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AI AND MACHINE TRANSLATION POST-EDITING: ADVANCEMENTS AND CHALLENGES (INSIGHTS FOR STUDENTS OF INTERNATIONAL STUDIES)

198 — Now, with the appearance of the latest wave of a sophisticated generative artificial intelligence (AI), humanity is about to embark on an entirely new functioning order. The challenge today is that due to AI the world will definitely undergo drastic metamorphosis tomorrow, and again the day after. To adapt to this reinvented economy, people will need to reinvent their skills, careers – and, indeed, their lives. Therefore, educating people for reinvention in this fluid context will require the reinvention of higher education itself. According to Joseph E. Aoun, taking into consideration the targets to be met in the nearest future, the next generation of HEI students are supposed to be educated to invent, to create, and to discover – to meet society's targets that any most sophisticated artificial intelligence agent cannot, consequently, a curriculum should include technological literacy, or understanding how machines work and how to work with them. Furthermore, the emergence of cognitive translation studies has stipulated an interdisciplinary approach to delve into the cognitive and behavioural aspects of a broad array of cross-language activities including all kinds of translation and interpreting. In a world that relentlessly pursues efficiency and productivity, the figure of a post-editor, a professional translator who has the skills to add that necessary human touch to a text which has previously been subjected to software algorithms, has become more prominent.

Keywords: cognitive translation studies, higher education, generative AI, machine translation, post-editing, interdisciplinary approach, students, International Studies.

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Штучний інтелект та постредагування машинного перекладу: перспективи та виклики (інсайти для студентів-міжнародників)

Нині, завдяки бурхливому розвитку штучного інтелекту (ШІ), людство впевнено крокує до абсолютно нових реалій. Виклики сьогодення, які постали перед світовим соціумом полягають в тому, що він зазнаватиме і подальших радикальних метаморфоз, використовуючи штучний інтелект абсолютно у всіх сферах діяльності. Щоб відповідати вимогам нового світового економічного порядку, людству варто буде кардинально змінити своє мислення на зростання, стиль життя і кар'єру та набутти наскрізні навички майбутнього. Власне, у цьому контексті, постає питання переосмислення сутності вищої освіти, зокрема, перспективи гуманітарної освіти. На думку Джозефа Ауна, з огляду на цілі, які мають бути досягнуті в найближчому майбутньому, освітянам варто вчити наступне покоління студентів вищих навчальних закладів бути життєздатними – винахідливими, креативними і допитливими, що не під силу жодному найдосконалішому штучного інтелекту. Відповідно, навчальна програма повинна включати комп'ютерну грамотність, тобто розуміння того, як працюють машини і як з ними працювати. У даному контексті, когнітивне перекладознавство та постредагування зумовлюють міждисциплінарний підхід до вивчення когнітивних і поведінкових аспектів широкого спектру міжмовної діяльності, включаючи всі види письмового та усного перекладу. Разом з тим, постредактори-професійні перекладачі, які володіють гуманними рисами, дотримуючись етичних норм і стандартів і є технічно грамотними, є невід'ємною складовою революційних змін у системі освіти.

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Ключові слова: когнітивне перекладознавство, вища освіта, генеративний ШІ, машинний переклад, постредагування, міждисциплінарний підхід, студенти, міжнародні студії.

“These [AI] tools will help us be more productive (can't wait to spend less time doing email!), healthier (AI medical advisors for people who can't afford care), smarter (students using ChatGPT to learn), and more entertained (AI memes lolol).” Sam Altman, the CEO of OpenAI; the co-founder of ChatGPT.

“The UN convened the first-ever global meeting with education ministers to discuss the risks and rewards of using chatbots in classrooms. Less than 10% of schools and universities follow formal guidance on using AI tools. Generative AI can create data and content based on existing algorithms, but can also make alarming fac-

tual errors. UNESCO is developing policy guidelines and frameworks for the use of generative AI in education.” (United Nations. UNESCO releases UNESCO releases a new roadmap for using AI in education, June, 2023, (<https://www.weforum.org/agenda/2023/06/unesco-new-roadmap-ai-education/>))

Problem statement. Nowadays, with the appearance of the latest wave of a sophisticated generative artificial intelligence (AI), humanity is about to embark on an entirely new functioning order. Furthermore, AI is giving us an excellent opportunity to observe the symbiosis between a sound human and smart technology. While blowing the whistle on AI, many top business leaders, including Geoffrey Hinton, the “godfather of AI”, are seriously worried that artificial intelligence could pose an existential threat to humanity in the not-too-distant future. What is more, within days of the arrival of GPT-4, Goldman Sachs warned that the latest AI systems could automate a quarter of all the work done in the US and the Eurozone, costing some 300 million jobs. At the same time, other CEOs indicated AI will have the most favourable and transformative impact in three key industries: healthcare (48%), professional services/IT (35%) and media/digital (11%). (Aoun, 2023).

