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J. Muthu Kumar has ~40+ years of experience as an oil and gas project delivery and risk expert, that is prone to high risks, complexity, uncertainties, non-linearity and randomness. He understands technology, its growth, applications, impact and consequences, the value of information technology and artificial intelligence. He also believes in sustainable growth with full understanding of intellectual, social and economic disparity such that it does not disturb the equilibrium of existence. He was fascinated and intrigued by AI post LLMs in 2022 and had dived deeply into future AI applications and research. He is currently developing a domain expert level AI, the world's first of its kind, for application in the oil and gas industry.

A Unified Roadmap to AgI* (2025-2032): Achieving Functional Equivalence to Human Intelligence by Demystifying Conflicts and Bridging Nature with Artificiality

** - AgI, with a lowercase "g", denotes a functional but non-conscious intelligence. See Sections 2.0 and 4.1).*

Purpose

Since its inception in the 1950s, Artificial Intelligence (AI) has aspired to achieve human level general intelligence, commonly referred to as Artificial General Intelligence (AGI). Yet even today's most advanced systems, including the Large Language Models (LLMs), remain narrow in scope, excelling at specific tasks, but without true generalization or adaptability. The pursuit of AGI is hindered by numerous technical, conceptual and systemic challenges including the integration of diverse architectures, cognitive mechanisms, scalable hardware and sustainable energy solutions. Despite notable innovations, current research remains siloed and fragmented lacking a unified framework. This paper aims to critically examine the fundamental limitations inhibiting AGI and proposes a pragmatic framework and roadmap to accelerate the development of Agi, a functionally equivalent but non-conscious intelligence (defined in Sections 2.0 and 4.1) as a transitional stage towards a true AGI. By demystifying entrenched conflicts, the proposed approach seeks to bridge the gap between nature and artificiality, accelerating meaningful progress in the field.

My Journey to AGI

With over 40 years as a project delivery and risk expert in drilling of oil and gas wells, a field defined by complexity, uncertainty, and systemic challenges, I have developed expertise in handling intricate systems and critical decision making under high risk situations. For nearly 25 years, I worked with advanced softwares, but all of them required expert human oversight and interpretation. AIs of the last few decades were unconvincing due to their limited scope. The LLMs that emerged in 2022 with their broad and interactive capabilities transcending traditional software paradigms sparked my interest and engagement with AI. Drawing on my experience and multi-disciplinary study of intelligence spanning science, philosophy and analytical systems, I believe I can contribute, where appropriate, in the journey to AGI.

1.0 Fundamental Conflicts and Challenges in the Pursuit of AGI

The 19th century marked the exponential rise of scientism (scientific dominance over nature), catalyzing a shift from theological, social and philosophical worldviews to a techno-scientific paradigm. Despite the catastrophic lessons of the World Wars I and II in the 20th century, the technology growth had accelerated at the expense of social equilibrium. In that process, scientism had convinced itself that nature is intelligible and that humans can leap over the biological, organic and natural processes by technology.

The globalization of the 1990s ushered in a new era dominated by financial paradigm ("financialism") where capitalism and consumerism engulfed social parity by prioritizing economic gains and sidelining other ideologies. The fusion of scientism and financialism laid the groundwork for an unprecedented technological boom. The result is today's quest for AGI. Although debates on its societal risks exist, they remain muted amid the dominant unrelenting competitive pursuit of AI supremacy.

Current GenAIs, while impressive in specific tasks, fall short of AGI. The path to AGI is complex and non-linear, which cannot be achieved through mere scaling of existing models or by isolated breakthroughs. Predictions about AGI's arrival vary widely, ranging from claims of optimistic imminent emergence to skeptism about its feasibility. Developing AGI demands a collaborative approach, integrating technical innovation, scientific understanding, ethical considerations and regulatory frameworks instead of competing priorities. However, few fundamental conflicts and forces that drive for rapid development prioritizing dominance over thoughtful resolution of these challenges impede progress towards AGI.

1.1 Fundamental Conflicts

Primary Conflict: Defining AGI

Absence of a universal definition for AGI creates a fundamental challenge: **do we want AGI to behave intelligently or consciously or both?**. This ambiguity stems from differing beliefs, with some arguing that intelligence is not dependent on consciousness and biological substrates, while others believe that consciousness can be computationally replicated. These conflicting perspectives, driven by divergent agendas and competing priorities of researchers, corporations and policy makers, fragment AI research into isolated silos. For example, corporates prioritize practical applications, but the academic researchers explore theoretical foundations leading to uncertain timeline to achieve AGI.

Second Conflict: Incomplete Understanding of Human Intelligence (HI)

A major barrier to AGI is science's incomplete understanding of HI, particularly its subjective aspects such as consciousness, experience (qualia) and emergent behaviour. While cognitive science has mapped many functional processes of the brain, conscious awareness remains elusive. Many AI experts adopt a functionalist view, treating intelligence as an information-processing system where subjective experience is irrelevant.

However, human intelligence is not purely functional. It is shaped by intangible factors (**IT^F**) such as consciousness, emotions, social contexts and biases, qualities that are absent in current AIs. Both are contradicting forces where machines cannot comprehend human subjectivity, yet humans attempt to imbue them by human fed data and computational systems without any direct connection to IT^F.

This creates the **second conflict** of incompatibility between AI and HI. A direct collision of the two will only experience repelling forces. As resolving this conflict is a long time matter, today's advanced AGI research focuses to achieve only functional equivalence excluding the subjective factors. Whether this approach is ethically and socially sustainable remains debated, but the momentum for the development of AGI, driven by competitive pressures, continues unabated, despite calls for regulation.

Third Conflict: Human Knowledge as Complex Adaptive Systems

Human knowledge is dynamic, diverse and context dependent, enabling adaptability in real world situations, but it also becomes highly fragmented and inconsistent. Factors like cultural conditioning, personal experiences, situational contexts shape how individuals perceive, reason and act. So no single person has universal expertise. Hence, humanity thrives through collective intelligence where shared knowledge and collaboration compensate for individual limitations. This also becomes a challenge for AGI as it must replicate not only an individual intelligence but also adapt to the collective nature of human knowledge systems.

For example, Einstein theory of relativity reflects specialized and unique knowledge, but it does not make his intelligence superior to a mother who instinctively distinguishes her newborn's cries of hunger from pain. Similarly Newton's invention of gravity is unique, but most people intuitively grasp how to carefully handle a material even if they have not heard of gravity.

Similarly, a child learns by observations and sensory experiences to interpret, infer and understanding of the real world. She would learn to avoid fire by a single painful direct experience. An adult who notices an abnormality uses intuitive reasoning to infer the causes even without explicit information. These behaviours reflect human intelligence as complex adaptive systems ("CAS") characterized by, (1) emergent behaviour, (2) continuous learning and persistent memory, (3) adaptation to complex multi-element interaction, (4) non-linear feedback loops, and (5) decentralized control. **Today's AIs and LLMs lack these CAS qualities.**

1.2 Challenges to AGI

Humanity has demonstrated remarkable progress in Scientific Application Technology ("**SAT**") applying known engineering principles to produce groundbreaking innovations. Yet, it continues to struggle with Fundamental Science ("**FS**") to resolve deeper underlying causes for those principles. For example, science knows how to apply gravitational principles, but the true cause of gravity remains elusive. Similarly it applies brain functions for growth without understanding how human brain works, consciousness or origin of intelligence. Medical technology enables surgery, organ transplants etc, but chronic diseases like diabetes, hyper tension and cholesterol still lack cures (except lifelong medicines). Hence, human intelligence emerges from complex, adaptive and emergent process of Fundamental Natural Biological System ("**FNBS**") whereas AI to date remains within the domain of SAT relying on engineering function without foundational awareness. This critical distinction leads to a conclusion that current AIs are not Complex Adaptive Systems ("**CAS**") like humans. This section identifies **nine principal challenges,** given in **Fig.1** as obstructions to the transition of AIs to CAS.

