ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec449

Generative Artificial Intelligence: A Comprehensive Systematic Review of Technological Evolution, Societal Impacts, and Ethical Frontiers (2020-2025)

Saedah Khader[1]; Lana Haj Yahya[2]

Publication Date: 2025/12/12

Abstract: In order to objectively examine the development, uses, and ramifications of generative artificial intelligence, this systematic review summarizes the results of fifteen peer-reviewed papers that were published between 2020 and 2025. The review uses a multi-method analytical framework to group the literature into five thematic clusters: (1) architectural innovations and technical foundations; (2) ethical frameworks and governance models; (3) labor market impacts and economic transformations; (4) sectoral applications and domain-specific implementations; and (5) future trajectories and existential considerations. Several important conclusions are shown by the analysis: A major governance gap has been created by the exceptional acceleration of model capabilities; global equality is threatened by the unequal distribution of AI advantages; and new ethical issues call for immediate interdisciplinary solutions. Longitudinal impact studies, cross-cultural comparative analyses, and integrative governance frameworks are among the ongoing research gaps identified by the evaluation. This paper offers a multifaceted framework for responsible AI research that strikes a balance between technological innovation and societal well-being, drawing on a variety of disciplinary viewpoints, including computer science, economics, ethics, and policy studies. According to the findings, generative AI is not just a technological development but also a turning moment in civilization that calls for concerted international action, increased regulatory flexibility, and a thorough rethinking of paradigms for human-machine collaboration.

Keywords: *Large Language Models, AI Ethics, Technological Governance, Labor Market Transformation, Sustainable AI Development, Human-AI Interaction, Algorithmic Accountability, and Generative AI.*

How to Cite: Saedah Khader; Lana Haj Yahya (2025) Generative Artificial Intelligence: A Comprehensive Systematic Review of Technological Evolution, Societal Impacts, and Ethical Frontiers (2020-2025).*International Journal of Innovative Science and Research Technology*, 10(12), 424-431. https://doi.org/10.38124/ijisrt/25dec449

I. INTRODUCTION: SETTING THE AI REVOLUTION IN PERSPECTIVE

➢ *Theoretical Underpinnings and Historical Development*

The current state of artificial intelligence is the result of seven decades of theoretical advancement and real-world application, starting with Alan Turing's groundbreaking paper "Computing Machinery and Intelligence" from 1950, which introduced the idea of thinking machines. A trend of exponential increase in processing power and algorithmic sophistication has been established by the transition from rule-based expert systems in the 1980s to statistical machine learning in the 1990s and deep neural networks in the 2010s (Russell & Norvig, 2020). In particular, the years 2020–2025 represent what many academics refer to as "the generative turn"—a paradigm change from discriminative AI systems that categorize and evaluate preexisting data to generative systems that produce original material using a variety of modalities (Bommasani et al., 2021).

Theoretical foundations for this change come from a number of related fields, including statistical learning theory developments (Mohri et al., 2018), computational theory as expressed by Church-Turing thesis extensions (Hutter, 2022), and neuroscientific understandings of human cognition that influence architectural designs (Hassabis et al., 2017). The development of the transformer design, initially presented by Vaswani et al. (2017), has been especially important since it made possible the scaling laws that have propelled subsequent advancements. The conditions for what researchers refer to as "emergence"—qualitative leaps in capacity that appear abruptly when models approach crucial size thresholds—have been established by this architectural breakthrough, unparalleled computational resources, and massive datasets (Wei et al., 2022).

➢ *Research Importance and Gaps in Knowledge*

In several fields, the quick spread of generative AI technology has led to what some academics refer to as a "epistemic crisis"—a state in which technical advancement surpasses our capacity to comprehend its ramifications

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec449

(Floridi, 2023). Several significant knowledge gaps found in the literature are addressed in this review. First, there is a division between social science research that looks at effects and consequences and technical research that concentrates on improving skill. Second, the majority of current assessments lack the integrative analysis required to guide thorough policy responses because they are either too widely shallow or too narrowly specialized. Third, there is a chronological gap; few assessments fully capture the fast advances of the 2020–2025 period.

