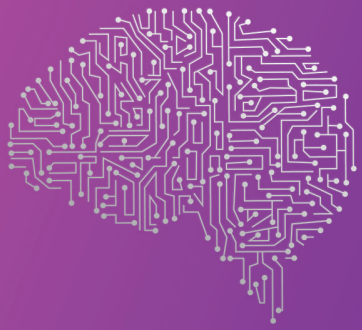

FOR CHILDREN

ARTIFICIAL INTELLIGENCE

This book was formed with the contribution of partners and within the scope of Erasmus+ project "Artificial Intelligence Education for Children" with number 2019-1-TR01-KA201-077041 with the guidance of project coordinator Assoc. Prof. Akın Özçift from Manisa Celal Bayar University.

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FOREWORD

Prof. Dr. Ahmet ATAÇ
Rector of Manisa Celal Bayar University

In this book, teachers will find artificial intelligence applications created within the "Artificial Intelligence for Children" Project supported by Turkish National Agency and carried out by Manisa Celal Bayar University, Directorate General of Innovation and Educational Technologies of the Ministry of National Education, Harran University, Genç STEM Association with European partners. By means of artificial intelligence technology, a great deal of data could be processed and the problems that people struggle with could be solved more easily. By this project, we support all educational inititates in this regard

Prof. Dr. Mehmet Sabri ÇELİK
Rector of Harran University

In the age of science, we need to know, use and develop every kind of technology in order to keep up with the rest of the world. This could only be achieved by internalizing technological trainings at every level and use them properly. Thanks to the recent developments, we have been creating education infrastructure for being the capital of technological developments and try our best to bring them closer to the youth. I hope that this book which evaluates the innovative technological developments and addresses the technological structures for national and innovative efforts will help you come up with new ideas, be a source for inspiration for you and be useful for your horizon-broadening work.

İsmail YAPICIER
Provincial Director of
National Education of Şanlıurfa

Our purpose of creating this book are to deliver important and useful information about the main topics of artificial intelligence such as machine learning and artificial neural networks, and help our students bring developing technologies into the next stage. Therefore, teachers have a great responsibility as always and education will be brought further on the shoulders of them.

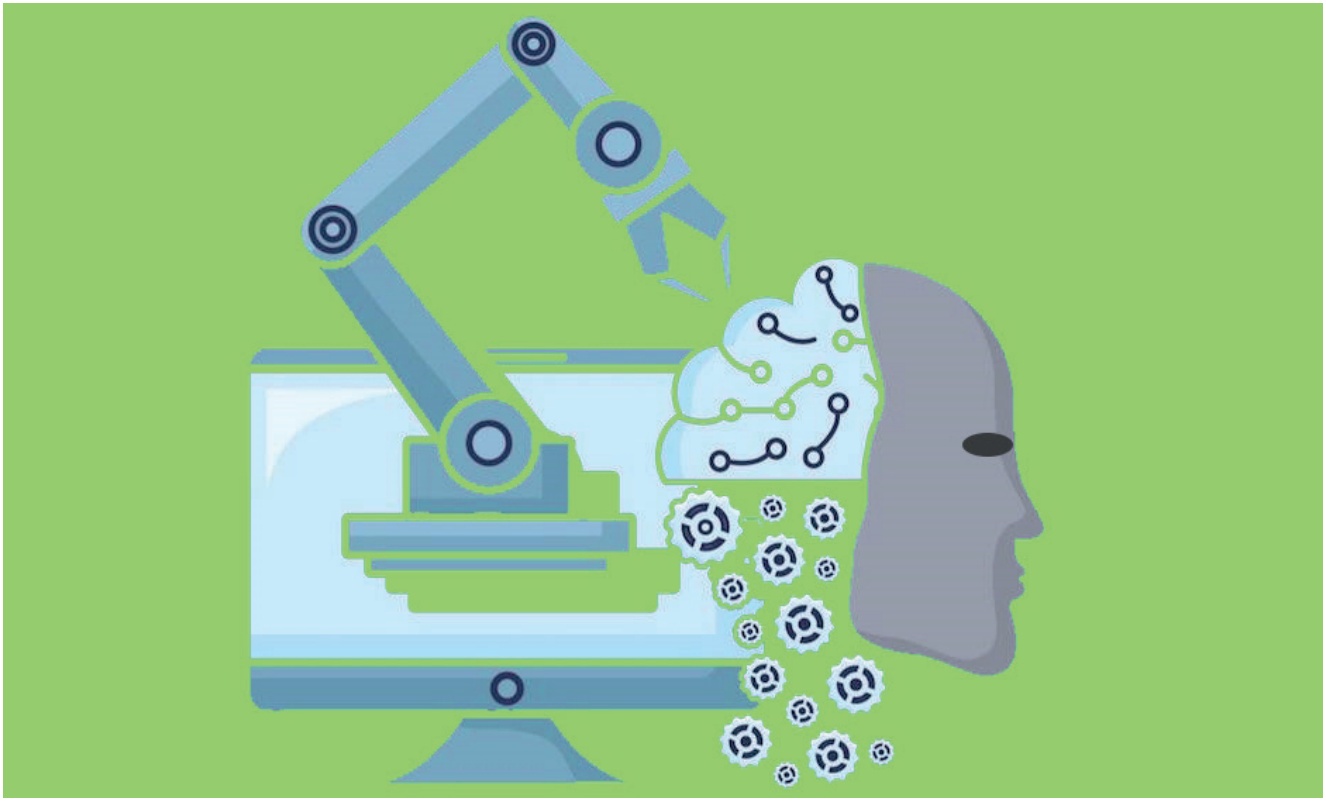
CONTENTS

ARTIFICIAL INTELLIGENCE DEVELOPMENT PROCESS

"Artificial Intelligence is the new electricity"

Andrew Ng

The concept of Artificial Intelligence involves the study of transferring the skill of learning and applying what's learned in human brains, into non-human and coded electronic structures and thereby creating outputs. In the simplest sense, artificial intelligence is a human-made structure's ability to imitate human features and mind processes such as reasoning. Fundamentally, artificial intelligence has been developed as an easier way to solve problems or reach decisions



that would otherwise require much more time or knowledge.

After a while, for example, a person forgets or hardly remembers the faces of people whom they haven't seen on a regular basis. However, using artificial intelligence-based software, today's social media platforms are able to find your friends or make suggestions of those you barely remember. Does this artificial process take place in a different way than those of people? To a certain extent, no. When you first meet a person you associate that person with (a) a mutual friend or (b) where they are from or (c) things he/she likes etc. Software based on artificial intelligence operate in a similar way. The only difference is that they don't forget, thanks to their sequential operating logic. If we code the people we meet on a certain characteristics and based on their fixed facial features, we can remember the person and not forget anything despite the years.

Although the concept and idea of artificial intelligence date back to 14th century, it actually emerged in 1937 as a result of Alan Turing's work. During the World War II, British computer scientist Alan Turing worked towards cracking the 'Enigma' code, which was then used by German forces to send messages securely. Alan Turing and his team created a machine called Bombe to decipher Enigma messages. Enigma and Bombe machines laid the foundation for Machine Learning. In 1950, Alan Turing created the Turing Test during which people were asked if they can differentiate between human and computer. A

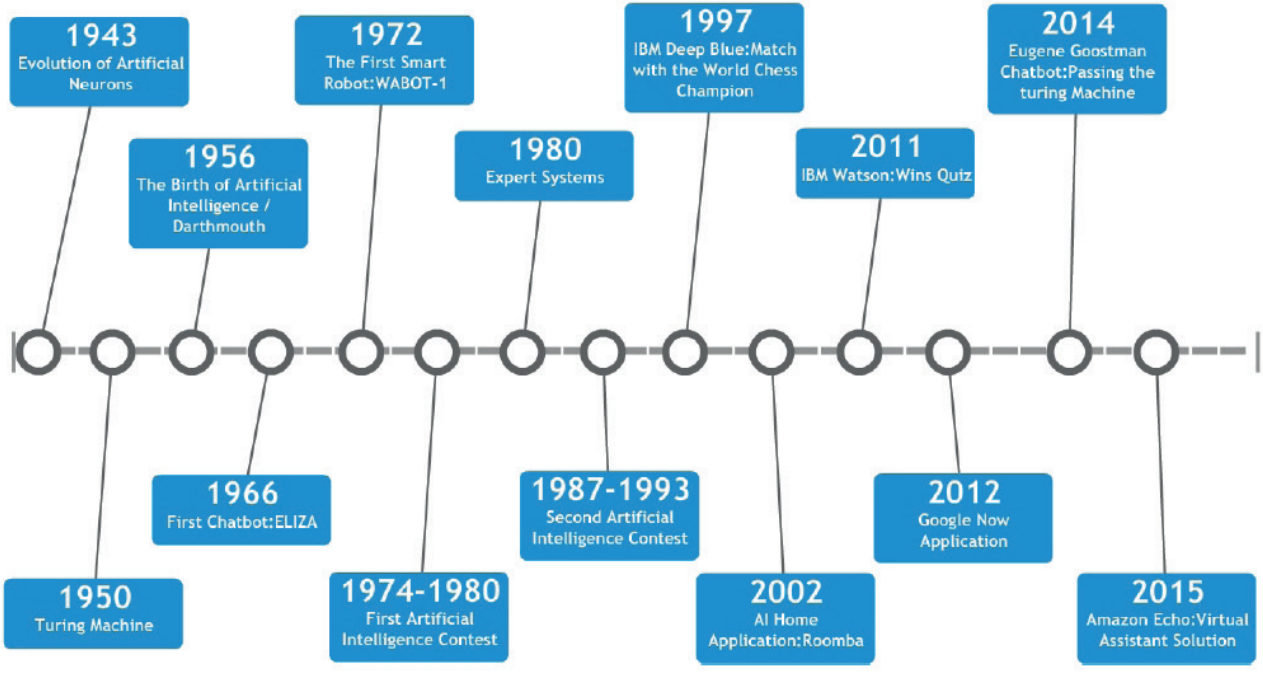


Figure 1: Historical Development of Artificial Intelligence

third person observes a conversation between 2 others (human and computer) by keyboard and screen. If the observer cannot tell if either is a machine, it is said to pass the test.. According to Turing, if it was possible to chat with a machine without knowing if it was a machine, it is considered an intelligent machine. Though artificial intelligence was developed further, the machines that have actually passed the similar tests only became a part of our lives recently.

In 1956, American computer scientist John McCarthy, organized the Dartmouth Conference where "Artificial Intelligence" was first accepted. Several research centres were founded in the United States of America to explore the potential of artificial intelligence. Two researchers Allen Newell and Herbert Simon were the influencers of introducing artificial intelligence as a computer science field that would change the world. In 1951, a machine known as Ferranti Mark 1 used a successful algorithm against amateur checkers and chess players. Over time, artificial intelligence applications dominated the game industry with Google's Artificial Intelligence AlphaGo's victory in East Asian game "Go", a game which has more possible moves than chess.

After Ferranti Mark 1, Newell and Simon developed a 'General Problem Solver' algorithm for solving mathematical problems. By the 1950's, John McCarthy, by then known as the father of AI, developed the LISP programming language. This became important in machine learning. In 1960's, researchers put great emphasis on developing algorithms to solve mathematical problems and geometrical theorems. Later that decade, computer scientists worked towards developing machine learning in robots, based on topics such as Machine Vision and Learning. The first humanoid smart robot called WABOT-1 was created in Japan in 1972. As a result of these long and well-funded global efforts, computer scientists realised that it was hard to create intelligence in machines. In order to be successful, artificial intelligence applications required a great deal of data to be processed. Computers weren't advanced enough to process such great amount of data, therefore governments and companies began to give up hope for artificial intelligence.

As a result, computer scientists had trouble finding the finance for artificial intelligence research from the mid 1970's to the mid 1990's. This period is known as 'AI Winter'. This winter turned out to have a Spring too. According to data from 2018 PwC, artificial intelligence is predicted to contribute 15 trillion US Dollars to the global economy by the end of 2030, changing the course of our economy. While China is getting ready to be the world leader in artificial intelligence, increasing its gross national product by 26% (7 trillion US Dollars), it is expected that the US share of will go down to about 15%. Historically, the US corrected technological deficiencies and made critical transformations after the launch of Sputnik. America is now getting ready for Round 2 against China which has invested greatly on artificial intelligence.

This will change the world economy and the most important question for our country, teachers, today's students and future policymakers is where we would like to see our country in this competition. While contemplating our answer to this question, it is important to consider earlier contributions to STEM. Al-Khwarizmi is the Muslim scientist who first devised a number system that included "0" and after whom the word algorithm comes, which is the main element of programming. His invention opened a new world of science. On the other hand, Ismail al-Jazari laid foundations for the industrial revolution in mechanisms, materials and the first step towards robotics. It is important to remember both Al-Khwa- rizmi and Al-Jazari who had roles in creating today's artificial intelligence robots, when we consider how we can continue this work

Following the Artificial Intelligence Winter

in the late 1990's, American companies became once again interested in using AI. The Japanese government also announced their plans to develop a fifth-generation computer for improving machine learning. Artificial Intelligence enthusiasts believed that computers will soon be able to hold conversa- tions, translate between languages, interpret images and believe in things that humans do. As a matter of fact in 1997, Deep Blue - developed by IBM, became the first computer to win a chess game against the world chess champion Garry Kasparov and today Google Translate can translate between languages in a highly consistent way.

Outstanding increases in computer processing capacity and storage have enabled companies to store large amount of data for the first time. In the last 15 years, Amazon, Google, Baidu and others have made use of the great commercial advantages of machine learning. As well as processing user data to understand consumer behaviour, the companies have also worked on other artificial intelligence applications such as computer vision, natural language processing, etc. Machine learning is now integrated into many online services that we use. Consequently, possibilities that have been long dreamed of are now realized, with many new electronic and computer infrastructures created. Platforms for coding help students code easily and become familiar with advanced level languages such as Python.

Examples of artificial intelligence include client services chatbot tools, autonomous vehicles/ smart cars, IoT devices, healthcare services, banking and logistics. The tools that are used as voice assistants, such as Apple's Siri, Amazon's Alexa, Google's Assistant and Microsoft's Cortana all contain artificial intelligence. They are in our lives to make it easier.

Artificial intelligence could be helpful for decreasing the number of human mistakes, create more sensitive analysis and turn data collection devices into strong identification tools. For instance, wearable devices like smart watches and fitness tracing devices can have active roles in managing consumers' health. In fact, we are getting closer to a life where we can do many things with a gesture, thanks to the developing mobile and sensor technologies. Artificial intelligence will soon be in our lives with advanced phone applications and eventually in all areas of daily life. It will be a convenient and help us save time.

Applications for making learning processes easier will be developed too. For example, many well-known online educational content providers have made investments for maximizing the learning experience with systems that assess registered users' progress and interest. Artificial intelligence will offer new opportunities, such as individualized education plans by identifying the topic in which students struggle and helping them keep more focused on each lesson by measuring attitudes and behaviours. Maybe mass success for Learning Models revealed by Bloom will be made possible by artificial intelligence. In fact, Bloom drew the road map for engineers working in artificial intelligence by claiming that everyone could learn if all necessary positive conditions are met.

COMPARING ARTIFICIAL INTELLIGENCE WITH HUMAN INTELLIGENCE

Artificial intelligence is a product and design of the human mind. This design has the ability to analyse settings that create actions and maximise their success.

Artificial intelligence-related research makes use of tools from areas such as computer science, psychology, philosophy, neuroscience, cognitive sciences, linguistics, operational researches, economy, control theory, probability, optimization and logic. Moreover, system timetabling, data mining, speech recognition, face recognition and others will be further developed with artificial intelligence.

Human intelligence is defined as a process grid that has the skill of learning from past experiences, adopting to new situations, considering abstract ideas and changing its own environment by making use of the knowledge gathered. While some think that intelligence is the ability of adopting to its environment while others think that it is a skill for survival. All studies related to artificial intelligence are based on mimicking human features.

Human intelligence enables people to pursue their lives in the best possible conditions and desired way and is the basis for identifying options and selecting the best one.

Intelligence contains brain activities for subjective thinking skills. Iterated and repeated structures during learning will result in permanent learning.

While artificial intelligence has relatively limited development area compared to human intelligence, it has several advantages for relative process capacity. These are:

- Application Speed: While a doctor could diagnose a patient in 10 minutes, an artificial intelligence system could do a million of these in less period of time and offer many ordered decisions.

- Less Biased: Artificial intelligence system doesn't have biased opinions on decision making process.

- Operational Skill: They produce results continuously without getting tired.

- Accuracy: The consistency of the output is very high unless there is an external intervention.

Artificial intelligence proceeds faster and is more effective for making outputs especially when there are monotonic decisions, that is to say where external data is supplied.

SUB-FIELDS OF ARTIFICIAL INTELLIGENCE

Artificial intelligence has many sub-fields. Artificial intelligence can be defined as developing computer systems that could fulfil tasks requiring human intelligence such as decision-making and object recognition. Every day, a new method is developed, in order to create the best system for transferring the human learning model and turn it into applications. Artificial intelligence is divided into three main sub-fields: artificial neural networks, machine learning and deep learning.

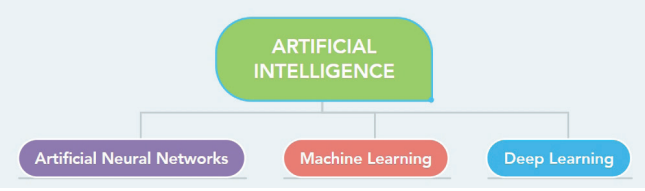


Figure 2: Sub-fields of Artificial Intelligence

Artificial Neural Networks

The human brain cell is called a neuron. Learning in humans occurs by neurons transferring signals to one another. To create this learning structure artificially, building the model structure in a similar way to neurons has become the main principle in artificial intelligence studies. We call these artificial neural networks.

The same neuron structure has been created by modelling the process of outside data processing and its transfer to the next neuron. Human neuron looks like the figure below:

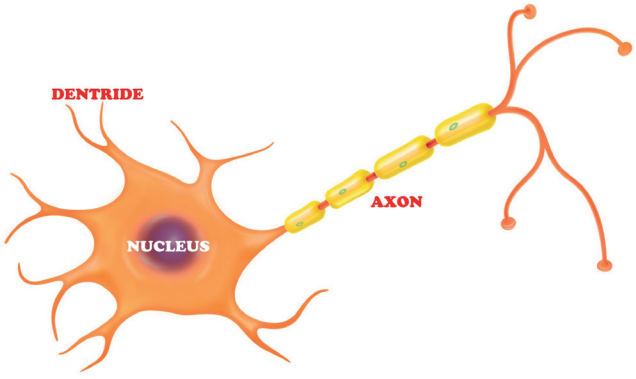


Figure 3: Human Neuron

Dendrites: They have the role of receiving signals from other neurons and transferring them to the nucleus.

Nucleus: It is the centre where all signals transferred by dendrites are gathered.

Axon: It is responsible for distributing all data from the nucleus to the next neuron. However, axon prevents the data to be delive-

red to the next neuron without being processed first. This is because the axon delivers the data to other units with synapses.

Synapses: They control delivery of data to other neuron dendrites, after they carry out the initial processing. Synapses are very important due to their role of carrying out initial processing.

This initial processing consists of changing all the signals delivered based on a threshold value. Therefore, all signals are delivered after being reduced to certain values instead of the initial state.

The same process is carried out in an artificial neural network. There are three main structures in the network. The parts are called: input layers, weights, adding function, activation function and output layers. Thinking and decision-making abilities of humans are converted from organic mathematics to systematic mathematics, using our natural systems as basis.

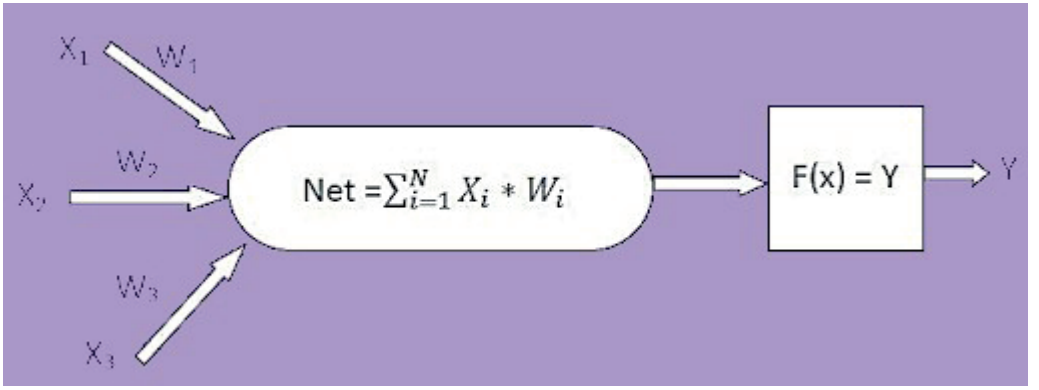


Figure 4: Artificial Neuron

Biological Neuron	Artificial Neuron
Axone	Output
Dendrite	Addition Function
Nucleus	Activation Function
Synapsis	Weights

Table 1: Demonstration of Natural and Artificial NeuronsNeurons

We have covered what artificial intelligence is, we will now move on to exploring artificial intelligence and neural networks in educational process in a more concrete way.

ACTIVITY

ACTIVITY NAME

MAKING AN ARTIFICIAL NEURAL NETWORK

ACTIVITY DURATION

2 HOURS

ACTIVITY MODULE

ARTIFICIAL INTELLIGENCE EDUCATION

ACTIVITY OUTCOMES

- Knowing the structure of neurons.
- Knowing that learning in humans is created by neurons.
- Noticing the connection between Artificial Neural Networks and biological neurons.
- Understanding the effects of input weight on the output in Artificial Neural Networks.

INFO NOTE:

Neurons (or nerve cells), the main units of brain and neural system are the cells responsible for receiving sensory input from the outside world, sending motor commands to our muscles, transform and transfer each signal.

There are three types of neurons:

1. **Sensory neurons** carry data from sensory organs (i.e. eyes and ears) to the brain.

2. **Motor neurons** manage voluntary muscle activity such as speaking and carrying messages from neurons of the brain to the muscles.

3. All other types outside these two groups are called interneurons.

MATERIALS

- 1 CD or DVD
- 2 Different-Coloured Threads

METHOD

First of all, we need to cut holes on the outer part of the CD/DVD for each student who will provide input. For example, if we have 5 students who will give input, we need to open up 5 holes on the CD/DVD.

Figure 5: Creating Neuron Input Holes on the CD / DVD

Then we need to cut 100 cm pieces from each thread and fix them where we opened holes (You can use a hot glue gun for this part). When you finish this step, the CD/DVD should look as shown below.

Figure 6: Making the Dendrites of the Neuron with Threads on CD/DVD

As shown below, we create the dendrites with the threads. The CD/DVD represents the nucleus. Now, the only thing we need is to create the axon. We need a different coloured 200 cm thread. You can see the final look below.

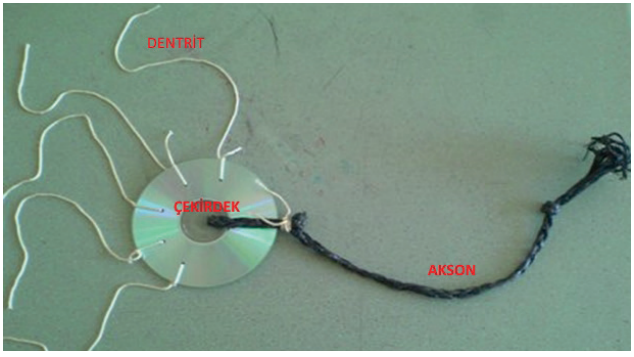


Figure 7: Artificial Neuron Model

Now, after creating the model, let's learn with the gamification structure. Below are the steps for the gamification of the model:

- Five students will hold each of five dendrite threads.
- One student will hold the axon.
- The logic of gamification will be as explained: Dendrites are receptors and they receive the external data. The nucleus processes the data and turn it into meaningful data. The axon delivers the data to another neuron. Wherever the dendrite thread moves more by being pulled by the student, the student who has the axon thread will get closer to her/him. We will repeat this process several times so that we can examine the change in the axon.

CONCLUSION

The weight of the data received from the dendrites are important. The heavier the data are, the closer output structure will be to the input structure of axon. The input weight in this activity is determined according to holding and pulling the thread. The axon thread in the output structure will move the same area.

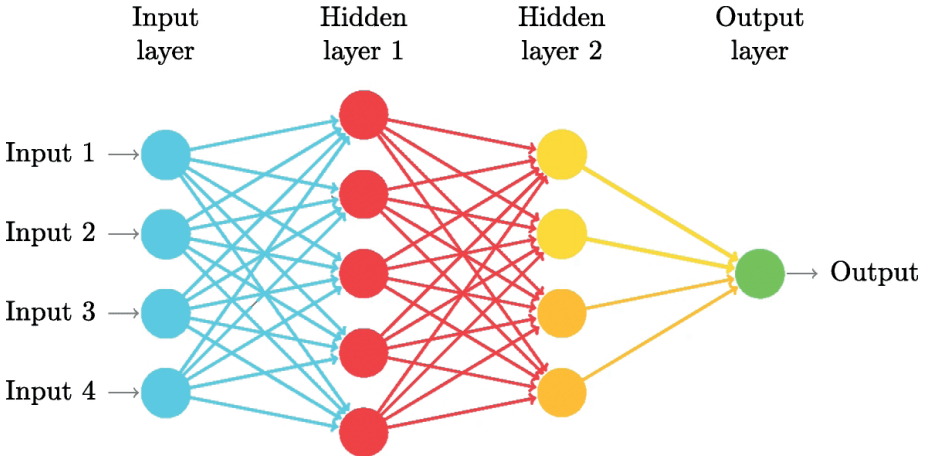


Figure 8: The General Structure of The Artificial Neural Networks

In order to produce output data after processing the data received from input layers in artificial neural networks, necessary steps are taken in hidden layers and delivered to the output layer. The bigger the intensity of the processes in the hidden layer by cross method, the more exhausted the processor will get and the later it will produce output data.

• **Input Layers:** It is the layer where outside input enters the artificial neural network. Although there are as many numbers of neuron as the input here, the input is generally delivered to the lower layers without being processed.

• **Hidden Layer(s):** In artificial neural networks, information coming from the input layer comes to this layer.

The number of the hidden layers vary depending on the network. While some artificial neural networks don't have any hidden layers, some have more than one hidden layer. The number of neurons in hidden layers are independent from the number of input and output layers. Although an increase in the number of hidden layers and the neurons in the hidden layers increase the complexity and time of calculation, it enables artificial neural networks to be used for solving more complex problems.

• **Output Layers:** It is the layer which processes the data coming from hidden layers and produce output of the artificial neural network. The output created in this layer are sent to the outside world. In the regenerative networks, new weight value of the network is calculated by making use of the output produced in this layer.

