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OPPORTUNITIES AND RISKS OF USING AI-BASED APPLICATIONS IN RESEARCH: THE CASE OF UKRAINIAN UNIVERSITIES

Abstract. The study seeks to explore the key opportunities and risks associated with the use of AI-based applications in research conducted by Ukrainian universities.

Findings reveal that the use of AI-based applications among Ukrainian university academic staff is limited. However, we identified certain patterns in how respondents perceive the key opportunities and risks in using AI-based applications in research. These perceptions are largely shaped by expert opinions from mass and social media, as well as scientific literature discussing AI's influence on research. In contrast, respondents' personal experience with AI-based applications plays a lesser role in shaping their views. However, there are notable differences in the experiences of using AI-based applications across various fields of expertise.

Among the most significant opportunities identified by respondents are the ability of AI-based applications to automate routine tasks, gather information from numerous sources, and accelerate

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the processing of large datasets. However, expectations regarding AI-based applications' potential to enhance research quality, offer unconventional insights, or detect anomalies and patterns are more limited. Respondents also showed little belief in AI-based applications' capacity to streamline the research process, improve scientific writing quality, boost research efficiency, or develop new skills for researchers.

Alongside these opportunities, respondents pointed to substantial risks, such as the unreliability of published research findings, compromised research integrity, the unethical use of AI-based applications in generating reviews by dishonest reviewers, and the need for more thorough peer review processes. Concerns also included a potential decline in research quality and an increase in plagiarism cases. However, respondents did not express major concerns regarding ethical issues like data privacy, ghost authorship, or dishonesty and irresponsibility in the use of AI systems.

The results underscore the importance of implementing institutional policies and enhancing the skills of academic staff in using AI-based applications to improve research quality.

Keywords: artificial intelligence; AI-based applications; research; Open Science; Ukrainian universities.

1. INTRODUCTION

Statement of the problem. The rapid development of artificial intelligence (AI) systems observed in recent years has led to significant and complex changes across many areas of human activity. In particular, the demand for AI-related professional skills is increasing. In 2022, the percentage of companies implementing AI doubled compared to 2017 [1, p.14]. In 2022, private investments in AI systems were 18 times higher in comparison to 2013 [1, p.17].

The use of AI in higher education and research is caused by the dichotomy of the complexity as a technology and the the simplicity of its application. The relative quality of text generation, due to the specifics of the linguistic context of ChatGPT, has resulted in an unexpected increase in the number of users, in particular in higher education. Thus, 11 countries have officially approved the use of AI-based applications in secondary schools. The number of AP exams (standardized tests designed to assess a student's mastery of a specific course) in computer science that utilize AI-based applications has increased significantly (rising ninefold in the U.S. since 2007). Between 2010 and 2022, the percentage of PhDs specializing in AI at U.S. universities doubled [1, p.16]. On the other hand, many universities have banned ChatGPT to prevent its use in writing essays or taking exams [2].

The use of AI–based applications in higher education and research can drive significant technological and socio-economic changes (by enhancing technological and industrial capacity through investing in research and innovation, improving better access to data to prevent brain-drain and make the EU "a consumer of solutions developed elsewhere" [3, p.5-6]. Additionally, AI can support the modernization of education and training systems, promote talent, diversity, and interdisciplinarity, anticipate changes in the labor market, ensure smooth transitions, and adapt social protection systems accordingly [3, p.12-13]. However, despite the clear benefits to the widespread use of AI-based applications in research and innovation, the challenge lies in ensuring establishing an ethical and legal framework that is grounded in EU values and complies with EU Charter of Fundamental Rights. This includes guidelines on the future of work, fairness, safety, security, social inclusion, and algorithms transparency to safeguard the fundamental rights such as privacy, dignity, consumer protection and non-discrimination [3, p.14-15].

It is clear that the use of AI-based applications in university research opens up new opportunities for researchers and potentially creates significant risks. This necessitates the implementation of relevant institutional policies and the development of researchers' skills. These institutional policies should be informed by an understanding of how academic staff members perceive the opportunities and risks associated with using AI-based applications in

their research. Thus, this study provides an evidence-based foundation for developing institutional policies for Ukrainian universities concerning the use of artificial intelligence in research.

Analysis of recent research and publications. The development of AI technologies and their impact on various aspects of human life have become a subject of increasing interest for both researchers and practitioners. In recent years the number of publications on the use of AI technologies in higher education has increased significantly (in such domains as "profiling and prediction, intelligent, tutoring systems, assessment and evaluation, and adaptive systems and personalisation" [4]. It is expected that "AI applications will be a top educational technology issue for the next 20 years" and will have a significant impact on the introduction of mass learning, transformation of the educational process throughout the student's life cycle [4]. In Ukraine, a limited number of studies on the use of AI in higher education and research have been conducted. Ukrainian researchers focus on responsible use of AI in teaching and learning [5], application of distance learning technologies using AI [6], [7], [8], legal status [9], [10] and social risks of using AI tools and services [11], using AI to help older people to overcome loneliness. Prospects for the use of AI in research are reflected in [12], which emphasises the need to thoroughly verify the results of research, ensure ethical principles in research, and overcome the problem of unreliability of research findings generated by AI.

