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Class VII

My Dream Book of ARTIFICIAL INTELLIGENCE

CBSE CODE 417

Learning challenges
Experience online!
Python Turtle
Build a game!
Mini Projects
Block Coding
AI Games







ISO 9001:2015 Certified Company

Class VII





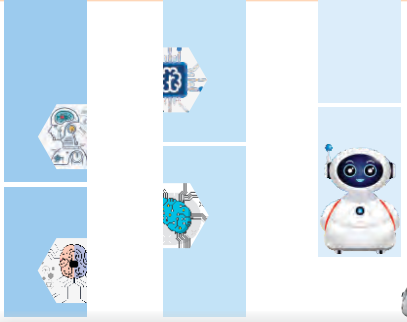
My Dream Book of
ARTIFICIAL INTELLIGENCE

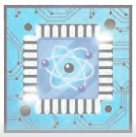
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A WORD TO THE LEARNERS AND THE MENTORS

MACHINES ARE COMING! They aren't dumb anymore! Machines are processing language, identifying pictures, recognising faces, voices and patterns, sensing trends, controlling vehicles, making forecasts using enormous data produced in past decades and still continued as you read this.

Our children are growing up with smart devices loaded with intelligence and intuitive interactions. When they grow up, the world would be unimaginably different. How? In terms of career opportunities, smart public services, smart homes, schools and hospitals and a daily life inhabited by smart machine-citizens.

This is the time to prepare them for the rapidly changing future.

This book – **My Dream Book of Artificial Intelligence**, is a primary effort in this direction. As CBSE has already announced about its endeavours in integrating AI with every subject and exposure to children about artificial intelligence in a fun oriented way, this book fulfils that very requirement.

HOW THIS BOOK IS ORGANISED?

Considering the very young age o the learners, this book brings fun to the learning desk. Children will explore AI concepts through the following:

- Fun activities to explore concepts.
- Games and challenges to understand the techniques.
- Mini projects (assignments and online exploration) to reinforce their learning.
- Exposure to computer programming logic development through Python Turtle library.
- Key Learning is a set of keywords used in the chapter.
- Learning Point to summarize the chapter.

GAME DEVELOPMENT

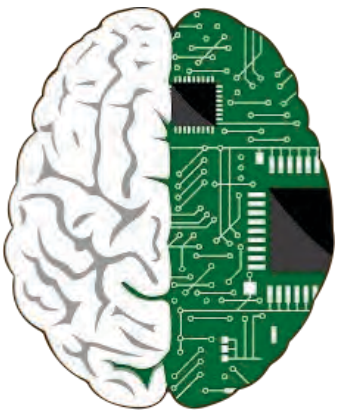
The book encourages kids to design and develop a game to inculcate in them the strong traits of problem solving, critical thinking, team dynamics and communication skills.

We strongly believe that our sincere efforts in bringing this book to you will surely help learners explore AI concepts in the most interesting ways and at the same time, teachers will enjoy conducting this course.

HAPPY LEARNING

1 Understanding Intelligence

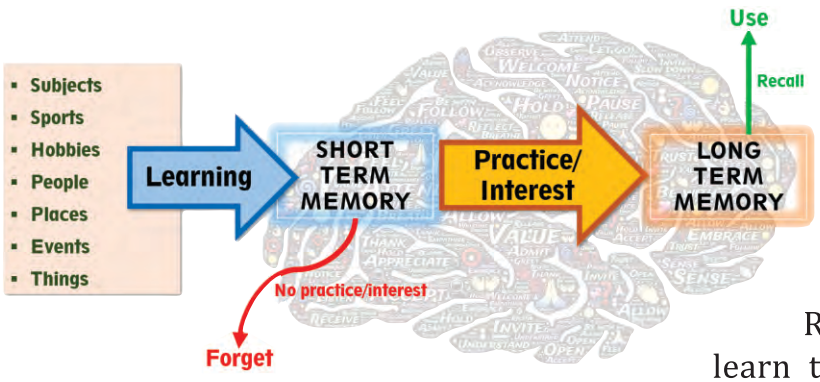
Dear children,



We have learnt that ***computers cannot learn***. Computers cannot have the kind of memory that remembers!

Computers can store data but they do not have their own intelligence to use it. To use that data, they need instructions from humans. Computers cannot decide and handle a situation on their own.

Whatever we humans learn, first goes in our short-term memory just like primary memory of the computer. By constant practice and repeating, this learning shifts from short-term memory to our long-term memory. In long-term memory, the learning remains for pretty long time, even for lifelong. For example, basic Math, knowledge of other subjects, things we use, people around us, sports and games we play, the books we read, the movies we watch and the songs and jokes we listen to. We remember all this because with constant exposure and practice, we retain it in our long-term memory.



Sometimes, certain unfortunate events like accidents and shocks occur in many people's lives. Their experience directly embeds in our long-term memory deep for almost lifelong. For example, the electric shock or touch of a hot object. Remember? That first shock made us learn that hot objects need to be handled carefully. So, shocking experiences – good or bad – influence the depths of our brain without going through short-term memory and stay there permanently.

Besides practice and exposure, there is ***interest***. Our interest determines how much we shall learn and remember about anything. That is why we all have favourite subjects and favourite things we like to do. Interest determines our likes and dislikes for learning about the things in the world.



It is the learning that has brought us from the stone age to the modern information age. And, today, we have modern technology, sophisticated machines, advanced software and several individuals of great intellect.

Today, we want our machines, our computers to learn and exhibit intelligence – **Artificial Intelligence!**

Exploring Intelligence

Brain is far superior than a computer. Computers are faster but they are not as smart as the brain is.

Let us try to decode the term ***intelligence***.

Many a times we hear that such and such person is very intelligent. Scientists are intelligent. Astronauts are intelligent. Dog and horse are most intelligent animals. Parrot and Cockatoos are among most intelligent birds.

Ants, Bees and Termites are intelligent insects.

FRIEND	EXCELLENCE

You must have noticed that while you are good at one thing, your friends are good in other things. One likes mathematics and the other likes to compose poetries. One of your friends is a good dancer while another has a nice voice. Some other people play musical instruments and some are very good at making friends. You agree? People possess multiple skills, talents and abilities.

Can you name five of your friends who are good at different things?

Let us see how our intelligence works.

Download the activity sheets from eduitspl.com – Teacher's Corner and let the students complete the challenges given in them.

So, you sure have enjoyed these teasers.

But what was the purpose of having you go through these activities?

To help you discover the facts that:

Intelligence comes from learning

Intelligence is used to draw conclusions and solve problems

To solve different types of problems, different types of intelligence are needed

Different Types of Intelligence

Can you confidently tell who is intelligent and who isn't? Do you think dogs and parrots are intelligent? If yes, how? Ants are not good at math but they sure are great engineers!
We all have a combination of various types of intelligence, if not all. Let us have a look at them.

Verbal Intelligence



Such people love words. They love reading, writing and making speeches. They like to argue, debate and discuss things. They have good vocabulary and they compose poetries, write essays, participate in spellathons. They make great writers, poets, scriptwriters, lyricists and orators.



Logical Intelligence

Such people love numbers. They like solving math problems and analysing numbers and data values. They make good computer programmers and strategy game players such as Chess and Go. They believe in deriving the conclusions from the given facts.

Spatial Intelligence



Such people love visuals. They perceive and think about things in graphics. They have strong visualisation power. They are creative in designing things. They are good at reading maps, drawing pictures and depicting concepts in graphical forms such as charts and diagrams. They make good graphics designers, animators and film makers.



Kinaesthetic Intelligence

These people love activity, movement and touch. They are dynamic in spirit. They like to do the things and experience first-hand. They would like to visit the place instead of learning about it in the books. They are outgoing and like to meet people. They make good sportspersons, soldiers, dancers, stage performers, mountaineers, travellers, builders, engineers, sculptors, carpenters and makers.

Musical Intelligence



They are feelers and thinkers. They like to perceive through listening. They look for harmony and balance in everything. They have a special knack to understand music and master it. They make good composers and singers, meditators, nature-healers and counsellors since they are good listeners.



Interpersonal Intelligence

These people love to meet other people, connect with them, develop contacts and have a good social circle. They possess strong communication skills irrespective of language. They have many friends and they are popular among the masses. Such people make businessmen, teachers, sales persons, counsellors, lawyers, public figures, political leaders and influencers.

