ARTIFICIAL SOCIAL INTELLIGENCE AND THE TRANSFORMATION OF HUMAN INTERACTION BY ARTIFICIAL INTELLIGENCE AGENTS

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Abstract
Artificial Intelligence (AI) has profoundly influenced numerous sectors, with Artificial Social Intelligence (ASI) emerging as an extremely important area focusing on AI agents' ability to understand, interpret, and engage within human social contexts. This article provides an analysis of ASI and its changing impact on human interaction. We trace the evolution of ASI from early concepts to complex computational agents capable of nuanced social behaviors, highlighting the interdisciplinary foundations spanning computer science, psychology, sociology, and ethics. The paper makes an in-depth analysis into the theoretical basis and into the key technologies that enable ASI. We explore the emergence of AI agents in diverse social settings and analyze the mechanisms through which they are reshaping communication dynamics, group interactions, social norms, empathy, and concepts of identity and authenticity. Furthermore, the article presents applications and case studies across very important domains, analyzing both the potential benefits and inherent challenges. A significant portion is dedicated to the ethical, legal, and societal implications (ELSI), addressing concerns related to transparency, privacy, bias, accountability, trust, and psychological well-being. We identify key challenges and open research questions and discuss future directions, exploring enhanced technologies, the pursuit of generalized social intelligence, and the potential for human-AI symbiosis. The conclusion emphasizes the need for a collaborative, ethically grounded, and systemic approach to guide the development and deployment of ASI, ensuring it serves to augment human flourishing and enrich the collective social experience rather than diminishing it.

Keywords: Artificial Social Intelligence, Computational Agents, Artificial Intelligence, AI Agents, Human Social Contexts, Human Interaction, Ethical Legal Societal Implications, Challenges and Open Research Questions

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1. Introduction

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Research and development in the field of AI have experienced unprecedented growth over the last several decades, influencing numerous sectors of society. Economic, political, and cultural domains have all felt the impact of increasingly complex AI systems. Nevertheless, within the emergence of AI in various industries, ranging from finance [1] and healthcare [2] to entertainment [3] and transportation [4], one of the most important and impactful aspects has been the rise of ASI. This area focuses on the ability of AI systems to control, interpret, and engage in social contexts, thereby influencing the way in which humans interact with each other and with computational agents [5]. An emphasis on social capabilities compels AI research to draw on theories and practices from psychology [6], sociology [7], linguistics [8], neuroscience [9] and cognitive science [10], among other fields, highlighting that ASI requires an inherently interdisciplinary approach.

In its most basic sense, ASI aims to replicate or approximate various dimensions of human social behaviors and interactions within artificial agents. Rather than simply performing computations or providing information, socially intelligent AI agents are designed to detect emotional expressions [11], infer intentions [12], respond empathically [13], and adapt to changing social environments [14]. While early AI research focused heavily on problem-solving, logic, and symbolic reasoning, the next generation of AI systems has shifted attention to nuanced interpersonal dynamics [15], complex communication patterns [16], and adaptive social behaviors [17]. This transformation is fueled by the growing recognition that human interaction encompasses much more than the exchange of factual content. It involves shared context, subtle emotional cues, cultural norms, relational history, and a wide range of evolving social meanings.

The significance of ASI is becoming more pronounced as AI technologies begin to mediate human communication on a large scale. Online platforms, messaging services, virtual assistants, and social media channels increasingly rely on AI algorithms that filter information, recommend content, and simulate social presence. Advancements in Natural Language Processing (NLP) [18], Machine Learning (ML) [19], and computer vision [20] have enabled the creation of conversational agents [21], social robots [22], and other AI-driven systems that can carry out tasks in ways that feel surprisingly personable and context-aware [23]. These developments prompt a recalibration of human interaction, as AI moves from an automated background function to a socially interactive presence capable of influencing interpersonal dynamics.

At the core of this progression is the fundamental question of how humans respond to, adapt to, and co-evolve with AI entities that exhibit social intelligence. The phenomenon transforms the user experience into technology-mediated settings, along with the broader landscape of social norms, ethical considerations, psychological constructs of identity and agency. It is therefore very important to investigate the interaction between AI systems with social capacities and the human communities that adopt them [24]. The transformation has potential to yield positive outcomes such as enhanced accessibility, improved social

connectivity, and the facilitation of collaborative tasks across cultural and geographic distances [19]. Nevertheless, it also raises critical challenges, including privacy concerns [25], bias in AI decision-making [23], the erosion of certain human to human interaction skills [26], and a reevaluation of how authenticity is defined and maintained in the digital and physical spaces [27].

Within this broader context, the article provides an in-depth exploration of ASI and of the way in which it supports and drives a transformation of the human interaction. The introduction focuses on the historical roots, theoretical frameworks, technological advancements, ethical considerations, and future directions that comprise this complex topic. By examining the motivations, scope, and significance of developing socially aware AI agents, it becomes possible to put forward the broader implications for human society, as well as the responsibilities of designers, policymakers, and researchers involved in this cutting-edge field. The following sections describe the motivations behind the field's rapid expansion, the objectives that guide ongoing research, the significance of interaction between human beings and AI technology for social experiences.

The evolution of AI, from symbolic reasoning to data-centric methods, has led to breakthroughs in image recognition [28], NLP [29] and robotics [30]. Nevertheless, many systems lack social awareness and interaction. The development of socially aware AI aims to replicate human social intelligence, including emotional recognition and perspective-taking, to enable more natural and ethical human-machine collaborations [31].

A particular interest consists in studying the field of socially aware AI, examining its theoretical foundations, technological innovations, historical developments, and ethical implications. We have analyzed how AI-based social intelligence differs from classical AI, evaluate key metrics for assessing AI performance in social contexts, and highlight the technological components enabling socially intelligent AI. The article has also analyzed current research within a historical perspective, discussing the impact of AI on human interaction by presenting applications and case studies.

The socially intelligent AI marks a significant shift in human-AI interaction [31], moving beyond traditional tool-like roles to more interactive and considerable positions. ASI introduces new forms of communication and collaboration [15], raising questions about trustworthiness [32], authenticity [27] and power dynamics in digital spaces [33]. This evolution impacts technology acceptance [34], community formation [35], and societal norms [36], prompting philosophical reflections on personhood [37] and human identity [31].

The present article is organized to provide a comprehensive examination of ASI, culminating in a full perspective that brings together various aspects. Therefore, following this introduction, the second section of the article makes an in-depth analysis into the foundations of ASI, the third one studies the theoretical and technological underlying

elements, the fourth section analyses the emergence and evolution of AI agents in human social contexts, the fifth one makes an in-depth analysis into the transformation of human interaction, the sixth section highlights applications and case studies, being followed by the seventh one that analyses the ethical, legal, and societal implications, the eighth section that investigates challenges and open research questions, while the ninth one analyses future directions and opportunities, along with a detailed conclusions section.

2. Foundations of ASI

ASI is a rapidly evolving domain that seeks to provide computational systems with capabilities that go far beyond simple data processing or pattern recognition. The emphasis lies in designing AI agents that can traverse social contexts with sensitivity, adaptability, and awareness of both the emotional states and the behavioral norms of the people around them. This field addresses the question of how machines can acquire and exhibit behaviors that typically demand high levels of human-like empathy, context understanding, and interpersonal intuition. Over the years, there has been growing recognition of the necessity for AI to perform tasks efficiently and to be able to engage in dynamic, nuanced interactions that reflect a certain level of social complexity [2,36].

The present section makes an in-depth analysis into the foundational aspects of ASI by first clarifying what "social intelligence" means in the context of AI research. It then puts together AI social skills with more conventional AI approaches, highlighting what sets socially capable AI apart from standard ML or knowledge-based systems. Following this, the cognitive and psychological aspects that inspire how AI agents can model and respond to human behavior has been discussed, with an emphasis on both classical and contemporary insights from psychology and neuroscience. Finally, key metrics and benchmarks for evaluating AI's social intelligence are analyzed with a view to how the field measures progress and determines the extent to which AI agents succeed in meaningful interactions between humans and AI technology.

Social intelligence in AI aims to give machines the ability to comprehend communication, predict human behavior, and act appropriately. This involves more than just language proficiency, it requires competencies like reading emotions and reflecting empathy. The field, at the intersection of computer science, behavioral psychology, and interaction design, has evolved from simple chatbots to systems that consider multimodal communication and cultural context [38].

Conventional AI excels at well-defined tasks with labeled datasets or explicit mathematical models, such as image classification, speech recognition, or strategic decision-making in deterministic environments [39]. Nevertheless, social intelligence demands that AI agents process, classify, interpret, and respond to subtle human interaction complexities, including emotional nuances, cultural specificities, and historical patterns of behavior [14,36,38].

A socially intelligent AI must integrate empathy [5,13], trust-building [40], politeness [41], cooperation [42], or conflict resolution [43] into its decision-making process [33], considering not just immediate outcomes but also their impact on future relationships, group norms, and individual well-being. This change in perspective fundamentally alters AI model design, training, and evaluation.

Context is very important in the field of AI, especially in social interactions. Image classification models focus on visual features, while language models consider textual syntax and semantics within a domain [44]. In contrast, social interactions are dynamic, encompassing real-time emotions, past interactions, environmental cues, and cultural norms [45]. For instance, scheduling a meeting differs from persuading someone to attend, requiring social skills like communication and understanding group dynamics. Conventional AI approaches that treat communication as a simple input-output problem may fail in these nuanced contexts due to the lack of relational and emotive dimensions.

Evaluation metrics for socially intelligent AI differ from those used in typical AI systems. Accuracy, precision, recall, and F1 scores do not capture the richness of social interactions [46]. These metrics provide insights for well-defined tasks but overlook aspects like natural responses [47], trust advancement [32,40], or conflict resolution [43]. Users might value perceived authenticity or comfort in social settings over computational accuracy. An AI system could be considered socially skilled for understanding implicit social rules, even with occasional errors, while conventional AI systems usually face harsh judgment for small inaccuracies in classification, regardless of social rapport.

The initiative to develop socially skilled AI aims to make machines integrated participants in our social and organizational landscapes, rather than isolated tools. This requires rethinking system architectures [48], training paradigms [49], and design philosophies [50]. Researchers focus on interdisciplinary knowledge, including social psychology, communication studies, organizational behavior, and philosophical inquiries into intelligence, in order to create AI agents that can authentically engage with human social realities [14]. These agents handle the cognitive load of processing high-dimensional data and the emotional and relational dimensions of human communities. While conventional AI is important for technical tasks, socially intelligent AI systems carry additional complexity and responsibilities in their operations and interactions with human stakeholders.

The design of socially intelligent AI is informed by cognitive, behavioral, and neuroscience research [9,10,17]. Psychologists study how individuals perceive, interpret, and respond to others' emotions, intentions, and beliefs, focusing on uncovering details regarding empathy, theory of mind, and social reasoning. Computationally, researchers model these processes within an AI architecture, drawing parallels between human cognitive functions and computational modules for perception, memory, attention, and decision-making processes.

In contrast to humans who rely on neural mechanisms, socially intelligent AI systems use algorithmic and data-driven methods to replicate or approximate these capabilities [51].

In classic cognitive science, theory of mind refers to the ability to attribute mental states to oneself and others, enabling prediction of behavior and adaptation of actions [52]. AI systems aiming for social intelligence need theory of mind to anticipate user or group responses [53]. Computationally, this can be approached using probabilistic models tracking latent states representing others' thoughts or feelings. Over time, the AI updates assumptions based on the observed behaviors and refines their predictions, putting the basis for socially aware planning and collaboration, allowing AI agents to adapt strategies when the goals shift [31].

Empathy, the ability to understand and experience another's emotions, enables support, compassion, and meaningful relationships [5,13]. Capturing emotional signals from text, voice, or facial expressions and mapping them to internal representations guides empathic AI responses. Early attempts focus on keyword detection or sentiment analysis, while contemporary approaches use deep learning for nuanced emotional state detection [11]. Some systems integrate physiological data or contextual variables. The challenge consists in ensuring that empathic responses go beyond superficial imitations. AI should understand narrative context, user background, and social norms in specific cultures or situations.

Beyond empathy and theory of mind, other cognitive capacities like attention and memory significantly influence social interactions. Humans selectively focus attention based on popularity, relevance, and social cues to manage group settings. AI systems with social intelligence need efficient mechanisms to direct computational resources to important stimuli, like dynamic attention models that shift focus based on conversation topics, emotional tone, or new individuals [54]. Memory systems must account for long-term language or cultural knowledge and short-term contextual details. This integrated approach to attention and memory creates fluid, contextually grounded interactions. Reinforcement learning from human feedback forms the basis for adaptation and improvement. Social interactions involve trial and error, and AI can benefit from interactive learning loops that capture user feedback, either explicit or implicit. As AI refines its models, it can develop more accurate expectations about actions that encourage cooperation, trust, or positive emotions. The convergence of empathy, theory of mind, attention, memory, and adaptive learning provides a framework for AI researchers to build systems that mirror human social interaction [5,13,52].

Developers must be mindful of the potential pitfalls of anthropomorphizing AI. Humans tend to attribute agencies and intention to entities exhibiting social cues, even if they are algorithmically generated. This inclination can be exploited for engaging user experiences, but it raises ethical dilemmas about deception and emotional reliance on AI companionship. Understanding how humans process social signals is very important for crafting responsible, respectful AI systems that are transparent about their computational nature.

Aligning AI design with these cognitive insights ensures social intelligence coexists harmoniously with human emotions and psychology [38] .

As AI research advances, there is a growing need for robust metrics and benchmarks to quantify social capabilities. Traditional AI evaluations like accuracy, precision, and recall are useful for tasks like object recognition or language translation, but they fail to capture the depth of social interactions. Researchers must translate subjective human judgments about empathy, rapport, trust, and adaptability into metrics that guide algorithmic development and compare systems [32].

One approach involves using standardized role-playing scenarios or simulated environments where human participants interact with AI agents under controlled conditions. Researchers can measure variables like user satisfaction, perceived empathy, willingness to disclose personal information, or physiological signals to assess emotional impact [55]. Surveys and questionnaires collect subjective evaluations of the AI's performance, capturing elements like perceived social presence, trustworthiness, and attentiveness. While subjective measures vary, aggregating results provides insights into how well AI meets social expectations. As scenarios become more immersive, new opportunities arise to evaluate AI's capacity for nonverbal communication and spatial interaction.

