



Technique Polytechnic institute  
Panchrokhi, Sugandhya, Hooghly



Department of  
Computer Science & Technology  
NBA Accredited



contact : (033) 2686-3682(ex:t:216)

institutional

## Vision

To make Technique Polytechnic Institute a CENTRE OF EXCELLENCE in learning, teaching and knowledge transfer in an ambience of Humanity, Wisdom, Intellect, Knowledge, Creativity and Innovation in order to nurture our students to become culturally and ethically rich professionals with bright future of our country.



## Mission

institutional

To provide Knowledge with Academic Excellence and to prepare our students for their successful professional career.

To inspire our Faculty members to always Excel and in turn Motivate the Students to achieve Excellence.

To provide a stimulating learning environment with a technological orientation to maximize individual Potential.

To develop innovative and efficient use of modern instructional technology.

To ensure our students of all ability levels are well equipped to meet the challenges of education, work and life.

To encourage development of interdisciplinary research, which addresses strategic needs of industry and society.

To encourage and support professional development for faculty and staff.

To educate and prepare students to contribute as engineers and citizens through the creation, integration, application, and transfer of engineering knowledge



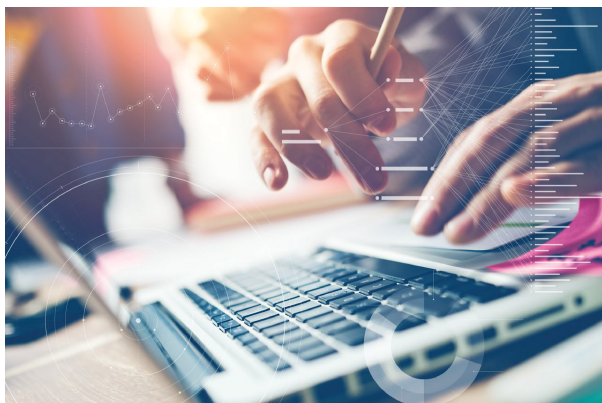


## departmental Vision

To be a Centre of Excellence in the Discipline of Computer Science and Technology

## departmental Mission

1. To impart updated and quality technical education to the students through state of art education in Computer science & Technology
2. To provide a learning environment that helps students to enhance problem solving skills and to be successful in their professional field
3. To provide exposure to students to the latest tools and technologies in the area of computer hardware and software
4. To groom our young students to become professionally and morally sound computer engineers
5. To Support society by participating in and encouraging technology transfer.
6. To develop human resource with sound knowledge-theory and practical- in the discipline of computing and the ability to apply the knowledge to the benefit of the society at large



# Index

Quantum Computer  
Internet of Things  
Effectiveness of Image Compression in Multimedia  
Human Computer Interaction Analysis and Journey through Eras  
Machine Learning (ML)  
Hacking  
Data Science  
Micro-Electro-Mechanical Systems  
Android Technology  
Cyber Security  
How Programming Will Change Over the Next 10 Years: 5 Predictions  
Near Field Communication  
Artificial Intelligence





---

### *Message from editorial team*

*It gives us immense pleasure and satisfaction to re-introduce our departmental technical magazine "technomutation vol-3" for the session 2017-18. A lot of effort has gone into the making of this issue. We hope you enjoy reading the magazine. The best thing about this issue is that it represents the contemporary face of DCT students. Amidst the busy schedule of a 4-month semester, with 3-exams, surprise quizzes and all these assignments and problem sheets that make you want to bang your head on the wall, it is fascinating to see how students are keeping abreast with trending technologies. To this time we have made an attempt to bring out the talent concealed within our student community. Faculties of the department has also contributed from their end by touring the grayer side of technical issues. This volume indulges research in one hand on other it presents cutting edges technologies. We hope you enjoy reading this issue as much as we have enjoyed making it.*

Editor in Chief  
*Shikhar Bhattacharya*

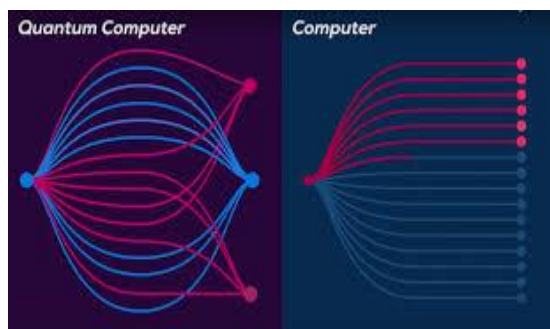
Co-Editor  
*Soumitri Roy*

Members:  
*Dipsa Mitra*  
*Sourashis Haldar*  
*Souradeep Sarkar*  
*Arhan Goswami*

A quantum computer is any device for computation that makes direct use of distinctively quantum mechanical phenomena, such as superposition and entanglement, to perform operations on data. In a classical (or conventional) computer, information is stored as bits; in a quantum computer, it is stored as qubits (quantum bits).

The basic principle of quantum computation is that the quantum properties can be used to represent and structure data, and that quantum mechanisms can be devised and built to perform operations with this data. Although quantum computing is still in its infancy, experiments have been carried out in which quantum computational operations were executed on a very small number of qubits. Research in both theoretical and practical areas continues at a frantic pace, and many national government and military funding agencies support quantum computing research to develop quantum computers for both civilian and national security purposes, such as cryptanalysis.

If large-scale quantum computers can be built, they will be able to solve certain problems exponentially faster than any of our current classical computers (for example Shor's algorithm). Quantum computers are different from other computers such as DNA computers and traditional computers based on transistors. Some computing architectures such as optical computers may use classical superposition of electromagnetic waves, but without some specifically quantum mechanical resources such as entanglement, they have less potential for computational speed-up than quantum computers. The power of quantum computers Integer factorization is believed to be computationally infeasible with an ordinary computer for large integers that are the product of only a few prime numbers (e.g., products of two 300-digit primes). By comparison, a quantum computer could solve this problem more efficiently than a classical computer using Shor's algorithm to find its factors. This ability would allow a quantum computer to "break" many of the cryptographic systems in use today, in the sense that there would be a polynomial time (in the number of bits of the integer) algorithm for solving the problem.



In particular, most of the popular public key ciphers are based on the difficulty of factoring integers, including forms of RSA. These are used to protect secure Web pages, encrypted email, and many other types of data. Breaking these would have significant ramifications for electronic privacy and security. The only way to increase the security of an algorithm like RSA would be to increase the key size and hope that an adversary does not have the resources to build and use a powerful enough quantum computer. It seems plausible that it will always be possible to build classical computers that have more bits than the number of qubits in the largest quantum computer.

The **Internet of Things (IoT)** is a computing concept that describes the idea of everyday physical objects being connected to the internet and being able to identify themselves to other devices. In the broadest sense, the term IoT encompasses everything connected to the internet, but it is increasingly being used to define objects that "talk" to each other. "Simply, the Internet of Things is made up of devices – from simple sensors to smart phones and wearable – connected together. By combining these connected devices with automated systems, it is possible to "gather information, analyze it and create an action" to help someone with a particular task, or learn from a process. IoT allows devices on closed private internet connections to communicate with others and the Internet of Things brings those networks together. It gives the opportunity for devices to communicate not only within close silos but across different networking types and creates a much more connected world. It's possible to turn anything, from a pill to an aero plane, into part of the IoT. This adds a level of digital intelligence to devices that would be otherwise dumb, enabling them to communicate without a human being involved, and merging the digital and physical worlds.



### IoT Examples:

Examples of objects that can fall into the scope of Internet of Things include connected security systems, thermostats, cars, electronic appliances, lights in household and commercial environments, alarm clocks, speaker systems, vending machines and more.

### How do Internet of Things devices connect?

IoT devices use a variety of methods to connect and share data: homes and offices will use standard wi-fi or Bluetooth Low Energy (or even Ethernet if they aren't especially mobile); other devices will use LTE or even satellite connections to communicate. However, the vast number of different options has already led some to argue that IoT communications standards need to be as accepted and interoperable as wi-fi is today.

### Applications of the Internet of Things:

The benefits of the IoT are first and foremost found in industry. In a way its manufacturing that has led the charge here, as letting machines talk to each other directly rather than through humans has brought about a serious uptick in production across the board. So now some factories basically run themselves, with machines telling each other what they need and when. The rise of the robots that is going to influence the labor market quite strongly over the next few decades is in large part due to IoT technology.

## **What are the benefits of the Internet of Things for business?**

Occasionally known as the Industrial IoT, the benefits of the IoT for business depend on the particular implementation, but the key is that enterprises should have access to more data about their own products and their own internal systems, and a greater ability to make changes as a result.

### **Internet of Things and the cloud:**

The huge amount of data that IoT applications generate means that many companies will choose to do their data processing in the cloud rather than build huge amounts of in-house capacity. Cloud computing giants are already courting these companies: Microsoft has its Azure IoT suite, while Amazon Web Services provides a range of IoT services, as does Google Cloud.

### **IoT data and artificial intelligence:**

IoT devices generate vast amounts of data; that might be information about an engine's temperature or whether a door is open or closed or the reading from a smart meter. All this IoT data has to be collected, stored and analyzed. One way companies are making the most of this data is to feed it into artificial intelligence (AI) systems which will take that IoT data and use it to make predictions.

### **The Internet of Things and smart cities:**

By spreading a vast number of sensors over a town or city, planners can get a better idea of what's really happening, in real time. As a result, smart cities projects are a key feature of the IoT. Cities already generate large amounts of data (from security cameras and environmental sensors) and already contain big infrastructure networks (like those controlling traffic lights). IoT projects aim to connect these up, and then add further intelligence into the system.