Intrapersonal Intelligence



These people are often labelled as introverts or shy. They feel, think and ponder. They do not haste. They take their time to reach at conclusions. They are deeply aware of their needs and wants. They love to do things alone and stay away from the crowd. They are reluctant in sharing their ideas openly with others. Such people make great thinkers, spiritual personalities and writers, painters, seekers and mentors.



Naturalistic Intelligence

These people are empathetic, feelers and kind in nature. People find them sweet and forgiving. Such people are closely interested in nature and its phenomena. They have a special knack to identify characteristics of living beings, plants and other natural elements such as rocks, soil etc. They are highly sensitive towards the threats to the nature. They are concerned about the ill practices that destroy natural bodies such as water, forests, animals and natural beauty. They make farmers, social workers, philanthropists, nature activists, geologists, environmental scientists, green fighters, marine or wildlife researchers and forest officers.

Now that you have better understanding of various types of intelligence and learning styles can you rethink on the challenges you did earlier as to which type of intelligence helped you in solving them.

Which types of intelligence helped in solution?

Challenge 1

Challenge 2	
Challenge 3	
Challenge 4	
Challenge 5	
Challenge 6	
Challenge 7	
Challenge 8	

Intelligence testing is a complex process and involves different types of assessments carried out by experts. However, to assess yourself as to which mix of intelligence type you possess, you can use this online assessment.

https://www.literacynet.org/mi/assessment/findyourstrengths.html

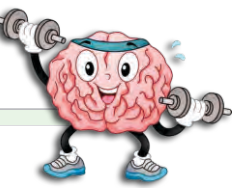
Learning Points

- Intelligence comes from learning.
- Intelligence helps us draw conclusions and solve problems.
- Intelligence is of different types.

Key Learning

- **Verbal:** Related to reading, writing and speech.
- **Logical:** Related to reasoning.
- **Spatial:** Related to visuals.
- **Kinaesthetic:** Related to movement and touch.
- **Interpersonal:** Among the people.
- **Intrapersonal:** Within one-self.
- **Naturalistic:** Having inclination towards nature and environment.

Exercise



A. Select the correct answer.

1. The process of learning enhances our _____.
   a. Knowledge ☐ b. Intelligence ☐
   c. Both a) and b) ☐ d. None of these ☐
2. Our intelligence helps in which of the following?
   a. Draw conclusions from the facts ☐ b. Solve problems ☐
   c. Learn more ☐ d. All of these ☐
3. To solve different types of problems, different types of _____ are needed.
   a. People ☐ b. Plans ☐
   c. Places ☐ d. Intelligence ☐
4. People with which type of intelligence make great writers and poets?
   a. Verbal ☐ b. Logical ☐
   c. Musical ☐ d. Kinaesthetic ☐

5. People possessing which of the following type of intelligence are considered introverts?

a. Interpersonal
b. Kinaesthetic
c. Intrapersonal
d. Verbal

B. Match the column A with column B.

A	B
1. Verbal intelligence	a. Good at reading maps, designing things, animators.
2. Logical intelligence	b. Love reading, writing, compose poetries, orators.
3. Spatial intelligence	c. Composers, singers, good listeners.
4. Musical intelligence	d. Mostly quiet, spiritual thinkers, painters.
5. Kinaesthetic intelligence	e. Empathetic, feelers, philanthropists.
6. Interpersonal intelligence	f. Have good social circle, strong communication skills.
7. Naturalistic intelligence	g. Outgoing, dynamic, like to explore things themselves.
8. Intrapersonal intelligence	h. Drive conclusions from facts, good at analysis.

C. Mark the following statements as True or False.

1. Some people are intelligent while some are utter fools.
2. Computers only know English language.
3. Computers are faster but not smarter than human brain.
4. Everyone is intelligent in different ways.
5. People can have multiple intelligences.

D. Answer the following questions.

1. What do you mean by learning?
2. How can you say that all the people are intelligent in different ways?
3. Where does intelligence come from? How does it help us?
4. List various types of intelligence.
5. Write one major trait of any five types of intelligence.

Mini Project...

Prepare a set of 10 questions asking the likes and dislikes of people. Identify any 3 of your friends. Ask them to fill answer the questions. Then, analyse their answers to the questions and find out the combination of intelligence types they possess.



Watch & Learn

www.eduitspl.com

www.youtube.com/edusoftknowledgeverse

2 Artificial Intelligence in Daily Life

Dear children,

Picking up from the previous learning



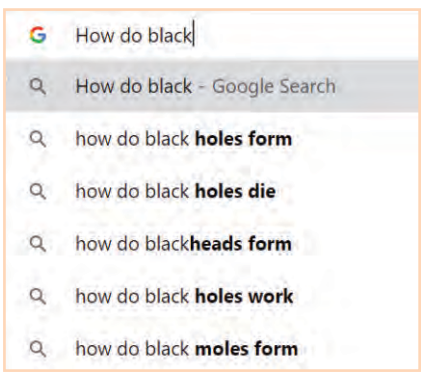
We have learnt...

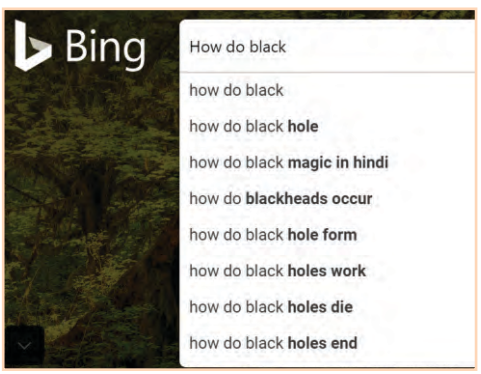
- That computers work differently than human brain.
- About the possibilities of a machine to learn like humans.
- Everyone is intelligent in their own ways.
- About different types of intelligence.
- That there are different types of learning styles.
- How different types of learning aid in different types of intelligence?

Before delving deep into the concepts of artificial intelligence (AI), let us explore how AI has already begun influencing our lives and industries in various exciting ways as we read this.

Smart Search

Go to Google or Bing or any popular search engine. As you type what you need to search, the search engine displays recommended words for you. These recommendations are generated by AI algorithms on the basis of your previous searches and the data collected



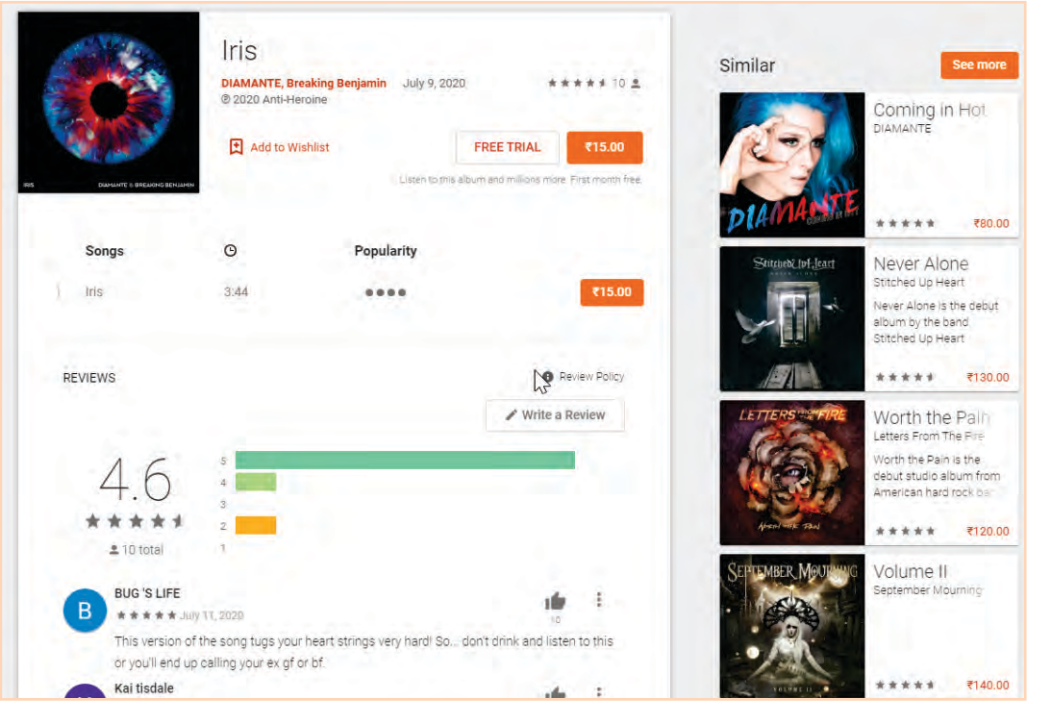


about you from your online activities. Such predictions of words in search is called ***predictive search***.