Objective measures assess social intelligence. Turn-taking fidelity quantifies how an AI adapts to conversational rhythms. Metrics assess topical coherence and topic shifts without losing user engagement. Some systems use sentiment analysis or emotion detection to measure alignment between user and AI responses [56]. Consistent supportive responses indicate empathic alignment, but quantifying it is an extremely complex task. Blending objective data with subjective user feedback creates multi-dimensional performance indicators [38].

Benchmark datasets standardize evaluations. Large-scale conversation datasets test AI's ability to generate context-appropriate, empathetic, or persuasive responses. Specialized elements contain emotionally charged dialogues, negotiations, or collaborative tasks requiring strong social components. Systems are evaluated against these benchmarks to measure response alignment with human examples or social criteria. Nevertheless, a universal benchmark is elusive due to varying social norms, cultural references, and contextual cues. Efforts develop more culturally diverse benchmarks, but inherent variability makes any single resource incomplete [45,57].

Progress in AI social competence depends on external validation through competitions and challenges organized by academic conferences and research consortia. These competitions simulate complex social interactions, assessing multi-party negotiation, collaborative storytelling, and group consensus-building. Successful systems demonstrate linguistic skills and effective interpersonal dynamics. These competitive settings promote community

convergence on best practices and refined metrics, leading to standardized evaluation protocols for ASI. However, the diversity of real-world social contexts emphasizes the need for adaptable AI social skills [58].

Iterative metric refinement extends beyond academic research. Standardized evaluations assess conversational agents, social robots, and AI-driven platforms for customer-facing tasks [22,23]. Regulatory bodies and stakeholders ensure compliance with transparency, safety, and fairness standards. A consensus may emerge on key indicators of social proficiency, such as emotional engagement, rapport continuity, privacy respect, and cultural sensitivity. Until then, the domain must balance objective and subjective metrics, universal standardization, and localized contextualization to measure AI's transition into genuinely social domains.

Social intelligence in AI combines ideas from computer science, cognitive psychology, neuroscience, sociology, and ethics. It reconciles human social competency with AI algorithmic methods. Distinguishing socially intelligent AI from traditional AI highlights its complexity and need for context-awareness, emotional resonance, and interpersonal nuance. Cognitive and psychological aspects like theory of mind, empathy, attention, and memory support AI architectures that mimic human interaction. In addition, measuring social intelligence in AI requires novel metrics beyond accuracy and efficiency, considering richness and sensitivity in genuine interpersonal interactions.

Building an AI system that truly integrates into human social fabrics goes beyond achieving high scores on narrowly defined tasks. It involves understanding how human relationships, cultural norms, emotional expressions, and interactive protocols influence community interactions. When AI agents learn dynamically, show empathy, respect social norms, and adapt, they approach true social intelligence [14,38]. This vision envisions AI entities seamlessly collaborating with people in various settings, enhancing the quality of human experience rather than displacing or disrupting it. One must take into account that this vision requires refining ethical, legal, and societal frameworks for socially intelligent AI [19]. The next sections explore the theoretical and technological underlying elements of such AI systems, their emergence, and their impact on human communities.

3. Theoretical and Technological Underlying Elements

This section focuses on the core theoretical and technological foundations that make ASI a reality. The interaction among ML, NLP, computer vision, reinforcement learning, and multi-agent systems provides numerous methods and frameworks for creating AI agents capable of understanding social cues, facilitating human-like communication, and adapting to dynamic group environments. Socially aware AI have to base upon fundamental principles from cognitive science and psychology, because the design of these agents cannot merely rely on standard computational approaches [6,10]. The more one advances

in this direction, the clearer it becomes that effective social intelligence arises from the tight integration of algorithmic innovations with nuanced models of human interaction. These interactions involve diverse signals in the forms of language, emotion, and behavioral cues, all of which shape how AI agents perceive and respond within human environments.

The strategic significance of these aspects can be understood considering the evolving applications of AI across fields such as healthcare, education, corporate environments, and the public sector. A robust understanding of the algorithms and theories is important for steering the ongoing transformation of the interaction between humans and AI technologies. By providing more details on the mechanisms by which AI systems learn, interpret, and modify social behaviors, we obtain deeper insights into how to design AI that operates with empathy and accountability [57]. Technical breakthroughs in these domains will redefine how we conceptualize interaction in the future, from small-scale personal companionship solutions to large-scale policymaking and governance tools.

ML is the backbone of socially aware AI, enabling models to capture input-output mappings and contextual variables of human interactions [19]. While traditional supervised learning approaches can be adapted to label social cues, unsupervised and semi-supervised methods are very important for uncovering latent social patterns. Despite advancements in architecture like multi-modal transformer models and generative modelling, addressing biases and ensuring ethical deployment remain ongoing challenges [58].

NLP occupies a central role in ASI, enabling conversational agents to interpret user input and generate coherent responses. Large pre-trained language models, refined for social contexts, require additional training data and ethical guidelines to ensure polite and empathetic interactions. Future advancements in NLP aim to incorporate extralinguistic context, emotional intelligence, and potentially gesture recognition, creating more sophisticated and empathetic conversational agents [29,46,56] .

Computer vision is very important for AI systems in order to understand human communication, particularly through emotion and gesture recognition. While traditional methods rely on labelled datasets, real-world scenarios demand more nuanced approaches, including temporal modelling and robust performance across diverse conditions. Combining emotion and gesture recognition with contextual cues, such as scene understanding and multimodal fusion, enables more accurate inference of complex emotional states, creating the premises for truly socially intelligent AI systems [20].

Reinforcement Learning (RL) is a powerful framework for training socially intelligent AI agents in order to optimize sequential decisions in uncertain environments. RL enables agents to adapt their behavior based on rewards capturing socially desirable outcomes, such as user satisfaction and group consensus. One must consider that designing complex reward functions, handling partial observability, and ensuring scalability and ethical behavior remain significant challenges [55].

Multi-agent systems, combining ML, NLP, computer vision, and reinforcement learning, enable complex social interactions between AI agents and humans [59]. These systems, which can exhibit collaborative intelligence, require trust and reputation mechanisms, effective communication protocols, and game theory-based coordination strategies. As multi-agent systems become more prevalent in everyday life, rigorous theoretical foundations and robust technological implementations are very important to ensure they align with human values and social norms.

4. Emergence and Evolution of AI Agents in Human Social Contexts

Ever since the earliest days of computing, researchers and thinkers have envisioned whether machines could emulate, simulate, or augment human social interaction. This interest traces back to post-World War II efforts in computer science, where pioneers like Alan Turing questioned whether machines could exhibit behaviors indistinguishable from humans. Turing's famous test for machine intelligence, introduced in 1950 [60], invited a wide range of ethical, philosophical, and technical inquiries, many of which were directly linked to how a machine's language use could approximate or surpass human capacities in conversation. During those formative decades, there was less public focus on the social dimension of these interactions. The perception about AI at that time concentrated more acutely on reasoning, problem-solving, and symbolic logic. Attempts to explore the social potential of AI can be found in even the earliest attempts at building programs capable of dialogue [60].

The mid-1960s saw a notable departure from purely logic-based or mathematically oriented AI when Joseph Weizenbaum introduced ELIZA, a program that engaged in rudimentary conversation by rephrasing user inputs in the style of a Rogerian psychotherapist. Weizenbaum's intentions were neither to create a companion nor to replicate human empathy [60]. However, the way people reacted to ELIZA revealed something profound, namely despite the system's obvious limitations, many users attributed human-like qualities and emotional understanding to the program. This phenomenon of anthropomorphizing what was in essence a simple pattern-matching script, signaled that the social dimensions of AI could not be dismissed as an afterthought. Even then, the media latched onto the idea of speaking machines, which intrigued the broader public and created an enthusiasm for imagining a future where computers might be embedded in human social contexts [60].

In the following decades, from the 1970s through the 1990s, AI witnessed "several winters" where enthusiasm and funding took a downturn. These periods were often tied to a mismatch between grand promises and the technical realities of hardware constraints, software complexity, and the challenges of generalization beyond narrow, rule-based problem domains. Nevertheless, research in areas such as knowledge representation, expert systems, and Natural Language Understanding (NLU) continued to progress. While the

focus was rarely placed on "social intelligence" directly, these advances created the foundational architecture that would later allow for more complex, context-aware, and interactive AI applications [46]. Systems like SHRDLU, which demonstrated the ability to interpret and act upon written commands about a virtual blocks world, hinted at the potential of AI to engage in conversation about shared contexts [57]. Even though these dialogues were strictly constrained, they represented a step forward in generating responses that took account of user input in a dynamically evolving situation [57].

In parallel, robotics labs around the world began to explore more physically embodied forms of AI. Machines that could move, sense their environment, and adapt to unpredictable contexts gave rise to early social robotics, though such projects were generally surpassed by more specialized or industrial applications. The notion of physical embodiment would later prove to be an important factor in how society received AI agents, as robots that could manage human spaces and physically assist people, aspects that generated enthusiasm, curiosity, and sometimes fear. By the late 1990s, humanoid robots started to appear in academic settings, often used for research on gait, balance, and automated movement. Some of these projects, while primarily technical, indicated the future integration of robots into domestic and care environments, signaling a transition from purely operational tasks to those that demanded social awareness [31].

As the 20th century gave way to the 21st, the internet and mobile devices revolutionized how people communicated, stirring fresh interest in socially oriented AI. Digital infrastructure evolved rapidly, with high-speed connectivity enabling large-scale data collection from user interactions. These data-rich environments became suitable for ML approaches, opening the door for systems that could learn from static databases and also from continuous streams of human behavior in real-world contexts. By this point, a historical pattern was beginning to manifest progress in AI's social capabilities followed closely behind by innovations in computational power, data availability, and fundamental algorithmic improvements. While the earliest conceptual explorations might have been rooted in philosophical questions about conversation, by the early 2000s, it was clear that the social dimension of AI was not a marginal or speculative curiosity. It was moving into the mainstream of research and, increasingly, into public awareness [25].

Interactive AI has evolved from early chatterbots like ELIZA to sophisticated systems capable of NLP [56,61] and generation [62]. Advancements in neural networks [63], computer vision [20], and robotics [30] have enabled AI to interpret visual signals and engage in social interactions [45,64]. The widespread adoption of deep learning techniques in the early 2010s further improved AI capabilities, leading to the development of more advanced chatbots and virtual assistants [65].

Advancements in AI have led to the development of advanced social robots, chatbots, and virtual assistants [46]. These agents, equipped with advanced sensors and computational frameworks, can interpret and respond to human cues, engage in dynamic dialogues, and

adapt to user emotions and contexts. The integration of large language models and multi-modal interaction further enhances their capabilities, enabling them to simulate social presence and seamlessly blend into daily life.

Public perception of AI agents in social contexts is shaped by cultural accounts, media portrayals, and historical experiences. While some regions, like Japan and South Korea, embrace AI due to positive cultural perceptions, others are concerned about job displacement, privacy, and ethical implications. The acceptance and integration of AI into society vary widely across demographics, nations, and historical contexts, influenced by factors like trust, cultural values, and technological advancements.

5. Transformation of Human Interaction

The advent of ASI has created an extremely important change in human activities, in which conversations, social gatherings, organizational meetings, and even personal relationships are being fundamentally changed by the presence of AI agents [11–14] . These agents, with capabilities ranging from NLP to emotion recognition, assist human beings in completing tasks and also actively participate in communicative settings that have historically been the exclusive domain of human-to-human interaction. Such participation leads to a profound reconfiguration of the ways in which people convey information, interpret social cues, form judgments, and develop empathy. Over time, the integration of AI agents into everyday communication holds the potential to transform cultural values, ethical norms, and conceptions of identity [15–17]. The following sections explore these developments by examining the specific impacts of AI agents on communication dynamics, the mediation of group interactions, the evolution of social norms and etiquette, the facilitation or hindrance of human empathy, and the larger implications for personal identity and authenticity in environments that blend human and AIs.

The integration of AI agents into communication channels is changing social and organizational ecosystems. AI agents, with their contextual awareness and real-time response capabilities, influence communication styles, pacing, and even non-verbal cues. As individuals adapt to the AI's presence, new norms of "AI etiquette" emerge, blurring the lines between human and machine input in communication.

The integration of AI agents into group settings, from small teams to large social networks, is changing collaboration, conflict resolution, and resource sharing. AI mediators, often acting as facilitators or leaders, can detect conflicts and propose data-driven solutions, potentially leading to more impartial decisions. Nonetheless, this raises concerns about autonomy, creativity, and the potential perpetuation of biases, highlighting the need for transparency and oversight in AI-mediated group interactions [31,45] .

The integration of AI agents into personal and professional spheres is leading to the emergence of new social norms and etiquette. These new conventions, which often develop

naturally, address the challenge of interacting with machines that mimic social behaviors [17]. As AI systems become more complex, etiquette rules will continue to evolve, reflecting the hybrid nature of modern interactions and potentially leading to numerous localized "AI etiquette" traditions [66].

The impact of AI on human empathy has a high degree of complexity. While AI can facilitate empathetic engagement through tools for emotional analysis and conflict resolution, it can also create dependencies and artificial simulations that weaken human-to-human emotional bonds. The net impact of AI on empathy depends heavily on design decisions, cultural interpretations, and user choices [5,13].

The introduction of artificial intelligence into social interactions prompts deep reflection on concepts like human identity and authenticity. AI-driven agents, capable of producing coherent and contextually relevant interactions, increasingly model our digital and social environments. Such involvement significantly influences the way individuals form and perceive identity across personal, community, and professional contexts, impacting factors such as creativity, interpersonal networks, and individual autonomy. Consequently, the distinction between identities constructed by humans and those influenced or created by AI becomes progressively ambiguous.

6. Applications and Case Studies

ASI, capable of interpreting, responding to, and anticipating social cues, has rapidly moved beyond theoretical constructions and laboratory experiments to become a significant force in various human-centered domains. Social Artificial Intelligence (AI) agents are becoming increasingly integrated into important societal sectors, including healthcare, education, corporate settings, and governmental institutions, thereby changing the operational practices, communication norms, and individual user experiences. The incorporation of socially capable AI is evolving from an optional enhancement to an important component for improving service quality, enhancing user satisfaction, and broadening access to resources. Nevertheless, the global proliferation of these technologies is uneven, presenting substantial ethical and structural complexities contingent upon variations in technological infrastructure, regulatory directives, and established societal values. Despite these impediments, an analysis of existent use cases and case studies highlights both the significant potential, and the inherent challenges associated with deploying social AI across diverse domains [62].

