



Toward Human-Level Artificial Intelligence: Technological Foundations and Trajectories

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Abstract:

Background of study: Human-Level Artificial Intelligence (HLAI) represents one of the most formidable dreams in laptop technology, aiming to create structures able to cognition, perception, and reasoning similar to people. Despite splendid development in slender AI programs, the development of Artificial General Intelligence (AGI) remains confined by conceptual, technical, and moral demanding situations.

Aims and scope of paper: This paper pursuits to analyze the theoretical foundations, technological enablers, and ethical dimensions of HLAI. It seeks to distinguish HLAI from slender AI and to make clear the clinical, engineering, and societal problems concerned in constructing structures with human-like intelligence.

Methods: The have a look at adopts a conceptual and literature-based totally method, synthesizing insights from synthetic intelligence, cognitive science, neuroscience, and ethics. Key frameworks and latest research are reviewed to pick out common concepts, technological developments, and unresolved challenges shaping the evolution of HLAI.

Result: The evaluation highlights essential enablers which include device gaining knowledge of, herbal language processing, laptop vision, and robotics as important pathways in the direction of HLAI. Findings screen that at the same time as development in these domain names is good sized, reaching popular intelligence calls for deeper integration of cognitive modeling, neural architectures, and moral alignment mechanisms.

Conclusion: The study shows that collaboration across sectors and designs with principles and safety in mind are important steps to create artificial brains that are robust and reliable. This underlines the need for ethical governance and adaptation of human values to cushion the risk associated with uncontrolled AI development.

Keywords: AI Ethics; Artificial General Intelligence; Cognitive Science; Human-Level Artificial Intelligence; Machine Learning.

1. INTRODUCTION

Narrow artificial intelligence (AI) is currently demonstrating superiority in specific fields around the world. Nevertheless, many permanent and complex questions related to General AI still remain largely unclear. This circumstance is unfortunate, given that the ambition of creating 'Intelligent Agents' was instrumental in the inception of the AI field. Machines possessed of human-level general intelligence could profoundly transform societal frameworks, carrying the potential for both advantageous and adverse

consequences. When Small AI begins to reappear, the research society expresses significant concerns for the time, technological development and underlying character of the upcoming AI level AI. The advent of thinking machines capable of human-level cognition holds the promise of unleashing previously unimagined capabilities and opportunities, yet, if left unchecked, it may also precipitate catastrophic outcomes. The pace of this transition is entirely dependent on what humans decide to do, and the choices we make. Nevertheless, surveys and other studies indicate that people and organizations do not consider the advent of Human-Level AI (HLAI) to be near (Zhang & Dafoe, 2019). This makes sense: fast progress in solving certain problems like natural language processing or computer vision does not necessarily raise hopes towards HLAI, as it would require assembly of many different mental faculties on a high level. This is reminiscent of the Wright brothers: they did FIRST powered flight in 1903, but it was a long time until the world around them believed powered flight was practical, embarrassing because such breakthroughs taken in isolation do not always lead quickly, and indeed at all, to expectations of great change. It may be asserted that the concepts of being either too early or too late are not

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wholly distinct from the gradual tipping points of disaster previously outlined. Some proponents argue that human beings exhibit irrationality and are indifferent to long-term repercussions; relying on technological remedies in the face of looming catastrophe is viewed as imprudent. Rather, it may be more judicious to acknowledge the constraints imposed by an eternal and unfathomable Nature, and to focus our endeavors on improving our existence within these limitations. It is clear that studies in Artificial General Intelligence (AGI), geared toward growing machines with human-degree intelligence and cognition, is based totally on a stochastic paradigm wherein AI isn't always predetermined with the aid of the fate of its human creators.

The history of synthetic standard intelligence (AGI) is marked by using numerous competitions. Some have accomplished widespread visibility earlier than fading away, while others persist as lesser-known members to their discipline. Additionally, some stay at the periphery of mainstream discourse, conducting a completely unique opposition to pursue increasingly bold goals. Observers reflecting on earlier trends in terms of current techniques and technologies can also show off a feel of irony, suggesting that contemporary advancements render beyond efforts inferior.

1.1 Historical Context of Artificial Intelligence

The idea of a synthetic intelligence just like human intelligence dates returned to ancient Greece. This idea didn't come the real proper away. As the improvement of formal common sense, arithmetic, pc technology, and even psychology and neuroscience, which can be stipulations to AI, blossomed, the belief of making machines "assume" flourished among researchers in the early 1950s, while computer systems have been invented and started to be used. AI as a proper field of take a look at commenced within the summer of 1956 on the Dartmouth summer research challenge on AI.