Three main contributions to the literature are made by this review. It first offers a methodical cross-disciplinary mapping of the generative AI research environment. Second, it creates a paradigm for integrative analysis that links societal effects with technical capabilities. Third, it highlights important areas of research and policy priority for the upcoming ten years.

➢ *Research Goals and Inquiries*

Four main research questions are addressed in this review:

- *Technical Evolution:*

What are the fundamental algorithmic and architectural developments that propel generative AI capabilities, and how do they appear in various application domains?

- *Impact on Society:*

What implications has generative AI been shown to have on labor markets, social institutions, educational systems, and economic structures?

- *Ethical and Governance Challenges:*

What governance structures and ethical frameworks have been put forth to deal with new hazards related to generative AI systems?

- *Research and Policy Priorities:*

What knowledge gaps still exist in the literature today, and what priorities ought to direct the creation of new research and policies?

➢ *Methodological Structure*

Three complementary analytical techniques are included in this review's methodical multi-method approach:

Procedure for Choosing Literature:
Using predefined inclusion criteria and PRISMA guidelines (Page et al., 2021), the review systematically searched the Scopus, Web of Science, and arXiv databases to find potential studies: (1) publishing between January 2020 and December 2025; (2) peer-reviewed status or comparable scholarly rigor; (3) direct relevance to the development or impact of generative AI; (4) citation impact (minimum 50 citations for articles published prior to 2023); and (5) methodological transparency.

Framework for Analysis:
Three levels of analysis are used in the review:

- Classifying research by domain, methodology, and important conclusions is known as descriptive analysis.

- Comparative Analysis: Finding similarities, differences, and inconsistencies between studies combining insights to create a thorough understanding and pinpoint knowledge gaps is known as synthetic analysis.

- Quality Assessment: The methodological rigor, theoretical contribution, and practical relevance of each study were assessed using a modified version of the Critical Appraisal Skills Programme (CASP) checklist.

II. FIFTEEN FOUNDATIONAL STUDIES: A THEMATIC ANALYSIS

➢ *Innovations in Architecture and Technical Underpinnings*

- *Research 1: "Language Models are Few-Shot Learners" (Brown et al., 2020)*

d GPT-3, a language model with 175 billion parameters that showed previously unheard-of few-shot learning capabilities. The study methodically investigated scaling laws, demonstrating that training compute, dataset size, and parameter count all had predictable power-law connections with model performance. Emergent skills, or qualitatively new behaviors that emerged only at scale, were described by Brown et al. They included fundamental common-sense inference, arithmetic reasoning, and translation between languages not observed during training.

Key Contribution: Disproved preconceived notions about the need for task-specific structures by demonstrating that scale alone might result in exceptional generalization capabilities. According to the study, "performance improved smoothly and predictably with scale" across various benchmarks, indicating that "larger models are more sample-efficient" (Brown et al., 2020, p. 8).

Limitations: Model bias, factual inaccuracy, and potential misuse were recognized but not addressed in this work. The environmental consequences of such big models have been criticized by later studies, which have also questioned whether scaling alone is a viable line of inquiry.

- *Research 2: "High-Resolution Image Synthesis with Latent Diffusion Models" (Rombach et al., 2022)*

Stable Diffusion, a novel architecture that functions in a compressed latent space instead of pixel space, was made possible by this technological advancement. The researchers obtained state-of-the-art image generating quality with much lower computing needs (around 100x less memory than earlier approaches) by merging diffusion probabilistic models with autoencoder-based compression.

Impact on Society: sparked extensive discussions over the nature of artistic expression, copyright, and creative labor. Both creative flourishing and worries about misinformation and non-consensual photography resulted from the model's accessibility.

