Review Article

Artificial Intelligence of Internet of Things (AIoT) Technology-based Law Enforcement Process

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Abstract:

Technological developments are increasingly developing in all fields, unstoppable in the area of law and the role of this IoT technology in solving legal problems, considering Society 5.0, which focuses on building a humane and prosperous society, especially people in Indonesia. And the role of IoT on the legal side is expected to be the answer for an appropriate and fair law enforcement process. IoT Technology collaboration with all sectors of human life, for example, legal, social and economic, as well as natural resource factors and human resources, are still needed. IoT is expected to be a tool to achieve a level of accuracy, real-time, fast, and stability. In the era of Society 5.0, all aspects were asked to be fast so as not to be left behind in any sector; the ability factor of the human being, namely human resources, also determines whether a matter or case can be appropriately resolved. This article is one of the review articles on the role of IoT in law enforcement. Some parameters within the Internet of Things form Artificial Intelligence, Deep Learning, Big Data, and Machine Learning. Solutions with AI can be seen in the lie detection system.

Keywords: Internet of Things, Legal problems, Law Enforcement process, Society 5.0 Era, Artificial Intelligence, Big Data

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1. INTRODUCTION

New values in the field of law, in the era of society 5.0, include the analysis of artificial intelligence, and big data, which contains thousands of data and information. That can read about human beings, starting from speech and face, meaning law enforcement processes centered on humans to resolve specific legal issues. This distinguishes the law enforcement process in the previous era from society 5.0, with the support of IoT technology and AI in the law enforcement process [1-8].

The characteristics of AI in information processing automation make it equivalent to an "electronic agent" in Indonesian legislation. In Article 1 of the ITE Law, "Electronic Agent" is defined as "a device of an electronic system that is made to perform an action on certain Electronic Information automatically held by a person." The word "automatic" in the definition of "Electronic Agent" is then used as a bridge by (Pratidina, 2017) to construct AI as an "Electronic Agent." If we use this construction the rules governing "Electronic Agents" also apply to AI. Regulation of Electronic Agents in Indonesia, Article 21 of the ITE Law, alludes

to arrangements for electronic agents during the implementation of electronic transactions. In the ITE Law, electronic agent operators are electronic system operators. Why? This is because an electronic agent is a form of electronic system administration. This means all rights and obligations of electronic system operators apply mutatis mutandis to electronic agent operators.

One of the AI technologies developed in uncovering the murder case, which until now has not been decided in early 2023, is the case of *Ferdi Sambo and his extended family* regarding the death of *Brigadier Joshua H.* this finally uses a lie detector system. This lie detection system can be developed in more detail using AI, for example, in detecting facial shapes or frequencies placed on the nerves in the head. The development was called the examiner polygraph. The examiner polygraph is a polygraph test or lies detector test. Polygraph machines are used in law enforcement and criminal justice to screen applicants and conduct investigations. The polygraph examiner must be able to administer the test and interpret the results ethically and legally. They may also be called into the courtroom or during related investigations and must be able to explain test results. In general, the detection based on this Polygraph examiner combines heart rate and frequency in the brain by looking at behavior, namely the value of heart rate (bpm) and frequency in the brain or neurons, which are always the same in normal people. The questions given to the tester will cause a change in the value or shape of a normal graph, a picture of a normal heartbeat called a Normal heart rhythm, and an Irregular heart rhythm. Not only in the pulse but also in changes in the frequency of waves in the brain and heart rate in the chest. Then what is the percentage of conformity of the examiner's polygraph calibration process, is the calibration appropriate or not very appropriate?

The frequency of waves in the human brain is classified into several: Gamma Waves 25-40 Hz, Beta Waves 12-25 Hz, Alpha Waves 8-12 Hz, and Theta Waves 4-8 Hz. This frequency is the comparison of the error value when an honesty check occurs. Does the frequency wave (Hz) change irregularly or regularly, this will determine whether there is an abnormality or not. For example, a normal heart rate is 60-100 BPM, but if the person runs fast, the heart rate rises > 100 BPM or causes tachycardia. The condition of tachycardia can be experienced by someone who is nervous or afraid. Fear or nervousness will be one basis for deciding that the examination shows a lie.

