



DEVELOPMENT OF ARTIFICIAL INTELLIGENCE TECHNOLOGY IN THE TRANSPORT SECTOR

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Abstract:

The article provides information about the content of the neuron, neurotechnologies concepts of artificial intelligence and their role in the field of transport. It was also highlighted that the use of artificial technologies in the field of transport is of great importance in the development of the country's economy.

Keywords: *a neuron*; digitization; digital economy; artificial intelligence technologies;

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Introduction

The level of development of the digital economy in global practice, the share of the digital economy in GDP, the amount of investments in the field of ICT (information and communication technologies), the speed of the Internet, its coverage of the territory of the country and the way it has been opened for use by the population, the level of development of e-commerce, the state services in the e-government system share is determined by ICT experts with indicators such as security organizations and others[8]. Digital technologies are gradually being used in various sectors of the economy, and Uzbekistan is no exception. Residents of Uzbekistan can pay various fees from their computers without leaving their homes, transfer money from card to card, find out the departure times of passenger trains and planes, call a taxi to their home address, etc. [1].

On February 17, 2021, the Decision of the President of the Republic of Uzbekistan "On measures to create conditions for the rapid introduction of artificial intelligence technologies" was adopted. The purpose of this

Decision is to rapidly introduce artificial intelligence technologies in accordance with the "Digital Uzbekistan-2030" Strategy and their widespread use in our country, to ensure the possibility of using digital data and their high quality, to provide qualified personnel in this field. is to create favorable conditions for personnel training.

Also, this document defines the main directions and principles of the application of artificial intelligence, as well as the development of the strategy for the development of artificial intelligence, which defines the conditions for the comprehensive formation of this field in the near and long term, in economic sectors and the social sphere, public administration. It envisages the development of artificial intelligence technologies in the system and the development of a legal framework defining uniform requirements, accountability, security and transparency in their use, improving the quality of public services in the interests of the population.

In many countries of Europe, Asia, and Latin America, a number of activities have



recently been implemented, the main task of which was to support public-private partnership mechanisms. The experience of developed countries shows that an increase in the share of services in GDP indicates a high level of welfare. In this context, transport services are important as leading sectors of manufacturing and social infrastructure[3].

Artificial intelligence has become a key technology trend with global investment in excess of \$500 million. According to IDC, global sales of cognitive and artificial intelligence systems will grow by 59.3% to reach \$12.5 billion[4]. Markets and Markets, an international research company, predicts that the AI market will grow to \$5 billion through the application of machine learning and natural language recognition technologies in advertising, retail, finance and healthcare. Gartner believes that about 40% of all interactions with virtual voice assistants will be based on data processed by neural networks.[5]. Consulting firm Tractica believes AI dynamics will be based on six fundamental technologies: machine learning, deep learning, computer vision, natural language processing, machine reasoning, and strong AI.

Although AI technologies will affect almost every business in the next 10 years, the main drivers of the market will be the sectors of consumer products, business services, advertising and defense. Tractica predicts the AI market will grow from \$643.7M in 2016 to \$38.8B by 2025.[5].

In turn, artificial intelligence that encourages the wide use of artificial intelligence technologies to increase the efficiency of state bodies in data processing, conduct fundamental and applied scientific research on the development of useful technological solutions, and their subsequent commercialization goals and tasks such as creating a local ecosystem of innovative developments in the field of.

The main part

So, Artificial Intelligence (AI) is a set of technological solutions that imitates human cognitive functions (including self-learning and searching for solutions without a predetermined algorithm) and allows achieving results when performing tasks that are at least comparable to the results of human intellectual activity. The complex of technological solutions includes

information and communication infrastructure, software, which, among other things, uses machine learning methods, processes and services for data processing and decision making.

Neurotechnologies are technologies that use or help to understand the functioning of the brain, thought processes, higher nervous activity, including technologies to enhance, improve brain function and mental activity.