Over the past fifty years, along the individuals accountable for the development of era, artificial intelligence has navigated a complex and hard direction. It has been more than ten years for the reason that ultimate period of full-size growth. Currently, it seems that this realm of technology and era has entered a phase harking back to a harsh winter, a phenomenon no longer with- out precedent inside the annals of sci Historical instances such as the decline of natural philosophy, the disintegration of the phlogiston theory, and the diminishment of various branches of mathematics serve as comparable illustrations. Conversely, the domain of AI has continued to receive various subsidies, primarily funded by military and security research budgets, a situation that is not necessarily conducive to the health of a scientific discipline (Harguess & Ward, 2022).

One cannot deny that AI has made a lot of contributions and progress on many specific tasks in its first half-century of research. The ability of machines in playing games and various competitive scenarios, in

pattern recognition, in data mining, and in many other aspects appears to be on par with or even surpassing that of humans to some extent. Nevertheless, neural networks, deep learning, and related models are exclusively used for formal IQ in the narrow sense, not the broad sense (Rawal et al., 2021). The successes of utilitarian AI are nothing but highly-powered tools, fundamentally different from artificial, robotic, or, suspense fully, post-human intelligence. In fact, recent years have seen serious, and sometimes ethical, implications, drawbacks, and even terrible consequences of such applications of machine intelligence.

1.2 Defining Human-Level Artificial Intelligence

The terms artificial general intelligence (AGI) and human-level artificial intelligence (HLAI) have been generally used interchangeably to refer to the Holy Grail of artificial intelligence (AI) research. This is the creation of the Intelligent Machine, or alternatively put, a machine capable of achieving goals in a wide range of environments (Islam, 2024). AGI is a more specific and difficult research objective because it must match not only the possibilities but also the actual ways people process information. And even if a system could act like a human, it would have to do things differently than biological intelligence does. A model may generate variations of how the left hemisphere of the human brain produces speech; however, these words would lack the experiential foundation necessary to convey genuine thoughts or emotions.

In this context, we ought to regard concepts such as sentience, consciousness, and self-awareness as philosophical matters within the AGI/HLAI discourse. These suggest that delineating the concept of 'human-like' intelligence constitutes both an interpretive and ethical challenge, as well as a series of particular technological or technical stipulations important for the development of 'clever' systems. This department highlights the special project of HLAI research, which have to deal with not only the superficial targets of computation but additionally the profound inquiries regarding human cognition. HLAI can hence be in addition described as intelligence that is similar to human intelligence, both in its skills and internal mechanisms, to the point of getting indistinguishable output to an outside observer (Emmanuel et al., 2022).

An essential distinction to be made is between robust AI and narrow AI systems, specifically regarding their respective performance competencies. It is predicted that the latter will continue to improve; however, the former is not likely to develop in its present day shape. The development of High-Level Artificial Intelligence (HLAI) may additionally render all human and slim AI abilities obsolete, a lot as hyperinflation has diminished the cost of fiat currencies. In this context, reliance on unquantifiable principles consisting of "sentience," "cognizance," and "self-awareness" turns into a essential issue of debate. This announcement aims to provide a comprehensive information of the importance of this difficulty, emphasizing the want to

keep away from untimely realistic issues, which can also be difficult to understand adherence to the precautionary precept regarding results of good sized moral and instrumental price (Stolpe & Hallström, 2024).

1.3 Key Technologies Enabling AI Advancement

Smart User Interfaces: Future interfaces should use all technologies that have something to do with the brain and the senses and motor actions of people. You should be able to interact with speech and gestures, not just text, a mouse, a pen, and touch. Audiobooks, automated transcription, and question-and-answer systems are just a few examples of how AI is bringing us into the audio age. Artificial intelligence tools that can read and understand complex descriptions and make multimedia presentations, detailed home cooking encyclopedias, and better audio analyses are important for making it easier to explore data. Also, interfaces must give users access to AI interpretations along with the changing foundational data models. This will make it easier to debug and analyze models. These improved environments may necessitate the development of novel multimodal (MAI) code representations that integrate both formal models and audiovisual elements (Gil & Selman, 2019).

The need for AI systems to work with people will lead to research into human-AI interfaces, including how people and AI can interact and explain things, what standards and criteria need to be met for implementation, and a general description of how people and AI can work together. New interactive modeling environments will make it easier for AI experts to make models. These environments will include tools for stories-based structured modeling and declarative methods such as agents, as well as a combination of numerical solvers, GIS and 3D visualizers. This will include research on the sensitivity and robustness of AI systems when data or assumptions about the world's change or are not matched, especially in high-risk areas where things change rapidly and unpredictably.

