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**ARTIFICIAL INTELLIGENCE AND INTELLECTUALIZATION: NEW
PROSPECTS FOR ECONOMIC DEVELOPMENT**

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The creation and development of artificial intelligence as a new market with growing investment and great prospects for global economic development and the economic development of Ukraine in particular in the article was viewed. The exponential trend of investment in the field of artificial intelligence in recent years in the world was defined and measures required to enhance the development of this market in Ukraine was described. The application of artificial intelligence, the risks associated with its implementation and the neglect of this area in countries with a weak level of development was considered.

Keywords: artificial intelligence, intellectualization, the market prospects of the economy.

Шевчук А. В. Штучний інтелект та інтелектуалізація: нові перспективи для економічного розвитку/ Тернопільський національний економічний університет, Україна, Нововолинськ

В статті розглядається створення та розвиток штучного інтелекту як новий ринок з зростаючими інвестиціями та великими перспективами для глобального економічного розвитку та розвитку економіки України зокрема. Визначено експоненціальний тренд інвестування в сферу штучного інтелекту в останні роки в світі та заходи необхідні для активізації розвитку такого ринку в Україні. Розглянуто сфери застосування штучного інтелекту, ризики пов'язані з його впровадженням та ігноруванням цієї сфери в країнах з слабким рівнем розвитку.

Ключові слова: штучний інтелект, інтелектуалізація, ринок, перспективи розвитку економіки.

Шевчук А. В. Искусственный интеллект и интеллектуализация: новые перспективы для экономического развития/ Тернопольский национальный экономический университет, Украина, Нововолыньск

В статье рассматривается создание и развитие искусственного интеллекта как нового рынка с растущими инвестициями и большими перспективами для глобального экономического роста и развития экономики Украины в частности. Определены экспоненциальный тренд инвестирования в сферу искусственного интеллекта в последние годы в мире и меры необходимы для активизации развития такого рынка в Украине. Рассмотрены области применения искусственного интеллекта, риски связанные с его внедрением и игнорированием этой сферы в странах со слабым уровнем развития.

Ключевые слова: искусственный интеллект, интеллектуализация, рынок, перспективы развития экономики.

Introduction. The human progress in recent years was related with the leading role of certain high-technology goods, which concentrated around a main idea and production capacity. This product was usually associated with IT and developed in developed countries, where the idea appeared. An example of such processes was the development of personal computers and related software market at the end of XX century, the rapid development of the Internet later, the development of the mobile market smartphones and tablets in recent years. The next big growth market and technology investments may be deep learning and artificial intelligence, which increasingly find its realization in personal computers and mobile devices and their software, the Internet and the processing and analysis of big data. Identify priority investment areas of major ideological and financial investment can be a significant advantage in preparation for release and occupying new niches in the promising market that can give impetus to the

economy. Therefore, special importance is now intellectualization and willingness of society and companies to create, use and implementation of artificial intelligence.

Analysis of recent research and publications. publication of this trend known of such scientists as R. Kurzweil, V. Healso, J. Hinton and others. The IT implementation at various institutional levels with a focus on economic processes was studied by V. Bech, Y. Bech, S. Bilichenko, M. Yermoshenko, S. Inosov, L. Piddubna, K. Sidun, T. Sobolevska and others.

The aim of this article is to assess prospects for the economy in the process establishment and use of artificial intelligence (AI).

The principal material statement. Many researchers in developed countries gradually come to the conclusion that the next human progress in the intellectual sphere depends on the possibility of creating artificial intelligence - as a continuation of special artificial intelligent agents, robotics and automation. Development and implementation of the AI can replace not only some human labor, but also to bring science and technology to a newest level, inaccessible to human achievement and perhaps even its understanding. The technology of artificial intelligence can bring humanity to a new stage of development, with completely different ways of life with new types of interpersonal and interinstitutional relations.