The research goal. The present study aims to examine the most significant opportunities & risks of using AI-based applications in research performed by Ukrainian universities. To address this question, we first present a conceptual framework that explores the opportunities and risks researchers face due to the increasing use of AI-based applications in practice. Next, we describe the research methodology, which consists of desktop studies of websites, documents, research findings, and survey aimed at addressing the core research question. The first step ensures a better understanding of the specifics of using AI-based applications in research. In the second step, we conducted a survey and analyzed the responses of 1502 respondents using descriptive and mathematical statistics methods. After that, we present our findings in the section on results and discussions. In the final section, we identify the opportunities and risks of using AI-based applications in research from the perspective of Ukrainian universities.

2. THE THEORETICAL BACKGROUND

The use of AI-based applications in university research opens up both new opportunities for researchers and potentially creates significant risks.

First and foremost, the use of AI-based applications enables the *automation and operationalization the research process and its stages*. In particular, with the help of AI-based applications, a researcher can develop a research plan, generate basic ideas for research questions [13], formulate a research hypothesis [14]. In addition, the use of specialised AI-based applications allows automating the process of literature search, identifying relevant studies [15] and assessing their quality [13]. Automation of data collection (selection of data sources, search of archives and databases), analysis and processing, as well as experimental validation and generation of preliminary research findings [14], forecasting the development of the phenomenon under study [16] is also possible due to the relevant use of AI-based applications. Another opportunity for the researcher is to simplify the process of creating high-quality and relevant scientific texts [13], improving their quality [14] drawing interesting analogies, generating connections between different concepts and ideas, improving the title, abstract and conclusions [15]. Besides, with the help of AI-based applications, a researcher can automate certain routine functions (text formatting, sizing graphic objects [15], reference formatting [14].

In general, the use of AI-based applications contributes to the efficiency of research activities and the development of new skills among researchers [17], [18]. The appropriate use of AI-based applications allows for the automation the repetitive processes, reducing the overall time spent by researchers [15, p.4092], and improves the processes quality and resource efficiency [16].

The use of AI-based applications also creates new opportunities to improve the quality of peer review by automating the identification of peer reviewers (which can be a key to eliminate "old boy networks or lobbying") [19], simplifying the process of searching for plagiarism and preparing an unbiased assessment of scientific articles [13].

In a broader context, AI-based applications create opportunities to improve the accessibility and usability of publications [20], use of accessible, interoperable and reusable (FAIR) data [21]. On the other hand, AI opens up significant opportunities for both interdisciplinary cooperation [22], and the resolution industry-specific and highly specialised research problems [16]. AI-based applications can be a relevant response to current challenges, including copyright infringement, royalty management, etc. [16].

The possibility of using AI-based applications within the realm of Open Science, the mutual influence and interpenetration of these phenomena are also the subject of current scientific discussions. The use of AI technologies within the realm of Open Science serves as a means to prevent and detect potential misuse of research data and tools, present science as a more open system, and make the use of its results more transparent [23]. The integration of AI technologies and Open Science can become a catalyst for further scientific discussions on the recognition of a researcher's scientific contribution [24], as well as the creation of algorithms for detecting signs of academic dishonesty (articles created by AI, falsified results) [20].

In the context of these problems, AI-based applications can play a key role in achieving effective results, which will generally contribute to the development of an inclusive scientific community [25, p.5].

At the same time, researchers emphasize the significant risks that arise from the use of AI-based applications in research. First of all, there are many plausible but fake articles generated by AI [20]. That is why one of the challenges is to verify the text generated by AI, since the very construction of the text, its language can be misleading and make one believe in its human origin and veracity [26]. G. Hinton noted that "generative A.I. can already be a tool for misinformation", "the internet will be flooded with false photos, videos and text, and the average person will "not be able to know what is true anymore" [26].

It is also noted that the use of some AI-based applications and services (such as ChatGPT) may reduce the quality of research - using outdated information and databases [15]. In addition, the technology for creating language models does not provide for the integration of analytical experience and best practices, which, however, is available to researchers. It is also worth taking into account such features of AI language models as insufficient creativity and critical thinking, inability to generate new ideas and create unique results, and duplication of generally accepted opinions [15]. The lack of competence among researchers in understanding AI algorithms leads to inaccuracies in application, in particular due to formulation of too long and incomprehensible queries to AI systems [27], which in turn leads to irrelevant results.

Excessive reliance on AI-based applications in the research process creates additional risks during the manuscript review stage. It is about the need to check references [15], presented facts [28], and correctness of the presented results [15]. In general, the lack of integrity in research and publication of research results can lead to the spread of falsified research, unfair publishing practices, and the risk of data fabrication [16], [20].

The risks of using AI-based applications also lie within the realm of research ethics. This includes the potential for significant harm in the absence of an official ethical framework for the use of AI at the national level [29] as well as the problems of data privacy, algorithmic bias,

and ethical implications of AI-based decision-making [13]. At the level of individual research, new challenges arise due to the possible failure of researchers to disclose the use of AI-based applications, which gives rise to a new form of ghost authorship [15], [27]. Another risk is the lack of skills to address issues in the field of ethical use of AI-based applications [29], dishonesty and irresponsibility in the use of AI systems [15].

Thus, to fully exploit the potential of AI-based applications and overcome or prevent the possible risks associated with their use, it is essential to consider innovative ways to introduce AI technologies in a meaningful, ethical and sustainable way into the university and research environment. By raising awareness of researchers, highlighting the benefits of using AI-based applications [16], [30] it is necessary to strive for "ultimately, research must have transparency in methods, and integrity and truth from authors" [31]. In turn, researchers should adhere to the norms of research ethics, in particular, recognise and identify the texts created by AI [27], indicating in (1) the introduction or methods, (2) references in the text and bibliography, (3) additional materials or appendices the facts of using AI-based applications [32]. The key for researchers should be the belief that AI-based applications should assist rather than replace human creativity; it is also important to distinguish between AI in the Social Sciences & Humanities and STEM fields.