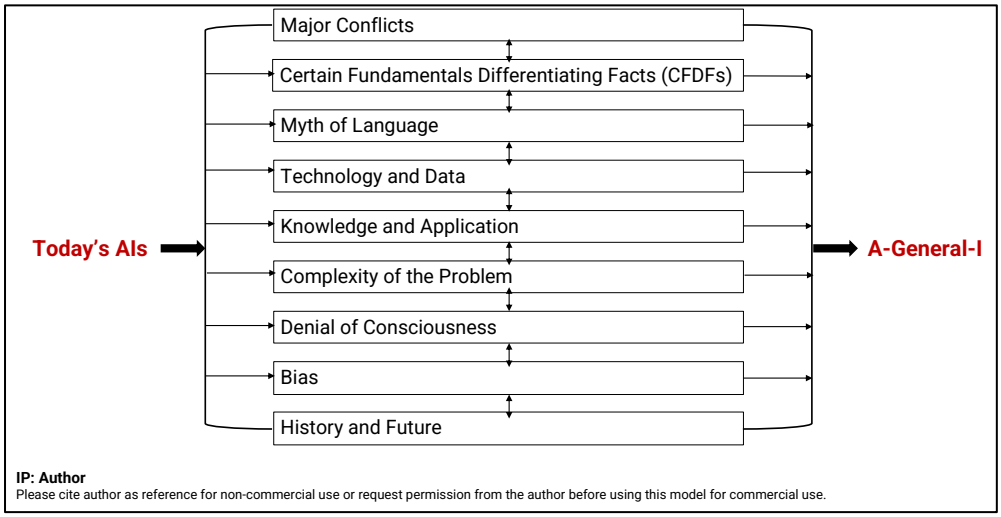


Fig. 1: Challenges in the Journey to a True A-General-I

1. **Fundamental Conflicts**
   The fundamental conflicts that were discussed in **Section 1.1**.

2. **Fundamental Disparity Between HI and AI**
   Human intelligence (HI) operates through at least five dimensions that can be expressed as follows:

   Human Intelligence (HI) ≡ f (x, y, z, t, Ce) + f (Uc) **(Equation 1)**

   Whereas x, y and z = spatial dimensional embodiment, t = temporal presence (not the measured clock time), Ce = cognitive and subjective conditioning experience and Uc = speculative unconscious processes which may have several dimensions. That is why every individual is distinctly different and excel in abstract cognition and ability.

   AIs operate in abstract text, vector and mathematical spaces in much higher dimensions without biological constraints. While can process 3D+t through 3D mapping and videos to imitate spatial space/time they lack first hand embodiment and physical reality. This crucial dimensional gap is unresolved.

   Due to this, future generation AIs can learn autonomously, be iterative, generalize, reason with sufficient data and high computational scale but without the ability to exhibit consciousness, broader spatial reasoning, persistent memory, deep creativity, intuitive problem solving, critical decision making that involves morality and ethics.

3. **Myth of Language as a Foundation**
   Although debates are still unresolved with respect to language being grounded in an abstract innate system (Noam Chomsky) or in shared social experiences rather than innate systems (Ley Vygotsky), language is not root of human intelligence. Biological intelligence predates language by billions of years when the life began ~3.6 billion years ago and the brain evolved ~600 million years ago. Early languages evolved probably a mere 100,000 years ago and the formal grammar based modern languages ~2,500 years ago. English is only ~800 years old. However, language enabled our ancestors to spread, create civilizations and establish history. Today it is an integral part of our life. It simulates our brain and helps us to act appropriately and rationally. That is why LLMs produce incredible outputs using language as the basis without understanding the real world. However, human intelligence (HI) transcends symbolic representations like text, images, audio and video that current LLMs rely on. Since HI exceeds the bounds of language, LLMs alone cannot be scaled to AGI.

4. **Limits of Technology, Data and Scaling**
   Today's LLMs and main stream AIs might be reaching practical limits due to scaling up problem like transformer saturation and in-context learning (ICL) plateaus, hardware limits like GPU and bandwidth bottlenecks, increasing cost to train and compute, energy constraints, global infra-structure disparity. The existing vast amounts of diverse and high quality data might be nearing exhaustion and creating new

synthetic reliable quality data imposes challenges and risks including prohibitive cost. Further, the law of diminishing value and returns may already be manifesting despite growing model sizes.

5. Knowledge Vs Application

Intelligence in biological systems is shaped by emergent embodied knowledge, not just data driven training. It is not feasible to breed intelligence and emergent behaviour through large data, technology and training alone. Yet, AIs currently depend on such data and training. Some narrow AI systems, like AlphaGo and Protein Fold, outperform humans in specific domains, but they lack the demands of general intelligence such as consciousness (C^s), subjective insights and experience (S^e) and abstract dimensional performance. Hence, AGI cannot be created solely by increasing data scale and computing power without right mechanisms.

6. Complexity of Evolutionary Paradigms

Evolutionary transformations are driven by chance paradigm shifting mutations. No one has understood how that change occurs. They are not inevitable or predetermined as observed by Stephen Jay Gould and few others. The emergent property is irreducible, unpredictable and has novel casual powers not driven systematically from a lower level as explained by the principle of radical emergence. Research has been ongoing **unsuccessfully** for decades to understand the brain of worms, mouse, rats and monkeys and to expand that knowledge to unravel the mystery of human brains. Hence, the idea that intelligence can be reverse engineered via deterministic engineering, computational models, and mechanical emulation underestimates the complexity of natural human intelligence.

7. Denial of Consciousness

Manu in the AI field argue that consciousness is unnecessary for AGI (primary conflict discussed in Section 1). However, this reflects deep divide in philosophical understanding. Divergent theories on consciousness like physicalism, functionalism, dualism, phenomenology, integrated information theory (IIT), higher order, global workspace, analytical idealism etc remain unresolved and conflicted. David Chalmer called this the hard problem of consciousness. Ignoring subjective intelligence and experience may simplify engineering goals to deliver a constrained AGI but it will leave a conceptual void. If AGI is to mirror human like general intelligence, consciousness cannot be ignored.

8. Bias Inheritance

Human society is inherently biased radically, culturally, socially, religion and caste wise and politically. Humans are subjective and judgmental. Doctrines of ethics and morality are prejudiced against others. As AI is trained with human-generated data, these biases get embedded into its reasoning. Despite best efforts like the RLHF and Differential Privacy, Pre-Processing and In-Processing etc, complete elimination of bias is not possible. If AIs are trained on such biased data, the risks of existing social prejudices are amplified.

9. Historical Amnesia and the Hype Cycle

Technology is cyclical. It circles between waves of promise followed by disillusionment. Every new scientific technology offers promises until it is beaten by another new technology. AI follows this pattern with claims of breakthroughs by each generation of AI which ends up in disappointment. This creates a hype cycle with short term gains, winters and summers. AGI must be pursued with long term vision including philosophical depth that is absent in the current pursuit.

Conclusion: The nine challenges outlined here highlight the need for a pragmatic, inter-disciplinary, ethically grounded approach under a global governance. Until the AI research transcends the current limitations to embrace the subjectivity and emergence qualities, a true AGI will remain a theoretical ideal for a long time.

2.0 The Current Approach CANNOT Achieve All the HALLMARKS of AGI

Contemporary AI research predominantly presume that the biological and non-biological divide is not a barrier to achieve AGI. Intelligence is considered only a functional capability that works on information processing for which subjective matters such as consciousness (C^s), subjective experience (S^e) and other intangible factors (IT^F) are unnecessary. Under this view, intelligence is not impacted by biological substrates. Hence, today's conception of AGI is built on a constrained and reductionist definition, one that aims only at the functional equivalence of human brain and intelligence, not the full spectrum of human-like general intelligence. Even then, the timeline to achieve AGI remains uncertain. Claims of conscious AI are most likely marketing exaggerations rather than credible scientific achievements.

