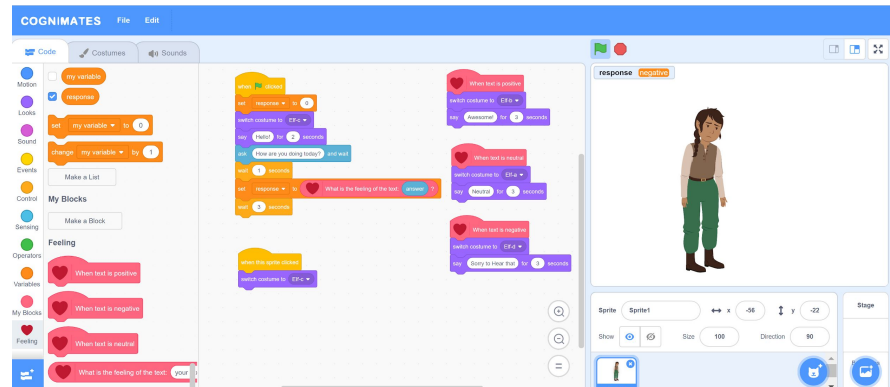
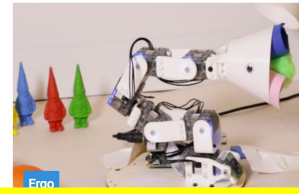
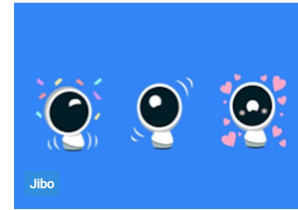
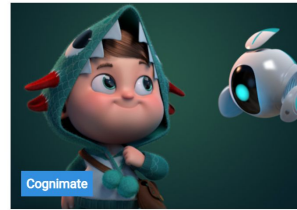
+ Add example



<http://cognimates.me>

Cognimates offers AI extensions for Scratch, such as:

- speech recognition
- sentiment analysis
- visual pattern detection
- robot control





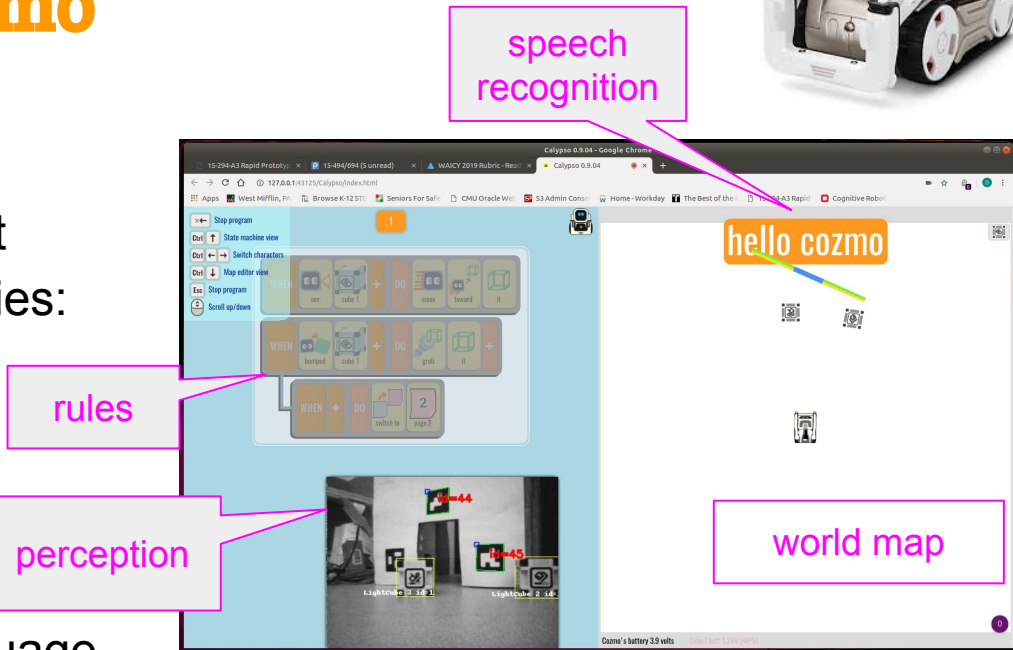
Calypso for Cozmo



- A robot intelligence framework that incorporates multiple AI technologies:

- Computer vision; face recognition
- Speech recognition and generation
- Landmark-based navigation
- Path planning
- Object manipulation

- Rule-based pattern matching language inspired by Microsoft's Kodu Game Lab
- Teaches computational thinking: “Laws of Calypso”, idioms, etc.
- Web site: <https://Calypso.software>



Stop program

Ctrl ↑ State machine view

Ctrl ← → Switch characters

Ctrl ↓ Map editor view

Esc Stop program

Scroll up/down

Visual programming rules interface with three rows of blocks:

- Row 1: WHEN (see) + DO (cube 1) + DO (move toward) + DO (it)
- Row 2: WHEN (bumped) + DO (cube 1) + DO (grab) + DO (it)
- Row 3: WHEN + DO (switch to page 2)

rules



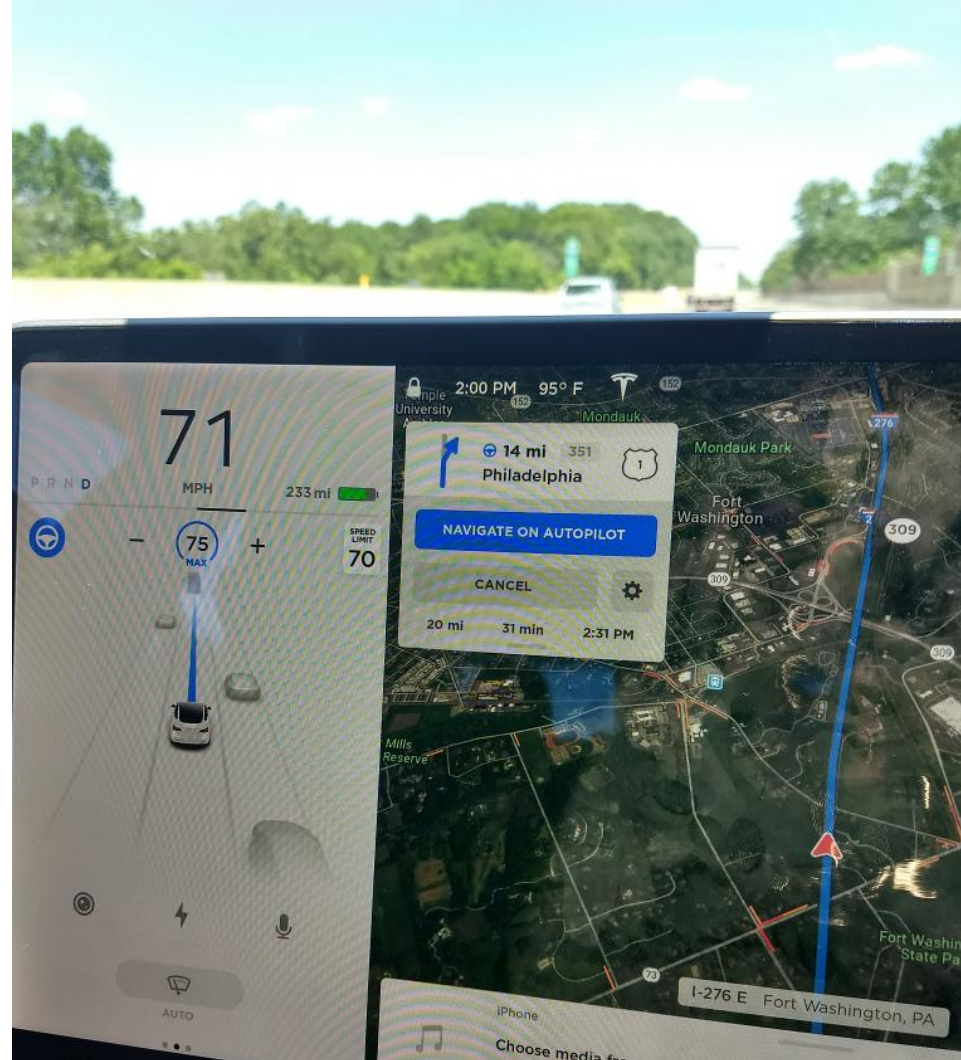
perception

hello cozmo

speech recognition

world map

Tesla dashboard image





WAICY: World Artificial Intelligence Competition For Youth

2018 WAICY Stats:

5+ Time zones

200+ Students

50 Teams

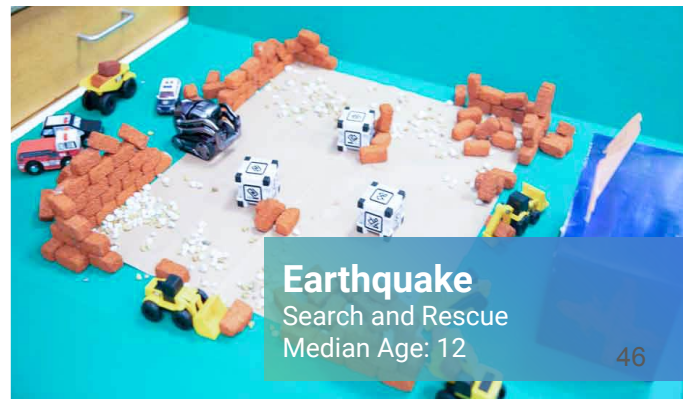
(20+ remote participation)

“S.T.E.A.M.-Powered A.I.”