2. THEORY

2.1 Poligraf examiner as a lie detector test

A polygraph examiner performs a polygraph test, also known as a lie detector test. Polygraph machines are used in law enforcement and criminal justice to screen applicants and conduct investigations. The polygraph examiner must be able to administer the test and interpret the results ethically and legally. They may also be called into the courtroom or during related investigations and must be able to explain test results.

Prospective polygraph examiners sign up for training accredited by the American Polygraph Association. This course covers interviewing, legal regulations, and polygraph technology. The next step is fieldwork, followed by state certification or licensing. Polygraph examiners must pass a background check and be licensed to work in law enforcement.

Polygraph examiners primarily work in criminal justice, law enforcement, and intelligence in agencies and departments specific to these fields. They can play an important role in investigating and screening job applicants. They may be summoned to courtrooms and legal proceedings to administer tests or testify about results. Some psychology practices may use a polygraph examiner. Private services also hire polygraph examiners for customers who want to know the truth from a spouse or loved one.

2.2 Artificial Intelligence (AI)

Artificial Intelligence has an essential role in the future, one of which is to produce a product capable of detecting lies called *iBorderCtrl*, as shown in Figure 1. As a system capable of learning faster and more than humans, Artificial Intelligence (AI) has a very broad future role. One of them is *iBorderCtrl*, which is a lie detector application that combines several parameters from every angle or curve on the face of a person being interrogated. *iBorderCtrl* is an application that uses AI to study patterns, especially facial patterns, changes in wrinkles, eyebrow movements, eye movements, and mouth movements that have learned their habits and taken as primary data called a datasheet, after which the detection process can begin. The trial use of this software or tools is for six months on the European border, namely Hungary, Latvia, and Greece. These tools may be available in Indonesia for the iBorderCtrl project funded by the European Union (EU). For lie detection, Indonesia still uses the Examiner Polygraph. *iBorderCtrl* also detects fake passports, passport theft, passport data, and fake visas. This is important because every time you enter another country, each country has a different security system and levels of security. European countries have been equipped with sophisticated detection systems, including *iBorderCtrl* and other integrated systems. The way AI works is not only in face detection but how in answering questions about the luggage being carried; for example, there is a question from the officer, what's in your bag? The answer given by the person being monitored must be correct or close to correct.

Facial movements that an AI-based lie detector can detect are gestures, small movements of the pupils, and facial expressions. If you use iBorderCtrl, someone who tells the truth will get a pass in the form of a QR code. However, suppose someone doesn't say something honest or is identified as lying. In that case, AI will automatically use more detailed biometric parameters, such as fingerprints, palm veins, and faces. All of these will be sent to the border security agent (for example, at the airport immigration area or border security). From the existing review process to date, AI is still in the experimental stage, where its success is

still around 76%. So the hope is that it can reach 85% in the future and is fully reliable.

Figure 1. Introgression using *iBorderCtrl* in lie detection *(source: iBorderCtrl)*

The process of improving the accuracy of AI needs to be carried out to be able to produce accuracy and the right results during the interrogation process or produce a reliable AI-based system.

2.3 Internet of Things (IoT) for law enforcement processes and Cybercrime

The Internet of Things (IoT) is one of the embodiments of technological developments in Era Society 5.0 with other parameters, namely Artificial Intelligence, Deep Learning, Machine Learning, and Big Data [11-15]. IoT has penetrated various groups, including the settlement of legal cases in Indonesia. IoT combined with wireless devices, such as research from Puput Dani Prasetyo Adi [9-10] and researchers in the field of LoRa and LoRaWAN for Medical Monitoring. IoT, which was developed for solving a legal case, is combined with AI and Big Data tools to solve various issues, such as detecting lies from suspects. In the era of society 5.0, access to information is high-speed, such as YouTube, TikTok, etc., so fast that science spreads without limits.