The functionality of socially aware AI relies upon several core technologies, namely Machine Learning (ML) which enables personalization, Natural Language Processing (NLP) that facilitates conversational capabilities, and Computer Vision which allows for the recognition and interpretation of human behavior. Furthermore, Reinforcement Learning techniques permit continuous adaptation, particularly within dynamic social

environments. Successful deployment requires rigorous methodologies for data collection and interpretation, along with ethically guided AI outputs. Domain-specific ethical considerations are very important, healthcare and education need strict privacy and security protocols due to the handling of sensitive personal data [30,40], while corporate and governmental applications emphasize the importance of fairness, accountability, and inclusivity [15].

The changing impact of AI is manifested in specific applications. Within healthcare, social AI agents contribute to mental health therapeutic interventions and help mitigate communication barriers [2,46,61]. In education, adaptive tutoring systems provide personalized learning experiences and support the development of social competencies [63]. Corporate environments leverage AI for enhanced coordination, although this raises concurrent concerns regarding employee privacy and the potential devaluation of human tasks [57]. In the situations of social media and personal digital life, AI-driven content recommendation presents an ethical dilemma, balancing beneficial personalization against the risk of promoting manipulative echo chambers [35]. Public administration applications highlight AI's role in changing civic engagement, policy decisions, and citizen trust [57]. Exploring these domains reveals AI's profound impact on human connections, cooperation, and agency in an automated world.

In the following there are depicted the applications of socially capable AI across five major areas: healthcare, education, corporate environments, social media and personal life, along with governance and public administration. There are also explored operational mechanisms, challenges, and opportunities in these rapidly evolving fields.

AI-driven companions and therapeutic interfaces in healthcare offer personalized support, medication reminders, and emotional assistance. These tools, powered by NLP and context-aware reasoning, improve communication between patients and professionals, potentially reducing misdiagnoses and enhancing treatment compliance.

AI-driven mental health companions, equipped with NLP algorithms, offer constant, stigma-free support. While promising in reducing mild to moderate depressive symptoms, challenges include data privacy, recognizing high-risk scenarios, and avoiding over-reliance on AI. Despite these concerns, AI companions show potential as scalable mental health support [13,67].

Socially aware AI systems enhance patient-clinician communication by gathering patient data, adapting to emotional states, and providing real-time translation. These systems offer decision-support functions during consultations, augmenting clinician expertise with data-driven insights. Nevertheless, challenges remain in trust, regulatory compliance, system interoperability, and cultural sensitivity [11,68].

Education presents another area where ASI's power grows rapidly. AI-driven platforms support students' intellectual, emotional, and social development. These systems provide

personalized learning, real-time feedback, and inclusivity. Social intelligence in AI tutors or collaborative learning agents interprets the learners' emotional states and adapts content delivery. This aims to impart knowledge and develop socio-emotional competencies which are extremely important in modern life. AI reimagines education as an instructional assistant and promoter for empathy, cooperation, and broader social skills [69].

Personalized AI tutors in education adapt instruction based on individual student performance and emotional states, promoting collaborative learning through AI-facilitated study groups. While offering advantages, this approach raises concerns about over-personalization, data privacy, and the balance between immediate fulfillment and long-term cognitive development.

Socially aware AI systems are increasingly used in education to facilitate social skills training through real-time feedback on interpersonal interactions. These systems that use techniques like sentiment analysis and facial expression detection offer custom support to students, particularly to those with special needs, in mastering social cues and peer interactions. Nevertheless, challenges persist in scalability, contextual nuance, and potential biases, necessitating ongoing research in order to improve AI systems and develop blended learning models [58].

Social AI can streamline various operations in corporate environments, from team communication and project management to customer service and marketing [70]. In inherently social workplaces, individuals must collaborate, manage hierarchies, and handle external client interactions. AI agents with social intelligence can facilitate these processes, boosting productivity, employee satisfaction, and customer engagement. Nevertheless, businesses deploying such agents must address transparency, privacy, job displacement concerns, and societal implications of delegating human-facing roles to AI.

Social AI tools, analyzing team communication and interpersonal dynamics, can enhance project management by identifying miscommunications, optimizing resource allocation, and improving team morale. However, concerns about surveillance, data consent, and algorithmic bias must be addressed to ensure ethical implementation [31,71,72].

Socially adept AI, particularly in customer service, can enhance operational efficiency and brand perception. Advanced virtual agents, equipped with real-time emotion detection and context-aware decision-making, offer personalized solutions and are able to escalate complex cases to human representatives. While this hybrid model improves customer satisfaction and reduces costs, concerns about depersonalization, skill erosion, data security, and cultural differences persist.

Social AI, particularly recommender systems and digital companions, significantly impacts daily life through social media and personal interactions. While offering personalized experiences, it can be both empowering and corrosive, amplifying voices while promoting echo chambers and enabling manipulative behaviors [35].

Recommender systems, while beneficial for personalization, can create echo chambers and societal polarization by reinforcing existing beliefs. Regulatory efforts and platform reforms aim to mitigate these effects, but commercial incentives for high engagement pose a challenge. Social AI extends into personal life through applications that facilitate relationships and virtual companionship platforms. These platforms use NLP models to engage users in conversations, offering advice and support, but raise concerns about authenticity, emotional dependency, and data handling. Despite these challenges, they will continue to evolve and broaden the perspectives [18,29,61].

As social AI gains traction, its implications for governance and public administration become more noticeable. Digital platforms and AI-assisted policy making processes change aspects such as power structures, civic engagement, and accountability. Governments seek efficiency, transparency, and citizen participation, but these benefits raise fairness, bias, and democratic norm concerns. Social AI streamlines policy-making and public services, but it must balance human oversight and community respect [57].

Socially aware citizen engagement platforms, powered by social AI, analyze user submissions to identify urgent issues and facilitate more inclusive civic dialogues. Nonetheless, concerns about algorithmic biases, data privacy, and surveillance must be addressed through careful dataset curation, transparent model design, and robust data protection protocols [23].

Socially intelligent AI is increasingly used in policymaking, analyzing data to evaluate public opinion and simulate policy outcomes. While this allows for real-time feedback and adaptive policymaking, it also raises concerns about policy automation, bias, and lack of transparency. Addressing these challenges through ethical considerations and democratic oversight is very important for the responsible use of AI in governance [1,73].

7. Ethical, Legal, and Societal Implications

The rise of ASI has highlighted its ethical, legal, and societal impacts. As AI mimics human behavior, addressing transparency, privacy, bias, and accountability becomes very important. While improving technology is important, designing, regulating, and reassessing the AI ecosystem responsibly is an extremely important necessary step. This section explores very important questions regarding the integration of AI within modern society. It emphasizes the need for transparency and explainability in social AI, privacy, data protection challenges, bias, fairness, inclusivity issues, accountability, legal frameworks, building trust and ensuring well-being. By understanding these dimensions, AI-driven transformations can uphold human dignity, autonomy, and progress.

Social AI's urgency is given by its intimacy with individuals and communities. Unlike abstract computational tasks, social AI agents engage in fluid dialogues, interpret emotions, and influence relationships. This depth of engagement offers support and enrichment but

also creates risks of manipulation, exploitation, and human value erosion. Ethical dilemmas intensify when systems replicate empathy or demonstrate emotional responsiveness, distorting genuine human connection with simulation. Ethical mandates must extend beyond data management and efficiency to include trust, authenticity, and emotional safety [11,67,68].

Legal questions arise when AI is embedded in social contexts. AI agents' nuanced conversations, apparent empathy, and adaptability to social norms suggest they may participate in social networks rather than being only static tools. This active role presents novel legal challenges, such as determining if an AI's decision or recommendation carries the same weight as a human actor's does, establishing liability among developers, data providers, deployers, and end users, and ensuring alignment with international human rights standards. Legislators and regulators must balance innovation with potential harms [5,68,74] .

Societal implications of AI-mediated interaction include transformations in social structures, cultural norms, and personal identity. Social AI agents can act as companions, advisors, educators, and intermediaries, potentially redefining family dynamics, reshaping workplace communication, and changing relationship formation. Some changes may be positive, encouraging inclusivity and bridging social barriers. Nevertheless, certain social skills and cultural expressions could erode or be distorted under continuous AI intervention. Sustained, multidisciplinary research and iterative policy development are needed to understand these shifts. Addressing the ethical, legal, and societal dimensions of ASI involves technical design, institutional oversight, and public awareness and engagement [62].

Transparency and explainability are very important for the responsible use of social AI systems. While transparency ensures clarity about AI decision-making processes and data sources, explainability allows AI systems to provide reasoning for their decisions. Achieving this balance is complex, involving technical solutions, ethical guidelines, and legal frameworks to ensure accountability and user trust [40].

The adoption of AI agents in social contexts raises privacy concerns due to the collection and storage of sensitive personal data [57]. While regulatory frameworks like the GDPR provide legal constraints, the rapid evolution of social AI outpaces legislative processes, creating ambiguities around compliance. A multi-layered approach involving industry, government, civil society, and academia is necessary to ensure robust privacy protections, including transparent communication with users and continuous monitoring of AI systems.

Bias in AI systems, particularly in social AI, arises from unrepresentative or skewed training data, potentially leading to discrimination and reinforcing harmful social hierarchies. Addressing these issues requires a complex approach, including data augmentation, algorithmic fairness, and continuous monitoring. Ensuring inclusivity

involves considering diverse user needs, cultural adaptability, and accessibility, while strong governance structures and societal conversations are very important for accountability and informed policymaking [66].

As AI agents become more complex and autonomous, questions of accountability and liability arise. Determining responsibility for AI-related harm is complex, involving multiple stakeholders and potentially challenging traditional legal frameworks. Collaborative efforts among lawmakers, technologists, ethicists, and civil society are needed to establish robust accountability measures for social AI [66].

Societal acceptance of social AI agents depends on their technical capabilities and users' trust in their interactions. Trust is linked to AI agents' perceived intentions, reliability, competence, and morality. As AI integrates into communication, domestic, and professional settings, people rely on it for support, companionship, decision-making, and social facilitation. These shifts in behavior and emotions are significant, but concerns about manipulation, loss of genuine human connection, and psychological dependency arise. Balancing AI benefits against mental health and social well-being challenges require public discussions, ethical oversight, and cross-sector collaboration.

Trust is not built solely based on assurances or compliance, it builds through cumulative interactions and experiences. When an AI assistant consistently offers sound guidance, accurately interprets emotions, and shows empathy, trust forms. Conversely, unpredictability, mishandling sensitive information, or expressing biases can erode trust quickly. In emotionally charged contexts like mental health counseling or grief support, any breach of privacy or feeling of judgment can cause emotional harm. Once broken, trust is challenging to rebuild. Rigorous testing, ongoing user feedback, and ethical design principles are very important [32,40,73].

Psychological well-being and social AI intersect in multiple ways. AI companions and chatbots can alleviate loneliness, especially for socially isolated individuals. Studies show potential improvements in mood and perceived social support among older adults using AI-powered robotic companions [36]. AI systems in education can boost self-esteem with personalized feedback. Chatbots serve as accessible first-line support in mental health applications, bridging healthcare gaps. These positive outcomes suggest social AI can enhance psychological welfare, complementing traditional human interventions [75].

Nevertheless, the pervasive presence of social AI agents may lead to dependencies and subtle social manipulation. Users might over-rely on AI-generated validation or emotional support, neglecting human relationships. AI systems gathering psychological profiles might influence users' behaviors or opinions, raising concerns about autonomy and free will. Subtle manipulations could be difficult to resist or identify, especially in contexts where commercial or political interests exploit AI for targeted advertising, information control, or ideological persuasion. Without clear boundaries and transparent mechanisms, social AI

could inadvertently or deliberately create echo chambers, polarize communities, or undermine critical thinking [68].

Advancing digital literacy and emotional intelligence among users is very important in mitigating the risks associated with social AI. Educational initiatives that teach users about AI's learning, data interpretation, and outcomes empower critical engagement and self-reflection. Recognizing when AI-driven advice or support should be supplemented by professionals helps users avoid unhealthy dependencies. Emotional intelligence training for both users and developers ensures respectful and supportive interactions, minimizing the risk of harmful manipulation. Robust oversight mechanisms, including independent audits, ethics review boards, and user advocacy committees, monitor the deployment of AI systems at scale. Public reporting of key metrics provides insights into how well these systems align with societal values and psychological needs. Policymakers can mandate reporting, set transparency requirements, and impose penalties to ensure trust is achieved through institutional processes and accountability.

Cultural factors shape how communities perceive and integrate social AI. In certain societies, AI agents facilitating communal problem-solving may be accepted more readily while more individualist cultures might be cautious about data-sharing and potential psychological influences. Developers must be sensitive to these cultural dimensions to design AI that resonates across societies. For instance, language patterns and norms of polite speech vary widely, and an AI agent's inability to conform can slow down trust and give rise to misunderstandings [19,50].

Psychological well-being depends on authenticity and genuine connection. Critics argue that advanced AI companionship can never replicate human emotion and empathy, potentially diminishing people's motivation and ability to connect with others. Social AI should serve as a supplement rather than a substitute for human interaction. Proponents argue that these technologies can fill care and communication gaps when human resources are insufficient or inaccessible. The debate is ongoing as AI advances to being capable of nuanced emotional engagement [5,13,68].

A balanced approach is needed to manage social AI's complexities, acknowledging its potential and risks to trust and psychological health. This includes proactive governance, user education, rigorous research on long-term impacts, and dialogue between technologists and the public. Societal trust is built when social AI acts consistently in people's best interests, respects autonomy, and is governed ethically and legally. Psychological well-being must remain a priority, ensuring technology contributes to human flourishing rather than replacing or distorting social connections [19,40].

This exploration of transparency, privacy, bias, accountability, and trust highlights the depth of ethical, legal, and societal challenges posed by social AI. Integrating AI into human communication and interaction requires reevaluating norms like data protection and human

agency. Multiple stakeholders must collaborate to control these changes. Responsibility spans design decisions, policy principles, cultural adaptations, and moral commitments. Thoughtfully approached, social AI can enrich interaction with empathetic support, inclusive communication, and complex social understanding. Nevertheless, misuse and harm highlight the urgency of robust governance and transparent design. In the following, we explore challenges, research questions, and future opportunities, guiding AI's evolution towards a more human-centered and socially beneficial paradigm.

8. Challenges and Open Research Questions

The rapid transformation of human interaction by AI agents with varying degrees of ASI has raised unresolved questions and technical obstacles. Researchers across multiple disciplines face challenges in conceptualizing, developing, deploying, and governing AI systems that engage effectively and ethically in complex social environments.