ACTIVITY

ACTIVITY NAME

LET'S UNDERSTAND THE HIDDEN LAYERS OF ARTIFICIAL NEURAL NETWORKS

ACTIVITY DURATION

2 HOURS

ACTIVITY MODULE

ARTIFICIAL INTELLIGENCE EDUCATION

ACTIVITY OUTCOMES

- Knowing about the hidden layers of artificial neural networks.
- Realising the impact of increased number of hidden layers on the process time.
- Realising the connection between the output layers and input values.
- Learning the output layers by concretizing.

INFO NOTE:

In artificial neural networks, hidden layers are where mathematical operations are completed in functions and delivered to the final structure.

The number of hidden layers and the intensity of the structures in hidden layers enable a deeper analysis. Accordingly, outcomes produced are more accurate or real-like.

MATERIALS

- 8 Chairs
- Coloured Strips
- Tape
- Name Cards

METHOD

Before preparing the setting, we need to explain what will be used and what will be achieved. In this activity, 4 people chosen randomly will be seated in the input chairs. Then, they will be asked to make sounds that will define themselves or pull the thread of their own colour. The person who is in the middle will try to memorise the names of the people in the input seats.

Then he/she will turn away and people will swap seats randomly. Then the people in input seats will give outputs based on their sounds or coloured stripes. The person who is in the middle will place the name cards on the seats opposite him/her.

You can see a picture of a possible layout below.

Figure 9: Artificial Neural Networks Drama

CONCLUSION

Learning the functions of the hidden layers in artificial neural networks and how outputs change according to the input.

MACHINE LEARNING

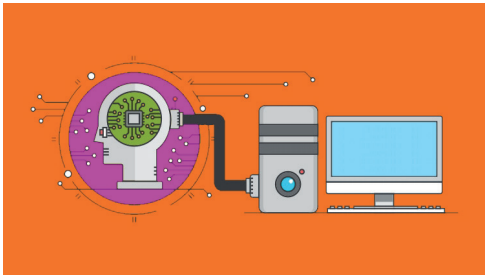


Figure 10: An Illustration of Machine Learning

Machine learning is an artificial intelligence application which enables systems to automatically learn and develop programs, based on the experiences without explicitly programming them. Machine learning focuses on developing computer programs that could access data and use learning for themselves. Machine learning is a structure that enables input data to be taken in accurately by learning even though data are shown or presented by different structures. It is the phase where artificial neural networks are used in the background and data are processed, results are achieved, and learning is realized based on the logic of human learning.

The process of learning begins with searching for patterns based on the examples provided and observations and data such as examples for better future decisions, direct experience or instructions. The primary aim of the machine learning is to enable computers learn automatically without the need for human intervention or help, and to arrange the actions accordingly.

What are the elements for creating good machine learning systems?

- Data preparation features.
- Algorithms- basic or advanced.
- Automation and iterative processes.
- Scalability
- Big Data modelling

Important Notes:

- A target in machine learning is called a label.
- A target in statistics is called a dependent variable.
- A variable in statistics is called a feature.
- A transformation in statistics is called creating a feature in machine learning.

Since machine learning is a widely studied subject, there are many suggested approaches and algorithms. Many of these approaches have the ability of predicting or estimating while some have the ability of classifying.

Prediction is the producing values with methods that are used when output of systems of data learning is quantitative. For example, weather forecast reports could be used to predict the current weather by using the previous data.

Classification is the process where the methods that are used when the output of the input data are qualitative and determine the class of each data sample. For example, predicting whether a picture shown in a before-learned structure is of an animal or plant.

DEEP LEARNING

Deep learning is a method of machine learning which consists of multiple layers and predicts the results based on a given dataset. Deep learning, machine learning and artificial intelligence are terms with different meanings. While deep learning is a sub-field of machine learning, machine learning is a sub-field of artificial intelligence. Since there is a great number of hidden layers in artificial neural networks, the intensity of data analysis results in the accuracy of results. On the other hand, the disadvantage of deep learning is that it exhausts the processor, due to the number of hidden layers.

If we are talking about an image, this image will exhaust the processor card as well as resulting in the delay of results due to the great deal of processes con- tinuing in hidden layers. A concrete example of deep learning could be rainbow springs.

As we know, a rainbow springs is a structure which has the colours but without the obvious colour transition when closed. However, if we open the spring, we will be able to see the colour transition and examine the structure in a deeper way.

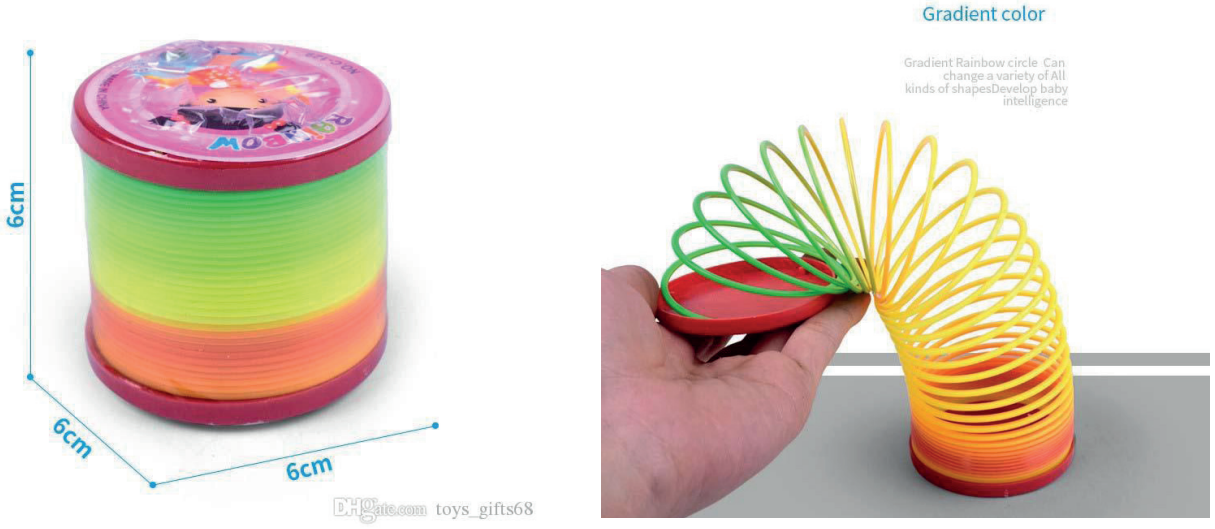


Figure 11: Rainbow Springs

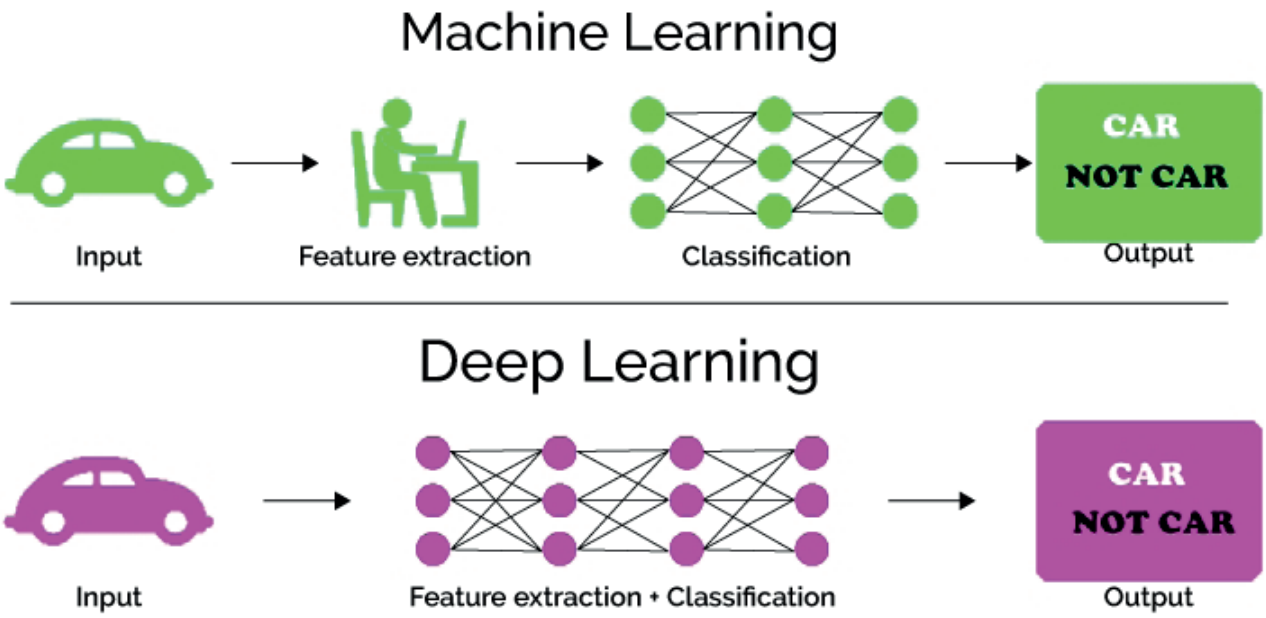


Figure 12: Machine Learning and Deep Learning

Since the numbers of algorithms used and calculations made in deep learning is more than those in machine learning, operations are completed in hidden layers instead of being completed in each operation separately.

Thanks to these structures, more accurate results are achieved. The data of complex problems is processed and analysed thanks to deep learning. Today's complex structures, autonomous systems and tools are completed with deep learning.

ACTIVITY

ACTIVITY NAME	ACTIVITY DURATION	ACTIVITY MODULE
ROCK PAPER SCISSORS	***2 HOURS***	***ARTIFICIAL INTELLIGENCE EDUCATION***

ACTIVITY OUTCOMES

- Recognizing the concept of artificial intelligence.
- Knowing about artificial intelligence practices and current structures.
- Listing the terms related to artificial intelligence.
- Knowing the definition of image processing and learning about the background operating logic.
- Knowing the definition of voice processing and learning about the background operating logic.
- Knowing data processing and learning about the background operating logic.
- Knowing how to run mBlock 5.
- Recognizing mBlock 5 interface.
- Noticing that mBlock 5 could be developed either on web media or downloadable structures.
- Knowing and using the code blocks on mBlock 5.
- Knowing how to install extensions on mBlock 5.
- Noticing the collaboration between mBlock 5 and artificial intelligence.
- Learning how to run the codes developed on mBlock 5 and display them on the stage.

INFO NOTE:

Played for years as a recreational activity, Rock Paper Scissors is a game with simple rules. It's played without any materials. The main logic of the game is that people close their fists in the shape of a rock or open in the shape of a paper or scissors.

Their hand gestures are compared with the opponents' gestures. According to the rules, rock breaks the scissors, paper wraps the rock and scissors cut the paper. The game ends depending on the number of rounds.

METHOD

What Is Image Processing?

Image processing is a method used for achieving an advanced image or manipulating an image in order to deduce some useful information from the image. It is a way of processing signals where the input is an image and the output is an image or characteristics/features related to the input image. Today, image processing is one of the fast-growing technologies and one of the main research fields of engineering and computer sciences.

There are three main steps of image processing.

These are:

- Importing the image with image collection tools.
- Analysis and use of the image.
- Reporting the image as an analysed structure.

What is Machine Learning?

Although Artificial Intelligence (AI) is a broad science that can imitate human skills, machine learning is a certain sub-field of AI that can teach a machine how to learn. Machine learning is a method of processing all data given in the background with various learning algorithms, solution methods and producing solutions for them.

In the next activity, we will collect images from the camera thanks to the artificial intelligence machine learning module that we will download as an extension on "mBlock 5". These images will be proceeded in the background, which will be machine learning. After learning is completed, we will start coding with sprite blocks. Based on what will be shown to the camera, we will code and produce outputs. Therefore, we will enable users to use the software.

INSTALLING THE SOFTWARE AND THE INTERFACE

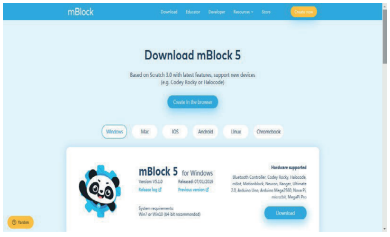


Figure 1: Downloading mBlock 5

Figure 1: Downloading mBlock 5

https://www.mblock.cc/en-us/download/

mBlock 5 uses block commands to help students code easily. Moreover, it makes coding with makeblocks and electronic devices easier.

To run or download the software, click on https:// www.mblock.cc/en-us/download/. You can either run it online or download and install on your laptop (Windows, Linux, MACOS).

On the mBlock 5 website, you can either click "Create in the browser" to start coding online. Alternatively, you can click on "Download" to download mBlock5 onto your computer. After downloading the setup file, you need to run it.

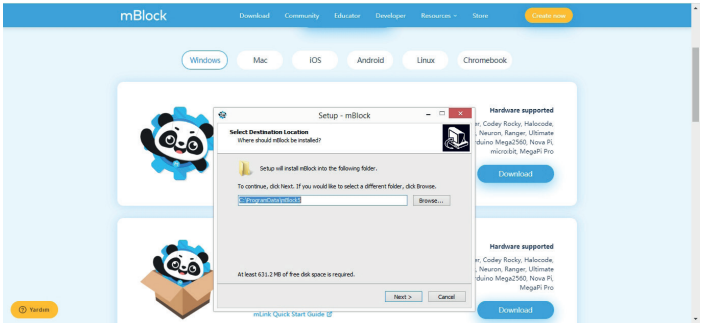


Figure 2: Installing mBlock 5

On the window opened, you need to click next until you finish installing. After completing the installation, the software will automatically run. You will see the window below, on the screen.

On the upper left part of the screen you will see the “file” tab. You can start a new project, save the current project or open an existing project. A panda sprite is located on a place called the stage. When you finish coding, the image will show up on the stage. On the Devices tab down left, you can choose what you would like to code. Clicking on the ”Sprites” tab, you can code the sprite on the stage. On the “Background” tab, you can change the background of the stage. On the code blocks section in the middle, you can drag motion, looks, sound, sensing, etc. codes and drop them into coding section. The empty space on the right is your coding area. You can add codes under other codes and arrange them.

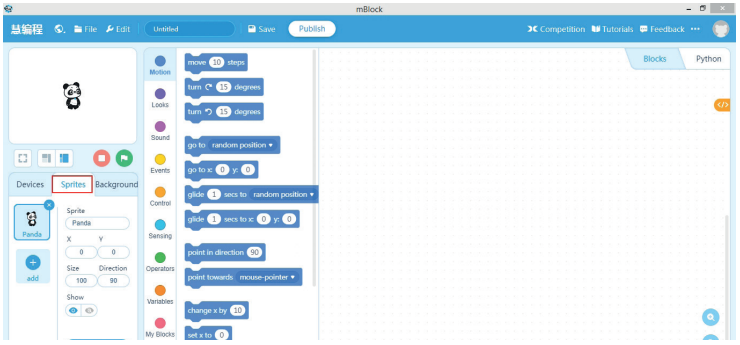


Figure 3: mBlock 5 Interface

ACTIVITY STEPS:

Now, run mBlock 5. Click on “Sprites” and then the extension.

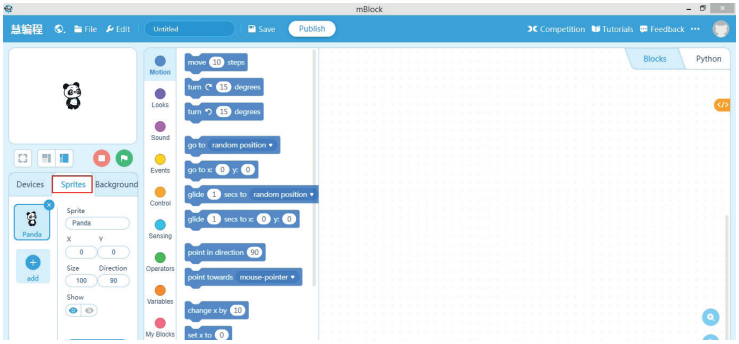


Figure 4: Sprites of mBlock 5 and Extension Structure

Here, you can add all the structures that you can add on your program as extensions later on.

After selecting the Teachable Machine extension, click on add. This is how the extension is added on your program.

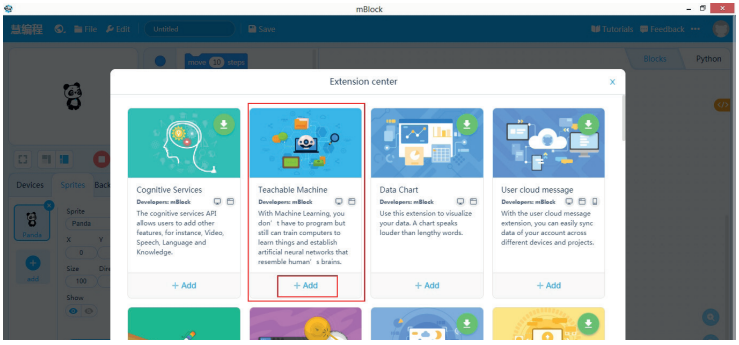


Figure 5: Selecting Teachable Machine on mBlock 5 Extensions

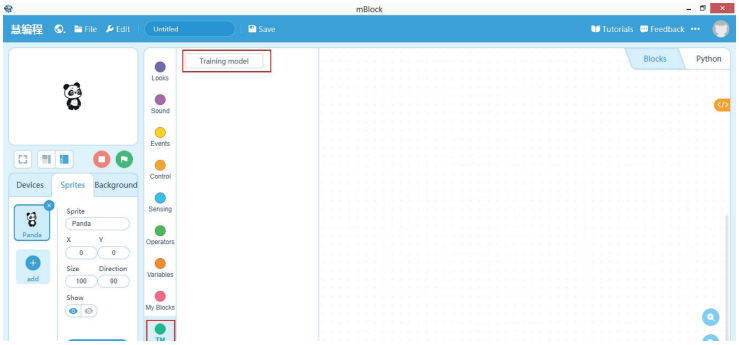


Figure 6: mBlock 5 Teachable Machine Code Block

Now, you've added Teachable Machine which is the menu to add codes. After completing machine learning on "Training Model", you can see the codes here. Click on "Training Model". You will see the structure where you complete Teachable Machine and Training Model.

Figure 7: Training Page for mBlock 5 Teachable Machine

On the left-hand side, you can see your webcam image. On the middle section for samples, there are structures where the input will be placed. If three models aren't enough for you, you can click on "Build a new model" and add another model. You can type the name of the sample on the empty line. The small square on the left side of the sample will show the preview of your webcam. You will display the image on the webcam and click on "Learn" so that the machine can learn our image. The most important thing here is that the more images you have, the more accurate the results will be. For this activity, we will name the 1st sample 'rock', 2nd sample 'paper' and 3rd sample 'scissors'. For the next step, we need to display 20 images for each sample and click "Learn".

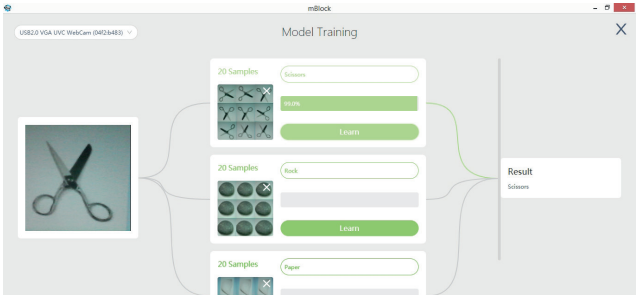


Figure 8: Scissors Training

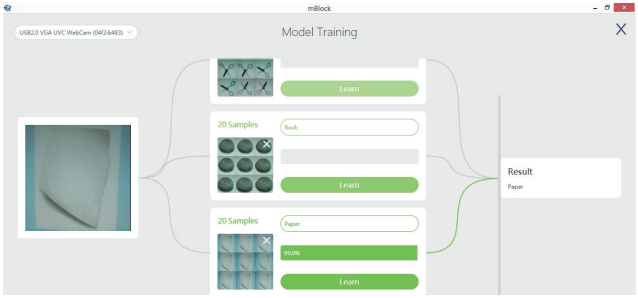


Figure 9: Paper Training

Figure 10: Rock Training

So, you've completed the training with 3 samples and 20 models for each sample. In order to check the accuracy of the training, we will show our papers again and check the result. If learning was completed fully, you will be able to see the results clearly. When you finish learning on this page, click on "Use the model".

Teachable Machine codes are added on the TM section of coding area. Now, you can add this to your codes and finish the game.

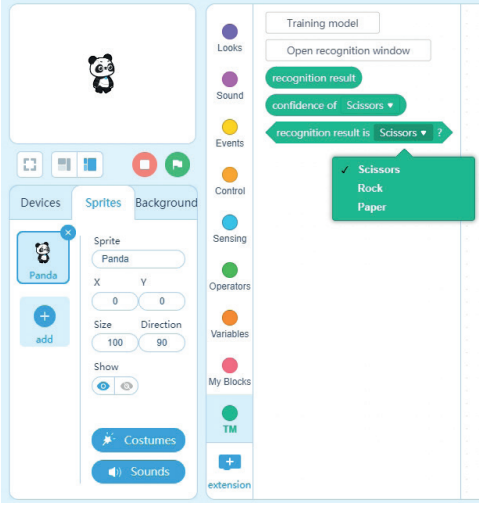


Figure 11: Code Blocks of mBlock 5 Teachable Machine

PSEUDO CODE STRUCTURE:

- The sprite will produce a random value between 1 and 3.

If the value is 1, the rock is selected.

If the user displays the rock, it will be a draw. If the user displays the paper, user will win.

If the user displays the scissors, user will lose.

- If the value is 2, the paper is selected.

If the user displays the paper, it will be a draw. If the user displays the scissors, user will win.

If the user displays the rock, user will lose.

- If the value is 3, the scissors are selected.

If the user displays the scissors, it will be a draw. If the user displays the rock, user will win.

If the user displays the paper, user will lose.

SAMPLE SCREENSHOT

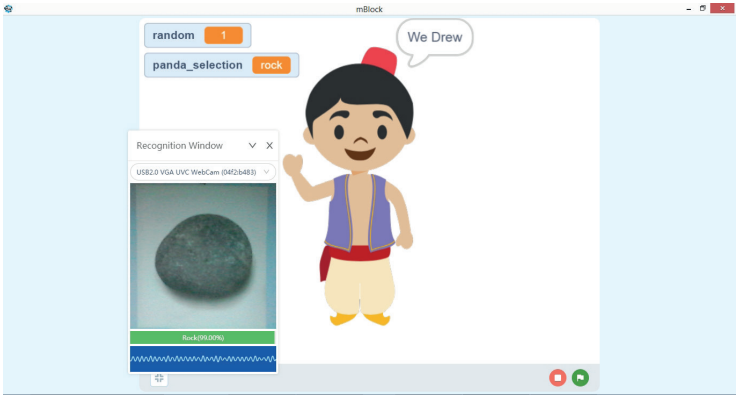


Figure 13: mBlock 5 Teachable Machine Sample Screenshot

CODE STRUCTURE:

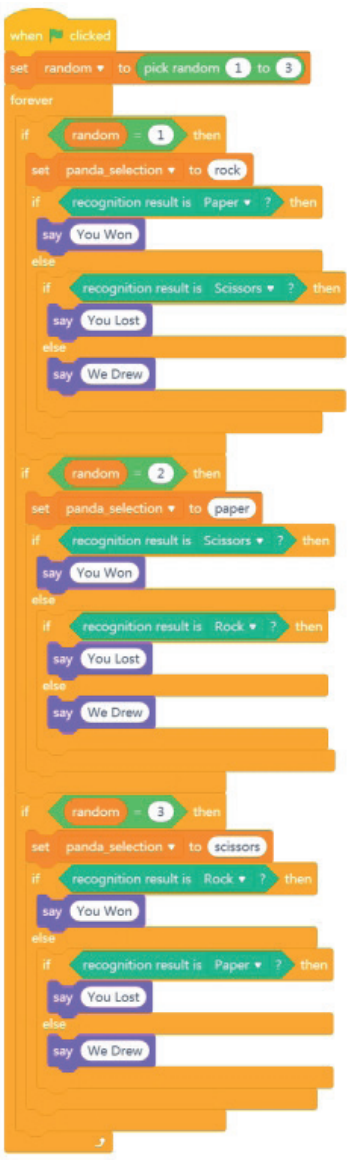


Figure 12: mBlock 5 Rock, Paper, Scissors Code Blocks

What Have We Learned?

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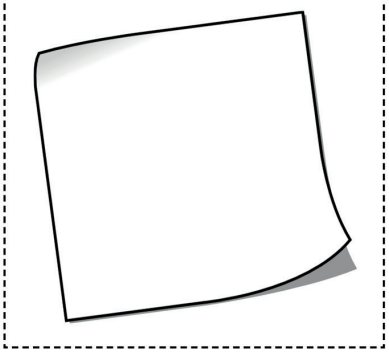
NOW, IT'S YOUR TURN!

Let's create a code which will add points when we win the game of rock, paper, scissors and reduce the points when we lose.

ACTIVITY PAPERS



ACTIVITY

ACTIVITY NAME	ACTIVITY DURATION	ACTIVITY MODULE
HOW OLD DO I LOOK?	***2 HOURS***	***ARTIFICIAL INTELLIGENCE EDUCATION***

ACTIVITY OUTCOMES

- Recognizing the concept of artificial intelligence.
- Knowing artificial intelligence practices and current structures.
- Listing the terms related to artificial intelligence.
- Knowing a definition of image processing and learning about the background operating logic.
- Noticing that certain points on the image have different meanings.
- Learning how to calculate age via image.
- Noticing the structures for comparing images and their effects on the result.
- Knowing how to run mBlock 5.
- Recognizing mBlock 5 interface.
- Noticing that mBlock 5 could be developed either on web media or downloadable structures.
- Knowing and using the code blocks on mBlock 5.
- Knowing how to install extensions on mBlock 5.
- Noticing the connection between mBlock 5 and artificial intelligence.
- Learning how to run the codes developed on mBlock 5 and display them on the stage.

INFO NOTE:

Age prediction is a structure based on the similarity to the structures on the database. Various algorithms are used for the process. However, people are evaluated based on the following age groups:

- Childhood (0-13 years old)
- Young adulthood (14-35 years old)
- Adulthood (35-65 years old)
- Old age (65+)

Algorithms running on the background compare the distinctive features of these age groups and produce a result accord-

ingly. For example; a typical baby face is considered to be different from an adult face because of:

- A larger head compared to the face
- Larger eyes proportional to the face
- A round face in general
- Chubby cheeks
- Short, straight eyebrows
- A short and small nose

These are the criteria that determine the age groups initially. Then, the process of comparing the faces of the people in this age range begins. An estimate is developed by detecting the closest image range. The structure used here aims to produce results by comparing the focused group with image processing and graphical data processing structure.

METHOD

What Is Image Processing?

Image processing is a method that is used for achieving an advanced image or manipulating an image in order to deduce some useful information from the image. It is a way of processing signals where the input is an image and the output is an image or characteristics/features related to the input image. Today, image processing is one of the fast-growing technologies. It is one of the main research fields of engineering and computer sciences.