3. METHODS

The study consists of two steps. Firstly, desktop research was conducted using theoretical research methods (literature review, bibliometric analysis methods, structuring, grouping, generalisation, and abstraction). At this stage, we analysed Ukraine's regulative acts on AI using, and the EU, UNESCO, and OECD policy documents. We also studied peer-reviewed articles on the use of AI-based applications in research, which are indexed in Scopus, Web of Science Core Collection, EBSCO databases, and Directory of Open Access Journals. The next stage was content analysis, generalisation and systematisation of publications to identify opportunities and risks for using AI-based applications in university research. This stage prepared a solid ground for conducting an empirical component. The empirical component of the research comprised surveying respondents to answer the key research question: What are the most significant opportunities and risks of using AI-based applications in research?

3.1. Data collection

An online questionnaire "Open Science in Higher Education Institutions of Ukraine" was created to survey employees (heads of HEIs and their structural units, academic and research staff, library staff, IT staff). Empirical data was collected from March 21 to April 3, 2023. The survey was conducted using a targeted sample type. The source for the targeted sample was the database of the Register of Education Institutions. For the online survey, the following types of higher education institutions were selected from the database: universities, academies, and institutes that conduct research, carry out scientific activities, ensure the educational process, and train professional researchers [33] (hereinafter – universities).

To ensure the purity and representativeness of the sample, access to the online survey was provided on a targeted basis, through closed links, minimizing the risk of involving random respondents who were not engaged in university research activities. In order to maintain the confidentiality of respondents' data all the answers were depersonalized. Besides, the commitments to confidentiality were obtained form all co-authors who had access to survey data and/or who participated in the data collections process.

To ensure the data reliability, before analysing the results, we checked the quality of the responses, which resulted in the removal of 15 ones that failed to identify the respondents'

affiliation with certain university or the respondents from colleges who were not part of the target group. In addition, we verified the data obtained using the data presented in the Unified State Electronic Database on Education.

3.2. Cohort characteristics

The survey involved respondents from 105 (out of 347) universities from all regions of Ukraine, except for the temporarily occupied territories of Crimea and Donbas. The largest number of respondents were from universities located Kyiv region (17), including the city of Kyiv – 7, Kharkiv (12), Odesa (10), Lviv (9) and Dnipropetrovsk (8) regions. The total number of respondents was 1,502. The largest number of respondents were from the universities located in Kyiv (379 persons, 25.2%), Kharkiv (225 persons, 15.0%) and Cherkasy (169 persons, 11.3%) regions (Fig. 1). About 84.8% of the respondents represented state-owned universities, and 7.6% of them were from municipal and private universities.

The individual and socio-demographic characteristics of the respondents also has their specifics. Thus, 66.2% of them are women and 33.0% are men (0.8% without respond). The vast majority of respondents (72.9%) belong to the age group 36-60, while representatives of the age groups under 35 and over 60 comprise 15.4% and 11.7%, respectively.

The distribution of respondents by position is also quite varied. In particular, 0.6% of respondents are rectors and vice-rectors of universities, 17.1% are heads and deputy heads of structural units, 73.7% are academic staff members (professors, associate professors, senior lecturers, lecturers, assistants, etc.), 5.5% are researchers, 1.5% are library workers, 0.5% are IT staff, and other positions (1.1%). Among the respondents, 23.0% have no academic degree, 59.3% have PhD degree, and 17.7% have DSc degree. The vast majority of respondents have the academic title of associate professor (48.1%), while professors and persons without academic title account for 14.5% and 37.4%, respectively.

Respondents also show significant differences in their research experience. The overwhelming majority (42.3%) have between 6 and 20 years of experience, and 25.8% have more than 20 years of experience. People with no experience made up 8.2% of the sample, and people with little experience (up to 1 year and 2 to 5 years) – 4.8% and 18.8% respectively. The overwhelming majority of respondents have 11 to 50 and more than 50 peer-reviewed publications (36.6% and 31.0%, respectively). Only about a third of respondents have no publication records or their number ranges from 1 to 10 (7.4% and 25.0%, respectively).

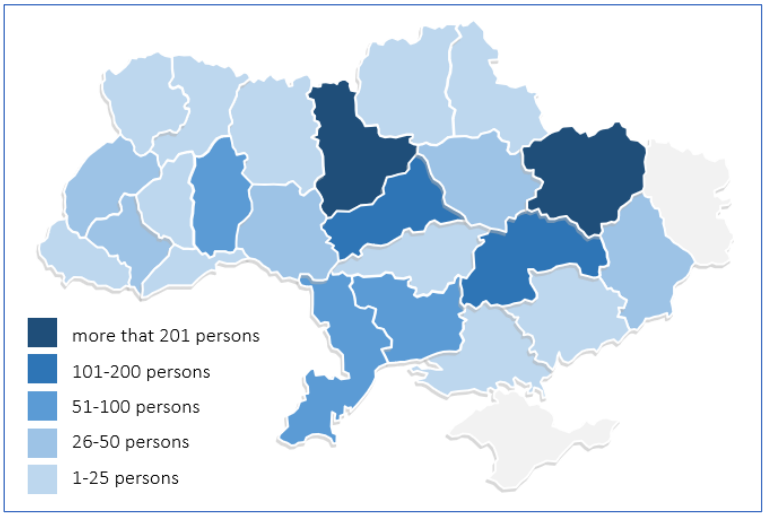

Fig. 1. Regional distribution of respondents

3.3. Data analysis

Data analysis and their interpretation is based on the generalisation of responses from 1502 respondents using Microsoft Excel (in particular, PivotTable) and the application of descriptive and mathematical statistics. Qualitative data analysis was used to analyse the answers to open-ended questions. Taking into account the research objective, hypothesis and data received (without normal distribution) we used the Pearson's correlation analysis. By using Test of independence, we aimed at finding out if there was correlation between variables. Therefore, the null hypothesis (H0) was that there is no correlation in perception of opportunities and risks of using artificial intelligence in research among different groups of respondents (in particular, by such factors as position, academic degree, academic rank, research experience, publication activity).