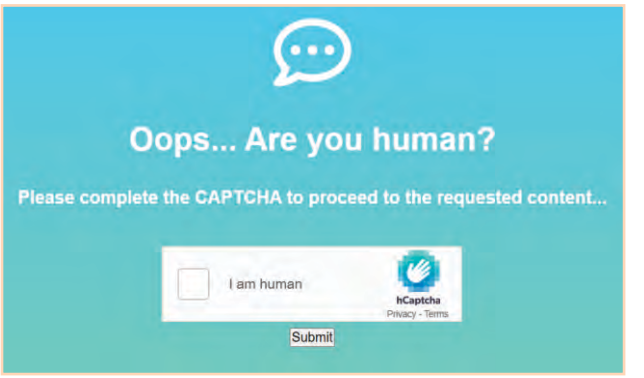
Product Recommendations

Try buying online your favourite book or running shoes and see how similar books and shoes are recommended to you. Along with this, other products related to these are also listed e.g. you buy a wallet and the belts are also recommended. AI algorithms do this by analysing the data collected about your buying habits and preferences in the past. This also happens when you browse new movies, music and articles online.





Fraud Detection and Prevention



Ask your parents or elders, if a transaction of huge amount is done online, the bank sends an alert on the phone of the customer. AI algorithms on financial websites, such as banks and loan companies, are programmed to look for unusual trends like huge amount, number and speed of transactions in an account at a time, repeated attempts of login in an account etc. In such cases AI algorithms respond in different ways such as confirming user's identity in multiple ways before executing the transaction, blocking the account temporarily, asking customer to call the bank, alerting authorities in case of huge amounts.

Such detections also help in tracing terrorist funding activities, black money trail, fraudulent businesses, illegal finances etc.

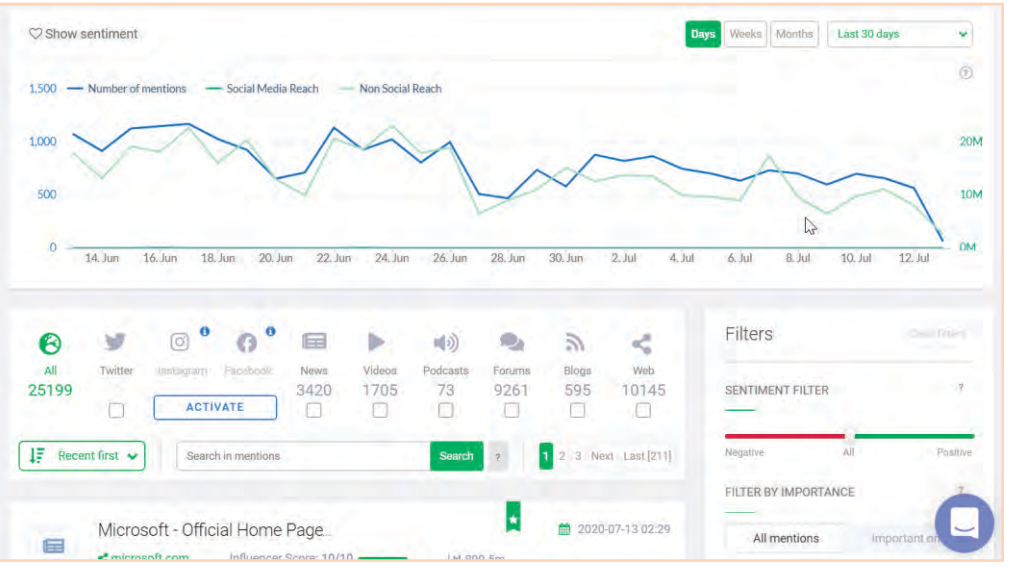
Location and Directions



Google Maps is indispensable today for those who travel. Its AI enabled system calculates commute time, displays traffic conditions, finds the best possible shortest or fastest route e.g. orange route indicates busy road while red means traffic jam.

Depending on your live location and specified destination, the apps display the current rides which you can share.

Sentiment Analysis



We interact with friends and other people online. We share tweets, messages, pictures, videos and we do online chat. All these details help in training AI algorithms to learn more about us and analyse our reactions towards things, events and personalities. These reactions help AI algorithms classify us as potential customers, assess our satisfaction level, likes/dislikes for a product or movie or song. This analysis helps

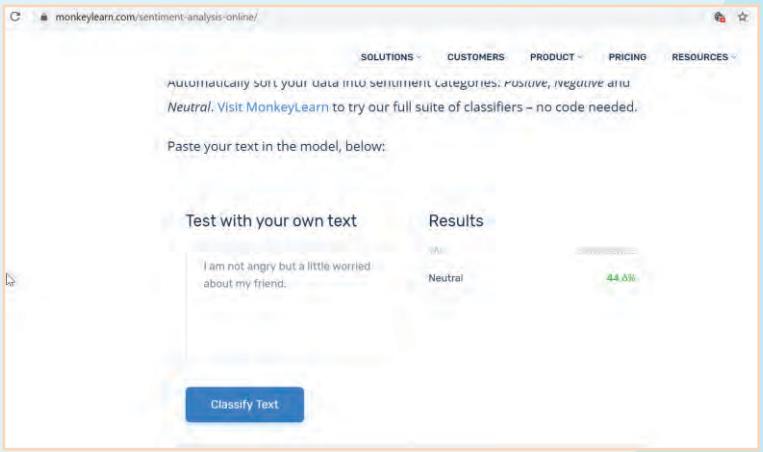
businesses devise their marketing and advertisement strategies. Sentiment analysis helps celebrities and political parties assess their popularity among masses. Our online responses make the digital pattern of our sentiments.



Activity

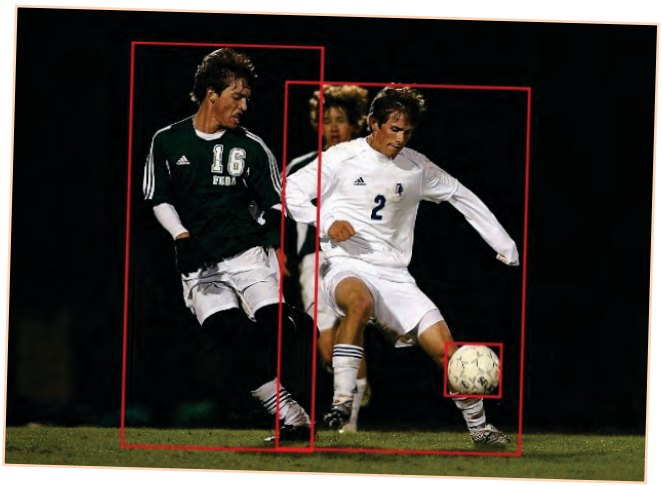
Sentiment Analysis

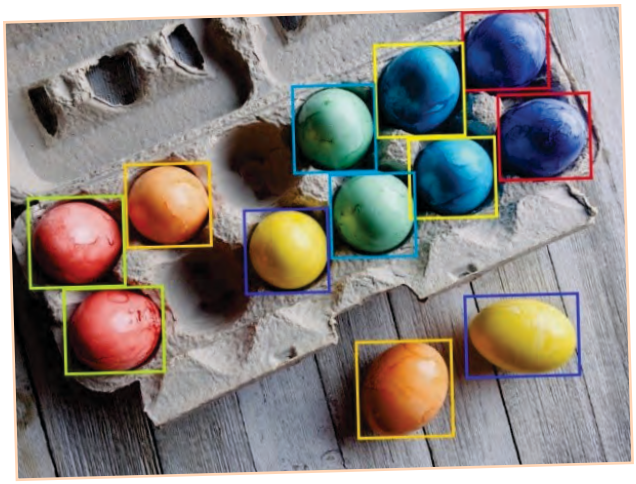
Go to **monkeylearn.com/sentiment-analysis-online** and try out different sentences expressing different emotions. See how the AI engine performs sentiment analysis.