For deploying methods learned, AI systems will be equipped with the ability to consider/originate multiple options at every decision point. They will manage exploration-exploitation trade-offs in acquiring or using sensors, experiment preventives, or changing data models. A major AI technology will permit the automatic design/evolution of algorithms suited for given tasks and datasets. They will affect all types of tasks and numerous domains. Logical bootstrap and maintainable general-purpose learning will be a majority of AI applications usable without expert intervention. Conversely, AI will need to manage social and data responsibilities or knowledge attribution disputes, concurrent innovations in legislation and social dynamics will apply harsh social sanity checks to many AI creations, requiring lots of human resources to comply in high-risk applications (Vasconcelos et al., 2023).

1.3.1 Machine Learning

Given that humans are conditioned through trial and error and learn incessantly from experience and interaction with the environment, it is very surprising that there is no machine-learning equivalent to this experience-based, physical interaction approach to learning, one that transforms low-level sensory signals into usable knowledge (Shafiq et al., 2021). There is no current machine-learning algorithm that fully mimics the human paradigm of learning and interacting with the physical world. Reinforcement learning and robotics are fields where people are directly trying to model the sort of interaction-driven learning between perception and action, but they have much more case-specific limitations, which again pales in comparison to the breadth of biological intelligence. Accomplishing anything like that sophisticated a learning capability is going to take a more complete theory of intelligence than we have now. Currently, even state-of-the-art algorithms achieve only superhuman performance in highly compressed domains (like virtual games), while still struggling to operate real-world high-dimensional freedom robots in real time. Despite this, much progress has been made in machine-learning particularly in the past decade with if not billions then at least hundreds of thousands of immensely powerful "learning machines" being deployed and utilized world-wide. However, even the largest and most capable of these massive machine-learning models have no perceivable conception of understanding, have no comprehension or insight into what they are learning, and have no cognitive agency whatsoever in terms of deciding what to learn from the environment and what to learn next. It is generally accepted that such narrow artificial intelligence is miles away from true artificial general intelligence. How far this is, and even if it is possible at all, is the subject of the following substratum regarding the matter of most profound complexity. Nevertheless, it is hoped that teasing apart and understanding what is known regarding biological intelligence may provide some guidelines on how to proceed toward that goal. It is also hoped that by unveiling some of the scientific mysteries of intelligence, some concrete technical options that fall within the realm of possibility may also come to light that could be pursued in earnest. One thing is undeniable. Despite the limitations discussed, a great deal has already been accomplished in machine-learning particularly during the past decade (Rajasekar et al., 2022).

1.3.2 Natural Language Processing

Natural Language Processing (NLP) aims at permitting a machine to understand Natural Language (NL) input. A conversational agent is a program capable of communication with humans using Natural Language. Most people interact with computer aids through graphical user interfaces; but the future seems to be to use conversational agents accessible through voice/human language interfaces. Since ELIZA, the first conversational agent ever built in the 60s, researchers have been trying to make machines understand Natural Language input (Coheur, 2020).

Many different systems have been developed, from small talk software to software aimed to accomplish some specific task. Nevertheless, no conversational agent in use today could be classified as having the same abilities in dialogue capacity as even that of young children, a result that may seem strange in view of the huge amount of research carried out in NLP.

A conversational agent may be defined as a program that, given an NL input (written/oral), has to produce an output in Natural Language. Many different modules are involved, being the first ones (and probably the most challenging) those dealing with the interpretation of the input. These aim to convert the raw input (written or oral text) into a representation of knowledge, which may be either a semantic representation or an at least partly structured representation. Model-based systems rely on knowledge bases containing information about either concrete things, being a sort of object-ontology or abstract knowledge. In case of task-oriented agents, the knowledge base would include all the necessary information to accomplish a task. In a dialogue-based agent, it would contain information about the conversational partner and about how to succeed in particular tasks.

1.3.3 Computer Vision

Computer vision (CV) technologies have been widely researched by a variety of disciplines to support such labor-intensive and time-consuming tasks like the recognition, detection, localization, tracking and counting of critical objects. Following the age of deep learning, CV increasingly adopted techniques from the field of artificial intelligence to either augment or automate currently laborious tasks to extract a significantly larger amount and variety of useful information from images for subsequent decision support and automation of business processes. To fully leverage the potential that CV offers through the incorporation of AI, a holistic design of human-machine-collaboration systems, which encompasses important socio-technical facets, is needed to overcome common barriers for the adoption of AI technology, such as mistrust in the reliability of AI output, lack of transparency in decision-making, and unintended audience by over-trust in the capabilities of AI or misuse of final outputs.

