WHO OWNS ARTIFICIAL INTELLIGENCE?

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ABSTRACT
This paper explores the complex landscape of AI-assisted and AI-generated work, examining the pressing concerns and issues regarding Intellectual Property Rights (IPR) and ownership in the future. AI presents unprecedented opportunities and challenges, potentially influencing every global citizen in profound ways. Against a backdrop of the historical evolution of disruptive technologies the paper navigates the current discourse and legal frameworks around AI and IPR. It underscores the pivotal role of authorship and ownership in shaping the intersection of AI and IP. The paper also considers the challenges faced by authorities grappling to regulate its application. Acknowledging the disruptive and contested nature of AI outputs in the context of IPR, the narrative raises ethical concerns around how AI is deployed and exploited. As AI becomes more ubiquitous, questions arise about its potential impact on the ecosystem which protects creative production and innovation, potentially posing a threat to established intellectual property norms. The paper considers the potential for a new AI/IP ecosystem as well as the intriguing possibility of AI itself being granted intellectual property rights, a development with far-reaching implications for global IP policy. The concluding focus underscores the profound implications of these issues on both Engineering and Design Practice and education, urging a careful consideration of how to harness the benefits of generative AI while preserving the integrity and motivation of human creative endeavours.

Keywords: Artificial Intelligence (AI), Intellectual Property (IP), ownership, authorship, innovation

1 INTRODUCTION
This paper considers AI as it has evolved in recent years and its paradigmatic potential to reshape the way we think, operate, and interact with both the natural and artificial world. Researchers have been interested in how to use computers to carry out intelligent tasks since the 1940s. Indeed, computer scientist John McCarthy coined the term “Artificial Intelligence” as far back as 1955 [1]. In attempting to define AI, Seaver, describes it as a diffuse term that corresponds to a web of human actors and computational processes interacting in complex ways [2]. In fact, there remains no clear definition of what AI actually is [3][4][5]. What is clear is that AI is a technological innovation that is set to shape and reshape our collective futures. Society has consistently made technological advances, achieving incremental breakthroughs leading to new capabilities that benefit humanity. These advances began almost 2 million years ago with the hand axe and evolved slowly over time. However, in recent history there have been three paradigm shifts often referred to as industrial revolutions, which have reshaped how we think, operate, and interact [6]. These paradigm shifts have created conflicts around authorship and ownership of these technological breakthroughs. Consequently, an IP ecosystem evolved to assign rights to this type of property. AI follows this pattern, however, the delineation of authorship and inventorship roles may become less clear [7].
The foundations of copyright and patent laws are being challenged by AI's rapid growth. The modern copyright system evolved in response to technological disruptions like the printing press [8] which revolutionized the way information was produced, disseminated, and consumed from the late 15th century. Previously, books and documents were painstakingly copied by hand, making them scarce, expensive, and often prone to errors. The printing press transformed the way information was created, shared, and consumed, leading to profound social, cultural, and economic changes in societies around the world [9]. The question is whether AI is just another disruptive technology or something more transformative and perhaps more profound. While section 8 of this paper considers the impact of AI on Education, sections 2 to 7 address some of the emerging discussions that our students and programmes need to engage with in order to be prepared to navigate a changing world.

2 AI AS DISRUPTIVE TECHNOLOGY

Klaus Schwab, founder of the World Economic Forum, coined the term Fourth Industrial Revolution describing the current technological revolution as 'characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres' [10]. This Fourth Industrial Revolution has evolved out of the three earlier Industrial Revolutions. The first utilized water and steam to power machinery and enable innovative structures, the second harnessed electric power to enable mass production, and the third enabled a 'digital revolution' which introduced personal computers and the internet. The Fourth Industrial Revolution builds on these, particularly leveraging digital technologies and supporting a vast, interconnected ecosystem, which dynamically shaped interactions between humans and the world around them [11]. With its roots in the mid twentieth century, it has been informed by the emerging technologies in engineering, science, computing and medicine. The foundations were established for the internet of things (IoT), virtual and augmented reality, AI, nanotechnology and robotics. AI has already significantly impacted human lives, extending its influence across diverse industrial, business and medical applications by analysing data for predictive insights. Disruptive technology is a signature of this Fourth Industrial Revolution and presents humanity with both great challenges and great opportunities. A comprehensive and expanding literature on disruptive technology places AI at the forefront of this disruption [12].