There three main steps of image processing. These are:

- Importing the image with image collection tools;
- Analysis and use of the image;
- Reporting the image as an analysed structure.

What is Machine Learning?

Although Artificial Intelligence (AI) is a broad science that can imitate human skills, machine learning is a certain sub-field of AI that can teach a machine how to learn. Machine learning is a method of processing all data given at the background with various learning algorithms, solution methods and producing solutions for them.

In the next activity, we will collect images from the camera thanks to the artificial intelligence machine learning module that we will download as an extension on “mBlock 5”. These images will be processed in the background, which will be the machine learning process. After learning is completed, we will start coding with sprite blocks. After coding, it will give us how old we are, as an average value.

INSTALLING THE SOFTWARE AND THE INTERFACE

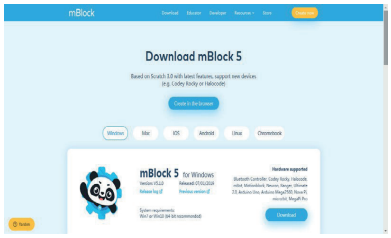


Figure 1: Downloading mBlock 5

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On the window opened, you need to click next until you finish installing. After completing the installation, the software will automatically run. You will see the window below, on the screen.

https://www.mblock.cc/en-us/download/

mBlock 5 helps students code easily with block commands. Moreover, it helps coding with makeblocks and electronic structures easily.

To run or download the software, click on https:// www.mblock.cc/en-us/download/. You can either run it onlin or download and install on your laptop (Windows, Linux, MACOS).

On mBlock 5 website, you can either click on "Create in the browser" and start coding online or you can click on "Download" to download mBlock5 on your computer. After downloading the setup file, you need to run it.

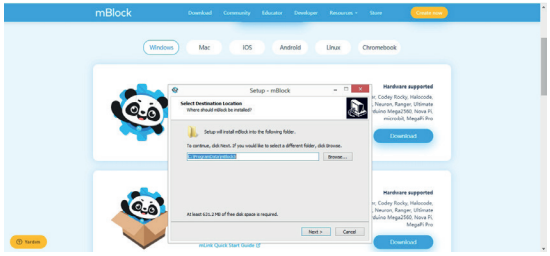

Figure 2: Installing mBlock 5

Figure 3: mBlock 5 Interface

On the upper left part of the screen you will see the "file" tab. You can start a new project, save the current project or open an existing project. Where the panda sprite is located is called the stage. When you finish coding, the image will show up on the stage. On the Devices tab down left, you can choose what you would like to code. Clicking on the" Sprites" tab, you can code the sprite on the stage. On the "Background" tab, you can change the background of the stage. On the code blocks section in the middle, you can drag motion, looks, sound, sensing, etc. codes and drop them into coding section. The empty space on the right is your coding area. You can add codes under other codes and arrange them.

ACTIVITY STEPS:

Now, you will run mBlock 5. Click on "Sprites" and then the extension.

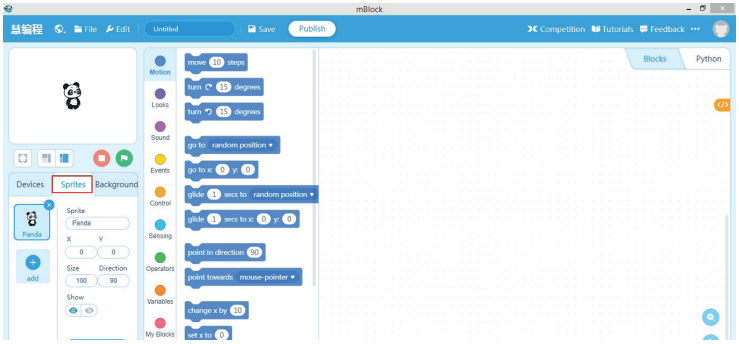

Figure 4: Sprites of mBlock 5 and Extension Structure

Here, you can add all the structures that you can add on your program as extensions later on.

After selecting Cognitive Services extension, you can click on add. This is how the extension is added on your program

Figure 5: Selecting Cognitive Services on mBlock 5 Extensions

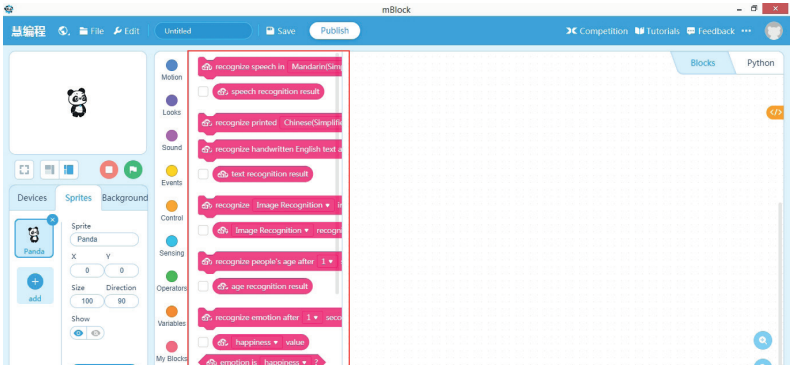

Figure 6: mBlock 5 Cognitive Services Code Block

This is how you add the menu to add codes that will provide machine learning and produce output by processing the image in the background. What you need to do now is to take screenshots by using the codes and create the final value.

First, you need to create the code structure.

PSEUDO CODE STRUCTURE:

- The sprite turns on the camera and takes the image.
- It processes the image in the background.
- Then, it predicts how old you are and prints it on the screen.

CODE STRUCTURE:

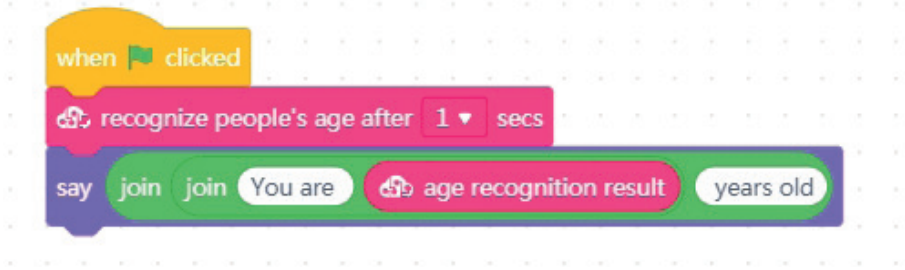

Figure 7: Age Prediction on the Image Code Blocks:

SAMPLE SCREENSHOT

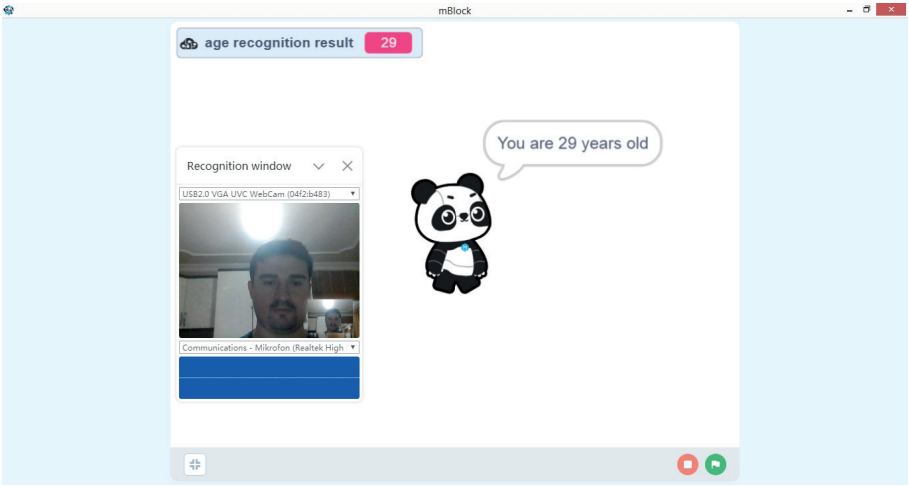

Figure 8: Sample Screenshot of mBlock 5 Artificial Intelligence Cognitive Screen

What Have We Learned?

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NOW, IT'S YOUR TURN!

Now, you can create a program that plays music when the displayed age is true and re-predicts the age if it is not true.

ACTIVITY

ACTIVITY NAME	ACTIVITY DURATION	ACTIVITY MODULE
HOW DO YOU LOOK TODAY?	***2 HOURS***	***ARTIFICIAL INTELLIGENCE EDUCATION***

ACTIVITY OUTCOMES

- Recognizing the concept of artificial intelligence.
- Knowing artificial intelligence practices and current structures.
- Listing the terms related to artificial intelligence.
- Knowing the definition of image processing and learning about the background operating logic.
- Noticing that certain points on the image have different meanings.
- Knowing that the mimics on the image are produced with similar indicators for everyone.
- Searching for the impact of the mood on the image.
- Noticing the structures for comparing images and their impacts on the result.
- Knowing how to run mBlock 5.
- Recognizing mBlock 5 interface.
- Noticing that mBlock 5 could be developed either on web media or downloadable structures.
- Knowing and using the code blocks on mBlock 5.
- Knowing how to install extensions on mBlock 5.
- Noticing the collaboration between mBlock 5 and artificial intelligence.
- Learning how to run the codes developed on mBlock 5 and display them on the stage.

INFO NOTE:

The human face is the structure which reflects the moods such as being happy, sad, angry, hesitant, etc. in the most significant way. Since these structures are similar for all humans, it is easy to compare the images that are taken by the camera, in the background. There could be differences due to the age, gender and weight of people. However, mimics such as opening the mouth or closing the eyes while smiling determine the mood. There are multiple algorithms to determine people's mood based on the facial expressions.

One of them is called Hyperspectral Imaging (HSI). It is used for identifying human moods according to saturation and absorption levels. HSI is used to remotely sense and distinguish blood chromophores in facial tissues and acquire an evaluation indicator (tissue oxygen saturation, StO2) using an optical absorption model. As a result of the analysis of facial muscles according to the reactions, emotions are detected.

It's seen that the domestic car now has a new feature. This feature is to determine the music genre based on the identified mood. Once you complete this activity, you will be able to produce outputs by identifying people's moods based on artificial intelligence.

METHOD

What Is Image Processing?

Image processing is a method that is used for achieving an advanced image or manipulating an image in order to deduce some useful information from the image. It is a way of processing signals where the input is an image and the output is an image or characteristics/features of the input image. Today, image processing is one of the fast-growing technologies. It is one of the main research fields of engineering and computer sciences.

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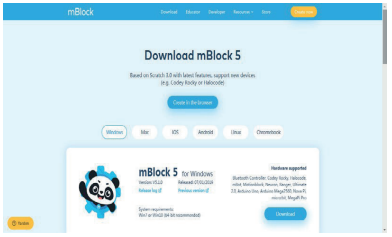

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https://www.mblock.cc/en-us/download/

mBlock 5 helps students code easily with block commands. Moreover, it helps coding with makeblocks and electronic structures easily.

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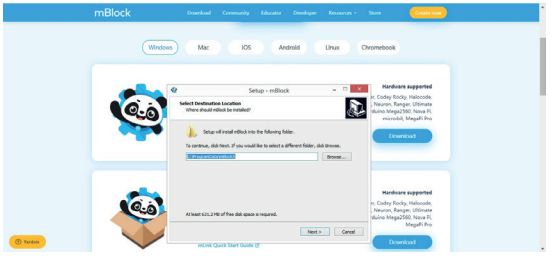


Figure 2: Installing mBlock 5

Figure 3: mBlock 5 Interface

On the upper left part of the screen you will see the "file" tab. You can start a new project, save the current project or open an existing project. Where the panda sprite is located is called the stage. When you finish coding, the image will show up on the stage. On the Devices tab down left, you can choose what you would like to code. Clicking on the" Sprites" tab, you can code the sprite on the stage. On the "Background" tab, you can change the background of the stage. On the code blocks section in the middle, you can drag motion, looks, sound, sensing, etc. codes and drop them into coding section. The empty space on the right is your coding area. You can add codes under other codes and arrange them.

ACTIVITY STEPS:

Now, you will run mBlock 5. Click on "Sprites" and then, extension.

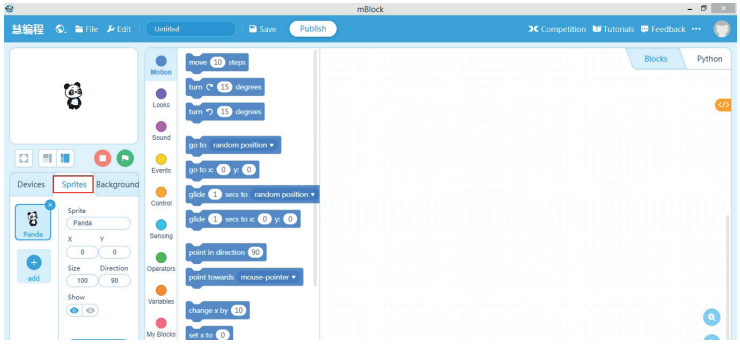


Figure 4: mBlock 5 Sprites and Extension Structure

Here, you can add all the structures that you can add on your program as extensions later on.

After selecting Teachable Machine extension, you need to click on add. This is how the extension is added on your program.

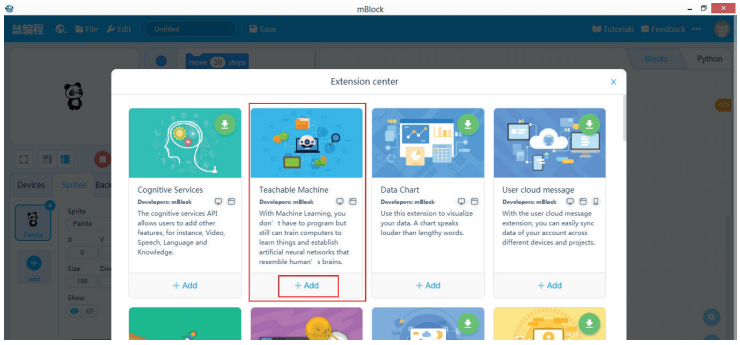


Figure 5: Selecting Teachable Machine on mBlock 5 Extensions

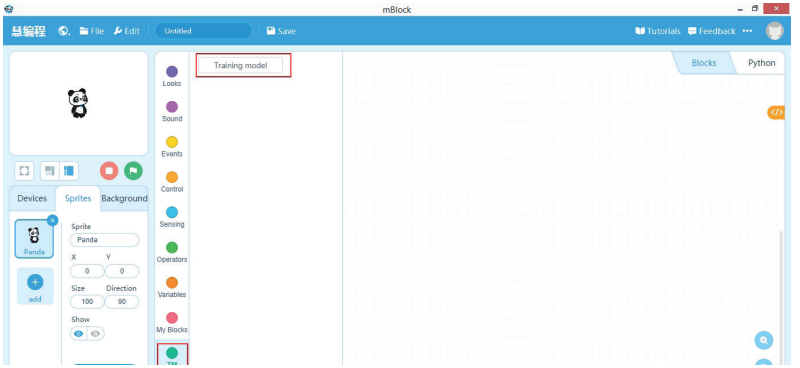


Figure 6: mBlock 5 Teachable Machine Code Blocks

Now, you've added the menu to add codes by means of machine learning. After completing machine learning with the "Training Model", you can see the codes here. Click on "Training Model". You will see the structure where you can complete Teachable Machine and Training Model.

On the left-hand side, you can see your webcam image. On the middle section for samples, there are structures where the input will be placed. If three models aren't enough for you, you can click on "Build a new model" and add another model. You can type the name of the sample on the top. The small square on the left side of the sample will show the preview of your webcam. You will display the image on the webcam and click on "Learn" so that the machine can learn your image. The most important thing here is that the more image we have, the more accurate the results will be. We will create three samples for the activity. These are: "happy", "sad" and "surprised". These expressions will be taught, and our mood will be used in the software.

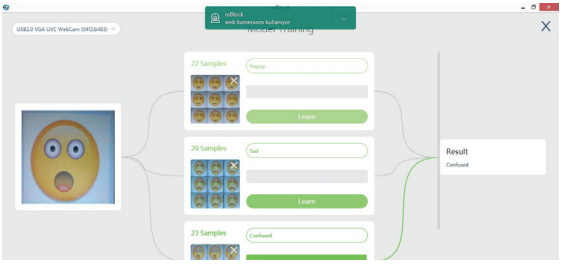


Figure 7: Training Page

Now, let's start the teaching process:

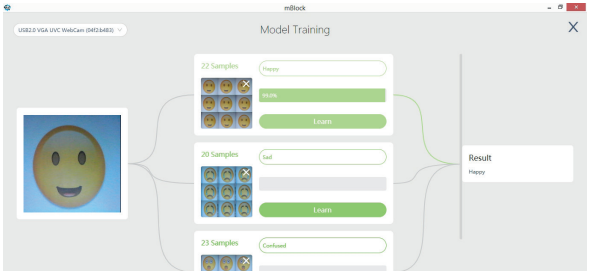


Figure 8: Emotion Training

Note: If you like, you can teach your images by displaying happy, sad and surprised expressions on your own face. Or you can use your own drawings, or the expressions given at the end of the activity.

This is how you add the menu to add codes that will provide machine learning and produce output by processing the image in the background. What you need to do now is to take screenshots by using the codes and create the final value.

First, you need to create the code structure.

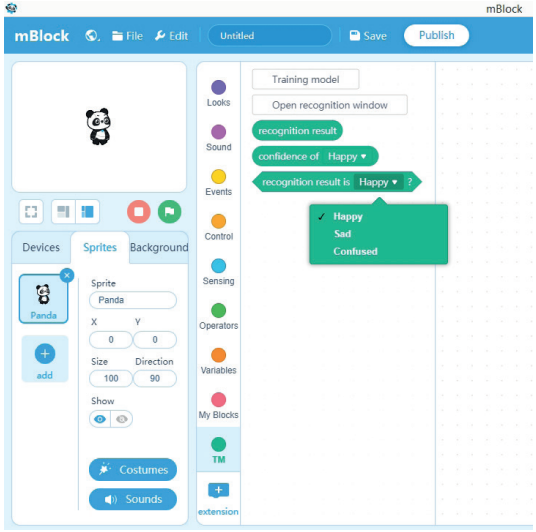


Figure 9: mBlock 5 Machine Learning Code Blocks

PSEUDO CODE STRUCTURE:

- The sprite turns on the camera and takes the image.
- It processes the image in the background.
- If your mood is happy, a Happy sprite will show up on the screen.
- If your mood is sad, a Sad sprite will show up on the screen.
- If your mood is surprised, a Surprised sprite will show up on the screen.

CODE STRUCTURE:

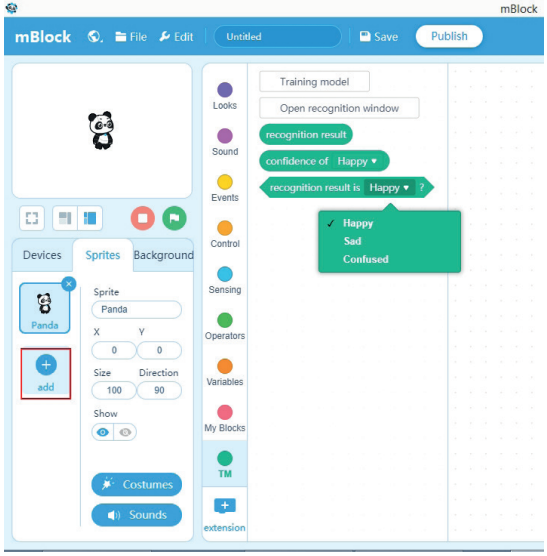


Figure 10: Selecting Sprites on mBlock 5

First, you need to select the sprites. For this, you will use the menu for selecting sprites.

Click on "Add" on the Sprites tab. You will see the category of sprites. You will need to add 'Baby', 'Baby5' and 'Baby6' sprites to your program.

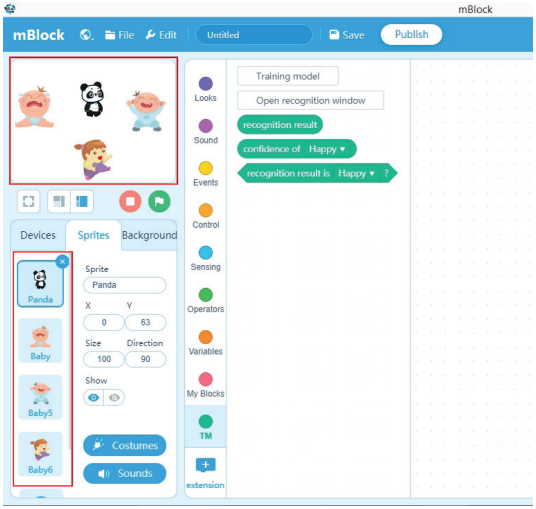


Figure 11: After Adding Sprites

After adding the sprites to your program, you need to add your codes in each sprite. You have 4 sprites. First, choose the Panda sprite. The codes inside the Panda sprite are shown below:

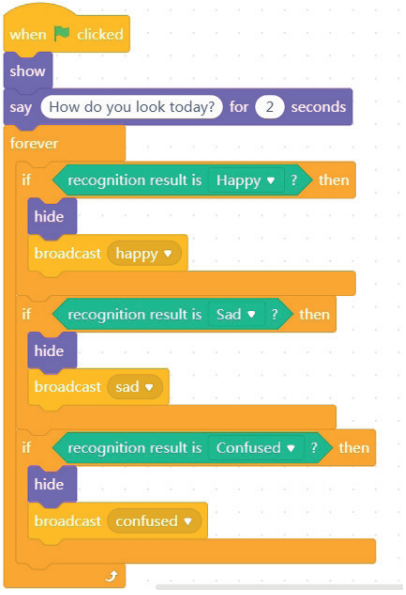
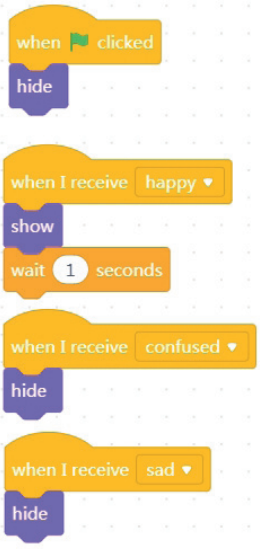


Figure 12: Code Blocks of Panda Sprite

sprite to show up and ask the user how he/she looks today. You need to add the codes into the program in order to check the mood regularly by checking the screen image continuously. You now have enabled the interaction with other sprites by informing them based on the results taken from Teachable Machine.

You need to select other sprites and add the code blocks inside them as well.

Figure 13: Code Blocks of Baby Sprite



You've enabled the Baby sprite to show up only when the mood is sad. You've placed t h e codes so that it is hidden during other moods.

Figure 14: Code Blocks of Baby5 Sprite

You've enabled Baby5 sprite to show up only when the mood is happy. You've placed the codes so that it is hidden during other moods.

Figure 15: Code Blocks of Baby6 Sprite

You've enabled Baby6 sprite to show up only when the mood is surprised. You've placed the codes so that it is hidden during other moods.

SAMPLE SCREENSHOT

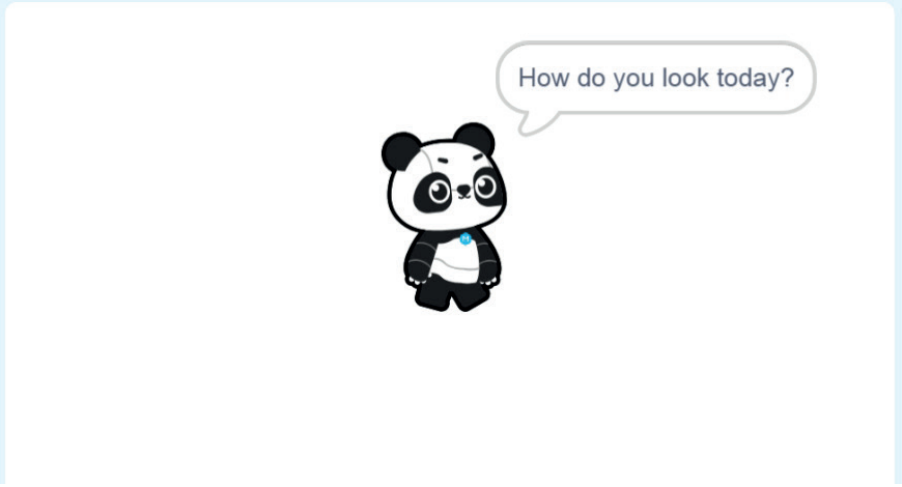


Figure 16: Screenshot of mBlock 5 Artificial Intelligence Teachable Machine 1

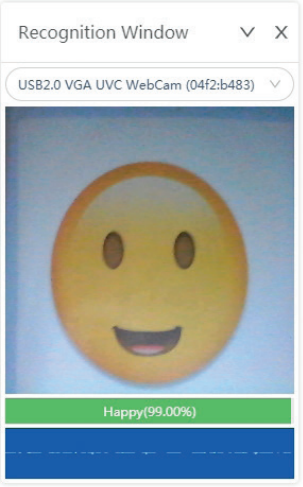


Figure 17: Screenshot of mBlock 5 Artificial Intelligence Teachable Machine 2

What Have We Learned?

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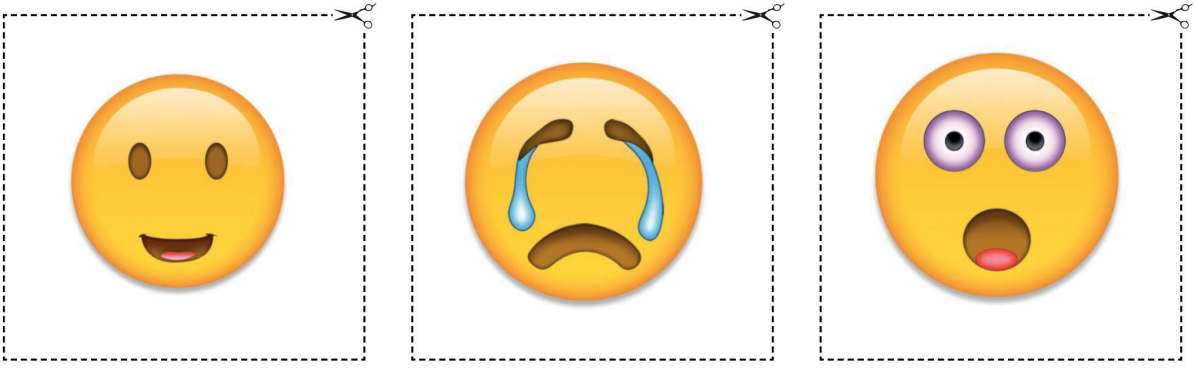
NOW, IT'S YOUR TURN!

Now you can create a program which will play music based on your mood by making use of the training of Teachable Machine and moods.

TIP: You can add sounds to your program by using the "Sounds" button under the Sprites tab.