4. FINDINGS

The empirical data obtained and analysed make it possible to identify the opportunities and risks to research at Ukrainian universities which are opening up for researchers with using the AI-based applications.

It has been found that despite the growing interest in the use of AI-based applications (both abroad and in Ukraine), the relevant experience of respondents is rather limited. Thus, 83.2% of respondents have no experience of using AI-based applications in research activities, with the largest share among research (86.0%), academic (84.4%), and IT (85.6%) staff. Among respondents with experience in using AI-based applications, the largest share is among those with up to six months of experience (44.8%). The share of respondents with six months to 1 year of experience (11.1%), from 1 to 2 years (20.6%), and from 2 to 5 years (23.4%) is significantly lower.

There are significant differences in the experience of using AI-based applications among representatives of different fields of knowledge. Thus, the proportion of respondents with no experience of using AI-based applications varies from 60% in the field of knowledge "Chemical Engineering and Bioengineering" to 71.98% in the field of "Information Technologies", 93.3% in the field of "Culture and Arts", and 95.0% in the field of "Architecture and Construction". It is noteworthy that all representatives of the "Social Work" and "Service Sector" fields reported no relevant experience. On the other hand, among the representatives of "Transport", "Journalism", and "Electronics, Automation, and Electronic Communications" fields, the share of those with 2-5 years of experience in using AI-based applications is the highest (15.6%, 12.5%, and 11.5%, respectively). Instead, representatives of such fields as "Social Work", "Service Sector", and "Architecture and Construction" have the lowest shares (0%, 0%, and 5.0%, respectively).

We have identified some peculiarities in the formation of respondents' perception of the most significant opportunities and risks to research that open up for researchers with the use of AI-based applications. Thus, it is mostly based on opinions of experts and practitioners published on mass and social media (47.1%), and scientific literature concerning the AI impact on research (30.7%). Respondents' perceptions are influenced to a lesser extent by their own experience of using AI-based applications (15.1%). Women (48.8%) are somewhat more likely than men (44.1%) to read the opinions of experts/practitioners published in social media, and men (32.7%) are more likely than women (29.8%) to prefer analysing scientific literature. At the same time, among professors (35.8%), the share of those who analyse specialised scientific literature is higher, compared to associate professors (31.5%) and persons without academic title (27.8%).

There is a certain connection between the sources of respondents' perception and their positions. Thus, the vision of the majority of university managers (77.8%) and librarians (56.5%) is based on the opinions of experts/practitioners presented in mass and social media. While the perception of 42.9% of IT employees is based on scientific literature and their own experience of using AI-based applications. Heads of structural units, research and academic staff use combined approaches, preferring to read expert opinions in mass and social media (48.6%, 46.3%, and 46.9%, respectively).

The opinions of experts and practitioners published in mass and social media are the predominant way to perceive the impact of AI-based applications for representatives of most fields of knowledge, primarily "Military Sciences, National Security, State Border Security" (72.7%), "Social Work" (57.3%), "Humanities" (57.5%), "Mechanical Engineering" (56.2%). At the same time, among the representatives of such fields as "Electrical Engineering", "Chemical Engineering and Bioengineering", "Public Management and Administration", "Veterinary Medicine", and "Journalism", the share of those who base their perception on research publications is quite large (57.1%, 50.0%, 47.0%, 42.9%, 37.5%). The largest share of those who rely on their own experience in using AI-based applications is among representatives of such fields as "Service Sector" (27.3%), "Journalism" (25.0%), "Biology" (24.0%), "Healthcare" (23.5%), "Information Technologies" (21.9%), and "International relations" (22.2%).

Publication activity does not have a significant impact on the respondents' perception of the of the key opportunities and risks to research that open up with the use of AI-based applications. At the same time, respondents with more than 50 publications are more likely rely on scientific literature (36.5% compared to 22.5% of respondents who have no publications). Respondents with minimal publication record are somewhat more likely to form an opinion based on their own experience of using AI-based applications (18.9% compared to 15.1% for the cohort of respondents with 11 to 50 publications and 14.8% for the cohort with more than 50 publications).

When assessing the most significant *opportunities* for researchers in using AI-based applications, our respondents note: replacing/performing routine processes (from 56.6% of librarians to 77.8% of institutional heads and their deputies), collecting information from a large number of sources (from 59.8% of researchers to 75.1% of institutional heads and their deputies), and increasing the speed of processing large volumes of data (from 57.1% of IT staff to 100% of institutional heads and their deputies). At the same time, there are lower expectations for AI in terms of improving the quality of research (from 36.6% of researchers to 56.5% of librarians), using non-traditional ways of understanding phenomena (not only through observation and simulation of processes, but also through the so-called generalised modelling) (from 14.3% of IT staff to 55.6% of heads of institutions and their deputies), detecting anomalies and patterns that cannot be seen by humans (from 14.3% of IT staff to 66.7% of heads of institutions and their deputies) (Table 1). At the same time, respondents do not see the possibility of AI-based applications in operationalising the research process [13], [14], [15], improving the quality of scientific texts [14], [15], increasing the efficiency of research activities and developing new skills of researchers [17], [18], increasing the efficiency of resource use [16].