Consequently, the challenge today is that because of AI the world will definitely undergo drastic metamorphosis tomorrow, and again the day after. To adapt to this reinvented environment, people will need to reinvent their skills, careers – and, indeed, agency over their lives. Therefore, educating people for reinvention in this fluid context will require the reinvention of higher education itself (Hawary, 2023).

Recent research and publications analysis. The concept of Industry4.0 has been characterised by a drive towards minimising human involvement and emphasising the automation of various processes. This has led to a scenario where humans are, to some extent, in competition with machines, resulting in the displacement of human labour in numerous situations.

In the context of Industry 5.0, there is a notable shift in this trend. The focus now is on establishing a balance wherein the interaction between machines and humans is optimised to yield maximum benefits. This represents a scientific acknowledgment of the need to harmonise technological advancements with the preservation and enhancement of human roles, recognizing the complementary strengths of both entities. The scientific thought behind Industry5.0 underscores the potential for a more synergistic relationship between humans and machines, aiming for a collaborative

coexistence that leverages the unique capabilities of each for enhanced productivity and overall societal well-being (Andres, et al, 2022, 2921-2926).

It is mandatory we should focus on theoretical views and considerations with some practical implications of the aforementioned research concepts and their potential to build a new system of innovation that promotes in a systematic way the open, 'glocal', social and digital social innovations for the benefit of people with a key role of science and its social and societal impact. The concept of University5.0 and Education5.0 is an attempt to address present ongoing digital transformation and green transitions, and to stimulate the social dimension of universities' missions. In a single university perspective, a micro level would concern the optimization of research and innovation processes. At a meso level, we can assume an analysis of the innovation ecosystem in which the university is located, also including the territorial peculiarities within which cooperative synergies would be developed (Carayannis, Morawska, 2023).

Noteworthy, Society5.0 epitomises a human capable of adeptly addressing diverse challenges and societal issues through the application of innovations that have arisen in the era of the fourth industrial revolution, predominantly centred on technology. The integration of these technological advancements necessitates a heightened level of discernment from educators. Consequently, the role of universities and educators within the framework of Society5.0, which places emphasis on human labour, assumes a paramount significance. Given the intricacies of this multifaceted progression, there is an imperative demand for a highly qualified workforce and educators. Their pivotal role lies in cultivating an educational milieu that equips students with the essential skills and knowledge required to navigate and contribute effectively to the evolving landscape of Society 5.0 (HARAHAP, et al, 2023, 249).

In her seminal work Dr. Nidhi Singh predicts that Education 5.0 harnesses advanced technologies to deliver a more personalised and human-centric approach to teaching, emphasising the social and emotional development of students, along with solutions that enhance societal well-being. Recognizing the transformative impact of technology across various sectors such as work, industry, and health, there is a growing consensus that technology should actively contribute to improving life. The evolving landscape of work, marked by digital transformation and automation, necessitates rapid adaptations to align with the dynamics of a swiftly changing global economy. In response to this, many nations are ushering in a new

era of industrial transformation known as Industrial Revolution 5.0 (IR 5.0). This latest industrial wave is anticipated to create opportunities for unprecedented economic growth and innovative ideas. However, to fully capitalise on these prospects, education must evolve in tandem. Consequently, Education 5.0 is emerging as a strategic approach for countries to align their educational systems with the demands of IR 5.0, ensuring that students are equipped to thrive in this rapidly evolving landscape (Singh, 2022).

202 — In this context, I would rather appeal to Jack Ma, a former teacher of English, the founder of Alibaba and one of the most influential entrepreneurs in the world who has some insights and suggestions concerning the problem under discussion. In his speeches and interviews, he often talks about the importance of being unique and human in the age of AI. He claims, “We do not have to compete with the machines to be smarter but teach our children something unique”. And “we [as human beings] should use AI to solve problems rather than being controlled by AI. Although the physical and mental strength of human beings are not comparable to machines, but human beings have a ‘heart’ whereas machines only have ‘chips’” (Ma, 2018).