Nonetheless, when designing AI-based CV systems, the focus of extant research is often exclusively on the technical side while important socio-technical facets, such as trust, control and autonomy, that have already been identified as central for various other sub-fields of AI remain neglected. Thereby, design knowledge is accumulated on how important socio-technical facets have to be understood, measured and translated into feasible ex ante design principles for the design of human-machine-collaboration systems. The derived meta-requirements and design principles present valuable design knowledge for the holistic design of AI-based CV systems that helps to overcome prevalent adoption barriers and thus supports the tumbling

diffusion of this promising technology across industries and disciplines. The consideration of the socio-technical facets of AI-based CV systems is of utmost importance to retain and strengthen the adoption of a technology that has the potential to create high societal and economical value.

The long-term goal of computer vision research is to create a system which can "see" in a way analogous to an animal (Kuru et al., 2023). Some of the sub problems which need to be addressed in order to accomplish this goal are detecting the presence of objects in an environment, identifying the location of those objects, and determining the motion of an object. Almost all of the available methods are based on approximating the results of models from biology as the capabilities of a human or animal are ultimately what is trying to be duplicated. One of the most fundamental problems in computer vision, and one of the first to be investigated, is how to identify and track an object.

1.3.4 Robotics

Robots currently perform tasks that are narrow in scope. Most robotics research centers around a few connected and reasonably controllable degrees of freedom (DOF): 6 for robotic arms, 12 for humanoids, and 60 for walkers (Feliu-Talegon & Feliu-Batlle, 2022). Learning from real robots at open-loop or closed-loop control also requires simple tasks, such as copying a motion, throwing a ball in one direction, or holding still (Fresca & Manzoni, 2022). Basic primitive motion training such as learning to move to a desired location seems highly desirable but is not represented in the open-loop control. With many competing DOFs, open-loop control has to be very accurate, which is questionable considering practical object uncertainties arising from manufacturing, grasping control, environmental perturbations, etc. The fallback option, force control with an $M \times 6$ actuator, is strictly limited due to manufacturing complexity. In addition, deterministic neural control is generally designed for systems with much fewer DOFs, and when there are more DOFs, learning from trials becomes the only choice. Learning is attractive but comes with a cost of efficiency. Therefore, more reasonable and possibly cheaper solutions should be sought (Zakaria et al., 2024).

A robot likely needs a few low-cost smart actuators and higher motor control costs for task-flexible execution. Robotic motion execution could also possibly be learned at task representation/automaton, handling physical dynamics of various scales. All of the above motors need low-level non-learning control: (1) open-loop control for global mapping and memory pre-coding, object recognition, and event monitoring; (2) closed-loop PID control for imageless precision using object descriptors. A transitioning solution likely is pursued since the pre-requisite learning requires much more time and labor.

Furthermore, there exists no notable robot within the marketplace or ongoing research that demonstrates the ability to comprehend and execute complex tasks. An exception to this is a particular robot that can autonomously and accurately complete a simple task after being shown and described the task six times (Yang et al., 2022). Additionally, robots lack the capacity for online learning and understanding in the same manner that toddlers do. It is crucial to emphasize that the three aforementioned capabilities namely, the handling of relatively advanced input types, the structuring of task representation or automation, and the application of a knowledge-to-action framework are all contingent upon knowledge. In accordance with the current classifications of general intelligence, which encompass physical intelligence, animal-level intelligence, and human-level intelligence, all existing research has predominantly involved either low-frequency/slow learning or relatively superficial comprehension.

1.4 Theoretical Foundations of Artificial Intelligence

Developing a set of tools dedicated to representing embedded knowledge is a fundamental task in modern artificial intelligence systems, ensuring the format is machine-readable and conducive to reasoning processes related to that knowledge. Providing explicit representations of the knowledge bases may simplify the tasks of debugging, enhancing, evaluating for consistency, augmenting, and adjusting an AI system to different contexts. This effort will require the utilization of knowledge representation tools and ontologies, which are currently undergoing substantial development and integration. Existing formal and systematic knowledge representation and reasoning frameworks are available for various specific domains to support this endeavor. Translating successfully the un formalized knowledge of an AI into one or many such systems would be another step towards human-level AI. AI would benefit from being partially embedded in a big symbolic knowledge system like these systems or something bigger and better (Crowley et al., 2023). In addition to the linguistic, commonsense world knowledge already in those systems, this would also require the integration knowledge of the more sub-symbolic kind into any such formal system, since a great deal of common knowledge about the world is grounded in it and it is needed for grounding symbols.