Table 1

Respondents' perception on opportunities of using AI-based applications in research (by positions)

	Opportunities of using AI-based applications in research (%)					
Position	replacing/ performing routine processes	opportunity to devote more time to the quality of research	collecting informati on from a large number of sources	use of an unconventional way of understanding phenomena (not only observation and simulation of processes, but also the so-called generalised modelling)	speed of processi ng large amounts of data	detecting anomalies and patterns that are probably not visible to humans
Heads and deputy heads of universities	77.8	55.6	66.7	55.6	100.0	66.7
Heads, deputy heads of structural units	68.9	38.5	75.1	26.5	73.5	34.2
Professors, associate professors, senior lecturers, lecturers, assistants, etc.	66.1	38.2	71.9	30.6	69.8	31.8
Researchers	61.0	36.6	59.8	23.2	62.2	26.8
Library staff	56.5	56.5	82.6	43.5	69.6	34.8
IT staff	57.1	42.9	71.4	14.3	57.1	14.3
Other	35.3	47.1	52.9	52.9	82.4	52.9

Respondents with different academic degrees have a rather low opinion of AI capability to contribute to the quality of research (the range of answers is from 39.7% of people without a degree, 38.4% of PhDs to 38.3% of DScs). Only about 30.0% of respondents in all categories believe that AI opens up opportunities for using unconventional ways of understanding phenomena (from 28.6% of DScs to 30.9% of PhDs). DScs (33.8%) are the most convinced of AI capability to detect anomalies and patterns that humans are probably unable to see, while those without a degree are the least convinced (30.1%). It is notes that DScs are more convinced of AI capability to collect information from a large number of sources (74.4%) compared to PhDs (71.7%) and those without a degree (69.6%). PhDs (72.4%) and DScs (71.1%) are more likely than those without a degree (64.3%) to believe in AI capability to speed up the processing of datasets (Table 2).

Table 2

Respondents' perception on opportunities of using AI-based applications in research (by scientific degrees)

	Opportunities of using AI-based applications in research (%)					
Scientific degree	replacing/ performing routine processes	opportunity to devote more time to the quality of research	collecting information from a large number of sources	use of an unconventional way of understanding phenomena (not only observation and simulation of processes, but also the so-called generalised modelling)	speed of processing large amounts of data	detecting anomalies and patterns that are probably not visible to humans
Without scientific degree	57.4	39.7	69.6	29.0	64.3	30.1
PhD	67.8	38.4	71.7	30.9	72.4	32.8
DSc	70.3	38.3	74.4	28.6	71.1	33.8

It is noted that professors (72.9%) and Associate Professors (67.5%) are more likely to assess it as opposed to those without academic title (61.2%) (Table 3).

Table 3

Respondents' perception on opportunities of using AI-based applications in research (by academic title)

	Opportunities of using AI-based applications in research (%)					
Academic title	replacing/ performing routine processes	opportunity to devote more time to the quality of research	collecting information from a large number of sources	use of an unconventional way of understanding phenomena (not only observation and simulation of processes, but also the so-called generalised modelling)	speed of processing large amounts of data	detecting anomalies and patterns that are probably not visible to humans
Without academic title	61.0	38.3	71.5	28.2	69.3	31.6
Associate Professor, Senior Researcher	67.5	38.7	71.1	32.0	71.1	32.0
Professor	72.9	39.4	74.3	28.4	70.2	35.8

As for respondents' perception of AI capabilities and their research experience it is notes that respondents with more than 20 years of research experience are the most likely to rate AI capabilities in terms of: replacing/performing routine processes – 72.9% (compared to the lowest rating of 51.2% by those without such experience), collecting information from a large number of sources – 73.7% (compared to 65.3% by respondents with up to 1 year of experience), and processing speed of large datasets – 74.0% (compared to 58.5% by those without experience). At the same time, people with up to 1 year of research experience (50.0%) are more likely than other categories of respondents in this group (the lowest rate is 36.0% from respondents with 2-5 years of experience) to assess the potential of AI to free up more time and devote it to the quality assurance of research. Respondents with no research experience rate AI capability to replace/execute routine processes (51.2%) and to process large datasets quickly (58.5%) much lower than others (Table 4).

Table 4

Respondents' perception on opportunities of using AI-based applications in research (by research experience)

	Opportunities of using AI-based applications in research (%)					
Research experience	replacing/ performing routine processes	opportunity to devote more time to the quality of research	collecting information from a large number of sources	use of an unconventional way of understanding phenomena (not only observation and simulation of processes, but also the so-called generalised modelling)	speed of processing large amounts of data	detecting anomalies and patterns that are probably not visible to humans
No experience	62.4	38.5	70.1	31.9	66.7	31.9
Up to 1 year	63.6	43.4	74.7	25.3	70.7	30.3
2-5 years	65.3	33.3	72.7	28.7	67.3	32.7
6-20 years	65.1	39.9	70.9	30.6	72.4	32.2
Over 20 years	74.2	41.2	73.4	29.6	74.7	33.9

The publication activity of respondents to a certain extent influences their perception of the possibilities of using AI-based applications in research. Respondents with publications (regardless of their number) have more similar opinions on AI capabilities compared to those who do not have such publications. This category of respondents has a more pessimistic view on AI capability to replace/execute routine processes (55.0%), to devote more time to the quality of research (34.2%), to collect information from a large number of sources (66.7%), to process large datasets quickly (60.4%), and to detect anomalies and patterns that humans are probably not able to see (27.9%) (Table 5).

