University “St. Kliment Ohridski”
Bitola
Faculty of Information and
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Republic of North Macedonia

PROCEEDINGS

15th International Conference on APPLIED INTERNET AND INFORMATION TECHNOLOGIES

AIIT 2025

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Bitola, November 7, 2025

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Introduction

As organizing partners of 15th International Conference on Applied Internet and Information Technologies AIIT 2025, we warmly welcome all participants, researchers, and colleagues joining us from various countries and universities, united by our shared commitment to advancing knowledge in the fields of computer science, applied Internet, and information technologies.

The AIIT conference has become a long-standing tradition of excellence and collaboration, co-organized by the Faculty of Information and Communication Technologies – Bitola, University "St. Kliment Ohridski," and the Technical Faculty "Mihajlo Pupin" – Zrenjanin, University of Novi Sad, Serbia. Over the past fifteen years, this partnership has fostered not only strong academic cooperation but also genuine friendship among our institutions and scholars.

This year's conference proudly continues that tradition, bringing together innovative research, diverse perspectives, and new insights into technologies that are shaping our digital future. The Scientific Program Committee once again faced the demanding task of selecting the highest-quality papers from more than sixty submissions spanning a wide range of topics—including Artificial Intelligence, Immersive Technologies, Mathematical Simulations, Data Science and Big Data Analytics, Knowledge and IT Management, Cybersecurity, Software Engineering, Data Mining, Digital Transformation, Behavioral Economics and Business, Social Engineering, Digital Humanities, Augmented Humanity, and Hybrid Intelligence. This ensures that the program reflects both scientific rigor and creative originality.

We would like to express our sincere gratitude to all reviewers for their dedicated work, as well as to the members of the Organizing Committee for their professionalism, commitment, and enthusiasm in preparing this event.

We are confident that these proceedings will provide an enriching and thought-provoking reading experience.

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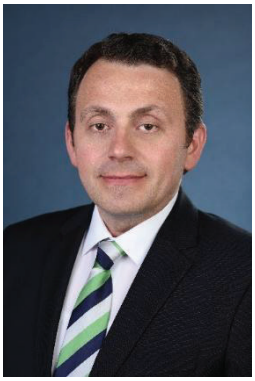

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The Role of Digital Humanism in Shaping AI-Driven Augmented Humanity

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Abstract:
The rapid advance of artificial intelligence (AI) and machine learning (ML) has triggered discussions on the role of humans in a technology-dominated world. The concept of Digital Humanism has emerged as a framework for aligning digital transformation with human-centered values and ethical imperatives. Alongside the concept of Augmented Humanity, the enhancement of human abilities through AI calls for a redefinition of human-machine interaction. This paper explores the intersection of these two domains by analyzing how Digital Humanism can guide the design and governance of AI systems that empower rather than replace humans. Considering recent research in AI ethics, intelligence augmentation, and digital humanities, this study proposes a conceptual framework for responsible AI-driven augmentation. It reflects on its implications for society, culture, and future interdisciplinary and transdisciplinary research in computer science, computer engineering, and the humanities.

Keywords:
Digital Humanism, Augmented Humanity, AI Ethics, Human-Centered Design, Technological Humanism, Hybrid Intelligence.

1. Introduction

The integration of AI into social, economic, and cultural systems has fundamentally redefined the meaning of a human in the digital era. The technology nowadays facilitates decision-making, communication, and creativity, influencing how individuals perceive activity and autonomy. While these technologies promise unprecedented efficiency and insight, they also raise profound concerns about algorithmic bias, dehumanization, and the systematic shrinkage of privacy.

Digital Humanism emerges as a corrective model in this landscape. It emphasizes the critical need to design, deploy, and regulate technology according to human values, fundamental human rights, and democratic principles. In parallel, **Augmented Humanity** and **Intelligence Augmentation** shift the focus from replacing humans to amplifying human cognition and creativity. In that context, **Hybrid Intelligence** integrates the cognitive capabilities of humans, such as emotional insight, contextual understanding, and ethical reasoning, with the computational power, data processing efficiency, and pattern recognition capabilities of AI, to significantly enhance collaborative decision-making, creativity, and innovative problem-solving.

This paper contends that Digital Humanism provides the ethical and epistemological foundation for AI-driven augmentation, prioritizing human dignity and social justice in technological advancement.

The remainder of the paper is structured as follows. Conceptual fundamentals: Digital Humanism, Augmented Humanity, and AI Ethics are presented in Section 2. The subsequent Section describes intersections between Digital Humanism and Augmented Humanity. A framework for human-centered augmentation is depicted in Section 4. Section 5 highlights the implications and challenges of the role of digital humanism in shaping AI-driven augmented humanity. The last Section concludes the paper by giving recommendations for future work.

