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# Analysis of Machine Learning Education Tool for Kids

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## *Abstract*

*Artificial intelligence and machine learning are used in many parts of our daily lives, but the basic processes and concepts are barely exposed to most people. Understanding these basic concepts is becoming increasingly important as kids don't have the opportunity to explore AI processes and improve their understanding of basic machine learning concepts and their essential components. Machine learning educational tools can help children easily understand artificial intelligence and machine learning. In this paper, we examine machine learning education tools and compare their features.*

*Keywords: Machine Learning, AI Education, Education Tool, Model Training, Kids*

## 1. INTRODUCTION

Artificial intelligence(AI) and machine learning(ML) are used in many parts of our daily lives, but the underlying processes and concepts are barely exposed to most people. Kids don't have the opportunity to explore the AI process and improve their understanding of basic machine learning concepts and essential components. Understanding the basic concepts is becoming more important than ever for people of all ages, including children growing up in an environment that integrates AI and ML products.[1][2]

There are various machine learning education tools for children, but among them, I will review Machine Learning for Kids, Teachable Machines, and Cognimates, and compare and analyze each feature.[3]

## 2. MACHINE LEARNING EDUCATION TOOL FOR KIDS

### 2.1 Teachable-Machine

Teachable Machine provides a fast and easy way to create machine learning models without the use of expertise or coding. The Teachable Machine can train a computer to recognize images, sounds, poses, and more.[4]

Figure 1 shows the main web page of the Teachable Machine site. The figure on the right shows a situation in which images learned through a webcam are classified.
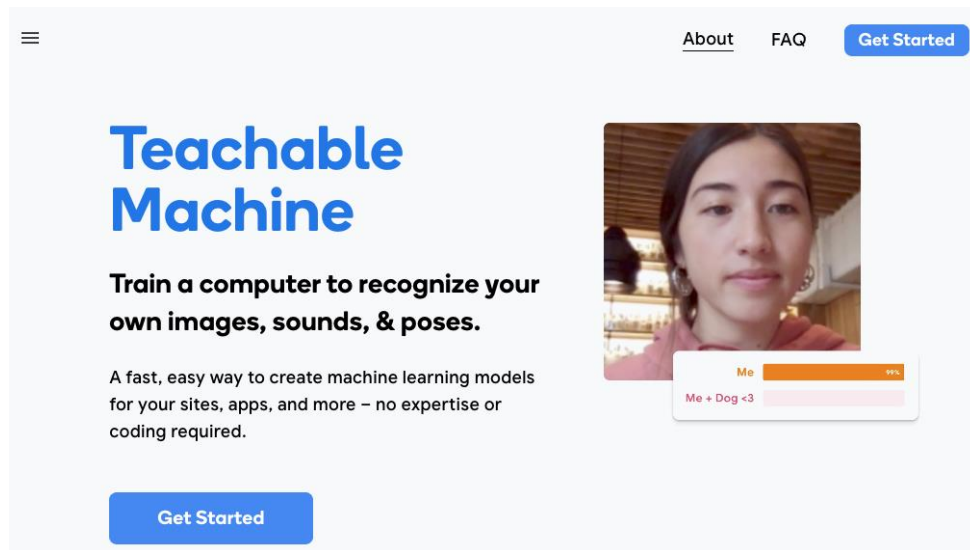
**Figure 1. Main Webpage of Teachable Machine**

Table 1 shows project types of Teachable Machine. Image and Pose projects use images as data sources, and Audio projects use sounds as data sources.