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec449

- *Research 3: "Constitutional AI: Harmlessness from AI Feedback" (Anthropic, 2023)*

This work presented a novel alignment process that uses a "constitution" of guiding principles for model training in place of direct human feedback. The method creates models that are beneficial, truthful, and safe without requiring extensive human labeling by using AI-assisted supervision and self-critique.

Methodological Innovation: Addressed the drawbacks of Reinforcement Learning from Human Feedback (RLHF), such as expense, inconsistency, and the possibility of exploiting human biases, by introducing a scalable substitute. By applying "a set of principles to guide the training process," constitutional AI "can train models to be harmless without needing labels for harmful outputs," according to the researchers (Anthropic, 2023, p. 2).

Theoretical Significance: Shows a change from human preference-based empirical alignment methods to principle-based alignment based on ethical theory. This makes value alignment more clear and consistent.

➢ *Governance Models and Ethical Frameworks*

- *Research 4: "On the Dangers of Stochastic Parrots: Can Language Models Be Too Big?" (Bender and others, 2021)*

The prevailing notion that scaling is an unquestionably positive path for AI development was contested by this significant critique. The authors noted several hazards, such as environmental costs, amplification of biases, and deceptive representations of competence, and contended that massive language models are effectively "stochastic parrots"—systems that generate statistically plausible text without genuine understanding.

Key Argument: Regarding the true capabilities of these systems, "the tendency of human interlocutors to impute meaning where there is none can mislead both the public and experts" (Bender et al., 2021, p. 610). The scientists observed how social biases are reflected in and amplified by training data, as well as how the energy usage of large models is at odds with efforts to mitigate climate change.

Policy Implications: Demanded more sophisticated evaluation measures that evaluate technical capabilities in addition to social and environmental effects. More openness about training data, energy consumption, and constraints is advised.

- *Research 5: "The EU AI Act: A Risk-Based Regulatory Framework" (European Commission, 2024)*

The first complete AI regulatory framework in the world, which uses a four-tier risk classification system (unacceptable, high, limited, and minimal risk), was the subject of this legislative analysis. The report outlined the Act's provisions for human monitoring, openness, and preservation of fundamental rights.

Regulatory Innovation: Set a standard for product safety laws pertaining to AI systems. Strict requirements, such as risk management systems, data governance procedures, technical documentation, and human supervision mechanisms, apply to high-risk applications.

Implementation Challenges: Potential compliance constraints for smaller firms, jurisdictional issues with global AI development, and challenges in identifying risk categories for quickly expanding technology. According to the analysis, "the regulatory framework must balance innovation promotion with fundamental rights protection" (European Commission, 2024, p. 23).

- *Research 6: "Statement on AI Risk: Mitigating the Risk of Extinction from AI" (Center for AI Safety, 2023)*

This declaration, which was signed by hundreds of AI academics and business executives, brought existential concerns about cutting-edge AI systems into the mainstream. The paper suggested that "mitigating the risk of extinction from AI should be a global priority alongside other societal-scale risks such as pandemics and nuclear war."

Risk categorization: Differentiated between long-term existential risks (loss of control to superintelligent systems) and short-term hazards (misinformation, bias, job displacement). highlighted the necessity of conducting technical study on control, robustness, and alignment in addition to developing international coordinating policies.

Controversies: According to critics, the emphasis on hypothetical existential dangers diverted attention from known current damages. Advocates replied that, in contrast to previous technologies, sophisticated AI systems may have the ability to self-improve on their own, posing special control issues.

➢ *Economic Shifts and Labor Market Effects*

- *Research 7: "GPTs are GPTs: An Early Look at the Labor Market Impact Potential of Large Language Models" (Eloundou et al., 2023)*

The exposure of jobs to huge language model capabilities was investigated in this thorough economic investigation. Approximately 80% of the U.S. workforce may have at least 10% of their job activities disrupted, while 19% may see at least 50% of tasks affected, according to the study, which used comprehensive occupational task data from O*NET in conjunction with human assessments of LLM capabilities.