2. Conceptual Fundamentals

Understanding the intersection of Digital Humanism and Augmented Humanity requires clarity on three foundational concepts, together with AI Ethics, that form the theoretical backbone of this study. These concepts represent distinct but interrelated approaches to reimagining the relationship between humans and technology.

Digital Humanism is an intellectual movement and practical approach to technological development grounded in the belief that humans must remain active agents in shaping digital transformation. The Vienna Manifesto on Digital Humanism has called for interdisciplinary collaboration to ensure that technological systems strengthen human autonomy, equality, and sustainability [1] [2] [15]. Humans must shape technologies in accordance with human values and needs, instead of allowing technologies to shape them. Moreover, a new vision is required for educational curricula development that integrates knowledge from the humanities, social sciences, and engineering [1]. Digital humanism is an ethical framework for the digital age that seeks to interpret and shape the processes of digital transformation in accordance with the fundamental concepts of humanist philosophy and practice [15]. It emphasizes that human beings should remain at the center of the digital world, with technological development aimed at enhancing human freedom, peace, and progress in harmony with nature, providing societal progress [2].

Augmented Humanity focuses on extending human potential through the symbiotic interaction of biological and digital systems. In contrast to automation, which endeavors to replace human labor, augmentation aspires to be a partner - AI as a collaborator rather than a competitor. This human-computer integration aims to enhance productivity and capacity by augmenting human capabilities through the extension or restoration of physical, intellectual, and social functions [3].

AI Ethics integrates philosophical exploration and technical implementation, concerning fairness, explainability, and harm prevention. Digital Humanism integrates the principles mentioned above within a human-centered design methodology by developing systems that adapt to human contexts [6] [10]. A framework is proposed that enables developers and policymakers to better comprehend the ethical implications of digital technologies before they are widely implemented, aiming to reduce risks and promote positive outcomes. This framework supports a balanced approach to digital innovation, ensuring that technological advancement aligns with universal human values and ethical principles, so the digital world continues to serve human well-being [6].

3. Intersections between Digital Humanism and Augmented Humanity

The convergence of Digital Humanism and Augmented Humanity creates a powerful framework for understanding how AI can enhance rather than diminish human potential. This intersection reveals three critical areas of synergy: ethical anchoring, collaborative intelligence, and cultural preservation.

Harfouche et al. [5] demonstrate how human-centric AI can mitigate algorithmic biases, introducing the concept of “augmented intelligence” as a corrective to purely autonomous systems. The synergy between Digital Humanities as an academic discipline and Hybrid Intelligence as a research paradigm with specific requirements and constraints is explored in [14]. Considering the gap between academic and managerial approaches towards integrating human knowledge with the use of AI tools, a new AI approach through the design science research methodology is developed [5]. Ciula and Eide [8], along with Hawkins [9], explore how digital humanities methods sustain human interpretation while leveraging computational techniques in the study of cultural heritage [12]. The datafication of digitised archives offers digital humanists new opportunities to engage with vast quantities of archival material [9].

The distinction between automation and augmentation represents more than a semantic difference. It reflects a fundamental reimagining of how humans and technology coexist and interact.

Guerrero et al. [3] provide a systematic mapping review of Augmented Humanity, identifying key application domains and limitations, and demonstrating how augmentation technologies extend rather than replace human capabilities. Figure 1 illustrates the paradigm shift from traditional automation (replacement pattern, efficiency-driven) to intelligence augmentation (collaboration pattern, creativity-driven) and augmented humanity (symbiosis pattern, flourishing-driven).

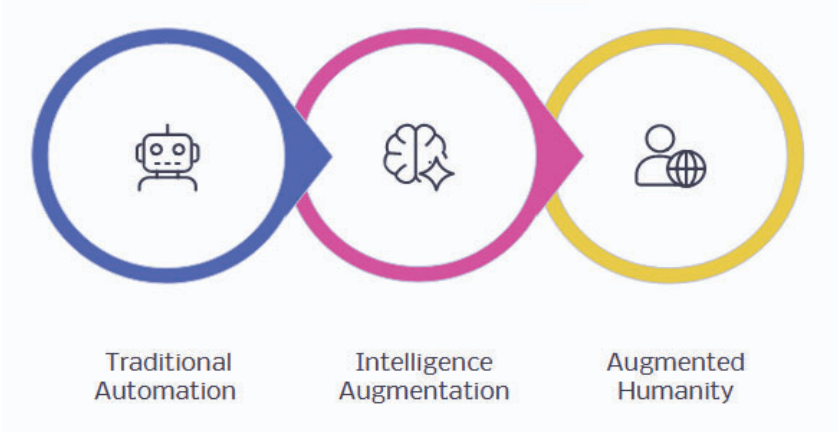

Figure 1: The paradigm shift from traditional automation (replacement paradigm, efficiency-driven) to intelligence augmentation (collaboration paradigm, creativity-driven) and augmented humanity (symbiosis paradigm, flourishing-driven).