**Table 1. Project Types of Teachable Machine**

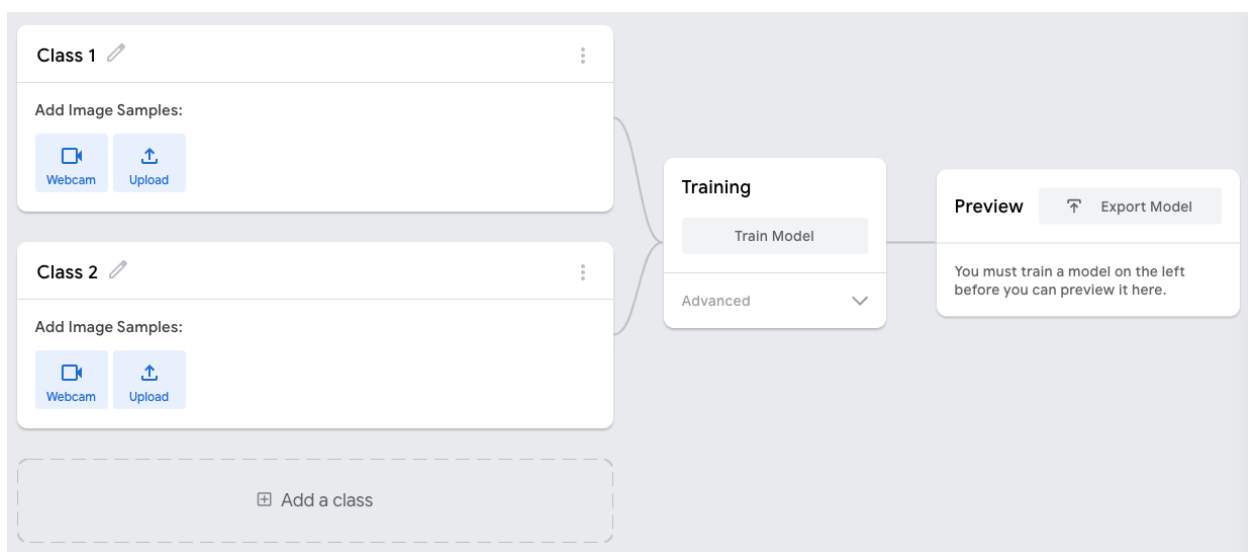| Project Type | Feature |
|---|---|
| Image | Teach based on images, from files or your webcam |
| Audio | Teach based on one-second-long sounds, from files or your microphone |
| Pose | Teach based on images, from files or your webcam |



**Figure 2. Training Process of Teachable Machine**

Figure 2 shows the training process of the Teachable Machine in the form of a visual diagram. After collecting data for each class using a webcam or file format, a machine learning model can be trained. After completing the training, you can get results for new data in the preview using the generated machine learning model.

Figure 3 shows the export model screen of Teachable Machine. Teachable Machine shows that the created model can be exported in three types: Tensorflow.js, Tensorflow, and Tensorflow Lite. Tensorflow.js is used in web pages, and Tensorflow is used as application. Tensorflow Lite can be used in smartphone apps.
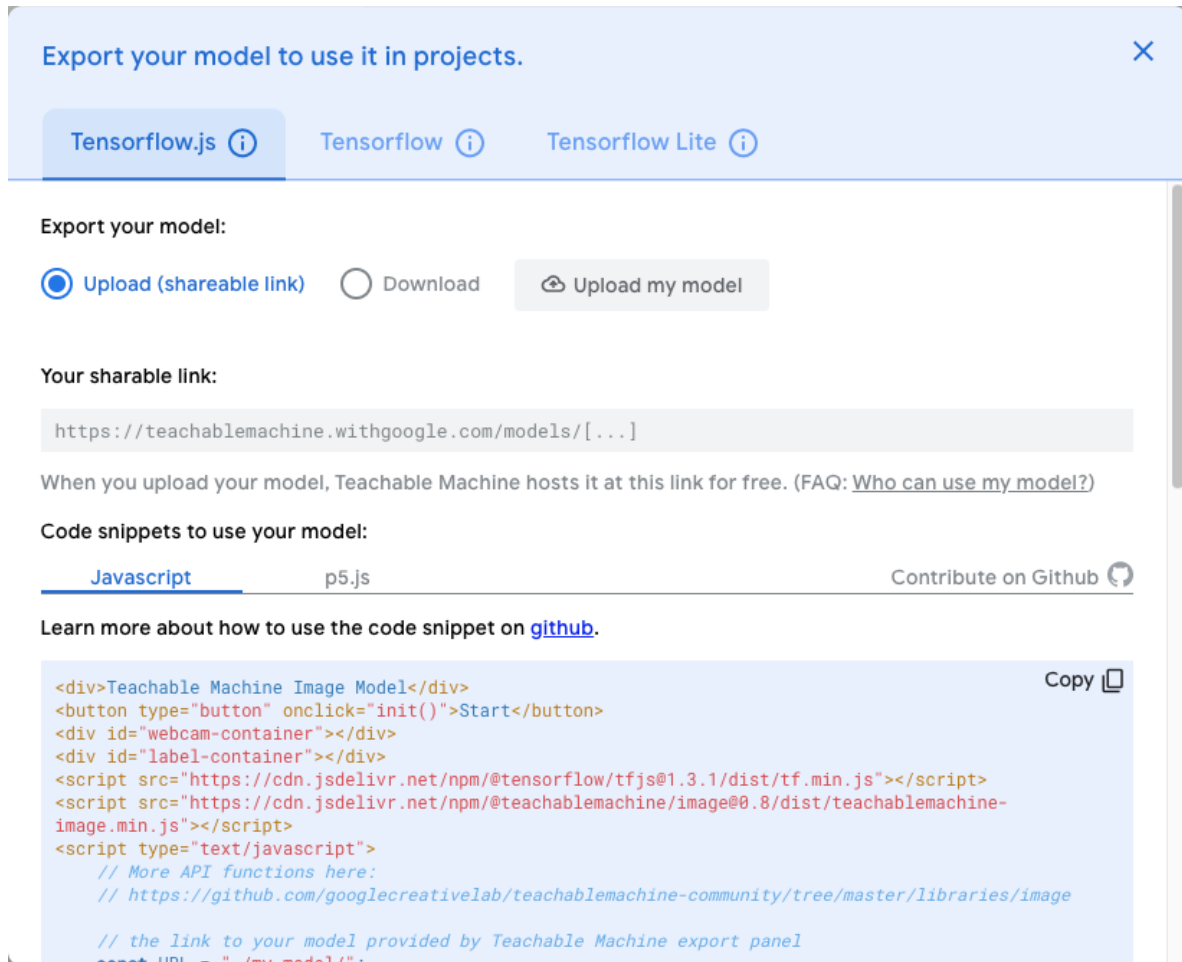