### **IoT evolution: Where does the Internet of Things go next?**

As the price of sensors and communications continue to drop, it becomes cost-effective to add more devices to the IoT -- even if in some cases there's little obvious benefit to consumers. As the number of connected devices continues to raise, our living and working environments will become filled with smart products -- assuming we are willing to accept the security and privacy trade-offs. Some will welcome the new era of smart things. Others will pine for the days when a chair was simply a chair.

# Effectiveness of Image Compression in Multimedia

Sohan Goswami  
Lecturer, DCST

## Abstract

Image Compression is an application of data compression that compresses original image in fewer bits. The objective is to find out the redundant image data and then remove it to effectively store or transmit image file. In Computer Science and Information Theory the effectiveness of Image Compression lies in the technique of reducing the image file size while maintaining image quality as much as possible.

## Basic Image Compression Technique

The basic image compression technique is to encode the original image data into digital form in such a way that the total data quantity of the bit stream is less than the total data quantity of the original image. The full compression flow is shown below:

Original Image ----- Encoder ----- 1001011100....----- Decoder ----- Decoded Image

The Compression ratio is defined as follows  $Cr = n1/n2$  where  $n1$  is the data rate of original image and  $n2$  is that of the encoded bit stream.

## Types Of Image Compression

There are basically two types of image compression techniques , Lossless and Lossy compression . Lossy compression means that some data from the original image file is lost. The biggest advantage of Lossy compression is that it significantly reduces the size of the image file but it is achieved with a loss of image quality. For example JPEG image is an example of lossy image compression.

Lossless image compression means that reduction of image size without any quality loss. It allows the original data to be reconstructed from the compressed data. For example PNG image uses lossless compression.

## Effectiveness Of Image Compression

In today's world time is really an important factor. Data transmission has become more and more faster and efficient. Therefore effective image compression is really a need from the perspective of data transmission. .jpg images are the most widely used image formats across the web because of its effective image compression technique which tries to maintain image quality while reducing file size. JPEG images use color transform , sampling , quantization and encoding techniques to compress image data.

However comparison arises based on certain circumstances. For example PNG image is a better choice than JPEG for storing images which demand better image quality whereas JPEG image is ideal for big images and photographs. BMP is a bitmapped graphics format used by Microsoft Windows as an uncompressed format. On the other hand TIFF is a popular format for high color depth images and TIFF image is widely supported by different image manipulation applications.

Depending on the requirement a particular compression technique is chosen.

## Conclusion

We conclude that effective image compression is a requirement as well as a careful choice also as there are several popular image formats like JPEG , PNG , TIFF , GIF etc depending on circumstances. Sampling , Quantization and Encoding techniques are essential to achieve that goal. As digital image processing is meeting new demands gradually , image compression algorithms are being modified day by day. More color support , transparency and number of bits to represent image pixel data are of significant importance to achieve effective image compression whether it be lossless or lossy compression.

## **Abstract:**

This paper provides an overview of Human Computer Interaction (HCI). It includes the explanation regarding how, when did the HCI emerge and how it evolved during years till date and what could be the future inventions in the field of HCI. This excerpt also gives an overview of HCI related terminologies and its design principles. The design models of HCI include unimodal and multimodal architectures. Various tools used for building interfaces have also been discussed in this paper. The interface building tools design theories and principles of HCI systems have been discussed in the medieval sections. Finally the future and various applications of the HCI are discussed.

## **Introduction:**

Computers have been an important and unavoidable part of our lives. This attachment and reliability on computers have made good as well as bad effects on human's life. Originally computers were used merely as calculators. It has not focused on improving the quality of existing interfaces rather it is looking forward to create intelligent and adaptive interfaces. The architecture of HCI has evolved replacing regular interfaces with unimodal and multimodal interfaces. The excerpt would explain the concept of unimodal and multi modal architecture of HCI later in the text. The latest fields of human Computer interaction are 3D animation, virtual reality, speech and gesture recognition. Later in this text we will also include the tools that are used for interface building. The initial sections will give a description about the definition of HCI and related terminologies, the fundamental interaction styles and design principles of the HCI systems. The last sections of the paper would describe about the future of HCI, its applications and conclusion.

## **Definition of HCI:**

The concept of Human Computer Interaction came into existence when computers or machines that serve human requirements came into existence. Any machine or system is worthless if it cannot be properly handled by human beings. For accomplishing our tasks through computers we need to be able to interact with the system and here comes the importance of human Computer interaction. The worth of a machine for a user depends on two major factors i.e. functionality and usability. The term Functionality means the range of services that a system can provide to its users. The term usability means for a particular user how much useful can be a particular system be. HCI system should be designed in such a way so that it provides quality and optimization in the services it provides. For example an electric water heating kettle does not need to have a proper and versatile interface because it needs just an ON/OFF switch to heat the water. Whereas if we are building a regular web page should build an interface that is enough complicated to provide good usability to its customers though the page may be limited in functionality. We can also build interfaces that can be used for meeting the requirements of more than one systems, for example pc's and laptops use windows as the interface. Now a days even mobiles, tablets, palm tops use windows as there interface. In the next section we will study about the fundamental interaction styles and interface builders.

## **Fundamental Interactive Styles :**

**Direct manipulation interfaces:** In this the objects that are visible on the screen can be directly manipulated using some pointing device. Ivan Sutherland was the first one to show this on sketchpad. He manipulated the objects on the screen using a light pen which could grab objects and place them on different locations on the screen. Also we can change the size of the objects on the screen. Air force and NSF supported the creation of this system in Lincoln labs. Yet another system that called AMBIT/G developed in Lincoln Labs in 1968 implemented iconic representations, dynamic menus with their options which could be selected using a pointing device. Macintosh that developed in 1984, Xerox Star developed in 1981 and the Apple Lisa developed in 1982 were the first commercial systems which made use of Direct Manipulation.

**Windows:** The idea of overlapping windows was first introduced by Alan Kay in 1969 at University of Utah. Lisp machines and symbolic Lisp machines were the first ones to use the windows commercially. The first major tiled window manager was created by Xerox PARC named Cedar Window Manager in 1981. Apple Macintosh, Xerox Star and the Apple Lisa majorly popularized the windows.

**Mouse:** the mouse is a pointing device established for cheap replacement of light pens and was developed at Stanford Research Laboratory in 1965. In 1970's the Xerox PARC made mouse a popular practical input device.

## **Tools for Building Interfaces:**

The software tools for creating interfaces are in great trends now. Such tools are sold by many companies. Today various interfaces are built using these software tools.

**Interface builders:** through these tools we can create interfaces which are composed of widgets like menus, buttons and scrollbars that can be placed on the screen using mouse. Xerox PARC developed TRILLIUM in 1981. Resource Editor was an interface builder that allowed placing and editing of the widgets. The first modern interface builder was the "SOS Interface" created by Jean-Marie Hullot. It was built in lisp for the Macintosh system and was known as the first "modern interface builder". This was commercialized in 1986. This was the starting of the production of Interface Builders. Now there are a huge number of interface builders in the market. A very common example of interface builder for android system is PENCIL.

**UIMS:** These are the software tools that create user interfaces by writing program codes. Reaction Handler created by William Newman at Imperial College, London was the first User Interface Management System (UIMS). NASA, NSF, DOE, NBS and SRC funded for its development. The first commercial system to have a large collection of widgets was Xerox PARC. These widgets included popup menus and scrollbars etc. The first commercial system to actively promote the use of its toolkit for the

development of interfaces to other commercial systems was The Apple Macintosh. Stanford Research Laboratory developed a c++ toolkit called Inter Views in 1988.

### **Design Principles for HCI:**

Typically there are many rules for the development of an interface system in order to as much as high usability as possible. Some rules were produced or formulated by Jacob Nielsen that explain a large amount of problems that are faced in designing the interface. These rules should be followed by all user interface designers:

1. One should avoid adding irrelevant information on the interface because every unit of irrelevant information destroys the importance and weightage of relevant information. Irrelevant information diminishes the relevance of correct information.
2. Actions, widgets, icons, situations should have same meaning and should trigger same action wherever they are used in system irrespective of the applications or programs under which they are used.
3. The interface should be developed in concepts and languages that are understood by the users rather than being familiar to systems.
4. A message should timely popup giving the information regarding what is going on in the System.
5. Error messages written in human readable languages should be shown in response to solution of any problem that has occurred in the system.
6. We sometimes do functions that we did not actually intend to do. In this the interface should provide clearly marked exits in order to undo the previous action without extending the dialog.
7. Shortcuts for different functions should be provided in order to speed up the human computer interaction.

### **Architecture of HCI systems:**

The number of inputs and outputs in an interface defines its architecture. HCI system architecture shows how these input and output work together. Following is the categorization of the interfaces in the basis of the no of modes input/output in the system:

**Unimodal:** In unimodal systems only one communication channel is used to communicate with the machine. There can be different communication channels like speech, face gesture, body movements etc. all these are called communication channels. If only one of these media of communication is used in the system then the system is called Unimodal HCI System. These unimodal systems can be categorized into 3 categories as follows:

**Visual Based HCI System:** the most widespread area in HCI is the visual based computers interaction. In this the user communicates with the machine using visual movements that may be minor but still visible to the computer. There are different types of visual movements that can be detected by a system. These are listed as follows:



- Analyzing facial expressions
- Recognizing Gestures
- Tracking body movements
- Tracking eyeball movements

The facial expression analysis and the body movements tracking is normally used in creating animation movies where the facial expressions in different emotions and the corresponding body movements are tracked for creating the same body movements in the cartoon characters of the animation movie. Gesture recognition techniques are generally used for manipulating the objects on the screen. For example we can manipulate an image on the screen using motions of our hands. We can select the image, zoom its size, scroll through parts of screen etc. These all areas of visual HCI systems have something in common but the fourth one i.e. the tracking of eyeball movements is used for disabled people who can move only their eyes. The movements of the eyes manipulate the coordinate positions on the screen. And the blinking of eyes may act as clicking of the mouse button.