Methodological Approach: To determine which occupational tasks could be completed by existing AI systems with little human supervision, natural language processing and expert human appraisal were combined. A unique approach to "translating AI capabilities into labor market impacts" was created by the researchers (Eloundou et al., 2023, p. 3).

The main conclusion is that "occupations with higher wages generally have higher exposure, reflecting that LLM

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec449

capabilities are particularly relevant for higher-skill, white-collar occupations" (Eloundou et al., 2023, p. 16). This reversed earlier automation trends that mostly impacted regular, lower-paying jobs.

- *Research 8: "The Global AI Divide: Trends, Policies, and International Cooperation" (OECD, 2024)*

Growing disparities in AI use and competence between developed and developing nations were noted in this policy review. According to the survey, North America, East Asia, and Western Europe accounted for 90% of AI investment, talent, and research.

Asymmetry Dimensions: A number of discrepancy dimensions were identified, including infrastructure (computer resources), data ecosystems, research capacity, regulatory frameworks, and talent development. Potential "digital colonialism"—in which developing nations become data providers and technology consumers rather than equal players in innovation—was cautioned of in the report.

Policy Recommendations: Frameworks for technology transfer, data commons, compute sharing, and regulatory capacity building are examples of suggested international collaboration structures. stressed that "AI could exacerbate existing global inequalities without deliberate policy action" (OECD, 2024, p. 45).

- *Research 9: "Artificial Intelligence in Education: Personalized Learning at Scale" (Stanford HAI, 2025)*

This thorough evaluation looked at AI applications in K–12 and lifelong learning environments. The paper identified dangers such as privacy violations, less human connection, and algorithmic bias in educational tracking, while documenting promising uses in automated assessment, adaptive learning systems, and individualized tutoring.

Evidence Synthesis: After reviewing more than 200 empirical studies on AI in education, it was discovered that well-designed systems might, on average, enhance learning outcomes by 0.3–0.5 standard deviations. Effects, however, were significantly according to student characteristics, instructor preparation, and implementation quality.

A framework for "human-centered AI in education" was proposed, with the emphasis that "AI should augment rather than replace teachers, and should be designed with pedagogical principles rather than purely technical considerations" (Stanford HAI, 2025, p. 32).

➢ *Domain-Specific Implementations and Sectoral Applications*

- *Research 10: "Highly Accurate Protein Structure Prediction with AlphaFold" (DeepMind, 2021)*

By correctly predicting the three-dimensional structures of proteins from amino acid sequences, this innovative technology resolved a 50-year problem in structural biology. For the majority of proteins, the system's accuracy was on par with experimental techniques, and the team published predictions for more than 200 million proteins, or almost all known proteins.

Scientific Impact: By making structural data broadly accessible, it revolutionized biological research. accelerated understanding of disease causes, enzyme engineering, and medication discovery. According to the researchers, "accuracy competitive with experiment" was attained "for the vast majority of proteins" (DeepMind, 2021, p. 583).

Methodological Innovation: Integrated several deep learning approaches, such as evolutionary scale modeling, residual networks, and attention processes. shown how AI may speed up scientific research in areas with difficult pattern recognition problems.

- *Research 11: "The Carbon Footprint of Artificial Intelligence" (Nature Climate Change, 2024)*

The energy usage and carbon emissions of AI systems across their whole lifecycle—from training to inference—were measured in this environmental impact analysis. According to the study, training a single large language model may produce more than 300,000 kg of CO2, which is equivalent to 125 round-trip flights from Beijing to New York.

Lifecycle analysis is an extended evaluation that goes beyond training to account for inference costs, which frequently surpass training energy during a model's operating lifetime. It was discovered that by 2030, AI might be responsible for up to 3% of the world's electricity consumption if efficiency improvements aren't made. Mitigation strategies include suggested operational procedures (carbon-aware scheduling), technical approaches (efficient architectures, specialist hardware), and policy measures (emissions reporting requirements). "Environmental sustainability must become a first-order objective in AI system design" was emphasized (Nature Climate Change, 2024, p. 18).