*Figure 3. Export Model Screen of Teachable Machine*

Table 2 shows the export targets of the Teachable Machine model. Teachable Machine provides various export types of models so that machine learning models can be used in web browsers, applications, and mobile apps. It supports export methods such as upload and download to use machine learning models in web browsers. The upload method uses a shareable link by uploading a machine learning model to the teachable machine site, and the download method is a method of saving and using the generated machine learning model.

The application is a program written in python using the Keras library, and Keras is an open source neural network library written in Python. The generated model must be converted to Keras' .h5 model to be used in the application. This conversion process occurs in the cloud, but the training data does not need to be uploaded in the trained model. The Savedmodel option converts the generated model to TensorFlow Savedmodel. This conversion process also occurs in the cloud, but trainging data does not need to be uploaded in the trained

model.

Mobile app must be converted to model convert type such as Floating Point, Quantized, and EdgeTPU for use in Android app. The floating point option converts the model to a tflite floating point model. This conversion occurs in the cloud, but the training data does not need to be uploaded in the trained model. The Quantized option converts the model to a tflite quantized point model. The EdgeTPU option converts the model to an EdgeTPU compiled tflite model that works on Coral device. Coral is a hardware and software platform for building intelligent devices with fast neural network inferencing. The Edge TPU coprocessor is a small ASIC built by Google that's specially-designed to execute state-of-the-art neural networks at high speed, with a low power cost.[5] This conversion occurs in the cloud and a subset of the data is uploaded to transform into a quantized model, but not stored on the server.

*Table 2. Export Target of Teachable Machine Model*

| Export Target | Model Conversion Type | Export Method |
|---|---|---|
| Web Browser | | Upload (shareable link) |
| | | Download |
| Application | Keras | |
| | Savedmodel | |
| Mobile App | Floating Point | |
| | Quantized | |
| | EdgeTPU | |

### 2.2 Machine Learning for Kids

Machine Learning for Kids allows students to train models and use models trained through Scratch. In addition to machine learning, it also provides smart lighting and digital personal assistant functions.[6]