This prevailing approach is problematic. Reducing intelligence to an objective mechanical principle fails to capture its full dimensionality. Science currently lacks the epistemic tools to resolve this paradox as it has not

demonstrated that brain alone is responsible to produce intelligence and consciousness. In fact, neuroscience is still only at the periphery of HI-S^e-C^s space. Thus the assertion that intelligence is entirely independent of consciousness and subjectivity is epistemologically premature.

Beyond the functional perspective, HI exhibits capabilities such as self-awareness, emergent behaviour, subjective experience, integration of sensory, emotional and cognitive inputs, intuitive creativity, robust reasoning and real world adaptability. These hallmarks of human general intelligence are poorly addressed by current theories of consciousness and remain outside the grasp of ongoing AGI research.

Why is it so critical? Consequently, AGI can be functionally superior to humans in specific fields, but cannot replicate the full gamut of human intelligence. Therefore, the first generation AGIs, designed to achieve functional equivalence excluding C^s and S^e, will be highly capable, task-oriented, multi-modal, hybrid and embodied machines. They may surpass human performance in defined fields, but will lack the essential hallmarks of general intelligence. For this reason, such systems, although represented as narrow AI or specialized AI, more aptly be referred as **A-general'ish-I, AgI (with a small "g") denoting the functional depth but conceptual incompleteness**.

Recent advancements in AgI research focuses on eight major dynamic areas of integration. While promising, none individually offers a complete path to AgI.

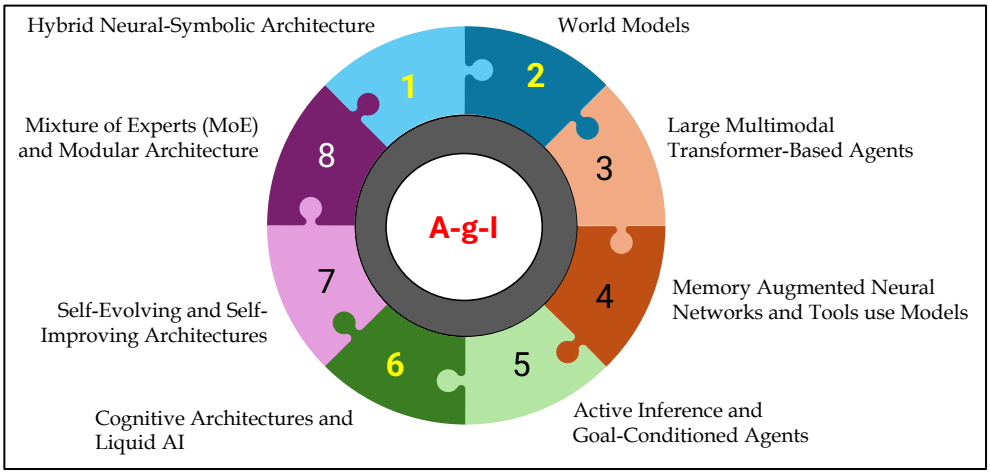
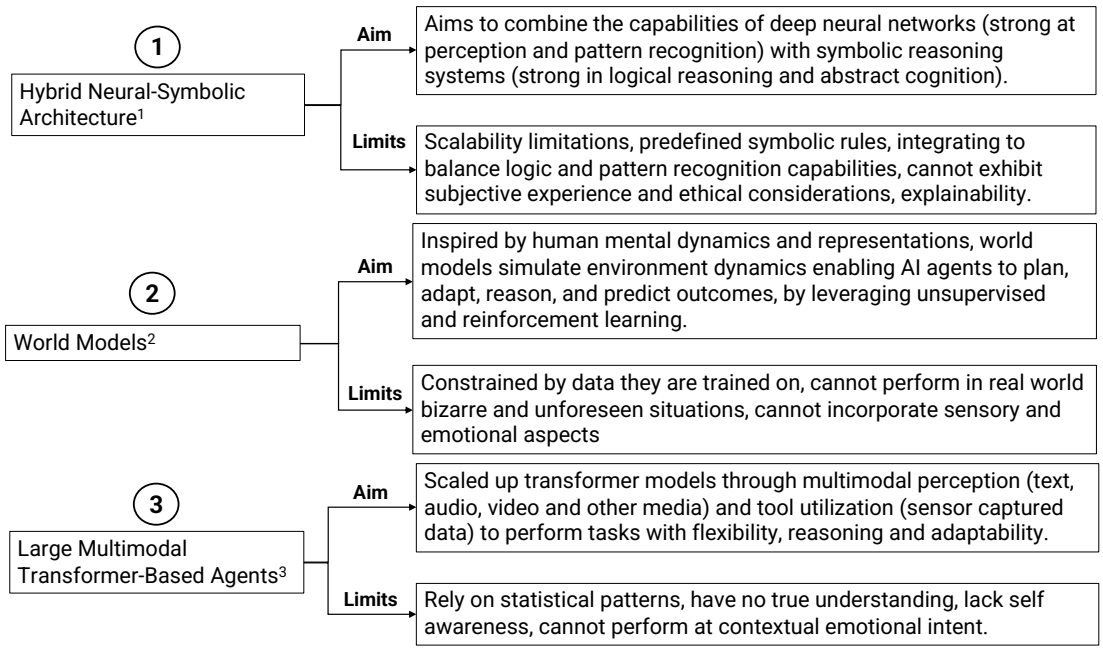
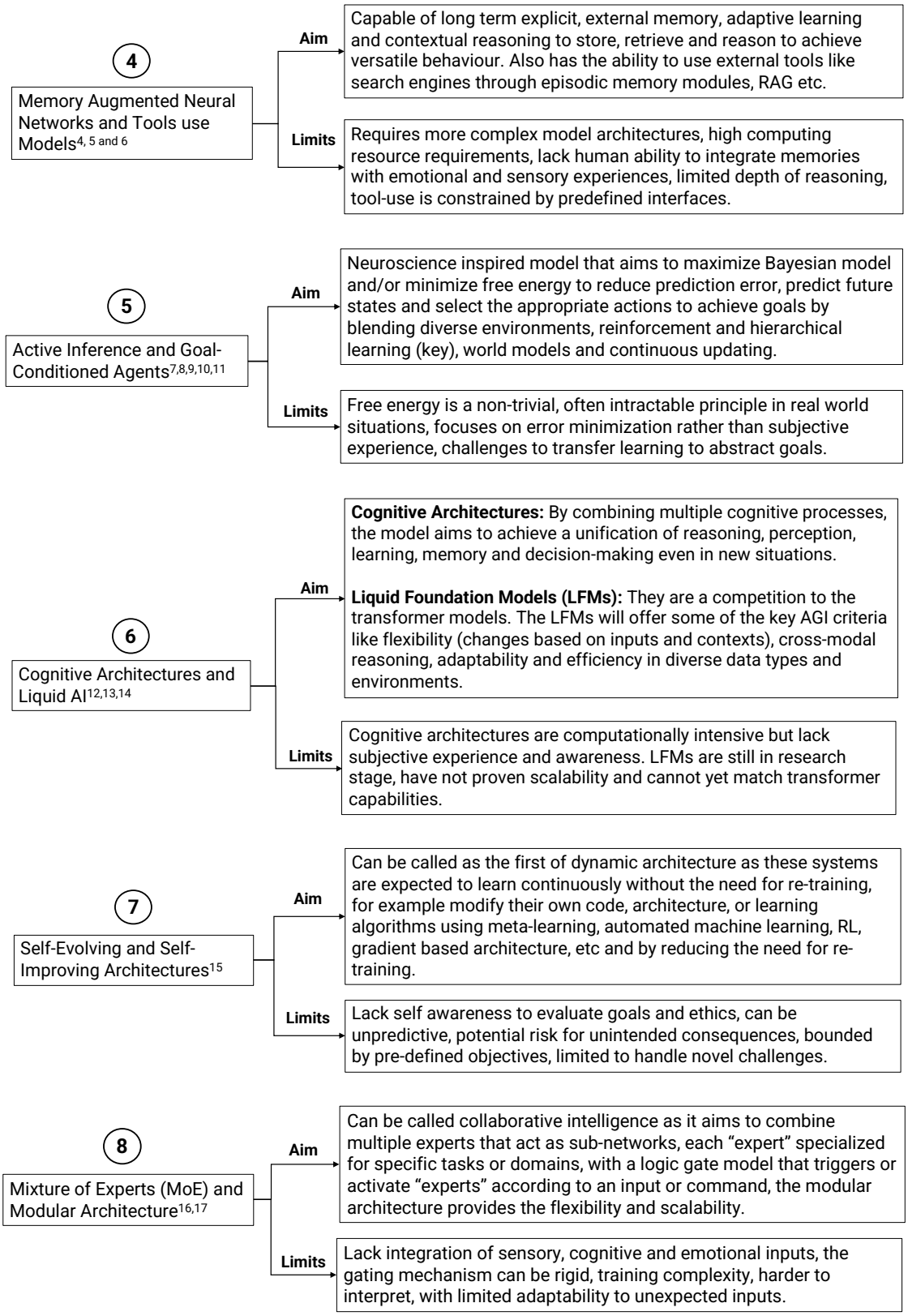


