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## Future Trends and Latest Applications of WSN, AI and IOTs

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**Abstract**— *Wireless Sensor Network (WSN) is a most excited area of research as it is an emerging technology that has a wide range of potential applications, hence computer science community is running towards networking of sensor's technology. Fundamentally Artificial Intelligence(AI) is a broader concept which is intended to make machines be trained in such a way that they behave as same as human in terms of decision making. Overall, the process of creating the intelligence equal to the intelligence of human is called as Artificial Intelligence. In the process of AI development, many applications and branches have been evolved. AI has distinct ability to concurrently stun, hypnotize, leave us inspiring and appal hence left its impression everywhere so randomly helps people to imagine and could someday materialized into reality !*

*Internet of Things (IoT) is nothing new but grouping of technologies like WSN and AI inspired devices. The thought connecting imaginary world is becoming a reality as everything from home appliances to jet engines are connected to the Network/Internet. IoT sometimes a confusing term due to its nature of accessing devices each other. This paper try to brief about terms and applications of 3 major technologies viz WSN, AI and IOTs. Ideally it is a collaborative 'Things' made up of embedded systems that require collaborating and making intelligent decisions so that it make meaning of it in the end.*

**Keywords**— WSN, AI, IoT, Smart

### 1. INTRODUCTION

WSN is called as Wireless Sensor Node/Network which has a sensing capability for various usages. Wireless Sensor Network (WSN) is an emanated technology for the future due to developments in technology in addition to the availability of small, cheap, and smart sensors to derive in cost effective and easily deployable WSNs. How synergy between WSN and other technologies can help sensor networks accomplish their full dormant! Latent synergies such as cloud computing, machine-to-machine communication, cognitive radio wireless channels, RFID, vehicular networks and content-oriented networks can help technology improve their overall performance and efficacy. Research trend in this area is changing and our society is adapting sensing technology very fast. Sensors are widely used in military, manufacturing,

health management, disaster management, agriculture, wildlife, construction, transportation etc. Sensors are becoming part of the life hence its usages are also spreading across machine/human health care, traffic control, home control, military operations, inventory control, area/forest/industry monitoring, air/water testing, etc., hence this field provides a wonderful opportunity for researchers, industrialists, students and others to explore more.

AI stands for Artificial Intelligence, which is a collaborative task of science and engineering involved to make intelligent machines, especially intelligent computer software. AI is a process of making a computer to think intelligently in the similar fashion the humans think. AI algorithms are applied on wide range of activities including robot control, medical diagnosis, electronic trading and remote sensing. AI has been used to implement and advance numerous fields and industries, including healthcare, finance, transportation, education and more.

### 2. LITERATURE SURVEY

Wireless sensors networks (WSNs) can be utilized in numerous domains[1], along with industrial robotization when WSNs can be worn for industrial plant and hardware observing and association. In the industrial designs, then again, the details are unique in relation to those of the General WSN. A few industrial collusions have set up prerequisites lately. These details are portrayed as casings that can be characterized dependent on WSN's specific application and have modifiable pieces. Nonetheless, there has been negligible work on distinguishing specific conventions for an industry that could be worn as an element of these qualities.

Since the field of industrial applications itself is broad, partition it into bunches with related prerequisites. To conform to these measures, these industrial classes, conventional demands and different current WSN standards are tended to. WSN applications incorporate continuous astute temperature checking, line violations and traffic observing, street traffic conduct, water pressing factor and wireless patient checking. The Wireless Sensor Network has been generally pondered in its execution in the different fields of science. WSN has been recognized in wireless zones not yet investigated because of its dangerous presence and exorbitant areas to be the best arrangement. In the current article, a detailed and deliberate way to deal with current and refreshed examination on the inescapable utilization of WSN in different areas is featured. Wireless Sensor Network (WSN) is the inherent concepts to implement and innovate Internet of Things' (IoT) communication (WSN-IoT) [2] [3] [4]. A good number of scientists are relentlessly working for the enhancements in sensor networks, yet, different exploration challenges are as of now needed to survive. Sensor hubs have volatile characteristics, hence, to determine the sensor hubs is the challenging task in WSN-IoT. Such systems present a basic examination of various sorts of sensory procedures, applications, and exploration challenges alongside their artistic works. This structure will be useful to intrigued scientists with regards to recognizing the prerequisite of sensor hubs while planning the applications for the sensor networks.