4. A Framework for Human-Centered Augmentation

To operationalize the synergy between Digital Humanism and Augmented Humanity, this paper proposes a comprehensive four-layer conceptual framework. Each layer addresses distinct but interconnected dimensions of responsible AI-driven augmentation.

Figure 2 depicts the framework consists of the following 4 layers:

- **Ethical Foundation Layer**. It establishes essential principles: autonomy, fairness, inclusivity, and sustainability. This layer ensures that all augmentation technologies respect human dignity and fundamental rights.
- **Cognitive Collaboration Layer**. It enables shared reasoning between humans and artificial intelligence. Systems at this layer are designed to enhance rather than replace human judgment and creativity.
- **Inclusive Design Layer**, that prioritizes accessibility, transparency, and adaptability. This layer ensures that augmentation technologies to adapt effectively across diverse populations and settings.
- **Societal Feedback Loop**, which implements participatory governance mechanisms. This layer creates channels for ongoing public input, evaluation, and democratic oversight of augmentation systems.

This framework draws on insights from Díaz de la Cruz et al. [6] and Hofkirchner and Kreowski [10].

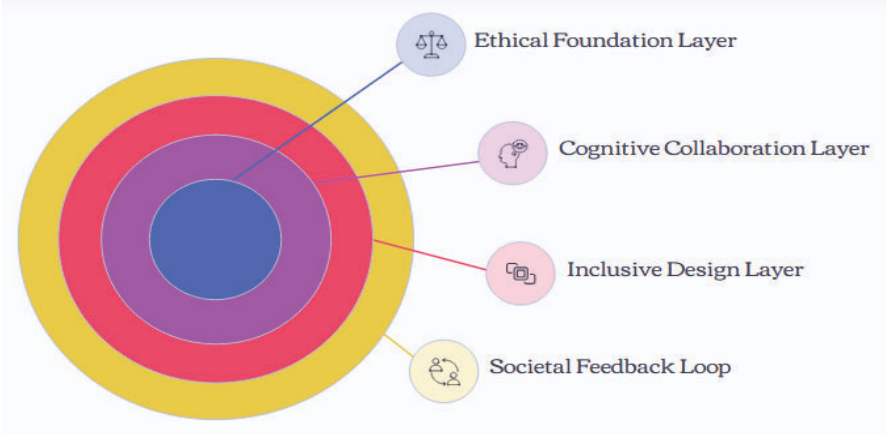

Figure 2: The framework: Ethical Foundation Layer, Cognitive Collaboration Layer, Inclusive Design Layer, Societal Feedback Loop.

5. Discussion

One of the most pressing challenges in AI systems is the perpetuation and amplification of social biases. Harfouche et al. [5] demonstrate that human-centric AI offers a pathway to mitigate these biases through Augmented Intelligence approaches that maintain human oversight and judgment. Sapignoli [13] critiques the "AI turn" in global governance, arguing that big data systems often produce a "mismeasure of the human." Algorithmically mediated knowledge and power are becoming increasingly significant in defining areas of human rights concern and methods for addressing them, as machine learning promises to uncover previously hidden patterns in human interaction, with huge amounts of information forming the ground for further analysis and interpretation [13].

Table 1 provides a comparative analysis of three augmentation approaches: traditional automation, Intelligence Augmentation, and Digital Humanist augmentation, across multiple dimensions, including their primary goals, the role of humans, value orientation, decision-making authority, ethical frameworks, design processes, and success metrics.

The impact of AI on labor markets represents a consequential domain. Paul et al. [4] and Zhou et al. [7] emphasize design principles that prioritize human factors. Ethical issues connected to human-computer interaction and Augmented Intelligence, which are crucial in shaping the future of human work, are considered in [4]. Besides finding good manners to use intelligence augmentation, appropriate socio-technical interaction metrics are required to measure its positive impact on humanity [7].