Fig. 2: Advanced Research on AgI

As it is not practical in this paper to discuss elaborately each area of research, only a brief discussion of the aim and limits of each are presented below.





In addition, Neuralese is a relatively new emerging concept and technique (not an architecture or algorithm), particularly for LLMs, that aims to enhance the LLM reasoning depth by enabling their internal language and reasoning, with high dimensional vectors and chain of thought in its native latent space using recurrent computation process and memory instead of words or tokens. It is still at early development and hence its full potential is unclear yet. JEPA is an architecture proposed by Yann Lecun as his broader vision for AGI meant to move AI from autoregressive token prediction to predictive modeling of abstract representations and passive text/statistics based learning to active world modeling. It is believed to be currently under in-house prototype development in Meta AI.

These research areas (and probably few more) collectively advance current AI towards AgI by enhancing reasoning, adaptability, multi-domain performance etc. However, as they focus only on functional equivalence of human intelligence, they remain grounded in computational paradigms that do not prioritize (or include) consciousness, emergent behaviour and subjective experience and other hallmarks of HI. The limitations of each research area demonstrates clearly the lack of cohesion and holistic exhibition of human like general intelligence.

While each architecture and mechanism make wonderful strides with step change improvements, their individual victories or paradigms do not matter as none of them is capable of delivering a true AgI. To achieve that, the strategy must be to develop a model of convergence that integrates the strengths of appropriate architectures, mechanisms, training patterns and interface modes that fits the puzzle.

Beyond the innovations on software, hardware and energy are also equally important. Hardware presents a greater barrier than software due to its physical, economic and systemic constraints, and it needs efficient collaboration across multiple domains and competitors. Importantly, as AgI also requires significant energy for training, interfacing and executing, optimum energy solutions are essential. However, as the speed of both the hardware development and energy optimization are lagging behind the software, they may become a deterrent to achieve AgI. Hardware and energy are not discussed in this paper, but the critical integration of software, hardware, energy and knowledgeful resources cannot be ignored as the mismatch will become a bottleneck.

Although there is a possibility that the divergent models may ultimately converge due to necessity, but its effectiveness will be questionable due to conflicting priorities that compete against each other.

3.0 An Empirical Understanding of Real Intelligence

Achieving a true AGI, one that embodies not just functional equivalence to humans but also general and conscious intelligence, is impossible without incorporating the three essential components namely, consciousness (C^s), subjective experience (S^e) and Intangible Thought Factors (IT^F). If the goal is merely functional equivalence, (i.e. AgI), the current research models may succeed within a few years. However, the pursuit of full spectrum of AGI (functional + general + conscious intelligence), demands a deeper understanding of human intelligence, its complexity, emergent nature, the capability to integrate mind, brain and behaviour.

As a book length discussion would be required for a complete account of intelligence, this section highlights only few critical concepts. Intelligence is not tangible, it does not arise by birth, race or social status. Humans display intelligence inconsistently subject to situational contexts, prevailing conditions and sensitive dependencies and individual uniqueness. Despite several theories spanning science, philosophy, physiology and theology, its essence is not captured yet. Based on cross disciplinary understanding, I have deduced a model as in **Fig. 3** that demonstrates the multi-layered process underlying intelligence.

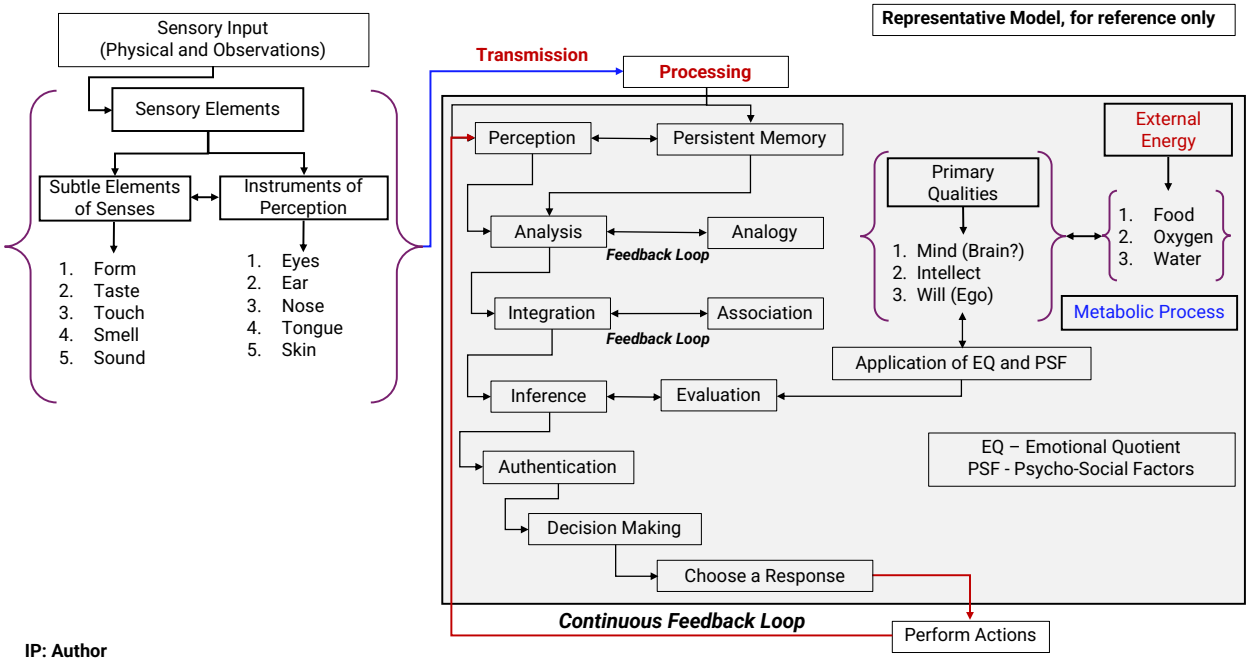


Fig. 3: Operating Process Envelope of Human Intelligence

Humans must be going through this complex process for nearly every decision and action, except in few cases like (1) automated behaviour like driving to home via a familiar route and (2) conditioned existence like the individuals conditioned to follow strict rules and norms without critical thinking and of logical reasoning.

The core problem is that the inherent objectivity of every element in this universe is seen by us only subjectively. If all the 8.5 billion people of the world are simultaneously observing a rose, each would see and smell it differently based on their subjective experience. No one experiences the rose objectively. Hence, denying the existence of subjective experience and the role of consciousness in shaping it is an oversight. Science, by attempting to prove the objectivity through subjective instruments (human senses, cognition and bias), reaches its paradoxical limit when trying to decode intelligence.

