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Research Article

Significance of Artificial Intelligence Applications in Industrial Safety

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Abstract – In today's conditions, where the digital age is accelerating with a very high acceleration, technological transformations are very trendy.In this age where technology is used very effectively, artificial intelligence is the most important element of the technological system. The use of artificial intelligence has a very large share in this digital cycle, which constitutes and is used in a large part of human life.The industrial area, which is the main area of industrialization, and the activities here are one of the central cycles of the world. Therefore, artificial intelligence in industrial activities finds the opportunity to be used for various purposes.Since industrial activities are labor-intensive sectors, the safety of human life is important all over the world.In this study, a qualitative literature research was conducted to investigate in detail the impact and use of artificial intelligence in the process of safety measures in industrial activities and to reveal what kind of applications of artificial intelligence in this field. According to the result obtained, it was seen that artificial intelligence was utilized in multiple areas while taking industrial safety measures.

Keywords – Industrial activity, security, artificial intelligence, digitalization

I. INTRODUCTION

There is no single definition of artificial intelligence, artificial intelligence is a technique that can be applied to multiple fields and can be considered as an interdisciplinary concept[1].Based on multiple definitions, the basis of artificial intelligence can be expressed as mathematics and computer science[2].The impact of artificial intelligence in industrial safety measures makes a big difference in critical areas such as early detection of hazards, prevention of accidents and creating safer working environments. Artificial intelligence minimizes human error and enables the implementation of proactive safety strategies by improving traditional methods, especially in areas such as occupational safety, machine safety and data security.

II. LITERATURE ANALYSIS

Guzel et al.[3] evaluated the opinions of health administrators about the use of artificial intelligence in the field of health.Şahiner et al.[4] discussed artificial intelligence systems, which are widely used against problems such as cyber intelligence, terrorism, human trafficking, drug trafficking and illegal immigration, especially within the scope of new policies and strategies in the field of border security. As a result, they made policy recommendations for the establishment of multi-disciplinary and multi-stakeholder artificial intelligence governance, which has analytical capabilities such as working with large and complex data by exceeding human capabilities, self-correcting, simulating human cognitive processes, and providing feedback by effectively analyzing complex processes. It has been observed that these systems, which have insufficient legal infrastructure, have the risk of being out of human control because they have superior capabilities than humans.In their study, Okutan and Eyupoglu[5] examined the artificial intelligence methods and studies used in the field of cyber security and made suggestions in terms of defense and attack. In his study, Gudek[6] presented the conceptual framework of Industry 5.0, aiming to contribute to industries in production management, resource planning, strategic decision-making processes, digital transformation and the execution of social responsibility projects, and offered predictions on the qualifications and standards that industries should have.

III. THE SAFETY PROCESS IN INDUSTRY

Basically, industrial safety is a set of measures and standards that ensure the integrity of an industrial environment. In other words, it encompasses all, including people, material goods or the environment. The industrial safety process refers to the systematic approaches applied to ensure the safety of employees, equipment and the environment. This process is of great importance for minimizing risks, preventing accidents and maintaining production continuity. The safety process in industry is based on occupational health and safety systems, but it also applies standardized safety processes such as quality control systems and environmental management systems. One of the most important contributions of the impact of AI in industry is that safety measures are designed based on human health and safety [7].

The security process consists of several basic steps:

a. Risk Assessment
b. Determination of Occupational Safety Policies
c. Education and Awareness
d. Protective Equipment and Engineering Controls
e. Protective Equipment and Engineering Controls
f. Emergency Plans and Drills
g. Continuous Improvement

IV. ARTIFICIAL INTELLIGENCE

Today, it is almost impossible to find an area where technology is not involved. As communication technologies develop, communication between people becomes more effective, so global transportation and transformation can be much faster.The biggest factor of this transformation in technology stems from artificial intelligence-supported systems.Artificial intelligence, which can be used in many areas from smart cities to smart watches, from robotics technology to drone systems, is primarily used in multiple fields to make people's lives easier and to develop better technologies.In addition, as with every technology, artificial intelligence has its advantages as well as disadvantages.In this context, it is necessary to think and take steps properly and meticulously when using artificial intelligence or integrating it into a system[8]. As of today, artificial intelligence has become a branch of science and engineering that creates intelligent machines, especially intelligent computer programs[9].