Object Detection

AI algorithms are today detecting faces to unlock devices and matching fingerprints to access applications. This is called **biometrics**. Some AI algorithms can record the 3D details of your face using several thousand infrared dots that fall on your face and a unique facial signature is created. Algorithms can detect specific objects in an image or a video still. E.g. detecting forest fire, emerging storm, dangerous tidal waves, approaching flying object or underwater object, identifying species of birds, animals and fish, creating visual patterns of population distribution, traffic control, self-driven cars etc. Object detection and object classification is a very useful application aided by AI. It can be used in all major industries to serve humanity.





Fun Fact



Self-driven Car - Waymo

Google's subsidiary Waymo developed this self-driven car after research that began in 2007. After several test drives and improvements the self-driven version of Waymo with no driver and any human help was tested successfully on real roads in Texas.



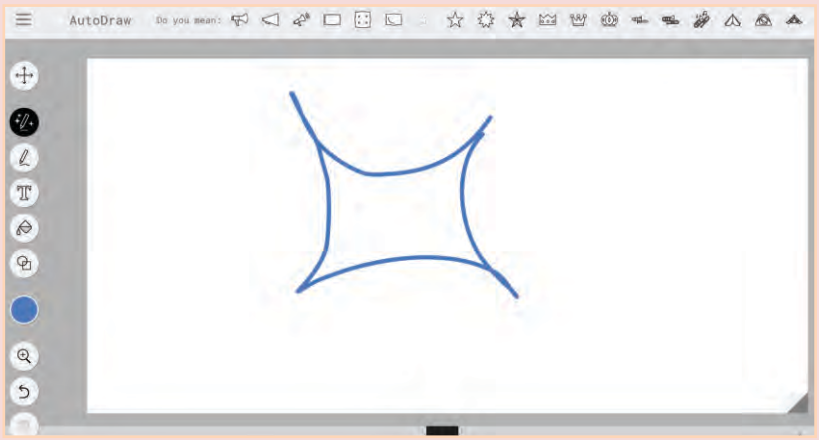
Waymo is equipped with a rooftop camera – LiDAR to create a 3D vision for the car 200 meters around. Overall, it has 6 such sensors. It has GPS sensors to help it assess road conditions and lane positions. Gyroscopes, tachometers and altimeters fitted inside the car help it maintain its direction and balance. The car is able to identify other vehicles and obstacles in front and around. It identifies traffic signals and hand gestures made by other commuters.

Activity



Drawing with Object Detection

Go to **www.autodraw.com.** This site detects the drawing strokes made by you, tries to guess the closest shapes and lists them. Users can select the shape they try to draw from among the list of shapes.

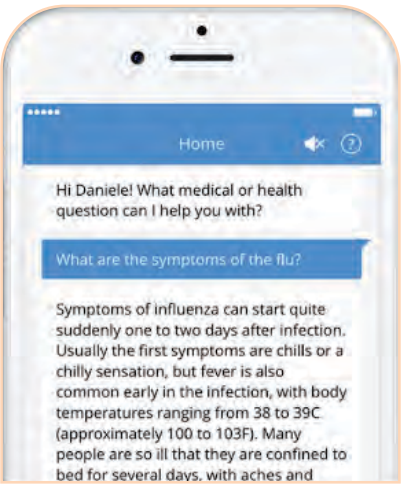


Language Processing

Computers equipped with AI algorithms are able to process language in various forms – spoken and written. This is called **Natural Language Processing (NLP)**.

AI algorithms can identify keywords in the text and execute tasks accordingly. Digital assistants

such as Amazon Alexa use NLP AI algorithms to understand human spoken language and respond in human-like voice (identified as Alexa's voice). NLP can also be used to identify and classify various documents like categorising books in a library under different genre. In any field where text, documents and speech are involved, NLP has its tremendous use.



There are two interesting terms worth knowing about – **Speech recognition**, which means recognising ***what*** is spoken and **Voice recognition**, which means who has spoken. Most of the applications work on speech recognition rules. Voice recognition is important where authorisation of a person is required.

One of the most popular applications of NLP are Digital Assistants and Chatbots. Digital Assistants can understand speech and execute the routine tasks such as playing a song, switching on the TV, checking email etc. Chatbots are used to handle customer queries and execute common requests such as placing request for cheque book with the bank, ordering food, securing appointment with the doctor etc.

Fun Fact



Amazon Alexa, Google Assistance, Apple Siri And Microsoft Cortana



Alexa, Assistant, Siri and Cortana are voice driven virtual assistants by their respective companies. They are just like voice-driven wizards, equipped with speech recognition and natural language processing technologies, which can do a lot of things for you such as answering almost any question on any topic, set reminders for you, doing weather forecasts, playing your preferred music, delivering messages, switch to various channels such as sports, education, markets, entertainment etc. Today Alexa has around 90000 functions and skills that it can perform for the user. Google Assistant identifies objects, songs, user preferences and allows E-commerce by voice. Users can set voice shortcuts for common commands. Siri can navigate locations. Coratana is available with Windows 10 systems to provide voice based commands and search features using Microsoft's search engine Bing.

Fun Fact



IBM Watson

Watson by IBM is an AI based Question-Answer system that answers the questions asked in natural language. It is developed by the team headed by David Ferrucci. Its first successful implementation was done at Memorial Sloan K. Cancer Centre, New York where it helps in lung cancer treatment.



Watson is able to gather massive data from encyclopaedias, newspapers, dictionaries, and databases. Then it analyses the immense amount of data to generate various hypothses which help it to answer the new questions posed by the users. It runs on Linux operating system and 90 powerful server computers of IBM equipped with 16 TB RAM and 3,5 GHz 8-core micro-processors.

Activity



My Smart School

Imagine that your school needs to run on artificial intelligence software. Right from coming to the school till leaving the school, think of various tasks and areas where AI can be used. Use your imagination and creativity to suggest what amazing things you would like AI to do for your school.

Activity



Word Association

Go to https://research.google.com/semantris/ and click on PLAY BLOCK button. It shows a set of blocks with words. You need to enter a clue for any word and AI system tries to guess the related word. For example, if you type: vast blue waves then it will guess the word Ocean.





The AI system is trained into several million examples and variations of text pieces so that it is capable to relate the phrase entered by you with the closest possible word.

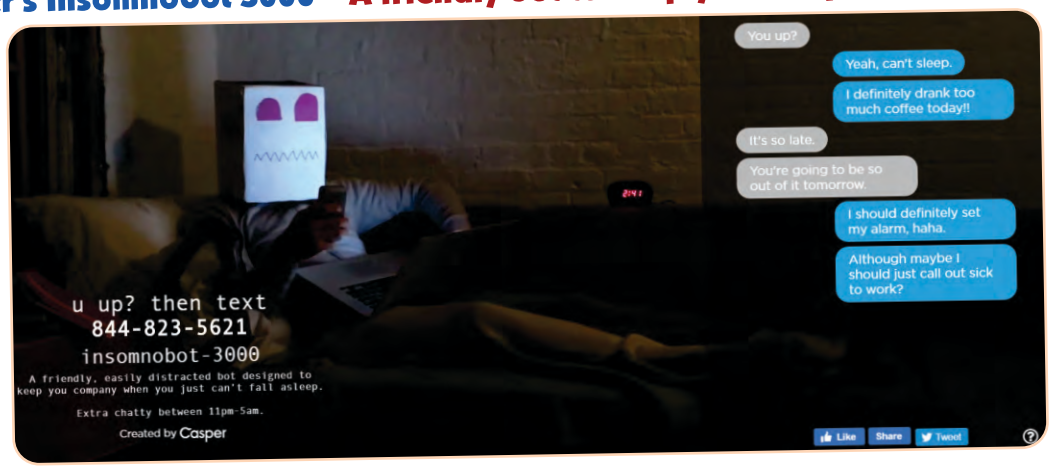
Semantris is built by Ben Pietrzak, RJ Mical, Steve Pucci, Maria Voitovich, Mo Adeleye, Diana Huang, Catherine McCurry, Tomomi Sohn, and Connor Moore.