ACTIVITY PAPERS



ACTIVITY

ACTIVITY NAME	ACTIVITY DURATION	ACTIVITY MODULE
MUSIC BOX	***2 HOURS***	***ARTIFICIAL INTELLIGENCE EDUCATION***

ACTIVITY OUTCOMES

- Recognizing the concept of artificial intelligence.
- Knowing artificial intelligence practices and current structures.
- Listing the terms related to artificial intelligence.
- Knowing the definition of image processing and learning about the background operating logic.
- Noticing that certain points on the image have different meanings.
- Discovering the positions of notes on the staff.
- Noticing the differences in the tones of notes.
- Realizing the importance of notes for making music.
- Noticing the structures for comparing images and their impacts on the result.
- Knowing how to run mBlock 5.
- Recognizing the mBlock 5 interface.
- Noticing that mBlock 5 could be developed either on web media or downloadable structures.
- Knowing and using the code blocks on mBlock 5.
- Knowing how to install extensions on mBlock 5.
- Noticing the collaboration between mBlock 5 and artificial intelligence.
- Learning how to run the codes developed on mBlock 5 and display them on the stage.

INFO NOTE:

The main structures of the music such as melody, timbre and rhythm create different meanings and emotions in the brain. The unique power of music in making use of nature, culture and mind is revealed as a result of the interaction between music and brain.

Notes are placed in an order to create a melody. Notes played one after another are perceived as a meaningful melody by brain and they affect our mood.

Sounds aren't only created by visible objects. It exists in the background and foreground of every creature in nature. There is always sound close to us or far from us. Silence doesn't exist. There are just different background noises. While some sounds could be heard by us, there are also other sounds that we can't hear.

In fact, listening to the silence or the silent sounds of nature has very beneficial effect on health which is a type of sensual hunger.

In this activity, you will create the structure of a piano or keyboard. In these structures which is generally called keyboards, different notes are heard at different timbres. This effect is called rhythm in the broad sense. Rhythm has a unique language and coordinates the movements and emotions of humans such as the actions and emotions of dancers. However, rhythm has deeper features such as effecting the perception and thought in brain. Thanks to the music that we will create in this activity, we will be able to experience something very different.

METHOD

What Is Image Processing?

Image processing is a method that is used for achieving an advanced image or manipulating an image in order to deduce some useful information from the image. It is a way of processing signals where the input is an image and the output is an image or characteristics/features of the input image. Today, image processing is one of the fast-growing technologies. It is one of the main research fields of engineering and computer sciences.

There are three steps of image processing. These are:

- Importing the image with image collection tools;
- Analysis and use of the image;
- Reporting the image as an analysed structure.

What is Machine Learning?

Although Artificial Intelligence (AI) is a broad science that can imitate human skills, machine learning is a certain sub-field of AI that can teach a machine how to learn. Machine learning is a method of processing data given in the background with various learning algorithms, solution methods and producing solutions for them.

In the next activity, we will collect images from the camera thanks to the artificial intelligence machine learning module that we will download as an extension on "mBlock 5". These images will be processed in the background, which will be the machine learning process. After learning is completed, we will start coding with sprite blocks. After coding, it will give us how old we are, as an average value.

INSTALLING THE SOFTWARE AND THE INTERFACE

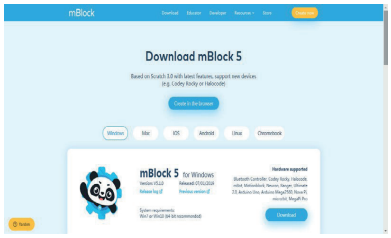


Figure 1: Downloading mBlock 5

Figure 1: Downloading mBlock 5

On the window opened, you need to click next until you finish installing. After completing the installation, the software will automatically run. You will see the window below, on the screen.

https://www.mblock.cc/en-us/download/

mBlock 5 helps students code easily with block commands. Moreover, it helps coding with makeblocks and electronic structures easily.

To run or download the software, click on https:// www.mblock.cc/en-us/download/. You can either run it online or download and install on your laptop (Windows, Linux, MACOS).

On mBlock 5 website, you can either click on "Create in the browser" and start coding online or you can click on "Download" to download mBlock5 on your computer. After downloading the setup file, you need to run it.

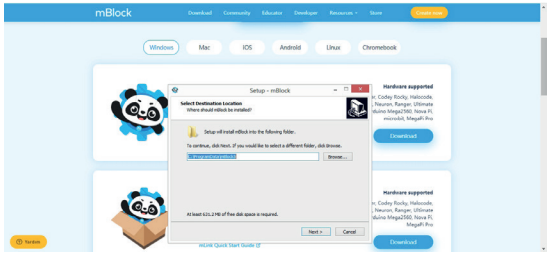


Figure 2: Installing mBlock 5

Figure 3: mBlock 5 Interface

On the upper left part of the screen you will see the "file" tab. You can start a new project, save the current project or open an existing project. Where the panda sprite is located is called the stage. When you finish coding, the image will show up on the stage. On the Devices tab down left, you can choose what you would like to code. Clicking on the" Sprites" tab, you can code the sprite on the stage. On the "Background" tab, you can change the background of the stage. On the code blocks section in the middle, you can drag motion, looks, sound, sensing, etc. codes and drop them into coding section. The empty space on the right is your coding area. You can add codes under other codes and arrange them.

ACTIVITY STEPS:

Now, you will run mBlock 5. Click on "Sprites" and then, extension.

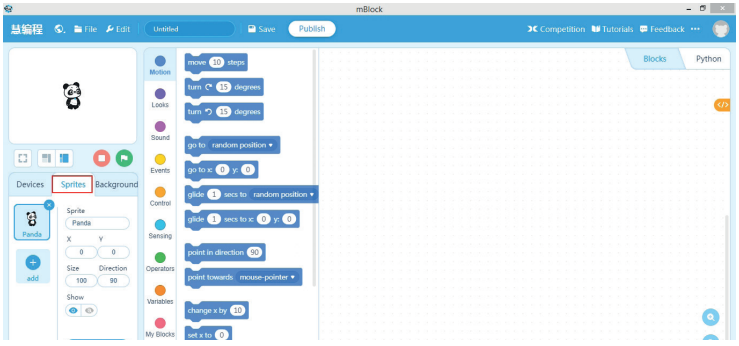


Figure 4: mBlock 5 Sprites and Extension Structure

Here, you can add all the structures that you can add on your program as extensions later on.

After selecting Teachable Machine extension, click on add. This is how the extension is added on

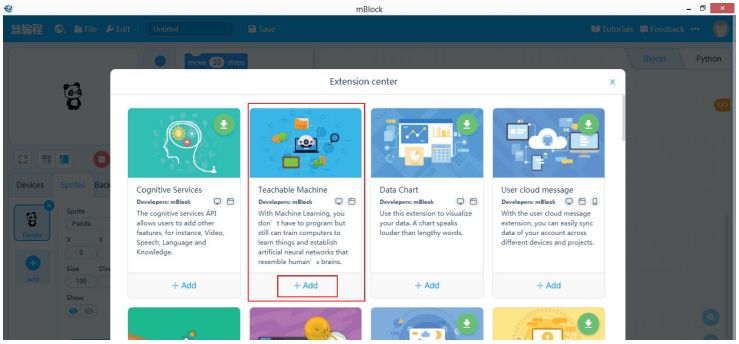


Figure 5: Selecting Teachable Machine on mBlock 5 Extensions

Since you will use notes and musical expressions in your program, you need to add this extension as well. You can add the extension as explained below.

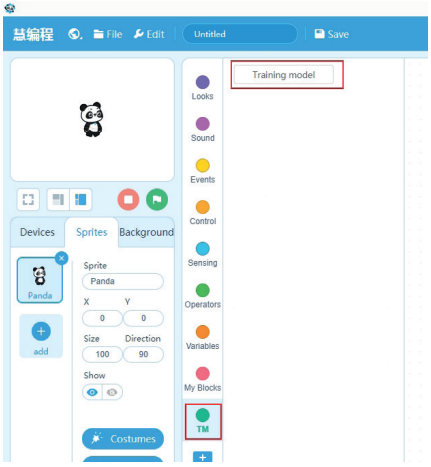


Figure 6: mBlock 5 Teachable Machine Code Blocks

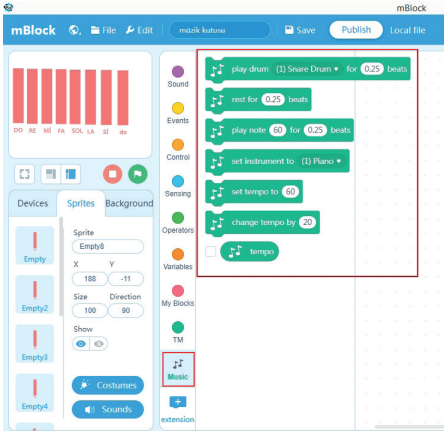


Figure 8: mBlock 5 Code Blocks for Adding Music Extension

Now, you've added the menu to add codes by machine learning and the menu to create music. After completing machine learning on "Training Model", you can see the codes here.

Click on "Training Model". You will see the structure where we complete machine learning and related training.

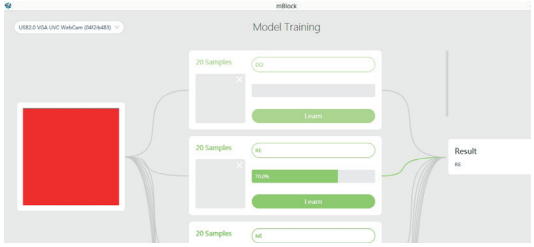


Figure 9: Training Page

On the left-hand side, you can see your webcam image. On the middle section for samples, there are structures where the input will be placed. If three models aren't enough for you, you can click on "Build a new model" and add another model. You can type the name of the sample on the top line. The small square on the left side of the sample will show the preview of your webcam. You will display the image on the webcam and click on "Learn" so that the machine can learn your image. The most important thing here is that the more image you have, the more accurate the results will be. You will create 8 samples for the activity.

These are "DO","RE", "MI", "FA", "SOL", "LA", "SI" notes. After teaching the statements, the program will be able to create music. Now, let's start the training:

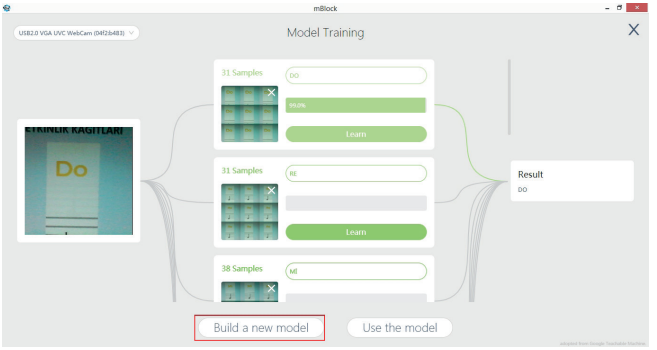


Figure 10: Notes Training - 1

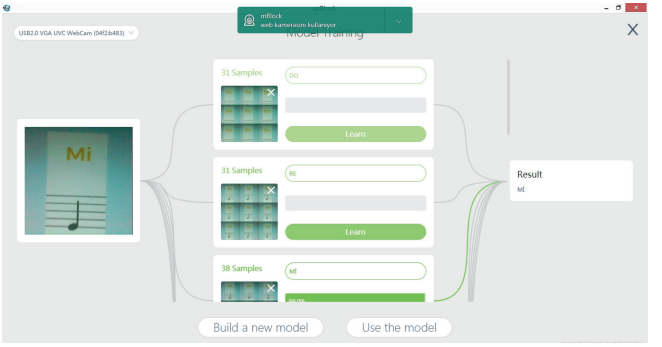


Figure 11: Notes Training - 2

NOTE: If you want, you can teach notes with musical statements.

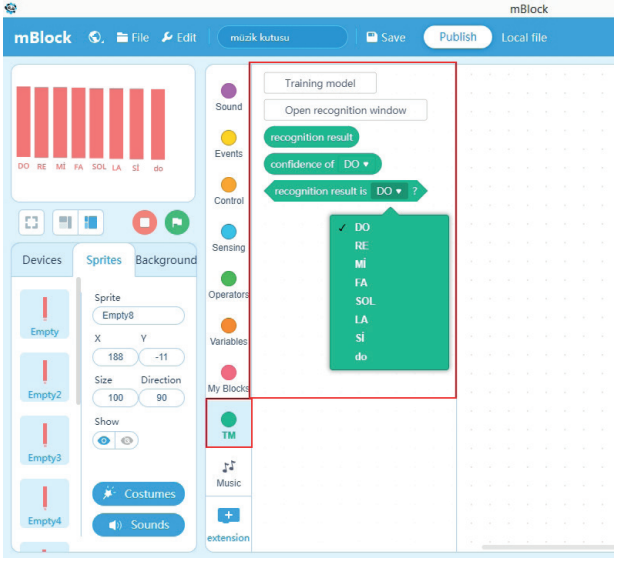


Figure 12: mBlock 5 Teachable Machine Code Blocks

Now, you've added the menu to add the codes which will complete the machine learning and process our image to produce outputs. What you need to do now is to take screenshots by using the codes and create the final value.

First, you need to create the code structure.

PSEUDO CODE STRUCTURE:

- The sprite turns on the camera and takes the image.
- It processes the image in the background.
- If there is “DO” on the screen, Do will be played for 0.25 beats.
- If there is “RE” on the screen, Re will be played for 0.25 beats.
- If there is “MI on the screen, Mi will be played for 0.25 beats.
- If there is “FA” on the screen, Fa will be played for 0.25 beats.
- If there is “SOL” on the screen, Sol will be played for 0.25 beats.
- If there is “LA” on the screen, La will be played for 0.25 beats.
- If there is “SI” on the screen, Si will be played for 0.25 beats.
- If there is “do” on the screen, do will be played for 0.25 beats.

First, you need to draw the ears in the shape of keyboard. For this, you need to use the Costumes menu. You need to start by removing panda sprite from the screen. Then, you need to add your own drawings. For this, you need to draw 8 identical notes and type what note it is under them.

CODE STRUCTURE:

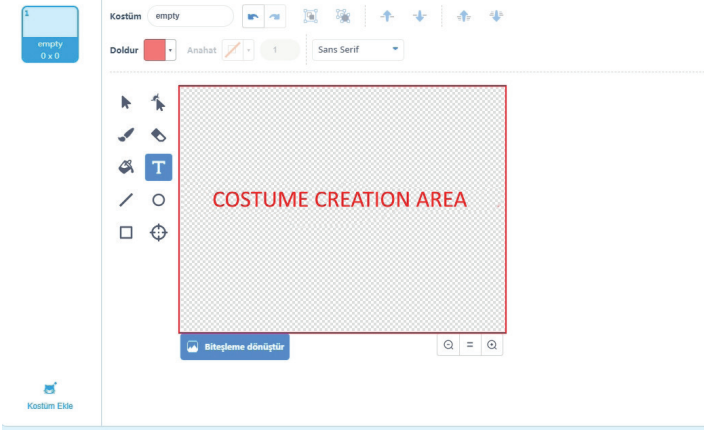


Figure 13: Costumes Menu

On the drawing are, you need to create rectangles similar to note structures and type what note it is, under the drawing. Therefore, you will be able to display your sprite in a clear manner.

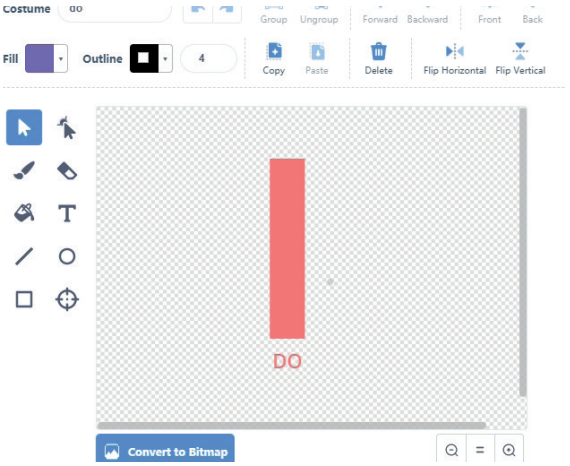


Figure 14: After Drawing A Sprite

Figure 15: mBlock 5 Sprites on the Stage

After drawing each sprite, you need to add it. Your design will look as shown below.

After adding sprites to your program, you can continue with adding your codes in each sprite. You now have 8 sprites. You need to add codes to each note, starting with "DO". Code blocks are given below:

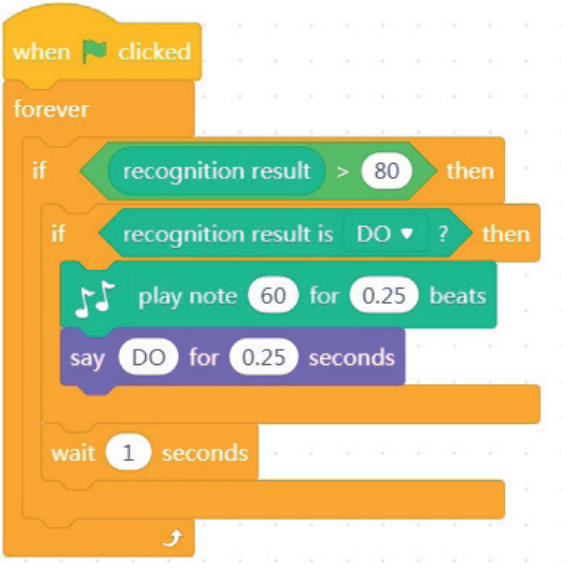


Figure 16: "DO" Sprite Code Blocks

Your sprite will regularly check the result of recognition on the machine learning. If it is more than 80 and "DO" is shown on the camera then "DO" will be played and it will show "DO" for 0.25 seconds. You have added this structure to all notes and created your program.

Now, you need to select other sprites and add code blocks in them.

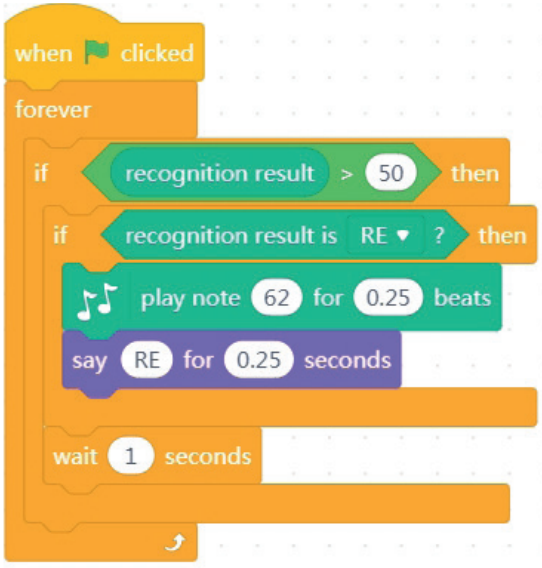


Figure 15: mBlock 5 Sprites on the Stage

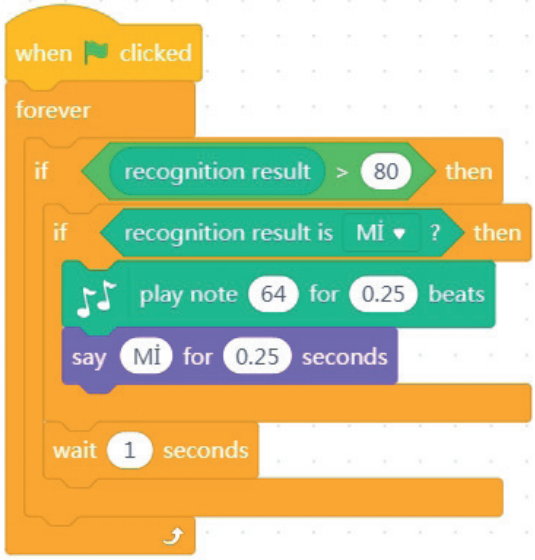


Figure 15: mBlock 5 Sprites on the Stage

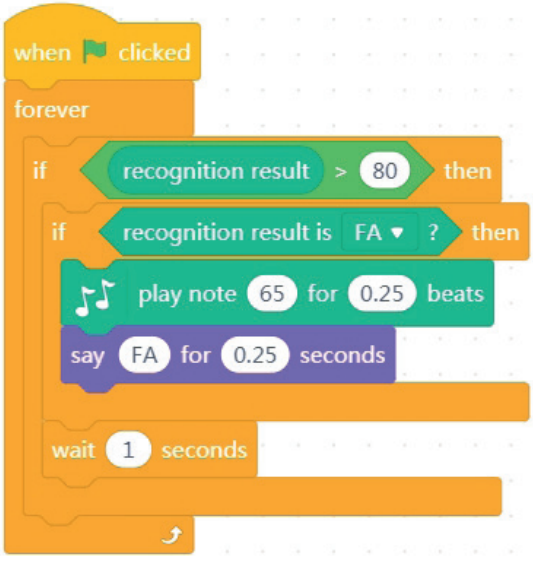


Figure 15: mBlock 5 Sprites on the Stage

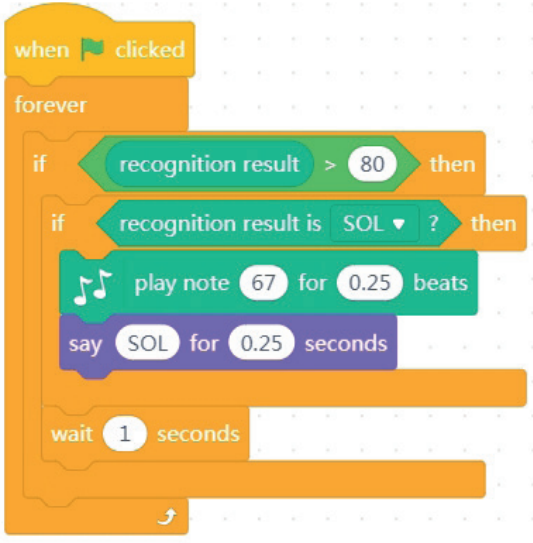


Figure 15: mBlock 5 Sprites on the Stage

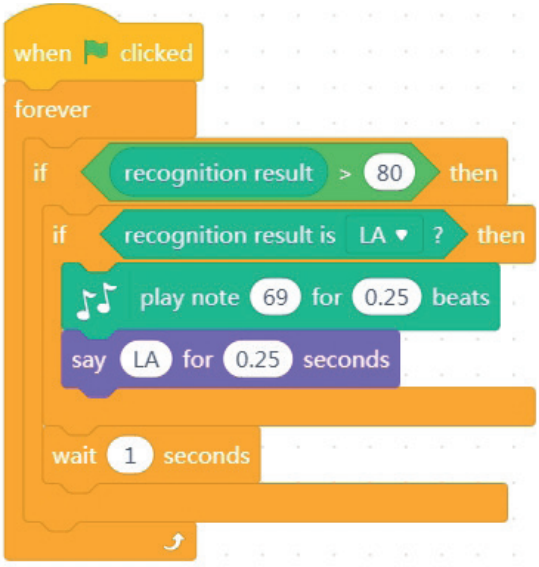


Figure 21: Code Blocks for "LA" Sprite

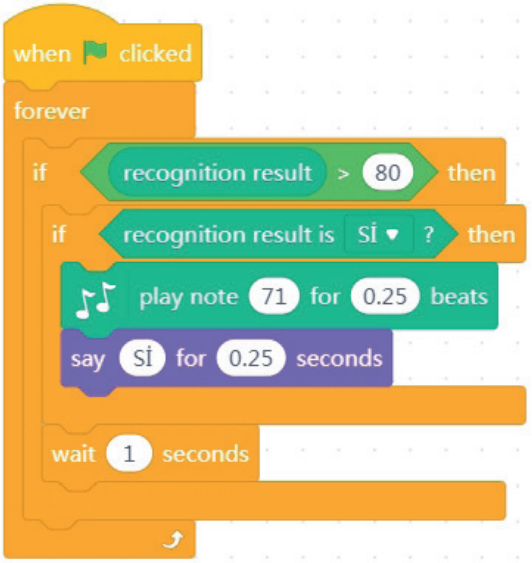


Figure 22: Code Blocks for "SI" Sprite

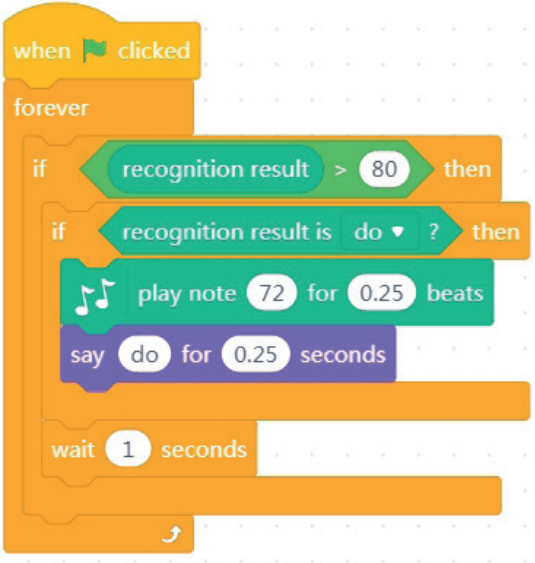


Figure 23: Code Blocks for "do" Sprite

After adding code blocks to each sprite, you need to click on the green flag and run your program. Once your program runs, it will take images from the screen. You need to keep your papers ready and show them. Here is a fun program, let's have fun!

SAMPLE SCREENSHOT

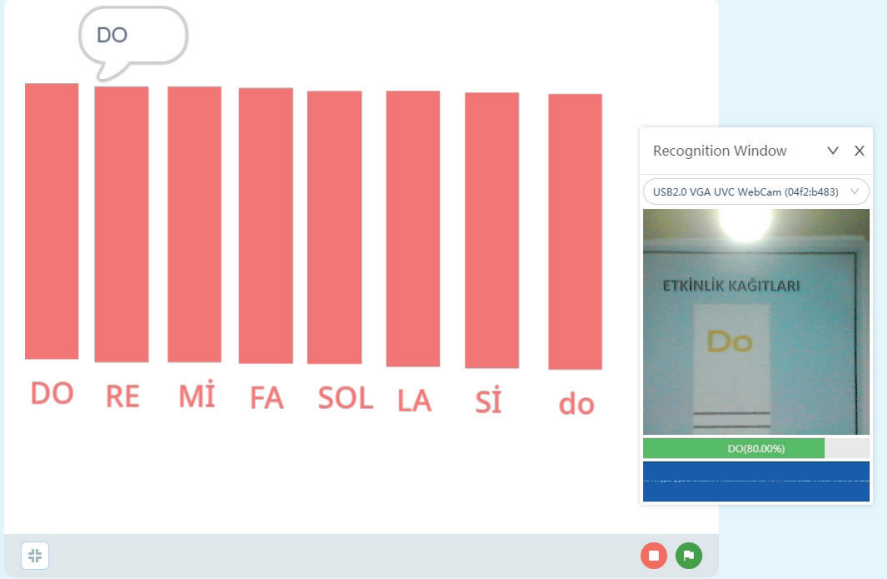


Figure 24: mBlock 5 Artificial Intelligence Teachable Machine Screenshot

What Have We Learned?

