Id:17008

Bs (CS)

IT Mid-Term Assignment

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Q1: Watch animated movie “Incredible 1” and discuss the technologies used by characters of the movie. Further, take note of the technologies used in making of this movie.

The Incredible 1 is an animated movie based on a family that consists of superheroes, due to their mistakes public opinion turns against Superheroes due to the collateral damage caused by their crime-fighting. After several lawsuits, the government initiates the Superhero Relocation Program, which forces Supers to permanently adhere to their secret identities and abandon their exploits. Fifteen years later, Bob and Helen Parr—formerly known as Mr. Incredible and Elastigirl—and their children Violet, Dash, and baby Jack-Jack are a suburban family living in **Metroville** (Metroville's name is a combination of Metropolis and Smallville). Although he loves his family, Bob resents the mundanity of his suburban lifestyle and white-collar job. Together with his best friend Lucius Best, formerly known as Frozone, Bob occasionally relives "the glory days" by moonlighting as a vigilante.

Technology used by the characters:

- **Syndrome:**

Syndrome (real name Buddy Pine) is the hidden main antagonist of the 2004 Disney/Pixar animated film The Incredibles. He originally wanted to be a superhero, but when his former idol, Mr. Incredible, turned him down and rejected his offer, Syndrome went insane, became a supervillain and devoted his life to killing superheroes in revenge on Mr. Incredible, so that he could take over as the world's sole "superhero", in addition to selling his impressive inventions to the world so that "everyone could be super", and therefore nobody would be unique.

His lair, which exists on a secret island which is protected by a cloaking device.

Cloaking device: Even though this technology is non-existent and doesn't actually work in real life, it is still based upon the technology of F-35 strike fighter jet which makes this fantasy a reality, as it navigates airspace with the most advanced powers of hide and seek. Its multiple stealth devices – radar-absorbing materials and internal infrared sensors – comprise the ultimate invisibility cloak.

Robotics: Even though the technology was misused by the antagonist (Syndrome), its structure was still based upon the idea of (AI) technology and supervised learning. But how supervised learning? Since the idea of supervised learning is using “collective data”, the Robot (Omnidriod) is learning during his first fight against Mr. Incredible and making up decisions on how to over-come his fight patterns. Also, the robot is based GUI because, GUIs are often associated with software-only products. However, the interface you use to control your robot is almost certainly a GUI if it uses graphical icons, buttons, etc.

Heat-seeking Technology: In one of the scenes during the arrival of Helen Parr with his kids to the secret island protected by the cloaking device, syndrome used “heat-seeking” technology to track the jet and take it down eventually. This sort of technology is used by the “Airforce” all the time during either training or actual missions. Infrared emissions are released and radiated strongly by Hot Bodies such as the engine of the jet. These missiles when fired track the heat signature and follow it. Due to the very strong heat radiated by the jet engines, these missiles easily track the target.

- **Edna mode:**

Edna "E" Mode is a fictional character
in Pixar's animated superhero film The Incredibles (2004). She is an eccentric fashion designer renowned for designing the costumes of several famous superheroes, having worked particularly closely with Mr. Incredible and Elastigirl (Bob and

Helen Parr), with whom she has maintained a strong friendship. When the couple resumes their superheroic careers after fifteen years, Edna is summoned out of retirement to aid both characters, first by equipping Mr. Incredible with a new costume and then by restoring Elastigirl's confidence in herself as a superheroine.

Biometrics: Edna mode, in her secret facility of designing super hero costumes is using a state of the art advance biometric security system. This includes:

1. Fingerprint scanner
2. Eye scanner
3. Keypad code (5 digit code)
4. Voice recognition

It also has a built in identifier which has pressure based sensors on the ground that detects “un-identified” personnel.

Specialized Suits:

Edna mode is proficient in engineering specialized suits designed with high-grade polymers (used only in fantasies) that can protect them from any sort of harmful attacks, such as, gamma rays or explosions. Even though the technology is exaggerated, in a way it becomes non-realistic, it still uses UI Tech built in the suits that help them track their enemy or have proficient radio tech to communicate with the other allies.