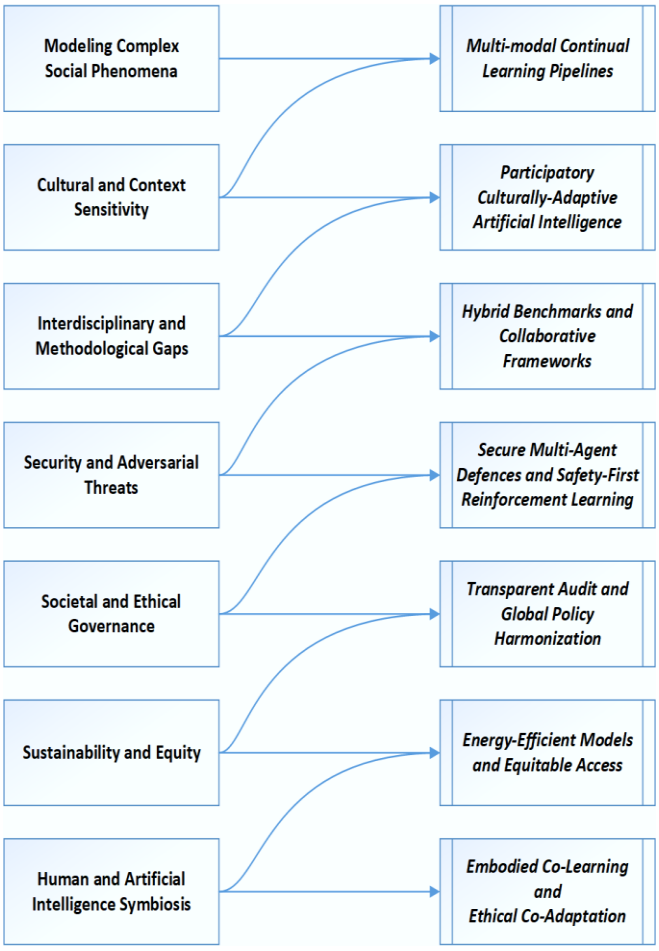

Figure 1. The proposed roadmap highlights a systemic continuity approach rather than an isolated paired one

This section examines the main challenges and open research questions, including technical limitations in modeling social phenomena, cultural sensitivity requirements, interdisciplinary collaboration, security threats from adversarial behavior, and societal integration. Each dimension poses distinct problems and highlights the inseparability of technical, social, and ethical considerations in ASI. The proposed roadmap highlights a systemic continuity approach rather than an isolated paired one, being depicted in **Figure 1** above.

Capturing the complexities of real-world social interactions in computational models remains a persistent challenge for ASI. While progress has been made, many forms of sociality, such as context-dependent schemas and dynamic group dynamics, remain elusive. Addressing these challenges requires interdisciplinary collaborations and the development of advanced computational frameworks that can handle multimodal data, subjectivity, and uncertainty in real time.

As AI systems become more prevalent, cultural sensitivity becomes very important. This involves understanding subtle nuances in communication styles, gestures, and social norms across different cultures. While some aspects of social intelligence may appear universal, culturally specific adaptations are necessary in order to avoid misinterpretations and ensure ethical behavior.

ASI requires interdisciplinary collaboration between computer scientists and social scientists in order to develop meaningful social capabilities. Nevertheless, this collaboration is hindered by methodological gaps, terminology differences, and institutional structures. Overcoming these challenges demands proactive strategies, including the creation of multi-disciplinary teams and the promotion of open dialogue about technical and social scientific frameworks.

As AI agents become more integrated into human life, security vulnerabilities and adversarial attacks become more urgent challenges. Adversarial attacks can manipulate data inputs, exploit trust in AI agents, weaponize generative models, and breach privacy. Adversarial resilience must be a priority in designing socially intelligent AI systems, integrating cryptographic safeguards, anomaly detection, robust ML paradigms, and user education.

Beyond immediate challenges, the long-term trajectory of AI agents in human societies is profound. As AI matures, it can transform interactions and the broader social, economic, and political aspects. Nevertheless, the direction and desirability of these transformations are debated and uncertain. Researchers must address fundamental questions about how AI will shape norms, structures, and human concepts.

An extremely important area involves the shifting nature of social bonds and interpersonal relationships. Early evidence suggests users derive emotional support from AI interactions. These relationships may deepen, raising issues about dependency, authenticity, and

emotional well-being. AI companions could mitigate loneliness, provide empathy, and encourage personal growth. Nevertheless, they might displace or erode genuine human connections, especially if AI agents become so compelling that they outcompete human interaction. The ethical implications of promoting AI-human emotional attachments are complex, as they can be unilateral, algorithmically mediated, and lacking reciprocity. Researchers must design AI systems that complement human bonds, supporting socially beneficial outcomes without undermining communities.

AI's integration into the workplace will have significant consequences. AI systems with nuanced social interaction may take on roles like recruitment, team management, negotiation, and customer service. While automation has been discussed in terms of its economic impact, the social dimension adds complexity. Intelligent agents may perform emotional labor tasks, such as comforting customers or resolving conflicts, redefining human skill sets and altering organizational hierarchies. Industries like healthcare, education, and hospitality may heavily rely on compassionate, empathetic, and culturally sensitive AI agents. The question is whether these agents will enhance human capabilities or lead to job displacement and to professional expertise erosion. Policy interventions, including retraining, labor regulations, and ethical guidelines, will determine how these technologies coexist with human labor.

The normalization of AI agents in daily life necessitates a deeper exploration of their impact on social norms and values. Societies evolve through interactions between individuals, institutions, and traditions. AI integration could accelerate shifts in norms around privacy, autonomy, and communication. For instance, as people rely on AI assistants for social interactions, expectations of responsiveness, politeness, and emotional availability may change. This could lead to new etiquette frameworks for the interactions between human beings and AI agents. Alternatively, it could exacerbate social inequalities as those with advanced AI tools better manage complex social networks. The trajectory depends on various factors, including technological innovation, market forces, cultural receptivity, legal frameworks, and public preferences.

AI's role in shaping collective decision-making processes is a significant open question. Some envision AI as a facilitator of "deliberative democracy", providing data-driven insights and moderating debates. This could reduce polarization by highlighting areas of agreement. Nevertheless, critics argue that ceding control of civic positions to algorithmic mediators risks undermining democratic values, especially if models are controlled by vested interests. Biases in training data or manipulations in information presentation can steer public opinion and amplify divisions. Rigorous research is needed to evaluate how AI systems might inadvertently institutionalize biases or marginalize certain voices. Developing transparent, accountable frameworks for deploying socially intelligent agents in public decision-making is very important.

Long-term integration hinges on the AI's ability to adapt ethically over time. Human societies continually redefine ethical boundaries. AI agents must have mechanisms for ethical self-reflection, guided by human oversight or normative frameworks. This raises the possibility of designing "moral machines" with dynamic ethical reasoning. Nevertheless, philosophical and technical hurdles remain. Determining ethical standards and resolving conflicts among competing moral systems are unresolved questions with global implications. Ensuring transparency and democratic oversight is necessary for maintaining trust.

Ecological sustainability and social stratification are very important aspects of evaluating the long-term role of socially intelligent AI. Training and deploying large-scale AI systems consumes significant computational resources and non-renewable energy, potentially exacerbating environmental costs and colliding with international emissions reduction commitments. If AI integration into daily life increases, energy demand could soar. Researchers must design energy-efficient models, explore decentralized computing, and integrate sustainability into AI ethics. Failing to do so risks accelerating the climate crisis.

Technological adoption also leads to social stratification, with wealthier communities benefiting sooner. If socially intelligent AI determines social and professional success, existing inequalities may worsen. Targeted interventions like subsidized or open-source AI solutions can mitigate disparities, but their effectiveness is uncertain. An integrative unifying perspective considering race, gender, age, and socioeconomic status is needed for equitable long-term strategies.

The future trajectory of AI in human societies requires sustained, globally inclusive discussions. Research should extend beyond laboratories to longitudinal field studies, pilot projects, and continuous feedback from diverse user groups. Cross-cultural collaboration involving global tech companies, local innovators, and community leaders is very important in order to ensure that AI integration does not exacerbate historical injustices or undermine cultural autonomy. The interaction of technology, policy, business interests, and civic values will determine whether AI evolves into a tool of liberation or social control.

The proposed roadmap comprising the identified challenges in ASI along with key insights towards solutions proposals is synthetized in **Table 1** below.

Challenge	The Reason for its Importance	Key Insights Towards Solutions Proposals
Modeling Complex Social Phenomena	Current approaches struggle with high-dimensional, sequential and culture-laden behavior	Multi-modal sensors, richer sequential models and continual-learning pipelines

Cultural and Context Sensitivity	Risk of mishandling idioms, norms or under-represented groups	Transfer/meta-learning plus genuinely participatory data-collection to "learn with" local communities
Interdisciplinary and Methodological Gaps	Social science insight rarely reaches model design or evaluation metrics	Shared vocabularies, hybrid qualitative-quantitative benchmarks, new collaboratory funding models
Security and Adversarial Threats	Social bots are attractive targets, adversarial inputs can hijack narratives	Secure multi-agent protocols, game-theoretic defenses and "safety-first" reward shaping
Societal and Ethical Governance	Fragmented regulation, opacity erodes trust and accountability	Global policy road-maps, transparent auditing, user-centric consent flows
Sustainability and Equity	Carbon cost of large models and the "digital divide" threaten inclusive progress	Energy-efficient architectures, open-source subsidies, intersectional impact audits
Human and Artificial Intelligence Symbiosis	Long-term vision where AI augments rather than supplants human agency	Embodied co-learning systems, mixed-reality collaboration, continual ethical co-adaptation

Table 1. Proposed Roadmap Comprising the Identified Challenges in ASI along with Key Insights Towards Solutions Proposals

The long-term integration of AI agents in human societies presents a defining challenge, encompassing technical, ethical, economic, and existential considerations. The ultimate shape and impact of these systems remain uncertain, and research plans must adapt to AI's connection with human needs and aspirations. Societies' evolution towards benevolent AI partners enhancing human flourishing or dystopian scenarios involving pervasive surveillance and social fragmentation depends on current decisions. The task's complexity emphasizes the urgency of robust, ethically grounded research, transparent policymaking, and inclusive societal debates.

The challenges and open research questions surrounding ASI and its impact on human interaction are vast and complex. Technical hurdles in modeling social phenomena, the need for cultural sensitivity, interdisciplinary collaboration, adversarial attacks, and long-

term integration implications demand sustained attention from various stakeholders. Only comprehensive, ethically informed, and collaborative efforts can harness the potential of socially intelligent AI for the collective well-being while respecting human social complexities.

9. Future Directions and Opportunities

ASI, a dynamic research area, bases on knowledge from diverse disciplines like computer science, cognitive psychology, and ethics. As AI integrates into human social spaces, its impact expands. Controlling the design, development, and deployment of AI with technical complexity and sensitivity to human emotions and cultures is very important. Ongoing research, policy-making, and cross-disciplinary engagement ensure responsible evolution and unlock novel possibilities. Emerging technologies for enhanced social cognition, ethical frameworks, and policy roadmaps, generalized social intelligence, human-AI symbiosis, along with a vision for the coming decades and beyond are explored.

The development of ASI relies on advanced technologies that enhance AI agents' social perception, interpretation, and responsiveness. These technologies include complex sensors, mixed reality interfaces, edge computing, quantum computing, neuromorphic computing, and brain-computer interfaces. By leveraging these technologies, ASI aims to create AI agents capable of near-human levels of social interaction and understanding in complex environments.

Ethical considerations and regulatory initiatives are very important as AI agents gain social responsibilities and decision-making capacities. Explainability, data privacy, bias, and fairness are dimensions that demand rigorous analysis. Policymaking must be adaptive, incorporating multi-stakeholder collaboration and global discussions in order to maximize the potential of social AI while safeguarding public welfare and individual rights.

Achieving generalized social intelligence in AI involves creating agents capable of adapting to diverse tasks and contexts. This requires multi-modal and multi-cultural competence, integrating language understanding, cultural anthropology, and advanced ML architectures. The approach involves interdisciplinary efforts, flexible architectures, and ethical considerations in order to develop AI agents that can enhance human communication and cross-cultural collaboration.

As AI integrates into society, a key question arises about genuine symbiosis between humans and artificial entities. Symbiosis goes beyond cooperation, it is a relationship where humans and AI enhance each other's capabilities and well-being, leading to new forms of collective intelligence and creativity. Advances in personalization, adaptive learning, trust-building, along with merging physical and digital realities are important prerequisites.

Personalized interaction is very important for symbiosis. AI systems that accurately model individual preferences and cognitive patterns can tailor assistance and companionship. In education, symbiotic AI tutors collaborate with teachers and students, providing just-in-time support that augments skills or emotional resilience. Over time, these adaptive tutors co-create educational content, refining lessons based on student feedback, while teachers maintain oversight. This collaborative learning system combines human intuition and empathy with the AI's data-driven insights.

Trust is very important for symbiosis, but humans may be hesitant to trust AI partners due to concerns about data misuse, opaque decision-making, or hidden programs. Socially intelligent AI designed for symbiotic relationships should prioritize transparency, consistency, and reliability. These systems should acknowledge their limitations, clarify uncertainty, and provide users with additional resources or expert opinions. Continuous user feedback loops reinforce trust by granting humans agency in shaping the AI's role. "Explainable symbiosis" may emerge, where AI provides correct or contextually relevant outputs to deepen mutual understanding by specifying core reasoning or data patterns.

Symbiosis implies growth and transformation for both humans and AI. For instance, AI-driven brainstorming assistants in creative industries can propose diverse concepts, enabling artists and designers to explore new aesthetic territories. Over time, this symbiotic relationship can shape human perception of creative processes, leading to emergent forms of expression. Similarly, AI can serve as a partner for hypothesis generation, data synthesis, or strategic planning in knowledge work, freeing human collaborators to focus on higher-level decision-making or ethical considerations. In these scenarios, AI becomes a valued co-contributor whose inputs and insights are integrated into the human mental model.

Physical embodiments of AI, like social robots, exoskeletons, or prosthetics, augment human physical capabilities. Socially intelligent exoskeletons could aid rehabilitation by dynamically adjusting support levels based on progress and factors like terrain or fatigue. These robotic aids, integrated with the user's body schema, could become extensions of their sense of agency. Over time, human intention and AI-driven movement can lead to augmented embodiment, diminishing the biological and technological boundaries.