According to Jack Ma, such authentic qualities as values, believing, independent thinking, teamwork, sports, music and art should be taught to make students/learners human and unique in the age of AI. From my perspective, the system of education is supposed to cultivate the best qualities that could help us not only survive but thrive in the future.

To do that, higher education needs to orient the curriculum to account for the prevalence of AI going forward. In Joseph E. Aoun’s vein, taking into consideration the targets to be met in the nearest future, the next generation of HEI students are supposed to be educated to invent, to create, and to discover – to meet society’s targets that any most sophisticated artificial intelligence agent cannot, therefore, a curriculum should include technological literacy. “The new literacies of Aoun’s humanics are data literacy, technological literacy, and human literacy. Students will need data literacy to manage the flow of big data, and technological literacy to know how their machines work, but human literacy – the humanities, communication, and design – to function as a human being. Life-long learning opportunities will support their ability to adapt to change. The only certainty about the future is change. Higher education based on the new literacies

of humanics can equip students for living and working through change” (Aoun, 2018).

A ‘now generation’ of digital natives appears to dominate every walk of human life. The impact of digital technology and the World Wide Web on translation as a cognitive science is incessant, all-encompassing and insightful. Furthermore, the emergence of cognitive translation studies has stipulated an interdisciplinary approach to delve into the cognitive and behavioural aspects of a broad array of cross-language activities including all kinds of translation and interpreting, namely, such issues as bilingualism and second language acquisition represent in many ways an even tighter focus on the uniquely human elements of linguistic structure and function, as theories build on and remain linked to current and developing knowledge of human cognitive processes.

In a world that relentlessly pursues efficiency and productivity, the figure of a post-editor, a professional translator who has the skills to add that necessary human touch to a text which has previously been subjected to software algorithms, has become more prominent. It is a halfway house between the human and the robotic solution. 203

Consequently, the emergence of cognitive translation studies has stipulated an interdisciplinary approach to delve into the cognitive and behavioural aspects of a broad array of cross-language activities including all kinds of translation and interpreting, namely, such issues as bilingualism and second language acquisition represent in many ways an even tighter focus on the uniquely human elements of linguistic structure and function.

Study objectives: The primary aim of this article is to elucidate key perspectives tailored for students specialising in International Studies, with a focus on Translation Studies (TS). The article contextualises the intricate nexus of artificial intelligence (AI) and machine translation (specifically post-editing), shedding light on both the advancements and challenges within this dynamic intersection.

Tasks: The article undertakes the task of distilling valuable insights pertinent to the realm of machine translation post-editing. This involves the establishment of a robust foundation encompassing best practices, guidelines, and methods for quality assessment within this swiftly evolving domain. The author’s focus revolves around the problem of instilling a more methodical and efficacious students’ approach to post-editing, thereby contributing to overall quality enhancement of machine-translated content.

Presentation of the main research material. English as EFL and the essential part of TS, in this regard, have an immediate relevance to new skills of a future educative and nurturing process -bilingualism, respectively, has a significant influence on students' mindset by stimulating their cognitive abilities, fostering curiosity and learning, promoting skill development, and encouraging a growth mindset. Developing students' different skills provide opportunities for them to engage in problem-solving, strategic thinking, and logical reasoning, which enhances their mental agility and flexibility. By engaging with English, learners develop a sense of confidence, perseverance, and a willingness to embrace challenges, ultimately shaping a positive and adaptable mindset.

Of particular interest for our research was the study of Brown et al (1990), where they delve into a statistical method for machine translation, while presenting a novel approach that leverages statistical models to improve the accuracy and efficiency of machine translation systems. The authors explore the application of statistical techniques in handling language translation, aiming to enhance the overall performance of automated translation processes.

Noteworthy, the digital age brought the brand-new CAT tools, optimising translation process, computer software SDL Trados, Star Transit, Across, and Wordfast. From a theoretical perspective, we are facing a new challenge of integrating a 'Computer-aided Tools Module' into our department curriculum for translator's training to meet the requirements of the present-day reality. We should provide the students with the necessary methods and knowledge to enable them to deal with this activity and, eventually, they will have an excellent opportunity to acquire the basic knowledge of CAT tools needed to do a high-quality translation and choose a wider variety of scenarios to advance (Bohatyrets et al, 2021, 236).