How does it work? This is a demonstration of how a computer can understand what you speak to it in everyday language.

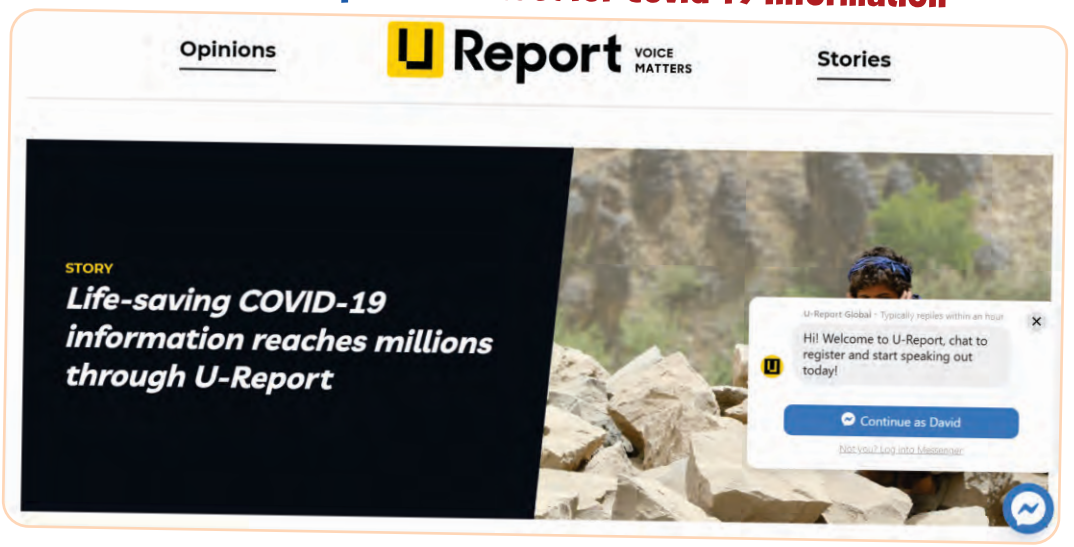
Several millions of lines of human conversations have been used to teach this AI system to figure out how real human conversations occur.

Once the AI is trained, it is able to predict how likely one statement would follow another as a response. The AI is simply taking in what you type and doing a lookup into a pool of many possible responses to find the most likely ones. The technique used is called **machine learning**. In the next section you will learn about machine learning.

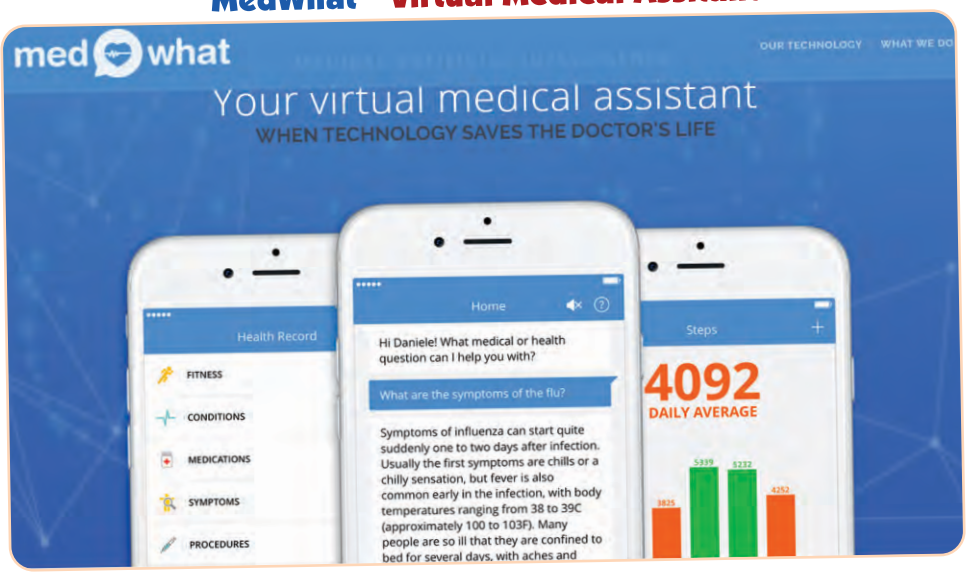
Casper's Insomnobot 3000 – A friendly bot to keep you company if you can't sleep.



UNICEF – U-Report – Chatbot for Covid 19 Information



MedWhat – Virtual Medical Assitant



ALICE – Bot for Assistance in Stock Trading





Activity

Interact with a Chatbots

Go to these URLs and try interacting with chatbots. Discuss your observations and experience.

https://watson-assistant-demo.ng.bluemix.net/

https://sites.google.com/site/webtoolsbox/bots



Practical Activity

Train A Computer



This project will give you a simple experience of how machine algorithms are trained with data and how they perform the desired task based on the training. This is called supervised machine laearning since you are telling the machine what it is supposed to do with the data.

In Teachable machine project, we are takin up image project to train the machine algorithm in identifying some image. After training, the machine will be able to identify and match the image shown through the web cam if a match is really found.

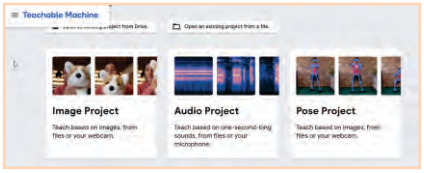
A. Preparing and Uploading the Data

Follow the steps given in the sections below:



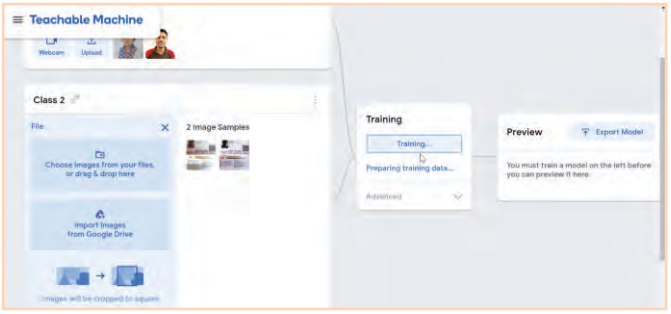
Arrange a dozen of images of which 4 should be yours and rest of other people. Then upload the images following the steps given here.

1. Visit https://teachablemachine.withgoogle.com/ and click on **Get Started.**
2. Click on **Image Project.**
3. Upload 6 images in each class (Class 1 and Class 2) one-by-one by clicking **Upload button**.



B. Train the Algorithm

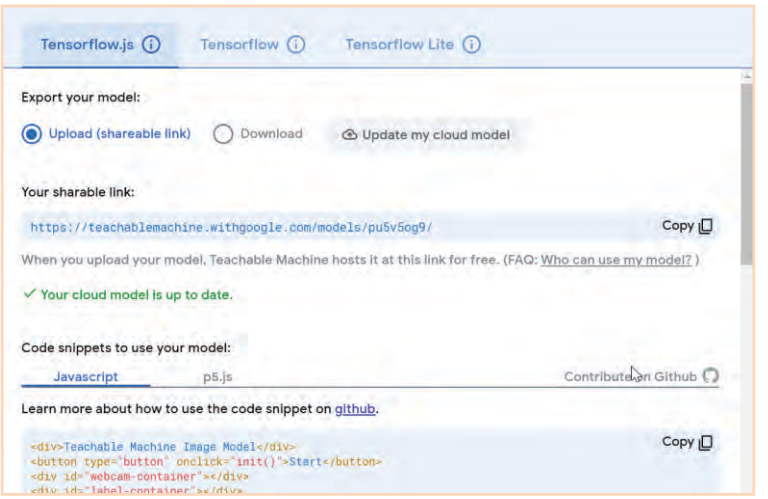
1. When all the images are uploaded, click on **Train Model** button. It will take a while to train the algorithm with the uploaded images.



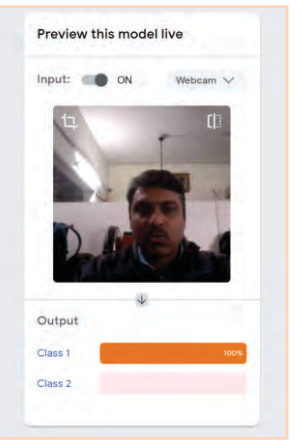
C. Export and Test your Model

1. After training, click on **Export Model** button.
2. In the popup, Click on **Update my cloud model**. A link to your teachable machine will be created.
3. Copy this link and paste it in new browser window to test.