Table 5

Respondents' perception on opportunities of using AI-based applications in research (by a number of peer-reviewed publications)

	Opportunities of using AI-based applications in research (%)					
Number of peer-reviewed publications	replacing/ performing routine processes	opportunity to devote more time to the quality of research	collecting information from a large number of sources	use of an unconventional way of understanding phenomena (not only observation and simulation of processes, but also the so-called generalised modelling)	speed of processing large amounts of data	detecting anomalies and patterns that are probably not visible to humans
No publications	55.0	34.2	66.7	33.3	60.4	27.9
From 1 to 10 items	66.0	41.5	73.4	31.9	69.7	30.6
From 11 to 50 items	65.6	35.9	71.0	28.4	70.9	33.5
Over 50 items	68.7	40.8	72.3	29.6	72.5	33.5

Pearson chi-square values in perception of opportunities of using AI-based applications in research were calculated (Table 6). According to the data obtained, there is no correlation between the academic degree, academic title, research experience, publication activity of the respondents and their perception of opportunities of using AI-based applications in research. At the same time, there is a statistically significant correlation between the respondents' position and their perception of such opportunities ($\chi 2=86.32 \geq 43.77$).

Table 6

Pearson chi-square values ($p< 0.05$) in perception of opportunities of using AI-based applications in research

Factor	Empirical values	*Critical values*
Position	86,32	43,77
Scientific degree	1,14	18,37
Academic title	1,21	18,37
Experience in conducting research activities	11,32	31,41
Publication activity	2,88	24,99

Along with the obvious opportunities respondents also noted significant *risks*: unreliability of published research results (45.9%), violation of integrity in research (42.7%), generation of reviews on submitted research papers by unscrupulous experts and reviewers by using AI (43.9%), the need for more thorough review of research papers by experts and reviewers (42.9%), decrease in the quality of research (38.9%), and increase in the number of plagiarism cases (36.6%). At the same time, respondents do not see risks that lie within the realm of research ethics (data privacy issues, ghost authorship, dishonesty and irresponsibility in the use of AI systems) [13], [15], [27], [34].

According to university heads and their deputies, as well as librarians, the highest risks are those of unscrupulous experts generating their reviews on submitted research papers by using AI-based applications (77.8% and 56.5%, respectively) and the need for more thorough review of research papers (66.7% and 47.8%, respectively). At the same time, research and academic staff are most concerned about the risks of lowering the quality of research (42.7% and 39.7%, respectively) and violations of research integrity (42.7% and 41.4%, respectively). In contrast, IT and librarian staff assess the risk of a decline in the quality of research rather low (14.3% and 21.7% respectively). IT staff, compared to other categories of employees, do not see great risks from the questionable publication of research results (14.3%) and violation of research integrity (28.6%). It is also noteworthy that heads' of structural units and their deputies, academic and research staff's perception of risks of using AI-based applications ranges from 30.5% to 49.5%. At the same time, the perception of other respondents varies

significantly: those of university heads and their deputies range from 33.7% to 77.8%, librarians from 21.7% to 56.5%, and IT staff from 14.3 to 42.9% (Table 7). In general, such heterogeneity in the assessments requires further study.

Table 7

Respondents' perception on risks of using AI-based applications in research (by positions)

	Risks of using AI-based applications in research (%)					
Position	decrease in research quality	doubtfulness of published research results reliability	violations of research integrity	the need for a more thorough manuscript review by experts and reviewers	increase in the number of plagiarism cases	unscrupulous experts and reviewers can generate their conclusions on submitted manuscripts using AI
Heads and deputy heads of universities	33.3	55.6	55.6	66.7	55.6	77.8
Heads, deputy heads of structural units	36.6	45.9	48.6	36.2	41.6	49.4
Professors, associate professors, senior lecturers, lecturers, assistants, etc.	39.7	46.5	41.4	34.1	35.6	40.6
Researchers	42.7	31.7	42.7	32.9	30.5	35.4
Library staff	21.7	43.5	47.8	47.8	34.8	56.5
IT staff	14.3	14.3	28.6	42.9	42.9	42.9
Other	47.1	52.9	47.1	47.1	47.1	64.7

Respondents with different academic titles have quite similar perceptions of the risks of using AI-based applications in research. At the same time, there are significantly higher concerns about such risks from Professors, who are more likely than others to assess the risks associated with the need for more thorough manuscript review (46.3% vs. 33.3% for Associate Professors and 32.0% for those without academic title) (Table 8, 9).

Table 8

Respondents' perception on risks of using AI-based applications in research (by scientific degree)

	Risks of using AI-based applications in research (%)					
Scientific degree	decrease in research quality	doubtfulness of published research results reliability	violations of research integrity	the need for a more thorough manuscript review by experts and reviewers	increase in the number of plagiarism cases	unscrupulous experts and reviewers can generate their conclusions on submitted manuscripts using AI
Without scientific degree	37.4	41.7	42.6	31.9	35.9	36.2
PhD	38.4	45.7	42.4	33.3	36.5	43.9
DSc	42.9	50.0	44.7	44.7	38.0	46.2

Respondents with different academic titles have quite similar perceptions of the risks of using AI-based applications in research. At the same time, there are significantly higher concerns about such risks from Professors, who are more likely than others to assess the risks associated with the need for more thorough manuscript review (46.3% vs. 33.3% for Associate Professors and 32.0% for those without academic title) (Table 9).