Despite its promise, operationalizing Digital Humanism faces challenges, including governance complexity, cultural bias, educational gaps, market pressures, technical limitations, as well as barriers during implementation. These challenges are synthesized in Table 2. Overcoming them necessitates ongoing, interdisciplinary dialogue and cooperation.

Table 1:
Comparative analysis of augmentation approaches

Dimension	Traditional Automation	Intelligence Augmentation	Digital Humanist Augmentation
Primary Goal	Efficiency and cost reduction	Capability enhancement	Human flourishing and empowerment
Human Role	Passive recipient or displaced worker	Active user of tools	Co-designer and partner
Value Orientation	Economic optimization	Individual productivity	Collective well-being and justice
Decision Authority	Algorithmic determination	Human-in-the-loop	Human-in-the-loop with participatory governance
Ethical Framework	Compliance-based	Risk mitigation	Rights-based and values-driven
Design Process	Technology-first	User-centered	Human-centered and democratically governed
Success Metrics	ROI (Return on Investment) and throughput	Task performance	Human agency, equity, and sustainability

Table 2:
Challenges in operationalizing Digital Humanism

Challenge Category	Specific Issues	Potential Responses
Governance Complexity	Coordinating stakeholders across sectors, jurisdictions, and cultures Balancing innovation with regulation	Multi-stakeholder forums Adaptive governance frameworks International cooperation mechanisms
Cultural Bias	Dominat-culture framing of "universal" values Insufficient representation of diverse epistemologies	Participatory design with marginalized communities Pluralistic value frameworks Decolonial approaches
Educational Gaps	Limited digital literacy Lack of interdisciplinary training Inadequate ethical formation	Curriculum reform Lifelong learning initiatives Ethics integration across disciplines
Market Pressures	Short-term profit motives Competitive dynamics favoring speed over safety Concentration of power	Regulatory incentives Public interest technology Alternative business models
Technical Limitations	Explainability challenges Scalability of oversight Measurement of human-centric outcomes	Advancing interpretable AI Human-in-the-loop systems Qualitative evaluation methods
Implementation Barriers	Resource constraints Organizational inertia Lack of standardized frameworks	Open-source tools; capacity building Shared best practices repositories

6. Conclusion and Directions for Future Work and Research

De Boer et al. [14] and Mozumder et al. [11] highlight opportunities and challenges in emerging technologies and future trends of the Metaverse. The convergence of Digital Humanism and AI-driven Augmented Humanity indicates a paradigm shift from tool-centered to value-centered design of digital systems, technologies, and human-machine interactions. This synthesis gives rise to **Technological Humanism**: a framework where innovation enhances empathy, creativity, and collective intelligence. Future research should include: (1) empirical validation of the framework; (2) cross-cultural perspectives; (3) governance mechanisms; (4) measurement instruments; and (5) educational interventions. As Werthner et al. emphasize, the future is actively created through deliberate choices [15].

Further study has to rigorously test the proposed framework across diverse contexts and applications. Longitudinal studies examining real-world implementations will provide crucial insights into the effectiveness and unintended consequences of human-centered augmentation approaches. Moreover, expanding beyond Western perspectives to include diverse epistemologies and global value systems remains crucial for a more inclusive understanding. This includes engaging indigenous knowledge systems and non-Western philosophical traditions in shaping AI development. Developing adaptive, participatory governance structures that can evolve alongside emerging technologies while ensuring democratic accountability. This includes exploring novel forms of public engagement and oversight.

Designing curricula and training programs that provide current and future practitioners with the interdisciplinary knowledge and ethical sensibilities required for implementing Digital Humanism principles, and creating robust metrics and evaluation frameworks that capture human-centric outcomes beyond traditional efficiency measures, are still challenging tasks. This includes developing qualitative and mixed-methods approaches to assessment.

This paper has explored the critical intersection of Digital Humanism and AI-driven Augmented Humanity, proposing a comprehensive framework for ensuring that technological advancement serves

human prosperity rather than diminishing it. The four-layer framework, spanning ethical foundations, cognitive collaboration, inclusive design, and societal feedback, provides a roadmap for responsible augmentation.

The comparative analysis reveals fundamental differences between automation, augmentation, and humanist approaches, demonstrating that achieving truly human-centered AI requires paradigm shifts in values, governance, and design philosophy. Finally, the convergence of Digital Humanism and Augmented Humanity offers a vision of technological development that enhances rather than replaces human actions, creativity, and dignity, considering AI-driven augmentation. This perception requires ongoing commitment from all stakeholders (researchers, practitioners, policymakers, and citizens) to respond effectively to rapid technological and societal changes, actively shape and move toward Technological Humanism.

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