Note: During the test, webcam should be on and working. The machine algorithm will try to recognise your face with the trained data and tell you how much percentage your face match was found. Also, try any other different printed image in front of web cam or ask a friend to show his/her face in the web cam. See if algorithm is able to tell that the match was not found.



Way Ahead

Similarly, try out **Audio project** and **Pose projects** also. **Have fun!**

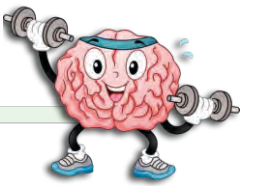


- Prediction of words while typing search string in a search engine is called predictive search.
- Some common applications of AI are smart search, fraud detection, product recommendation, location and direction, sentiment analysis, object detection and language processing.



- **Biometrics:** Process and applications of detecting fingerprints, faces etc.
- **NLP:** Natural Language Processing – a domain of AI.
- **Sentiment:** Like/ dislike about something or someone.
- **Predictive:** To be predicted or forecasted on the basis of collected data.

Exercise



A. Select the correct answer.

1. Predictive search is the feature of which of the following?
   a. Chatbot
   b. Digital assistant
   c. Search engine
   d. Database
2. Product recommendations during online shopping is based on which of the following?
   a. Our bank balance
   b. Our profile picture
   c. Our hobbies
   d. Our buying habits
3. Blocking a bank account is a response to which of the following?
   a. Zero balance in bank account
   b. Fraudulent transaction
   c. Payment of credit cards defaulted
   d. No login in account for long time
4. Identifying face by its features is an example of which of the following?
   a. Biometrics
   b. Predictive search
   c. Digital fingerprinting
   d. Classification
5. How we feel and think about a product is called our _____.
   a. Sentiment
   b. Nature
   c. Experience
   d. Feedback

B. Match the column A with column B.

A	B
1. Predictive search	a. Identify a face in a video clip.
2. Fraud detection	b. Our buying habits and preferences.
3. Product recommendation	c. Words recommended based on the previous searches.
4. Sentiment analysis	d. Transfer of a huge amount from one account to other.
5. Object detection	e. Our online interactions about a product or service.

C. Fill in the blanks.

Fraud, Chatbot, Digital assistant, NLP, Sentiment analysis

1. Customers can find out about services and products of a company by using its _____.
2. _____ can understand speech and execute routine tasks.
3. Identifying and classifying documents is an application of _____.

4. _____ helps in assessing the popularity of a product or celebrity.
5. Repeated attempts of login in a bank account could be an attempt of _____.

D. Mark the following statements as True or False.

1. Speech recognition means what has been spoken.
2. Voice recognition means what has been spoken.
3. Chatbots are applications of NLP.
4. Fingerprint recognition is a feature of fraud detection.
5. The features of AI can be used to serve humanity.

E. Answer the following questions.

1. How does search engine determine what words to recommend while typing the search text?
2. Mentions ways through which AI algorithm detects online fraudulent transactions.
3. How does an online map application help us?
4. What is sentiment analysis?
5. List any 3 applications of Object detection.
6. What is NLP?
7. How is speech recognition different from voice recognition?
8. What are digital assistants and chatbots?



Mini Project...

Visit kids.kiddle.co/Chatterbot and create a short report on chatbots and their use.



Watch & Learn

www.eduitspl.com

www.youtube.com/edusoftknowledgeverse

3 Introduction to Artificial Intelligence

Dear children,

Picking up from the previous learning



We have learnt...

- That computers work differently than human brain.
- About the possibilities of a machine to learn like humans.
- About different types of intelligence.
- That there are different types of learning styles.
- How different types of learning aid in different types of intelligence?
- Various applications of AI presently.
- AI-enabled machines have variety of applications such as Smart search, product recommendations, fraud detection, sentiment analysis, object detection and language processing etc.

We now know that human brain is capable to process information in various forms and ways. Since birth, even before birth (remember the story of brave Abhimanyu?), brain develops the tendency to take inputs and process them to train itself. As tiny tots, we used to identify various objects around us by their properties and behaviour. Properties such as shape, size, colour, features etc. Behaviour such as speaking, walking, rolling, turning, stopping, starting etc. How does a child record the learning about a television in his mind? Infants do not have language. They express in gesture, giggles and cries. Slowly, as they grow, the brain grows in learning about surroundings. Language is learnt in bits and pieces – alphabets, words, phrases, simple sentences, basic grammar and so on. By the time we grow up past our teenage, our mind is mature enough to learn about new things faster depending on our interest and aspirations. Then the learning becomes deeper instead of broader. Deeper learning means detailed knowledge in a particular subject or field. This deeper learning becomes expertise which is utilised in earning our livelihood and in making discoveries, inventions and innovations.

At what level of learning do you think today's machines are? Are they novice or intelligent or expert? Do you think the machine that beat Kasparov in Chess was expert? Or, the robots that work in factories are intelligent? Or, the device that recognises you by your voice or face is sharper than a human being?



Fun Fact

IBM DEEP BLUE

In 1997, the world chess champion Gary Kasparov was beaten by IBM's Deep Blue – a chess playing supercomputer. Earlier versions of Deep Blue were beaten by Kasparov. Deep Blue was capable of computing 200 million positions or moves per second with a processing speed of 11 Gigaflops. The Deep Blue program was written in C programming language and it ran on AIX operating system over 480 VLSI chips.



Possibilities of a Computer to Learn?

What kind of efforts and approaches are needed to have a computer "think" like humans can only be assessed by comparing human intelligence with artificial intelligence. There are 2 aspects to AI – expectations from a computer to exhibit intelligence and reality. To see the possibilities of a computer to learn, we first need to understand the difference between how human brain functions and how does a computer brain (processor, memory and storage) works.

BRAIN	COMPUTER
Brain is composed of millions of neurons which store and transmit information in entire nervous system.	Computer's brain (processor, memory and storage) is controlled and used by set of instructions issued in the form of programs and software.
Note: A logical set of instructions is called a program. To run similar instructions again and again, we can keep them as a single program and run it as and when required. A software is a set of several programs packaged together.	
Structure is far more complex and still the subject of research.	Computer architecture is not as much complex as that of natural brain.
Few neurons in brain process a lot of information while consuming very little amount of energy.	If a computer system is made to utilise as many neurons, it will need a lot of energy.

Performs a lot of processing simultaneously.	Performs the tasks in a linear fashion and a sequence of steps.
All the neurons are utilised.	Has artificial neurons where, certain neurons may remain idle during an operation.
Processing speed is slower (thousand instructions/sec).	Processing speed is higher (million instructions/sec)
The learning mechanism is complex.	Computers with AI logic are continuously fed with immense amount of data for training and then they are fed with separate sets of immense data for testing.
Processes complex and rich variety of information hence it is less accurate in outcome.	More accurate since they mostly deal with processing which is sequential and focused on a selective set of tasks only.
Can be distracted by various signals and stimuli. Such unwanted stimuli are termed as *noise*.	Computers do not get distracted.
Encodes information in the memory in a way which is still part of study and research.	Retain information in numeric form as patterns and trends recognised in the data used to train them.
Can decide and deduct suitably in different situations. This is called generalised intelligence.	Take decisions on the basis of the data used to train them. They simply overlook anything which they are not trained to deal with.

Looking at the comparison above, it is not necessary to have machines as intelligent as human brain or rather more intelligent. Important is to have useful machines with enough intelligence to perform assigned tasks efficiently. There are many such examples such as object recognition, smart image recognition, speech recognition, video processing, text recognition and pattern recognition in data. There are several applications of these functionalities which make computers simulate intelligence.

Defining Artificial Intelligence

So, how do you define the term Artificial Intelligence?

Artificial intelligence is the field to develop machines which should learn and act like humans.

In simple terms:

Artificial intelligence is the art and science of developing machines intelligent like humans.

We know human intelligence is of different types. Same goes for artificial intelligence. Some machines are good at playing different sports, some are good at driving a vehicle on road or fly a drone, other machines can detect cancer cells while others can churn huge amount of numbers to do useful predictions yet there are some machines which can understand natural language to execute voice commands, classify documents and process hundreds of thousands of pages of text.