Figure 4 shows the main web page of Machine Learning for Kids, and Figure 5 shows the start screen for creating a project.
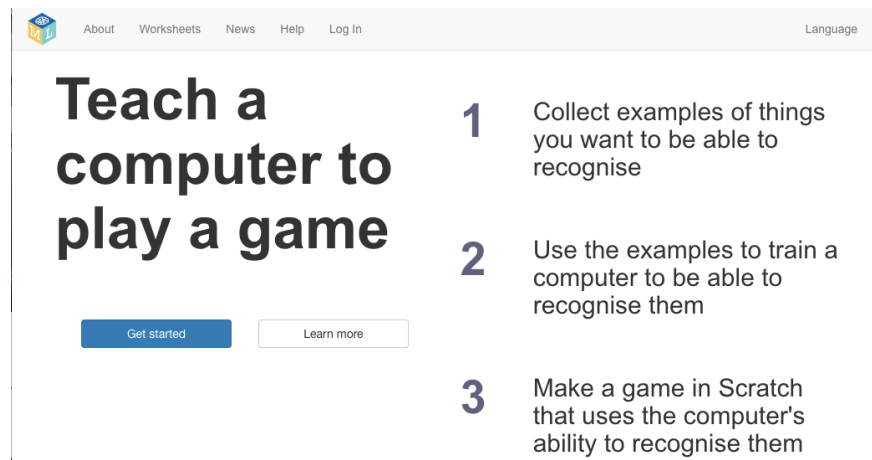


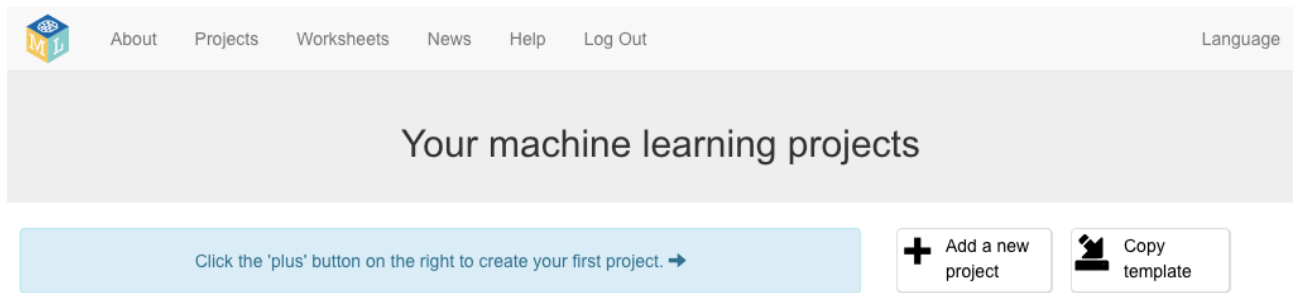*Figure 4. Main Webpage of Machine Learning for Kids*

*Figure 5. Project Screen of Machine Learning for Kids*

Table 3 shows the project types of Machine Learning for Kids. Text project represents Words, Sentences, Paragraphs, Image project represents photos, diagrams, pictures, Numbers project represents sets of numbers or multiple choices, and Sounds project represents voices and sounds.

*Table 3. Projects of Machine Learning for Kids*

| Project Type | Data Source |
|---|---|
| Text | Words, Sentences, Paragraphs |
| Image | Photos, Diagrams, Pictures |
| Numbers | Sets of Numbers or Multiple Choices |
| Sounds | Voices, sounds |

Figure 6 shows how Machine Learning for Kids supports a variety of development tools including Scratch, Python, and App Inventor. Scratch and App Inventor are tools that can make programs that children can use easily with machine learning models.
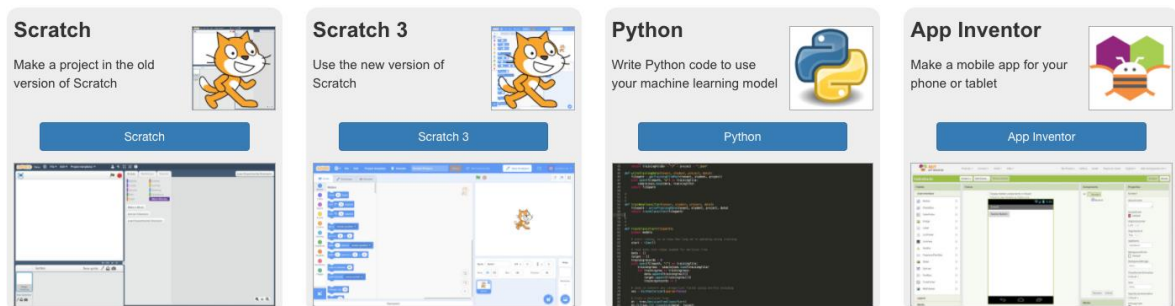


*Figure 6. Development Tool of Machine Learning for Kids*

## 2.3 Cognimates

Cognimates is an AI education platform for building games, programming robots, and training AI models, created by Stefania Druga, and started as a project at MIT Media Lab. It's possible to see what machine learning can do with pre-trained models using the Cognimates codelab's "Feelings" extension.[7]

Figure 7 shows the screen of Cognimates Studio, which can train machine learning models of images and text.