Finally, to reason formally with the knowledge in representations, systems like these have their own query languages. Apart from research on representational systems, one must also pursue research on these query languages for further reasoning capabilities of AI. AI would be more intelligent if it can derive new knowledge, falsify false hypotheses, and in general prove theorems in those representations alongside representing the knowledge in them. That is needed for common reasoning tasks that current AIs cannot accomplish but humans do, like questions about indirect causality, inductive queries, metaphors, explanations for observations, etc. (Pantsar, 2024). There are well-known and given requirements on

account of a good reasoning system, like soundness, completeness, and efficient implementations. Therefore, the task is not trivial and challenges some of the current research. As discussed, many proposals exist to ensure further progress in this direction. But it is unclear if any of them is doable, or would it take decades to solve the outlined topics.

1.4.1 Insights from Cognitive Science

At some level, AI can be analyzed in terms of high-level representations, such as knowledge structures, visual concepts, goals, etc., which support processes involving reasoning, planning, and mental simulation. Meanwhile, the representations might also be analyzed in terms of lower-level cognitive processes, such as different kinds of attention, perception, encoding, retrieval, and executive function. There are respective gaps between current Large Language Models (LLMs) and human intelligence at the high level and low levels. To achieve general human-like intelligence with LLMs, it is essential to first draw on insights from cognitive science concerning the representational and process-related ingredients that minds leverage in broadly cognition, planning, and action. This may further clarify how to develop human-like LLMs and point to promising possible pathways for doing so (Lake et al., 2017).

At the high level, Large Language Models (LLMs) lack a symbolism-based and relationally organized representation of knowledge that grounds various high-level cognitive processes. As such, high-level goal planning and reasoning capabilities may be hard to integrate into LLMs. By contrast, such representations are core constituents of human cognition and planning. The first challenge is to ground such high-level symbolic and relational representations of knowledge in a subset of low-level inputs. If successful, this lays the foundation for developing LLMs with high-level cognition and reasoning capabilities and guiding further theoretical and empirical investigations of human cognition.

More intriguingly, integrated cognitive architectures capture such psychological insights well and have been developed in detail in computational form over the years. Such architectures can be used as blueprints to extend LLMs with grounded, symbolic, relational, and hybrid representations. Such cognitive architectures also provide a framework for extending current processing mechanisms or proposing new ones to enhance the performance of LLMs on a wide range of tasks (Gupta et al., 2025). Thus, integrating cognitive architectures with LLMs is a promising means of bridging the gap between the high-level cognition between humans and LLMs, and further provide insights into both cognitive architectures and LLMs.

1.4.2 Findings from Neuroscience

While a major focus of this work is on advancing the technological foundations of human-level artificial intelligence, this effort is also informed by key principles and findings from neuroscience, that are

highly relevant for the design and operation of any human-level AI system. This section summarizes some key findings from neuroscience. Two notable principles or findings from neuroscience that appear to play a major role in the performance of the human brain are organized into fundamental principles for the design and operation of robust and efficient AI systems. The first set of principles pertains to the encoding and organization of knowledge in AI systems. Memory such as static knowledge, dynamic knowledge, and structured knowledge all consist of neural patterns in high-dimensional space. Relational memory and sensitive temporal coding mechanisms might organize such memories and related cognitive abilities using invariant references. The features of memory have been studied, and two methods for modeling information representation of concept network models and learning structure prior by reference frame methods are described. The second set of principles involves the pruning of over connected networks. Over connected networks of artificial neurons display functional advantages of being robust, expressive, and efficient in certain tasks. The pruning procedure after training can remove unimportant connections without severe detriment to dynamic performance. Recent studies suggest that over connected networks can be found in biological neural systems as well. Investigations of the existence of these networks in the nervous system may shed light on possible underlying mechanisms by which biological systems are built. While initial investigations of the information encoding characteristics of such networks began some time ago (Lake et al., 2017), this work began to explore additional issues like the effects of neuronal connection capacity and application to brain or vision-related tasks.

1.4.3 Ethical and Philosophical Implications

An important aspect that should be addressed before starting the technical studies of ACM Architecture is the ethical considerations buried in the very notion of building more and more powerful, human-like machines. ACM is concerned with the architectural study of the implementation of an extremely powerful human-like machine. Such machines, once built, would be capable of implementing an unlimited number of applications, with those applications working in the physical world through the actual means of control and robotic technology. This section does not concern the specific social ethics of those applications once they come to life. Rather, the focus is upon the prior and more fundamental moral implications of the sheer existence of such machines. Human worries about the development of powerful machines predate current computer technology, but the dramatic pace at which this technology has developed has sharpened those worries significantly by today. This larger existential question has been picked up recently as value alignment and AI safety by the current academic AI community. The results so far have been thought-provoking and have proposed formal methodologies to address the specification of moral preferences. Still, the

encouragement for a societal consensus upon those preferences has yet to be satisfactorily formed. This is partly due to the sheer breadth of this moral question, and partly due to the question of whether any machine could be expected to resolve all of humanity's differences on this matter. Based on the effort to ensure that future machines are not capable of catastrophic choices, the following question arises: if human decisions can be engineered to ensure some degree of safety, is it possible to sum up those decisions in a value system that could then be assigned to a controlled machine so that it would provide human-level services in full obedience.