Most modern scientists distinguish and predict the three stages of AI at the present stage of human development: specialized AI, full or general AI and super intellect [1]. Today AI have become an essential part of the IT technology industry, providing the heavy lifting for many of the most challenging problems in computer and data science [2].

The emergence of specialized AI brings significant changes in public life, particularly in the area of industrial relations, which is likely to lead to the next:

- a significant reduction of employees in professions where AI is much prevail of human;

- loss of motivation in areas where AI significantly prevail of human;
- exclusion from the list of human professions with no changes and creative approach to production.

The robotic technologies can change the principles of financial and economic activities, define new terms of competition in the production and on the labor market.

Development of AI will certainly reflect on the future of human life. For example, modern car will drive with AI autopilots and people may be will not be allowed to drive cars on most highways.

Developing and implementing the AI is comparable to the rate of development of the Internet in the past and this development will have to pass more quickly.

The development of AI in financial investments now is experiencing exponential growth and is rapidly bringing us closer to the singularity. This shows the great interest in the areas of research that will lead to the rapid development of the industry in the near future. 2015 was the best year in Artificial Intelligence funding with almost \$1.2B raised, according to VentureScanner with data of investing in startups in the world [3] (see figure 1).

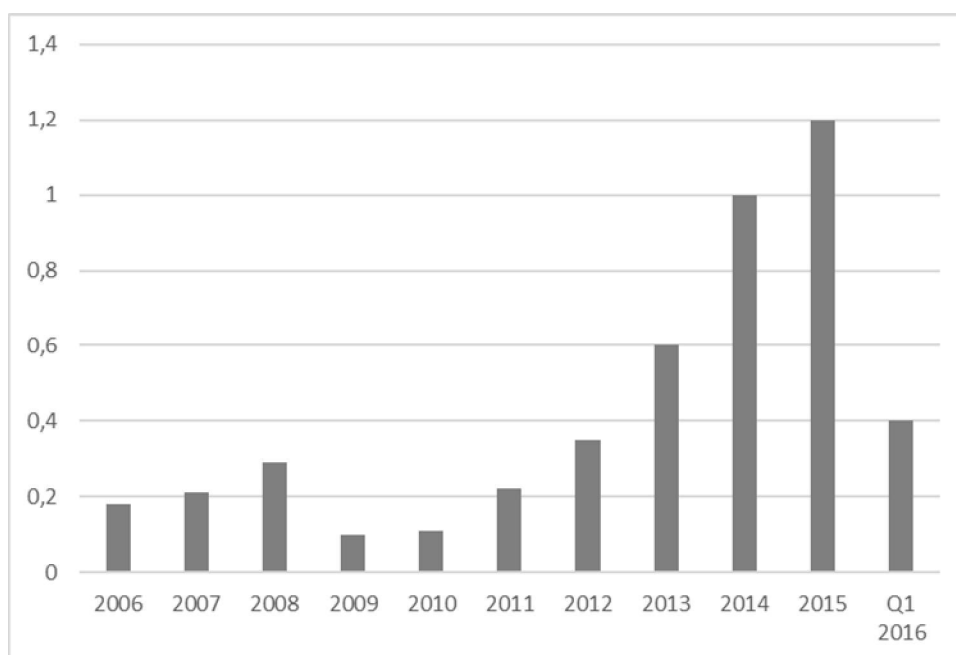


Figure 1. Artificial Intelligence total funding by year [3].

From the figure 1 we can see that from 2009 after world financial crisis investing in AI startups rapidly grows with exponential trend. The subdivision of CBInsight VentureScanner in the first quarter of 2016 was tracking 957 AI companies with a combined funding amount of \$4.8 Billion. The main amount of companies concentrated in the US – 499, with the United Kingdom at a distant second with 60, Ukraine has registered only three such companies.