Organizational structures and social norms will also change. AI-enabled group decision-making platforms collect inputs, identify consensus, and suggest compromise solutions. Socially aware AI in boardrooms, strategic planning, or public policy forums can make use of collaborative intelligence by integrating multiple perspectives. These AI systems manage conflict, recognize agreement or dissent, and adapt communication styles to de-escalate tension or build rapport. This leads to more inclusive and transparent processes that empower marginalized voices. Human–AI symbiosis amplifies collective intelligence, but it also raises questions about responsibility and leadership when AI insights are the ones shaping the outcomes.

Achieving true symbiosis between humans and AI faces challenges. Over-reliance on AI may diminish essential skills and critical thinking. AI agents with cultural or social biases could reinforce those biases, creating a symbiotic loop. Power imbalances in AI access may lead to stratified symbiosis, benefiting some while others lag. Addressing these pitfalls requires thoughtful design, oversight, resource distribution, and public debates on AI boundaries.

Despite complexities, the symbiosis between humans and AI technology remains a powerful motivator for social AI research. Focusing on personalization, trust, co-creation, augmented embodiment, and organizational transformation can lead to AI as a genuine partner, not just a tool or competitor. Mutual respect, aligning AI with human values, and refining collaborative processes are key to success. Symbiosis is not an unattainable ideal but a practical, human-machine evolving partnership.

The future of social AI, driven by advancements in machine learning and the interaction between human and computer technology, promises to integrate seamlessly into daily life, healthcare, education, and beyond. While this integration offers opportunities for personalized care, adaptive learning, and enhanced community engagement, it also raises concerns about privacy, bias, and significant changes in social interactions. Ultimately, the responsible development and deployment of social AI will be very important in creating a future where technology amplifies human creativity, empathy, and problem-solving capacity.

10. Conclusions

ASI, rapidly impacting human interaction, is a complex domain where computational systems replicate, simulate, and reconfigure social dynamics. Unlike just processing information or solving logical tasks, true ASI arises from integrating psychological, cognitive, and sociocultural insights into ML architectures, NLP, computer vision, multi-agent systems, and reinforcement learning. These advancements enable AI agents, from chatbots to advanced social robots, to interpret, predict, and shape human behavior in real-time.

The conducted analysis highlighted the interaction between AI theoretical constructs and practical implementations. Traditional AI relied on rigid rule-based systems or specialized ML models for limited interaction. Recent advances in deep learning, transfer learning, and multi-modal processing expanded the AI's operational domain, enabling new forms of interaction. Conversational agents understand contextual shifts, computer vision systems detect facial expressions, and reinforcement learning agents adapt in dynamic settings. Examining these technological aspects shows that AI is evolving from technical problem-solvers to social participants, reinforcing the need for social intelligence combining reasoning, perception, adaptability, and cultural sensitivity.

AI's deployment in social contexts spans decades, starting with primitive chatbots like ELIZA, progressing to interactive robots, and culminating in contemporary virtual assistants managing personalized services. These historical aspects highlight the tension between aspirations and realizations, where early visions faced limitations in sustaining natural dialogues or interpreting emotions. Recent improvements in GPU computing, large-scale NNs, and datasets have addressed these limitations. Today, AI-driven systems are integrated into daily life, from digital customer service to healthcare companionship. These developments change our perception of AI agents from static tools to dynamic interactants in the human social existence.

Throughout the article, transformations in communication and group dynamics were highlighted. AI-mediated interactions reconfigure social exchange patterns, altering conversational flow and agency distribution. AI agents can facilitate group interactions as neutral mediators, but they can also introduce biases, reinforce echo chambers, or undermine privacy. These shifts in social norms and etiquette necessitate recalibrating social protocols in AI-coexistent environments. Boundaries between private conversations and AI-stored data tend to dissipate therefore challenging autonomy, disclosure, and intimacy assumptions. The role of AI in empathy adoption or hindrance is a concern, as mechanized empathy can extend care or lead to manipulation.

Socially aware AI has proven beneficial in diverse domains, from education and healthcare to corporate and governmental settings. In education, personalized tutoring systems improve engagement, while group-based AI facilitates collaborative learning. In healthcare, social robots and AI companions support mental health, covering the needs of isolated populations. Corporates use AI for project management and team communication, sometimes replacing traditional management tasks. Governments and public administration employ AI to engage citizens, reflecting an effort to integrate intelligent platforms into governance. Nevertheless, accountability, data security, and the potential erosion of direct human oversight remain pertinent concerns.

AI's ethical, legal, and societal implications are very important aspects, especially when it influences mental health, political stance, or group decision-making. Bias in AI-driven interactions arises from skewed training data or flawed algorithms, emphasizing the importance of inclusive design processes. Privacy and data protection concerns grow as social AI collects sensitive data. Accountability mechanisms, from legal frameworks to public oversight, are emerging but lag behind innovation. Societal acceptance depends on ethical behavior, privacy protection, fairness, and security against manipulation.

AI is evolving into a social actor that supports, augments, or supplants human interaction. Interdisciplinary integration between computer science, psychology, sociology, ethics, and law is very important for constructing general models that are capturing human communication and group behavior. While remarkable milestones have been reached,

fundamental challenges remain, including modeling context, culture, and emotion, and societal questions about autonomy, identity, and authenticity in AI-augmented spaces.

The article emphasizes the need for critical engagement with AI systems that assume social roles. AI's evolving complexity holds significant potential to change the way in which individuals and societies construct meaning, form relationships, and organize collective activities. The pursuit of artificial social intelligence is no longer a peripheral research question but a central concern requiring robust theoretical models, empirical validation, ethical scrutiny, and inclusive design practices. An integrative approach is needed to ensure that AI's growing presence in human social life serves as a technical milestone, a channel for human flourishing, and an opportunity to enrich, rather than diminish, the collective social experience.

ASI's implications extend to various stakeholders, shaping how individuals, communities, institutions, and global networks interact with AI-augmented realities. In the case of users, socially aware AI offers personalization, convenience, and accessibility, addressing emotional states, interpersonal nuances, and contextual cues. Mental health support is accessible through empathetic AI companions, while adaptive tutoring and therapy cater to social and cognitive impairments. In consumer contexts, AI assistants enhance daily tasks with nuanced social understanding, from scheduling to domestic management.

Nevertheless, AI's implications for individuals are mixed. While convenience is appealing, AI systems trained on proprietary data continuously gather insights into personal habits, emotions, and social networks, potentially eroding privacy and autonomy. Surveillance demonstrates how data can be harvested and leveraged for targeted advertising, potentially harming users' interests. Psychologically, relying on AI for social needs raises questions about how human empathy and emotional intelligence might decline if AI mediates more interpersonal contact. AI's subtle influence on self-expression, self-awareness, and social development must be carefully considered in order to avoid offloading human capacities to machines.

At the community and societal levels, socially adept AI offers opportunities for collective problem-solving, inclusive group dynamics, and enhanced public discussions. Social robots in eldercare facilitate group activities and reduce isolation, while AI-based platforms in education provide broader and more equitable access to specialized knowledge and collaborative learning experiences. AI-driven interfaces can simplify bureaucratic processes, promote digital town halls, deliver multilingual support, increase civic participation and lower barriers to engagement. These improvements can be significant in under-resourced or remote settings where access to human experts or specialized infrastructure is scarce.

Society-wide implications reveal complex aspects. AI-mediated social systems can systematically manipulate public sentiment through content curation, targeted persuasion,

or synthetic media, making institutions susceptible to algorithmic influence. Socially oriented AI can either promote civic renewal or exacerbate political polarization. When AI becomes a cultural gatekeeper, limiting public discourse to automated curation, modelling social norms, values, and discussions become very important aspects to analyze. AI's proliferation in social media, news aggregation, and interpersonal communication emphasizes this significance.

In the case of corporate stakeholders, AI-driven social environments and processes promise efficiency, insights, and innovative service delivery. Customer service deploys conversational agents for routine inquiries and data collection. Decisional factors analyze internal communication for collaboration bottlenecks and team dynamics improvements. Cost savings, faster decision-making, and a cohesive culture entice integration. Nevertheless, ethical dilemmas arise from employee surveillance, data ownership, and job displacement. The modern workplace's change to AI-driven decision-making raises labor questions about error responsibility, inclusive workforce development, and preserving human qualities like trust and empathy in professional contexts.

Policymakers face unique challenges in responding to AI's profound social transformations. Drafting and implementing regulations that balance innovation, and public welfare requires forward-looking legal frameworks for rapid technological changes. Social intelligence in AI diminishes the user and subject separation, raising questions of liability, data governance, and ethical accountability. Explainability is very important in public administration, where citizens must trust resource distribution, service administration, and policy recommendations. Transparency, oversight, and cross-sectoral partnerships maintain democratic accountability when AI reshapes public opinion, participation, and resource allocation. Governments risk widening social disparities, enabling discrimination, or authoritarian surveillance.

Collaborative, interdisciplinary engagement is important for socially aware AI systems with ethical principles, robust design, and cultural sensitivity. Societal transformations will vary based on resources, infrastructure, norms, and regulations, magnifying global inequities. Stakeholders responsible for fairness, explainability, and inclusivity can harness the AI's positive potential while mitigating adverse outcomes. Open dialogue between technologists, ethicists, user communities, corporations, and public institutions is very important, in situations where each sector contributes expertise to shape AI attuned to human values and social well-being.

Despite significant progress in developing AI systems with social intelligence, intrinsic limitations persist due to technical, methodological, and conceptual challenges. Capturing the contextual richness of human social interaction is particularly difficult. Human communication involves various signals, and while AI excels at language parsing, facial expression recognition, and context-awareness, it struggles to adapt to rapidly shifting environments with subtle contextual cues, power dynamics, historical relationships, and

cultural norms. The high variability of social scenarios means that impressive capabilities in a well-defined domain can be inadequate in novel or cross-cultural interactions. Models trained in one language or cultural context often fail to generalize, highlighting the challenge of building truly universal social intelligence.

Modern AI's data-driven foundations face limitations. Deep learning systems require large, high-quality training datasets representing real-world interactions. Nevertheless, these datasets often suffer from biases, inconsistencies, or insufficient coverage, leading to harmful stereotypes and misinterpretations of underrepresented groups. Mitigating bias through specialized algorithms or representative datasets is partial and addressing how societal inequities are encoded in data and replicated by AI is challenging. Quantitative measures like accuracy do not capture qualitative dimensions of social intelligence like trust-building, empathy, or moral discernment.

Methodologically, there is a significant need for integrating theoretical models from psychology, sociology, anthropology, and related fields into AI architectures. While some research attempts to import concepts like theory of mind, self-awareness, or moral reasoning into algorithmic frameworks, these are nascent and often fragmented. Reinforcement learning, for instance, trains agents to optimize rewards for cooperative behavior but fails to grasp ethical dimensions or long-term social implications. Multi-agent systems that cooperate or compete in dynamic environments are hindered by modeling emergent social phenomena like complex group behaviors, hierarchical roles, and intricate relationship networks. Achieving a rigorous, interdisciplinary methodology that unites social science insights with computational efficiency remains an open research frontier.

Technical limitations in explainability, interpretability, and real-time adaptation affect black-box models, especially large NNs. These models can produce socially compelling responses but lack transparency in their decision-making processes. This opacity is problematic in high-stakes contexts like healthcare diagnosis or criminal justice risk assessments, undermining user trust. While explainable AI research advances, reconciling interpretability with complex neural architectures still remains challenging. Real-time adaptation requires continuous context updates, potentially leading to re-training or catastrophic forgetting. Achieving adaptability and stability is very important, especially in multi-party interactions where trust, timing, and rapport building are of extreme importance.

The ethical and regulatory frameworks remain fragmented. Existing guidelines, like responsible AI, highlight broad principles but lack granularity to address socially capable AI deployment. Issues of consent, data ownership, and user autonomy are challenging when AI integrates into daily life, capturing sensitive social data. Without cohesive legal frameworks, the risk of misuse can become large. Normative debates on AI integration in domains like childcare, therapy, eldercare, and education remain unresolved. Preserving

human agency and ensuring AI advances human dignity rather than infringing on it is both technical and philosophical.

Adversarial behavior and security vulnerabilities pose challenges for AI systems operating in open social contexts. Malicious actors can manipulate outputs, disseminate misinformation, or exploit system weaknesses. Adversarial examples, specially crafted inputs that deceive AI models, demonstrate that advanced models remain susceptible to tampering. Targeting social AI systems with adversarial methods can spread disinformation and undermine public trust. Safeguarding AI from these threats requires specialized countermeasures, but few comprehensive frameworks exist to robustly defend socially oriented AI applications.

These limitations highlight the challenges of achieving genuine ASI. While progress has been made, the envisioned environment where AI seamlessly manages human social life is still far from realized. This aspect emphasizes the need for patient, thorough research that integrates engineering ingenuity with humanistic insight to design AI that aligns with social reality. Only through sustained effort can the field move closer to producing AI systems that truly enrich human life, rather than merely replicating social interaction.

Artificial social intelligence holds immense potential. AI agents' integration into human society through language comprehension, emotional attune, adaptive behavior, and collaborative intelligence suggests a new era of human-machine interactions. These developments promise enhanced efficiency, improved access to services, amplified creativity, and societal benefits in education, healthcare, governance, and personal well-being. Nevertheless, they also raise concerns about privacy erosion, social divisions, manipulation, and displacement of empathy, trust, and mutual understanding.

Technologists, policymakers, ethicists, psychologists, and diverse voices from marginalized communities, industry leaders, government agencies, and academic researchers must collaborate to develop socially responsible AI. This collaboration should establish shared principles, including clear regulations protecting individuals' rights, incentives for ethical AI design, and public engagement campaigns to clarify the AI's societal impact. Participatory processes ensure a genuine alignment with global societies' pluralistic values.

Incorporating interdisciplinary research methodologies from the humanities and social sciences into technological design is another very important aspect. Engineering solutions to social interaction challenges should be tested against psychological theories of emotion, cognition, and interpersonal dynamics. Anthropology can guide AI system development by understanding cultural variation in communication styles and normative behaviors. Sociology and political science can reveal macro-level implications of AI deployment, such as power changes, identity formation, and civic participation. By integrating social science

theories, AI developers can move beyond superficial human interaction emulations and create systems that engage with and replicate human social complexity.