2. MATERIAL AND METHOD

This paper employs a conceptual and literature-based research methodology. It systematically reviews scholarly works, reports, and theoretical contributions in the fields of artificial intelligence, cognitive science, and neuroscience. The studies framework follows an integrative synthesis model aimed toward identifying key topics, ancient developments, and emerging paradigms applicable to Human-Level Artificial Intelligence (HLAI). The take a look at does no longer consist of empirical experimentation however as a substitute conceptual evaluation supported via secondary information assets from peer-reviewed literature.

3. RESULT AND DISCUSSION

3.1 Results

There is a longstanding community consensus that the quest for AI is inextricably tied to the quest for human-like AI. In domains ranging from game and NLP systems to robotic perception and action, there is growing evidence that a monolithic capability, embracing human-like breadth and depth of learning, reasoning, and resourcefulness, is possible to achieve. Human-like intelligence is nonetheless a major leap beyond what has been demonstrated so far, and pragmatic considerations suggest a gradual and systematic expansion of current methods and systems towards this AI goal.

The first priority should be to expand today's level of intelligence not by vesting agents with full-fledged capabilities, but rather through pathways of gradual and systematic growth. This would entail injecting various sapience-related capabilities into agents that are being trained on human-competitive system and knowledge (Nair & Banaei-Kashani, 2022). Examples include enhancing agent architectures with self-organizing and self-modifying capacities, as in the more ion-minded, resourceful, productive, reasoning, creative, etc. that humans exhibit. Apparently simple structural and architectural capabilities such as rapid goal switching, self-modification, representation building, memory, self-control, and guarding against or

learning from faults could dramatically enhance capabilities.

An early application of these principles could aim to inject a slow pace and gradual phases of training into today's deep learning systems, as it appears that the current flat and single-growth phases may tumble such systems into dramatic and severe disruptions during the course of growth (Kambhampati, 2020). The hope is that this cascading of disasters could be prevented by building agents that habitually dedicate enough time and cycled resources to either slow, gradual configurations of trials in trained, safety-gradual, more capable and wise ways. This is complemented by a more cautious, refined design of agent action sets, that would both mitigate dramatic action outcomes and help to analyze eventual action results.

3.2 Discussion

As the systems improve, the speed of conditional, ordinary and differential use increases naturally. This is because agents with better analytical skills are better able to handle speed -packed and demanding environments.

In the long term, two -sided measures will help make AI faster and as smart as humans. Depending on when the agents act and how flexible each of them is, a degree of knowledge can be obtained for both parties. This will provide feedback that will make intelligence more active in the persecution. These types of conversations do not happen very often anymore, but they can become more frequent as problems escalate on both sides. Colleges, universities, companies and social groups can all help create opportunities for meaningful conversations on how to do AI more as people (Jadczyk, 2018).

3.2.1 Implications

The rapid development of artificial intelligence (AI) technology is expected to provide fundamental changes in many aspects of life when disturbances spread over economies and society. AI technology will affect the nature of work, employment levels and wages, the prosperity and power of firms, education, personal connections, trust in institutions, social cohesion, and much more. Ensuring that the impact of AI technology is beneficial for humanity is a major challenge of the decades ahead.

AI technology will change the nature of work. The current labor market is characterized by specialization and division of labor, where human productivity has been improved by tool-making and tool-using. In the near future, AI technology will take up more and more roles of tool-using and appropriate knowledge representation (O'Hara, 2022), affecting white-collar jobs that require reasoning and critical thinking. For low-knowledge work, such as driving taxis, truck driving, store checkout, and cashier, automation is easier, where autonomous vehicles and cashier-less stores are being built and piloted. This could lead to an eventual loss of jobs.

AI will also change the firms that former employees would look for work. Companies using advanced AI technology will have a competitive edge in the market, while others won't be able to compete. This will severely affect today's companies, such as those in journalism, design, programming, or computer science. (Sasilatha et al., 2025).

AI will also change jobs, as graduates and former workers change the kinds of companies they work for. Companies that use robust AI solutions might be the high-quality, even as the ones that don't may additionally fail to survive. This exchange will probably have an effect on other areas too, like journalism, design, programming, and laptop science. So, universities need to appearance over their curricula to make certain they are up to date with the task marketplace, with a focal point on capabilities like adaptability, performance model, interdisciplinary teamwork, and lifelong mastering. Teaching ethics, important thinking, and digital resilience will assist the next institution of graduates do better in a job marketplace that is continually changing.