(Image shows tracking of body movements for animation)

### **Audio-Based HCI System**

In these systems the user interacts with the system using audio or speech as input. The nature of audio signals is not as variable as the visual signals but the audio signals prove to be more reliable source of correct information. There are following categories or research fields under this HCI system:

- Distinguish the users on the bases of their speech
- Recognizing the actions to be performed on different speech
- Synchronizing speech with lip movements to produce more accurate operations
- Analyzing emotions in the audio e.g. Anger, sadness, neutral, happy, etc.
- Recognizing musical interactions

The speech recognition and the speaker recognition have been used for very long. A recent appearance in this field is the analysis of emotions in the audio signals. Typical audio sounds produced by humans in different emotions, along with pitch and tone of the data was manipulated to design more intelligent HCI systems. Art industries use the latest area of audio-based HCI i.e. recognition of musical interactions. This is used in both audio based and video based systems.

### **Multimodal HCI systems:**

As the name suggests multimodal means many modes. In these systems multiple channels of communication are used for interacting with computers. These systems are able to take five senses of human beings as input which includes sight, smell, hearing, touch and taste. When two or more such modes are used as inputs then the interface is called a multi modal interface. The number and diversity of the modes and their combinations used can vary from one MMHCI System to another. The most commonly used combination of inputs used is gestures and speech. No doubt the multimodal systems are giving us more accuracy as compared to single modal systems because the combination of these modalities produces more reliable operations. Another aspect worth noticing are those different modalities can collaborate together to assist each other. For example, lip movement tracking that is visual based is used for helping speech recognition which is audio-based. And further the speech recognition can help gesture recognition. In next section we will discuss about the Existing HCI technologies.

### **Existing HCI technologies:**

The existing HCI technologies differ in the combination of degree of functionality and usability they show to the users. Before designing an HCI we should thoroughly think about the usability or the functionality it can provide to the users and according to that we should consider the number of modalities in a system. The existing technologies can take the following categories of signals as input: namely- audition, touch and vision. The devices that use vision as their input are generally switch based or pointing devices. The switch based devices contain buttons and switches and the examples of pointing devices is mouse, light pen, joysticks etc. the devices that use audio as their input normally deal with speech recognition. It is difficult to create input auditory devices as compared to output auditory devices where the output signals are in the form of audio. For example, All the electronic devices like telephones, mobiles, beeps and alarms give audio output. A recent advancement in the HCI systems is the haptic devices which produce sensations to skin and muscles through touch or weight. They are generally used in virtual reality. Now a days the conventional systems have been replaced by wearable, virtual and wireless devices. These new technologies rather being used in separate systems, they are clubbed together to create a system that uses a combination of these technologies. For example, military super-soldier enhancing devices, GPS navigation systems, personal digital assistance, RFID products etc. A solution to conventional keyboarding, Compaq's iPAQ created a virtual keyboard which is made by projecting a keyboard like pattern using a red light on a solid surface. The device tracks the motion of the fingers and captures the keystrokes using motion sensors and sends it back to the device.

### **Advancements in HCI technologies:**

#### **Intelligent and Adaptive Systems:**

Majority of the public in today's life uses command or action based interfaces that are not very sophisticated. But researchers are heading towards the design of intelligent systems. Intelligent systems are created by a large scale growth and development in usability and functionality in upcoming devices. Intelligent systems provide a more natural interface to the users and provide them with more pleasurable and satisfying experience. Earlier for writing text, typewriters were used, and then keyboards came into scenario. And now we use touch phones and tablets to write text messages and send to many users. These are also used for writing text in our own handwriting and the system would interpret the text and display it on the screen. New systems have been introduced smart phones in the market which can capture the speech of the users and convert it into text without the need of writing

anything at all on the device with our hands. New advances have come in speech recognition interfaces. They can take speech input in a particular language and can convert or translate it into a different language to be produced as output. An adaptive HCI on the other hand does not use intelligence. It simply keeps the tracks of actions performed by the user and remembers the action and use these actions to be performed as suggestions when the user is likely to perform such an action in future. For example, a regular website having graphical user interface selling various products in the market can be called adaptive if it is able to keep a record of his purchases on the site, and keeps a record of the types of searches the user makes so that whenever in future the person visits the same website, he is able to see advertisements and products on the site which relate to his interest.

### **Ubiquitous computing (UbiComp)**

Ubiquitous computing refers to the embedding of virtual computers in the environment which can't be seen or felt by the humans but they are always present around them. The idea is to embed computers everywhere in the objects surrounding human beings and the people are able to interact with more than one system at the same time.

### **Applications of Various HCI systems:**

Multi-modal systems offer a wide range of applications over single modal interfaces because they can offer a more user friendly and pleasurable interaction with the system. Few examples of applications of multimodal systems are as follows:

- Helping disabled people
- Intelligent gaming
- E-commerce
- Emotion Recognition
- Medicine

### **Multimodal Systems for Disabled People**

These are used by people who are physically handicapped who need different interfaces than normal people. Since these people can't use their hands or body parts for giving input instructions to the systems, they should be provide with system with which they can interact using eye, head movements and speech signals. In such systems both the movement input and voice inputs are sensed simultaneously in the computer. Head position indicates the coordinate position on the screen whereas the voice signals are used to perform meaningful action on an object selected by the cursor.



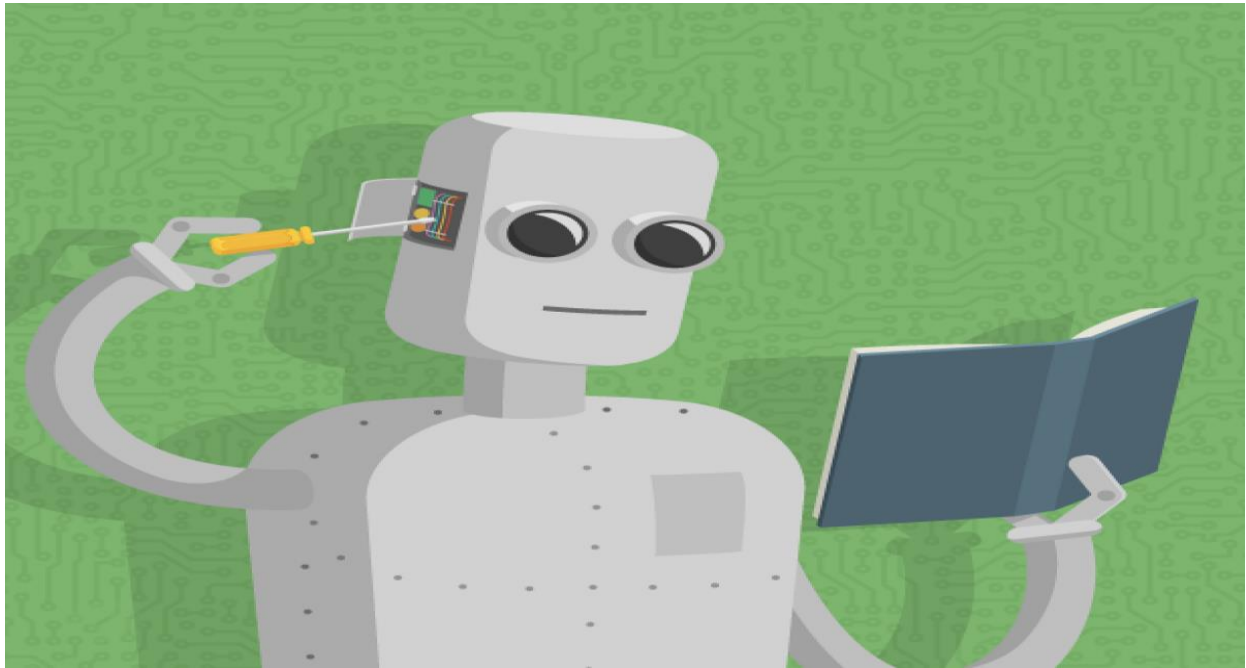
A Mobile, Multi-Modal Human Interface Device for People with Disabilities

## **Emotion Recognition Multimodal System**

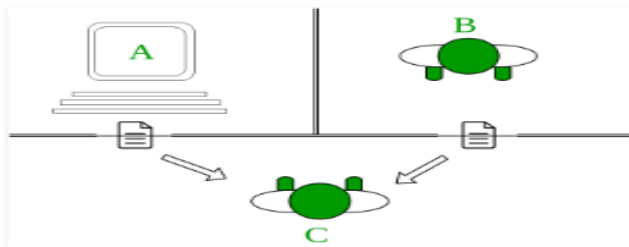
Emotion recognition systems detect various behavioral signals produced by humans in order to make out one's emotional state. Generally whether a person is happy or neutral or angry or sad, it may be seen by the effects these emotions cause on their face, body and voice. If we consider making a single mode interface the best option out of these modes of input signal is the face modality as it would produce the best predictions. An increase in 35% of accuracy would be made if we combine the face and body modalities which prove that single modality systems produce lesser accuracy than multimodal systems. Machines classify the emotions as sadness, anger, neutral and happy most accurately when facial and voice data are fused. It has been observed that audio based emotion recognition system provide 70% of accuracy in predicting the mood of a person whereas 89% accuracy is provided by facial expression (visual based) systems. There fusion i.e. bimodal systems which are a combination of both vocal and facial data as input produce an accuracy of 90%.