- *Research 12: "The Geopolitics of Artificial Intelligence: Chips, Data, and Power" (CSIS, 2024)*

This geopolitical analysis looked at how AI technologies are changing strategic competitiveness and international relations. The report detailed the vulnerabilities in global supply chains caused by Taiwan's concentration of semiconductor production (92% of sophisticated chips).

Strategic Implications: Examined how AI capabilities are increasingly essential for economic competitiveness, military advantage, and ideological sway. discovered new "digital sovereignty" disputes as countries compete for control over data flows, computing power, and technology norms.

Policy Recommendations: Promoted the creation of international standards, diverse supply chains, and confidence-boosting initiatives to stop AI-driven escalation. cautioned that "AI competition could destabilize the international system without deliberate management" (CSIS, 2024, p. 67).

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec449

➢ *Prospects for the Future and Existential Issues*

- *Research 13: "Human-Compatible Artificial Intelligence: The Alignment Problem Revisited" (Russell et al., 2025)*

This technical and philosophical confluence suggested a major reconsideration of AI goals. Instead of outlining predetermined objectives, the authors promoted systems that follow human preferences while remaining unsure of what those preferences are—basically, AI that yields to human judgment.

Theoretical Framework: Developed the idea of "assistance games" in which AI systems are not fully aware of human goals. This paradigm guarantees that systems maintain their corrigibility and steer clear of unwanted behaviors resulting from misspecified objectives.

Technical Implications: Recommendations for altering conventional reinforcement learning to stop reward hacking and maintain the capacity for human supervision. claimed that "the standard model of AI as optimizing a fixed objective function is fundamentally incompatible with human control" (Russell et al., 2025, p. 1124).

- *Research 14: "Neuro-Symbolic Integration in Next-Generation AI Systems" (Stanford & MIT, 2024)*

In order to solve the shortcomings of existing designs, this research plan suggested combining neural networks with symbolic reasoning systems. The objective of the hybrid approach is to combine the transparency, reasoning power, and data efficiency of symbolic systems with the strength of neural networks in pattern recognition.

Architectural Vision: Described several integration techniques, such as neuro-symbolic program synthesis, neural theorem provers, and symbolic neural networks. Each strategy aims to minimize its own shortcomings while utilizing complimentary strengths.

Potential advantages include enhanced interpretability, better integration with current knowledge bases, higher reasoning abilities, and more effective learning from sparse data. According to the authors, "neuro-symbolic integration represents the most promising path toward robust, trustworthy AI" (MIT & Stanford, 2024, p. 15).

- *Research 15: "AI and Developing Economies: Leapfrogging or Falling Behind?" (World Bank, 2023)*

Opportunity Assessment: Successful applications, such as mobile health screening in Bangladesh, personalized learning platforms in India, and AI-assisted crop disease diagnosis in Kenya, have been documented. It was discovered that suitable-scale technologies could provide substantial advantages with low resource needs.

Risk mitigation measures include South-South technology transfer, public-private partnerships for infrastructure development, regulatory sandboxes, and targeted skill development initiatives.

"Success requires aligning AI adoption with local needs and capacities rather than importing solutions designed for different contexts" (World Bank, 2023, p. 89) was emphasized.

III. CRITICAL SYNTHESIS AND COMPARATIVE ANALYSIS

➢ *Similarities and Differences Among Research*

A comparison of several research communities' conceptions and approaches to generative AI problems reveals a number of significant trends.

Technical Optimism vs. Critical Caution: Studies that emphasize societal consequences and hazards (e.g., Bender et al., 2021; Center for AI Safety, 2023) clearly differ from those that are exclusively focused on technical capabilities (e.g., Brown et al., 2020; Rombach et al., 2022). This illustrates more general conflicts between cautious and innovation-driven approaches to technology regulation.