The outcomes of AI can be felt in businesses, governments, and the manner establishments and citizens engage with each other. Automating data offerings may assist with a few policy issues, but it may additionally lead to a world of automatic lies, propaganda assaults, and online harm on a huge scale. So, it's vital to hold the public's consider whilst making choices. Governments have to create social protection nets to assist workers who lose their jobs, make rules that require AI systems to be open and accountable, and installation programs to train humans a way to use the internet so that it will severely look at the information they find there.

Education that appears to the future and accountable governance may additionally help manipulate risks and let societies take gain of the benefits of AI. To hold trust, equity, and recognize for guidelines that govern each day existence and basic rights, this -pronged method might be wished.

AI era could have a massive impact on governments and establishments and how they interact with people. Relaxing policy limits is feasible while you could automate answering questions. Automated AI marketers can replenish online statistics channels with false facts, advertisements, propaganda, and content that makes human beings hectic, which can trade how human beings act. One of the maximum critical things to do is to maintain human beings's faith within the accuracy of choices that have an effect on their everyday lives and basic rights. People may not observe the rules if they don't apprehend why decisions had been made, which is critical for guidelines to work. Because algorithms are changing quick and getting more steeply-priced, many people also don't know a way to address the flood of false facts and bot feedback, and they do not have the tools to check the reliability of assets.

Lastly, you can actually photograph a good bigger effect on society as an entire. AI era essentially alters the lengthy-mounted courting between humans and technology, which has been cultivated through centuries of knowledge and consider. Now, era can make decisions on its very own, because of this that approaches can be optimized without any ethical implications, but it's tough to tell if they are ethical or now not. As human beings rely increasingly on AI generation, it may change how they act in social conditions due to the fact they may not be capable of make choices on their very own and could lose their abilities. Psychosocial dangers emerge from the rise in human-machine interactions and the following transformation of the place of work, leading to a discount in social connections and an escalation of stress, tension, and depression (Qi & Yao, 2021).

3.2.2 Research contribution

This study contributes to the developing discourse on Human-Level Artificial Intelligence (HLAI) by means of setting up an integrative conceptual framework that bridges technological progress, cognitive theory, and moral philosophy. Unlike maximum previous works that recognition solely on technical or algorithmic advances, this paper synthesizes insights across laptop technological know how, neuroscience, cognitive psychology, and philosophy to endorse a unified information of what constitutes "human-like" intelligence in artificial structures.

At the theoretical degree, the paper advances the argument that achieving HLAI requires no longer best more suitable computational architectures but additionally the emulation of representational, relational, and contextual reasoning akin to human cognition. It introduces the perception that proper widespread intelligence relies upon on multi-layer integration between symbolic reasoning and sub-symbolic mastering a technique that provides a conceptual basis for hybrid AI fashions.

This examine affords a dependent analytical framework for classifying technological enablers and cognitive correlates of intelligence, serving as a reference for destiny interdisciplinary research. It combines facts from system mastering, natural language processing, computer vision, and robotics into one view that indicates how they all connect to human-degree abilities.

The paintings demonstrates the way to combine AI development with human values and social goals, with emphasis on safety, openness and governance. It allows teachers, choice makers and researchers discover a way to obtain a stability between being responsible and being innovative. This is a massive step in the direction of making sure that AI technologies increase in a way that is good for people ultimately.

3.2.3 Limitations

This research provides a thorough conceptual synthesis of the literature on artificial intelligence at human level (HLAI); However, it is important to recognize more limitations.

First, the study is theoretical and obtained from the literature, primarily when using secondary sources instead of empirical experiments or quantitative verification. As a result, the findings constitute an interpretive analysis of existing knowledge rather than a direct measurement or evaluation of HLAI systems. This makes it difficult to confirm any claims through repeatable experiments or large -scale data analysis.

Secondly, the literature that has been reviewed is wide, but not very deep, and it is limited in time. AI research is changing rapidly, with new models, algorithms and ways of thinking almost every month. As a result, the conceptual synthesis delineated herein may not entirely reflect the most recent technological innovations or unpublished progress in niche areas such as neurosymbolic AI, embodied cognition, or artificial consciousness.

Third, the study aims to amalgamate perspectives from various fields, including computer science, neuroscience, ethics, and cognitive psychology; however, this interdisciplinary synthesis inevitably entails epistemological tension. Each discipline employs unique methodologies, terminologies, and evaluation criteria, potentially constraining the coherence or universal applicability of the proposed integrative framework.

Fourth, the analysis emphasizes theoretical generalization over domain-specific depth. For instance, the treatment of technological enablers such as machine learning, robotics, and computer vision remains at a conceptual level, omitting detailed algorithmic comparisons or performance metrics that would be necessary for a technical engineering audience.