## **Conclusion**

Human Computer Interaction is a very important part to be considered while building up a new system which has some usability and functionality for the users. A system can be highly sophisticated which can serve wide range of applications but they become worthless if the services provided by the system are not presented properly to the user which finally leads to less understanding between system and users. Because of this the user may not be able to make full use of a system. The upcoming technologies in the field of HCI are ubiquitous computing which is trying to embed computers in environment to make its use more natural. Virtual reality is also a new advancement in the field of HCI. This paper used following references for its creation.



The journey started in the year of **1950** when **Sir Alan Turing** developed a test popularly known as ‘Turing Test’ used to determine whether or not computer(machine) can think intelligently like human”? Imagine a game of three players having two humans and one computer, an interrogator(as human) is isolated from other two players. The interrogator job is to try and figure out which one is human and which one is computer by asking questions from both of them. To make the things harder computer is trying to make the interrogator guess wrongly. In other words computer would try to indistinguishable from human as much as possible.



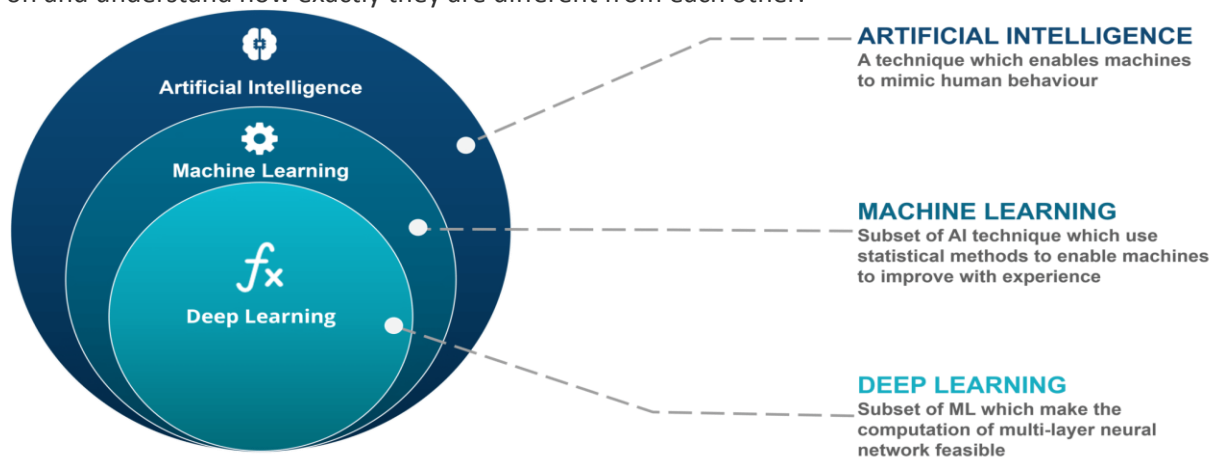
During that time a “**handful of scientists from a variety of fields (mathematics, psychology, engineering, economics and political science) began to discuss the possibility of creating an artificial brain. The field of artificial intelligence research was founded as an academic discipline in 1956**”.(collected from wikipedia)



AI has seen so many so many experiments and evolution with the course of and today has given birth to the **first robot citizen Sophia**. This shows how artificial intelligence will become a prevalent part of people's lives.

In this context I would like to discuss about the very basics of AI and its sub domains in a lucid way so that readers will can earn some motivations in studying it.

**Artificial Intelligence** is the broader domain under which **Machine Learning** and **Deep Learning** come. And one can also see in the diagram that even deep learning is a subset of Machine Learning. So all three of them **AI, machine learning and deep learning** are just the subsets of each other. So let us move on and understand how exactly they are different from each other.



### What is Artificial Intelligence?

Artificial Intelligence is a technique which allows the machines to act like humans by replicating their behaviour and nature.

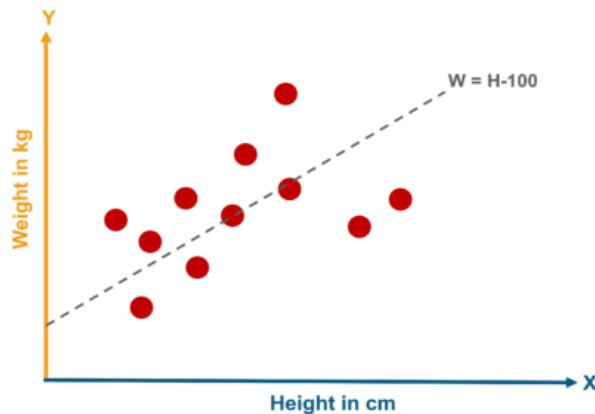
Artificial Intelligence makes it possible for the machines to learn from their experience. The machines adjust their response based on new inputs thereby performing human-like tasks by processing large amounts of data and recognizing patterns in them.

### What is Machine Learning?

**“Machine Learning is a subset of artificial intelligence. It allows the machines to learn and make predictions based on its experience(data)”**

Understanding Machine Learning with an Example

Let's say you want to create a system which could predict the expected weight of a person based on its height. The first thing you do is collect the data. Let us say this is how your data looks like:



Each point on the graph represents one data point. To start with we can draw a simple line to predict the weight based on the height. For example, a simple line.

$$W = H - 100$$

Where W is weight in kg and H is height in cm

This line can help us to make predictions. Our main goal is to reduce the difference between the estimated value and actual value. So in order to achieve it, we try to draw a straight line that fits through all these different points and minimize the error and make them as small as possible. Decreasing the error or the difference between the actual value and the estimated value increases the performance.

Further, the more data points we collect, the better will our model become. We can also improve our model by adding more variables (e.g. Gender) and creating different prediction lines for them. Once the line is created, so in future, if a new data (for example height of a person) is fed to the model, it would easily predict the data for you and will tell his predicted weight.

I hope you got a clear understanding of machine learning. So moving on ahead let's learn about Deep Learning.

## What is Deep Learning?

“Deep learning is a particular kind of machine learning that achieves great power and flexibility by learning to represent the world as nested hierarchy of concepts or abstraction”

You can consider deep learning models as a rocket engine and its fuel is the huge amount of data that we feed to these algorithms.

The concept of deep learning is not new. But recently its hype has increased, and deep learning is getting more attention. This field is a special kind of machine learning which is inspired by the functionality of our brain cells called artificial neural network. It simply takes data connections between all artificial neurons and adjusts them according to the data pattern. More neurons are needed if the size of the data is large. It automatically features learning at multiple levels of abstraction thereby allowing a system to learn complex functions mapping without depending on any specific algorithm.

Understanding Deep Learning with Analogies

Let me start with a simple example which explains how things work at a conceptual level.

### **Example 1:**

Let us try and understand how you recognize a square from other shapes.



- Sides = 4 ✓
- Closed ✓
- Perpendicular ✓
- Equal Sides ✓

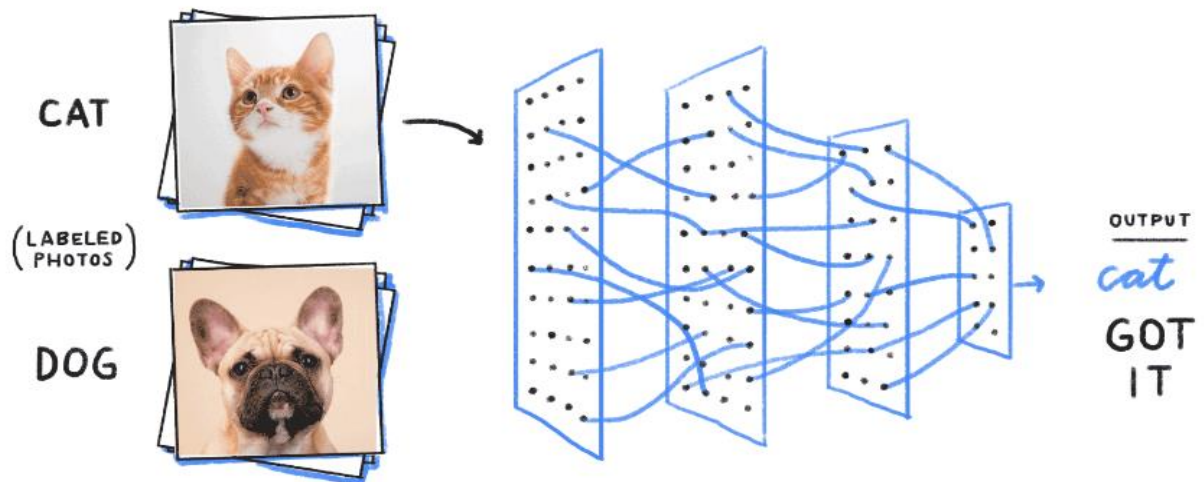
The first thing is to check whether there are 4 lines associated with a figure or not (simple concept right!). If yes, we further check, if they are connected and closed, again if yes we finally check whether it is perpendicular and all its sides are equal (Correct!). Well, this nothing but a **nested hierarchy of concept**.

What we did, we took a complex task of identifying a square in this case and broke it into simpler tasks. Now, this Deep Learning also does this but on a larger scale.

### **Example 2:**



Let's take an example of a machine which recognises the animals. The task of the machine is to recognize whether the given image is of a cat or of a dog.



What if we're asked to resolve the same issue using the concepts of machine learning, what we would do? First, we would define the features such as check whether the animal has whiskers or not, or check if the animal has pointed ears or not or whether its tail is straight or curved.

**In short**, we will define the facial features and let the system identify which features are more important in classifying a particular animal.

Now when it comes to deep learning. It takes this to one step ahead. Deep Learning automatically finds out the features which are important for classification, comparing to Machine Learning where we had to manually give the features.

By now I guess my blog- AI vs Machine Learning vs Deep Learning has made you clear that AI is a bigger picture, and Machine Learning and Deep Learning are its subparts, so concluding it I would say the easiest way of understanding the difference between machine learning and deep learning is to know that **deep learning is machine learning**. More specifically, it's the next evolution of machine learning.