At this moment, research and development of artificial intelligence is mainly in the area of the creation of a specialized artificial intelligence based on the interaction of software and hardware platform. Among areas of companies in the development and implementation of AI are:

- deep learning, machine learning with predictive data models and software platforms that analyze behavioral data;

- computer vision and image recognition with technology that process and analyze images to derive information and recognize objects from them (face recognition, road marking, car numbers recognition);

- natural language processing (voice recognition, text to speech);

- smart robots;

- virtual personal assistants (such as Google Now, Apple Siri, Microsoft Cortana);

- recommendation engines and collaborative filtering;

- gesture control;

- context aware computing.

Venture Scanner were tracking 957 Artificial Intelligence companies across 13 categories by count and fundings. The category Machine Learning in Q1 2016 is leading with 263 companies, and the next Natural Language Processing category with 154 companies and the Machine Learning category is leading the market with over \$2B in total funding, the second is Natural Language Processing with \$662M (see fig.2).

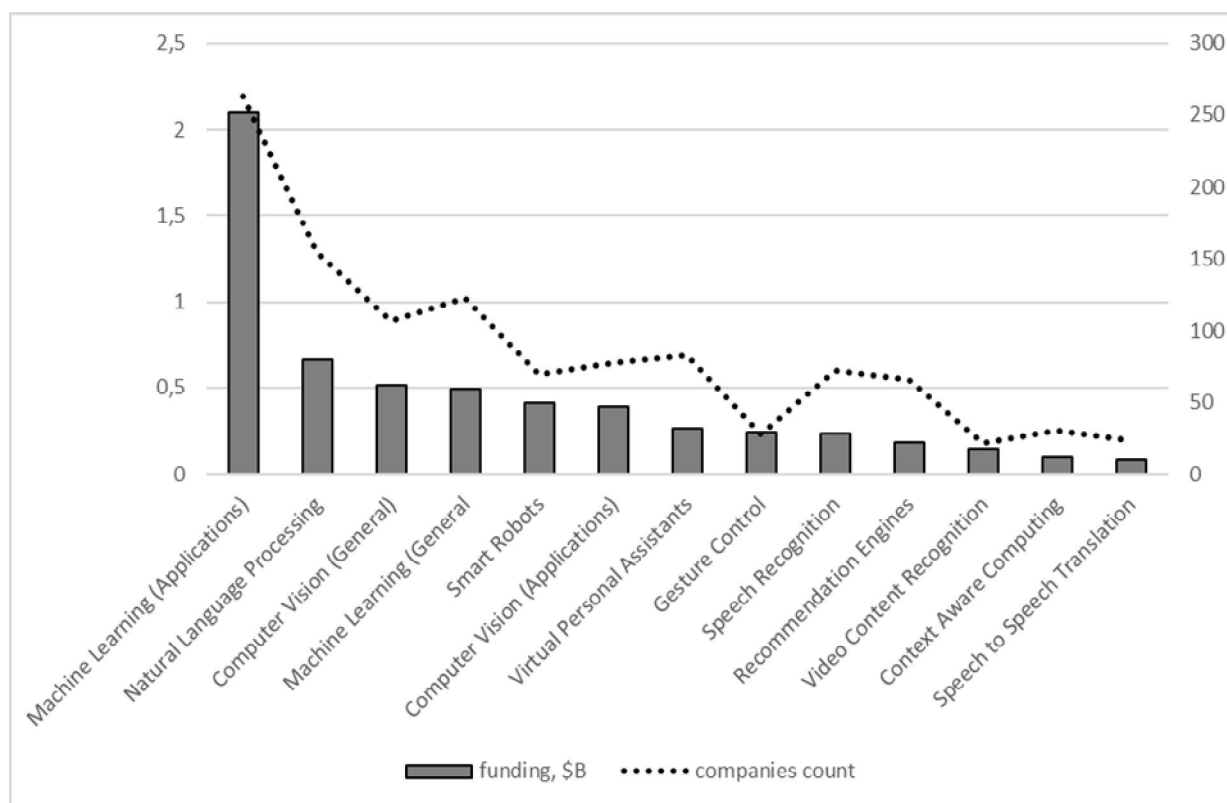


Figure 2. Investing in Artificial Intelligence by amount of funding and category [3].