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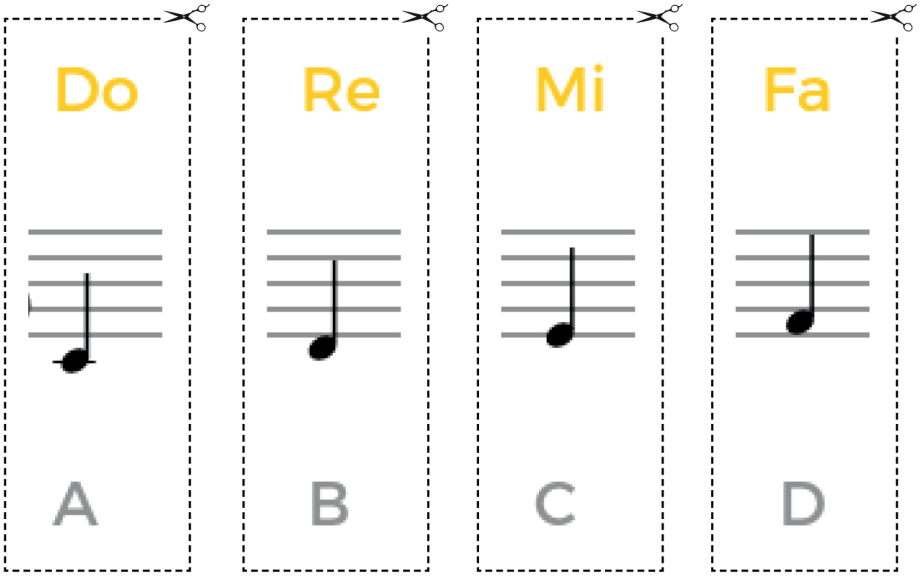
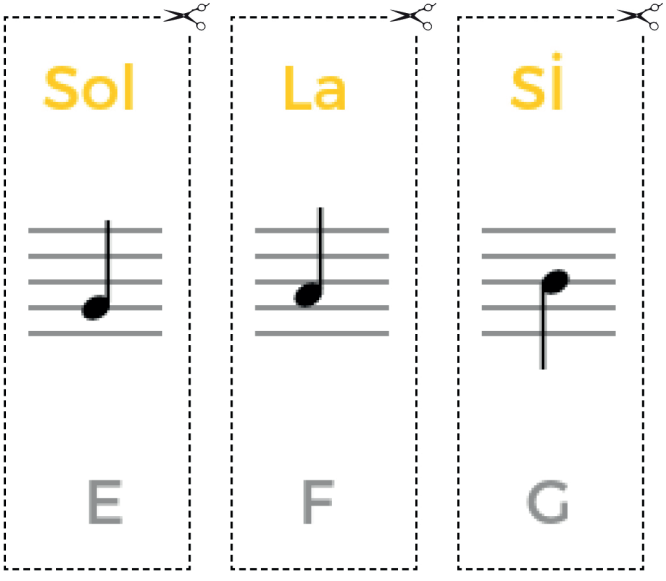
NOW, IT'S YOUR TURN!

You need to arrange your sprites in a way that they will change colour according to the note played.

ACTIVITY PAPERS





ACTIVITY

ACTIVITY NAME	ACTIVITY DURATION	ACTIVITY MODULE
ESCAPE FROM THE LABYRINTH	***2 HOURS***	***ARTIFICIAL INTELLIGENCE EDUCATION***

ACTIVITY OUTCOMES

- Recognizing the concept of artificial intelligence.
- Knowing artificial intelligence practices and current structures.
- Listing the terms related to artificial intelligence.
- Knowing the definition of image processing and learning about the background operating logic.
- Noticing that certain points on the image have different meanings.
- Noticing game structures.
- Learning the effects of direction keys in gamification and game coding.
- Enabling the visual integration of direction statements into background machine learning.
- Knowing how to work solution oriented.
- Noticing the structures for comparing images and their impacts on the result.
- Knowing how to run mBlock 5.
- Recognizing mBlock 5 interface.
- Noticing that mBlock 5 could be developed either on web media or downloadable structures.
- Knowing and using the code blocks on mBlock 5.
- Knowing how to install extensions on mBlock 5.
- Noticing the collaboration between mBlock 5 and artificial intelligence.
- Learning how to run the codes developed on mBlock 5 and display them on the stage.

INFO NOTE:

Dating back to ancient times, the labyrinth is considered as a way of inspiration and wisdom, that is used for getting rid of stress or meditating. It is an activity used in all countries and many areas such as competitions. According to researches, labyrinths enable left lobe of the brain to work actively. Labyrinths could be solved starting from the end or start; from the inside or outside part. Dead-ends are obstacles; however, the aim is to reach to the end without going through dead-ends.

The labyrinth which was first created for gyroscopes, are based on stabilisation and fixation structures. Solving labyrinths have the following effects on people:

- Being peaceful and experiencing peace
- Restoring balance (Logic of Gyroscope)
- Increasing perspective and insight
- Bettering physical and emotional well being
- Experiencing happiness and disappointment
- Decreasing sadness, improved physical and emotional well being
- Building creativity and awareness

It will create a labyrinth structure on our feelings. You will try to reach the target thanks to the directions in the labyrinth. You will motivate yourself, enable the left lobe of the brain work actively and keep fit thanks to this structure created as a game.

METHOD

What Is Image Processing?

Image processing is a method that is used for achieving an advanced image or manipulating an image in order to deduce some useful information. It is a way of processing signals where the input is an image and the output is an image or characteristics/features of the input image. Today, image processing is one of the fast-growing technologies. It is one of the main research fields of engineering and computer sciences.

There are three main steps of image processing. These are:

- Importing the image with image collection tools.
- Analysis and use of the image;
- Reporting the image as an analysed structure.
- Reducing stress

What is Machine Learning?

Although Artificial Intelligence (AI) is a broad science that can imitate human skills, machine learning is a certain sub-field of AI that can teach a machine how to learn. Machine learning is a method of processing data given in the background with various learning algorithms, solution methods and producing solutions for them.

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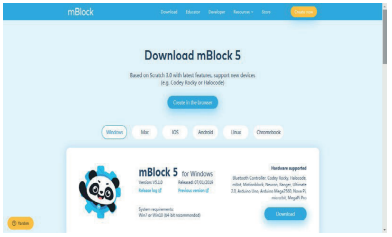

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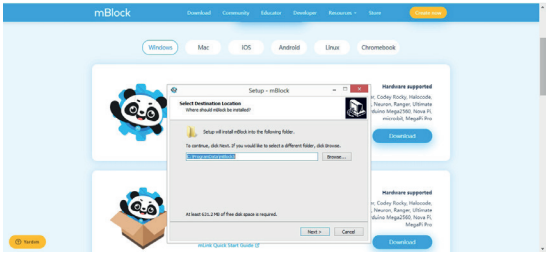

Figure 2: Installing mBlock 5

Figure 3: mBlock 5 Interface

On the upper left part of the screen you will see the "file" tab. You can start a new project, save the current project or open an existing project. Where the panda sprite is located is called the stage. When you finish coding, the image will show up on the stage. On the Devices tab on the left, you can choose what you would like to code. Clicking on the "Sprites" tab, you can code for the sprite on the stage. On the "Background" tab, you can change the background of the stage. On the code blocks section in the middle, you can drag motion, looks, sound, sensing, etc. codes and drop them into coding section. The empty space on the right is your coding area. You can add codes under other codes and arrange them.

ACTIVITY STEPS:

Now, you will run mBlock 5. Click on "Sprites" and then, extension.

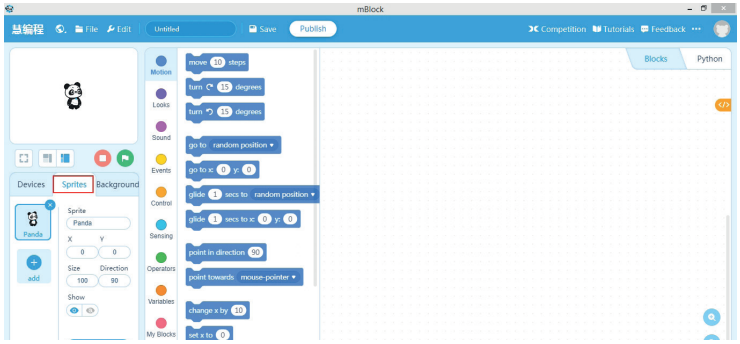

Figure 4: mBlock 5 Sprites and Extension Structure

Here, you can add all the structures that you can add on your program as extensions later on.

After selecting Teachable Machine extension, click on add. This is how the extension is added on your program.

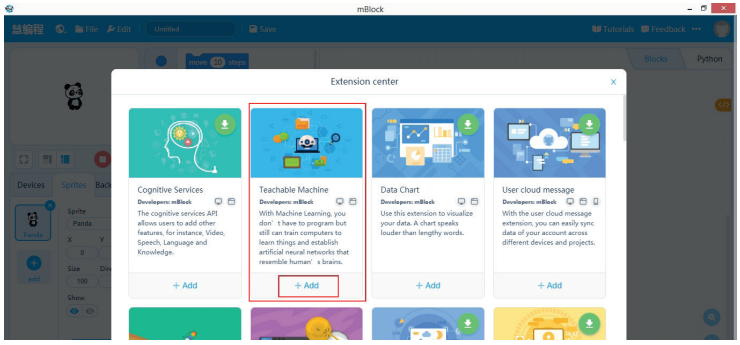

Figure 5: Selecting Teachable Machine on mBlock 5 Extensions

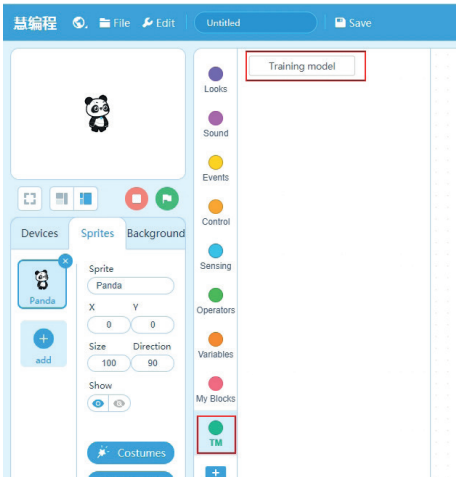

Figure 6: mBlock 5 Teachable Machine Code Block

Now, you've added Teachable Machine which is the menu to add codes. After completing machine learning on "Training Model", you can see the codes here. Click on "Training Model". You will see the structure where you will complete machine learning and Training Model.

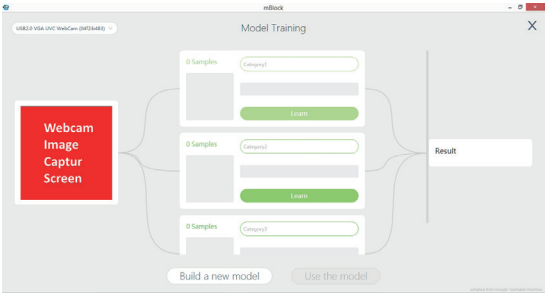

Figure 7: Training Page

On the left-hand side, you can see your webcam image. On the middle section for samples, there are structures where the input will be placed. If three models aren't enough for you, you can click on "Build a new model" and add another model. You can type the name of the sample on the top line. The small square on the left side of the sample will show the preview of your webcam.

You will display the image on the webcam and click on "Learn" so that the machine can learn our image. The most important thing here is that the more image you have, the more accurate results will be. You will create 4 samples for the activity. They will include the directions. They are 'LEFT', 'RIGHT', 'UP' and 'DOWN'. After teaching the statements, the program will be able to use the directions to help the sprite reach the target.

Let's start the training.

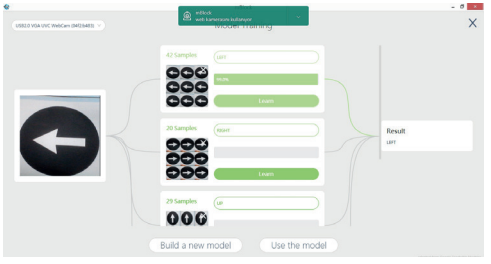

Figure 8: Directions Training - 1

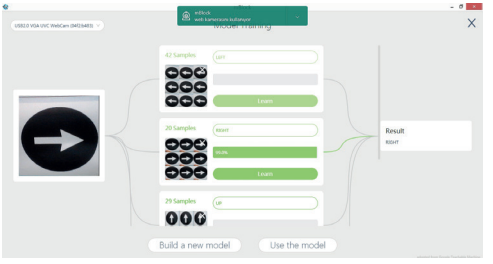

Figure 8: Directions Training - 2

NOTE: The important point here is to be aware of the direction you hold the paper. If you want, you can teach directions by writing.

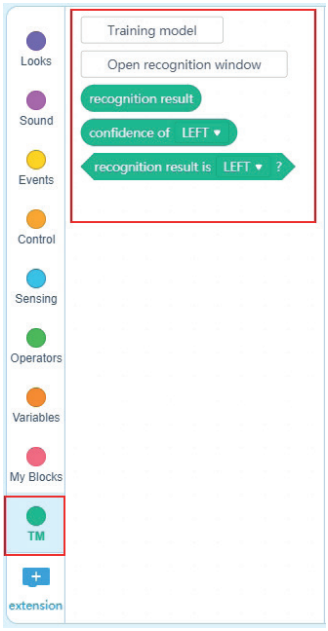

Figure 10: mBlock 5 Teachable Machine Code Blocks

This is how you add the menu to add codes that will provide machine learning and produce output by processing the image in the background. What you need to do now is to take screenshots by using the codes and create the final value.

First, you need to create the code structure:

PSEUDO CODE STRUCTURE:

- The sprite turns on the camera and takes the image.
- It processes the image in the background.
- If Sprite Hasn't Reached the Target
    - If "LEFT" is selected, the sprite will take a step to the left
    - If "RIGHT" is selected, the sprite will take a step to the right
    - If "UP" is selected, the sprite will take a step up
    - If "DOWN" is selected, the sprite will take a step down
- If Sprite Has Reached the Target:
    - Congratulations, You Win!
- If Sprite Has Touched the Lines:
    - Go Back to the Starting Point!

CODE STRUCTURE:

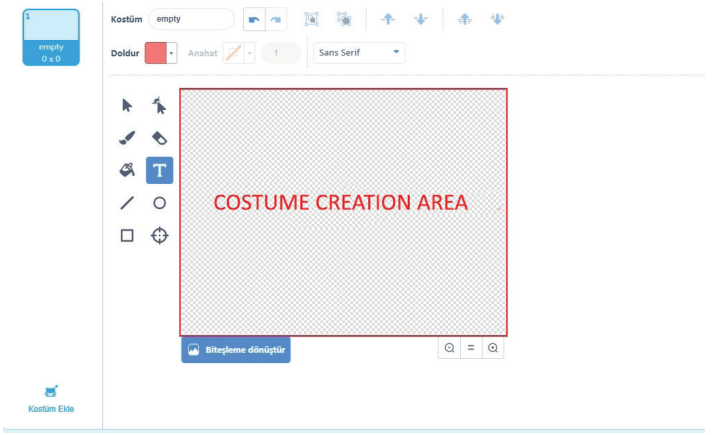

Figure 11: Costumes Menu

First, you need to create the background and then draw the background. For this, you need to click on "Background" tab. You will use "Costumes" menu. Here, you need to use the Line tool to create the labyrinth.

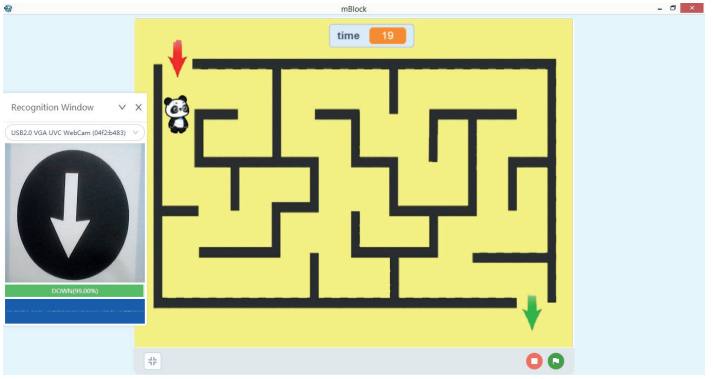

Figure 12: After Drawing the Stage

After creating the background on the drawing area, you will see that it's been added to the background of the stage. Drawing evenly will make it easy to reach the target in the game.

Now, it's time to edit the sprite. If you like, you can change your sprite with another one. You will continue with the panda sprite for this activity. You need to make your sprite smaller so that it could move easily around the lines.

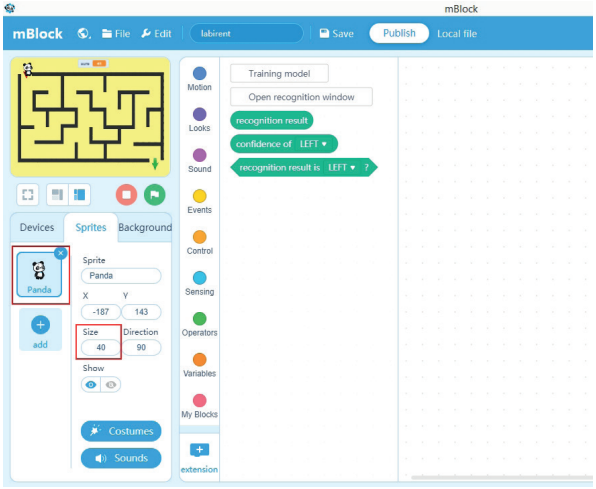

Figure 13: Changing the Size of The Sprite

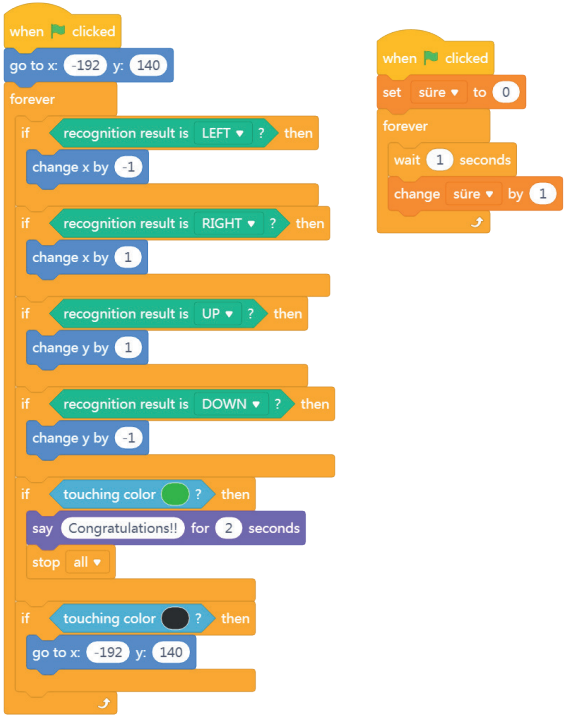

Figure 14: Code Blocks of Panda Sprite

The starting point for the sprite should be the entrance to the labyrinth. Black lines are the obstacles that should be avoided. Green exit is the target to be reached. If you like, you can add a sprite or an object to this area. You need to help the sprite reach the target by moving it to the direction shown. It will be fun to play the game where time is important too.

After changing the size of the sprite, you need to place it on the starting point. Then it means that you've completed your design. Now, you can start coding. Code blocks are given below:

SAMPLE SCREENSHOT

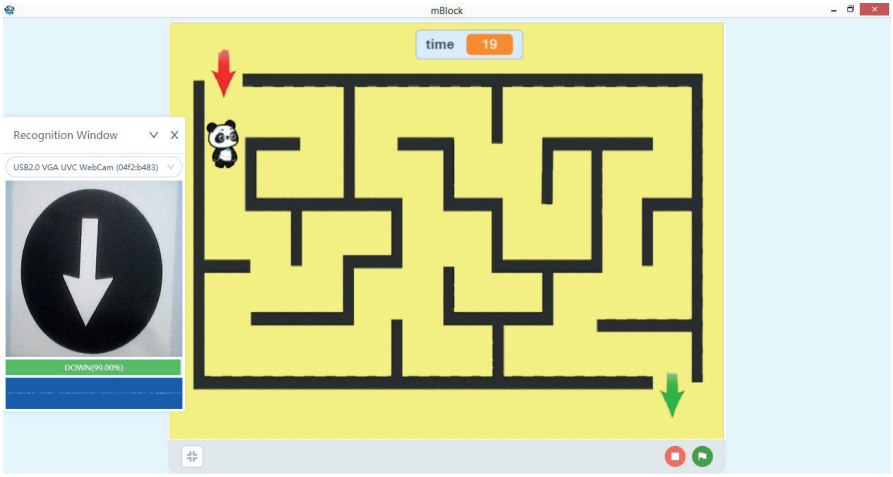

Figure 15: mBlock 5 Artificial Intelligence Teachable Machine Screenshot

What Have We Learned?

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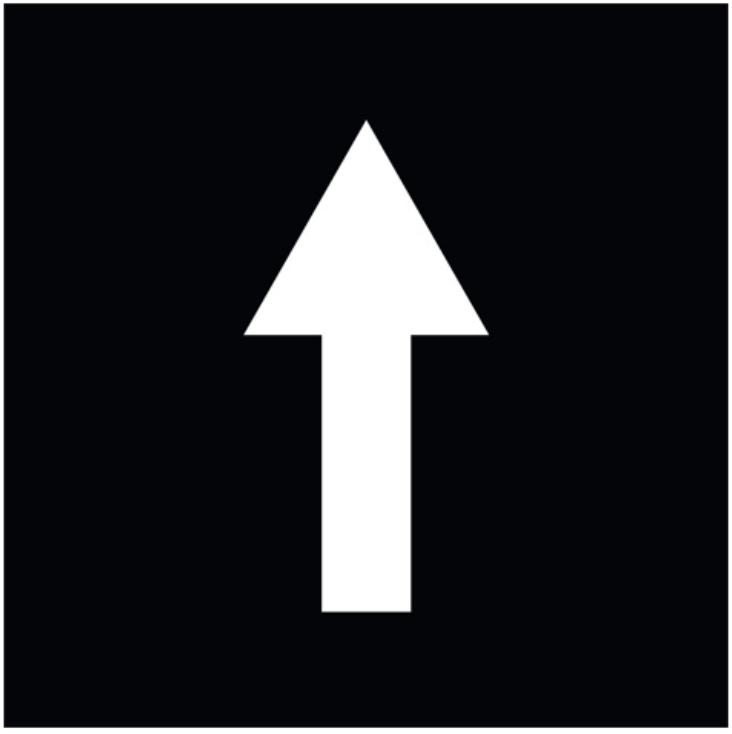
NOW, IT'S YOUR TURN!

You need to create a circle track for your sprites and try to block the track with various obstacles.

ACTIVITY PAPERS



ACTIVITY

ACTIVITY NAME	ACTIVITY DURATION	ACTIVITY MODULE
GUESS WHAT I AM	***2 HOURS***	***ARTIFICIAL INTELLIGENCE EDUCATION***

ACTIVITY OUTCOMES

- Recognizing the concept of artificial intelligence.
- Knowing artificial intelligence practices and current structures.
- Listing the terms related to artificial intelligence.
- Knowing the definition of image processing and learning about the background operating logic.
- Identifying geometrical figures.
- Enabling distinguishing geometrical figures by machine learning.
- Knowing how to run mBlock 5.
- Recognizing mBlock 5 interface.
- Noticing that mBlock 5 could be developed either on web media or downloadable structures.
- Knowing and using the code blocks on mBlock 5.
- Knowing how to install extensions on mBlock 5.
- Noticing the collaboration between mBlock 5 and artificial intelligence.
- Learning how to run the codes developed on mBlock 5 and display them on the stage.

INFO NOTE:

Geometrical figures are almost everywhere. Wherever you look, whatever you see is made with basic geometry. For example, a truss bridge is made from rectangles, squares and triangles. A snowman is made from circles and its nose is made with a carrot in the shape of a cone.

These figures of both two and three dimensions are incredibly important in the context of mathematics as well.

Using examples of geometrical figures teaches your students their prevalence so they can recognize them more readily.

Examples of Geometrical Figures

Below you can find a list of geometrical figures and where you can use them in your daily life:

- Circle: It is a shape whose all points lie at an equal distance from a centre point. For example, a pizza, a biscuit, a bicycle tyre

• Square: It is a shape of four equal sides and four right angles. For example, a garage, floor tiles

• Triangle: It is a shape with three straight sides. For example, a slice of cheese, a sandwich cut diagonally

• Rectangle: It is a shape with four right angles and four sides, with opposite sides of equal length. For example, apartments, a hopscotch board, a book cover, the majority of phones.

• Pentagon: It is a shape with five straight and typically equal sides. For example, Pentagon, designs on footballs.

• Hexagon: It is a shape with six straight and typically equal sides. For example, ice crystals, some snowflakes, beehive cells.

• Heptagon: It is a shape with seven straight and typically equal sides. For example, lids of some biscuit boxes, some pill boxes.

• Octagon: It is a shape with eight straight and typically equal sides. For example, stop signs, some umbrellas, the UFC ring.

• Nonagon: It is a shape with nine straight and typically equal sides. For example, lids of some nut boxes.

• Decagon: It is a shape with ten straight and typically equal sides. For example, some collectible coins.

• Trapezoid: It is a shape with 4 straight sides that has a pair of opposite sides parallel. For example, some bridge trusses, a pyramid that is cut from the top, a popcorn box.

• Parallelogram: It is a shape with four sides where only the opposite sides are equal. For example, a typical eraser, some wallets, structure of some bridges.

• Rhombus: It is a quadrilateral with all four sides equal in length. For example: some kites, certain crystals

• Star: It is an equilateral equiangular polygon. For example: The Star of David, star stickers, star-shaped cutting appliances.

• Crescent: It is a thin, curved shape that's thicker in the middle and tapers to thin points at each end. For example, crescent rolls, the moon at some stages, the shape in the flags of Pakistan and Turkey.

• Oval: It is a shape that is like a circle but is wider in one direction than the other. For example, an egg, hotdog bread, running tracks.

• Semicircle: It is a half of a circle formed by cutting a whole circle along a diameter line. For example, half a biscuit, half a pizza, etc.

• Cylinder: It is a three-dimensional shape with two identical flat ends that are circular. For example, cardboards inside paper rolls, a pipe, a glass.

• Prism: It is a three-dimensional shape with two identical parallel polygons facing each other. For example, a cardboard box, cameras, cereal boxes, Toblerone boxes.

• Pyramid: A three-dimensional shape with a base and sloping sides that meet in a point at the top. For example, the Great Pyramid of Giza, the roof of a house.