Advanced mechanics and Artificial Intelligence, applications have assumed a fundamental part in overseeing and controlling COVID-19 pandemic explicitly in emergency clinics, inns, cafe's, airport facilities, transportation frameworks, educational institutions, and others local area facilities. Manmade brainpower advancements, autonomous vehicle systems, drones, portable robots, humanoid robots (HRs) [5], controller robots as well as other insightful robots have been utilized conceivably during the episode to regulate the transmission networks from one individual to another [6]. With the presence of the exceptional facilities, people think about A.I. and advanced mechanics in wellbeing that would probably improve post-COVID-19 pandemic as well as improvement of these innovations is required to battle against irresistible illnesses. Besides, the employments of these innovative frameworks for various fields like industry 4.0, sports, ergonomics, dispersion of merchandise, as well as public activity will continue going in the coming years. The

counterfeit astute gadgets and robots helped in battling, and overseeing covid19 are investigated, including the recent fads. These recent fads are driven by man-made reasoning, self-sufficient driving, network communication, helpful work, nanorobotics, agreeable human-robot interfaces, safe human-robot collaboration, and feeling articulation and discernment. Besides, these news patterns are applied to various fields like medication, medical services, sports, ergonomics, industry, conveyance of products, and administration robot. These inclinations will be keep improving for the best developments in the forthcoming years.

At present, internet of things (IoT)[7] gadgets like ecological sensors are utilized to catch constant information that can be seen and deciphered by means of a visual organization upheld by a worker PC [8].

Notwithstanding, to work with demonstrating and gauging, man-made brainpower (AI) methods are powerful in genuinely dissecting complex non-direct frameworks and a lot of authentic information arrangement inside a brief period. The ANN instruments can assess chronicled information gathered from various stream stations and wastewater therapy plants with least blunders inside a brief timeframe. Subsequently, in light of the chose past writing utilized for this audit they have tracked down that various kinds of ANN algorithm like feedforward backpropagation algorithm (FFBP), Broyden-Fletcher-Goldfarb-Shanno (BFGS), gradient descent, conjugate gradient, radial basis function neural networks (RBFNN), neural network fitting (NNF), cascade forward back propagation (CFBP), ensemble ANN (EANN) and single AAN (SANN) have been utilized in the forecast and checking of water quality boundaries with agreeable result. Moreover, demonstrating close by estimating of water quality boundaries would go about as a major jump for government offices and free associations in observing, dynamic and directing waste released into common water bodies to accomplish a protected and improved water quality for clients. For cutting edge IoT applications, edge gadgets gives the vast majority of the registering assets near the vicinity of the end clients. These gadgets having underlying knowledge utilizing different AI procedures can take autonomous choices in the climate where these are sent [9]. The multiplication of the Internet and cell phones has prompted clients progressively speaking with one another and communicating on an assortment of computerized channels. Social detecting alludes to the assortment, handling and investigations of information from such web-based media and

Internet communications. This new type of detecting methodology gives experiences into client communications, and along these lines can assume a focal part in the Internet-of-Things(IoT)[10] [11].

### 3. LATEST APPLICATIONS OF WSN, AI AND IOT

Major applications of WSN include, Military Applications, Safety Applications, Inventory Management, Health Monitoring, Robots Management, spatial monitoring, Environmental/Earth monitoring, Air quality / Pollution monitoring, Forest Fire detection, Landslide detection, Water quality monitoring, Natural disaster prevention, Industrial monitoring, Agriculture monitoring, Smart home monitoring etc.

Broad usages of AI is, gaming, NLP, Vision, Robotics, Speech/face/hand- writing/disease/pattern/image recognition etc.