## Definition:

Hacking is an attempt to exploit a computer system or a private network inside a computer. Simply put, it is the unauthorized access to or control over computer network security systems

## Description:

To better describe hacking, one needs to first understand hackers. One can easily assume them to be intelligent and highly skilled in computers. In fact, breaking a security system requires more intelligence and expertise than actually creating one. There are no hard and fast rules whereby we can categorize hackers into neat compartments. However, in general computer parlance, we call them white hats, black hats and grey hats. White hat professionals hack to check their own security systems to make it more hack-proof. In most cases, they are part of the same organization. Black hat hackers hack to take control over the system for personal gains. They can destroy, steal or even prevent authorized users from accessing the system. They do this by finding loopholes and weaknesses in the system. Some computer experts call them crackers instead of hackers. Grey hat hackers comprise curious people who have just about enough computer language skills to enable them to hack a system to locate potential loopholes in the network security system. Grey hats differ from black hats in the sense that the former notify the admin of the network system about the weaknesses discovered in the system, whereas the latter is only looking for personal gains. All kinds of hacking are considered illegal barring the work done by white hat hackers.

## Advantages of Hacking

Hacking is quite useful in the following scenarios –

1. To recover lost information, especially in case you lost your password.
2. To perform penetration testing to strengthen computer and network security.
3. To put adequate preventative measures in place to prevent security breaches.
4. To have a computer system that prevents malicious hackers from gaining access.

## Disadvantages of Hacking

Hacking is quite dangerous if it is done with harmful intent. It can cause –

1. Unauthorized system access on private information.
2. Privacy violation.
3. Hampering system operation.

4. Denial of service attacks.
5. Malicious attack on the system

## **Hacking Techniques:**

### **Key logger**

Key logger is simple software that records the key sequence and strokes of your keyboard into a log file on your machine. These log files might even contain your personal email IDs and passwords. Also known as keyboard capturing, it can be either software or hardware. While software-based key loggers target the programs installed on a computer, hardware devices target keyboards, electromagnetic emissions, smart phone sensors, etc.

Key logger is one of the main reasons why online banking sites give you an option to use their virtual keyboards. So, whenever you're operating a computer in public setting, try to take extra caution.

### **Denial of Service (DoS\DDoS)**

A Denial of Service attack is a hacking technique to take down a site or server by flooding that site or server with a lot of traffic that the server is unable to process all the requests in the real time and finally crashes down. This popular technique, the attacker floods the targeted machine with tons of requests to overwhelm the resources, which, in turn, restrict the actual requests from being fulfilled.

For DDoS attacks, hackers often deploy botnets or zombie computers which have got the only work to flood your system with request packets. With each passing year, as the malware and types of hackers keep getting advanced, the size of DDoS attacks keeps getting increasing.

### **Waterhole attacks**

If you are a big fan of Discovery or National Geographic channels, you could relate easily with the waterhole attacks. To poison a place, in this case, the hacker hits the most accessible physical point of the victim.

For example, if the source of a river is poisoned, it will hit the entire stretch of animals during summer. In the same way, hackers target the most accessed physical location to attack the victim. That point could be a coffee shop, a cafeteria, etc.

Once hackers are aware of your timings, using this type of hacking, they might create a fake Wi-Fi access point and modify your most visited website to redirect them to you to get your personal information. As this attack collects information on a user from a specific place, detecting the attacker is even harder. One of the best ways to protect yourself against such types of hacking attacks is to follow basic security practices and keep your software/OS updated.

### **Fake WAP**

Even just for fun, a hacker can use software to fake a wireless access point. This WAP connects to the official public place WAP. Once you get connected to the fake WAP, a hacker can access your data, just like in the above case. It's one of the easier hacks to accomplish and one just needs a simple software and wireless network. Anyone can name their WAP as some legit name like "Heathrow Airport WiFi" or "Starbucks WiFi" and start spying on you. One of the best ways to protect you from such attacks is using a quality VPN service.



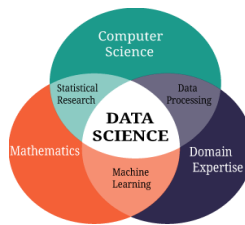
## Introduction:

Before Data Science, there was a popularized term Data Mining, in an article called "From Data Mining To Knowledge Discovery In Database" in 1996, in which it referred to the overall process of discovering useful information from data.

In 2001, William S. Cleveland wanted to bring data mining to another level, he did that by combining computer science with data mining. Basically, he made statistics a lot more technical which he believed would expand the possibilities of data mining and produce a powerful force for innovation. Now we can take advantage of computer power for statistics and he called this combo Data Science.

## What is Data Science?

So, Data Science is the study which deals with the identification, representation and extraction of meaningful information from data sources to be used for business purposes. And the job of a Data Scientist is to dig into the granular level in order to understand complex behaviors, trends, inferences, analytical creativity, time series analysis, segmentation analysis, inferential model, quantitative reasoning, and more.



With the enormous amount of data generating each minute, the requirement to extract the useful insights is a must for the businesses to stand out from the crowd. Data engineers set up the database and data storage in order to facilitate the process of data mining, data munging and other processes.

## What can you do with Data Science?

- Some of the tasks you can do with Data Science include:
- Come up with conclusive research and open-ended questions
- Extract large volumes of data from external and internal sources
- Deploy statistical, machine learning and analytical methods
- Clean, prune and get data ready for processing and analysis
- Look at data from various angles to determine hidden patterns, relations and trends
- Use a mix of algorithmic and automation tools
- Redesign processes, systems using a data-driven approach

## Advantages of Data Science:

- Data scientist helps the management to come up with better and faster decisions
- It empowers the decision-makers with solid data and outlines a path to achieve business goals
- You can anticipate new challenges and opportunities through the power of data
- Spotting trends and capitalizing on it before the competition
- Setting the guidelines for best practices and tried and tested methodologies
- Rigorously testing the decisions until it achieves perfection

## Top Data Science Companies:

Today the data scientist requirement is across the board cutting across industry verticals. Here is a list of some of the biggest and best companies that are hiring data scientists at top-notch salaries

- **Google:** Google is by far the biggest company that is on a hiring spree for top-notch data scientists. Since today most of Google is driven by data scientists, artificial intelligence and machine learning, Google offers some of the best data science salaries.
- **Amazon:** Amazon is another global e-commerce and cloud computing giant that is hiring data scientists on a big scale. They need data scientists to find out about the customer mindset, enhance the geographical reach of both the e-commerce domain and cloud domain among other business-driven goals.
- **Visa:** Visa is an online financial gateway for most of the companies and Visa does transactions in the range of hundreds of millions over the course of a regular day. Due to this the requirement for data scientists is huge at Visa to generate more revenue, check fraudulent transactions, customize the products and services as per the customer requirements among other things.

## How this technology will help you in career growth?

It is clear that the job of data science is going to reach its heights in the future. However, a clearer picture of the opportunities provided by data science will drive you in this direction:

**Attractive Package** – Data scientists have become one of the hottest commodities around the industries. Whether it is a start-up or a Fortune 500 company, data scientists are always in a demand than any other professionals and are getting eye-popping salaries which can reach an average of \$120,000.

**Combination of knowledge and money-** Data science is not all about money but allows you to gain immense knowledge also. So it is this heady mix of money and deep domain knowledge that makes data science such an enviable career option for budding technology professionals.

## Conclusion:

It is not for nothing that the Harvard Business Review has mentioned that Data Science is the hottest job opportunity of the twenty-first century. Today if any digitally driven organization is starved of data even for a short duration of time then it loses its competitive edge. Data Scientists help organizations to make sense of their customers, markets and business as a whole. So it is just the beginning of the rise of the Data Scientist role in today's world and things can only get better with time for Data Science and Data Scientists.



**Micro-Electro-Mechanical** Systems, or **MEMS**, is a technology that in its most general form can be defined as miniaturized mechanical and electro-mechanical elements that are made using the techniques of micro fabrication. The critical physical dimensions of MEMS devices can vary from well below one micron on the lower end of the dimensional spectrum, all the way to several millimetres.

The term used to define MEMS varies in different parts of the world. In the United States they are predominantly called MEMS, while in some other parts of the world they are called “**Microsystems Technology**” or “**Micro Machined Devices**”. While the functional elements of MEMS are miniaturized structures, sensors, actuators, and microelectronics, the most notable elements are the micro sensors and micro actuators. Micro sensors and micro actuators are appropriately categorized as “transducers”, which are defined as devices that convert energy from one form to another. In the case of micro sensors, the device typically converts a measured mechanical signal into an electrical signal.

The more complex levels of integration are the future trend of MEMS technology. The present state-of-the-art is more modest and usually involves a single discrete micro sensor, a single discrete micro actuator, a single micro sensor integrated with electronics, a multiplicity of essentially identical micro sensors integrated with electronics and a single micro actuator integrated with electronics. MEMS technology is sometimes cited as separate and distinct technology. In reality the distinction is not so clear-cut. The well-known Scanning Tunnelling Tip Microscope (STM) which is used to detect individual atoms and molecules on the nanometre scale is a MEMS device. Similarly, the Atomic Force Microscope (AFM) which is used to manipulate the placement and position of individual atoms and molecules on the surface of a substrate is a MEMS device as well. In fact, a variety of MEMS technologies is required in order to interface with the nanoscale domain.

Thus the MEMS is a technology of encompassing highly miniaturized things that cannot be seen with the human eye. The common benefits afforded by this technology, include: increased information capabilities, miniaturization of systems, new materials resulting from new science at miniature dimensional scales, and increased functionality and autonomy for systems.