Some of these shapes could be changed, of course. For example, a purse can't be in the shape of parallelogram all the time because there are circular bags and other shaped ones. Since there are other two and three-dimensional geometrical shapes, this list doesn't include all. In this activity, you will make the program that tell the shape shown.

METHOD

What Is Image Processing?

Image processing is a method that is used for achieving an advanced image or manipulating an image in order to deduce some useful information. It is a way of processing signals where the input is an image and the output is an image or characteristics/features of the input image. Today, image processing is one of the fast-growing technologies. It is one of the main research fields of engineering and computer sciences.

There are three main steps of image processing.

These are:

- Importing the image with image collection tools;
- Analysis and use of the image;
- Reporting the image as an analysed structure.

What is Machine Learning?

Although Artificial Intelligence (AI) is a broad science that can mimic human skills, machine learning is a certain sub-field of AI that can teach a machine how to learn. Machine learning is a method of process- ing data given in the background with various learning algorithms, solution methods and producing solutions for them.

In the next activity, we will collect images from the camera thanks to the artificial intelligence machine learning module that we will download as an extension on "mBlock 5". These images will be processed in the background, which will be the machine learning process. After learning is completed, we will start coding with sprite blocks. After coding, it will give us how old we are, as an average value.

INSTALLING THE SOFTWARE AND THE INTERFACE

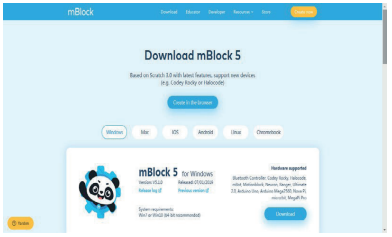


Figure 1: Downloading mBlock 5

Figure 1: Downloading mBlock 5

On the website of mBlock 5, you can either click on “Create in the browser” and start coding online or click on “Download” to download mBlock5 on your computer. After downloading the setup file, you need to run the program.

mBlock 5 helps students code easily with block commands. Moreover, it helps coding makeblocks and electronic structures easily.

To run or download the software, click on https:// www.mblock.cc/en-us/download/. You can either use the software online or download and install it on your computer (Windows, Linux, MACOS).

On the window opened, you need to click next until you finish installing. After completing the installation, the software will automatically run. You will see the following window on the screen.

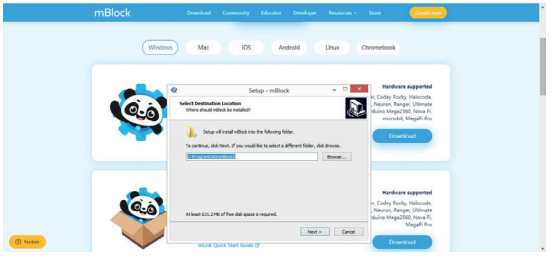


Figure 2: Installing mBlock 5

Figure 3: mBlock 5 Interface

On the upper left part of the screen you will see “file” tab. You can start a new project, save the current project or open an existing project. Where the panda sprite is located is called the stage. When you finish coding, the image will show up on the stage. On the Devices tab on the left, you can choose what you would like to code. Clicking on the “Sprites” tab, you can code for the sprite on the stage. In the “Background” tab, you can change the background of the stage.

On the code blocks section in the middle, you can drag motion, looks, sound, sensing, etc. codes and drop them into coding section. The empty space on the right is your coding area. You can add codes under other codes and arrange them.

ACTIVITY STEPS:

Now, you will run mBlock 5. Click on "Sprites" and then extension.

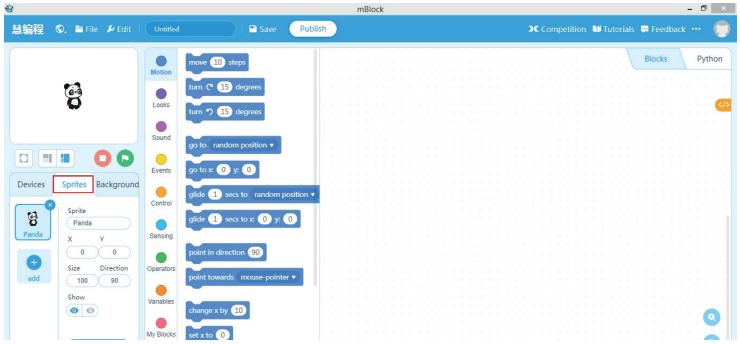


Figure 4: mBlock 5 Sprites and Extension Structure

Here, you can add all the structures that you can add on your program as extensions later on.

fter selecting Teachable Machine extension, click on add. Then, the extension is added to your program.

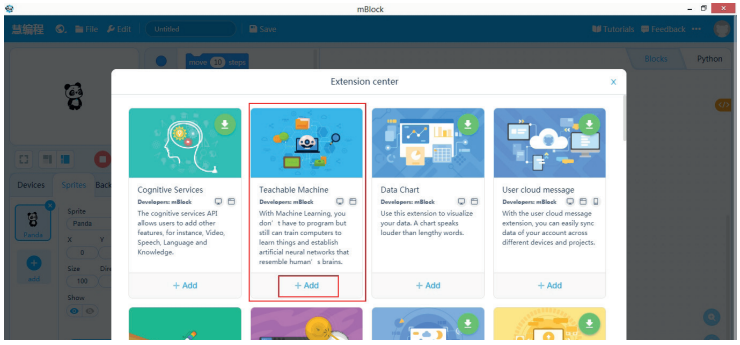


Figure 5: Selecting Teachable Machine on mBlock 5 Extensions

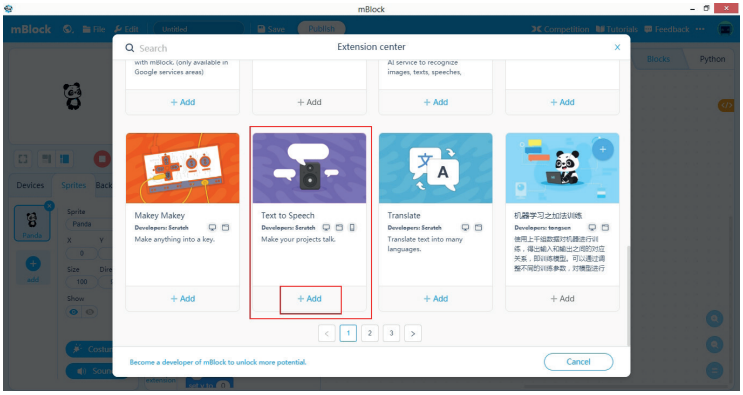


Figure 6: Adding Text to Speech

In order to vocalize the name of the figure, you need to add the extension called "Text to Speech".

After adding the extension, you will have both the machine learning and text to speech on your program.

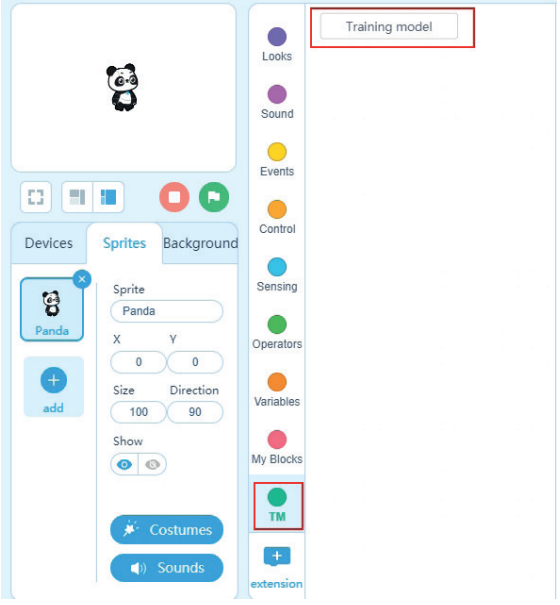


Figure 6: mBlock 5 Teachable Machine Code Blocks

Now, you've made the menu to add codes by through machine learning. After completing machine learning on "Training Model", you can see the codes here. Click on "Training Model". Now you will see the structure where you carry out machine learning and the training.

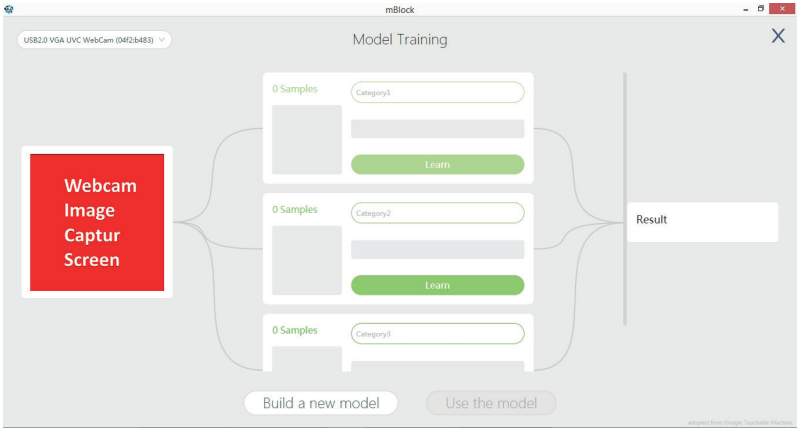


Figure 7: Training Page

On the left-hand side, you can see your webcam image. On the middle section for samples, there are structures where the input will be placed. If three models aren't enough for you, you can click on "Build a new model" and add another model. You can type the name of the sample on the top line. The small square on the left side of the sample will show the preview of your webcam. You will display the image on the webcam and click on "Learn" so that the machine can learn our image. The most important thing here is that the more image we have, the more accurate the results will be. You will create 3 samples for the activity. They will be "Triangle", "Rectangle" and "Circle". In this activity, you will teach the program to tell what shape is shown and what features it have. Let's start the training.

Figure 8: Figure Training - 1

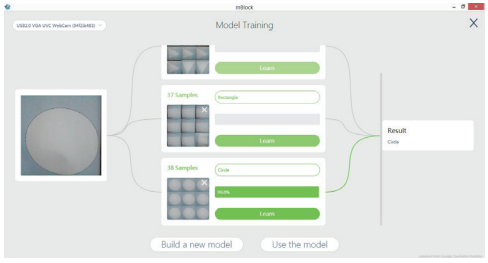
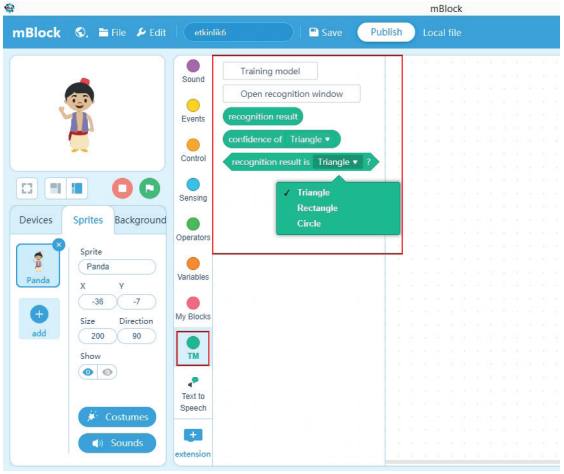


Figure 9: Figure Training - 2

NOTE: If you like, you can draw something else and paint.



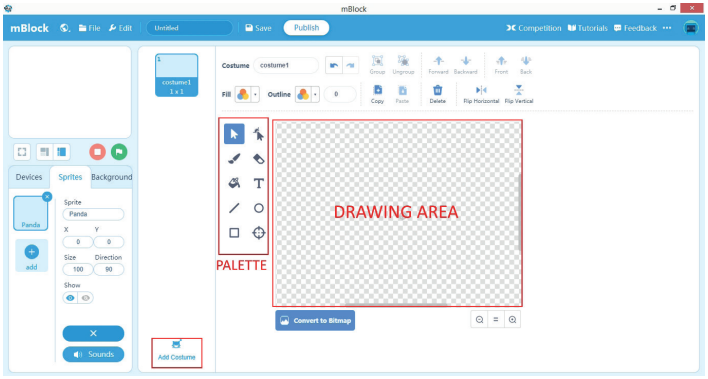
This is how you add the menu where you can add codes that will provide machine learn- ing and produce out- put by processing the image in the background. What you need to do now is to take screen- shots by using the codes on the bottom and create the final value. First, you need to create the code structure.

Figure 10: mBlock 5 Teachable Machine Code Blocks

PSEUDO CODE STRUCTURE:

- The sprite turns on the camera and takes the image.
- It processes the image in the background.
- If the Sprite Sees A Triangle Image
    - It will play This Is A Triangle
    - It will tell the features.
- If the Sprite Sees A Rectangle Image
    - It will play This Is A Rectangle
    - It will tell the features.
- If the Sprite Sees A Circle Image
    - It will play This Is A Circle
    - It will tell the features.

CODE STRUCTURE:



First, you need to draw a triangle, a rectangle and a circle on your sprite area and add them. For this, you need to select “Costumes” on “Sprites” menu. You need to remove the ex- isting costumes and create your own sprite. Next to the sprite drawing area, you will see the tools. If you want, you can select the line and create your own figures. Or you can make changes on the existing ones.

Figure 11: Costumes Menu for Sprite Drawing

You need to draw the sprites on the drawing area. You need to add a sprite and costumes to each of the 3 sprites, then you need to go back to Sprites menu. There will be 4 sprites under the Sprites tab. You can see the example of sprite drawing below:

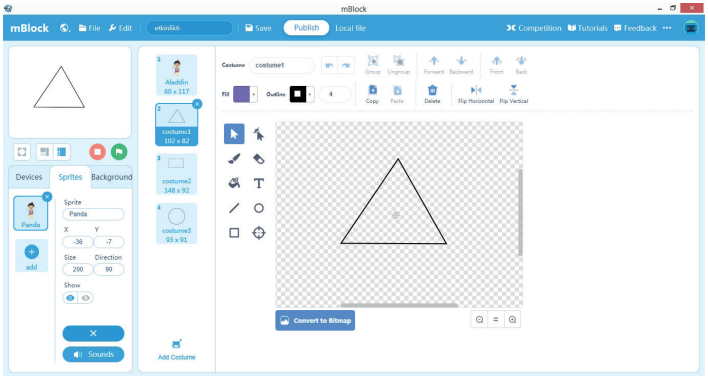


Figure 12: After Drawing Sprites

You need to set the size of the main sprite to 200 and place it on the starting point. Now, it’s time to code. You can see the codes of the main sprite below:

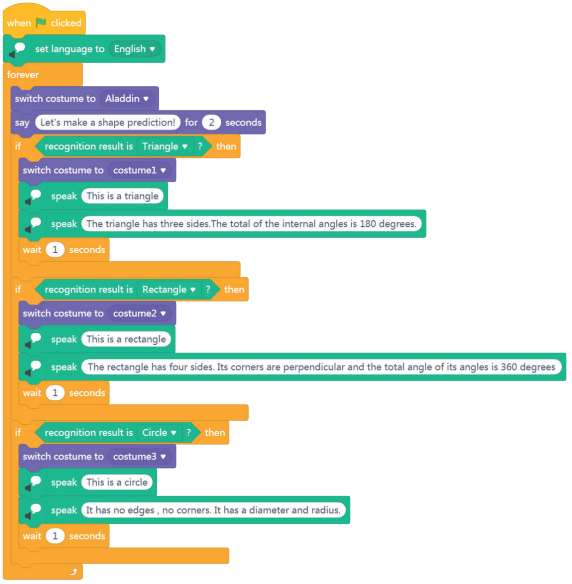


Figure 13: Code Blocks of the Main Sprite

You may need to set the language of the sprite to English. For this, you need to go to "Text to Speech" tab. Then, you need to place the figure that matches the image shown on a conditional statement and deliver the voice output features to the user. The next look of the sprite will give information about the figure displayed.

SAMPLE SCREENSHOT

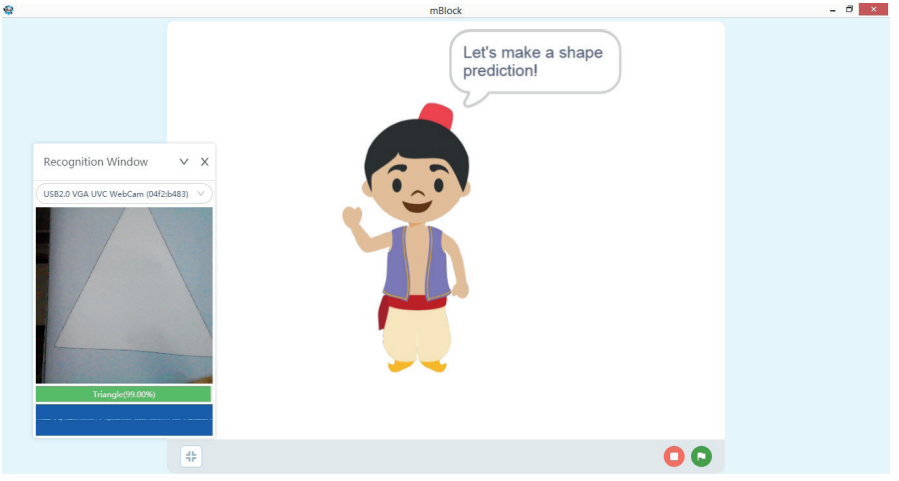


Figure 14: mBlock 5 Artificial Intelligence Teachable Machine Screenshot

What Have We Learned?

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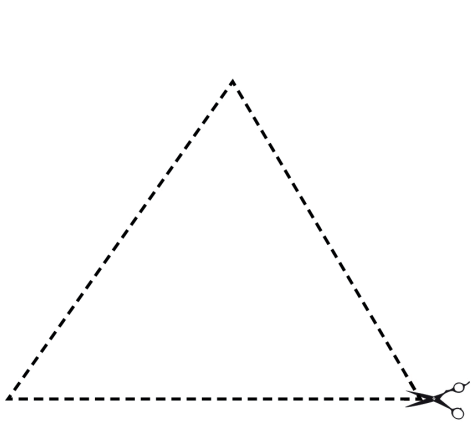
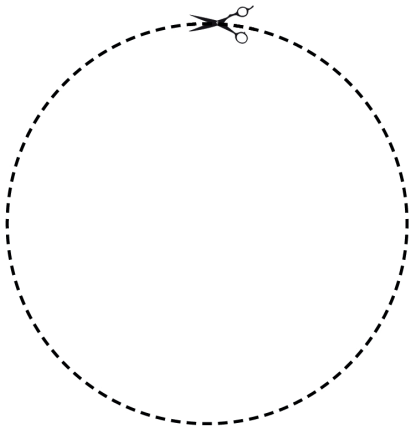
NOW, IT'S YOUR TURN!

Create a program where you show traffic signs to sprites and teach them what they mean. Therefore, you will be able to transfer traffic awareness into coding.

ACTIVITY PAPERS





ACTIVITY

ACTIVITY NAME	ACTIVITY DURATION	ACTIVITY MODULE
CAN YOU COMPLETE MY LINE?	***2 HOURS***	***ARTIFICIAL INTELLIGENCE EDUCATION***

ACTIVITY OUTCOMES

- Recognizing the concept of artificial intelligence.
- Knowing artificial intelligence practices and current structures.
- Listing the terms related to artificial intelligence.
- Knowing the definition of image processing and learning about the background operating logic.
- Realizing how image completion structures are created.
- Noticing the areas of use for Artificial Neural Networks.
- Learning the use of an example in other structures.
- Gaining information about TensorFlow.
- Studying online experiment structures.
- Knowing how to use online artificial intelligence experiments.

INFO NOTE:

It is an open source deep learning library. It enables you to process computation using multiple CPUs and GPUs by using a single API, providing a flexible space regardless of the platform. This framework that was developed using Python supports the other programming languages (C++, Java, C#, JavaScript and R) as well as Python. You can do many things related to artificial learning on your browser thanks to TensorFlow.js. You can also develop or teach machine learning models on your browser with TensorFlow.js. It gives a whole range of advantages.

In this activity, you will see an example of an artificial neural network asking you to draw a given model which was created using TensorFlow. The artificial neural networks are asked to collect the input data given by us and use them for object completion and show us the most preferred output with examples. After studying this example, you will be able to learn how images are completed in the background by being processed with artificial intelligence technology. Well, what kind of advantages will it provide? For example, it will be able to simulate the rest of a torn photograph. It will decrease the time spend on creating a figure. It will help with architectural drawings and it will help develop an architectural structure for a restoration project, in the future.

METHOD

What Is Image Processing?

Object recognition and completing the object accordingly thanks to deep learning are among the most important subjects of artificial intelligence. Today, there are many pre-trained object recognition models (YOLO, RCNN, Fast RCNN, Mask RCNN, Multibox, etc.). Therefore, it takes a little effort to identify the objects on an image or in a video. It is possible to identify the objects thanks to a ready algorithm. Below are the steps of image recognition:

- Image is identified.
- Object is detected.
- Object is classified.
- A matching process is performed among the object figures.
- The missing parts of the object are identified and marked with marking methods.
- A drawing takes places to complete the object.
- Suggestions for drawings are placed and accurate completion is made.

As seen here, the existing algorithms are sufficient for the object completion while using artificial neural networks. However, they won't be sufficient for objects that haven't been identified before, in the future. It could be considered as a limitation.

INSTALLING THE SOFTWARE AND THE INTERFACE

The structure that will be used here could be run online on https://magenta.tensorflow.org/assets/sketch_rnn_demo/index.html. When you visit the link, you will see the window below:

https://magenta.tensorflow.org/assets/sketch_rnn_demo/index.html

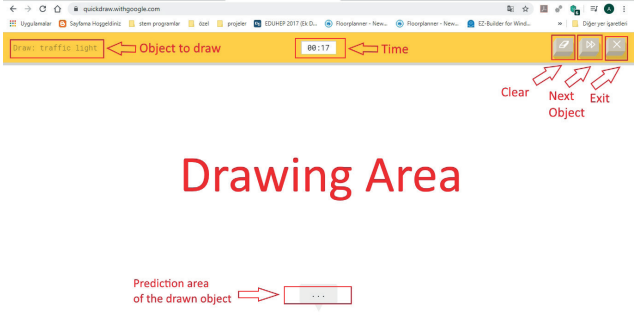


Figure 1: Image Completion Website

As you can see on the image, a random structure from the model selection menu appears. You are trying to draw the structure on the designing space by simulation. However, artificial intelligence structure helps us while drawing, by showing the missing parts.

ACTIVITY STEPS:

In this activity, you will draw objects and the artificial intelligence will complete them. First, we need to visit https://magenta.tensorflow.org/assets/sketch_rnn_demo/index.html and start the example. Let's have a look at the example on the screen.

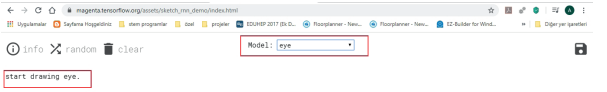


Figure 2: Example 1 Website Selections

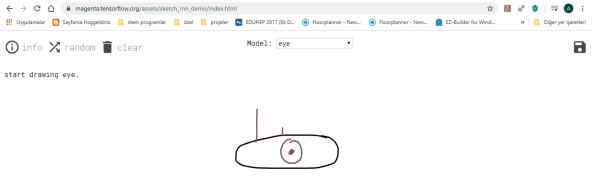
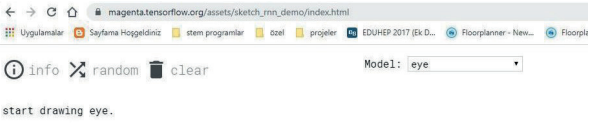


Figure 3: Sample Drawing of An Eye

On the model selection menu, the eye is selected. First, the eye structures are added to the background of the web environment by using artificial neural networks. Now, it's time to draw!



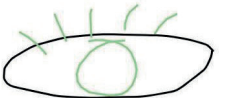


Figure 4: Suggestion Structure for the Eye Example

The black lines are yours and the coloured ones inside the black ones are object completion suggestions.

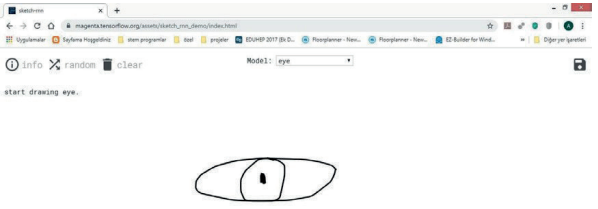


Figure 5: Final Look of the Example

The black lines are yours and the coloured ones inside the black ones are object completion suggestions.
You can complete this example by completing the image. You can add more extensions for the drawing, for which suggestion will be made too. For example, the other eye. You can save the drawing by clicking on the saving button on the top right.

What Have We Learned?

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NOW, IT'S YOUR TURN!

Create a program where you show traffic signs to sprites and teach them what they mean. Therefore, you will be able to transfer traffic awareness into coding.

ACTIVITY

ACTIVITY NAME	ACTIVITY DURATION	ACTIVITY MODULE
GUESS WHAT I'VE DRAWN	***2 HOURS***	***ARTIFICIAL INTELLIGENCE EDUCATION***

ACTIVITY OUTCOMES

- Recognizing the concept of artificial intelligence.
- Knowing artificial intelligence practices and current structures.
- Listing the terms related to artificial intelligence.
- Knowing the definition of image processing and learning about the background operating logic.
- Realizing how image completion structures are created.
- Noticing the areas of use for Artificial Neural Networks.
- Learning the use of an example in other structures.
- Gaining information about TensorFlow.
- Studying online experiment structures.
- Knowing how to use online artificial intelligence experiments.

INFO NOTE:

It is an open source deep learning library. It enables you to process computations using multiple CPUs and GPUs by using a single API, providing a flexible space regardless of the platform. This framework that was developed using Python, supports other programming languages (C++, Java, C#, JavaScript and R) as well as Python. You can do many things related to artificial learning on your browser thanks to TensorFlow.js.

You can also develop or teach machine learning models on your browser with TensorFlow.js. It offers a whole range of advantages.

In this activity, you will use a structure which identifies a drawing by means of an artificial intelligence structure developed by Google. Thanks to the artificial intelligence machine learning running in the background, images are processed with the images on the Google database and a comparison is carried out, then the best match is given to the user verbally.

METHOD

What Is Image Processing?

Creating an artificial intelligence is one of the biggest challenges for game developers. However, the commercial success of a game depends on the quality of AI. The visual effects and user interactions developed with online structures and artificial intelligence increase the popularity of games. Since the information delivered by gamification will be more permanent for younger children, artificial intelligence should be given in a gamified way. In this activity, they will be taught about the artificial intelligence structures thanks to the practices related to game logic.