It should also be noted that the activities of companies in some areas is practically impossible without progress in others, as companies that deal with virtual personal assistant is obviously very dependent on companies working with voice recognition, definition and context of computer training in general. Thus the development of all areas is important, but most sections of investments obviously most interested in manufacturers of other goods.

Investigation of the development of AI market requires a comprehensive approach - consideration of not only the trends and prospects, but also the possible risk aspects. Among the threats posed by the new stage of human development, characterized by the development and implementation of AI will be the following:

- the first time level of automation goes beyond unskilled occupations and work monotonous, repetitive, with jumping to the new kind of automation in more professions with rising amount of unemployment in the world;

- widening gap between large companies and small, developed countries and developing countries, that will lead to an increase in social inequalities in the world, due to the presence of high technology in large companies and developed countries and their inaccessibility for others;

- threats that not yet possible to estimate at the present stage of development (growth value AI errors in critical areas for people, the risks of creating superintelectuall AI etc.).

AI is also finds its expression in the new culture. For example, the creation of neural networks by Google proved themselves in the field of fine art and taught to create paintings for the styles of famous artists [4]. A new AI religion (Artificial Intelligence Religion) was created that forms a new cultural dimension to the perception of technology in society [5]. The spread of these innovations could mean the emergence of new types of human activity in AI sphere, including in the economic in the near future.

Global market trends AI somehow gains are determined by the leading countries of the world. There is the possibility of Ukraine to become active member in the process creating AI technology, while using the existing intellectual and IT potential.

Ukraine were rated in the StartupRanking around the world at April 2016 on 33 position with 138 startups [6]. It also has a good chance to enter AI new markets through large IT companies in cities like Kharkiv, Lviv, Kyiv, Dnipropetrovsk, Odessa. Along with prospects the are main threats and risks:

- poor ability to create in Ukraine the end of high-tech products - usually most IT companies specializing in offshore programming for EU and US companies and are unable to provide the final product on global markets;

- the weakness of the domestic market, where such products are evident in the near future will not be enough demand;

- weakness of high-tech hardware component of the domestic market, which cannot afford to carry out the implementation of new software solutions to the appropriate hardware platform.

Despite the difficulties identified active AI market development in Ukraine obvious software solutions using this technology can make a decisive impact on economic and political processes in Ukraine now. For example, relevant to the development and broad social and administrative use can be a program that after training of neural networks will able detect propaganda information on the Internet, neural network, based on information about sales and service detects shortages in the collection of taxes and others.

The development of AI market in the Ukraine can't progress without this stimulating effect tomorrow and there is a risks being on the periphery of global innovation processes. To avoid this, a comprehensive approach should ensure development of the AI by combining:

1) spatial aspect of development - concentration of resources available in limited spatial coordinates, usually it should be cities or regions where there is a more active employment in the IT sector, favorable structural characteristics of the economy and the adoption of technological society with IT clusters (like Lviv IT Cluster <http://itcluster.lviv.ua/>), business incubators, technology parks;

2) spatiotemporal aspect of development - concentration of resources available to a limited temporal coordinates that would provide an innovative breakthrough favorable conditions diffusion of innovation;

3) specialized aspect of development - with priority support for individual market segments AI, the development of which have some experience startup IT companies;

4) functional aspect of development - with the support of the priority areas of the market AI products which commit the greatest impact on economic and social processes (in the positive-expected context);

5) stimulating aspect of development - with the support of the priority areas of the market AI implementation experience which exert a stimulating effect on the processes technologizing other areas of economic and social activity.

Conclusions. So, now we can see the formation of a new global technological market with high investment, which involves the creation and use of AI. Trends indicate that investments in this sphere annually grow with exponential trend and are great prospects for domestic IT companies. Measures to stimulate similar developments and the creation of the final product of this area of domestic producers can bring in the future Ukrainian economy to a new stage of development.

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