Respectively, the paper by Carl (2012), presented at the 8th International Conference on Language Resources and Evaluation (LREC 2012), focuses on the practice of post-editing machine translation (PEMT) output. The author explores the process of refining and improving machine-generated translations by post-editors after the initial machine translation has been produced. The researcher discloses the challenges, methodologies, and implications of post-editing, shedding light on the role of human intervention in enhancing the quality of machine-generated translations.

Koponen and Salmi (2017) orchestrated a preliminary investigation with the objective of scrutinising the revisions executed by 16 translation

students who had previously undergone instruction in machine translation (MT) and post-editing. This analysis focused on a lucid post-editing task involving English to Finnish translation, with emphasis on evaluating the accuracy and essentiality of the alterations made. The findings revealed that while a majority of the corrections undertaken by the students were accurate, potentially attributable to their prior training, a substantial proportion (34%) appeared superfluous, suggesting a nuanced aspect of their editing decisions.

By leveraging their linguistic expertise and contextual knowledge, post-editors can improve the accuracy, fluency, and overall quality of the translated content. Ultimately, post-editing serves as a quality assurance step that bridges the gap between machine-generated translations and human-level linguistic accuracy. It ensures that the output meets the desired quality standards, aligns with the target audience's expectations, and effectively fulfils the intended purpose of the translation in terms of Error Correction/ Terminology Adjustment/ Style and Tone Refinement/ Cultural Adaptation/ Contextual Clarification/ Adaptation to Target Audience. These examples demonstrate how post-editing fine-tunes machine-translated content, rectifying errors, refining style, maintaining consistency, adapting to context, and meeting the specific requirements of the target audience. Through these postediting interventions, the quality and effectiveness of machine-translated content are significantly enhanced.

Shifting to a practical perspective, I came up with the idea to make use of machine translation post-editing into the target language (on the example of the English poem). Taking into account the fact that the use of translation and MT post-editing are increasing the demand for language-skilled professionals and aiming at gauging the use of MT post-editing in the foreign language class, I came up with the idea to make use of computer-aided error analysis (CEA) to extract patterns of error found in translation and MT post-editing into the foreign language (on the example of the English poem). To employ the freshmen's creative mindset and the mental elasticity to see the beauty and peacefulness of a cruel reality, the students were suggested translating the poem (entitled "Worst Day Ever?") of an amazing Chanie Gorkin, a 17-year-old about to enter the 12th grade at the Lubavitch high school Beth Rivkah (CBS News, 2015).

Interestingly, the complex poem contains a surprise. From top to bottom it reads negatively, but when the message read in reverse drastically changes. (Students' Translation, 2023).

<p>Today was the absolute worst day ever And don't try to convince me that There's something good in every day Because, when you take a closer look, This world is a pretty evil place. Even if Some goodness does shine through once in a while Satisfaction and happiness don't last. And it's not true that It's all in the mind and heart Because True happiness can be attained Only if one's surroundings are good It's not true that good exists I'm sure you can agree that The reality Creates My attitude It's all beyond my control And you'll never in a million years hear me say Today was a very good day</p> <p>* Now read it the other way, from bottom to top *</p> <p>CHANIE GORKIN</p>	<p>Це був найгірший день у моєму житті І не намагайся мене переконати, що Можна знайти щось хороше у кожному дні Тому що, як тільки ти приглянешся, Помітиш, що у світі сила-силенна зла Навіть якщо Час від часу проблискує маленька частинка добра Насолода і щастя – не вічні. І це повна брехня, що Все залежить від твоїх думок і поглядів Тому, що Справжнє щастя досягне Лише за умови, що твоє оточення сприятливе І міфом є те, що добро існує Я певна, ти погодишся, що Реальність Формує Наше світовідчуття Все це – поза нашим контролем Ти ніколи в житті не почувеш від мене, що «Сьогодні – день повен добра».</p> <p>А зараз прочитайте знизу вгору</p> <p>Ванар Євентіна</p>	<p>Сьогодні був найгірший день, І не намагайся мене переконати. Та є добро у кожному із нас, Коли ти пильним оком глянеш. Цей світ жорстокий, повен зла, Хоча добро проблискує десь зрідка. Задоволення і щастя не триває вічно, безумовно, І неправда це, що все життя належить розуму і серцю. Тому що справжнє щастя є, існує, Серед буденних днів стількох. І це неправда, що добро існує, Що кожен день хороше щось несе, Я впевнена, що ти погодишся на це. Моя реальність творить щось незриме, і все поза моїм контролем невлотимим. І ти ніколи не почувеш від мене теж, Що сьогодні був хороший день без меж.</p> <p>Roksolana Myroniuk</p>
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Needless to say, since the Russia's unprovoked full-scaled war burst out, our students were still stressed and exhausted from the unprecedented effects of COVID-19 and were struggling to return to a less stressful lifestyle. Likewise, education objectives are to go beyond limited goals such as academic achievement to actively promote and maintain students' both physical and emotional well-being. In my opinion, English is really important as a tool for students' mental health as well as their self-esteem. What is more, bilingual translation activities develop their cognitive and emotional competencies to navigate successfully through the challenges of the current realities.