While brain is central in sculpting the intelligence, something beyond it influences human intelligence. As discussed in **Section 2.0**, a continuing debate surrounds consciousness and subjective experiences. Though unmeasurable, consciousness can be explored through contemplative thought experiments:

- What does it feel like to be a being?
- What does it feel to be you, deliver a baby, to fly gracefully as an eagle?, to suffer as a victim, to be an animal like a dog, cat or ant?

These thought experiments are not rhetorical but are capable of producing profound insights into the depth of intelligence. It is also essential to ask questions like: Is intelligence purely individual or subtly interconnected across humans, species or even nature itself? The nature of instant connectivity, empathy, compassion or even hatred suggests that consciousness may be functioning under a universal natural network. Exploration of this aspect may expand pathways of research on consciousness and subjective experience.

Intelligence may be operating across multiple layers of states such as conscious, subconscious and unconscious. These states may exist beyond the known space-time dimensions which makes it difficult to comprehend intelligence scientifically and computationally.

I propose that human intelligence arises from the interaction and integration of two inherent but distinct forces, namely:

- Objective Intelligence ("OI") in which brain is the predominant force, and
- Conscious Intelligence ("CI") that acts as a subtle force for converting brain's objectivity to subjectivity.

Please refer to Fig. 4.

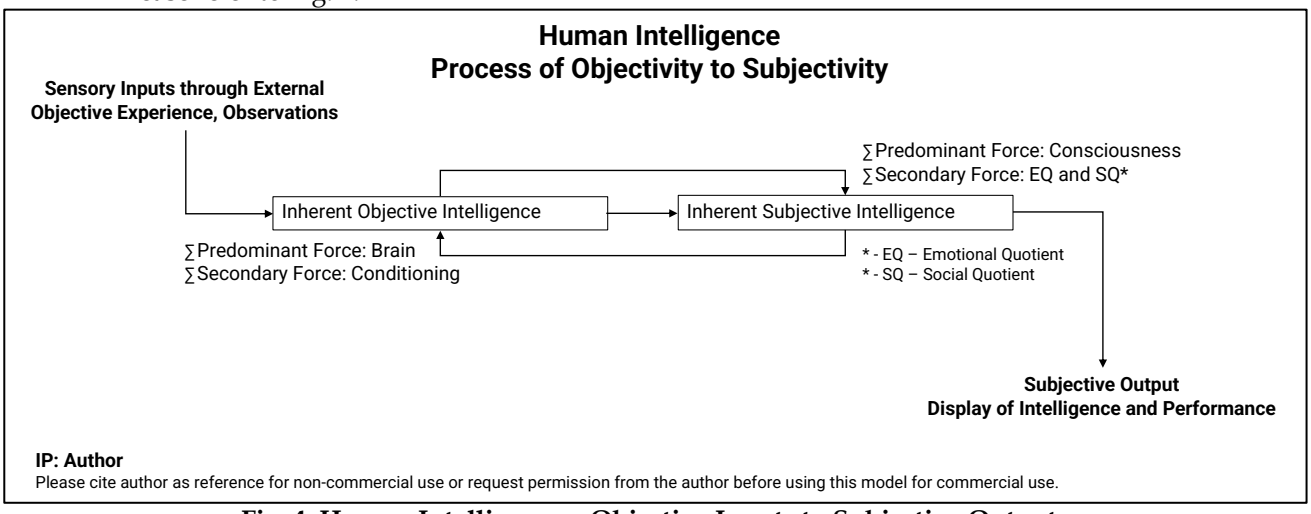


Fig. 4: Human Intelligence – Objective Inputs to Subjective Outputs

This can be conceptually expressed as Equation 2 (following Equation 1).

Human Intelligence (HI) ≡ f(x, y, z, t, Ce) + f(Uc) ≡ f(OI) + g(CI) **(Equation 2)**

It takes ~14-18 years for the human brain to be fully developed and matured, far longer than any other species. The early years of childhood is hence vulnerable when most children are conditioned by parents, family, society, culture, religion, and social structures which shape them as a programmed machine throughout their life,

automated social products. The brain's peak performance window of ~18-35 years of age, determines the span of applied intelligence, while the fundamental intelligence remains shaped by the conditioning. This causes the circle of competence to vary significantly between people depending on how effectively they are integrated.

Conditioning impacts the CI more deeply than the OI. When CI dominates OI, humans often behave inconsistently exhibiting varying degree of intellect from rational to irrational behaviours even by the same individual throughout in a single day.

That is why, **human intelligence is fragmented**, and that fragmentation is real. Yet, humans thrive through a collective intelligence.

As human intelligence is inherently subjective and variable, it can be only expressed as a **degree of magnitude**, not an absolute. This paper proposes the following equation as a model for the **Degree of Intelligence ("DoI")**.

Degree of Intelligence (DoI) ≡ f(IQ, CQ, EQ) – f(S^CQ x B) **(Equation 3)**

Where IQ = Intelligent Quotient (not as measured by the tools used today), CQ = Consciousness Quotient, EQ = Emotional Quotient, S^CQ = Social Conditioning Quotient (social conditioning, conformity, herd effect), B = Cognitive Biases + Intangible Faiths + Superstitious Beliefs. The variables of Eq. 3 are called as Conscious Intelligence Factors ("**CIF**"). High EQ, S^CQ and B will lower the DoI by suppressing logic and reasoning. Hence, understanding of the CIFs, although intangible, are essential to achieve a true AGI.

4.0 A Practical Road Map to A-General-I

4.1 Multiple Stages to Achieve AGI

As discussed in Section 2.0, the ongoing advanced research to AGI aims at only a functional equivalence of human intelligence excluding consciousness, C^s and subjective experience, S^e as factors affecting intelligence,. Due to this, between today's AIs to AGI, there is no direct jump because a true AGI cannot be devoid of C^s and S^e. Hence, practically, the journey to AGI requires multiple stages. Accordingly, this paper presents three major order of change stages to achieve AGI with limiting thresholds for each.

If AGI is termed as a true AI that matches human like general intelligence, as discussed in Section 2.0, the functionally equivalent AI is expressed as AgI (with a small "g"), which is the current focus. Then the next stage from AgI should be A-G'-I, where G' denotes certain limitations. The third stage would be AGI, which may still not be at 100% human level general intelligence but close. That is why, this stage is not called as Final Stage.

- ✓ First Step: Artificial **general** Intelligence (small "g")
- ✓ Second Step: Artificial **General'** Intelligence (G' – indicates certain limitations)
- ✓ Third Step: Artificial **General** Intelligence

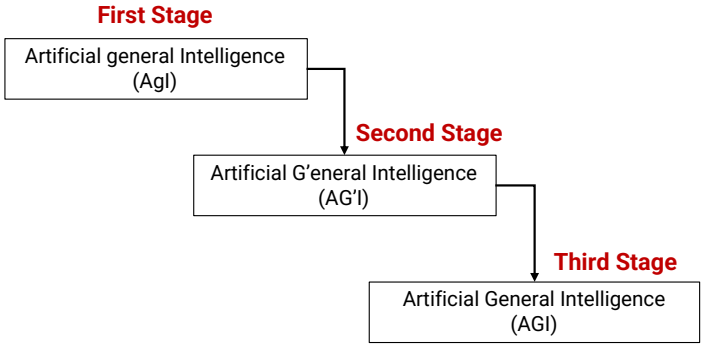


Fig. 5: Road Map - Stages to AGI

4.2 Realistic Expectations from the First Set of Next Generation AgI

The first set of next generation AgIs will be transformative advanced intelligence from where today's AIs are but limited.

- ∫ They will exhibit superior functional equivalence and perform as powerful specialist tools across multiple domains including personal assistants, organizations, healthcare, education and other industries, but weak outside of the trained domains.

- ∫ They may even imitate empathy and strategic social behaviours by simulation.
- ∫ They will demonstrate powerful, creative and abstract reasoning capabilities, enhanced by improved episodic memory and adaptive mechanisms.
- ∫ They will assist in novel scientific discoveries and complex problem solving in medicine, law, logistics, manufacturing, technology, manufacturing, logistics and finance.
- ∫ They will enhance support to scientific research for new ideas or products, in informed decision making including policy development and crisis management.