A neuron means an artificial neuron, or rather a computer program. Today, despite the fact that neural networks have not been studied in depth, positive results are achieved by applying them to the following areas:

1. business - the application of neural networks to this field began in 1984 with the creation of an adaptive channel equalizer. This device is very simple and consists of one neuron. It was a great economic success because it improved the quality of sound by stabilizing long-distance telephone lines;
2. banking and finance - in real estate valuation, loan selection by calculating risks, debt valuation, loan utilization analysis, trade portfolio programs, financial analysis, currency value forecasting; birja – valyuta va aksiya kurslarini prognozlashda, bozorni prognozlashda, korxonalar kelajagini baxolashda;
3. production - process management, product design and analysis;
4. medicine - in analyzing lung cancer cells, DNA analysis, prosthetic modeling, optimizing transplant times, reducing hospital costs and improving quality, examining emergency rooms;
5. robotics - in trajectory construction, motion control, manipulator control, image analysis and vision, shape and figure recognition, sound analysis and synthesis;
6. transport - optimal planning of routes, planning of timetables, analysis of truck brake systems;
7. automobile - in automatic control systems, automatic map systems, inspection of warranty work;
8. space - in the creation of high-performance autopilots, flight trajectory imitation systems, control systems of flying objects, narrowing and elimination of defects and malfunctions of flying objects;



9. mudofaa – tovush, radar, infraqizil signallarni taxlil qilishda, axborotlarni umumlashtirishda, avtomatik qurilmalarni boshqarishda;
10. telecommunications - image and sound compression, encryption and other processing processes, automated information, simultaneous translation systems into different languages, etc.[2].

Taking into account the advantages of neural networks and the convenience and efficiency of existing computer software packages, it is not difficult to conclude that their use in innovation processes is promising.

Artificial intelligence AI (artificial intelligence) is usually interpreted as the property of automatic systems to take on individual functions of the human mental ability, for example, to choose and make optimal decisions based on previously gained experience and a rational analysis of external influences. The field of artificial intelligence is highly heterogeneous [6].

It is possible to form an artificial intelligence database from currently available data sources in Uzbekistan and use them effectively. Including:

1. Unified identification system - (id.gov.uz);
2. Open data portal of the Republic of Uzbekistan - (data.gov.uz);
3. Electronic government system database - (my.gov.uz);
4. State Services Agency database - (davkhizmat.uz);
5. database of various ministries and agencies.

Also, in the world experience in the formation of an artificial intelligence database in programs oriented to the social sphere, data from national ID systems, population census and tax payer database, medicine, banking, insurance companies, store and market buyers, data of mobile communication operators and sources such as public utility payments and debts, credit history, activity in social networks are used within the law.

Artificial intelligence is implemented using four approaches: logical, evolutionary, simulation and structural. All these four directions develop in parallel, often mutually intertwining[7].The basis for the logical approach is Boolean algebra and its logical operators.

Artificial intelligence used in the field of transportation infrastructure can collect industry-specific data to reduce congestion and improve public transportation schedules. It also affects traffic flow, simplifies traffic, intelligent traffic light algorithms and real-time monitoring can effectively monitor high and low traffic, and can be used for optimal planning and routing in public transportation. The most promising direction of the development of the automobile industry is the development of tasks in the management and control of the vehicle with the help of artificial intelligence. The large amount of data collected using connected devices and services is the most important key to the proper functioning of artificial intelligence in any field, because with it the system learns to analyze and identify the human factor, which is artificial. enables the intellect to think and act like a human.

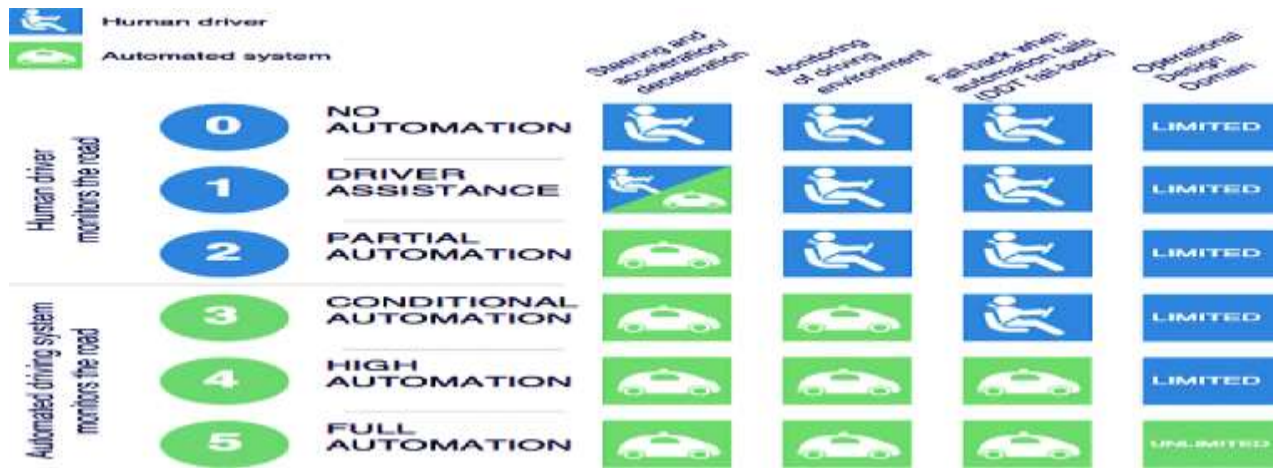
The final stage of development in this matter is the creation of fully autonomous (self-driving) cars and will be further developed by improving the created algorithms and increasing computing power. It should be noted that machine learning is part of the general concept of artificial intelligence . Figure 1 shows the relationship between artificial intelligence and machine learning.