## What is Android?

Operating Systems have developed a lot in last 15 years. Starting from black and white phones to recent smart phones or mini computers, mobile OS has come far away. Especially for smart phones, Mobile OS has greatly evolved from Palm OS in 1996 to Windows pocket PC in 2000 then to Blackberry OS and Android.

One of the most widely used mobile OS these days is **ANDROID**. **Android** is a software bunch comprising not only operating system but also middleware and key applications. Android Inc was founded in Palo Alto of California, U.S. by Andy Rubin, Rich miner, Nick sears and Chris White in 2003. Later Android Inc. was acquired by Google in 2005. After original release there have been number of updates in the original version of Android.

<b>Android 1.1</b> Feb 2009	<ul style="list-style-type: none"> <li>• Support for saving attachments for MMS</li> <li>• Marquee in layouts</li> <li>• API changes</li> </ul>
<b>Android 1.5</b> Cupcake April 2009	<ul style="list-style-type: none"> <li>• Bluetooth A2DP and AVRCP support</li> <li>• Uploading videos to YouTube and pictures to Picasa</li> </ul>
<b>Android 1.6</b> Donut Sep 2009	<ul style="list-style-type: none"> <li>• WVGA screen resolution support</li> <li>• Google free turn by turn support</li> </ul>
<b>Android 2.0/1</b> Eclair Oct 2009	<ul style="list-style-type: none"> <li>• HTML5 file support</li> <li>• Microsoft exchange server</li> <li>• Bluetooth 2.1</li> </ul>
<b>Android 2.2</b> Froyo May 2010	<ul style="list-style-type: none"> <li>• USB tethering and Wi-Fi hotspot functionality</li> <li>• Adobe flash 10.1 support</li> </ul>
<b>Android 2.3</b> Gingerbread Dec 2010	<ul style="list-style-type: none"> <li>• Multi touch software keyboard</li> <li>• Support for Extra Large screen sizes and resolution</li> </ul>
<b>Android 3.0</b> Honeycomb May 2011	<ul style="list-style-type: none"> <li>• Optimized tablet support with a new user interface</li> <li>• 3D desktop</li> <li>• Video chat and Gtalk support</li> </ul>

*Fig. 2: Flow Chart Showing Various Updates In Original Version of Android*

## Features & Specifications

**Android** is a powerful Operating System supporting a large number of applications in Smart Phones. These applications make life more comfortable and advanced for the users. Hardwares that support Android are mainly based on ARM architecture platform.

Android comes with an Android market which is an online software store. It was developed by Google. It allows Android users to select, and download applications developed by third party developers and use them. There are around 2.0 lack+ games, application and widgets available on the market for users.

Android applications are written in java programming language. Android is available as open source for developers to develop applications which can be further used for selling in android market. There are around 200000 applications developed for android with over 3 billion+ downloads. Android relies on Linux version 2.6 for core system services such as security, memory management, process management,

network stack, and driver model. For software development, Android provides **Android SDK** (Software development kit). Read more about open source software.

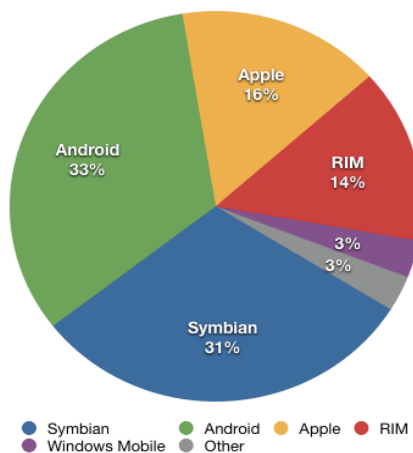
## Applications

These are the basics of Android applications:

- Android applications are composed of one or more application components (activities, services, content providers, and broadcast receivers)
- Each component performs a different role in the overall application behavior, and each one can be activated individually (even by other applications)
- The manifest file must declare all components in the application and should also declare all application requirements, such as the minimum version of Android required and any hardware configurations required
- Non-code application resources (images, strings, layout files, etc.) should include alternatives for different device configurations (such as different strings for different languages)

Google, for software development and application development, had launched two competitions ADC1 and ADC2 for the most innovative applications for Android. It offered prizes of USD 10 million combined in ADC1 and 2. ADC1 was launched in January 2008 and ADC 2 was launched in May 2009. These competitions helped Google a lot in making Android better, more user friendly, advanced and interactive.

## Other Mobile OSs



## Android's Latest

**Android** is still updating. The recent version of Android (Honey comb 3.1) has very advanced features and updated applications which are optimized for use on larger screen devices. These applications are mentioned below:

**Browser:** Android's new version includes a number of new features for simple, fast and convenient browsing with the Quick UI controls.

**Gallery:** Now the new gallery supports PTP (Picture Transfer Protocol) so that users can directly connect their cameras with Android device and transfer pictures with a single touch.

**Calendar:** Calendar grids are larger, for better readability and more accurate touch-targeting. Additionally, users can create a larger viewing area for grids by hiding the calendar list controls. Controls in the date picker are redesigned, making them easier to see and use.



**Contacts:** The Contacts app now lets you locate contacts more easily using full text search. Search returns matching results from all fields that are stored for a contact.

**Email:** When replying or forwarding an HTML message, The Email app now sends both plain text and HTML bodies as a multi-part mime message. This ensures that the message will be formatted properly for all recipients.

**Enterprise support:** Users can now configure an HTTP proxy for each connected Wi-Fi access point. This lets administrators work with users to set a proxy hostname, port, and any bypass sub domains. This proxy configuration is automatically used by the Browser when the Wi-Fi access point is connected, and may optionally be used by other apps. The proxy and IP configuration is now backed up and restored across system updates and resets.

The internet has become need of today's generation, most of the people using internet to meet the needs of daily life like Banking online shopping and other various purpose. Now a days we all are addicted to this virtual world. Everywhere we need a security. So in this field the security is named as cyber security. It is a process or technique to ensure information security goals, various terms used to mean information security, include it security, electronic security, internet security, digital security etc.

If we say in simple language cyber security means protecting data, networks, and other information from unauthorized access and to minimize threats and any kind of vulnerabilities and enforcing required policies for prevention data assurance, recovery and other cyber security related operation. A computer is not having appropriate security can be infected with malicious logic and can be hacked. Cyber threats can be caused due to negligence and vulnerabilities or unintentional accident nevertheless. Many online transactions are being done through many website wallet and bank. These are secured by using strong password and or many other steps verification mode if we don't use strong password our confidential information can be stolen. Also now days we use social networking sites. It is a very popular platform to share information and connecting with people, but if we neglect some security panel then it becomes an opportunities to hacker to steal our personal details and information leakage. Therefore it is important for individuals to understand how to protect against cyber threats. Everyone should learn how to protect their computer mobile phones, and personal information from being hacked and to eliminate changes of cyber threats and thereby creating a safer online environment and apply security patches and need to update, take backup regularly and test backup for restoration, use strong password will save system from vulnerabilities and from hackers also.

### Tools & Techniques Used in Cyber -Security

Cyber security is gaining prominence in the light of increasing number of unauthorized attempts to barge into private data with the explicit aim of stealing the same to intimidate or coerce users into information blackmailing. The tools and techniques employed to tackle cyber security concerns are:

**Authentication:** It is the basic or fundamental process to secure our data from a unauthorized access. Now a days authentication are two types:

1. Password verification mode: it is a very common technique we use to save our data but it is not more securable now a day because many others password cracking tools are available to crack the password easily and third party can access our data.
2. Two steps verification mode: it is also use password to save our data but here one password is use to protect our data and another password is send to our email or mobile to verify the password entered by owner is correct or not.

Here one thing though it is secure than simple password technique but here also a vulnerabilities may arise which is where the second password is send if that email or mobile can be access by third party then they can access our private things, two step is secure but there is a chance it can be hacked by third one so these technique are more or less not secure now a days.

Though it is not secure if we use strong password, it quite difficult to break in this way we can secure our data. This problem is countered by encryption.

**Encryption:** Encryption renders data undecipherable without application of a proper key to unlock the same. Encryption is more secure because to combat an encryption, one would be required to undertake solving complicated mathematical problems like factoring large primes that would consume astronomical amount of computing resources and time. Symmetric encryption utilizes the same key for the purpose of message encoding and decoding. In this way we can send or receive data. Without any hazards.

**Digital signatures:** it is also a part of a encryption where it can be erected out of the same mathematical algorithms that are employed in asymmetric encryption. This process is in essence the exact reciprocal of public key encryption and likewise functions on the assumption that the authorized user only has the private key.

**Firewall:** Firewalls effectively hinders any attempt of unauthorized access to a computer when it is connected on the internet by hackers directly or via other network connections. Firewalls come bundled up with most operating systems and are turned on by default. The help of commercial firewalls can be sought if the security level of the default firewall is not strong enough or if it is posing interference to legitimate network activities.

**Anti virus :**it is kind part of a cyber security because it helps us protect our computers and laptops, The threats of computer viruses or undesirable short programs that trigger unwanted commands without the explicit consent of user have assumed monstrous proportions.

The functions of a anti viruses it prevents the installation of virus in a system and scans the systems for viruses that are already installed. Most viruses have been constructed to target Windows operating system as it is the most preferred computing platform of masses.

Those all are techniques and algorithms we use to protect our data and systems from cyber attacks, vulnerabilities.

## How programming will change over the next 10 years: 5 predictions

Rohan Sarkar  
DCST, 3<sup>rd</sup> Year

Developers working in the field for even just a few years have already seen the rise and fall of several programming languages and tools. Software development is a dynamic field, and job needs are constantly shifting, so it's key to keep an eye on future trends and technologies that could aid the process.

Here are five predictions for what programming will look like 10 years from now.