IoT-Internet of things would increase efficiency, improve health and safety, or create better experiences. IoT describes a network of physical objects, among other things, "Content" - integrated into software, sensors and other technologies to connect and exchange information with other devices and systems on the Internet. Major applications of IoT are listed below,

- a. Smart Homes: Truly outstanding and the most commonsense utilizations of IoT, smart-homes would take both, accommodation, and home security, to the higher level. Although smart-homes have different levels of IoT, the best is a combination of utility systems and hijacking. For example, your electricity meter with an IoT gadget will allow you to gain knowledge about regular water consumption, decoders, automatic lighting systems, advanced locking systems, connected monitoring systems that allow you to "Record performance remotely, it will be suitable for this smart home idea. As IoT evolves, we can expect most gadgets to become smarter, providing better home security.
- b. Smart City: Internet access for the people around is not yet for the gadgets it contains; it should make urban areas smart. In addition, we are happy to say that we are moving towards understanding this fantasy. Additional innovations are being sought on some key issues, such as infrastructure requirements and traffic management, waste management, water distribution, electricity management and so on. This is just the beginning. All these work towards dispensing with sometime in the future to-day challenges looked by individuals and get added comfort.
- c. Self-driven Cars : Already we have heard much about selfdriven cars. Tech giants, such as Google gave it a shot, Tesla tried it, moreover Uber thought of a variant of self-driven cars but they have withdrawn from this work, later. Since it is living souls on the streets that we're managing, we need to guarantee the innovation has everything necessary to guarantee better security for the traveller and those on the streets. The cars utilize a few sensors and implanted frameworks associated with the Cloud and the internet to continue streaming the information and uploading it to the Cloud for learning dynamics through Machine Learning. In spite, of the fact, that it will require a couple of years for the innovation to develop totally and for nations to alter their laws and strategies, what we're seeing right currently is perhaps the best use of IoT.
- d. IoT Retail Shops: If you haven't effectively seen the Amazon Go video - Goliath Ecommerce Idea Store, it is recommended to watch it. This is probably the best application of innovation to overcome any barrier between an online store and a retail store. The retail store allows you to make credits just by withdrawing money from your Amazon wallet. This in turn complements your cart when you select items from the shelves. When you can change your perspective and get another story, the past is erased, and your cart is replaced with new content. The most amazing idea about the store is that there is no clerk to load your items. Once you have collected items from the shelves, you do not have to stand in line. While this innovation is strong enough to support more, it will certainly become the norm in the coming years.
- e. Farming: The farming industry is one of the areas that will fetch profit the most when IoT is used efficiently. With such countless advancements occurring on apparatuses ranchers can use for farming, what's to come is certain promising.

Instruments are being created for Drip Irrigation, sensing the crop yield, distribution of water, usage of drones for Farm Surveillance, and so on. These would permit farmers to think of a more beneficial yield and deal with the worries better.

- f. **Wearables:** Devices such as wearables stay an interesting issue on the lookout, even today. These gadgets fill a wide scope of needs going from clinical, wellbeing to wellness. Among all the IoT new companies, Jawbone, one of the producers of wearable devices, is top notch as far as financing.
- g. **Smart Grids:** IoT Utilities is one of the most intelligent, configurable sensing devices with a wealth of innovative technology information, the most affordable rose-style existence, and the fastest stones in the world. Future smart grid ameliorate functions, electronics and financiers of smart grids.
- h. **Industrial Internet:** Technology has advanced to the Industrial Internet of Things which comprises of organised sensors, devices, and different gadgets associated with PCs' industrial applications such as assembling, energy administration, and so forth. While it is being disliked in contrast with IoT wearables and different utililites, market investigates such as Gartner, Cisco, and so on, accept the industrial internet to have the most noteworthy generally speaking potential.
- i. **Telehealth:** Telehealth, or Telemedicine, hasn't totally thrived at this point. Regardless, it has extraordinary futuristic potential. Examples for IoT can be incorporated for Telemedicine for the advanced correspondence of medical imaging, remote medical investigations and evaluations, online consultations with medical specialists, and so forth.

**Smart Supply-chain Management:** Supply-chains have stayed on the lookout for some time now. A typical model can be Solutions for following products while they are out and about. Supported with IoT innovation, they make certain to remain on the lookout for the since a long time ago run.