As shown in the figure below, when considering artificial intelligence in motor vehicles, different levels of autonomy are distinguished, that is, the ability to do without the help of a human driver. SAE, the international body of automotive engineers, has identified six levels of autonomy for self-driving cars¹

¹SAE International Releases Updated Visual Chart for Its «Levels of Driving Automation» Standard for Self-Driving Vehicles [Электронный ресурс].

Режим доступа:
<https://www.sae.org/news/press-room/2018/12/saeinternational-releases-updated-visual-chart-for-its-%E2%80%9Clevels-of-driving-automation%E2%80%9D-standard-for-self-driving-vehicles>





1- Picture. Levels of driving automation.

1. Level 0 - without automation. There is no automation at this level. Most vehicles on the road today are manually operated. There may be systems that assist the driver, such as emergency braking, but it does not technically "drive" the car and therefore cannot be considered automation.

2. Level 1 driver assistance. These cars have only one automated system, such as adaptive cruise control. A human driver controls steering and braking with adaptive cruise control, so it's compatible with Level 1 autonomy.

3. Level 2-partial automation of driving. The car can control both steering, acceleration and deceleration. A human driver can take control of the car at any time.

4. Level 3 conditional automation. Here the options for determining the environment around Informatics 9 will appear. A car can make conscious decisions, such as overtaking a slow-moving vehicle. However, if the system is unable to perform the task, the driver can cancel the control of the vehicle.

5. Level 4-higher automation. These cars are mostly fully automated. However, a human driver can block the system from functioning.

6. Level 5 - full automation. These cars do not require the participation of a human driver and do not even have a steering wheel or accelerator and brake pedals. Figure 2 shows the classification of autonomy levels developed by the International Society of Automotive Engineers (SAE).

The introduction of "Smart traffic lights" in the field of motor transport is one of the current issues. Today in the city of Tashkent "Smart traffic lights" Nurafshan road Labzak, Sebzor? It is installed at the intersections of Karasaroy, Sag'bon, Farabi, Beruniy, Bog', Kochcha gate, Khumdosoy, Samarkand gate, Oklon 3-proyezd, North Almazor streets. Figure 2 below shows a map of "smart traffic lights" installed at 12 intersections along the Nurafshon ring road of the Tashkent city administration and the capital.

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2- Picture. Map of "smart traffic lights" installed at 12 intersections along the Nurafshon ring road of the Tashkent Hokimiy and the capital Security Directorate road traffic .



Traffic lights were monitored for three months. The electricity supply continuity was ensured at these intersections by the Tashkent City Electric Networks Company.

The installation of "smart traffic lights" was provided for in the decree of the President of April 1, 2021 "On the improvement of the state management system for the development of scientific and innovative activities". The traffic lights are connected to a computer. The program that controls them can make decisions by itself, "consult" with other traffic lights and work synchronously with them. In paragraph 5 of Annex 2 of the decision of the President of the Republic of Uzbekistan dated February 17, 2021 "On measures to create conditions for the rapid introduction of artificial intelligence technologies" PQ-4996 tasked with using artificial intelligence technologies to track and warn drivers in dangerous situations, analyze public transport traffic and determine their optimal routes, as well as monitor car traffic and traffic congestion. The following work has been done so far:

The national information system was developed together with the scientific staff of the Research Institute for the Development of Digital Technologies and Artificial Intelligence. In order to install this program, a video image taken from the cabin of the high-speed train "Afrosiyab" was uploaded. Various obstacles were artificially inserted into the video to simulate possible emergency situations. The system successfully recognizes them at a distance of 250-300 meters. The technical specification of the system was developed and approved in the established order. According to it, the braking distance is calculated at different speeds.