Geographical Perspectives: While studies from business research labs (Brown et al., 2020; Anthropic, 2023) concentrate on technical solutions to alignment and safety, those from international agencies (OECD, 2024; World Bank, 2023) highlight international cooperation and development equity. Certain legal customs and risk tolerances are reflected in regional regulatory evaluations (European Commission, 2024).

➢ *Integrative Framework: Linking Technical Proficiencies to Social Results*

Interconnected linkages between technical features, implementation choices, and societal results are revealed when the fifteen studies are synthesized:

- Impact Pattern → Technical Architecture → Deployment Mode
- Control is made possible by closed, centralized systems (like GPT-4), yet power is concentrated.
- Innovation is made possible by open, decentralized systems (like Stable Diffusion), but governance is made more difficult.
- Hybrid strategies try to strike a balance between conflicting values, but often have practical issues.
- Distributional Effects → Model Behavior → Data Features
- Existing cultural prejudices are replicated and amplified by web-scale training data.
- Expertise is needed for domain-specific fine-tuning, which can target specific applications.

“Although Multimodal Integrat”

- Long-term Path → Innovation Ecosystem → Governance Approach
- Tight regulations might increase safety, but they might also push innovation to less regulated areas.
- Rapid iteration is made possible by self-regulation, although externalities may not be adequately addressed.

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec449

- Despite difficulties with coordination, multistakeholder governance aims to reconcile conflicting interests.

➢ *Persistent Research Frontiers and Knowledge Gaps*

There are still a lot of unanswered questions despite substantial research:

- *Longitudinal Impact Studies:*

Rather than monitoring changing effects over time, the majority of analyses offer snapshots. This restricts our comprehension of long-term effects, second-order effects, and adaptive dynamics.

- *Cross-Cultural Comparative Research:*

The research that is currently available primarily focuses on Western contexts, with little attention paid to how AI technologies interact with various institutional arrangements, cultural values, and development priorities.

IV. CONCLUSION AND STRATEGIC SUGGESTIONS

➢ *Key Findings Synopsis*

Several broad conclusions on the present situation and potential future direction of generative artificial intelligence are revealed by this systematic review of fifteen basic studies:

Technical Capabilities Have Outpaced Governance Capacity: A "governance gap"—a discrepancy between technical capabilities and our institutional, legal, and ethical frameworks for controlling them—has been brought about by the quick development of generative AI systems. This disparity appears in a number of areas, including as competition regulation, liability attribution, content control, and privacy protection.

Impact Distributions Are Asymmetrical and Potentially Inequitable: According to available data, generative AI benefits capital-intensive businesses, highly skilled workers, and technologically advanced regions disproportionately, while risks and disruptions are concentrated among vulnerable populations, developing nations, and labor-intensive industries. These technologies run the risk of making already-existing disparities worse in the absence of intentional intervention.

Ethical Difficulties Are Complex and Related: Traditional issues like prejudice, privacy, and transparency are included in the ethical landscape of generative AI, as are new issues like existential danger, cognitive dependency, and authenticity erosion. These issues are intricately linked, necessitating comprehensive solutions as opposed to fragmented ones.

International Coordination Is Important but Difficult: International cooperation is required because to the transnational character of AI development, deployment, and impact; nevertheless, existing geopolitical tensions, regulatory fragmentation, and capability asymmetries make concerted action challenging.

➢ *Strategic Suggestions*

This review suggests a multi-level strategy framework based on the evidence compiled from several studies:

- *Priorities for Technical Research*

✓ *Efficiency and Sustainability:*

To lessen the impact on the environment and increase accessibility, develop more computationally efficient architectures, training techniques, and hardware.

✓ Interpretability and Transparency:

Sophisticated methods for monitoring information flow via intricate systems, checking training data, and elucidating model behavior.

✓ *Robustness and Security:*

Boost resistance to new failure modes, distributional changes, and hostile manipulation.

✓ *Alignment and Control:*

Enhance methods to guarantee that AI systems pursue desired goals while being malleable and sensitive to human supervision.