However, they would be limited in the following:

- x Albeit their enhanced cognitive and reasoning capabilities, these systems will lack subjective intelligence, sentience and emergent conscience as hypothesized in cognitive science.
- x They will not possess awareness of experience (qualia), capacity for emotional and moral insight.
- x Their performance will remain fundamentally computational, shallow without deep insight and existential understanding potentially susceptible to bias and manipulation.
- x They will suffer from a moral vacuum and manipulative bias that arises from misuse of agents or from biased data.

In a nutshell, they will not be conscious beings, morally and ethically trustworthy, emotionally reliable, capable of compassion, empathy and love, psychologically a true friend or mentor. Their superior behaviour is from computational surface performance and not a truly felt experience.

Conclusion:

The first generation AgI will surpass human performance in many functional tasks, but they will operate without wisdom, conscience and moral standards. They will pose significant risks to society if not governed under robust ethical and regulatory frameworks.

4.3 Impact of Isolated Siloed Research

The ongoing advanced research on AgI is isolated and siloed due to different technical strategies, social risk principles, competing and commercialization priorities, winning over competition in the race to AI supremacy, need for protection of IP from competitors, nations requiring military dominance etc. Hence, the efforts of various organizations are fragmented, independent and without or minimum collaboration. This leads to both negative and positive impacts as shown in Fig. 7.

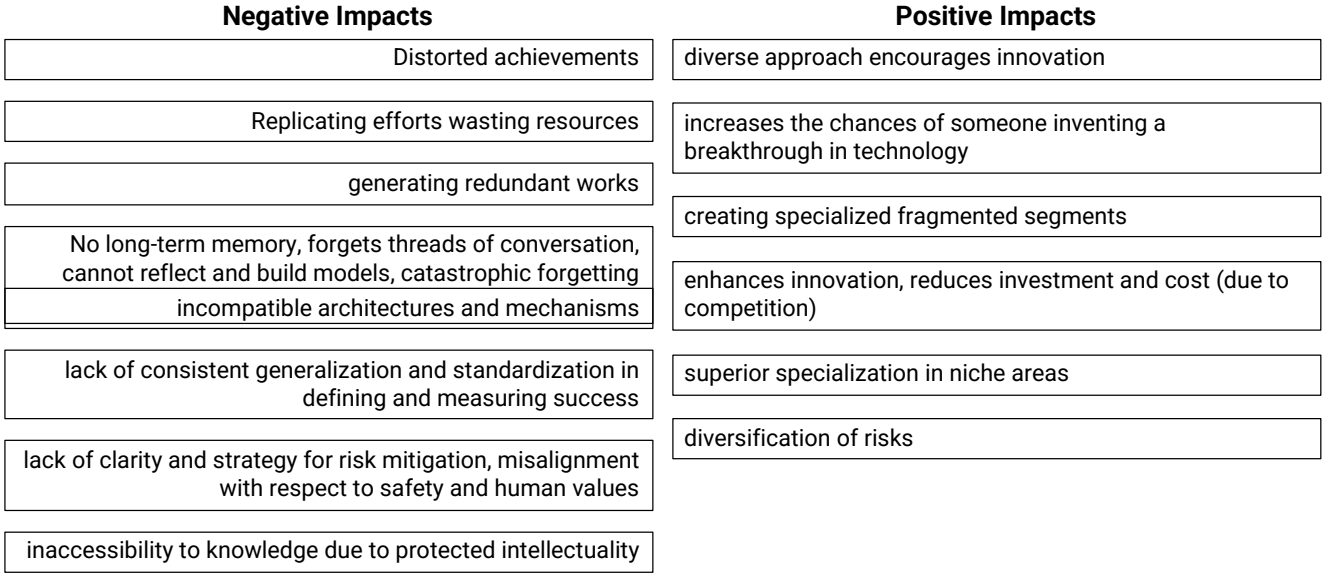


Fig. 6: Negative and Positive Impacts of Siloed Advanced Research

The net result is fragmented patchy AgI with uncertain and delayed timeline, short term gains with huge gaps and unmanaged social, moral and ethical risks.

4.4 A Unified Approach to AgI (eventually to AGI)

Achieving AgI is a deeply complex global endeavour which transcends technical challenges and demands unprecedented collaborative efforts across scientific, institutional, governmental and geopolitical boundaries. Siloed efforts driven by corporate competition and national interests are unlikely to yield a safe, ethical and equitable AgI. Governments must intervene to establish enabling platforms, collaborative frameworks and incentive structures. Only through mutual trust, courageous leadership, systemic transformation, the formidable barriers (Section 1.2 and 2.0) to AgI can be overcome. Hence, a pragmatic, integrated, effective globally coordinated effort is essential to develop the expertise needed for a safe and meaningful human aligned AgI.

This section proposes five actionable steps as discussed below:

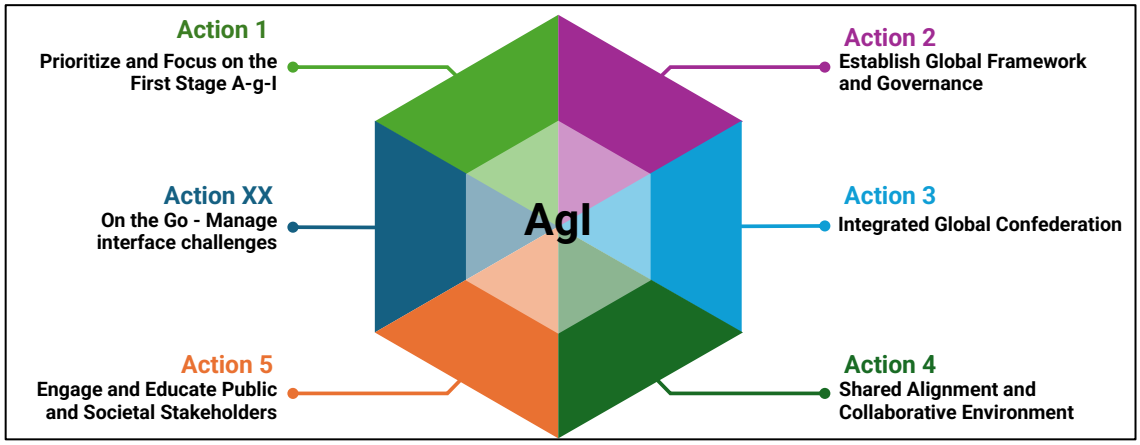


Fig. 7: Five Actionable Steps to AgI

Action 1: Prioritize and Focus on the First Stage AgI

As discussed in Section 4.1, current AI development prioritizes functional equivalence without integrating consciousness and subjective experience. This makes a true AGI unattainable in the near term. Therefore, it is prudent to prioritize and focus on AgI as a first generation precursor to a true AGI aimed at domain specific functional equivalence. This would help to achieve measurable progress while avoiding speculative claims about AGI that fuel hype and misalignment. For example, AgI systems can excel on targeted fields like energy (in energy production and optimizing distribution grids), manufacturing (increasing quality and eliminating repetition), logistics (enhancing efficiency, optimizing supply chain, reducing inconsistencies) etc where technology is the primary focus, and the impact of social, moral and ethical factors is extremely low.

Action 2: Establish Global Framework and Governance

To achieve AgI, a globally accepted framework is essential to define its technological capabilities, reduce its impact on social risks and establish adequate governance treaties. This framework must involve nations, regulatory bodies, AI organizations and research forums through cooperation instead of competition. IPCC (Intergovernmental Panel on Climate Change) could be considered as an example to model this framework along with adequate regular audits for compliance by a neutral body.

The reality is that there are already several independent and some regulatory forums on AI such as OECD AI Policy Observatory, Global Partnership on AI (GPAI), UNESCO Recommendation on the Ethics of AI, UN AI for Good, G7 and G20 AI Working Groups and other national forums but they are not unified effectively.