Table 1.Advantages and disadvantages of Al

Advantages	**Disadvantages**
Increased Efficiency and Speed	Risk of Job Loss and Unemployment
Accurate and Fast Decision Making	Privacy and Security Concerns
Error-Free Operation and Accuracy	Ethical Issues and Decision Making
New Opportunities and Innovation	High Development Costs
Cost Savings	Dependency and Declining Human Competence
Personalized Experience and Services	Control and Safety Issues

V. THE EFFECTS OF ARTIFICIAL INTELLIGENCE ON TECHNOLOGIES USED TODAY

Artificial intelligence pushes the limits of machines and paves the way for them to work in a useful, efficient and trouble-free way. Artificial intelligence, which increases human interaction, opens the doors to a new generation working environment. In addition, artificial intelligence is aimed to create a more efficient working environment rather than replacing humans. Artificial intelligence supports better utilization of workplace resources and allows employees to focus on more important tasks instead of wasting time on easy tasks. With simple tasks being taken over by artificial intelligence, employees focus on more important tasks, allowing organizations to manage their operations more efficiently. One of the most important advantages of artificial intelligence is the ease of application to the whole sector[10].Artificial intelligence can also significantly reduce the possibility of human error. Artificial intelligence also has the ability to perform the work by ignoring possible risks in the criteria determined within the program.While humans may doubt when there are various risks in a job to be done, artificial intelligence can evaluate many possibilities, determine the lowest-risk road map, and if it is compatible with the allowed parameters, it can accept the risk and start the process[11].An important part of artificial intelligence technologies is neural networks. Self-developing and self-learning neural networks are an indispensable part of artificial intelligence that makes independent decisions. In this way, artificial intelligence provides advantages in face recognition applications with image and audio technologies, voice recognition and speech detection

applications with audio technologies. On the other hand, it can be used in automatic language translators, image analysis programs, person detection from voice recordings, and risk detection from images. Thanks to these features, smartphones, robotic systems and autonomous defense vehicles can work much more efficiently [12].

VI. Artificial intelligence-supported security applications

AI-powered security applications are advanced technologies used to enhance security in workplaces, public spaces and digital environments. These applications are widely used to detect hazards early, provide rapid response to incidents and minimize human error. The data processing power and predictive capability provided by artificial intelligence has drastically transformed traditional security approaches. AI-powered security applications offer a powerful solution to enhance security in both physical and digital environments. When integrated with sensors, cameras, biometric verification and cyber security systems, proactive security systems can be created to detect potential threats in advance and ensure effective response.

Below are some key areas of AI-powered security applications:

a. Video Surveillance and Image Processing
b. Smart Camera Systems Behavior Analysis
c. Facial Recognition Technology
d. Occupational Health and Safety
e. Cyber Security
f. Access Control
g. Emergency Management
h. Artificial Intelligence Drones
i. Dangerous Goods and Explosives Detection
j. Data Security and Authentication
k. Noise and Sound Analysis [13].

VI. Use of artificial intelligence in industrial activities

The use of AI in industry is becoming increasingly common, with the aim of increasing efficiency, reducing costs, optimizing processes and creating safer working environments. AI finds a wide range of applications, from production to quality control, maintenance management to logistics processes. In particular, AI is increasingly valued as a result of the impact of technological advances on industry, with Industry 5.0's new generation of factories and production methods[14]. In addition, artificial intelligence can play an important role in ensuring sustainable development15].Artificial intelligence technology facilitates the development of new models, tools, system designs and technological systems in the field of smart manufacturing [16]. Production based on artificial intelligence is energy and resource friendly and is an important performance indicator for industrial companies to operate economically and remain competitive.

Some key areas of artificial intelligence use in industry:

- Production and Automation
- Predictive Maintenance
- Quality Control and Error Detection
- Supply Chain and Logistics
- Occupational Health and Safety
- Energy Management and Efficiency
- Design and Product Development
- Human Resources and Business
- Customer Relations and Demand Management

VII. CONCLUSION

Industrial safety measures are mandatory and legally binding. If a company fails to comply with these rules, a fine or strict sanctions will be imposed. Industrial Safety is a system that focuses on keeping workers safe and sound. Safe employees work better and more efficiently than those who are in fear every day at work.Yapay zeka, endüstride rekabet avantajı sağlarken, hem operasyonel verimliliği artırıyor hem de inovasyona dayalı yeni iş modelleri geliştirilmesine katkıda bulunuyor.The use of AI in industrial activities offers innovations in many areas, from production to maintenance, supply chain to quality control, increasing efficiency and profitability. AI has become a cornerstone of the industry 5.0 revolution, enabling industrial businesses to become smarter, more flexible and more efficient. While the advantages of AI offer a wide range of benefits such as increased efficiency, cost savings, speed, innovation and personalization, there are also some significant disadvantages such as unemployment, ethical issues, data privacy and high costs. It is necessary to optimize the impacts of AI, develop ethical rules of use and prepare society for this change. A balanced approach is required to both maximize its advantages and minimize its disadvantages. Artificial intelligence provides a competitive advantage in the industry, while increasing operational efficiency and contributing to the development of new business models based on innovation.

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