Not only its advantages but Era Society 5.0 also has weaknesses; the weakness is on the server side of IoT; because it is connected to the internet, loopholes can occur through the security system from a weak programming language. The Internet of Things works by establishing communication from end devices to the internet server through the Application Programming Interface (API) and working on the internet server through an internet connection, data theft can occur, and hacking can occur on the server side or on the API. Some types of disturbance or Cybercrime are in the form of spreading viruses, cracking, and hacking. Previously, technology also had weaknesses, social media, such as Facebook, Instagram, Whatsapp, and Twitter, had become the ground for irresponsible people, such as fraud, humiliation, and gambling.

Crimes that occur in the digital world have the following characteristics:

1) *Borderlines*, digital space is global and not limited to geographical boundaries.
2) *Accessibility*, anyone and anytime can access it.
3) *Anonymity*, digital space provides anonymity features that can keep user identities confidential.
4) *Interactivity*, digital space provides a forum for interaction between users that occurs non-stop, and 5) rapidity, digital space allows the quick exchange of data and information.

Cybercrime is regulated by the Criminal Code (KUHP) and Law No. 19 of 2016 concerning information and electronic transactions (UU ITE). Therefore, The existence of these laws and regulations will become a firm milestone in eradicating Cybercrime, especially in Indonesia. And the important thing is to provide training on IT, IoT, and AIoT technology to law enforcers so they can better understand how to solve crime problems on social media, the internet, or even on Internet servers.

2.5 Big Data

Big data is a collection of data whose size or type is beyond the capabilities of traditional relational databases to capture, manage, and process data with low latency. The characteristics of big data include high volume, high speed, and high variation. Data sources are becoming more complex than traditional data, driven by artificial intelligence (AI), mobile devices, social media, and the Internet of Things (IoT). For example, different types of data come from sensors, devices, video/audio, networks, log files, transactional applications, the web, and social media — much of it is generated in real-time and on a large scale.

Big data is a large, complex, and growing collection of data all the time. This data is generated from internet activities that are increasingly routinely carried out for personal and business purposes. In the world of law, big data has been used for years. The more detailed the data is until it forms a data set that can be called a dataset. Datasets in AI are significant because they are used to produce precise data. For example, AI data is used in Deep Learning using a Convolutional Neural Network (CNN) to recognize a particular shape or object, including human behavior. You can determine the actuator from CNN, which can be robotic movements, DC Motors, Servo Motors, Pistons, or other actuators. A person with a certain body temperature and whether or not wearing a mask during the COVID-19 pandemic season can be easily classified by Deep Learning if the dataset is specific.

***Figure* 2**. Big Data parameters

The larger or wider the available data, the certain legal cases, even large and hard-to-trace cases, will be helped by the presence of Big Data. Data that can be connected to one another can produce valid conclusions and are considered as an answer to the truth of the data. Examples of this data include witness testimony, trial results, precedents, court decisions, and other parameters that aim to win a case.

Implementing AI, Big Data in the legal world is not easy because there are many parameters in the legal world, for example, documents that are very thick and complete, and the contents of a document are so long and wide. This is very different from the industry, as well as the company. Some things are more towards a human touch, for example, emotions that cannot be resolved with Artificial Intelligence (AI).

Furthermore, with today's increasingly rapid technological developments, of legal cases cansolveddled quickly, and AI can process existing data to make decisions. So if AI data or big data is more complex and complete, it will make the system more accurate and useful in resolving legal cases, especially in court. Furthermore, in the future, big data can solve cases, predict trial results and even be able to become a cornerstone of law enforcement in the future. Even making a new law, a new legal system that can determine a verdict that was originally unfair to be fair in the future. This means that there is fairness that can be drawn from certain legal cases. This Big Data analysis has a very large and diverse data set, which includes structured, semi-structured, and unstructured data and has a size that is quite large, from Terabytes to Zettabytes.