#### 4. FUTURE RESEARCH AREAS OF WSN, AI AND IOTs

This section will try to highlight few research areas which are not in race or just started and it takes a lot of time to improve or to reach a peak!

##### 4.1 *Body Parts as Unique Id*

Already world has known Generating unique IDs out of few parts of the human body like Iris, Ear, Lip print, Tongue, Voice, Toe print, Teeth, Retina and Gait [12]. In future other parts of the body are evaluated for unique identification at-least with combination if not a single part.

##### 4.2 *Inter Brain Cell Network*

Neural circuits interconnect to one another to form large scale brain net- works, till now this is developed to a peak level, now it's time to shift the paradigm to work on inter brain [13] networking as shown in Figure 4.1!

These paradigms to work on inter brain networking as shown in Figure 4.1! Looks like it is really a tough research but nothing is impossible.

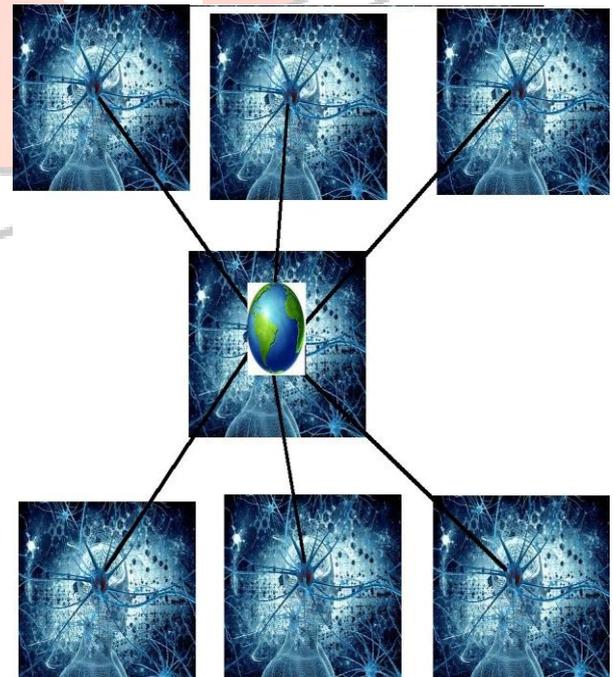


Figure 4.1 Sample of Inter Brain Cell Network

##### 4.3 *Enable Gadgets Action with Empty Hands*

This is something looks like a magic but with help of our body and it's temperature, neurons communications, variations inside body, and/or minimal tiny devices[14] (which is almost like

integrated part of human!); this kind of assessment can lead us to a new era where human can roam anywhere with- out any gadgets/IoTs or with almost negligible tiny-devices.

Say, using our palm/volar (which is the central region of the anterior part of the hand) can act like a keypad as shown in Figure 4.2 for few commands which can be routed through neuron networks and actions will be performed.

#### 4.4 *AI for finding a True Love*

Finding a compatible Lover or Wife is really a challenging task since ages, as time goes in the relationship, the definition of compatibility is diluted and reasons would be ego, misunderstanding, lack of give-and-take policy, responsibility taking, sharing thoughts...N(not limited !). Even many sites talks about matching compatible parameters however all those data pointers are fed/manipulated by us directly/indirectly.

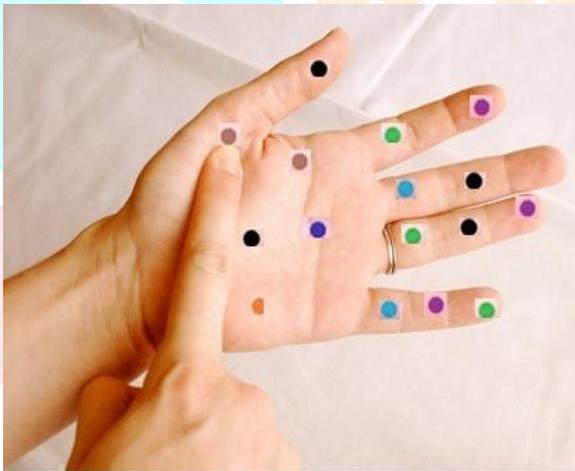


Figure 4.2 Example of Enable Gadgets Action with Empty Hands



Figure 4.3 AI for finding a True Love

Now AI is landing to solve those issues as shown in Figure 4.3 ! We can extract behavioural parameters from gadgets which are used by him/her, what is tasting and food cooking based on how many times he/she enters into kitchen of own/hotel with help of IoTs, how many times the mood swings in a day/week/month based on what issues which can be assessed by temperature/sound/BP/Conversation etc. May be we can get the Android Apps help for such things in coming days.