- 50/50 Rubric
- [Winning Project](#)



East to West
Energy Transportation
Median Age: 8



TensorFlow Playground

<https://playground.tensorflow.org>

Tinker With a **Neural Network** Right Here in Your Browser.

Don't Worry, You Can't Break It. We Promise.

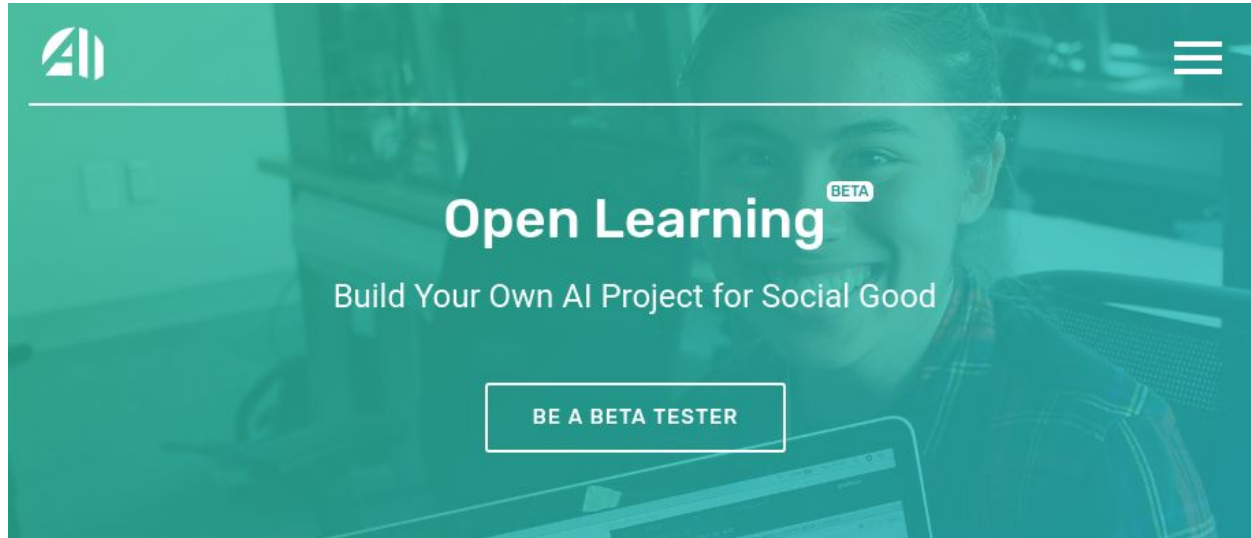
The screenshot displays the TensorFlow Playground interface. At the top, there are controls for Epoch (000,000), Learning rate (0.03), Activation (Tanh), Regularization (None), Regularization rate (0), and Problem type (Classification). Below these are sections for DATA, FEATURES, HIDDEN LAYERS, and OUTPUT. The DATA section includes a dataset selector, a 50% training to test data ratio, and a noise slider. The FEATURES section lists input features like X_1 , X_2 , X_1^2 , X_2^2 , $X_1 X_2$, $\sin(X_1)$, and $\sin(X_2)$. The HIDDEN LAYERS section shows 2 hidden layers with 4 neurons in the first and 2 neurons in the second. The OUTPUT section shows a scatter plot of data points and a color scale for neuron and weight values. The test loss is 0.508 and the training loss is 0.504. A 'REGENERATE' button is located at the bottom left of the interface.

Tutorial: <https://cloud.google.com/blog/products/gcp/understanding-neural-networks-with-tensorflow-playground>

AI4All: Online Student Portal

<http://ai-4-all.org/open-learning>

The AI4All Open Learning platform will offer a series of online AI courses for high school students. As of summer 2019, the first course is in beta test. This courses focuses on the basics of machine learning.





Professional Development Course

Artificial Intelligence Explorations and Their Practical Use in Schools

www.iste.org/learn/iste-u/artificial-intelligence

Course Dates:

Summer 2019 Session: June 3 - September 13

*Enrollment period: **Now until July 12****

ENROLL NOW

ENROLL A GROUP

Fall 2019 Session: October 14, 2019 - January 27, 2020

*Enrollment period: **Now until October 28****

Course Details:

- > Grade Level: 6-12
- > Course Length: 30 hours
- > Cost: \$224 Member / \$299 Non-member
- > Course Style: asynchronous with instructor

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

Visit us:

<http://AI4K12.org>

Join the mailing list:

Visit AI4K12.org for the signup link



Questions?

