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A Survey on Artificial Intelligence In Internet of Things

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Abstract:-- **IOT is the internetworking of "things" that collects and exchanges information from the environment. AI, on the other hand, is the engine or the "brain" that will enable analytics and decision making from the data collected by IoT. In other words, IoT collects the data and AI processes this data in order to make sense of it. The AI and IOT systems are working together in devices like fitness trackers and Google Home. AI can be used to make inferences about this data and summarize it before transmitting it to other devices. This would reduce the flood of data to a manageable level. This would enable the attachment of a larger number of devices to the network. This paper describes the advantages, applications, analysis and result of using Artificial Intelligence in Internet of Things.**

Keywords **– Artificial Intelligence, IOT-Types of AI, AI in IOT, AI in IoT Applications.**

I. INTRODUCTION

Internet of Things (IoT) is an ecosystem of connected physical objects that are accessible through the internet. The 'thing' in IoT could be a person with a heart monitor or an automobile with built-in-sensors, i.e. objects that have been assigned an IP address and have the ability to collect and transfer data over a network without manual assistance or intervention. The embedded technology in the objects helps them to interact with internal states or the external environment, which in turn affects the decisions taken. Artificial Intelligence provides us the framework and tools to go beyond trivial real-time decision and automation use cases for IoT. AI can be used to make inferences about this data and summarize it before transmitting it to other devices. This would reduce the flood of data to a manageable level. Other AI can be used to coordinate the devices and act like a manager of groups of devices. This would enable the attachment of a larger number of devices to the network.

II ARTIFICIAL INTELLIGENCE

Artificial intelligence is the intelligence of machines where an intelligent agent is a system that takes actions which maximise its chances of success. John McCarthy coined the term in 1955, defines it as "the science and engineering of making intelligent machines". The goals of AI research include reasoning, knowledge, planning, learning, natural language processing, and the ability to move and manipulate objects. Currently popular approaches include statistical methods; computational intelligence and traditional symbolic AI. There are a large number of tools used in AI, including versions of research and mathematical optimisation, logic, methods based on probability and economics, and many others. The AI field is inter-disciplinary, in which a number of sciences and professions converge, including computer science, mathematics, psychology, linguistics and neuron science. The field was founded on the claim that central property of humans, human intelligence-the sapience of homo sapiens-"it can be soon precisely described that a machine can be made to simulate it. Artificial Intelligence can be divided into two categories as Symbolic AI and Computational Intelligence.

III METHODS OF AI

Artificial Methods can be divided into two categories as

A) Symbolic Artificial Intelligence

The Symbolic Artificial Intelligence is touchy about defining their object. It focuses on the development of knowledge based systems that are a computer system capable of giving advice in a particular domain utilizing knowledge provided by a human expert.

B) Computational Artificial Intelligence

The computational Intelligence focuses on neural networks, fuzzy systems and evolutionary computing, that is neural networks are biologically inspired systems consisting of massively connected networks of computational neurons organised in layers. The central goal is to understand the principles that make intelligent behaviour possible, in natural or artificial systems.

IV INTERNET OF THINGS

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The concept of the Internet of things was invented by and term coined by Peter T. Lewis in September 1985 in a speech he delivered at a U.S. Federal Communications Commission (FCC) supported session at the Congressional Black Caucus 15th Legislative Weekend Conference. Internet of Things (IoT) is an ecosystem of connected physical objects that are accessible through the internet. The 'thing' in IoT could be a person with a heart monitor or an automobile with built-in-sensors, i.e. objects that have been assigned an IP address and have the ability to collect and transfer data over a network without manual assistance or intervention. The embedded technology in the objects helps them to interact with internal states or the external environment, which in turn affects the decisions taken.

YEAR	NUMBER OF CONNECTED DEVICES
1990	0.3 million
1999	90.0 million
2010	5.0 billion
2013	9.0 billion
2025	1.0 trillion

The above is a small survey taken by the HP in accordance to the number of connected devices.

V TECHNOLOGIES ENABLING IOT

There are many technologies that can enable IOT, like the communicating technology is the important source technology for IOT. There are three wireless communications as,

A) Short-Range Wireless:

The technologies enabling the short range wireless communication are Bluetooth low energy, Light- Fidelity, Thread, Wi-Fi, and Z-Wave.