Finally, the ethical and philosophical discussions presented here are context-dependent and culturally situated. Ethical frameworks differ across societies, and global consensus on AI safety and governance standards remains elusive. Therefore, some of the proposed principles for responsible AI development should be interpreted as normative recommendations rather than universally applicable solutions.

Recognizing these limitations underscores the need for future empirical and cross-disciplinary studies to validate, refine, and operationalize the theoretical insights proposed in this paper.

3.2.4 Suggestions

Building upon the theoretical and conceptual foundations mounted on this observe, several promising guidelines emerge for destiny studies on Human-Level Artificial Intelligence (HLAI).

First, there is a need for empirical frameworks and measurable signs to evaluate the degree of human-likeness in artificial intelligence structures. Current

benchmarks focus on slim overall performance metrics, along with accuracy or velocity, which fail to seize better-stage cognitive functions like reasoning, abstraction, creativity, and emotional understanding. Future research should increase multidimensional evaluation models that combine both cognitive and affective overall performance criteria, permitting a more nuanced comparison between human and synthetic intelligence.

Second, information scientists, neuroscientists, cognitive psychologists and ethologists should cooperate more carefully across disciplines. The future of HLAI research lies inside the merger of algorithmic accuracy with insights from biological cognition and ethical philosophy. This requires interdisciplinary research tasks that look into how cognitive structure and neural mechanisms can enhance the improvement of extra adaptable and self-conscious AI structures.

Third, there is lots of room to observe hybrid intelligence fashions that integrate symbolic reasoning with sub-symbolic (neural) studying. These models may be used to create systems that could perform each based reasoning and flexible generalization. This is an vital step closer to cognition at human degree. Research ought to additionally check out their use to neuromorphic hardware or quantum to increase the efficiency and scalability of those hybrid models.

Fourth, studies on ethics and governance ought to awareness on growing to powerful framework for AI safety, fee adjustment and regulatory supervision. As AI systems turn out to be extra self sustaining, it is essential to set up mechanisms that ensure that their design and use are accountable, obvious and ethically sound. Future research can check out worldwide frameworks for AI management that integrates moral design ideas with prison and cultural diversity.

Fifth, schooling and the capability to transform society are important regions which might be frequently unnoticed. Future studies must check out how educational structures can prepare the group of workers for an AI-driven society by using selling digital resistance, important questioning and lifelong mastering. Longitudinal study analyzing character variation to collaboration paintings with an AI machine.

Lastly, the long-term philosophical study of consciousness, agency, and moral status in artificial beings must continue. As progress toward HLAI speeds up, the line between a tool and a sentient agent may become less clear. This means we need to think more deeply about the rights, responsibilities, and moral limits of artificial minds.

These research routes can collect the transformation of conceptual understandings of HLAI into practical, responsible and ethically based innovations that unite technological progress with human well-being.

4. CONCLUSION

In this article, I describe several important technologies to build robust, adaptive, flexible, sophisticated artificial minds and cognitive agents. Overall, these technologies provide a transformative path to a new class agents capable of sophisticated perception, cognition and action. At the same time, there has been real discussion about a smarter way of making things safer and ensuring that systems work together through theory-driven research strategies and development audit checks. These various technological supports and design roads help to clarify what is meant by "artificial mind" and "human level ai". They also show a clear way forward from existing systems, which are weak, crispy and cannot generalize beyond small contexts and exercise distributions.

However, this article does not try to present any solid argument that artificial minds will be developed or integrated into the social material. An informed discussion of the starting scenario can only begin after a thorough nuclear assessment of baseless assumptions, fear and unrealistic timelines. More generally, there will be a need to create different paths for stakeholders that are technically knowledgeable, technocrats and those with information asymmetry, as well as for potential users of these brain-like sensory and cognitive improvement devices and groups that need protection and authority. Systems that are on the way to human-level AI will be able to change and will inevitably change the way their human users think. Despite risks of malicious and inadvertent negative exploitation, there will be opportunities for evolutionary development of trusted augmentation systems across governments, business, and education. But with transformative technologies, evolutionary trajectories depend heavily on the initial conditions fostered at the outset. Hence, a minutes-to-mid-years timeframe concerning the present moment. Delineating these technological foundations and design trajectories helps delineate the safety and aligned characteristics of both the technologies themselves and potential strategies (at various levels) for their development. It is hoped this discussion will encourage open, de-biased, and behavioral center dialogue about how best to promote foundationally safe and beneficial systems and societal development scenarios.

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6. AUTHOR CONTRIBUTION STATEMENT

The author conceived the study, conducted the literature review, performed the analysis, and wrote the manuscript.

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