Technology used in making the movie:

For over 25 years, Pixar, which is owned by The Walt Disney Company (DIS), has used an image processing technology called RenderMan that converts two-dimensional images into three-dimensional graphics. It's the core technology that gives depth to flat images by adding more color and shading. (The process of generating finished 2D images from the geometry, surfacing and lighting data used to create a 3D animation). Two years later, Finding Nemo pioneered new techniques in digital lighting, which were used to create realistic-looking water. **The Incredibles** and Ratatouille brought with them believable human characters, and advances in the simulation of crowds and fluids. Since then, the development of new techniques for simulating human skin – such as subsurface scattering, a technique that simulates how light is absorbed, scattered and re-emitted by skin – have led to more realistic digital skin. And advances in performance capture have made it possible to record an actor's facial movements in ever greater detail, before transferring them to a character. Both developments have brought us to the brink of having convincing digital actors on screen. Although, no matter how fast computers get, the average time taken to render a frame of animation stays the same. In part, this extra processing power is soaked up by increasing complexity: more detailed models, larger sets and more characters on screen simultaneously. But faster, more powerful computers also permit the use of more computationally demanding techniques.

Q2: Write a note on the following embedded technologies in detail.

a) Robotics:

The field of computer science and engineering concerned with creating robots, devices that can move and react to sensory input. Robotics is one branch of artificial intelligence.
Robots are now widely used in factories to perform high-precision jobs such as welding and riveting. They are also used in special situations that would be dangerous for humans -- for example, in cleaning toxic wastes or defusing bombs.

Although great advances have been made in the field of robotics during the last decade, robots are still not very useful in everyday life, as they are too clumsy to perform ordinary household chores. Robotics also involves design, construction, operation and use of robots in these scenarios. Robotics develops machines that can substitute for humans and replicate human actions. Robots can be used in many situations and for lots of purposes , but today many are used in dangerous environments (including inspection of radioactive materials, bomb detection and deactivation), manufacturing processes, or where humans cannot survive (e.g. in space, underwater, in high heat, and clean up and containment of hazardous materials and radiation). Robots can take on any form but some are made to resemble humans in appearance. This is said to help in the acceptance of a robot in certain replicative behaviors usually performed by people. Such robots attempt to replicate walking, lifting, speech, cognition, or any other human activity. Robotics is a branch of engineering that involves the conception, design, manufacture, and operation of robots.

This field overlaps with computer engineering, computer science (especially artificial intelligence), electronics, mechatronics, nanotechnology and bioe ngineering.

b) 5G Technology:

5G stands for fifth generation wireless technology.

It is the latest iteration of cellular technology that has three main features: greater speed, lower latency, and the ability to connect a lot more devices simultaneously. A commercial 5G wireless network is expected to be deployed by 2020. Wireless communication technology has grown and advanced significantly over the years through research and innovation. The time has come when we can connect various wireless technologies, networks, and applications simultaneously. This latest technology is called 5G. The fifth generation wireless system (or 5G for short) is now the next generation of wireless communication systems. It is the next major phase of mobile telecommunications standards beyond the current 4G. 5G moves us beyond networks design for mobile devices alone toward systems that connect different types of devices operating at high speeds. The key features of 5G include high throughput, improved spectrum efficiency, reduced latency, better mobility support, and high connection density. It supports interactive multimedia, voice, video, Internet, and other broadband services. To support increased throughput requirements of 5G, new spectrum has been assigned to 5G in mmWave

Bands. 5G will use Multiple Input Multiple Output (MIMO) to significantly increase network capacity. The move to 5G wireless communication standard is an action in response to the growth of the Internet of Things and the rise in demand for access to video and services over wireless broadband. Although 5G is not expected until 2020, an increasing number of companies are investing now and are creating 5G products. Development of the new mobile wireless standard is being led by companies such as Intel, Qualcomm, Nokia, Ericsson, BT, Verizon, AT&T, and Samsung.