#### 4.5 *IoE (Internet of Everything)*

There is no surprise if we get IoE for what we can assume. As in previous decades, IoE will rely in the future on the idea that internet connections are not limited to laptops, desktops and some tablets. Instead, machines tend to become smarter with better data access and expanded network capabilities. By this process we mean the process of carrying out an activity, such as the production process, the market strategy, etc. Using the Internet of Everything, we can create information to guide decision-making at every stage of the business. Many data sources open up new types of information that can be used to convert qualitative information into numbers. For example, linking employee output based on changes in the work environment variable.

#### 4.6 *Land in any Planet with VA*

Computer and Computing around AI can put us in a big change over a space technology with help of VA. Virtual Assistants usually work sitting at remote location such as from home, possibly as a freelancer (not as a W2 employee). While VAs can do what they really need, many do things that fascinate themselves with the virtual world. Few of the possible jobs or professions that would provide ease of work as virtual assistants:

- Online managerial activities
- Email campaigning
- Calendar organization
- Scheduling
- Transcription activities
- Event organization

- Developing and editing the content
- File Organization
- Travel booking

Virtual Assistant Lifestyle takes a long time and each show can be different, but usually you get the benefits of a Virtual Assistant. These virtual assistants can usually work from their home and set their own working hours, while spending their with their spouse.

#### 4.7 *AI for self-coding/decoding*

This is already in-progress area, however it will be extended to ethical hacking, personalized Apps, etc. Artificial intelligence has evolved over the years, as has computer technology, hardware, memory, and processor speed. As computers accelerate, more computation can be done, increasing the power required to compute the processing of many artificial intelligence algorithms.

Writing a new Artificial Intelligence program is enabled by one of the tools, SketchAdapter. Made from tens of thousands of program programs, SketchAdapt learns to compose small, high-level programs, while the algorithms lets you find the right subprograms to complete the details. Unlike similar automatic program writing methods, SketchAdapter knows when to switch from statistics mapping to a less efficient but more versatile symbolic reasoning mode to fill in the blanks.

#### 4.8 *Cartoons behavior into reality*

May be this could be possible with help of VA. In the next couple of years, virtual reality applications are likely to become more sophisticated with the emergence of more powerful devices capable of developing high-quality visuals. There is also a growing awareness of how we can effectively communicate and navigate the virtual environment, leading to more intuitive methods of exploring and interacting with virtual space. Here are the immediate consequences of the immersive virtual reality experience, amplified by the power of AI.

#### 4.9 *Can we trace God/Devil/Aliens?*

Computer technology can answer to these dilemmas. We exist in an universe bound and presented to the laws of physics. We constantly learn how the

universe works, starting from the tiniest scale of a unit, to the inconceivably vast space called the observable universe, and we increasingly do extremely well in it, discovering and re-discovering things, enlarging our ever-growing sphere of knowledge. So one day, we can certainly put effort to search for this supreme being a lot of us called 'God'. If we desire it, we can even characterize what 'God' is ?



Figure 4.4. A phenomenon of tracing God

#### 4.10 *Robots as Pets/Friend/Spouse*

Nowadays people are more compatible with pets than their spouse, and in coming days it will be enhanced to next level to create more comfort level like Robots of their own kind of as shown in Figure 4.5 !

#### 4.11 *Astrology can be replaced?*

Astrology may be replaced with improvements of AI. It is claimed by few researchers that astrology is one the applications of data science. From the ancient times, a continuous research has produced many theories. Among them few have stood strong till today, but many of them have vanished due to the proofs that they are misinterpretations. This clearly shows that unless there is voluminous data, a scientist cannot infer a theory. Moreover, the same theory has to be validated, which needs data science. Hence, there is more scope for research in Astrology. It is obvious that working with Astrology is endless.