Initiatives to adopt transparency, explainability, and accountability must continue and expand. While explainable AI research makes progress, further transparency around data usage, decision-making, and system limitations is very important for building user trust and responsible AI deployment. Governments and international bodies must collaborate to create enforceable standards for comprehensible AI system reporting. Accountability is urgent as AI systems operate semi-autonomously in sensitive domains. Deciding where responsibility lies, with developers, data sources, deployers, or users, is a complex problem. Legal frameworks must evolve to address responsibility distribution when AI becomes a participant in human social ecosystems.

Robust ethical oversight and governance are strategic for sustaining societal trust. Ethical review boards or cross-disciplinary committees can integrate into AI research pipelines to systematically identify and mitigate potential risks. Oversight mechanisms must adapt to AI technology evolution, reflecting real-time updates in capabilities, data collection, and usage. Civic organizations and public play a very important role in scrutinizing AI deployments, supporting user rights, and ensuring equitable AI adoption.

Improving public literacy in AI is very important as social interactions with AI become commonplace. Educational programs can empower citizens to make informed decisions about data sharing, chatbot engagement, and cautious use of AI. Encouraging digital skepticism helps inoculate society against AI manipulation. Improvements in user interface design and consent processes make interactions more transparent, preserving individual agency.

A broader vision of the symbiosis between humans and AI technology emerges, envisioning collaborative, mutually beneficial relationships that enhance human capacities while preserving autonomy, dignity, and sociability. This symbiosis requires ongoing negotiation involving technical breakthroughs, policy changes, and cultural discussions about human social bonds. Ensuring that AI augments human potential rather than subjugating it is fundamental. The AI's role as a social actor should complement human emotional intelligence, ethical reasoning, and creative expression, recognizing the depth of human lived experience while contributing computational insights to solve the society's problems.

Without a doubt, ASI requires a multi-layered approach. Researchers and developers should integrate cross-disciplinary wisdom, refine computational models for cultural and ethical sensitivity, and strive for new forms of transparency and user engagement. Policymakers and regulatory agencies should collaborate internationally to establish frameworks that safeguard public interests and encourage responsible innovation. Corporate stakeholders should view ethical, social, and cultural considerations as strategic requirements, investing in comprehensive risk assessments and community engagement. Civil society groups,

educators, and media organizations should raise public awareness about the AI's impact on society. Finally, individual users should remain vigilant, recognizing that every interaction with AI shapes the norms and values of technologically mediated social life. The future trajectory of AI depends on collective efforts to design, deploy, regulate, and use AI ethically and responsibly. By promoting collaboration, ethical rigor, and human sociality, we can steer AI toward outcomes that enhance societal flourishing and promote human identity. The path forward requires vigilance, imagination, and a commitment to shaping technology for humanity's best interests.

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References

[1] Lim, T. Environmental, Social, and Governance (ESG) and Artificial Intelligence in Finance: State-of-the-Art and Research Takeaways. *Artif Intell Rev* **2024**, *57*, doi:10.1007/s10462-024-10708-3.

[2] Sun, T.Q. Adopting Artificial Intelligence in Public Healthcare: The Effect of Social Power and Learning Algorithms. *Int J Environ Res Public Health* **2021**, *18*, doi:10.3390/ijerph182312682.

[3] St. Amant, R.; Young, R.M. Links: Artificial Intelligence and Interactive Entertainment. *Intelligence* **2001**, *12*, doi:10.1145/378116.378120.

[4] Bharadiya, J. Artificial Intelligence in Transportation Systems A Critical Review. *American Journal of Computing and Engineering* **2023**, *6*, doi:10.47672/ajce.1487.

[5] Brännström, A.; Wester, J.; Nieves, J.C. A Formal Understanding of Computational Empathy in Interactive Agents. *Cogn Syst Res* **2024**, *85*, doi:10.1016/j.cogsys.2023.101203.

[6] Uludag, K. The Use of AI-Supported Chatbot in Psychology. *SSRN Electronic Journal* **2023**, doi:10.2139/ssrn.4331367.

[7] Baranowski, M. The Database Construction of Reality in the Age of AI: The Coming Revolution in Sociology? *AI Soc* **2024**, doi:10.1007/s00146-024-01873-8.

[8] Kartal, G.; Yeşilyurt, Y.E. A Bibliometric Analysis of Artificial Intelligence in L2 Teaching and Applied Linguistics between 1995 and 2022. *ReCALL* **2024**, doi:10.1017/S0958344024000077.

[9] Montag, C.; Ali, R.; Davis, K.L. Affective Neuroscience Theory and Attitudes towards Artificial Intelligence. *AI Soc* **2024**, doi:10.1007/s00146-023-01841-8.

[10] Van Rooij, I.; Guest, O.; Adolfi, F.; De Haan, R.; Kolokolova, A.; Rich, P. Reclaiming AI as a Theoretical Tool for Cognitive Science. *PsyArXiv* **2023**.

[11] Ciraolo, D.; Fazio, M.; Calabrò, R.S.; Villari, M.; Celesti, A. Facial Expression Recognition Based on Emotional Artificial Intelligence for Tele-Rehabilitation. *Biomed Signal Process Control* **2024**, *92*, doi:10.1016/j.bspc.2024.106096.

[12] Miranda, L.; Garibary, O.O. Approaching (Super)Human Intent Recognition in Stag Hunt with the Naïve Utility Calculus Generative Model. *Comput Math Organ Theory* **2023**, *29*, doi:10.1007/s10588-022-09367-y.

[13] Sharma, A.; Lin, I.W.; Miner, A.S.; Atkins, D.C.; Althoff, T. Human–AI Collaboration Enables More Empathic Conversations in Text-Based Peer-to-Peer Mental Health Support. *Nat Mach Intell* **2023**, *5*, doi:10.1038/s42256-022-00593-2.

[14] Chang, Y.L.; Ke, J. Socially Responsible Artificial Intelligence Empowered People Analytics: A Novel Framework Towards Sustainability. *Human Resource Development Review* **2024**, *23*, doi:10.1177/15344843231200930.

[15] Li, J.; Chu, Y.; Xu, J. Impression Transference from AI to Human: The Impact of AI's Fairness on Interpersonal Perception in AI-Mediated Communication. *International Journal of Human Computer Studies* **2023**, *179*, doi:10.1016/j.ijhcs.2023.103119.

[16] Celik, A.; Eltawil, A.M. At the Dawn of Generative AI Era: A Tutorial-Cum-Survey on New Frontiers in 6G Wireless Intelligence. *IEEE Open Journal of the Communications Society* **2024**, *5*, doi:10.1109/OJCOMS.2024.3362271.

[17] Panicker, A.; Sasidevan, V. Social Adaptive Behavior and Oscillatory Prevalence in an Epidemic Model on Evolving Random Geometric Graphs. *Chaos Solitons Fractals* **2024**, *178*, doi:10.1016/j.chaos.2023.114407.

[18] Gloor, P.; Fronzetti Colladon, A.; Grippa, F. Measuring Ethical Behavior with AI and Natural Language Processing to Assess Business Success. *Sci Rep* **2022**, *12*, doi:10.1038/s41598-022-14101-4.

[19] Tiwari, R. Ethical And Societal Implications of AI and Machine Learning. *INTERANTIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT* **2023**, *07*, doi:10.55041/ijsrem17519.

[20] Prajapati, D.K.; Upadhayay, D.; Kumawat, A.; Shekhawat, A.P. Application of AI Computer Vision and Image Recognition. *Industrial Engineering Journal* **2022**, *51*, doi:10.36893/iej.2022.v51i10.081-087.

[21] Baabdullah, A.M. Generative Conversational AI Agent for Managerial Practices: The Role of IQ Dimensions, Novelty Seeking and Ethical Concerns. *Technol Forecast Soc Change* **2024**, *198*, doi:10.1016/j.techfore.2023.122951.

[22] Broadbent, E.; Loveys, K.; Ilan, G.; Chen, G.; Chilukuri, M.M.; Boardman, S.G.; Doraiswamy, P.M.; Skuler, D. ElliQ, an AI-Driven Social Robot to Alleviate Loneliness: Progress and Lessons Learned. *The Journal of Aging Research & Lifestyle* **2024**, doi:10.14283/jarlife.2024.2.

[23] González, A.S.; Rampino, L. A Design Perspective on How to Tackle Gender Biases When Developing AI-Driven Systems. *AI and Ethics* **2024**, doi:10.1007/s43681-023-00386-2.

[24] Singh, A.; Kanaujia, A.; Singh, V.K.; Vinuesa, R. Artificial Intelligence for Sustainable Development Goals: Bibliometric Patterns and Concept Evolution Trajectories. *Sustainable Development* **2024**, *32*, doi:10.1002/sd.2706.

[25] Li, J.; Wu, L.; Qi, J.; Zhang, Y.; Wu, Z.; Hu, S. Determinants Affecting Consumer Trust in Communication With AI Chatbots: The Moderating Effect of Privacy Concerns. *Journal of Organizational and End User Computing* **2023**, *35*, doi:10.4018/JOEUC.328089.

[26] Farhan, A. The Impact of Artificial Intelligence on Human Workers. *Journal Of Communication Education* **2023**, *17*, doi:10.58217/joce-ip.v17i2.350.

[27] Coman, A.W.; Cardon, P. Perceptions of Professionalism and Authenticity in AI-Assisted Writing. *Business and Professional Communication Quarterly* **2024**, doi:10.1177/23294906241233224.

[28] Liu, J.; Li, C.; Pan, J.; Guo, J. Visual Communication of Moving Images Based on AI Recognition and Light Sensing Image Edge Detection Algorithm. *Opt Quantum Electron* **2024**, *56*, doi:10.1007/s11082-024-06542-0.

[29] Ismail, W.S. Threat Detection and Response Using AI and NLP in Cybersecurity. *Journal of Internet Services and Information Security* **2024**, *14*, doi:10.58346/JISIS.2024.I1.013.

[30] Neupane, S.; Mitra, S.; Fernandez, I.A.; Saha, S.; Mittal, S.; Chen, J.; Pillai, N.; Rahimi, S. Security Considerations in AI-Robotics: A Survey of Current Methods, Challenges, and Opportunities. *IEEE Access* **2024**, *12*, doi:10.1109/ACCESS.2024.3363657.

[31] Alexander Obaigbena; Oluwaseun Augustine Lottu; Ejike David Ugwuanyi; Boma Sonimitiem Jacks; Enoch Oluwademilade Sodiya; Obinna Donald Daraojimba;

Oluwaseun Augustine Lottu AI and Human-Robot Interaction: A Review of Recent Advances and Challenges. *GSC Advanced Research and Reviews* **2024**, *18*, doi:10.30574/gscarr.2024.18.2.0070.

[32] Braunschweig, B.; Buijsman, S.; Chamroukhi, F.; Heintz, F.; Khomh, F.; Mattioli, J.; Poretschkin, M. AITA: AI Trustworthiness Assessment. *AI and Ethics* **2024**, *4*, doi:10.1007/s43681-023-00397-z.

[33] Booyse, D.; Scheepers, C.B. Barriers to Adopting Automated Organisational Decision-Making through the Use of Artificial Intelligence. *Management Research Review* **2024**, *47*, doi:10.1108/MRR-09-2021-0701.

[34] Norzelan, N.A.; Mohamed, I.S.; Mohamad, M. Technology Acceptance of Artificial Intelligence (AI) among Heads of Finance and Accounting Units in the Shared Service Industry. *Technol Forecast Soc Change* **2024**, *198*, doi:10.1016/j.techfore.2023.123022.

[35] Wei, Y.; Tyson, G. Understanding the Impact of AI Generated Content on Social Media: The Pixiv Case. **2024**, doi:10.1145/3664647.3680631.

[36] Oladoyinbo, T.O.; Olabanji, S.O.; Olaniyi, O.O.; Adebiyi, O.O.; Okunleye, O.J.; Alao, A.I. Exploring the Challenges of Artificial Intelligence in Data Integrity and Its Influence on Social Dynamics. *Asian Journal of Advanced Research and Reports* **2024**, *18*, doi:10.9734/ajarr/2024/v18i2601.

[37] Voruganti, S.S.J.; Gadepalli, T.N. Person-Hood Issues Related To Artificial Intelligence. *International Journal For Multidisciplinary Research* **2024**, *6*, doi:10.36948/ijfmr.2024.v06i01.14177.

[38] Sufyan, N.S.; Fadhel, F.H.; Alkhathami, S.S.; Mukhadi, J.Y.A. Artificial Intelligence and Social Intelligence: Preliminary Comparison Study between AI Models and Psychologists. *Front Psychol* **2024**, *15*, doi:10.3389/fpsyg.2024.1353022.

[39] Otis, N.; Clarke, R.; Delecourt, S.; Holtz, D.; Koning, R. The Uneven Impact of Generative AI on Entrepreneurial Performance. *SSRN Electronic Journal* **2024**, doi:10.2139/ssrn.4671369.

[40] Oloyede, J. Ethical Reflections on AI for Cybersecurity: Building Trust. *SSRN Electronic Journal* **2024**, doi:10.2139/ssrn.4733563.

[41] Rafique, H.; Nazeer, I.; Rehman, J. The Impact of ChatGPT on Language Evolution: A Linguistic Analysis. *Journal of Education and Social Studies* **2024**, *5*, doi:10.52223/jess.2024.5106.

[42] Li, J.; Huang, J.; Liu, J.; Zheng, T. Human-AI Cooperation: Modes and Their Effects on Attitudes. *Telematics and Informatics* **2022**, *73*, doi:10.1016/j.tele.2022.101862.

[43] Abdul Wasay Khan Mandokhail The Transformative Role of Artificial Intelligence in Conflict Resolution and Peacekeeping. *NUST Journal of International Peace & Stability* **2024**, doi:10.37540/njips.v7i1.166.

[44] Bird, J.J.; Lotfi, A. CIFAKE: Image Classification and Explainable Identification of AI-Generated Synthetic Images. *IEEE Access* **2024**, *12*, doi:10.1109/ACCESS.2024.3356122.

[45] Peng, Y.; Han, J.; Zhang, Z.; Fan, L.; Liu, T.; Qi, S.; Feng, X.; Ma, Y.; Wang, Y.; Zhu, S.C. The Tong Test: Evaluating Artificial General Intelligence Through Dynamic Embodied Physical and Social Interactions. *Engineering* **2024**, *34*, doi:10.1016/j.eng.2023.07.006.