But how does it work?

As any other cellular network, 5G networks will consist of cells divided into sectors and send data through radio waves. Each cell is connected to a network backbone through a wired or wireless connection. 5G may transmit data over the unlicensed frequencies currently used for Wi-Fi. It promises a smarter, faster and efficient network. The goal of 5G is to have far higher speeds available, at higher capacity per sector and at far lower latency than 4G. In order to increase network efficiency, the cell is subdivided into micro and pico cells, 5G will be a new mobile revolution as it is expected to provide gigabit-per-second data rates anytime, anywhere. In a

5G wireless network, every mobile phone will have an IPv6 address depending on the location and network being used. 5G utilizes user-centric network concept World-Wide-Wireless-Web (W.W.W.W) instead of operator- centric as in 3G or service-centric as in 4G. (WWWW) will be capable of supporting applications and services and interconnected the whole world. 5G

includes the latest technologies such cognitive radio, Internet of things, nanotechnology, and cloud computing.

c) **Artificial Intelligence:**

Artificial intelligence (AI) is wide-ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence. AI is an interdisciplinary science with multiple approaches, but advancements in machine learning and deep learning are creating a paradigm shift in virtually every sector of the tech industry.

Overall, there are 4 different approachable ideas to (AI):

1) Thinking Humanly
2) Thinking Rationally
3) Acting Humanly
4) Acting Rationally

The idea to follow (AI) from today's standards can be defined as "Artificial intelligence (AI) is wide-ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence. AI is an interdisciplinary science with multiple approaches, but advancements in machine learning and deep learning are

creating a paradigm shift in virtually every sector of the tech industry”.

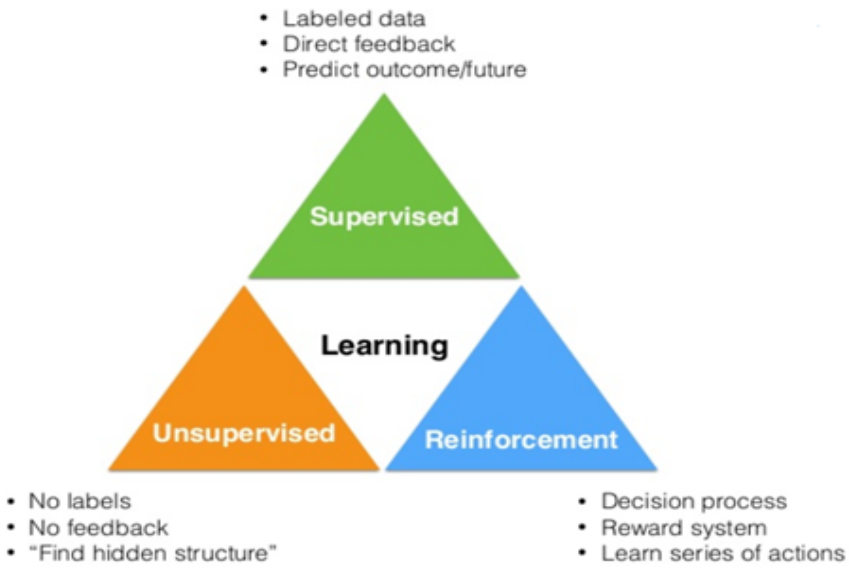
Colloquially, the term "artificial intelligence" is often used to describe machines (or computers) that mimic "cognitive" functions that humans associate with the human mind, such as "learning" and "problem solving". As machines become increasingly capable, tasks considered to require "intelligence" are often removed from the definition of AI, a phenomenon known as the AI effect. A quip in Tesler's Theorem says "AI is whatever hasn't been done yet." For instance, optical character recognition is frequently excluded from things considered to be AI, having become a routine technology. Modern machine capabilities generally classified as AI include successfully understanding human speech, competing at the highest level in strategic game systems (such as chess and Go), autonomously operating cars, intelligent routing in content delivery networks, and military simulations. The traditional problems (or goals) of AI research include reasoning, knowledge representation, planning, learning, natural language processing, perception and the ability to move and manipulate objects. General intelligence is among the field's long-term goals. Approaches include statistical methods, computational intelligence, and traditional symbolic AI. Many tools are used in AI, including versions of search and mathematical optimization, artificial neural networks, and methods based on statistics, probability and economics. The AI field draws upon computer science, information engineering, mathematics, psychology, linguistics, philosophy, and many other fields.

d) **Machine Learning:**

Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves.