B) Medium-Range Wireless:

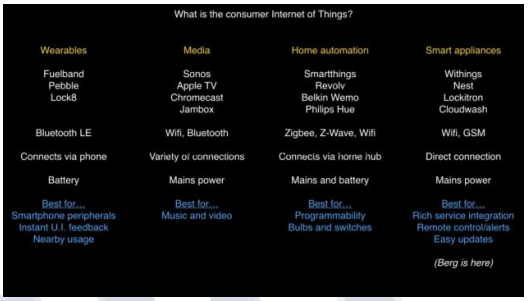
The technologies enabling the medium range wireless communication are, Ha-Low, LTE- Advanced etc.

C) Long-Range Wireless:

The technologies enabling the long range wireless communications are Low-power wide-area networking (LPWAN) which works by wireless networks designed to long range communication and Very small aperture terminal (VSAT) which works by satellite communication technology using dish antennas and broad band data.

VI CATEGORIES OF IOT

According to the present world applications the IOT can be categorized into four types as Wearable, Media, Home Automation and Smart Appliances.



The above picture describes the categories of the IOT.

VII APPLICATIONS OF IOT

According to Gartner, Inc. (a technology research and advisory corporation), there will be nearly 20.8 billion devices on the Internet of things by 2020. ABI Research estimates that more than 30 billion devices will be wirelessly connected to the Internet of things by 2020. As per a 2014 survey and study done by Pew Research Internet Project, a large majority of the technology experts and engaged Internet users who responded—83 percent—agreed with the notion that the Internet/Cloud of Things, embedded and wearable computing will have widespread and beneficial effects by 2025. As such, it is clear that the IoT will consist of a very large number of devices being connected to the Internet. In an active move to accommodate new and emerging technological innovation, the UK Government, in their 2015 budget, allocated £40,000,000 towards research into the Internet of things. The former British Chancellor of the Exchequer George Osborne, posited that the Internet of things is the next stage of the information revolution and referenced the inter- connectivity of everything from urban transport to medical devices to household appliances. The ability to network embedded devices with limited CPU, memory and power resources means that IoT finds applications in nearly every field. Such systems could be in charge of collecting information in settings ranging from natural ecosystems to buildings and factories, thereby finding applications in fields of environmental sensing and urban planning.

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VIII ARTIFICIAL INTELLIGENCE IN INTERNET OF THINGS

In an IoT situation, AI can help companies take the billions of data points they have and boil them down to what's really meaningful. The general premise is the same as in the retail applications – review and analyze the data you've collected to find patterns or similarities that can be learned from, so that better decisions can be made. To be able to call out potential problems, the data has to be analyzed in terms of what's normal and what's not. Similarities, correlations and abnormalities need to be quickly identified based on the real-time streams of data. The data collected, combined with AI, makes life easier with intelligent automation, predictive analytics and proactive intervention.

IX AI IN IoT APPLICATIONS

The usages of Artificial Intelligence in Internet of Things are,

- Visual big data, for example – will allow computers to gain a deeper understanding of images on the screen, with new AI applications that understand the context of images.
- Cognitive systems will create new recipes that appeal to the user's sense of taste, creating optimized menus for each individual, and automatically adapting to local ingredients.
- Newer sensors will allow computers to "hear," gathering sonic information about the user's environment.
- These are just a few promising applications of Artificial Intelligence in IoT. The potential for highly individualized services are endless and will dramatically change the way people live, for example helping Pandora to determine what other songs you may like, Amazon.com to suggest other books and movies to you and your doctor would receive notification if a certain condition was met – your heart rate increased to an unsafe level.

X RESULT

The usage of Artificial Intelligence in Internet of Things gives promising advantages to the mankind whereas it too deals with high security issues and insecure problem to mankind. The day to day development of the technologies makes a way to both efficient usage of Internet of Things and high security to it. This paper concludes that the security and the high corrective data of Artificial Intelligence in Internet of Things is the way that makes outreach to people for their daily usage of Internet of Things in their lives.

XI ANALYSIS

According to my research to predict the medications for highly affecting viruses like HIV and AIDS, it is necessary to diagnose the viruses where it is necessary to process more than a trillion data points in a single tissue. Therefore using the Artificial Intelligence in the Internet of Things can give a very best accuracy to progress the data. As the thing of Internet monitors the human body's physical and chemical state and the Artificial Intelligent machines collects the information gathered by the IoT and on the other side AI machines transfers the information to the analyzer of the patient. This method can bring out a mark able result to process the preparations of the medicines in very short period of time.

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