[46] Babu, A.; Boddu, S.B. BERT-Based Medical Chatbot: Enhancing Healthcare Communication through Natural Language Understanding. *Exploratory Research in Clinical and Social Pharmacy* **2024**, *13*, doi:10.1016/j.rcsop.2024.100419.

[47] Kalogiannidis, S.; Kalfas, D.; Papaevangelou, O.; Giannarakis, G.; Chatzitheodoridis, F. The Role of Artificial Intelligence Technology in Predictive Risk Assessment for Business Continuity: A Case Study of Greece. *Risks* **2024**, *12*, doi:10.3390/risks12020019.

[48] Park, S.; Lee, J. yoon; Lee, J. AI System Architecture Design Methodology Based on IMO (Input-AI Model-Output) Structure for Successful AI Adoption in Organizations. *Data Knowl Eng* **2024**, *150*, doi:10.1016/j.datak.2023.102264.

[49] Sai, S.; Garg, A.; Jhawar, K.; Chamola, V.; Sikdar, B. A Comprehensive Survey on Artificial Intelligence for Unmanned Aerial Vehicles. *IEEE Open Journal of Vehicular Technology* **2023**, *4*, doi:10.1109/OJVT.2023.3316181.

[50] Simon, J.; Rieder, G.; Branford, J. The Philosophy and Ethics of AI: Conceptual, Empirical, and Technological Investigations into Values. *Digital Society* **2024**, *3*, doi:10.1007/s44206-024-00094-2.

[51] Chongwatpol, J. A Technological, Data-Driven Design Journey for Artificial Intelligence (AI) Initiatives. *Educ Inf Technol (Dordr)* **2024**, doi:10.1007/s10639-024-12459-8.

[52] Lenaerts, T.; Saponara, M.; Pacheco, J.M.; Santos, F.C. Evolution of a Theory of Mind. *iScience* **2024**, *27*, doi:10.1016/j.isci.2024.108862.

[53] Harré, M.S.; El-Tarifi, H. Testing Game Theory of Mind Models for Artificial Intelligence. *Games (Basel)* **2024**, *15*, doi:10.3390/g15010001.

[54] Cheng, C.; Wang, C.; Yang, D.; Wen, X.; Liu, W.; Zhang, F. Underwater Small Target Detection Based on Dynamic Convolution and Attention Mechanism. *Front Mar Sci* **2024**, *11*, doi:10.3389/fmars.2024.1348883.

[55] Lahudeo, B.N.; Vayadande, M.; Malviya, R.; Haldule, A. Walking and Survival AI Using Reinforcement Learning - Simulation. *International Journal of Scientific Research in Computer Science, Engineering and Information Technology* **2024**, *10*, doi:10.32628/cseit2390629.

[56] Pirnau, M.; Botezatu, M.A.; Priescu, I.; Hosszu, A.; Tabusca, A.; Coculescu, C.; Oncioiu, I. Content Analysis Using Specific Natural Language Processing Methods for Big Data. *Electronics (Switzerland)* **2024**, *13*, doi:10.3390/electronics13030584.

[57] Kaleel, A.; Alomari, M.S. Integrating Artificial Intelligence in Public Relations and Media: A Bibliometric Analysis of Emerging Trends and Influences. *Iraqi Journal for Computer Science and Mathematics* **2024**, *5*, doi:10.52866/ijcsm.2024.05.01.002.

[58] Krugmann, J.O.; Hartmann, J. Sentiment Analysis in the Age of Generative AI. *Customer Needs and Solutions* **2024**, *11*, doi:10.1007/s40547-024-00143-4.

[59] Shaikh Mohd Azhar Mohd Abrar Integrating Artificial Intelligence with Human Psychology. *International Journal of Advanced Research in Science, Communication and Technology* **2024**, doi:10.48175/ijarsct-15250.

[60] Morais da Silva, D.; Da Costa Farias, R.; Cunha, A.; Salete Casagrande, L.; Antunes Peres, R. History and Legacy of Alan Turing for Computer Science. *International Journal of Scientific Research and Management (IJSRM)* **2024**, *12*, doi:10.18535/ijsrm/v12i02.ec06.

[61] Zhou, B.; Yang, G.; Shi, Z.; Ma, S. Natural Language Processing for Smart Healthcare. *IEEE Rev Biomed Eng* **2024**, *17*, doi:10.1109/RBME.2022.3210270.

[62] Vanhée, L. Organizing Transdisciplinary Research and Innovation: The Case of the Socially-Aware Artificial Intelligence Focus Area. In Proceedings of the CEUR Workshop Proceedings; 2024; Vol. 3634.

[63] Farrelly, T.; Baker, N. Generative Artificial Intelligence: Implications and Considerations for Higher Education Practice. *Educ Sci (Basel)* 2023, *13*.

[64] Chandra, B.; Rahman, Z. Artificial Intelligence and Value Co-Creation: A Review, Conceptual Framework and Directions for Future Research. *Journal of Service Theory and Practice* **2024**, *34*, doi:10.1108/JSTP-03-2023-0097.

[65] Zhou, M.; Lei, L.; Chen, W.; Luo, Q.; Li, J.; Zhou, F.; Yang, X.; Pan, Y. Deep Learning-Based Diagnosis of Aortic Dissection Using an Electrocardiogram: Development, Validation, and Clinical Implications of the AADE Score. *Kardiol Pol* **2024**, *82*, doi:10.33963/v.phj.98880.

[66] Flathmann, C.; McNeese, N.J.; Schelble, B.; Knijnenburg, B.; Freeman, G. Understanding the Impact and Design of AI Teammate Etiquette. *Hum Comput Interact* **2024**, *39*, doi:10.1080/07370024.2023.2189595.

[67] Elyoseph, Z.; Refoua, E.; Asraf, K.; Lvovsky, M.; Shimoni, Y.; Hadar-Shoval, D. Capacity of Generative AI to Interpret Human Emotions From Visual and Textual Data: Pilot Evaluation Study. *JMIR Ment Health* **2024**, *11*, doi:10.2196/54369.

[68] Liu, W.; Zhang, S.; Zhang, T.; Gu, Q.; Han, W.; Zhu, Y. The AI Empathy Effect: A Mechanism of Emotional Contagion. *Journal of Hospitality Marketing and Management* **2024**, *33*, doi:10.1080/19368623.2024.2315954.

[69] Kim, J.; Ham, Y.; Lee, S.S. Differences in Student-AI Interaction Process on a Drawing Task: Focusing on Students' Attitude towards AI and the Level of Drawing Skills. *Australasian Journal of Educational Technology* **2024**, *40*, doi:10.14742/ajet.8859.

[70] Zhang, R.; Duan, W.; Flathmann, C.; Mcneese, N.; Freeman, G.; Williams, A. Investigating AI Teammate Communication Strategies and Their Impact in Human-AI Teams for Effective Teamwork. *Proc ACM Hum Comput Interact* **2023**, *7*, doi:10.1145/3610072.

[71] Hu, Y.H.; Fu, J.S.; Yeh, H.C. Developing an Early-Warning System through Robotic Process Automation: Are Intelligent Tutoring Robots as Effective as Human Teachers? *Interactive Learning Environments* **2023**, doi:10.1080/10494820.2022.2160467.

[72] Deng, W.; Liu, Q.; Zhao, F.; Pham, D.T.; Hu, J.; Wang, Y.; Zhou, Z. Learning by Doing: A Dual-Loop Implementation Architecture of Deep Active Learning and Human-Machine Collaboration for Smart Robot Vision. *Robot Comput Integr Manuf* **2024**, *86*, doi:10.1016/j.rcim.2023.102673.

[73] Laux, J.; Wachter, S.; Mittelstadt, B. Trustworthy Artificial Intelligence and the European Union AI Act: On the Conflation of Trustworthiness and Acceptability of Risk. *Regul Gov* **2024**, *18*, doi:10.1111/rego.12512.

[74] Kleinrichert, D. Empathy: An Ethical Consideration of AI & Others in the Workplace. *AI Soc* **2024**, doi:10.1007/s00146-023-01831-w.

[75] Kusal, S.D.; Patil, S.G.; Choudrie, J.; Kotecha, K. V. Understanding the Performance of AI Algorithms in Text-Based Emotion Detection for Conversational Agents. *ACM Transactions on Asian and Low-Resource Language Information Processing* **2024**, *23*, doi:10.1145/3643133.

Bibliography

Abdul Wasay Khan Mandokhail The Transformative Role of Artificial Intelligence in Conflict Resolution and Peacekeeping. *NUST Journal of International Peace & Stability* **2024**, doi:10.37540/njips.v7i1.166.

Alexander Obaigbena; Oluwaseun Augustine Lottu; Ejike David Ugwuanyi; Boma Sonimitiem Jacks; Enoch Oluwademilade Sodiya; Obinna Donald Daraojimba; Oluwaseun Augustine Lottu AI and Human-Robot Interaction: A Review of Recent Advances and Challenges. *GSC Advanced Research and Reviews* **2024**, *18*, doi:10.30574/gscarr.2024.18.2.0070.

Baabdullah, A.M. Generative Conversational AI Agent for Managerial Practices: The Role of IQ Dimensions, Novelty Seeking and Ethical Concerns. *Technol Forecast Soc Change* **2024**, *198*, doi:10.1016/j.techfore.2023.122951.

Babu, A.; Boddu, S.B. BERT-Based Medical Chatbot: Enhancing Healthcare Communication through Natural Language Understanding. *Exploratory Research in Clinical and Social Pharmacy* **2024**, *13*, doi:10.1016/j.rcsop.2024.100419.

Baranowski, M. The Database Construction of Reality in the Age of AI: The Coming Revolution in Sociology? *AI Soc* **2024**, doi:10.1007/s00146-024-01873-8.

Bharadiya, J. Artificial Intelligence in Transportation Systems A Critical Review. *American Journal of Computing and Engineering* **2023**, *6*, doi:10.47672/ajce.1487.

Bird, J.J.; Lotfi, A. CIFAKE: Image Classification and Explainable Identification of AI-Generated Synthetic Images. *IEEE Access* **2024**, *12*, doi:10.1109/ACCESS.2024.3356122.

Booyse, D.; Scheepers, C.B. Barriers to Adopting Automated Organisational Decision-Making through the Use of Artificial Intelligence. *Management Research Review* **2024**, *47*, doi:10.1108/MRR-09-2021-0701.

Brännström, A.; Wester, J.; Nieves, J.C. A Formal Understanding of Computational Empathy in Interactive Agents. *Cogn Syst Res* **2024**, *85*, doi:10.1016/j.cogsys.2023.101203.

Braunschweig, B.; Buijsman, S.; Chamroukhi, F.; Heintz, F.; Khomh, F.; Mattioli, J.; Poretschkin, M. AITA: AI Trustworthiness Assessment. *AI and Ethics* **2024**, *4*, doi:10.1007/s43681-023-00397-z.

Broadbent, E.; Loveys, K.; Ilan, G.; Chen, G.; Chilukuri, M.M.; Boardman, S.G.; Doraiswamy, P.M.; Skuler, D. ElliQ, an AI-Driven Social Robot to Alleviate Loneliness: Progress and Lessons Learned. *The Journal of Aging Research & Lifestyle* **2024**, doi:10.14283/jarlife.2024.2.

Celik, A.; Eltawil, A.M. At the Dawn of Generative AI Era: A Tutorial-Cum-Survey on New Frontiers in 6G Wireless Intelligence. *IEEE Open Journal of the Communications Society* **2024**, *5*, doi:10.1109/OJCOMS.2024.3362271.

Chandra, B.; Rahman, Z. Artificial Intelligence and Value Co-Creation: A Review, Conceptual Framework and Directions for Future Research. *Journal of Service Theory and Practice* **2024**, *34*, doi:10.1108/JSTP-03-2023-0097.

Chang, Y.L.; Ke, J. Socially Responsible Artificial Intelligence Empowered People Analytics: A Novel Framework Towards Sustainability. *Human Resource Development Review* **2024**, *23*, doi:10.1177/15344843231200930.

Chaturvedi, R.; Verma, S.; Das, R.; Dwivedi, Y.K. Social Companionship with Artificial Intelligence: Recent Trends and Future Avenues. *Technol Forecast Soc Change* **2023**, *193*, doi:10.1016/j.techfore.2023.122634.

Cheng, C.; Wang, C.; Yang, D.; Wen, X.; Liu, W.; Zhang, F. Underwater Small Target Detection Based on Dynamic Convolution and Attention Mechanism. *Front Mar Sci* **2024**, *11*, doi:10.3389/fmars.2024.1348883.

Chongwatpol, J. A Technological, Data-Driven Design Journey for Artificial Intelligence (AI) Initiatives. *Educ Inf Technol (Dordr)* **2024**, doi:10.1007/s10639-024-12459-8.

Ciraolo, D.; Fazio, M.; Calabrò, R.S.; Villari, M.; Celesti, A. Facial Expression Recognition Based on Emotional Artificial Intelligence for Tele-Rehabilitation. *Biomed Signal Process Control* **2024**, *92*, doi:10.1016/j.bspc.2024.106096.

Coman, A.W.; Cardon, P. Perceptions of Professionalism and Authenticity in AI-Assisted Writing. *Business and Professional Communication Quarterly* **2024**, doi:10.1177/23294906241233224.

Deng, W.; Liu, Q.; Zhao, F.; Pham, D.T.; Hu, J.; Wang, Y.; Zhou, Z. Learning by Doing: A Dual-Loop Implementation Architecture of Deep Active Learning and Human-Machine Collaboration for Smart Robot Vision. *Robot Comput Integr Manuf* **2024**, *86*, doi:10.1016/j.rcim.2023.102673.

Elyoseph, Z.; Refoua, E.; Asraf, K.; Lvovsky, M.; Shimoni, Y.; Hadar-Shoval, D. Capacity of Generative AI to Interpret Human Emotions From Visual and Textual Data: Pilot Evaluation Study. *JMIR Ment Health* **2024**, *11*, doi:10.2196/54369.

Farhan, A. The Impact of Artificial Intelligence on Human Workers. *Journal Of Communication Education* **2023**, *17*, doi:10.58217/joce-ip.v17i2.350.

Farrelly, T.; Baker, N. Generative Artificial Intelligence: Implications and Considerations for Higher Education Practice. *Educ Sci (Basel)* 2023, *13*.

Flathmann, C.; McNeese, N.J.; Schelble, B.; Knijnenburg, B.; Freeman, G. Understanding the Impact and Design of AI Teammate Etiquette. *Hum Comput Interact* **2024**, *39*, doi:10.1080/07370024.2023.2189595.