Table 9

Respondents' perception on risks of using AI-based applications in research (by academic title)

	Risks of using AI-based applications in research (%)					
Academic title	decrease in research quality	doubtfulness of published research results reliability	violations of research integrity	the need for a more thorough manuscript review by experts and reviewers	increase in the number of plagiarism cases	unscrupulous experts and reviewers can generate their conclusions on submitted manuscripts using AI
Without academic title	38.1	42.2	42.2	32.6	37.6	40.8
Associate Professor, Senior Researcher	39.3	47.4	44.0	33.5	35.3	42.7
Professor	39.9	47.7	40.8	46.3	38.5	46.3

It is also noted that respondents with more experience (more than 20 years and 6-20 years) assess the risks of using AI-based applications highly in most criteria: dishonesty of experts and reviewers (49.0% and 41.8%, respectively), doubtful reliability of publications of research results (47.7% and 47.6%); violation of integrity (42.0% and 44.8%, respectively); increase in the number of plagiarism cases (39.2% and 36.6%, respectively) and the need for more thorough manuscript review (37.4% and 36.9%, respectively); and decrease in the quality of research (36.6% and 40.3%, respectively). Instead, respondents with no experience and minimal research experience (up to 1 year) are more optimistic about the likely risks: dishonesty of experts and reviewers (36.6% and 38.9%, respectively), doubtful reliability of research results publications (40.7% and 43.1%); violation of research integrity (41.5% and 40.3%, respectively); increase in the number of plagiarism cases (37.4% and 31.9%, respectively); the need for a more thorough manuscript review (33.3% and 27.8%, respectively); decrease in research quality (33.3% and 44.4%, respectively) (Table 10).

Table 10

Respondents' perception on risks of using AI-based applications in research (by research experience)

	Risks of using AI-based applications in research (%)					
Research experience	decrease in research quality	doubtfulness of published research results reliability	violations of research integrity	the need for a more thorough manuscript review by experts and reviewers	increase in the number of plagiarism cases	unscrupulous experts and reviewers can generate their conclusions on submitted manuscripts using ai
No experience	33.3	40.7	41.5	33.3	37.4	36.6
Up to 1 year	44.4	43.1	40.3	27.8	31.9	38.9
2-5 years	40.3	40.6	41.0	30.0	33.9	38.9
6-20 years	40.3	47.6	44.8	36.9	36.6	41.8
Over 20 years	36.6	47.7	42.0	37.4	39.2	49.0

The publication activity of respondents influences respondents' perception on risks of using AI-based application in research. Respondents who have more than 50 and from 11 to 50 peer-reviewed publications perceive the risks more seriously by most criteria. At the same time, respondents with no publications and respondents with up to 10 publications are somewhat more optimistic in their perception of the relevant risks (Table 11).

Table 11

Respondents' perception on risks of using AI-based applications in research (by a number of peer-reviewed publications)

	Risks of using AI-based applications in research (%)					
Number of peer-reviewed publications	decrease in research quality	doubtfulness of published research results reliability	violations of research integrity	the need for a more thorough manuscript review by experts and reviewers	increase in the number of plagiarism cases	unscrupulous experts and reviewers can generate their conclusions on submitted manuscripts using AI
No publications	35.1	36.9	42.3	33.3	43.2	36.0
From 1 to 10 items	38.8	45.7	40.7	34.3	36.4	43.9
From 11 to 50 items	39.2	45.2	42.6	32.4	34.8	40.8
Over 50 items	39.7	47.9	45.1	39.1	37.3	45.1

Pearson chi-square values in perception of risks of using AI-based applications in research are calculated (Table 12). According to the data, there is no correlation between the respondents' scientific degree, academic title, research experience, publication activity, and their perception of the risks of using AI-based applications in research. At the same time, there is a correlation between the respondents' position and their perception ($\chi 2=57.60 \geq 43.77$).

Table 12

Pearson chi-square values ($p< 0.05$) in perception of *risks* of using AI-based applications in research

Factor	Empirical values	*Critical values*
Position	57,60	43,77
Scientific degree	1,80	18,37
Academic title	2,80	18,37
Experience in conducting research activities	6,13	31,41
Publication activity	3,62	24,99

4. CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

As a result of the Russian war of aggression, there is a need to increase Ukraine's technological and industrial potential by improving the quality of research. Using AI-based applications for research conducted at Ukrainian universities can generate significant opportunities. This includes increasing the efficiency of research activities, developing new skills among researchers, reducing the time researchers spend on routine processes, and using resources efficiently.

In our study we aim to identify the most significant opportunities and risks to research in Ukrainian universities that open up for researchers using AI-based applications. We have found that despite the significant attention to AI development at the national level (adoption of the Concept of Artificial Intelligence Development in Ukraine, justification of the principles of development and use of AI technologies, funding of the Institute of Artificial Intelligence Problems of the Ministry of Education and Science of Ukraine and the National Academy of Sciences of Ukraine, drafting the National Strategy for the Development of Artificial Intelligence in Ukraine for the period 2021-2030), the experience of using AI-based applications by research and academic staff of Ukrainian universities is very limited. That is why it is crucial to find innovative ways to introduce AI technologies into the university and research environment meaningfully, ethically, and sustainably.