However, AI may be more than disruptive with Schwab [13] suggesting that we are now standing at the edge of a transformative technological revolution, where we face an unprecedented shift in technological innovation which is set to redefine 'our daily lives, professional landscapes, and interpersonal dynamics'. This transformation distinguishes itself through its vast scale, far-reaching implications, complexity and embeddedness, presents a significant departure from any historical precedents. This Fourth Industrial Revolution is unfolding at an unprecedented pace which is disrupting industries on a global scale and reshaping the nature of manufacturing, distribution, administration, governance and education. The increasing deployment, ubiquity and invisibility of AI, should prompt a collective refocus on personal and societal values. Creating a future that prioritizes the well-being of all requires placing people, not machines or tools, to the forefront both in application and ownership. While the Fourth Industrial Revolution carries the potential to mechanize and therefore dehumanise humanity, in its most pessimistic manifestation, it also harbours the capability to enable the positive qualities of human nature and to develop a new collective moral and ethical consciousness where AI technology can enable us to co-create a sustainable and resilient future. However, managing the evolution of our technological innovations and their transformative potential presents many challenges.

3 THE INTELLECTUAL PROPERTY ECOSYSTEM

IPR, including patents, copyrights, designs, trademarks, and trade secrets, provide legal protection to individuals and corporate entities for their intellectual creations. The two core categories of copyright and patent, represent legal rights for the creators and inventors who generate the content which generates both creative culture and technological innovation as outputs of the human mind.

The technological revolution marked by the invention of the print press, which enabled the mass dissemination of information [14], was the catalyst for one of the earliest pieces of IP copyright law which was passed into the UK statute books in 1710 [15]. This initial law set a precedent for the development of a comprehensive global IP ecosystem. By 1948 intellectual property rights were enshrined as human rights by the United Nations under article 27 of the Universal Declaration of Human Rights [16].

The original purpose of the patent system was to promote innovation by granting exclusive rights for a period of time to inventors in exchange for making their inventions available to the public. These exclusive rights were guaranteed by government and protected through national and international legal systems. Overall, IPR aims to strike a balance between providing creators and inventors with the incentives and protection needed for their endeavours while supporting a climate of innovation that benefits society as a whole. Wills reminds us that 'IP's core function is promoting innovation and not preserving tradition… [17], with the intention being a better societal future. The disruption to IPR presented by the very nature, scale and pace of AI will require establishing a new balance between stimulating, generating and protecting IP and the IP ecosystem.

4 AI DISRUPTION TO THE IP ECOSYSTEM

The challenge of AI in the realm of IPR is complex, stemming from the unique nature of AI-generated creations and the emergence of blurred ownership positions. Key issues include determining authorship and ownership of AI-produced works within existing IPR frameworks designed for *human* creations. Concerns extend to data ownership and access, especially considering the use of diverse datasets in AI training, which potentially pose challenges to intellectual property provenance.

The evolving nature of AI challenges patent law, necessitating increasingly complex definitions of inventive steps and non-obviousness requirements. Further challenges result from the pace in AI developments and questions around human/machine collaborative. Addressing these challenges necessitates an increasingly nuanced approach, potentially incorporating new AI-specific categories or regulations within IPR frameworks. International agreements and standards are proposed which would aim to harmonize AI and IPR practices. The intention would be to continue to promote innovation while safeguarding both creators and the interest of society in general.

The intersection of AI and IPR also raises ethical concerns, particularly regarding the concentration of power in the hands of advanced AI technology processors and owners, potentially leading to economic and societal inequalities. The autonomous nature of AI in creative endeavours challenges traditional authorship concepts and prompts questions about fair compensation for human creators of content. This emphasises the need to strike a balance between innovation incentives and ownership if we want to continue to encourage human creativity. Ethical and legal questions increasingly arise from AI's role in both accidental and intended intellectual property violations, resulting in production of illicit output. In addition, biased algorithms and discriminatory AI practices may result in social injustices and exploit IPR to protect questionable content. Responsible AI use within IPR bounds requires ethical considerations in both development and application. Therefore, IPR frameworks may need a comprehensive overhaul to remain credible in the face of questions and challenges.