3. METHOD

3.1 iBorderCtrl work

This is one of the methods used in assisting certain legal cases, which have to do with the lie detector system of the accused or suspect. *iBorderCtrl* can assist in uncovering a suspect for lying or honesty in answering any questions from investigators. In the future, this system will help investigators in more detail and become one of AI's references in a fairer legal world. As shown in figure 3, the iBorderCtrl Engine consists of modules, including the Document Validation Module, Fingerprint Validation Module, FMT Module, and Risk Assessment Module, and the communication between the Traveler User Application which communicates with the iBorderCtrl Engine, and then the Border Guard. Agent Application that communicates with iBorderCtrl Engine.

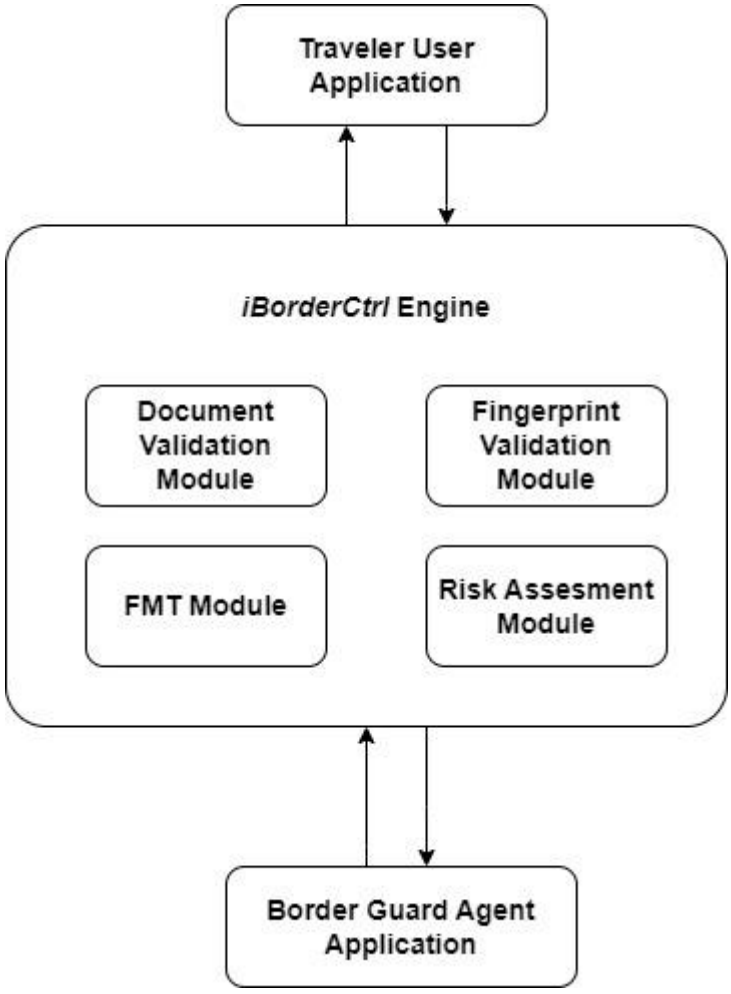

Figure 3. *iBorderCtrl* Flowchart work for lie detection

4. RESULT AND DISCUSSION

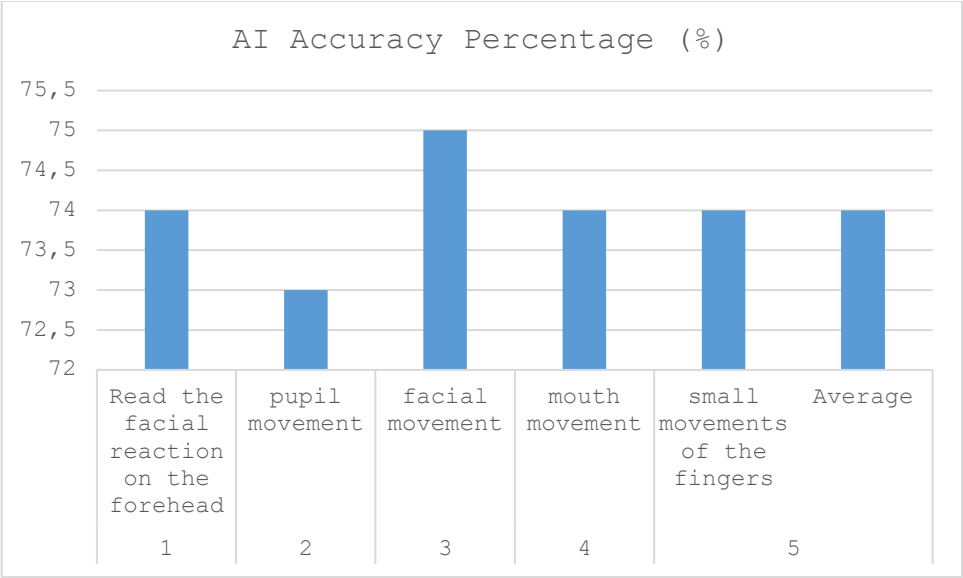

Figure 4. AI Accuracy Percentage (%)

The accuracy in reading facial movements in the *iBorderCtrl* application software is still around 74%, meaning that it is still below the accuracy expected by AI.

Furthermore, five essential points need to be discussed in this article regarding the impact of Artificial Intelligence in the legal field, including:

1) AI will win cases such as the introduction of uncharted areas and can assist in the judicial process; AI is able to work faster because of the technology it has, while Judges may not understand this technology.

2) Who's a fault? This is something that needs to be brought up or discussed. For example, a Smart Car that can drive itself automatically turns out to have hit a road user; how do you settle the judicial process?

3) AI exceeds human intelligence; the more complex coding that is applied to AI, the more detailed AI can recognize shapes, and colors in more detail, for example, a strange pattern. Humans may still think what pattern it is, but AI will quickly define it as a pattern -certain patterns can be defined quickly, so from the speed, the AI will finish the job quickly, which will also affect certain legal processes.