### **Programming will be more abstract**

Trends like server less technologies, containers, and low code platforms suggest that many developers may work at higher levels of abstraction in the future, removed from lower-level details of coding, said Forrester vice president and principal analyst Jeff Hammond.

"In theory, we should have to care less about the infrastructure of how cloud native applications are built," Hammond said.

Hammond predicts that we will see more augmented reality (AR) and virtual reality (VR) on the front end, which means developers will need to gain the skills to build those applications, along with voice and natural language processing capabilities built in. "We're going to have to get used to doing things other than pixel-based developments with frameworks that we're comfortable with today to build web apps and mobile apps," Hammond said.

### **AI will become part of every developer's toolkit--but won't replace them**

AI is beginning to infuse itself into developer tools today, Hammond said. For example, Microsoft added an AI platform into its Windows 10 update so that every developer building app on the OS will be able to use pre-trained machine learning models. Rice University researchers created an application called BAYOU that uses deep learning to act as a search engine for coding, allowing developers to enter a few keywords and see code in Java that will help with their task.

"I think we'll see more examples where development tools will try to predict developers' intent, and make it quicker for them to express that intent, which in the end, becomes another form of abstraction," Hammond said.

It's unlikely that these technologies replace developers, Hammond said.

"I think it's going to enable them to develop solutions even quicker than they are today, which is good, because there doesn't seem to be any shortage of people wanting additional applications in these services and new software," Hammond said. "I'm pretty bullish on that idea of those technologies becoming an aid to developers as opposed to a replacement to developers. There always enough low level stuff to do, and not enough time to do the high level stuff. Maybe it will give us more time to spend testing what we code."

### **A universal programming language will arise**

To reap the benefits of emerging technologies like AI, programming has to be easy to learn and easy to build upon, said Karen Panetta, an IEEE fellow and dean of graduate engineering at Tufts University.

"Python may be remembered as being the great-great-great grandmother of languages of the future, which underneath the hood may look like the English language, but are far easier to use," Panetta said. "Programs will be built using coding blocks, like the wooden alphabet blocks we used when we were

children. Developers will be able to connect the blocks to implement whatever functionality they need, and the blocks may not even be required to be written in a textual form."

Languages of the future may include visual images of data transformations, such as an image of a calendar to say, "This block allows the user to select and set dates," Panetta predicted. They might also involve blocks that enable tactile sensory devices to be included, so that even individuals with vision impairments would be able to develop programs, she added.

The dominant programming language of the future will also be universal, in that it will support all developers regardless of their spoken language, Panetta said.

### **Every developer will need to work with data**

Developers of the future will need to learn more skills, particularly in data analysis, said Kristen Sosulski, clinical associate professor of information, operations, and management sciences in the Leonard N. Stern School of Business at New York University, and author of *Data Visualization Made Simple*.

"Everything from statistical data analysis, to non-linear and linear data analysis, to machine learning and even artificial intelligence," Sosulski said. "It's really not just learning how to code, it's also learning how to analyze data and sell different models."

### **Programming will be a core tenet of the education system**

For students, programming will join reading, writing, and arithmetic to become a principle of education, Panetta said. "Every professional career of the future will require proficiency in providing data analysis for large data sets, machine learning and using simulation to reduce the cost of testing and manufacturing."

Sosulski recommends that those interested in becoming a developer start with an object-oriented programming language like Python, to give yourself a foundation to build on.

For developers entering or working in the field right now, it's important to understand the architecture behind the tools and frameworks you are using to prepare yourself for the future, Hammond said.

"What I found over the past almost 30 years is, the languages change, the frameworks change, the vendors change, but these implementation patterns tend to repeat themselves in each era," Hammond said. "If you understand that, you can begin to see the differences as new technologies come out and apply what you already know in these new contexts."

## **Abstract:**

Near Field Communication (NFC) Technology represents short range (practically up to 4 cm) wireless communication offering safe yet simple and intuitive communication between electronic devices that we use on a daily basis. Users of devices having NFC application in it can simply touch their devices to other similar elements having NFC application to communicate with them, making application and data usage easy and convenient. NFC can be called as the next generation of Radio Frequency Identification (RFID) as technically its working principal is based on RFID however from application point of view it is similar to Bluetooth in some ways since it allows communication between two active devices.

NFC can be the future medium of contactless electronic payment as it inhibits eavesdropping on NFC - enabled transactions pertaining to its short range, however range can be extended by attackers using some range extension system. In this paper we briefly discussed the advantages, limits or challenges of NFC technology along with its applications which opens up exciting new usage scenarios for mobile devices.

## **Introduction:**

Near Field Communication or NFC is a type of technology that soon will be a must for each gadget and is an integration of Radio Frequency Identification (RFID) technology with mobile devices which allows them to communicate with each other by simply touching or bringing them very close to each other. RFID is used mainly for applications like indicating or identifying goods or persons without a line of sight while NFC on the other hand is used for more sophisticated and secure transactions like contactless access or payment. NFC is the outcome of joint work done by NXP Semiconductors (formerly Philips Semiconductors) and Sony Corporation . Near field communication technology has already come in existence in many of the smart phones but still due to lack of awareness of people it is not in that much use. But with the growing popularity and demand for android applications, soon NFC will be found in every nook and corner of the world due to its compatibility with almost every existing technology in one way or the other.

## **NFC Standards:**

Near Field Communication (NFC) standards were first developed by the NFC forum, which was founded jointly by Nokia, Sony and Philips in the year 2004 with an aim to spread knowledge about NFC among people. In December 2003, NFC was accredited with the standard ISO/IEC 18092 (NFC IP-1) which specifies the interface and set of rules to be followed for simple wireless communications between devices kept closely that does communication with transfer rates of 106, 212 and 424 kbps. In 2005, NFC also earned a further internationally accredited standard ISO/IEC 21481 which meant in the future it will soon become a known technology all over the world and will have various applications. According to the ISO standard, NFC is not encrypted which makes it compatible with previous RFID technologies

## Modes of Communication:

Using NFC, communication could take place between two active devices such as cell phones called active mode or even between a NFC device and a passive (or unpowered) 'tag' called passive mode . In active mode, both the initiator and the target generate the RF signal on which the data is carried while in passive mode, RF signal is generated only by the initiator, and target communicates back to the initiator using a technique called load modulation.

Table 1: Coding and modulation schemes varying according to data rate [3].

kbit/s	Active Device	Passive device
424	Manchester, 10% ASK	Manchester, 10% ASK
212	Manchester, 10% ASK	Manchester, 10% ASK
106	Modified Miller, 100% ASK	Manchester, 10% ASK

## NFC Modes of Operation:

NFC has three operating modes; Peer-to-Peer, Reader/Writer, and Card Emulation.

In **card-emulation** mode the data is copied from a NFC enabled mobile device to NFC-Reader. The most important feature of card emulation mode is elimination of physical objects and providing access control through user's respective smart phones. Thus the most used mode of NFC too.

In **reader/writer mode** data is copied is from NFC tag to cell phone or vice-versa. This is a novel technology proposed by NFC and will become the user selling point of NFC in coming future.

In **peer-to-peer mode** data commutes between two NFC enabled active devices. But it is rarely used because of tough competition given by other wireless technologies like Bluetooth as it is more widely spread compared to NFC.

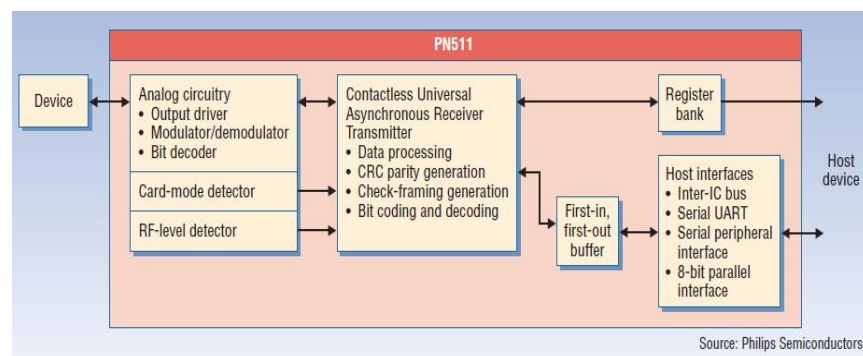
Mode of communication of the device whether active or passive, cannot be changed while the transaction is going on unless and until the target device vanishes i.e., removed or deactivated



## Advantages:

- NFC provides bidirectional communication for exchanging information i.e. both devices can send and receive data simultaneously unlike Bluetooth which promotes unidirectional communication.
- NFC consumes less power in comparison of Bluetooth while working in active mode while more in case working in passive mode but Bluetooth has only active mode so NFC is more advantageous in this case .

- Also there is no requirement of setting up a connection between two devices in action in case of NFC unlike that of Bluetooth. Thus NFC is easier to use especially in crowded places.
- NFC can be used for handshaking
- Less probability of unknown connections setting up due to short range of communications.
- Mobile devices can be used both as an information storage device or a NFC reader. They can read information from NFC tags which can further be manipulated and worked on accordingly. Also information like website account passwords or such type of confidential information can be stored thus it acts as a digital storage.
- NFC can be used to build small devices as there will be no need for embedding any display unit in a device having NFC. The equipment can be touched by an NFC-enabled device and readings can be displayed.
- As the communication range for NFC is nearly 4 cm practically, thus when the devices are separated even a little distance apart, the communication ends which depicts in built security.
- Components for NFC module can be integrated on one chip device as shown in Figure 3, saving space on the device which can be utilized for including other necessary functions and still keeping the size of the gadget small and handy.