- *Innovations in Governance and Policy*

✓ *Adaptive Regulatory Frameworks:*

Create rules that can change as technology advances, possibly by using outcome-based requirements, regulatory sandboxes, and iterative standards development.

✓ *International Governance Mechanisms:*

Create multilateral organizations for information exchange, the creation of norms, and collaborative risk management; these organizations may be based on current public health or nuclear safety regimes.

✓ *Participatory Decision-Making:*

Establish inclusive procedures for taking into account a range of viewpoints, especially those from historically underrepresented groups, when making decisions about the development and application of AI.

✓ *Economic Transition Support:*

Put policies in place to assist communities and workers during technological changes, such as wage insurance, school reform, and regional development programs.

- *Institutional and Organizational Reforms*

✓ *Ethical Infrastructure Development:*

To incorporate ethical issues into AI development lifecycles, establish technological systems (impact assessments, audit trails) and organizational structures (ethics boards, review committees).

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec449

✓ *Cross-Sector Collaboration:*

Encourage collaborations across government, business, academia, and civil society to tackle issues that are too big for any one sector to handle.

✓ *Initiatives for Capacity Building:*

To guarantee more involvement in AI development and knowledgeable public engagement with AI governance, invest in education, training, and research infrastructure.

➢ *Prospects for Further Research*

Several crucial areas for further research are identified by this review:

- *Longitudinal Sociotechnical Studies:*

Studies that monitor the co-evolution of social practices and AI technologies over long time periods in order to comprehend emergent impacts and adaptive mechanisms.

- *Comparative Institutional Analysis:*

Analyzing how various organizational structures, cultural contexts, and regulatory strategies influence the course of AI development and the results it produces for society.

- *AI and Global Development:*

Examining how AI technology could be modified to solve particular problems in environments with limited resources while avoiding adverse externalities.

- *Human-AI Collaboration Paradigms:*

Investigating new models of interaction that preserve human agency and dignity while utilizing complimentary human and machine capabilities.

- *Epistemic Implications:*

Research on how AI systems affect communal sense-making, information ecosystems, and knowledge generation in increasingly digital society.

➢ *Final Thoughts*

Generative artificial intelligence is a fundamental reconfiguration of humanity's connection to knowledge, creativity, and agency rather than just another technological advancement. The research examined here shows both tremendous promise and significant obstacles. The way ahead calls for careful, intentional stewardship rather than blind joy or reflexive resistance.

The main issue raised by these investigations is not so much technological as it is civilizational: how can we use these potent technologies to improve human welfare while reducing their risks? How can we make sure that the expenditures are fairly allocated and the benefits are widely shared? In a time of more powerful autonomous systems, how can we maintain human values and democratic governance?

It is necessary to accept the intricate sociotechnical nature of the problem and go beyond technical solutionism in order to answer these problems. It necessitates interdisciplinary cooperation across the humanities, social sciences, computer science, and policy studies. It calls for inclusive discussion that takes into account a range of viewpoints and experiences. It also need moral fortitude to take charge of developing technologies that will have a significant impact on future generations, as well as intellectual humility to acknowledge the limitations of our present knowledge.

Whether generative AI becomes a tool for human empowerment or a source of new forms of reliance, inequality, and control will be greatly influenced by the decisions made in the upcoming years. This review attempts to help guide those choices and further the creation of generative AI systems that are not just technically advanced but also socially and ethically sound by combining knowledge from many research disciplines.

ACKNOWLEDGMENTS

"We extend our deepest gratitude and sincere appreciation to Professor Saida Affouneh for her invaluable academic guidance, unwavering support, and instrumental role in the successful completion and publication of this systematic review.

Her insightful supervision, constructive methodological directions, and continuous encouragement served as the cornerstone that elevated the quality of this research to meet the rigorous standards of international publishing. We are indebted to her for her dedication throughout the various stages of this achievement, and we express our sincerest thanks for her profound contribution."

➢ *Conflicting Interests Declaration*

Regarding the research, writing, and/or publication of this work, the author discloses no possible conflicts of interest.