The proposed framework would align and unify the current siloed efforts to nurture a path for convergence towards AgI and help to establish universal benchmarks covering technical performance, societal impacts and ethical boundaries.

While national interests for military supremacy, organizations for commercial dominance and individuals for personal superiority may resist such cooperation, a treaty based approach supported by neutral international bodies can incentivize participation and build trust.

Action 3: Integrated Global Confederation

To overcome the challenges in creating a global framework, an international AI confederation should be established, uniting experts from AI industry, academia, diverse domains (example: neuroscience, philosophy, psychology, technology domain), regulatory, law and policy makers etc. Taking inspiration from CERN's (CERN

comes from French, but in English, European Organization for Nuclear Research) successful collaborative model, this confederation would facilitate shared research, talent exchanges defining transparent rules and parameters. It would also mandate interdisciplinary research hubs to advance AgI development. Such a confederation is essential not only to achieve an AGI of functional efficiency, but also for safety to humanity.

Though competing priorities may pose challenges, the goal can be achieved through stepping stones starting from regional innovation hubs and expanding them to a global model.

Action 4: Shared Alignment and Collaborative Environment

To establish alignment for shared responsibility between all the stakeholders to understand intelligence holistically instead of restraining only to its functionality.

The misalignment between AI developers and stakeholders creates a divergence and risk between dominance over social good. Hence, integration of functional equivalence and philosophical subjective intelligence (that incorporates consciousness, moral, ethics, emotions and social factors) is essential to align AgI to absorb human values. It must also address ethical reasoning, safety, reliability, and robustness. For example, in actions that involve ethical decision making, like Level 5 autonomous cars, judgement in law enforcement or life-decisive medical diagnostics, incorporating human values are critical. Hence, AgI systems should include fail-safe mechanisms and corrigibility to prevent unintended consequences.

Issues like protection of Intellectual Property, conflicts and disparities may resist such collaboration, but Governments can foster such a collaborative environment by incentives, tax reliefs and grants to organizations that share data, technology and expertise. Funding by corporations, investors, philanthropists, public and governments through a defined financial structure will accelerate progress towards human values embedded AgI.

Action 5: Engage and Educate Public and Societal Stakeholders

Beyond governments, corporations, AI experts and neuroscientists, the public and societal stakeholders including marginalized groups who are at the risk of being negatively impacted play a major role in successfully implementing a safe and reliable AgI. Hence, these stakeholders must gather in a defined and continuous basis through educational design workshops for knowledge exchange to ensure equity rather than disparity.

Overcoming public indifference and corporate resistance requires strong unrelenting efforts including public AI awareness campaigns (like health care campaigns), establishing scalable platforms such as community forums, and inclusive policies. By ensuring transparency and equity, an AgI (ultimately AGI) can foster trust and deliver equitable utilization.

Conclusion:

By adopting the proposed structured five steps action model diligently, encompassing global governance, shared alignment and stakeholders engagement, we can build a safe, reliable, ethically sound and robust AGI starting with the first generation AgI. Now is the time for stakeholders to unite, foster transparency and equity to ensure AGI benefits all of humanity, not just a few. Through cooperation and effective implementation, we can convert this challenge into an opportunity for universal good.

However, due to competing priorities, the proposed unified approach, and the five steps actionable plan may prove to be difficult to implement. Hence, a pragmatic roadmap is provided to achieve a AgI within the next 5-7 years in Section 4.6.

4.5 Timeline to AgI and Ultimately AGI

While it is difficult to predict the timeline, if genuine efforts are made, the following timelines are feasible:

2025-2032: A meaningful well defined **functionally equivalent** AgI.

2032-2050: Transition from AgI to AG'I, that is **functionally efficient with partial consciousness**.

2050-Unknown: AGI with both functional and conscious capability to match human like intelligence **will remain uncertain** unless objective measurement of C^s and S^e is scientifically viable to incorporate them to AIs.

4.6 Roadmap for Functionally Equivalent AgI (2025-2035)

A pragmatic roadmap to achieve the **functionally equivalent** AgI before 2032 is presented briefly below.

Definition of AgI:

The next generation functionally equivalent AgI will be of three types. Only the principles and concepts of the models are discussed and not mathematically or architecturally.

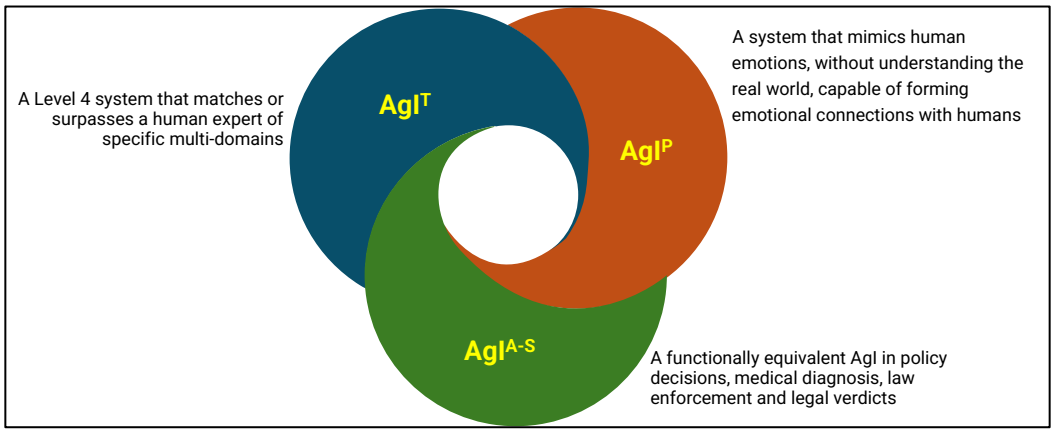


Fig. 8: Three Types of Next Generation AgI (2025-2032)

AgI^T (T refers to Technology):

A Level 4 system that matches or surpasses a human expert of specific multi-domains in executing complex multi-tasks independently where critical technical and operational decisions do not involve ethical, moral, social and emotional judgements. This may also include advanced robotics.

Level 4: Level 4 represents a semi-autonomous AgI^T (in my own scale of autonomy) which operates with high reliability in technical tasks, but rely on human intervention in critical decision making and to ensure functional accuracy in complex scenarios.

Partial judgements and bias are prevalent in many AIs today. Such AI driven credibility assessments with biased outputs reveal systemic flaws that undermine trust and fairness. This causes ethical issues if a wrong person is assessed as credible and a credible person is wrongly rejected. This bias issue becomes even more critical in high-stakes domain like law enforcement, where a biased AI could lead to wrongful convictions eroding societal trust. Societal momentum often overrides these ethical concerns due to competing and systemic inertia.

However, AgI^{T}s generated according to its definition will be unique and devoid of such bias as it aligns with the current AI research that focuses on functional equivalence of human intelligence excluding consciousness and subjective experiences.

AgI^P (P refers to Personal):

It is a system designed to mimic and reciprocate human emotions, although without understanding the real world, capable of forming emotional connections with humans, similar to how humans bond with pets or objects.

Humans have an inherent connection to non-human beings like a teddy bear, cow, dog, cat, even cars and computers. While they crave for a human connection, in its absence or lack of satisfaction, humans choose another being to be a partner. Hence, personal AI agents including robots of various categories will naturally arise abundantly. The urgent requirement is to enforce strict governance like data transparency, bias audits and strict limits to authority on decision making in sensitive contexts to prevent unintended consequences.

AgI^{A-S} (A-S refers to Assessment minus subjective intelligence):

The biggest challenge in limiting the AgI to only AgI^T and Agi^P as next generation AgIs, is the use of functionally equivalent AgI in policy decisions, medical diagnosis, law enforcement and legal verdicts. While humans also make mistakes in judgements, the lack of subjective intelligence (consciousness, emergence, emotions, morality, ethics etc) in AgI imposes a much larger issue in such domains. However, as the race to AI supremacy and dominance will not restrain such AIs, that is where the five steps action plan of Section 4.4 becomes critical.