Image Recognition and Completion

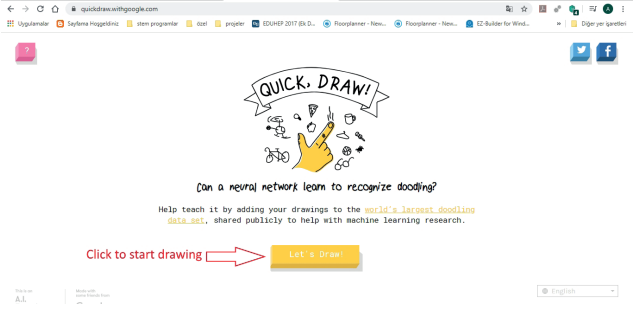
Object recognition and completing the object accordingly thanks to deep learning are among the most important subjects of artificial intelligence. Today, there are many pre-trained object recognition models (YOLO, RCNN, Fast RCNN, Mask RCNN, Multibox, etc.). Therefore, it takes a little effort to identify the objects on an image or in a video. An object could be identified thanks to an existing algorithm. Below are the steps of image recognition:

- Image is identified.
- Object is detected.
- Object is classified.
- A matching process is performed among the object figures.
- The missing parts of the object are identified and marked with marking methods.
- A drawing takes places to complete the object.
- Suggestions for drawings are made and accurate completion takes place.

As seen here, the existing algorithms are sufficient for object completion by making use of artificial neural networks.

INSTALLING THE SOFTWARE AND THE INTERFACE

The structure that will be used here could be run online on https://quickdraw.withgoogle.com/. After visiting the link, you will see the window shown below:

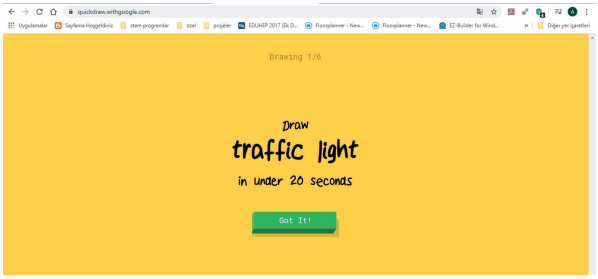


As seen on the image, you need to click on “Let’s Draw” on the top part of the screen.

Figure 1: Image Completion Website

ACTIVITY STEPS:

In this activity, you are asked to draw random objects and complete them in a given time. The drawing will be completed with artificial intelligence. First, we need to visit https://quickdraw.withgoogle.com/ and start the first example. Now, let's start with the first example.



https://quickdraw.withgoogle.com/

Figure 2: Example 1 Drawing Object

Here, you randomly selected the "feather" and got asked to draw a feather in 20 seconds. Your time starts when you click on "Got It!" and you are directed to drawing menu. Now, it's time to draw!

Drawing Area

Figure 3: Online Drawing Area

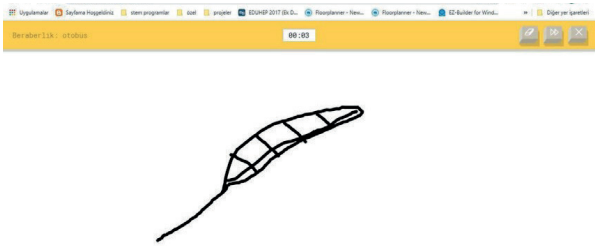


Figure 4: Feather Example

Here, you will try to draw the object given in the drawing area.

For this activity, the object that you are drawing is stated by both writing and vocalizing on the bottom. Example:

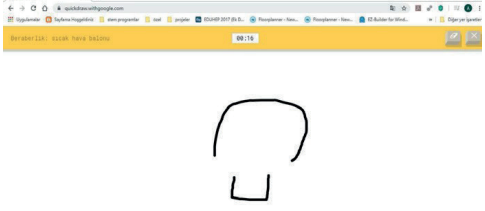


Figure 5: Final Look of the Example

What Have We Learned?

NOW, IT'S YOUR TURN!

Use the application for drawing different objects and understand the features that the application uses to identify the objects. Have fun!

ACTIVITY

ACTIVITY NAME	ACTIVITY DURATION	ACTIVITY MODULE
COMPLETE MY MOVE!	***2 HOURS***	***ARTIFICIAL INTELLIGENCE EDUCATION***

ACTIVITY OUTCOMES

- Recognizing the concept of artificial intelligence.
- Knowing artificial intelligence practices and current structures.
- Listing the terms related to artificial intelligence.
- Knowing the definition of image processing and learning about the background operating logic.
- Realizing how image completion structures are created.
- Learning to compare the identified image by processing and comparing it with those on the database.
- Noticing the areas of use for Artificial Neural Networks.
- Learning the use of an example in other structures.
- Gaining information about TensorFlow.
- Studying online experiment structures.
- Knowing how to use online artificial intelligence experiments.

INFO NOTE:

It is an open source deep learning library. It enables you to process computations using multiple CPUs and GPUs by using a single API, providing a flexible space regardless of the platform. This framework that was developed using Python supports other programming languages (C++, Java, C#, JavaScript and R) as well as Python. You can do many things related to artificial learning on your browser thanks to TensorFlow.js.

You can also develop or teach machine learning models on your browser with TensorFlow.js. It gives a whole range of advantages.

In this activity, we will examine an AI (Artificial Intelligence) structure developed by Google. The application which will access our images by means of webcams will mark our joints and important movement points. Therefore, it will identify movements and compare them with those in the database. It will match them with the images on Google images.

METHOD

Artificial Intelligence and Games

Image processing allows identifying an image processed outside the system and matching it thanks to special points. Many algorithms have been developed for producing points automatically on images and matching them with other images. Today, SURF and FAST are the most used algorithms that are edge and point detection-based algorithms. All algorithms running in the background have the same logic and algorithm, and outputs are similar.

Having a very important role in artificial intelligence applications, image processing completes objects and processes them.

In this application, world's largest database, Google identifies an image with certain points and matches them with the existing ones so that it could tell what movement you have just shown.

INSTALLING THE SOFTWARE AND THE INTERFACE

The structure that will be used here could be run online on https://experiments.withgoogle.com/move-mirror. When you visit the link, you will see the window below:

https://experiments. withgo- ogle.com/mo- ve-mirror

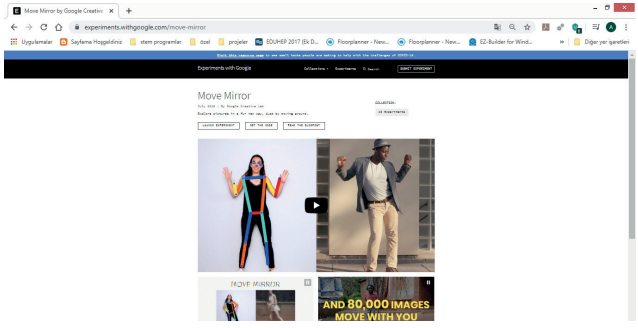


Figure 1: Image Matching Website

As seen on the image, when you visit the online platform you need to click on "Launch Experiment". Then a window will be shown where you will start the application.

ACTIVITY STEPS:

In this activity, you are asked to show some movements to the webcam. Then the application matches your movements with those in the database. First, you need to go on https://experiments.withgoogle.com/move-mirror and then start the example.

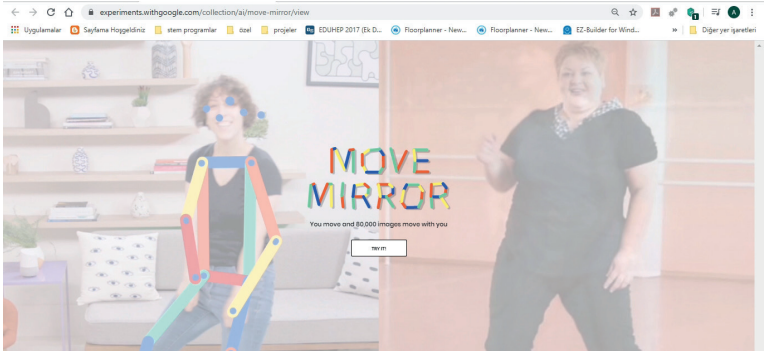


Figure 2: Image Matching Page

You can start the activity by clicking on "Try it". Since you will use the webcam in the activity, you need to allow webcam display on the top left of the window. Now, it's time for fun!

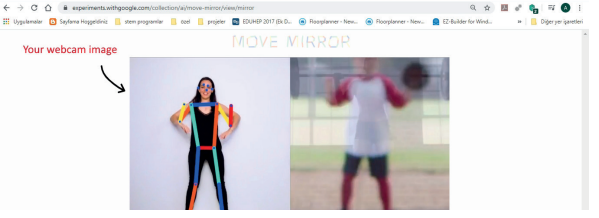


Figure 3: Artificial Intelligence Image Matching Application

Once your image is taken by the webcam, you are shown similar images to yours on the right-hand side of the page. The images of the similar movements are selected from the database thanks to the point-based algorithm. You can save your images as gifs by clicking "Make a GIF".
If you like to contribute to Google as a developer, you can download the code of the application and make changes on the code.

What Have We Learned?

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NOW, IT'S YOUR TURN!

Run the application and try to take photos with different movements and gestures. Check the results and save your images as GIFs. Have fun!

ACTIVITY

ACTIVITY NAME	ACTIVITY DURATION	ACTIVITY MODULE
PAC-MAN	***2 HOURS***	***ARTIFICIAL INTELLIGENCE EDUCATION***

ACTIVITY OUTCOMES

- Recognizing the concept of artificial intelligence.
- Knowing artificial intelligence practices and current structures.
- Listing the terms related to artificial intelligence.
- Establishing a connection between artificial intelligence and games.
- Comprehending the relationship between the logic of creating and completing games.
- Learning to make a game console with image processing.
- Comprehending that there isn't a connection between different images thanks to image processing.
- Noticing the areas of use for Artificial Neural Networks.
- Learning the use of an example in other structures.

INFO NOTE:

History of Pac-Man

Pac-Man video game was first released on 22 May 1980 in Japan and October 1980 in United States of America. Pac-Man who must eat all the dots inside an enclosed maze while avoiding four coloured ghosts has become the symbol of 1980's.

Pac-Man is still one of the most popular video games in history.

We will learn to control the game by making use of image processing by artificial intelligence. You will play one of the most-known games, Pac-Man with images thanks to machine learning.

METHOD

Artificial Intelligence and Games

Digital image processing is processing images on a computer. It could be described as applying a set of processes on the numerical display of an object in order to achieve a desired result. It consists of turning a physical image into a corresponding digital image and deducting important information from the image by applying various algorithms. Digital image processing mainly includes the image collection, image processing and image analysis.

Basically, a digital image processing system consists of three components which are: a computer system - where images are processed, an image digitiser and an image displaying device.

Image processing is the analysis and manipulation of an image, such as a photograph or a video frame by making use of a signal processing form and some mathematical operations in order to improve the quality. An image processing output could be an image, a set of features of the image or a parameter.

Image quality and image processing are very important for games. Images will be taken and processed with artificial intelligence so that they could be used instead of direction keys.

INSTALLING THE SOFTWARE AND THE INTERFACE

The structure that will be used here can be run online on https://storage.googleapis.com/tfjs-examples/webcam-transfer-learning/dist/index.html. When you visit the link, you will see the window below:

https://storage.googlea- pis.com/tfjs-examples/ web-cam-transfer-lear- ning/dist/ index.html

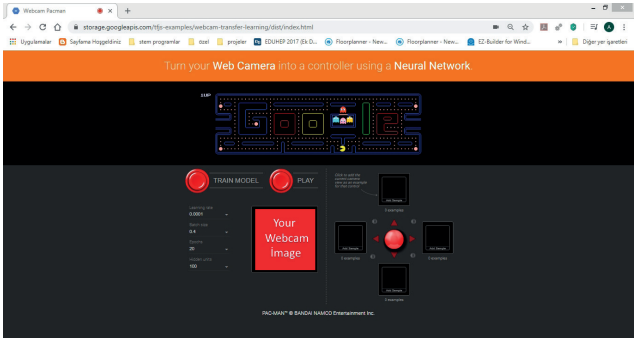

Figure 1: Pac-Man Website

As seen on the image, when you visit the online platform, you need to click “Play”. And after machine learning is completed, you can start the game.

ACTIVITY STEPS:

In this activity, you are asked to take photos with your webcam to be used instead of direction keys. After designating the images, you need to assign them to the direction keys. Then, you will click on "Train Model" to carry out machine learning. Then, you can start the game by clicking "Play". First, you need to go on https://storage.googleapis.com/tfjs-ex- amples/web-cam-transfer-learning/dist/in- dex.html. Then you can start the example.

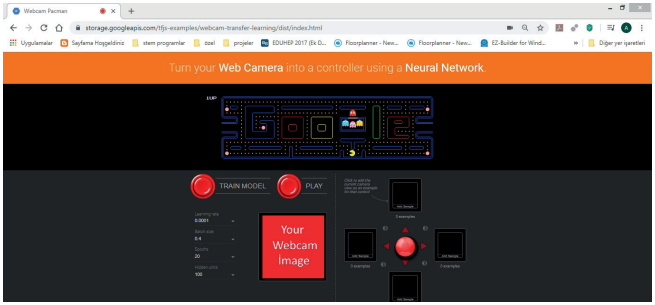

Figure 2: Introduction of the Images

On the left-hand side, you can see your webcam image. You can designate the images to up-down-left-right direction keys on the right side of the page and the structures you follow on the left side of the page. Then you can click on "Train Model" to complete machine learning. You can click on "Play" to start the game and use the images instead of direction keys. Have Fun!

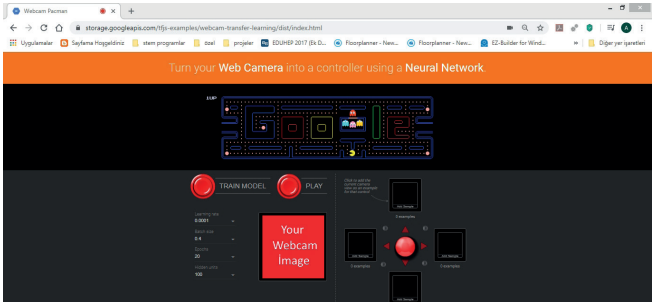

Figure 3: Pac-Man Screenshot

What Have We Learned?

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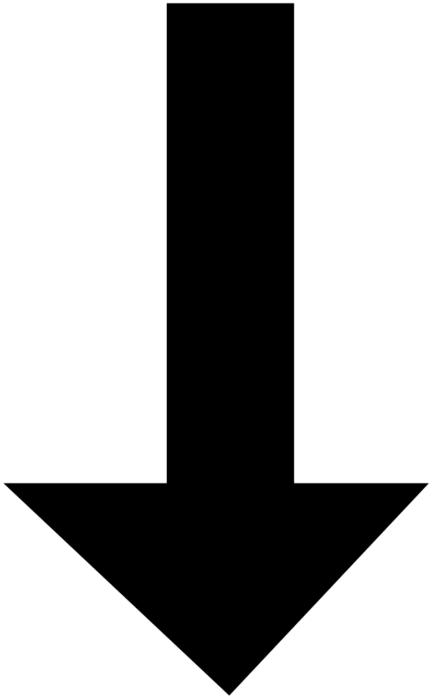
NOW, IT'S YOUR TURN!

Try to eat it all and reach the target avoiding the monster.

ACTIVITY PAPERS



ACTIVITY

ACTIVITY NAME	ACTIVITY DURATION	ACTIVITY MODULE
CAN YOU RECOGNISE MY HANDWRITING?	***2 HOURS***	***ARTIFICIAL INTELLIGENCE EDUCATION***

ACTIVITY OUTCOMES

- Recognizing the concept of artificial intelligence.
- Knowing artificial intelligence practices and current structures.
- Listing the terms related to artificial intelligence.
- Establishing a connection between artificial intelligence and games.
- Knowing that image processing with handwriting is possible.
- Placing suggestions for the characters that are added to handwriting with the values on the database.
- Knowing about handwriting detection and where to use it.
- Comprehending that there isn't a connection between different images thanks to image processing.
- Noticing the areas of use for Artificial Neural Networks.
- Learning the use of an example in other structures.

INFO NOTE:

Handwriting and Its Analysis

Deep learning is widely used in order to recognise handwriting. Received offline handwriting recognition is analysed after text is written. The only information that is analysed is the binary print of a character in the background. It gives information such as the angle of the pen, pen pressure and speed of writing for spell checking. Offline methods and algorithms should be developed to access this information. In order for to learn by comparing handwriting, structures that were written before, that have multiple samples and that are converted into numerical values are needed.

Starting in 1990's with PalmPilot and Newton MessagePad, handwriting recognition has been used for decades. It was needed to write in a readable way in order for Newton to recognise handwriting and it was necessary to learn Graffiti language for Palm to recognise handwriting. Many mobile applications allow you to draw letters, outlines and shapes on the screen on iOS and Android devices. However only a few of them recognise, convert or digitise the input.

In this application, words will be suggested once the first letter is written and autocompletion will start.

METHOD

Image Processing and Handwriting Recognition

Image Processing provides a set of services that perceive and sort out the texts of handwriting. It is useful for scenarios such as punctuation, medical records, security and banking. However, its general use is mostly the handwriting recognition on smart phones and tablets and letter recognition in applications.

OCR (optical character recognition) separate the texts created with certain fonts included in image processing on images and re-create them. One of the challenges of the OCR libraries is that handwritten texts couldn't be analysed. The suggested way of solving this problem is to create an artificial neural network and try to analyse the text with this neural network. Data about handwriting is required for the machine translation of the neural network. This data is covered by mnist dataset. For this, it is necessary to create the optimization structure, with the help of several algorithms.

INSTALLING THE SOFTWARE AND THE INTERFACE

The structure that will be used here can be run online on https://distill.pub/2016/handwriting/. When you visit the link, you will see the window below:

https://distill.pub/2016/ handwriting/

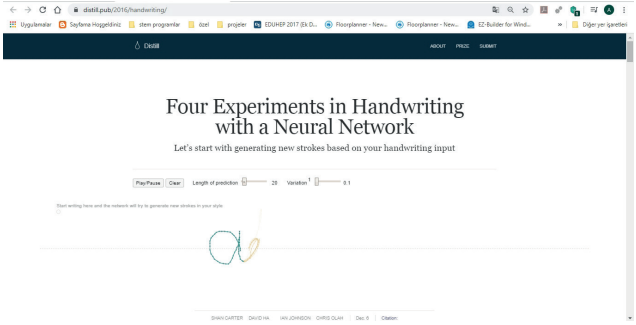


Figure 1: Handwriting Recognition Website

As seen on the image, when you visit the online platform, you need to click on "Play". When you start writing the letters, suggestions will begin appearing.

ACTIVITY STEPS:

When you write the letters, this platform will come up with word suggestions. These words are ENGLISH words. However, the important point is recognising the letters and creating meaningful words. For this activity, you need to go to https://distill.pub/2016/handwriting/. Then you can start the example. First, let's draw an "a" letter and check the suggested examples/predictions.

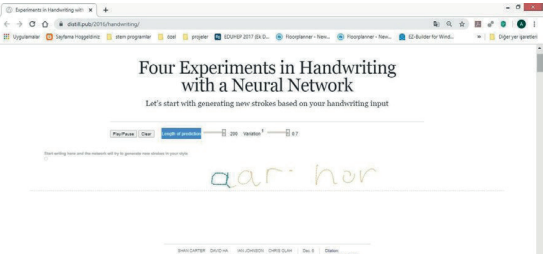


Figure 2: Letter Completion Screenshot

It's not only letters but also words that could be completed. Now, let's write play and check the suggestions.

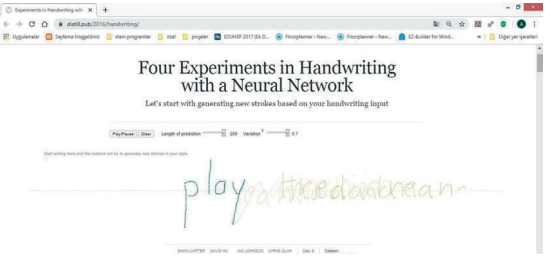


Figure 3: Word Completion Screenshot

What Have We Learned?

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NOW, IT'S YOUR TURN!

Complete a handwriting recognition process with different letters and words. If this was in Turkish, how would it be created? Think about it.

ACTIVITY

ACTIVITY NAME	ACTIVITY DURATION	ACTIVITY MODULE
I AM AN ORCHESTRA CONDUCTOR!	*2 HOURS*	*ARTIFICIAL INTELLIGENCE EDUCATION*

ACTIVITY OUTCOMES

- Recognizing the concept of artificial intelligence.
- Knowing artificial intelligence practices and current structures.
- Listing the terms related to artificial intelligence.
- Establishing a connection between artificial intelligence and games.
- Knowing the difference between image processing and voice processing.
- Knowing that human body is marked with certain points.
- Knowing how to manage voice structures with artificial intelligence.
- Comprehending when there isn't a connection between different images.
- Noticing the areas of use for Artificial Neural Networks.

INFO NOTE:

Voice Processing

The history of music in many aspects is the history of technology. Composers and musicians have made use of the developments in human understanding to create music and notation, design the performance and the acoustic structure, and to make musical instruments. Unsurprisingly, these people are among the first ones to make use of electronics, telecommunication and new techniques and opportunities offered by digital computers.

The way of creating the musical structures, structuring the mechanics of it and digitalising it have an innovative impact on the audience. Consequently, people who produce art with sounds don't only have the various tools but also a very suitable environment for the technological experiments.

In this activity, you will be an orchestra conductor by the method of image processing in artificial intelligence machine learning and you will direct the musical instruments.

METHOD

Image Processing and Handwriting Recognition

Image processing will enable taking photos of human body with the webcam and marking certain points on the body in order to recognise the certain parts of human body.

What are needed for achieving a full image is to make use of low-level methods such as image pro- cessing algorithms, colour correction and noise re- duction as well as medium-level methods such as compaction and binarization. It also includes deducing meaningful information from the data with segmenta- tion, detection and recognition algorithms. In this ac- tivity, the first image to be taken by the webcam will mark hands, face, torso and feet. Then, it will make you the orchestra conductor by taking your image and placing it to a setting with several musical instruments. Therefore, you will be able to direct the orchestra and musical instruments by your hands. Have Fun!

INSTALLING THE SOFTWARE AND THE INTERFACE

The structure that will be used here can be run online on https://semiconductor.withgoogle.com/. When you visit the link, you will see the window below:

https://semiconductor.withgoogle.com/

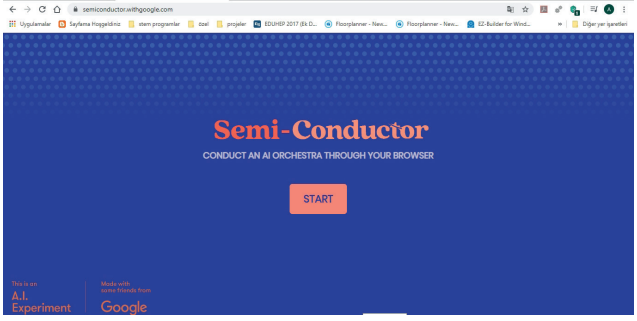

Figure 1: Orchestra Conductor Website

As seen on the image, when you go to the online platform, click on “Start” and start the activity.

ACTIVITY STEPS:

In this activity, you will learn to direct the musical instruments with hand gestures. For this activity, you need to go to https://semiconductor.withgoogle.com/, then you can start the example. First, you need to enable the webcam to integrate your image here. On the same page, click on "Start" to start the web application.

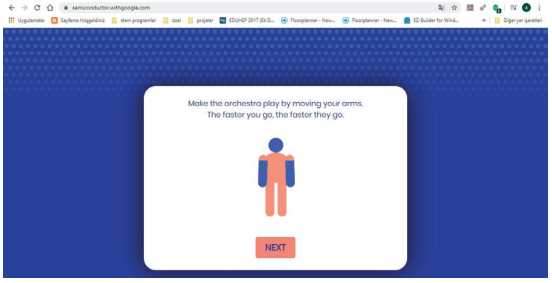

Figure 2: Orchestra Conductor Training Page 1

Then click on "next" to go to the page where your image will be taken by the webcam.

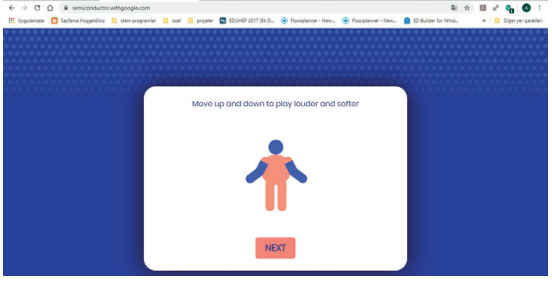

Figure 3: Orchestra Conductor Training Page 2

The important points of the orchestra conductor training are:

- You will be able to play the musical instruments by moving your hands right, left, up and down.
- You will be able to increase or decrease the tone of the instruments by pulling your feet up or moving your torso down.
- If hand gestures are faster, the tempo will be higher.

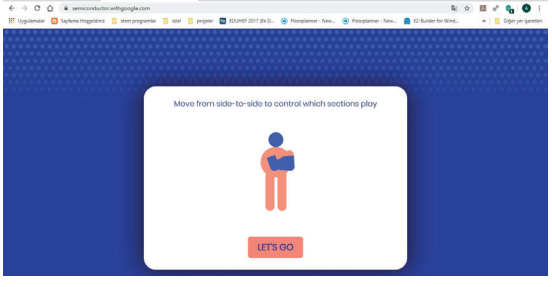

Figure 4: Orchestra Conductor Training Page 3

Start the application by clicking on "Let's Go". On the screen, your image will be recognised by image processing and your face, hands, torso and feet will be identified.

After the image is processed, the purple screen will turn green. There will be dots on the green area and image will be identified. The next screen is the one where you will direct the instruments as the orchestra conductor.

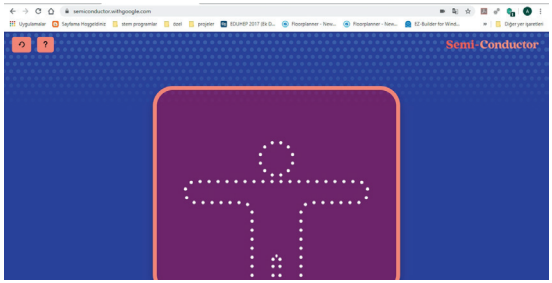

Figure 5: Processing the Image Taken by the Webcam

Here, you will perform the gestures mentioned above in front of the camera in order to play the musical instruments. Now, it's your turn!

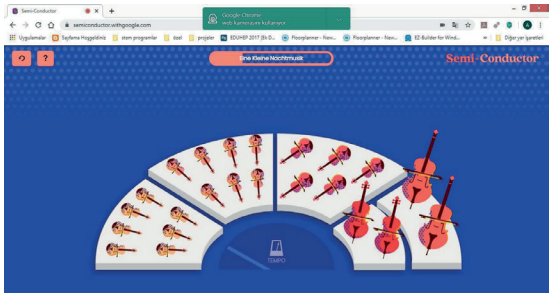

Figure 6: Directing Musical Instruments

What Have We Learned?

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NOW, IT'S YOUR TURN!

You can try the application with different people. You can decide on the sounds of musical instruments and the tempo with people who have different hand coordination skills.