The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly.

Some Machine Learning methods:



Machine learning algorithms are often categorized as supervised learning, un-supervised learning and reinforcement learning.

Supervised Learning:

Supervised learning can apply what has been learned in the past to new data using labeled examples to predict future events. Starting from the analysis of a known training dataset, the learning algorithm produces an inferred function to make predictions about the output values. The system is able to provide targets for any new input after sufficient training. The learning algorithm can also compare its output with the correct, intended output and find errors in order to modify the model accordingly.

Un-supervised Learning:

In contrast, unsupervised machine learning algorithms are used when the information used to train is neither classified nor labeled. Unsupervised learning studies how systems can infer a function to describe a hidden structure from unlabeled data. The system doesn't figure out the right output, but it explores the data and can draw inferences from datasets to describe hidden structures from unlabeled data.

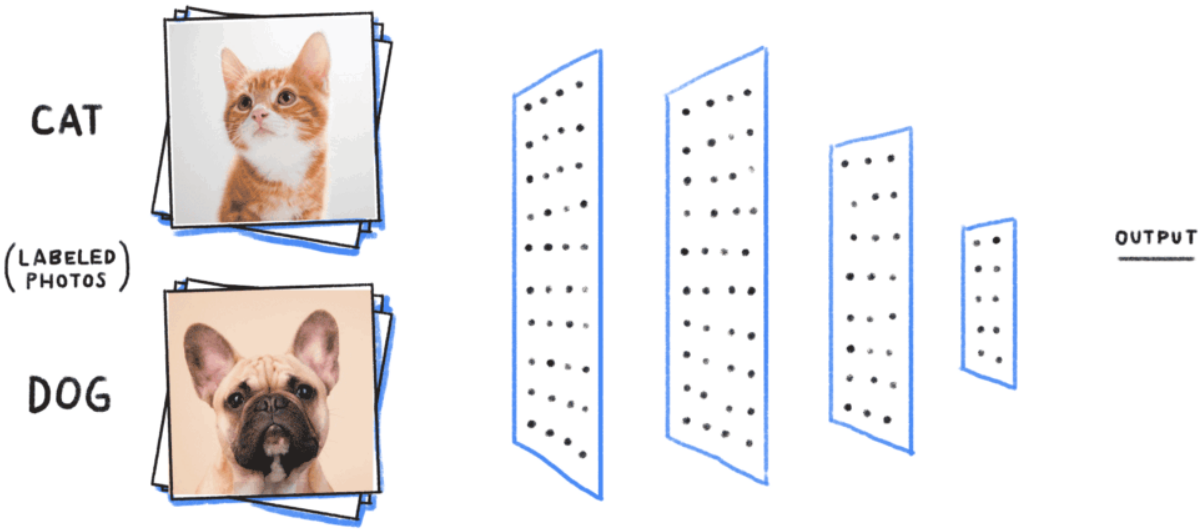
Reinforcement Learning:

Reinforcement machine learning algorithms is a learning method that interacts with its environment by producing actions and discovers errors or rewards. Trial and error search and delayed reward are the most relevant characteristics of reinforcement learning. This method allows machines and software agents to automatically determine the ideal behavior within a specific context in order to maximize its performance. Simple reward feedback is required for the agent to learn which action is best; this is known as the reinforcement signal.