**Figure 7. Cognimates Studio**

Figure 8 shows various blocks such as Vision Training, Text Training, Speech to Text, Text to Speech, Feelings, Twitter, and Translate blocks through Scratch in Cognimates. Through these blocks of Scratch, Cognimates provides the ability to learn images and texts, as well as to translate voice and text. It uses python to train the model, and Scratch to write code to use the model.



**Figure 8. Scratch Blocks of Cognimates**

## 3. ANALYSIS OF MACHINE LEARNING EDUCATION TOOLS

This section compares the features of machine learning education tools. Table 4 shows the companies and data sources of machine learning education tools. Most tools use image data, and some tools use audio and text data. It can be seen that machine learning models targeting image data are common. Text data means words, sentences, and paragraphs, and image data means photos, diagrams, and pictures. Numerical data refers to a set of numbers or multiple choices, and sound data refers to speech and sound. We can see that each tool uses a model that trains on a variety of data.

Table 5 shows the development tools and targets of machine learning education tools. Python is used to train datasets to generate related machine learning models, and JavaScript, Scratch, App Inventor, and Android Studio are used to create programs that provide services using the generated models. We can see that most of the tools support JavaScript, Python and Scratch, and some of them support App Inventor and Android Studio. JavaScript is used to create web-type services, and Python and Scratch create applications. App Inventor and Android Studio are used to create smartphone apps. From this, it can be seen that most of the tools support web, applications, and smartphone apps.

**Table 4. Company and Data Source of Machine Learning Education Tool**

| Name | Company | Data Source | | | | |
|---|---|---|---|---|---|---|
| | | Image | Audio | Pose | Text | Number |
| Teachable Machine | Google | O | O | O | X | X |
| Machine Learning for Kids | IBM Watson | O | O | X | O | O |
| Cognimates | MIT Media Lab | O | X | X | O | X |

**Table 5. Development Tool and Target of Machine Learning Education Tool**

| Name | Development Tool | | | | | Target | | |
|---|---|---|---|---|---|---|---|---|
| | JavaScript | Python | Scratch | App Inventor | Android Studio | Web | Application | Mobile App |
| Teachable Machine | O | O | X | X | O | O | O | O |
| Machine Learning for Kids | X | O | O | O | X | O | O | O |
| Cognimates | O | X | O | X | X | O | O | X |

## 4. CONCLUSION

This paper reviews machine learning education tools and compares the various features of machine learning education tools.

Artificial intelligence and machine learning are used in many parts of everyday life, but the basic processes and concepts are not easy for most people to understand.

Machine learning educational tools help kids easily understand artificial intelligence and machine learning.

A review of machine learning education tools can help them find suitable machine learning education tools, which we believe will provide them an opportunity to explore AI processes and improve their understanding of basic machine learning concepts and essential components.

## REFERENCES

[1] Baiju NT, "How to teach your kids about Machine Learning and AI," *https://roboticsbiz.com/how-to-teach-your-kids-about-machine-learning-and-ai/.*

[2] Randi Williams, "How to Teach AI to Kids … In 30 Minutes," *https://medium.com/@randiw12.mit/how-to-teach-ai-to-kids-in-30-minutes-79c39facac4d.*

[3] Sonit Singh, "AI and Machine Learning for Kids - Resources*," https://www.mq.edu.au/__data/assets/pdf_file/0009/810189/AI_and_Machine_Learning_for_Kids___Resources.pdf*

[4] Teachable Machine, *https://teachablemachine.withgoogle.com/.*

[5] Coral, *https://coral.ai/.*

[6] Machine Learning for Kids, *https://machinelearningforkids.co.uk/.*

[7] Cognimates, *http://cognimates.me/home/.*