ACTIVITY

ACTIVITY NAME	ACTIVITY DURATION	ACTIVITY MODULE
ARTIFICIAL INTELLIGENCE EDUCATION WITH ARDUINO	***2 HOURS***	***ARTIFICIAL INTELLIGENCE EDUCATION***

ACTIVITY OUTCOMES

- Recognizing the concept of artificial intelligence.
- Knowing artificial intelligence practices and current structures.
- Listing the terms related to artificial intelligence.
- Establishing a connection between artificial intelligence and games.
- Knowing about microprocessors and microcontrollers and telling the difference between them.
- Identifying Arduino circuit boards, analogue/digital input and output units.
- Knowing the function of servomotors and how to integrate them into the circuits.
- Knowing how to code with Arduino. Being able to code with block commands.
- Establishing a connection between artificial intelligence and electronic structures.
- Knowing how to use electronic structures and sensors with artificial intelligence applications.
- Noticing the areas of use for Artificial Neural Networks.

INFO NOTE:

What is Arduino?

Arduino is a microcontroller with analogue/digital inputs and connection cables, where you can create great circuits at low costs. It is an open source structure where block commands and syntax are used. You can design and create devices that will interact with its environment, on Arduino. Arduino boards are basically the tools to control the electronics. Internal microcontrollers could read inputs (i.e. light on the sensor or an object next to the sensor) and convert it into an output (i.e. riding a motorbike, ringing an alarm, turning the LED on or showing info on LCD screens).

Arduino is one of the most-used structures to transfer artificial intelligence application to electronics, to see their use in daily life and integrate them into projects. Thanks to this board, various outputs could be created by linking sensors.

METHOD

Image Processing and Managing Audio Devices

Servomotor is a small device which has an output shaft. This shaft could be rotated by different angles by sending a coded signal to the servo. As long as it finds the coded signal on the input line, servo will maintain the angular location of the shaft. If the coded signal changes, the angular location of the shaft will change too. You can control the servomotor and rotate to any angle with Arduino.

These two structures which are used the most in projects are used in everywhere from making humanoid robots to making r/c planes.

There are two structures that will be used in this application. The webpage in the programming unit will be visited. The servomotor will be connected to the Arduino circuit board. Therefore, it will be able to process and separate the image taken by the camera, thanks to the structure of the board.

INSTALLING THE SOFTWARE AND THE INTERFACE

The structure that will be used here can be run online on https://experiments.withgoogle.com/tiny-sorter/view. When you visit the link, you will see the window below:

https://experiments.withgo- ogle.com/tiny-sorter/view

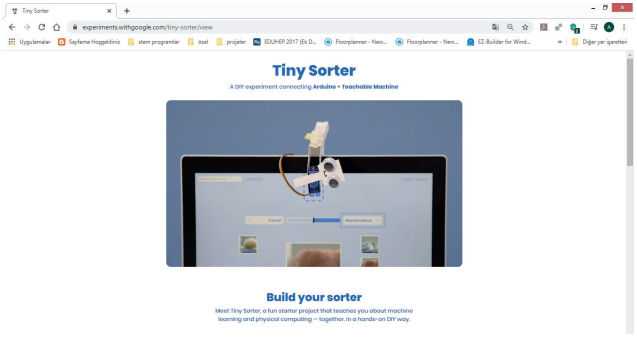
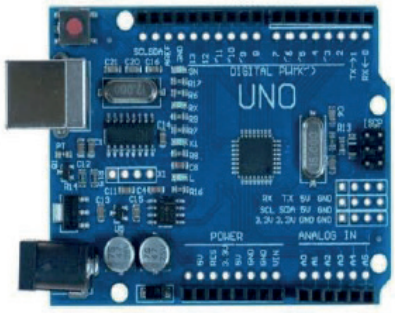


Figure 1: Arduino Project Page

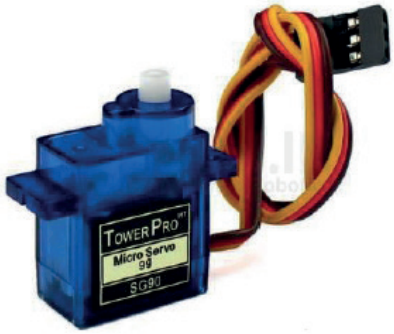
As seen on the image, there is an online page for the experiment. When followed step-by-step, an object separator will be made by using Arduino with machine learning.

ACTIVITY STEPS:

In this activity, we will carry out a project with an electronic circuit and webcam. The following materials will be used:



· ***Arduino Uno***



· ***Servomotor (SG90)***

· ***Tape***
· ***Scissors***
· ***Ruler***
· ***Activity Paper (heavy paper or cardboard)***

You need to cut the activity paper according to the instructions. You also need to download the Arduino software on https://www.arduino.cc/en/main/software and install. In order to teach the object with webcam and put the necessary codes in Arduino and connect, you then need to click on https://editor.p5js.org/ gbose/present/2BN-5HQYNK. You will see the window below:

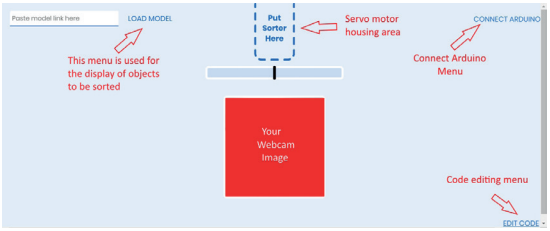


Figure 2: Connecting Arduino and Machine Learning

Then on the website given above, you need to click on "Load Model" to enter into the machine learning area. You need to select two objects here. First, name them. Then, you need to take pictures on your webcam and teach them with machine learning. Then determine the empty area to be used when there is no selection.

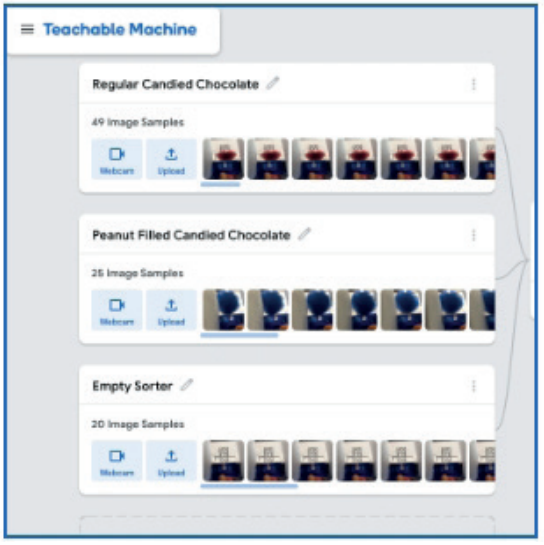


Figure 3: Machine Learning

Click on “Connect Arduino” and select the device that you plugged into the USB port on your computer and click on “connect”. Then, place the activity paper on your servomotor and place it on “Put Sorter Here”. The images sent from the webcam will be used for machine learning.

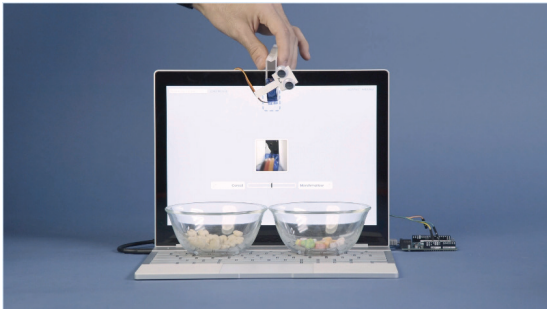


Figure 4: The Layout and the Application of the Project

What Have We Learned?

.....

.....

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.....

.....

NOW, IT’S YOUR TURN!

Now it’s time to try different materials for the separator circuit! Design a circuit which will separate white chocolate and dark chocolate.

Tiny Sorter Assembly

Follow the online instructions at experiment.withgoogle.com/tinysorter

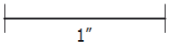
Parts Required

Electronic Stuff
- Arduino Leonardo
- Micro servo (SG90)
- Jumper wires (male to male)

Paper Stuff
- Printer
- 8.5 x 11" paper (preferably cardstock)
- Tape
- Scissors
- Ruler
- Google-y Eyes (MANDATORY!)

Printing Tips

Print at 100% scale.

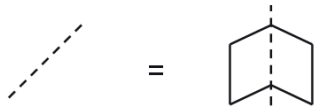


This line should be one inch

Cutting & Folding

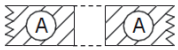
1) Cut solid lines with scissors or craft knife.

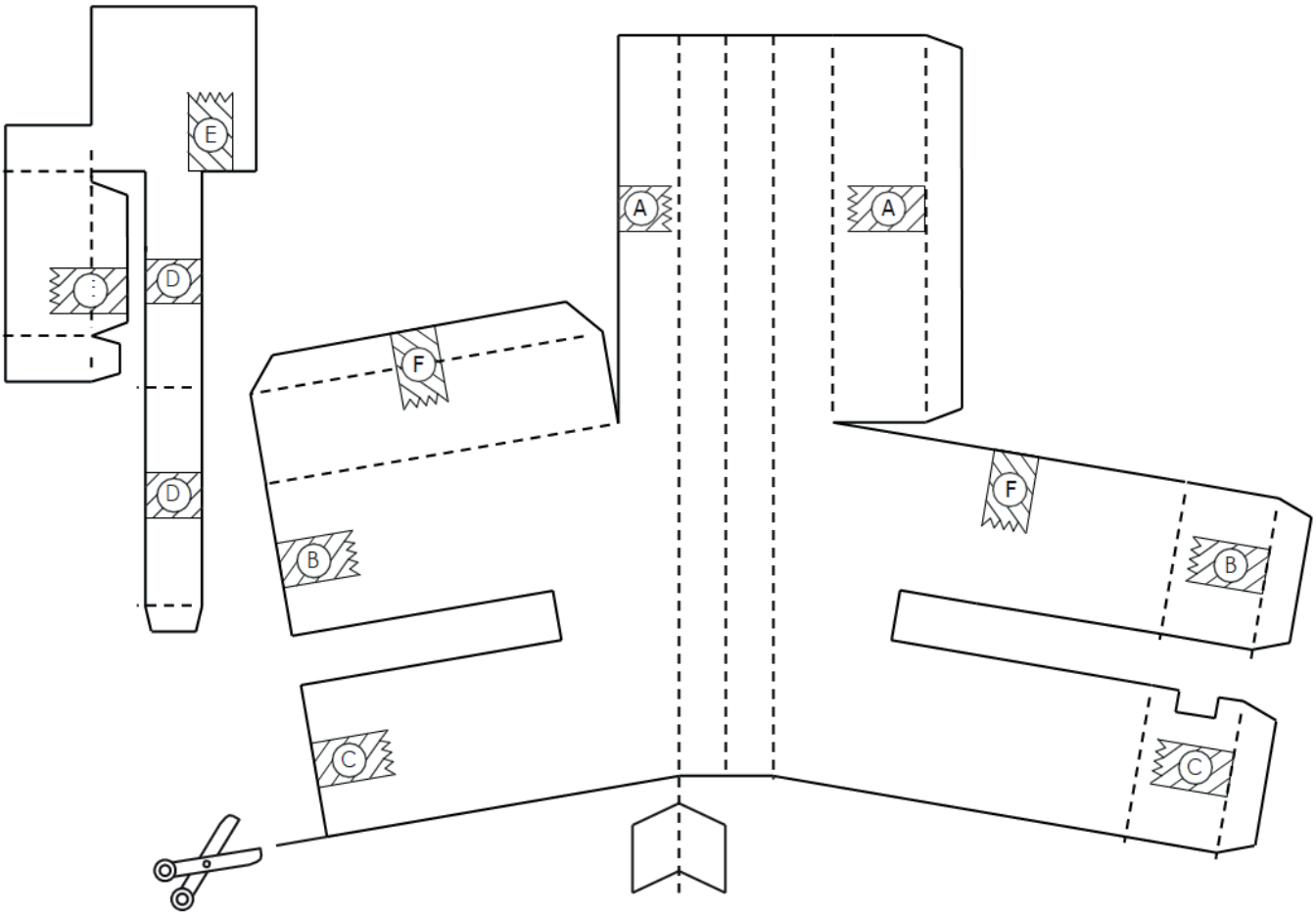
2) Fold on dotted line, using the straight edge of the ruler might make it easier.



Stick it Together

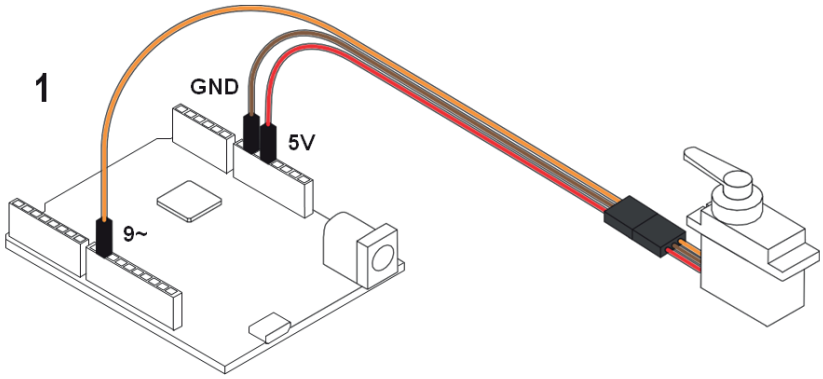
Connect each letter with tape. A to A, B to B, and so on.




E
D
D
F
A
A
F
B
B
C
C

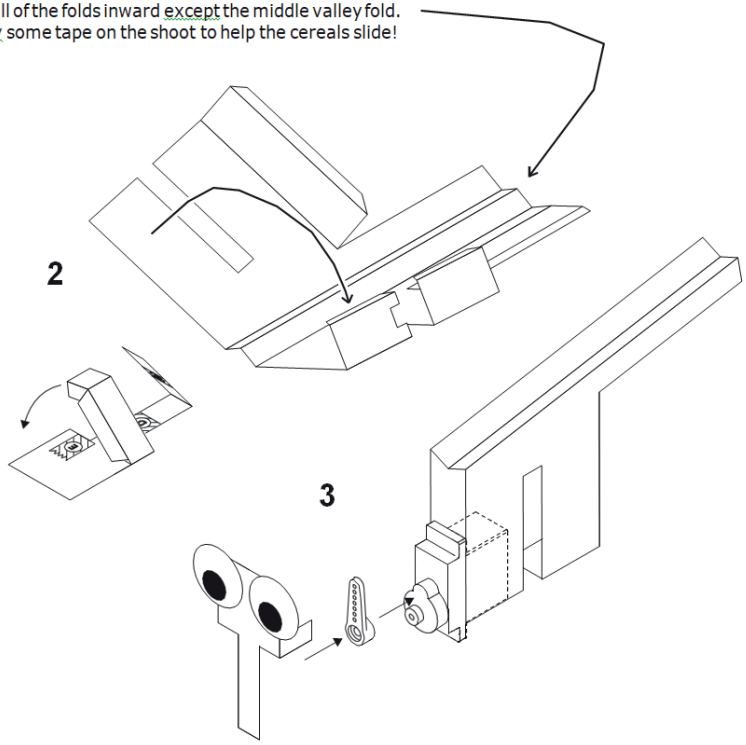
Electronics

Connect the arduino to the micro servo using the jumper wires.



Folding

For step 2 make all of the folds inward except the middle valley fold.
After step 3 apply some tape on the shoot to help the cereals slide!



WHAT HAVE WE LEARNED; LET'S ASSESS!

1. ACTIVITY QUESTIONS

· Neurons are made up of 3 main parts. These are:

√
√
√

· Match the structures below.

a) Dendrites	**1) Input (Weights)**
b) Axon	**2) Adding Function**
c) Nucleus	**3) Activation Function**
d) Synapses	**4) Output**

2. ACTIVITY QUESTIONS

· What does the increase in the number of hidden layers in artificial neural networks, cause?

√
√

· What is the result of the increase in the weight of input in artificial neural networks?

√

3. ACTIVITY QUESTIONS

· Which extension is required for artificial intelligence application on mBlock 5?

√

· Which tab is used for adding "duration" in an activity?

A) Sensing B) Variables C) Control D) Looks

4. ACTIVITY QUESTIONS

· Which extension is required in order to create an integrated artificial intelligence application on mBlock 5?

√

· Which emotions can't be measured in an activity?

A) Happy B) Sad C) Angry D) In Love

5. ACTIVITY QUESTIONS

· Is it possible to identify moods?

o Yes o No

· Complete the code structure like shown below.

· The sprite turns on the camera and takes the image.
· Processes the image in the background.
· If my mood is,
o Play "dance music" on the music structure.
· If my mood is,
o Play "sad music" on the music structure.
· If my mood is not - - - - - -
o Play "Classical music" on music structure.

6. ACTIVITY QUESTIONS

· Which method was used for artificial intelligence applications for this activity?

o Image Processing
o Voice Processing
o Text Processing

· Which "Conditional Statement" is used for playing musical notes on cue?

o _____repeat until done
o _____wait until done
o If _____
o Continuously

7. ACTIVITY QUESTIONS

· Which code is used to move the sprite one step right?

o add 1 to x
o add 1 to y
o subtract 1 from x
o subtract 1 from y

· Which one is created for a circle labyrinth platform?

o Sprites
o Background
o Devices

8. ACTIVITY QUESTIONS

How could you use image processing, object prediction and definition within an AI structure that could be used in a daily life activity? (Create 1 sample and list the features.)

Example:_____

Features: _____
_____
_____
_____

· Which sound processing feature is used for converting text to sound on mBlock5 and other software?

- **o TexttoSpeech**
- **o SpeechtoText**

9. ACTIVITY QUESTIONS

· Your drawing on the web-based application appear as example on others' screens and others' drawing appear on your screen as examples. What is the structure in the background which enables this?

- **o Data Structures**
- **o Algorithm**
- **o Database**
- **o Programming**

· In which structures could you use the object completion structure in an application for everyday life? (Create 1 sample and list the features.)

Example:_____

Features:_____
_____
_____
_____

10. ACTIVITY QUESTIONS

· Which method was used to predict the drawings in artificial intelligence application for this activity?

o Image Processing
o Voice Processing
o Text Processing

· Which method was used for Artificial Neural Networks for this activity?

o Classification
o Prediction

11. ACTIVITY QUESTIONS

· Which method is used for identifying movements for image processing in artificial intelligence application for this activity?

o Marking
o Prediction
o Classification

· In which structure of the daily life could you use the object matching structure of the application? Create 1 sample and list the features.)

Example:_____

Features:_____
_____
_____
_____

12. ACTIVITY QUESTIONS

· Which method was used in the activity to determine the direction keys that are often used in artificial intelligence applications?

o Image Processing
o Voice Processing
o Text Processing

· Which one is among the field of use for artificial intelligence?

o Games
o Autonomous Devices
o Robot Structures
o Data Analysis Structures
o All

13. ACTIVITY QUESTIONS

· Which one is intervened the most by users in Artificial Neural Networks?

o Inputs
o Hidden Layers
o Outputs

· Which one/ones are used in artificial intelligence applications?

o Artificial Neural Networks
o Machine Learning
o Deep Learning
o All

14. ACTIVITY QUESTIONS

· In which layer does Deep Learning take place in Artificial Neural Networks?

- **o Input**
- **o Adding Function**
- **o Hidden Layers**
- **o Output**

· Which structure was used in the activity to recognise human body and allow it to be used in the applications?

- **o Voice Processing**
- **o Image Processing**
- **o Data Processing**
- **o Text Processing**

15. ACTIVITY QUESTIONS

· Which electronic card was used in the activity to code for artificial intelligence?

- **o Mbot**
- **o Arduino**
- **o Raspberry Pi**
- **o Microbit**

· Where in everyday life could you use the separator developed with Arduino in the application, as an example? Create 1 sample and list the features.)

Example:_____

Features:_____
_____
_____
_____

ANSWERS

ACTIVITY 1

· INPUT, HIDDEN LAYERS, OUTPUT

· A-2 , B-4 , C-3 , D-1

ACTIVITY 2

· Increase in the time, Exhausted Processor

In the event that input weight increases, output value shifts towards the increased input value. During the machine learning, output value will increase or decrease the same as input value.

ACTIVITY 3

· Machine Learning

· B) Variables

ACTIVITY 4

· Cognitive Services

· D) In Love

ACTIVITY 5

· Yes

· The sprite turns on the camera and takes the image.

·Processes the image in the background.

· If your mood is happy,

o Play "dance music" on music structure.

· If your mood is sad,

o Play "sad music" on music structure.

· not

o Play "classic music" on music structure.

ACTIVITY 6

· Image Processing

· If

ACTIVITY 7

· Subtract 1 from x

· Background

ACTIVITY 8

· Example: Medicine System in Chemists: A system could be created to inform the consumers about the effects of a certain medicine, its use, advantages and disadvantages.

ACTIVITY 9

·Database

· Example: Drawing Software for Civil Engineers

Features:

With an application where the completion is performed according to the drawings, space could be drawn in an easier way and different architectural structures could be created with different drawings.

ACTIVITY 10

· Image Processing

· Prediction

ACTIVITY 11

· Marking

· Example: Features of System That Detects If Someone Is Resting or Working

People could automatically be monitored with a system developed to tell if a person who works in a physical job (i.e. a builder) is working or resting at that moment.

ACTIVITY 12

· Image Processing

· All

ACTIVITY 13

· Inputs

· All

ACTIVITY 14

· Hidden Layers

· Image Processing

ACTIVITY 15

· Arduino

· Example: A Separator System for Red Apples and Green Apples

Features: Thanks to a system where apples are sorted based on their colour and put into boxes, time will be saved, and it will be easier to sort kilograms of apples

ARTIFICIAL INTELLIGENCE SOFTWARES FOR KIDS

https://machinelearning-forkids.co.uk/#!/work-sheets

1-) Machine Learning for Kids: https://machinelearningforkids. co.uk/

About: Providing hands-on experience for machine learning, the website contains beginner activities for learning about artificial intelligence. It is an environment with text, number, image and voice recognition as well as easy block-based coding for machine learning models. Students could carry out block-based coding either on Scratch or MIT App Inventor. It was first created in 2017 and it has been used by schools, coding clubhouses and thousands of families.

Examples:

https://machinelearningforkids.co.uk/#!/worksheets

https://experiments.withgoogle. com/

2-) Google Experiments: https://experiments.withgoogle.com/

About: Since 2009, coders have produced thousands of interesting experiments on Google Chrome by using Android, AI, Web VR, AR and more. Incorporating every new structure, it is an ever-developing platform. It provides a user-friendly interface and infrastructure. Now, let's list the extensions:

Examples: Teachable Machinehttps://experiments.withgoogle.com/teachable-machine

Examples: MixLab- https://experiments.withgoogle.com/mixlab

Examples: With audio directions: https://experiments.withgoogle.com/collection/voice

Examples: Augmented Reality

https://experiments.withgoogle.com/collection/ar

Examples: Chrome Experiments- https://experiments.withgoogle.com/collection/ch- rome

http://cognimates.me/home/

3-) MIT Media Labs: Cognimates: http://cognimates.me/home/

About: An AI education platform for creating games, programming robots and artificial intelligence and machine learning.

Examples: http://cognimates.me/projects/

ecraft2learn.github.io

4-) eCraft2Learn: ecraft2learn.github.io

About: Thanks to this model that was created to be used for delivering training with an interface similar to that of Scratch 1.1, the structures to be used for artificial intelligence and machine learning have been added to the website.

Examples: https://ecraft2learn.github.io/ai/

appsforgood.org

5-) AI Examples with Good Practices: appsforgood.org

About: Appsforgood is a free platform offering technological structures to schools and young people. One of the latest applications is a machine learning application including artificial intelligence.

Examples: https://www.appsforgood.org/courses/machine-learning

aiinschools.com

6-) Artificial Intelligence and Machine Learning for Schools: aiinschools.com

About: AIinSchools provides free lesson plans for teachers to explain AI to 13-14 years old children in average. The classrooms created for this purpose are equipped with artificial neural networks, cameras and GPUs.

Examples: http://aiinschools.com/resources/

readyai.org

7-) AI-in-a-Box: readyai.org

About: AI-in-a-Box provides a set for applying robots, accessories and teaching materials on artificial intelligence. There is a well-known device in the set. It's Cozmo, an education model including the world's smallest robot with artificial intelligence.

Examples: https://www.readyai.org/readyai-you/ai-in-a-box/

www.ai4children.org

8-) AI for Children: www.ai4children.org

About: It is supported by Dalton Learning Lab, AI and Artificial Learning Tools. Dalton Learning Lab was created to perform widely accepted teaching operations and help children about machine learning by using Scratch.

Examples: https://www.ai4children.org/

https://childsafe.ai/

9-) Childsafe: https://childsafe.ai/

About: This structure whose beta version will be published soon will help machine learning to be done easily. Website will be activated soon.

Register: https://childsafe.ai/beta-signup

www.youngwonks.com

10-) YoungWonks: www.youngwonks.com

About: It is a tool for children and young people to learn about machine learning and carry out activities of machine learning an AI. At this level, students learn about SciPi, OpenCV and TensorFlow. It allows people who know about Python programming to code easily.

Examples: https://www.youngwonks.com/machine-learning-ai-programming

AFTERWORD

Artificial Intelligence for Children is the product of our efforts towards the new educational approach that we have been working on with great devotion in coordination with Urfa STEM Center, Karaköprü STEM Center and Genç STEM centres which derived from two initial STEM workshops. In the past years, every step of STEM approach has been handled in a holistic way and artificial intelligence application which is an important part of technology use in education has been prepared with the hope that it will be beneficial for Turkey.

Every book is a product of an opinion and a subject matter that the author is occupied with. Our matter is our nation and the future of our nation, children.

Just like all teachers who have been working devotedly for their country, we have been feeling the joy of providing children with new sources as a handful of honoured teachers who are devoted to their occupation. This book is the printed material of a project carried out to help children produce with developing technologies and keep up with the rest of the world.

For books to be functional and beneficial for the reader, author should be competent with the subject and write about what he/she knows the best. This was ta- ken into consideration while writing this book. To create a book full of the related content, we have worked rigorously with experts from Urfa STEM Center and the educators of Genç STEM Association.

This book contains artificial intelligence application from beginner level to advanced level. Illustrations were included so that every reader could comprehend the topics and application. Providing full support throughout the process of creating this work and during the pilot as a production of a projects supported by the Turkish National Agency, we would like to thank The Directorate General of Innovation and Educational Technologies of the Ministry of National Education, Harran University, Şanlıurfa Provincial Directorate of National Education, and educators of Genç STEM who have pioneered many projects since the establishment, made a difference in education in Şanlıurfa, worked night and day, spared time for education more than their families and aimed to contribute to the society more than themselves.

On behalf of
Urfa STEM and Genç STEM
Halil İbrahim ÇETİN

Erasmus+

FOR CHILDREN

ARTIFICIAL INTELLIGENCE

ABDURRAHİM SARGIN
DR. AHMET GÖÇEN

URFASTEM