Weak and Strong Artificial Intelligence

Broadly, AI has two categories of machines. First are those which are intelligent at performing certain specific and specialised tasks. The other type includes the machines which are able to perform complex tasks by taking their own decisions. As of this writing, the second type of AI is hypothetical only and under research. Second type of AI machines do not exist.

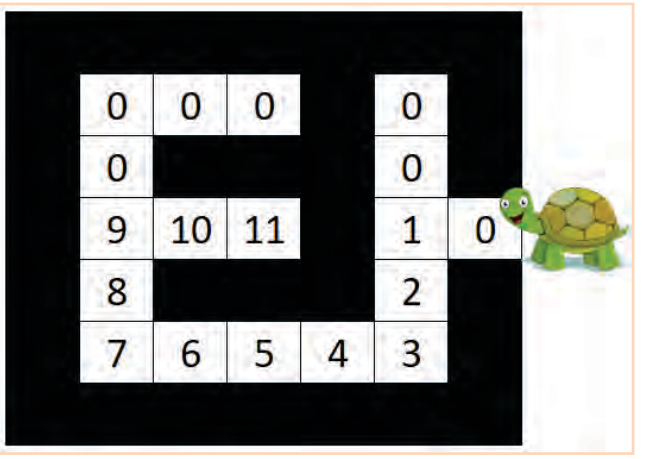
Weak/Narrow AI

Machines with weak AI perform tasks with some guided instructions. They simulate intelligence which is not like true intelligence. In specialised tasks, AI-enabled machines are doing wonders. A majority of them we have seen in earlier chapter on applications of AI. Machines that exhibit intelligence in a limited area or to perform specific tasks are said to be showing **weak or narrow intelligence**. Today weak AI machines are being used extensively in variety of tasks in various industries and disciplines.

Narrow AI Game

Below are the 3 sets of rules which will help Tinu the turtle to reach to the square number 11. Tinu is at square numbered 0 currently.

The game begins with reading instructions from **Rule Set 1**. Whenever an instruction fails (false), jump to the next rule set. If rule set 3 is finished then come back to rule set 1 and this cycle goes on until the task is accomplished. Let's take out a sheet of paper and begin the workout.



Rule Set 1

```
Check Front
If White
Move Forward
        If Number Smaller
        Move Backward
        Turn Left
```

Rule Set 2

Check Front
If Black
Turn Left
    If White
    Move Forward
        If Number Smaller
        Move Backward
        Turn Right

Rule Set 3

Check Front
If Black
Turn Left
    If Black
    Turn Right
        If White
        Move Forward
            If Number Smaller
            Move Backward

After several passes through all the rule sets and turning multiple times left and right, finally Tinu will reach square number 11.

This is a very simple and limited demo of intelligence. If a robotic machine is loaded with an algorithm developed on the above four rule sets then that robot will find its way through to square 11.

How will artificial intelligence work in this scenario?

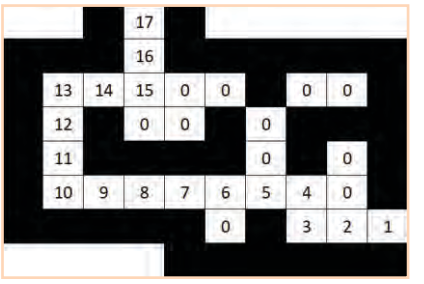
Artificial intelligence of the robot will try to learn from every successful move and finally make its own rule set (learning) for this particular grid. The learning is given here.

Move 1 step
    Turn Left
        Move 3 steps
            Turn Left
                Move 4 steps
                    Turn Right
                        Move 2 steps
                            Turn Right
                                Move 2 steps

Stop

This way, machine has chucked out all the unsuccessful (unnecessary) moves and learnt exact moves and turns to reach the destination.

Do you think the same set of rules will help a machine in reaching square number 17 from square number 1 in this grid? Find out.



Strong/Generalised AI

Machines showing generalised intelligence with autonomous ability of decision making are said to possess **strong or generalised intelligence**. Such machines are in research phase and are expected to simulate human brain. The algorithms od such a machine will have mental abilities such as thinking, deciding, remembering, emoting etc. These machines can perform tasks without any guidance and they work constantly like our brain does.

Our brain is capable of autonomous thinking after we reach certain age. Similarly, it is thought that if a strong AI machine is made, it would take a few years to learn things like children do.

Weak AI vs Strong AI

Let us compare the two types of AI:

WEAK AI	STRONG AI
Needs guiding rules to perform tasks.	Can perform tasks autonomously.
Programmed by developer. Does not learn in true sense.	Programmed once and then learns on its own.
Simulate human intelligence.	Can think, decide and evolve in intelligence.
Perform specific tasks in controlled way.	Work constantly and learn from it.

Artificial Superintelligence

Artificial superintelligence is a futuristic hypothesis that mentions about machines which will not only attain general, strong intelligence but surpass human brain capacity and human intelligence. They will be far more intelligent than the most intelligent person on the planet. It will be champion in all the activities humans do. The theory is appealing and at the same time scary. Have you seen the movie AI by Steven Spielberg which shows the emotional aspect of a child robot? Or, Terminator series showing machines trying to rule the world in future? Or, I, Robot where a good robot saves all? There are many such science fiction movies and TV series. So, ASI is just a fantasy today but who knows what future holds.

Note

Artificial intelligence has been divided on the basis of functionality of the machines also in categories like reactive machines, limited memory, theory of mind and self-awareness. You shall learn about them in higher classes. Here is a brief introduction:

Reactive machine: This is the most basic (weak) kind of intelligence with no previous memory or learning. They perform specific tasks that involve responding to some event or stimuli like playing a strategy game or simulated sport.

Limited memory: These machines retain memory and utilise it for immediate future use only, not for longer time. For example, self-driven car can retain memory of the surroundings while going through the traffic and detecting objects and obstacles around it. Another example is chatbots.

Theory of mind: These machines are able to interact socially. They understand emotions and know how to respond accordingly.

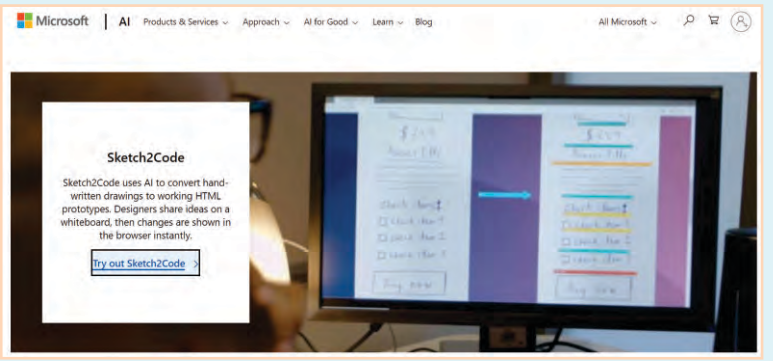
Self-awareness: A machine that is near human-intelligent. Such machines are hypothetical and part of research and development.



Activity

Experience Narrow AI

Go to **https://sketch2code.azurewebsites.net/** and show the computer your hand-drawn diagram of a web form. Click or upload its picture and let the computer generate HTML code for it. HTML is used to create web pages.





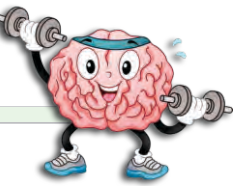
Learning Points

- Human brain and computer function in a completely different way.
- Artificial intelligence is the field to develop machines which should learn and act like humans.
- Machines with weak AI perform tasks with some guided instructions.
- Machines with generalised intelligence have ability of autonomous decision making.
- Artificial superintelligence is a futuristic hypothesis of machines having stronger intelligence that will surpass human intelligence.
- On the basis of functionality, AI is of 4 types namely reactive machine, limited memory, theory of mind and self-awareness.



- **Narrow intelligence:** Intelligence that can perform specific tasks well.
- **Strong intelligence:** Intelligence that is capable of autonomous decision making.