To calculate the braking distance of locomotives, the Rules for maintenance of braking equipment and control of braking of railway cars approved by the Railway Transport Council of the Commonwealth of Nations (Declaration No. 60, May 6-7, 2014) was used. In turn, the rules were developed on the basis of the braking distance calculation methodology.

Table 1
Calculation of braking distance
 in meters

Naming of trains	Speed of movement, km/h		
	90	120	200
Passenger train	590	1083	-
3500 t freight train	1885	-	-
Afrosiyob	471	855	2479

Due to the presence of curved tracks on railway sections, the video camera's field of view does not exceed 300 meters. All railway crossings are equipped with automatic railway signaling devices, barriers and barriers. Guarded crossings are guarded by guards around the clock. Learning artificial intelligence in shunting locomotives is not practical, since the locomotives are driven by a single driver.

In general, the study of foreign experience shows that locomotive control without a driver has not been implemented in the railways of the CIS and leading foreign countries. It can be concluded that there is still no example

of driving a locomotive without a driver using artificial intelligence in any country of the world.

Today, experts believe that in the next 15-20 years, computers will be able to successfully replace humans, and this applies not only to the field that requires accurate calculations, but also to the field of aviation, which is also related to the flight and the fate of passengers. In the course of recent experiments, it became clear that artificial intelligence (AI) has already been created in the United States, which surpasses human intelligence by its actions.

According to experts, equipping artificial intelligence with preset rules will ensure a high



level of safety, in particular, the computer program will allow the plane to land at the airport without obstacles even in difficult meteorological conditions, and ensure the safety of flights in case of any technical failure. 'can provide (for example, one of the engines in case of failure), avoid the storm in bad weather.

These specific examples only demonstrate the simple possibilities of artificial intelligence in its implementation in the field of aviation, but there are other, more complex tasks, for example, controlling the same combat aircraft in unmanned mode, testing new air equipment, etc.

One of the main areas in which the aviation sector is constantly trying to improve is the training of pilots. Training a future pilot is a long and intensive process that includes ground school and certification tests. According to experts, artificial intelligence will significantly improve the training of pilots. According to experts, artificial intelligence will allow pilots to experience more realistic simulations, providing pilots with the full visual range of augmented reality. The implemented computer with artificial intelligence not only collects all training data, but also records the behavior of the pilot during training. All data collected during training will be used to improve autopilots.

Another company that has implemented artificial intelligence technologies to train pilots is the US Air Force. The U.S. Air Force has begun training pilots in a future program to try to develop a new way to train pilots using state-of-the-art biometric systems, artificial intelligence and virtual reality systems in their simulators. These AI-powered simulators reproduce real-world mistakes to help students better understand and correct mistakes. The introduction of artificial intelligence will allow the US Air Force to train more airmen each year, creating a faster and more efficient way to train and practice.

Assisting pilots is another important task that can be improved with artificial intelligence. In theory, this could give pilots more situational awareness and less time spent on instrument controls. It could also allow pilots to better communicate with other crew members during flight. And this is not just a theory, because Garmin, which specializes in GPS

technology, has already introduced "Telligence". It is a product designed to reduce the pilot's workload and ensure a pleasant flight. Telligence allows pilots to talk to the plane — communicating in the cockpit using simple voice commands. This product is already certified and available for installation today.

Artificial intelligence has great potential to revolutionize the aviation industry. Despite the fact that the implementation of artificial intelligence is only at an early stage, great progress has been made. Unfortunately, there is one main reason why the full implementation of artificial intelligence in the aviation industry has stopped.

It is planned to develop artificial intelligence in Uzbekistan in 3 stages.