**Contactless Payment:** With the use of NFC in the smart phones, they can be used in place of wallet, credit cards, debit cards etc. Cards with a direct physical contact interface are known as contact smart cards which receive power from the reader they are inserted in and exchange data with it using physical contacts while cards with a remote contactless interface are known as contactless smart cards which are waived from a very short distance so that electromagnetic wave from the reader will be used as the energy source, and wireless communication like NFC will be used for data exchange at the same time. SIM (Subscriber Identity Module) cards which are a must requirement in cell phones, in addition to authenticating users to the cellular network, contain a secure storage area, which provides necessary security conditions and performs data encryption and decryption. Mobile Network Operators (MNOs) and service providers such as banks use this area to provide value added services such as mobile financial services, e-government services, digital signature services, etc. to the users. Thus NFC is used for the electronic payment in which SIM card acts as a contactless smart card while the users smart phone acts as a mobile wallet.

### Transit and Ticketing:

Contactless tickets, once introduced, will result in increase in speed and ease with which all consumers can use public transport like buses and access controlled environments like parking garages, transportation gates or get into events etc. Thus making travelling quite comfortable and fast . Also provides flexibility of choosing sources and destination compared to present format and decreases



wastage of resources like paper and time making it an eco friendly option along with providing better monitoring thus giving way for transparency of the system

NFC-enabled smart phones can be used as a room key in hotels making the check-in and check-out procedure free of standing in queues and waiting. Instead a person can directly enter their allotted rooms after making a booking and in return receiving a soft-key to their rooms



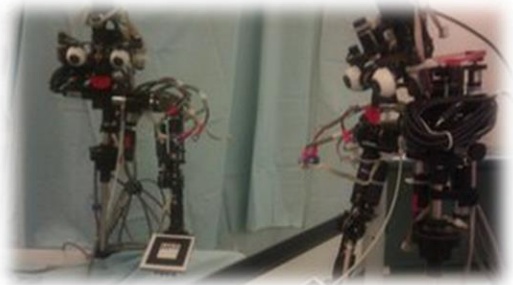
## Conclusion:

Near Field Communication has already begun to shape the future of electronic gadgets in people's life. As the prices of chip manufacturing falls, the likelihood is that NFC-enabled mobile phones will become standard and their applications will become a part and parcel of life. According to a survey .it is found that NFC technology was preferred by people over other technologies including Bluetooth Beacons and QR codes. It is inferred that NFC technology works on the basis of RFID technology which uses magnetic field induction as a medium to establish communication between electronic devices placed closely and operating at 13.56 MHz as it is unlicensed frequency and can transmit data at a maximum rate of 424kbps . NFC like any other technology has its own pros and cons.

When compared to other technologies however presently it is less popular but with the increasing android applications, soon it will become a need. In the present world where digital transaction are so common, there exist people who try to manipulate, disrupt or misuse the data that is transmitted and so users will no doubt initially be concerned about the security of their personal data that is stored on the NFC devices. Still besides this, it is a must application for smart phones and people need to be made aware about how it works.

The name “Artificial Intelligence” covers a lot of disparate problem areas, united mainly by the fact that they involve complex inputs and outputs that are difficult to compute (or even check for correctness when supplied). One of the most interesting such areas is sensor-controlled behavior, in which a machine acts in the real world using information gathered from sensors such as sonars and cameras. The difference between sensor-controlled behavior and what computers usually do is that the input from a sensor is ambiguous. When a computer reads a record from a database, it can be certain what the record says. There may be philosophical doubt about whether an employee’s social-security number really succeeds in referring to a flesh-and-blood employee but such doubts don’t affect how programs are written. As far as the computer systems is concerned, the identifying number is the employee, and it will happily, and successfully, use it to access all relevant data as long as no internal inconsistency develops.

Contrast that with a computer controlling a soccer-playing robot, whose only sensor is a camera mounted above the field. The camera tells the computer, several times per second, the pattern of illumination it is receiving encoded as an array of numbers. (Actually, it’s three arrays, one for red, one for green, and one for blue.) The vision system must extract from this large set of numbers the locations of all the robots (on its team and the opponent’s) plus the ball. What it extracts is not an exact description, but always noisy, and occasionally grossly wrong. In addition, by the time the description is available it is always slightly out of date. The computer must decide quickly how to alter the behavior of the robots, send them messages to accomplish that, and then process the next image.



## Philosophy of AI:

While exploiting the power of the computer systems, the curiosity of human, lead him to wonder, “Can a machine think and behave like humans do?”. Thus, the development of AI started with the intention of creating similar intelligence in machines that we find and regard high in humans.

**To Create Expert Systems:** The systems which exhibit intelligent behavior, learn, demonstrate, explain, and advice its users. From SIRI to self-driving cars, artificial intelligence (AI) is progressing rapidly, human-like characteristics, AI can encompass anything from Google’s search algorithms to IBM’s Watson to autonomous weapons..

## Why research AI safety?

In the near term, the goal of keeping AI’s impact on society beneficial motivates research in many areas, from economics and law to technical topics such as verification, validity, security and control. Whereas it may be little more than a minor nuisance if your laptop crashes or gets hacked, it becomes all the more important that an AI system does what you want it to do if it controls your car, your airplane, your pacemaker, your automated trading system or your power grid. In the long term, an important question is what will happen if the quest for strong AI succeeds and an AI system becomes better than humans at all cognitive tasks. As pointed out by I.J. Good in 1965, designing smarter AI systems is itself a cognitive task. Such a system could potentially undergo recursive self-improvement, triggering an intelligence explosion leaving human intellect far behind.

## How can AI be dangerous?

Most researchers agree that a super intelligent AI is unlikely to exhibit human emotions like love or hate, and that there is no reason to expect AI to become intentionally benevolent or malevolent. Instead, when considering how AI might become a risk, experts think two scenarios most likely:

### The AI is programmed to do something devastating

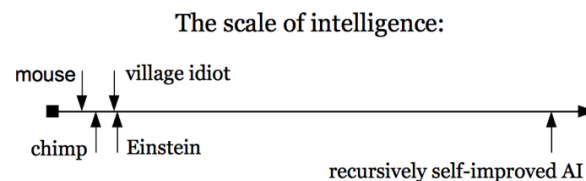
Autonomous weapons are artificial intelligence systems that are programmed to kill. In the hands of the wrong person, these weapons could easily cause mass casualties. Moreover, an AI arms race could inadvertently lead to an AI war that also results in mass casualties. To avoid being thwarted by the enemy, these weapons would be designed to be extremely difficult to simply “turn off,” so humans could plausibly lose control of such a situation. This risk is one that’s present even with narrow AI, but grows as levels of AI intelligence and autonomy increase.



As these examples illustrate, the concern about advanced AI isn’t malevolence but competence.

### Myths About the Risks of Superhuman AI:

Many AI researchers roll their eyes when seeing this headline: “*Stephen Hawking warns that rise of robots may be disastrous for mankind.*” And as many have lost count of how many similar articles they’ve seen. Typically, these articles are accompanied by an evil-looking robot carrying a weapon, and they suggest we should worry about robots rising up and killing us because they’ve become conscious and/or evil. On a lighter note, such articles are actually rather impressive, because they succinctly summarize the scenario that AI researchers *don’t* worry about. That scenario combines as many as three separate misconceptions: concern about *consciousness*, *evil*, and *robots*.



The fear of machines turning evil is another red herring. The real worry isn’t malevolence, but competence. A super intelligent AI is by definition very good at attaining its goals, whatever they may be, so we need to ensure that its goals are aligned with ours. Humans don’t generally hate ants, but we’re more intelligent than they are – so if we want to build a hydroelectric dam and there’s an anthill there, too bad for the ants. The beneficial-AI movement wants to avoid placing humanity in the position of those ants.

The consciousness misconception is related to the myth that machines can’t have goals. Machines can obviously have goals in the narrow sense of exhibiting goal-oriented behavior: the behavior of a heat-seeking missile is most economically explained as a goal to hit a target. If you feel threatened by a

machine whose goals are misaligned with yours, then it is precisely its goals in this narrow sense that troubles you, not whether the machine is conscious and experiences a sense of purpose.

### **How can we overcome the weakness of AI:**

**Apple's movement:** Apple's recent acquisition of Vocal IQ, an artificial intelligence company that specializes in voice programs, should not on its face lead to much fanfare: It appears to be a smart business move to enhance Siri's capabilities. But it is also another sign of the increased role of AI in our daily lives. While the warnings and promises of AI aren't new, advances in technology make them more pressing.

**Silicon valley's concept:** While Silicon Valley enthusiasts hail the potential gains from artificial intelligence for human efficiency and the social good, Hollywood has hyped its threats. AI-based enemies have been box office draws at least since HAL cut Frank Poole's oxygen hose in *2001: A Space Odyssey*. And 2015 has truly been the year of fictional AI provocateurs and villains with blockbuster movies including *Terminator Genisys*, *Ex-Machina*, and *The Avengers: Age of Ultron*.

But are the risks of AI the domain of libertarians and moviemakers, or are there red flags to be seen in the specter of "intelligence agents?" Silicon Valley cannot have "exponential" technological growth and expect only positive outcomes. Similarly, Luddites can't wish away the age of AI, even if it might not be the version we see in the movies.

AI needs to enter the public and political discourse with real-world discussion between tech gurus and policymakers about the applications, implications and ethics of artificial intelligence. Specialized AI for product design may be possible today, but answering broad questions such as, "Will this action be harmful?" is well outside the capabilities of AI systems, and probably their designers as well.

Answering such questions might seem like an impossible challenge, but there are signs of hope. First, the risks with AI, as with most technologies, can be managed. But the discussions have to start. And second, unlike in an AI-themed Hollywood thriller, these machines are built to work with humankind, not against it. It will take an army of human AI experts to keep it that way, but precautions can and should be sought now.