4) Humanizing Robots, in the rapid development of social media on the internet, the role of AI is very broad, such as determining a search engine in e-commerce, several times we visit similar items, then other similar items are automatically shown from various stores, this is still simple, what if the more complex we lead to AI developed by Facebook apps, for example, or other platforms that can automatically send messages that are dangerous, for example, threats and others, what if seen from the law, which can be responsible with this, for example again there are prohibited

goods or substances that are purchased by AI or robots automatically via e-commerce.

5) Privacy is lost. The more widespread AI is in human life, it will become a factor that is quite dangerous for humans, especially in terms of privacy. AI can automatically determine a person's position, behavior, and movements, even predict the components owned by human beings, for example prediction of lies, criminal trials, hiding, and others. How valid are these things AI can do?

5. CONCLUSIONS

The existence of technological developments, especially the internet of things (IoT), is capable of detecting lies that can help legal cases. This is one thing that can be beneficial, but what about other sectors, such as AI will win cases such as the introduction of uncharted areas? Who's a fault? , AI exceeds human intelligence, Humanizing Robots, Privacy is lost. In this case, AI has not been relied on significantly even though in the future, it will be very influential in the world of law, several legal cases can be resolved with AI technology, but it still needs development, especially accuracy, which is applied throughout the world law.

AUTHOR CONTRIBUTIONS

Conceptualization; Muhammad Iqbal Tarigan [M.I.T], Noviyanti Wulandari Sitepu [N.W.S], methodology; [M.I.T],[N.W.S]; validation; [M.I.T],[N.W.S], formal analysis; [M.I.T],[N.W.S], investigation; [M.I.T],[N.W.S], data curation; [M.I.T],[N.W.S], writing—original draft preparation; [M.I.T],[N.W.S], writing—review and editing; [M.I.T],[N.W.S], visualization; [M.I.T],[N.W.S], supervision project administration; [M.I.T],[N.W.S], funding acquisition; [M.I.T],[N.W.S], have read and agreed to the published version of the manuscript.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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