Machine learning enables analysis of massive quantities of data. While it generally delivers faster, more accurate results in order to identify profitable opportunities or dangerous risks, it may also require additional time and resources to train it properly. Combining machine learning with AI and cognitive technologies

can make it even more effective in processing large volumes of information.

Example of how the methods are used in a general sense.



Q3.

(a) Write a note on prevailing generation of computers in use and discuss its characteristics in detail.

What Are the Five Generations of Computers?

Five generations of computers and the advances in technology that have led to the development of the many computing devices that we use today. Our journey of the five generations of computers starts in 1940 with vacuum tube circuitry and goes to the present day — and beyond — with artificial intelligence (AI) systems and devices.

1) First Generation: Vacuum Tubes (1940-1956)

The first computer systems used vacuum tubes for circuitry and magnetic drums for memory, and were often enormous, taking up entire rooms. These computers were very expensive to operate and in addition to using a great deal of electricity, the first computers generated a lot of heat, which was often the cause of malfunctions.

First generation computers relied on machine language, the lowest-level programming language understood by computers, to perform operations, and they could only solve one problem at a time. It would take operators days or even weeks to set-up a new problem. Input was based on punched cards and paper tape, and output was displayed on printouts.

The UNIVAC and ENIAC computers are examples of first-generation computing devices. The UNIVAC was the first commercial computer delivered to a business client, the U.S. Census Bureau in 1951.

2) Second Generation: Transistors (1956-1963)

The world would see transistors replace vacuum tubes in the second generation of computers. The transistor was invented at Bell Labs in 1947 but did not see widespread use in computers until the late 1950s.

The transistor was far superior to the vacuum tube, allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable than their first-generation predecessors. Though the transistor still generated a great deal of heat that subjected the computer to damage, it was a vast improvement over the vacuum tube. Second-generation computers still relied on punched cards for input and printouts for output.

From Binary to Assembly

Second-generation computers moved from cryptic binary machine language to symbolic, or assembly, languages, which allowed programmers to specify instructions in words. High-level programming languages were also being developed at this time, such as early versions of COBOL and FORTRAN. These were also the first computers that stored their instructions in their memory, which moved from a magnetic drum to magnetic core technology.

The first computers of this generation were developed for the atomic energy industry.

3) Third Generation: Integrated Circuits (1964-1971)

The development of the integrated circuit was the hallmark of the third generation of computers. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers.

Instead of punched cards and printouts, users interacted with third generation computers
through keyboards and monitors and interfaced with an operating system, which allowed the device to run many
different applications at one time with a central program that monitored the memory. Computers for the first time became accessible to a mass audience because they were smaller and cheaper than their predecessors.

Fact:

(An integrated circuit (IC) is a small electronic device made out of a semiconductor material. The first integrated circuit was developed in the 1950s by Jack Kilby of Texas Instruments and Robert Noyce of Fairchild Semiconductor).

4) Fourth Generation: Microprocessors (1971-Present)

The microprocessor brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. What in the first generation filled an entire room could now fit in the palm of the hand. The Intel 4004 chip, developed in 1971, located all the components of the computer—from the central

processing unit and memory to input/output controls—on a single chip.

In 1981 IBM introduced its first computer for the home user, and in 1984 Apple introduced the Macintosh. Microprocessors also moved out of the realm of desktop computers and into many areas of life as more and more everyday products began to use microprocessors.

As these small computers became more powerful, they could be linked together to form networks, which eventually led to the development of the Internet. Fourth generation computers also saw the development of GUIs, the mouse and handheld devices.

5) Firth Generation: Artificial Intelligence (Present)

Fifth generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today. The use of parallel processing and superconductors is helping to make artificial intelligence a reality.

Quantum computation and molecular and nanotechnology will radically change the face of computers in years to come. The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self-organization.

(b) Multiply the given binary numbers 10001001 with 10010011.

Binary value:

10001001 × 10010011= 0100111010101011

Sorry for the long submission, I went over-board with some of the information in the question 1 part a, I didn't know how much would be enough. I hope you find my 5 hours of work acceptable. Thank you for reading till the end.