Stage 1. 2021-2022 - development and targeted systematization of the fundamental foundations of the development of artificial intelligence: systematic organization of scientific research and development activities in the main priority directions of the development of artificial intelligence, effective reform of the educational system in the field of SI, and scientific research and acceleration of international cooperation in education. Also, to support the digital economy in production and increase the innovative activity of entrepreneurs.

Stage 2. 2023-2025 - to increase the quality and prestige of human resources and intellectual potential in the field of artificial intelligence in the field of international competition: establishment of new scientific research and development centers in priority areas. To offer a set of rational solutions to the problems of economic sectors with the help of SI by strengthening the business-science-state integration system. Also, increasing the export share of national developments based on high technologies based on artificial intelligence in the national economy. Wide use of digital production products created on the basis of artificial intelligence technologies in national economic sectors and having competitive national brands in the world market.

Stage 3. 2026-2030 - Formation of a highly developed information society in Uzbekistan: increasing the transparency and efficiency of public administration, formation of a unique information society that fully guarantees



the rights and freedoms of citizens based on national values and universal principles, information provided to create high-value products from its collection, and to transform the country into an innovative hub that is a leader in the Central Asian countries and competes with Asian countries in the priority sectors of the country's economic development.

The following are defined as the main priorities for the development of artificial intelligence in 2021-2022:

1. Normativ-huquqiy va ahloqiy munosabatlarda fundamental asoslarni tartibga solish;
2. Step-by-step formation of an informed society;
3. Supporting educational reforms and scientific research activities in personnel training;
4. Support for the production of digital products and smart industry.

The list of pilot projects for the introduction of artificial intelligence technologies to be implemented in 2021-2022 has been approved, these projects will be implemented in the following areas:

The Ministry of Information Technologies and Communications Development, the State

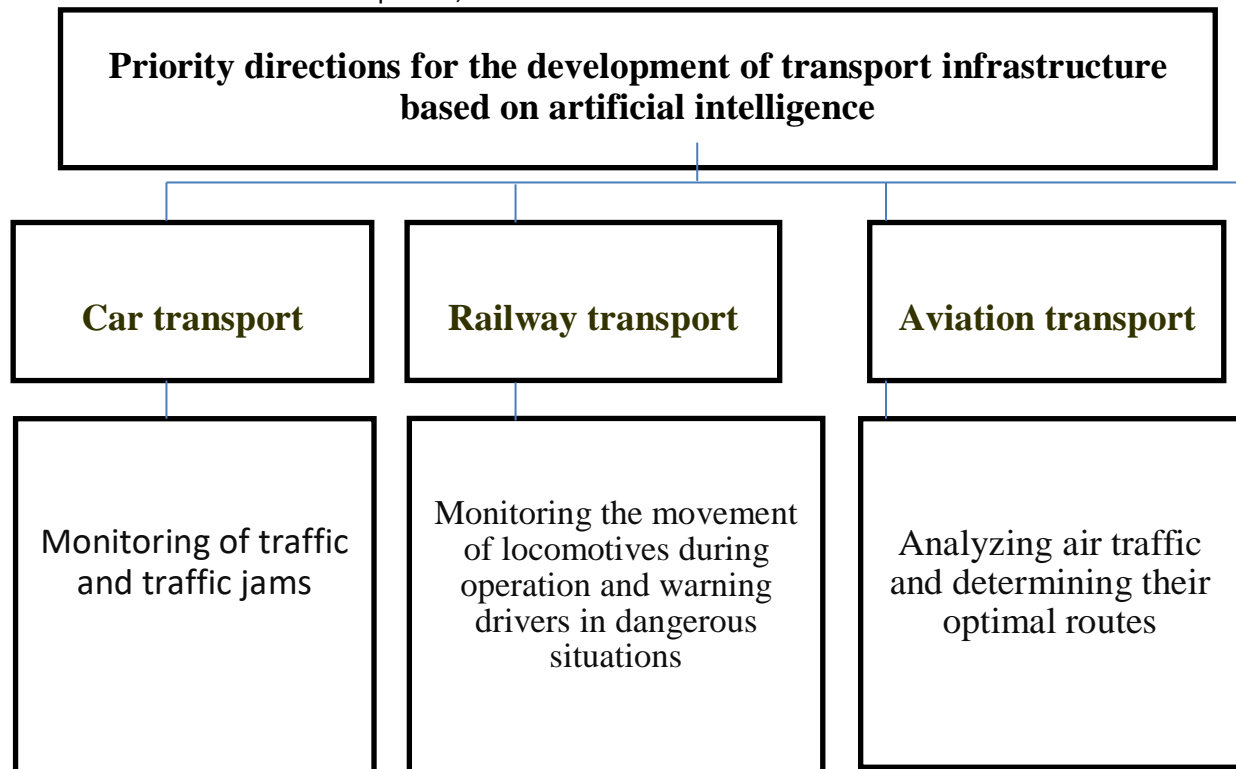
Statistics Committee until September 1, 2021 to local scientific organizations and higher education institutions, as well as programmers and organizations in the field of information technologies, state and other data for use in software based on artificial intelligence creation of a digital information platform that provides access to collections of