Therefore, the activity was spruced up during our class when I noticed that my students-translators-to-be felt dreary and depressed. So, they were pushed to use their blue-sky thinking (the activity of trying to find completely new ideas) about reading the poem, analysing the contrast of attitudes towards meaningful life and the sense of gratitude, since there are two ways of reading this incredible poem, the difference teaches us perspective!

Likewise, they were made to compare the translations made by their

fellow-students and Google Translate to their own ones in order to evaluate machine translation quality and their new-gained skills. The experiment proved the machine translations to be 'ridiculous', but in fact quite acceptable. In the cases investigated, machine translations are sometimes as acceptable as the ones post-edited by the professional translators, since the MT through a lack of attention or by ignoring the case of polysemous words. To recapitulate, the experiment proved the Google translations to be obviously plain and sometimes absurd and there are a number of mistakes such as wrong subject-verb agreement, wrong interpretations of polysemous words (where a single word or phrase has multiple related meanings), wrong interpretation of gendered words. However, overall, the results are far more satisfying than forecast. Additionally, the students had an excellent opportunity to analyse the idiosyncrasies of every author (translator), the machine translation provided a basic ground for their creativity and flexibility of their mindset. This experiment provided some insights into the main difficulties found by the students in MT post-editing into their mother tongue, paying attention to all the peculiarities of a foreign language. 207

Thus, a comparative analysis of error frequency has been performed on the results of EFL first-year students' doing post-editing as compared to another group doing translation in order to gauge the level of difficulty of MT post-editing and opposed to translation from the foreign language into a mother tongue.

My strong conviction is the EFL class served as a platform for the bilingual student's enrichment in positive psychology, feeling the beauty of the flowery English and embracing the difference between the source language (English) and target language (Ukrainian) as well as gaining a new experience of MT post-editing (their future job).

The role of postediting in ensuring high-quality translations cannot be overstated, as it adds the essential human touch needed to deliver accurate, natural, and contextually appropriate translations.

Conclusions. To finalise, the intersection of Artificial Intelligence (AI) and Machine Translation Post-editing (PE) presents a dynamic landscape of advancements and challenges. The rapid progress in AI technologies has significantly improved the efficiency and accuracy of machine translation systems, leading to increased adoption across various industries. However, the need for post-editing remains crucial to ensure the quality and context-specific nuances of translated content. Challenges such as linguis-

tic nuances, cultural context, and domain-specific terminology continue to pose hurdles for fully autonomous machine translation. Collaboration between AI systems and human post-editors is emerging as a promising approach to address these challenges. As technology evolves, striking the right balance between automated translation and human intervention will be pivotal for achieving optimal results in the field of language translation. The ongoing exploration of innovative solutions and the continuous refinement of AI algorithms will likely shape the future landscape, offering a synergistic approach that leverages the strengths of both machines and human expertise in the realm of translation.

Hence, contemporary technology significantly shapes the translation industry, impacting the methods employed by professional translators and consequently influencing the pedagogy for training future translators. Machine Translation (MT) has emerged as a pivotal force in the translation market, and staying competitive in the field necessitates future translators to adeptly utilize and integrate technology as an essential tool in their professional practices. To accomplish this objective, extensive research on different facets of MT usage and the post-editing process is essential. In this regard, the current study highlights various avenues for future research.

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