5 AUTHORSHIP AND OWNERSHIP

Given the economic significance of these AI innovations, there's an inclination to 'control' such intellectual creations through IPRs. A pivotal question arises regarding how to interpret the notions of 'authorship' in the realm of ‘copyright,’ and 'inventorship' in the realm of patents, when AI systems generate creations and inventions [18]. Authorship is central in copyright law, raising questions about AI's role in the creative process. International treaties, such as the Berne Convention, lack explicit definitions of 'author' or 'authorship,' leaving room for interpretation at the national level. [19]. Ginsburg argues that the person who conceptualizes and directs the development of the work is the author, rather than the person who simply follows orders to execute the work. Most national copyright laws agree that mere execution does not make one an author. Ginsburg goes on to suggest that the "author" conceives of the work and supervises or otherwise exercises control over its execution. [20].

Within patent law Abbott [21] challenges conventional notions of inventorship and advocates for recognizing AI as a ‘co-creator’. The absence of legal clarity prompts a call for adaptive frameworks that balance innovation encouragement, human creators' rights, and AI's unique contributions. In the European Union, most Member States lack a specific definition of 'inventor,' relying on the presumption that inventions are solely made by natural persons [22]. While patent ownership may include legal persons, only humans typically qualify as 'inventors'. The collaborative nature of AI-human interactions raises issues of both authorship and ownership. The lack of clarity on policy has been prompting discussions on updating legal frameworks to accommodate AI-generated works, which argue for recognition and protection for both human and AI contributors. As technology advances, collective agreement becomes crucial for fostering a fair and adaptive intellectual property ecosystem.

6 NEW IP/AI ECO SYSTEM

Questions of accountability, copyright, and patent rights become challenging when discussing AI. The notion of creativity and authorship is entwined with human emotion, intuition and experience, characteristics that AI does not possess. While AI can evaluate and optimise data sets, it arguably lacks the depth of understanding, meaning, and personal experiences that define human creativity. As AI becomes increasingly prevalent in society, it becomes important to assess how ethical responsibility is tied to developers and owners of AI systems. As more sophisticated AI raises fundamental questions about the roles of authors and inventors, blurring distinctions between human and machine-generated

content. AI's capacity to autonomously create types of content, can appear to challenge conventional definitions of creativity and invention. Collaborative efforts further complicate the attribution of authorship, raising legal challenges in intellectual property frameworks that often assume a human creator. AI will inevitably disrupt labour within the creative industries. Understanding the potential impact on existing professional pathways in these industries is essential as AI continues to shape this sector [23]. As AI systems evolve to produce more complex content, the question over whether machines can be considered authors or inventors becomes an increasing discourse. Legal frameworks surrounding intellectual property are grappling with these challenges. Current IPR assumes a human creator or inventor, which poses difficulties in assigning ownership to machine-generated works. Striking a balance between acknowledging the contributions of AI tools in the creative process and preserving the unique aspects of human authorship and invention remains a complex and evolving challenge. Inevitably the existing IP ecosystem needs to evolve to recognise and acknowledge the changes and potential impacts to protect the richness of human culture and innovation while embracing the co-creation potential of AI as a transformative technology.

7 REGULATION AND CONTROL

The World Intellectual Property Organization (WIPO) acknowledges the growing impact of AI on IP and has been actively monitoring developments in this field. WIPO recognizes the need for a balanced approach that fosters innovation while addressing ethical, legal, and policy challenges associated with AI. WIPO has engaged in discussions and forums to explore the intersection of AI and IP, seeking to emphasize the importance of ensuring that IP systems effectively accommodate and incentivize AI-related innovation [24]. WIPO has encouraged member states and stakeholders to share their experiences and insights on the challenges posed and highlighted the significance of a global dialogue to develop guidelines and frameworks that align with the evolving landscape of AI technologies.

WIPO's stance underscores adapting IP systems to cater to the unique aspects of AI creations, promoting innovation, and safeguarding ethical considerations. The European Commission recently published a proposal for regulating AI detailing definitions and uses of the technologies, with important sections on the prohibited uses of AI and what are referred to as high-risk activities, requiring that the latter go through an approval process much like medications or vehicles would before being made available to the public [25].

Many jurisdictions are addressing challenges as they arise and navigating between existing IPR, legal judgement and contract law in the absence of a global guidance or policy. The resulting uncertainty has the potential to disincentivise using AI tools to develop works which may not be guaranteed protection and also a fear of liability as a result of unwittingly infringing the IPR of others. [26].