Exercise



A. Select the correct answer.

1. Brain is composed of which of the following to store and transmit information?
   a. Arteries ☐ b. Veins ☐
   c. Neurons ☐ d. Chips ☐
2. Unwanted signals in communication ares called which of the following?
   a. Pollution ☐ b. Noise ☐
   c. Distraction ☐ d. Short circuit ☐
3. Machines that execute voice commands are able to understand which of the following?
   a. Grammar ☐ b. Commands ☐
   c. Machine language ☐ d. Natural language ☐
4. Today, which of the following intelligent machines are used in most of the industries?
   a. Weak intelligence ☐ b. Narrow intelligence ☐
   c. Both a) and b) ☐ d. Strong intelligence ☐

B. Fill in the blanks.

Narrow, Limited memory, Self-awareness, Generalised, Weak

1. Machines with _____ intelligence are under research.
2. _____ intelligence needs guiding rules to perform the tasks.
3. Another name for weak intelligence is _____ intelligence.
4. Self-driven car is said to possess _____ intelligence.
5. _____ is the highest form of machine intelligence on the basis of functionality.

C. Mark the following statements as True or False.

1. AI-enabled machine function exactly like human brain. ☐
2. Computer's processing speed is higher than that of human brain. ☐
3. Just like human intelligence, AI is also of different types. ☐

4. Generalised machines can also be used for performing a specialised task.
5. Strong AI is capable to evolve in intelligence.

D. Answer the following questions.

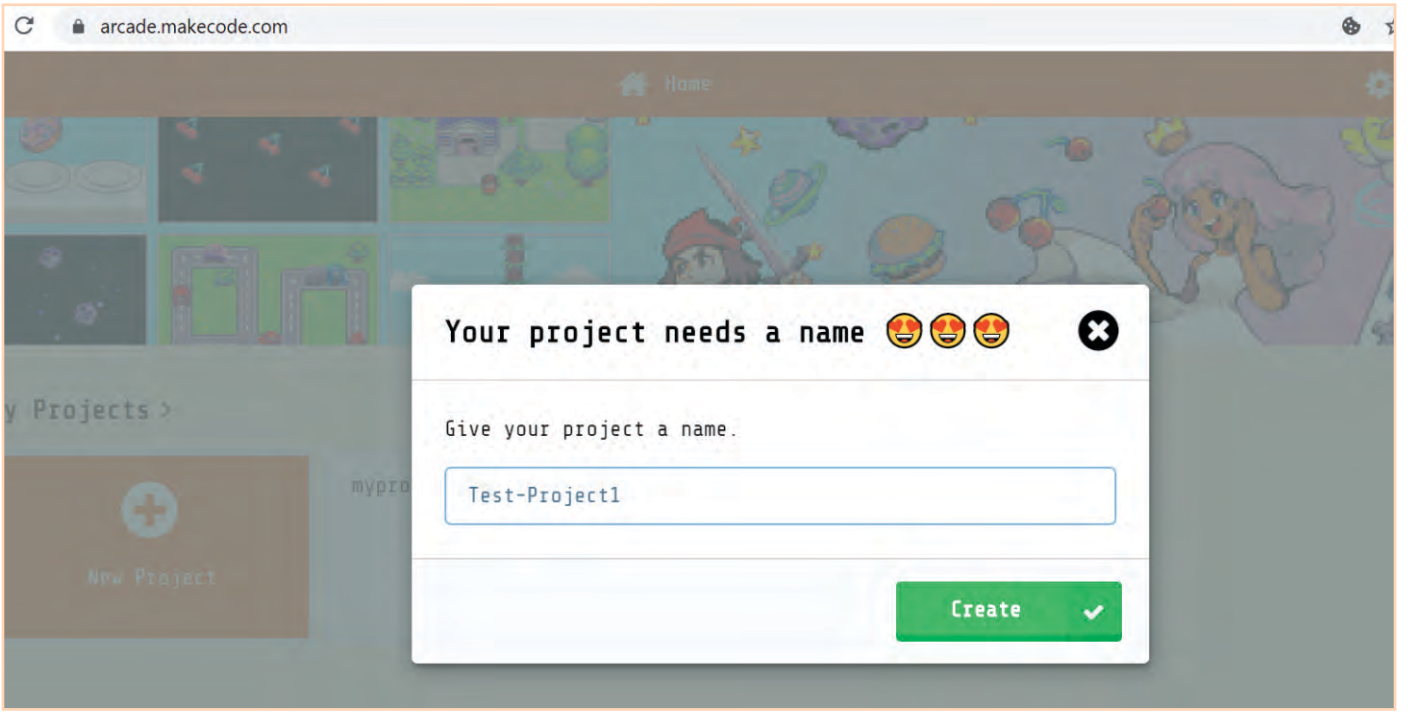
1. Define the term Artificial Intelligence. Name its 4 types on the basis of functionality.
2. How is narrow intelligence different from generalised intelligence?
3. Briefly describe any 2 types of artificial intelligence based on functionality.
4. List any 4 difference between the functioning of human brain and computer.
5. What do you mean by a program and software?



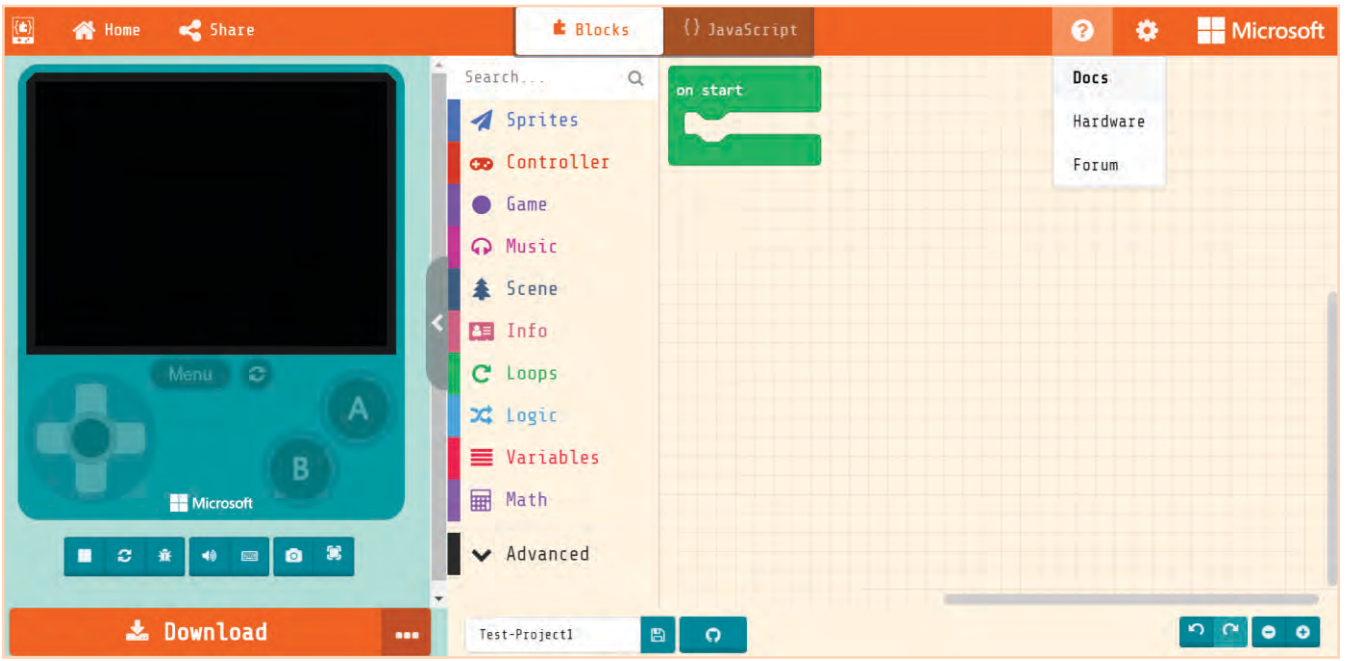
Mini Project...

The purpose of this project is to introduce you with the step-wise, logical thinking approach that makes the foundation of computer programming. As you learn further in higher classes, this foundation will help you in grasping AI programming easily. Your teacher will stipulate a time frame for you to complete this project.

Go to https://arcade.makecode.com/. Click on New Project. Give a relevant name to your project and click on Create.



On the next screen, click on Help (?) icon and select **Docs**.





In the slide-out, scroll down and select **Lessons > Cherry Pickr**.



Follow the instructions and develop the game.



Watch & Learn

www.eduitspl.com

www.youtube.com/edusoftknowledgeverse