Our findings suggest that academic staff perceptions of the opportunities and risks of using AI-based applications in research are based more on the opinions of experts/practitioners published in mass and social media and scientific literature on the impact of AI on research. To a lesser extent, it is influenced by personal experience in using AI-based applications.

According to the respondents, the most significant opportunities for researchers in using AI-based applications are: replacing/performing routine processes, collecting information from a large number of sources, and increasing the speed of processing large datasets. At the same time, respondents have lower expectations for improving the quality of research, using non-traditional ways of understanding phenomena (not only through observation and simulation of processes but also through the so-called generalised modelling) and identifying anomalies and patterns that humans are unable to see. Respondents do not see the capability of AI in operationalising the research process, predicting the development of the phenomenon under study, improving the quality of scientific texts, increasing the efficiency of research activities and developing new skills of researchers, increasing the efficiency of resource use. Pearson chi-square values in the perception of opportunities of using AI in research show no correlation between the scientific degree, academic title, research experience, or publication activity of respondents and their perception, while there is a statistically significant correlation between respondents' perception and their positions.

According to respondents, the most significant risks associated with the use of AI-based applications are: unreliability of published research results, violation of research integrity, generating reviews on submitted research papers using AI, the need for more thorough manuscript review, decline in research quality, and increase in plagiarism cases. At the same time, respondents do not see risks that lie within the realm of research ethics (data privacy issues, ghost authorship, dishonesty and irresponsibility in the use of AI systems).

The results demonstrate the importance of implementing institutional policies on using AI-based applications in Ukrainian universities to improve research quality. These institutional policies should include the principles of using AI-based applications in research, address issues of research ethics (in particular, data privacy, ghost authorship, dishonesty and irresponsibility in the AI use), and promote the relevant use of AI-based applications to increase the efficiency of research activities, reduce the time researchers spend on routine processes, and use resources efficiently. In addition, it is essential to develop relevant in-service programmes for researchers aimed at developing skills in automating and operationalising the research process and its stages using AI-based applications. Another problem is the integration of AI-based applications and Open Science, particularly in the context of avoiding the risks of dishonesty and irresponsibility in using AI systems.

Given the challenges posed by AI in research, we are well-positioned to address these issues and explore effective ways to integrate AI-based applications in research. We also see prospects for further research in substantiating the theoretical foundations of the responsible use of the potential of AI and the principles of open science (OS), as well as increasing the level of readiness of research and academic staff members for the use of AI technologies in research in compliance with the principles of OS as an integral component of the research capacity of universities.

Authors' contributions:

Oleksandra Borodiyenko conceptualised and supervised the study and contributed to the development of the methodology.

Iryna Drach and Iryna Reheilo developed the methodology and wrote the manuscript draft.

Oleksandr Bazeliuk examined the literature and was a major contributor to the article's theoretical framework.

Nataliia Bazeliuk, Olha Petroye and Olena Slobodianiuk realised data collection and analysis.

All authors revised the draft and contributed to the final manuscript.

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МОЖЛИВОСТІ І РИЗИКИ ВИКОРИСТАННЯ ШТУЧНОГО ІНТЕЛЕКТУ В ДОСЛІДЖЕННЯХ: КОНТЕКСТ УКРАЇНСЬКИХ УНІВЕРСИТЕТІВ

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Анотація. Метою статті є вивчення можливостей та ризиків використання програм і додатків, створених на основі ШІ, у дослідженнях, які здійснюються в українських університетах.

Визначено, що досвід науково-педагогічних та педагогічних працівників українських університетів у використанні ШІ є досить обмеженим. Сприйняття респондентами можливостей та ризиків використання ШІ переважно ґрунтується на експертних висновках, трансльованих у ЗМІ та соціальних мережах, та вивченні літератури, присвяченої питанням впливу ШІ на наукові дослідження.

Серед найбільш суттєвих можливостей ШІ респонденти відзначили здатність автоматизувати рутинні процеси, збирати інформацію з великої кількості джерел, прискорити обробку великих масивів даних. Значно менша кількість респондентів відзначила можливість підвищення якості досліджень, генерування нетрадиційних ідей, визначення моделей та аномалій у розвитку досліджуваних явищ. Респонденти висловили сумнів у спроможності ШІ оптимізувати процес дослідження, покращити якість наукових текстів, підвищити ефективність досліджень або сприяти розвитку нових навичок.

Поряд із можливостями, респонденти відзначили суттєві ризики, пов'язані з використанням ШІ: недостовірність опублікованих наукових результатів, порушення дослідницької доброчесності, неетичне використання програм для генерування рецензій на наукові тексти і, як наслідок, необхідність більш ретельного їх рецензування. Занепокоєння респондентів викликає також можливе зниження якості наукових досліджень та зростання кількості явищ плагіату. З іншого боку, питання етики досліджень (зокрема захист даних, примарне

авторство, нечесне та недобросовісне використання ШІ) не вбачаються респондентами суттєвими ризиками.
Результати дослідження актуалізують необхідність впровадження інституційної політики щодо відповідального та етичного використання ШІ, а також зусиль, спрямованих на вдосконалення компетентності науково-педагогічних та педагогічних працівників українських університетів щодо професійного та етичного використання програм у дослідженнях.

Ключові слова: штучний інтелект; програми і додатки, створені на основі ШІ; наукові дослідження; відкрита наука; українські університети.

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