Gloor, P.; Fronzetti Colladon, A.; Grippa, F. Measuring Ethical Behavior with AI and Natural Language Processing to Assess Business Success. *Sci Rep* **2022**, *12*, doi:10.1038/s41598-022-14101-4.

González, A.S.; Rampino, L. A Design Perspective on How to Tackle Gender Biases When Developing AI-Driven Systems. *AI and Ethics* **2024**, doi:10.1007/s43681-023-00386-2.

Harré, M.S.; El-Tarifi, H. Testing Game Theory of Mind Models for Artificial Intelligence. *Games (Basel)* **2024**, *15*, doi:10.3390/g15010001.

Hu, Y.H.; Fu, J.S.; Yeh, H.C. Developing an Early-Warning System through Robotic Process Automation: Are Intelligent Tutoring Robots as Effective as Human Teachers? *Interactive Learning Environments* **2023**, doi:10.1080/10494820.2022.2160467.

Huang, L.; Freeman, J.; Cooke, N.J.; Cohen, M.C.; Yin, X.; Clark, J.; Wood, M.; Buchanan, V.; Corral, C.; Scholcover, F.; et al. Establishing Human Observer Criterion in Evaluating Artificial Social Intelligence Agents in a Search and Rescue Task. *Top Cogn Sci* **2023**, doi:10.1111/tops.12648.

Ismail, W.S. Threat Detection and Response Using AI and NLP in Cybersecurity. *Journal of Internet Services and Information Security* **2024**, *14*, doi:10.58346/JISIS.2024.I1.013.

Johnston, W.J.; Cortez, R.M. Business-to-Business Digitalization, Artificial Intelligence, and Social Action. *J Bus Res* 2024, *172*.

Kaleel, A.; Alomari, M.S. Integrating Artificial Intelligence in Public Relations and Media: A Bibliometric Analysis of Emerging Trends and Influences. *Iraqi Journal for Computer Science and Mathematics* **2024**, *5*, doi:10.52866/ijcsm.2024.05.01.002.

Kalogiannidis, S.; Kalfas, D.; Papaevangelou, O.; Giannarakis, G.; Chatzitheodoridis, F. The Role of Artificial Intelligence Technology in Predictive Risk Assessment for Business Continuity: A Case Study of Greece. *Risks* **2024**, *12*, doi:10.3390/risks12020019.

Kartal, G.; Yeşilyurt, Y.E. A Bibliometric Analysis of Artificial Intelligence in L2 Teaching and Applied Linguistics between 1995 and 2022. *ReCALL* **2024**, doi:10.1017/S0958344024000077.

Kim, J.; Ham, Y.; Lee, S.S. Differences in Student-AI Interaction Process on a Drawing Task: Focusing on Students' Attitude towards AI and the Level of Drawing Skills. *Australasian Journal of Educational Technology* **2024**, *40*, doi:10.14742/ajet.8859.

Kleinrichert, D. Empathy: An Ethical Consideration of AI & Others in the Workplace. *AI Soc* **2024**, doi:10.1007/s00146-023-01831-w.

Krugmann, J.O.; Hartmann, J. Sentiment Analysis in the Age of Generative AI. *Customer Needs and Solutions* **2024**, *11*, doi:10.1007/s40547-024-00143-4.

Kusal, S.D.; Patil, S.G.; Choudrie, J.; Kotecha, K. V. Understanding the Performance of AI Algorithms in Text-Based Emotion Detection for Conversational Agents. *ACM Transactions on Asian and Low-Resource Language Information Processing* **2024**, *23*, doi:10.1145/3643133.

Lahudeo, B.N.; Vayadande, M.; Malviya, R.; Haldule, A. Walking and Survival AI Using Reinforcement Learning - Simulation. *International Journal of Scientific Research in Computer Science, Engineering and Information Technology* **2024**, *10*, doi:10.32628/cseit2390629.

Laux, J.; Wachter, S.; Mittelstadt, B. Trustworthy Artificial Intelligence and the European Union AI Act: On the Conflation of Trustworthiness and Acceptability of Risk. *Regul Gov* **2024**, *18*, doi:10.1111/rego.12512.

Lenaerts, T.; Saponara, M.; Pacheco, J.M.; Santos, F.C. Evolution of a Theory of Mind. *iScience* **2024**, *27*, doi:10.1016/j.isci.2024.108862.

Li, J.; Chu, Y.; Xu, J. Impression Transference from AI to Human: The Impact of AI's Fairness on Interpersonal Perception in AI-Mediated Communication. *International Journal of Human Computer Studies* **2023**, *179*, doi:10.1016/j.ijhcs.2023.103119.

Li, J.; Huang, J.; Liu, J.; Zheng, T. Human-AI Cooperation: Modes and Their Effects on Attitudes. *Telematics and Informatics* **2022**, *73*, doi:10.1016/j.tele.2022.101862.

Li, J.; Wu, L.; Qi, J.; Zhang, Y.; Wu, Z.; Hu, S. Determinants Affecting Consumer Trust in Communication With AI Chatbots: The Moderating Effect of Privacy Concerns. *Journal of Organizational and End User Computing* **2023**, *35*, doi:10.4018/JOEUC.328089.

Lim, T. Environmental, Social, and Governance (ESG) and Artificial Intelligence in Finance: State-of-the-Art and Research Takeaways. *Artif Intell Rev* **2024**, *57*, doi:10.1007/s10462-024-10708-3.

Liu, J.; Li, C.; Pan, J.; Guo, J. Visual Communication of Moving Images Based on AI Recognition and Light Sensing Image Edge Detection Algorithm. *Opt Quantum Electron* **2024**, *56*, doi:10.1007/s11082-024-06542-0.

Liu, W.; Zhang, S.; Zhang, T.; Gu, Q.; Han, W.; Zhu, Y. The AI Empathy Effect: A Mechanism of Emotional Contagion. *Journal of Hospitality Marketing and Management* **2024**, *33*, doi:10.1080/19368623.2024.2315954.

Miranda, L.; Garibary, O.O. Approaching (Super)Human Intent Recognition in Stag Hunt with the Naïve Utility Calculus Generative Model. *Comput Math Organ Theory* **2023**, *29*, doi:10.1007/s10588-022-09367-y.

Montag, C.; Ali, R.; Davis, K.L. Affective Neuroscience Theory and Attitudes towards Artificial Intelligence. *AI Soc* **2024**, doi:10.1007/s00146-023-01841-8.

Morais da Silva, D.; Da Costa Farias, R.; Cunha, A.; Salete Casagrande, L.; Antunes Peres, R. History and Legacy of Alan Turing for Computer Science. *International Journal of Scientific Research and Management (IJSRM)* **2024**, *12*, doi:10.18535/ijsrm/v12i02.ec06.

Neupane, S.; Mitra, S.; Fernandez, I.A.; Saha, S.; Mittal, S.; Chen, J.; Pillai, N.; Rahimi, S. Security Considerations in AI-Robotics: A Survey of Current Methods, Challenges, and Opportunities. *IEEE Access* **2024**, *12*, doi:10.1109/ACCESS.2024.3363657.

Norzelan, N.A.; Mohamed, I.S.; Mohamad, M. Technology Acceptance of Artificial Intelligence (AI) among Heads of Finance and Accounting Units in the Shared Service Industry. *Technol Forecast Soc Change* **2024**, *198*, doi:10.1016/j.techfore.2023.123022.

Oladoyinbo, T.O.; Olabanji, S.O.; Olaniyi, O.O.; Adebiyi, O.O.; Okunleye, O.J.; Alao, A.I. Exploring the Challenges of Artificial Intelligence in Data Integrity and Its Influence on Social Dynamics. *Asian Journal of Advanced Research and Reports* **2024**, *18*, doi:10.9734/ajarr/2024/v18i2601.

Oloyede, J. Ethical Reflections on AI for Cybersecurity: Building Trust. *SSRN Electronic Journal* **2024**, doi:10.2139/ssrn.4733563.

Otis, N.; Clarke, R.; Delecourt, S.; Holtz, D.; Koning, R. The Uneven Impact of Generative AI on Entrepreneurial Performance. *SSRN Electronic Journal* **2024**, doi:10.2139/ssrn.4671369.

Panicker, A.; Sasidevan, V. Social Adaptive Behavior and Oscillatory Prevalence in an Epidemic Model on Evolving Random Geometric Graphs. *Chaos Solitons Fractals* **2024**, *178*, doi:10.1016/j.chaos.2023.114407.

Park, S.; Lee, J. yoon; Lee, J. AI System Architecture Design Methodology Based on IMO (Input-AI Model-Output) Structure for Successful AI Adoption in Organizations. *Data Knowl Eng* **2024**, *150*, doi:10.1016/j.datak.2023.102264.

Peng, Y.; Han, J.; Zhang, Z.; Fan, L.; Liu, T.; Qi, S.; Feng, X.; Ma, Y.; Wang, Y.; Zhu, S.C. The Tong Test: Evaluating Artificial General Intelligence Through Dynamic Embodied Physical and Social Interactions. *Engineering* **2024**, *34*, doi:10.1016/j.eng.2023.07.006.

Pirnau, M.; Botezatu, M.A.; Priescu, I.; Hosszu, A.; Tabusca, A.; Coculescu, C.; Oncioiu, I. Content Analysis Using Specific Natural Language Processing Methods for Big Data. *Electronics (Switzerland)* **2024**, *13*, doi:10.3390/electronics13030584.

Prajapati, D.K.; Upadhayay, D.; Kumawat, A.; Shekhawat, A.P. Application of AI Computer Vision and Image Recognition. *Industrial Engineering Journal* **2022**, *51*, doi:10.36893/iej.2022.v51i10.081-087.

Rafique, H.; Nazeer, I.; Rehman, J. The Impact of ChatGPT on Language Evolution: A Linguistic Analysis. *Journal of Education and Social Studies* **2024**, *5*, doi:10.52223/jess.2024.5106.

Sai, S.; Garg, A.; Jhawar, K.; Chamola, V.; Sikdar, B. A Comprehensive Survey on Artificial Intelligence for Unmanned Aerial Vehicles. *IEEE Open Journal of Vehicular Technology* **2023**, *4*, doi:10.1109/OJVT.2023.3316181.

Shaikh Mohd Azhar Mohd Abrar Integrating Artificial Intelligence with Human Psychology. *International Journal of Advanced Research in Science, Communication and Technology* **2024**, doi:10.48175/ijarsct-15250.

Sharma, A.; Lin, I.W.; Miner, A.S.; Atkins, D.C.; Althoff, T. Human–AI Collaboration Enables More Empathic Conversations in Text-Based Peer-to-Peer Mental Health Support. *Nat Mach Intell* **2023**, *5*, doi:10.1038/s42256-022-00593-2.

Simon, J.; Rieder, G.; Branford, J. The Philosophy and Ethics of AI: Conceptual, Empirical, and Technological Investigations into Values. *Digital Society* **2024**, *3*, doi:10.1007/s44206-024-00094-2.

Singh, A.; Kanaujia, A.; Singh, V.K.; Vinuesa, R. Artificial Intelligence for Sustainable Development Goals: Bibliometric Patterns and Concept Evolution Trajectories. *Sustainable Development* **2024**, *32*, doi:10.1002/sd.2706.

St. Amant, R.; Young, R.M. Links: Artificial Intelligence and Interactive Entertainment. *Intelligence* **2001**, *12*, doi:10.1145/378116.378120.

Sufyan, N.S.; Fadhel, F.H.; Alkhathami, S.S.; Mukhadi, J.Y.A. Artificial Intelligence and Social Intelligence: Preliminary Comparison Study between AI Models and Psychologists. *Front Psychol* **2024**, *15*, doi:10.3389/fpsyg.2024.1353022.

Sun, T.Q. Adopting Artificial Intelligence in Public Healthcare: The Effect of Social Power and Learning Algorithms. *Int J Environ Res Public Health* **2021**, *18*, doi:10.3390/ijerph182312682.

Tiwari, R. Ethical And Societal Implications of AI and Machine Learning. *INTERANTIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT* **2023**, *07*, doi:10.55041/ijsrem17519.

Uludag, K. The Use of AI-Supported Chatbot in Psychology. *SSRN Electronic Journal* **2023**, doi:10.2139/ssrn.4331367.

Van Rooij, I.; Guest, O.; Adolfi, F.; De Haan, R.; Kolokolova, A.; Rich, P. Reclaiming AI as a Theoretical Tool for Cognitive Science. *PsyArXiv* **2023**.

Vanhée, L. Organizing Transdisciplinary Research and Innovation: The Case of the Socially-Aware Artificial Intelligence Focus Area. In Proceedings of the CEUR Workshop Proceedings; 2024; Vol. 3634.

Voruganti, S.S.J.; Gadepalli, T.N. Person-Hood Issues Related To Artificial Intelligence. *International Journal For Multidisciplinary Research* **2024**, *6*, doi:10.36948/ijfmr.2024.v06i01.14177.

Wei, Y.; Tyson, G. Understanding the Impact of AI Generated Content on Social Media: The Pixiv Case. **2024**, doi:10.1145/3664647.3680631.

Wided, R.; Alfalih, A.A. Extremism Immunity through Artificial Intelligence Networks: Extremism Awareness and Social Intelligence. *International Journal of Data and Network Science* **2023**, *7*, doi:10.5267/j.ijdns.2022.9.013.

Yetişensoy, O.; Rapoport, A. Artificial Intelligence Literacy Teaching in Social Studies Education. *Journal of Pedagogical Research* **2023**, *7*, doi:10.33902/JPR.202320866.

Zhang, R.; Duan, W.; Flathmann, C.; Mcneese, N.; Freeman, G.; Williams, A. Investigating AI Teammate Communication Strategies and Their Impact in Human-AI Teams for Effective Teamwork. *Proc ACM Hum Comput Interact* **2023**, *7*, doi:10.1145/3610072.

Zhou, B.; Yang, G.; Shi, Z.; Ma, S. Natural Language Processing for Smart Healthcare. *IEEE Rev Biomed Eng* **2024**, *17*, doi:10.1109/RBME.2022.3210270.

Zhou, M.; Lei, L.; Chen, W.; Luo, Q.; Li, J.; Zhou, F.; Yang, X.; Pan, Y. Deep Learning-Based Diagnosis of Aortic Dissection Using an Electrocardiogram: Development, Validation, and Clinical Implications of the AADE Score. *Kardiol Pol* **2024**, *82*, doi:10.33963/v.phj.98880.