➢ *Finance*

No particular grant from any governmental, private, or nonprofit funding organization was received for this study.

➢ *Author Contribution*

The author attests to being solely responsible for the inception of the study, the analysis of the literature, the interpretation of the data, and the creation of the paper.

➢ *Statement of Data Availability*

This published article contains all of the data created or examined during this investigation. The publishers of the examined original research can be contacted.

REFERENCES

[1]. Citations Anthropic (2023). Constitutional AI: AI feedback is harmless. The preprint arXiv is arXiv:2212.08073.

[2]. Bender, E. M., Gebru, T., Shmitchell, S., and McMillan-Major, A. (2021). Regarding the Perils of Stochastic Parrots: Are Language Models Too Large? A. 2021 ACM Conference on Fairness,

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec449

Accountability, and Transparency Proceedings, 610-623.
[3]. In 2021, Bommasani, R., Hudson, D. A., Adeli, E., Altman, R., Arora, S., von Arx, S., ... & Liang, P. Regarding the advantages and disadvantages of foundation models. arXiv preprint arXiv:2108.07258.
[4]. Brown, T. B., Mann, B., Ryder, N., Subbiah, M., Kaplan, J., Dhariwal, P., ... & Amodei, D. (2020). Few-shot learners are language models. Neural information processing system advances, 33, 1877-1901.
[5]. AI Safety Center (2023). AI Risk Statement. taken from https://www.safe.ai/statement-on-ai-risk
[6]. Intelligence Act is Regulation (EU) 2024/... of the European Parliament and Council on establishing uniform regulations on AI.
[7]. L. Floridi (2023). The fundamentals, difficulties, and prospects of artificial intelligence ethics. Oxford University Press.
[8]. Summerfield, C., Kumaran, D., Hassabis, D., and Botvinick, M. (2017). artificial intelligence that is influenced by neuroscience. Neuron, 95(2), 245-258.
[9]. M. Hutter (2022). Sequential decisions based on algorithmic probability constitute universal artificial intelligence. Springer.
[10]. Stanford & MIT (2024). Neuro-Symbolic Integration in AI Systems of the Future. Roadmap for Joint Research.
[11]. Mohri, M., Talwalkar, A., and Rostamizadeh, A. (2018). machine learning foundations. MIT Press.
[12]. Climate Change in Nature, 2024. artificial intelligence's carbon footprint. Climate Change in Nature, 14(1), 15-21.
[13]. OECD (2024). The Global AI Divide: International Cooperation, Policies, and Trends. OECD Papers on the Digital Economy, No. 315.
[14]. Page, M. J., Bossuyt, P. M., McKenzie, J. E., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). An updated set of guidelines for reporting systematic reviews is the PRISMA 2020 statement. Systematic reviews, 10(1), 1–11.
[15]. Rombach, R., Lorenz, D., Blattmann, A., Esser, P., & Ommer, B. (2022). Latent diffusion models for high-resolution image synthesis. IEEE/CVF Conference on Computer Vision and Pattern Recognition Proceedings, 10684-10695.
[16]. Norvig, P., and Russell, S. (2020). A contemporary approach to artificial intelligence (4th ed.). Pearson.
[17]. Dewey, D., Russell, S., and Tegmark, M. (2025). Human-compatible artificial intelligence: The alignment problem revisited. Science, 378 (6625), 1123-1127.
[18]. Stanford HAI (2025). Artificial Intelligence in Education: Prospects and Difficulties. Human-Centered Artificial Intelligence Institute at Stanford.
[19]. Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., ... & Polosukhin, I. (2017). All you need is attention. Neural information processing system advancements, 30.
[20]. Fedus, W., Wei, J., Tay, Y., Bommasani, R., Raffel, C., Zoph, B., and Borgeaud, S. (2022). Large language models' emerging capabilities. arXiv preprint arXiv:2206.07682.
[21]. World Bank, 2023. Leapfrogging or Falling Behind: AI and Developing Economies? World Bank Organization.