8 EDUCATION AND AI

AI's has enormous potential to transform educational practices and enhance learning experiences. [27], however, it is not without concerns. There is now a critical discourse happening around AI and education which is appropriate to those of us who are educators. This discourse influences the ethical and integrity contexts of our graduates as they permeate through their professional careers. Their position is being influenced and shaped by the current debates, debates which they need to be part of. Regardless of concerns, doubts or fears from many within the education community, AI continues to open up new possibilities for innovations in education [28]. Spennemann [29], outlines some of the educational questions which we might reflect on, proposing Integration, Integrity and Equity as critical criteria. Integration focuses on how we should integrate AI tools like GPT-4 into education in a way that enhances learning outcomes without compromising the development of critical thinking and analytical skills. Integrity focuses on what policies should be implemented to ensure the use of AI in education upholds academic integrity, particularly in core courses and examinations. Equity focuses on how we should address the potential for AI tools to disproportionately benefit certain groups of students over others, ensuring equitable access and benefits from these technologies.

Careful consideration needs to be given to the nature and pace of integration of AI tools within education to ensure we appropriately maximise the benefits without compromising the integrity of educational practice itself. Responsible innovation while exploiting the potential of AI tools underpins the nature of Engineering and Product Design Education.

9 SUMMARIES

While AI has the potential to enhance creativity and innovation, there are concerns that its implementation may also pose challenges and inhibit certain aspects of these processes. AI systems are often trained on existing datasets, which might inadvertently reinforce biases present in the data, limiting the diversity of ideas generated. Moreover, the reliance on algorithms to predict trends or optimize solutions might result in a narrowing of creative exploration, as AI tends to favour patterns and existing knowledge. The justifiable fear of job displacement due to automation by AI could also impact the willingness of individuals to take creative risks or explore unconventional ideas. The inherent emphasis on predictable outcomes and efficiencies of AI systems, may undermine the tolerance for failure, which is a characteristic element in the creative process. Furthermore, there is a risk that overreliance on AI-generated solutions might reduce human involvement and intuition, eroding the unique, serendipitous, and emotionally driven aspects of creativity that AI tools might struggle to replicate.

While AI holds immense potential to augment and catalyse certain aspects of creativity and innovation, careful consideration and human oversight are crucial to ensure that its implementation does not constrain the very qualities it seeks to enhance. Balancing the strengths of AI with the unique capacities of human creativity remains a key challenge in maximizing the synergies between the two. Perhaps the emphasis should be taken off the distraction of attempting to recognise AI as an independent creator and realise that it itself is a creation of the human intellect and that it presents us with a powerful tool for co-creation. Perhaps too much of the discussion on AI focuses on the 'intelligence' and not on the 'artificial.' AI is a powerful new tool, which in the right hands can enable and expand human intelligence. However, it is just a more advanced stone axe, a complex tool which we are still trying to figure out how to deploy appropriately.

AI has the potential to assist in solving existing and future challenges across many fields. It is incumbent upon us to find a framework that enables its potential to be truly universal in a fair and equitable way. Evidence would suggest that AI can be used for the generation of human-like creative output, however this is based on the existing limited definitions of creativity. Perhaps the greatest distinction between AI creativity and human creativity lies in its primary purpose, the making of human culture through human creativity. This paper is not an interrogation of creativity but yet its context is central to most debates on AI/IP. The IP system has been primarily formed to protect the economic benefit of human intellectual and creative output, however, there is much more to the human experience and creativity than an economic output. Perhaps the questions raised around authorship and ownership point to an opportunity to re-evaluate the nature of a new AI/IP ecosystem which captures and reward the best of human creativity and imagination.

So, to answer the question, "Who owns AI?" we realise there are many elements to the term own. There is the patent ownership of those who create the AI algorithms and tools; the natural ownership of those who create the content and data on which AI is trained; and those who create new content while using AI tools. It is clear however that we need to address the relationship between AI and IPR to enhance and improve the legal and ethical frameworks that support innovation and ensure fair reward for all those creators. On attempting to interrogate the subject of the paper new questions emerge? Is the blurring of ownership just a distraction? Who benefits from the tool being granted rights?

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