#### 4.12 *IA v/s AI v/s AI: Meta-AI*

Intelligence Assessment (IA) v/s Artificial Intelligence(AI) makes system like human thinking and apply on him back what that is thinking like search, pattern recognition, image processing, machine leaning, deep learning etc. This is called as

AI in Infinite Loop where everybody will have AI to create security breaches and prevent others attack on his stuff and so on ! This is really a challenging one and endless unless politically or technically cut this loop. However, Only AI can predicts about AI.

#### **4.13 AI makes you laughter**

In the future, we tune AI systems to produce smile on your face like you feed i/p: "Joke with these words : Rain and Wife" and immediately you will receive a formed laughing message like- "Due to heavy rain, I am stuck at home with my wife Please HELP !".

#### **4.14 If immature, make matured!**

AI can help to solve/fill the gap of maturity including growing babies and idiots by training their attitudes/mind etc. As per the psychology, maturity refers to the ability to respond to the situation(s) being aware of the appropriate time and location to perform and realizing when to act, according to the situations and the culture of the society one lives in.



Figure 4.5 Robots as Pets/Friend/Spouse

If the researchers could develop the machines that can understand the psychology of the humans then those machines can help humans think better than they were. Through the idea sounds good the process involves interpreting many psychological aspects such as mentality, emotions, etc. However, in future this idea would be realized to make human life more comfortable.

#### **4.15 Disaster handling and recovery**

In the situations such as natural calamities, the human cost that is involved during the relief work is gigantic which involves the life risk. The developments in the area of AI application for robots, and drones which can arrive at affected areas, a situation which can avoid damage for human lives.

#### **4.16 Human detachments from real world**

We already have started living in the world in which we're surrounded by devices and started detaching ourselves detaching from the real-world. Various studies conducted by the psychologists have estimated that this kind of developments would affect the emotions of the humans. Furthermore, emotional imbalance would affect the sensitiveness in the people. Humans have also started depending on the devices from which people expect their work to be done by the devices. If this situation continues, soon people lose their jobs, for the reason that, people would lose decision-making capabilities.

#### **4.17 AI helps people with impairments to live comfortably like normal people**

It is true that AI technologies have the impending to considerably impact the lives of people with disabilities. AI has made technology easily accessible to people with impairments such that they do not even feel they are lacking something.

#### **4.18 AI motivated device is a personalized doctor**

Deep Medicine, also known as Deep Doctor is one of the AI applications in the healthcare domain. A collection of relevant machine-learning algorithms, and related software with the assistance of IoT devices mimics the human intellect in the analysis, presentation phases to comprehend the complicated healthcare data [15]. Especially, when ML and DS are used to improve the capability of computer algorithms which would help approximate the conclusions, solely dependent on input data. AI is the ability of computer algorithms to approximate conclusions based solely on input data by using ML and DS.

#### 4.19 Artificial Intelligence can help in finding viral mutations of New Disease

Emergence of new disease or virus pandemic such as prevailing SARS-CoV-2 or COVID19 remains a vital constraint in human's health as well as society's. The advancements in AI permit for a swift processing of complicated and massive data and analysis of the same. The current applications across medical industry for development of disease prediction for COVID-19 pandemic has been reviewed [16]. Various governments and government agencies have developed the smartphone applications and encouraged their citizens to use them during the pandemic. This approach has helped the respective governments and government agencies to share the data for faster development of the drugs for treatment and to develop the vaccines too. All this has become possible due to AI and machine learning (ML) methodologies which helped the scientists to speedup the processing big medical data. This data was produced on daily basis from which key insights were extracted using ML applications. In the aspect of predicting the disease, and viral mutations appropriate and timely usage of ML helps the researches, before new strains emerge.

#### 5. CONCLUSION

We are inventing many automated devices or applications triggered by WSN, AI and IoT directly or indirectly. This will fetch us many benefits as well as its own challenges. The WSN are the backbone implementation for the IoT to be realized. For the IoT to produce efficient results, AI becomes the key assistance with enhanced algorithms. This paper has attempted to bring out the major applications of these technologies.

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