The following have been confirmed:

1. The list of higher education institutions and scientific organizations that will gradually start training personnel in the field of "Artificial Intelligence" on the basis of a grant from the 2021/2022 academic year;

2. The list of higher education institutions where the introduction of training courses and subjects on the practical application of artificial intelligence technologies in the economic sectors, social sphere and public administration system is envisaged.

Based on the above, it is possible to indicate the following priority directions for the development of transport infrastructure based on artificial intelligence.



Drawing 1. Priority directions for the development of transport infrastructure based on artificial intelligence²

²Author development



To develop the field of artificial intelligence in the transport system, first of all, financial mechanisms should be developed. For this, a special account will be opened at the "Innovative Development and Innovative Ideas Support Fund" under the Ministry of Innovative Development, and the funds will be directed to the financing of artificial intelligence projects. Also, measures aimed at developing financing mechanisms for start-up projects will be adopted. It is appropriate for professors and teachers and students of the University of Transport to participate in this project.

Conclusions and suggestions

The following conclusions were made as a result of the research of decisions and regulatory guidelines on the economic development of transport infrastructure based on artificial intelligence:

1. Digitization of the transport system requires a lot of money. Taking this into account, the leading countries are planning to move to digitization of transport for a long time. In this case, the process of digitalization in Russia began with the creation of various platforms that could interact with each other, which is considered the basis of digitalization. Many leading countries started using the Internet much earlier than other countries, and naturally they are leaders in the implementation of digital technologies in their economies, including in the field of transportation.

2. Digitization of the economy, including transport, does not mean only the use of information and communication technologies, but also implies the improvement of the country's economy, including the transport system;

3. It is necessary to attract highly qualified experts in artificial intelligence from abroad to the University of Transport. It is desirable that the science of artificial intelligence is perfectly taught in the field of transport. The organization of training courses in this direction also gives positive results. An international conference dedicated to the issues of artificial intelligence in transport should be organized on the basis of its technological development.

Based on the conclusions formed above, the following scientific proposals and practical recommendations were developed:

1. It is necessary to attract specialists with high qualifications in artificial intelligence from abroad to the University of Transport. It is desirable that the science of artificial intelligence is perfectly taught in the field of transport. The organization of training courses in this direction also gives positive results. An international conference dedicated to the issues of artificial intelligence in transport should be organized on the basis of its technological development.

2. Development of a concept for solving the traffic problem, which envisages changing the architecture of intersections and the phase of traffic lights. As a result, by changing the traffic light phases, it is aimed to reduce the time of vehicles stopping from 66 seconds to 34 seconds; In order to solve this issue, it is necessary to announce the selection of innovative projects and attract venture investors. That is, it is appropriate to use the infrastructure of intelligent motor vehicle movement in all regions of our Republic.

3. Implementation of technologies that serve to monitor the movement of locomotives in railway transport and warn drivers in dangerous situations. For this, first of all, it is necessary to improve the infrastructure. It is necessary to introduce virtual reality and artificial intelligence technologies using the conditions and financial mechanisms created by the state. It is necessary to create a system of relevant legal and regulatory documents and a mechanism for involving the private sector in order to ensure the participation of the private sector in the financing of projects.

4. It is necessary to attract highly qualified specialists in artificial intelligence from abroad to the University of Transport. It is desirable that the science of artificial intelligence is perfectly taught in the field of transport. The organization of training courses in this direction also gives positive results. An international conference dedicated to the issues of artificial intelligence in transport should be organized on the basis of its technological development.



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