Proposed Roadmap:

This paper proposes briefly a practical roadmap that spans 5-7 years of genuine and dedicated efforts to achieve AgI using the principles discussed in Section 4.4 and the definitions of AgI^{T}, AgI^{P} and AgI^{A-S}.

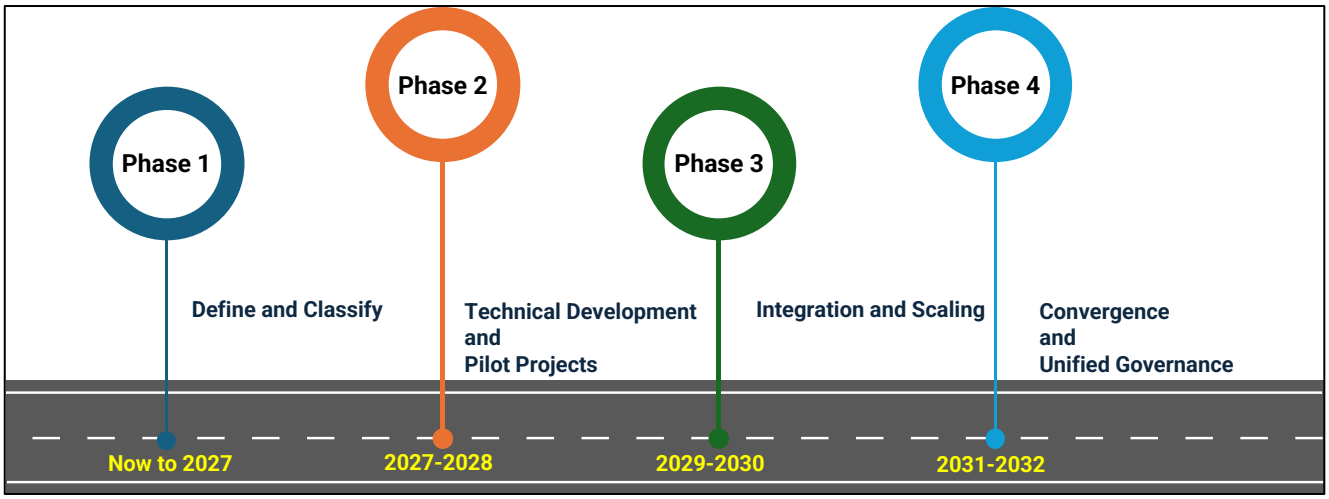


Fig. 9: Proposed Roadmap to Next Generation AgI (2025-2032)

Phase 1 (Now to 2027) – Foundation Establishment

P1.1: Define and Classify

1. Establish formal international definitions for AgI^{T}, AgI^{P} and AgI^{A-S} under AI governance bodies (such as IEEE, UN AI, AAAI etc).
2. Establish the International AI Federation (Action 3 of Section 4.4), starting with a small multi-disciplinary group who aligns with the concept.
3. Define the technical capability levels, principles and assessment rubrics of each type of AgI.

P1.2: Policy Frameworks

1. Create governance charters, especially for AgI^{A-S}.
2. Launch AI bias audit standards and emotional response regulations.

P1.3: Proto-Types, R&D and Sandbox Environments

1. Define proto-type use cases in engineering, manufacturing, logistics, energy etc for low-stakes AgI^{T}.
2. Create personal early AI agents AgI^{P} proto-types and encourage their trials with strict consent frameworks.
3. Design and create a proto-type AgI^{A-S} with strict governance frameworks.

Phase 2 (2027-2028) – Technical Development and Pilot Projects

Expand the International AI Federation (P1.1 - 2) to national levels with cooperative global involvement.

P2.1: AgI^{T}

1. Develop robust AgI^{T} as defined as a multi-modal multi-domain expert AI agents.
2. Launch in fields like energy (oil and gas), manufacturing, logistics and medicine etc, for design support but not for authority for critical decisions.

P2.2: AgI^{P}

1. Develop robust AgI^{P} as emotion-recognizing simulated empathy models for elder care, children support, personal assistants etc.
2. Launch with enforced limits on authority and data access.
3. Initiate psychological studies on emotional dependence and long term cognitive efforts.

P2.3: AgI^{A-S}

1. Develop robust AgI^{A-S} systems for law enforcement, legal, policy making etc but not for adjudication.
2. Launch pilot trials with enforced human supervision and adequate safeguards and bias audits.
3. Initiate research studies and design of self-explainable AgI^{A-S} that can justify the recommendations.

Phase 3 (2029-2030) – Integration and Scaling

Expand further the International AI Federation (Phase 2) to a true global forum and regulatory body with veto rights, audit privileges and risk review boards.

P3.1: AgI^{T}

1. Launch AgI^{T} with Level 4 autonomy in applicable technical mission and critical fields with ability to take decisions, but in not critical contexts.

P3.2: AgI^{P}

1. Integrate AgI^{P} in homes, cars, offices, educational institutions with digital disclosure laws and emotional safety protocols.

P3.3: AgI^{A-S}

1. Encourage AgI^{A-S} to contribute to policy modeling, legal forecasting and simulations for justice under strict judiciary oversight.

Phase 4 (2031-2032) – Convergence and Unified Governance

Converge all systems under a unified global AgI leadership and governance model.

1. Converge and blend functional, emotional and assessment capabilities (integration of functional equivalence + subjective intelligence) into hybrid AgI (combination of AgI^{T}, AgI^{P} and AgI^{A-S} models) for advanced domains and capabilities.

2. Create and publish a Global AgI trust index consisting of system reliability, bias, performance and ethical alignment.

3. Create and establish a global codified AgI bill of human rights to define and protect humans from misuse, abuse and exploitation by AIs as wells humans themselves.

Conclusion:

The proposed roadmap to the next generation AgI is a systematic holistic strategy, which is practical and achievable within the estimated timeline by diligent and prudent execution.

4.7 Our Current Ambitious AgI^{T} Project

Drawing inspiration from this paper, especially the unified approach (Section 4.4) and practical roadmap (Section 4.6), we have launched an ambitious project to develop a Level 4 AgI^{T} that would replicate a high calibre senior well engineering domain expert ("SDE") in the field of drilling in the upstream oil and gas industry. As the field of drilling is prone to complexity, uncertainties, randomness and high risks, the SDE must be highly competent. Our aim is to launch a functional SDE with nearly 80% capability of a human SDE of 20+ years of experience, but without the authority to make critical decisions in complex scenarios (as per Level 4 AgI^{T} definition).

We commenced this ambitious SDE-AgI^{T} project in January 2025 with a timeline to release a Minimum Viable Product (MVP) by early 2026 and a fully functional SDE-AgI^{T} by Q2-Q3, 2027.

Although the development of a highly competent expert level SDE-AgI^{T} will be a formidable challenge, we strongly believe that by applying the principles outlined in this paper and using the latest AI technologies and foundational models, the goal is achievable.

5.0 The Real Risk to Humanity: Not Machines but Ourselves

The paper would not be complete without a reality check on the risk to humanity by AgI (and ultimately AGI). The next generation AgIs will be functionally efficient to surpass humans in specific tasks and/or fields, but without internal realization and subjective experience. Hence, they pose less technical rebellion risks than a misuse risk on society.

The fundamental issue is that technology growth and humanity hold an inversely proportional relationship. As the technology leaps up, humanity unknowingly outsources its freedom, and skills to machines.

Prior to the agricultural revolution, our ancestors were free, independent hunters and foragers. At the onset of agricultural revolution, they fell to monotonous hard labour, hierarchical systems, slavery and disparity. The advent of mining and manufacturing shifted farmers and peasants from their fields by propaganda and lies to work with poor salaries, working conditions and worse treatments. The global financialism, commercialism and consumerism, made people to live a sedentary, stressful and chronic diseases life. IT world had created a virtual society replacing personal interface by machines increasing isolation and fragility.

Technology is the primary cause for the paradigm leap in humanity's growth, but it has also been misused to create destruction.

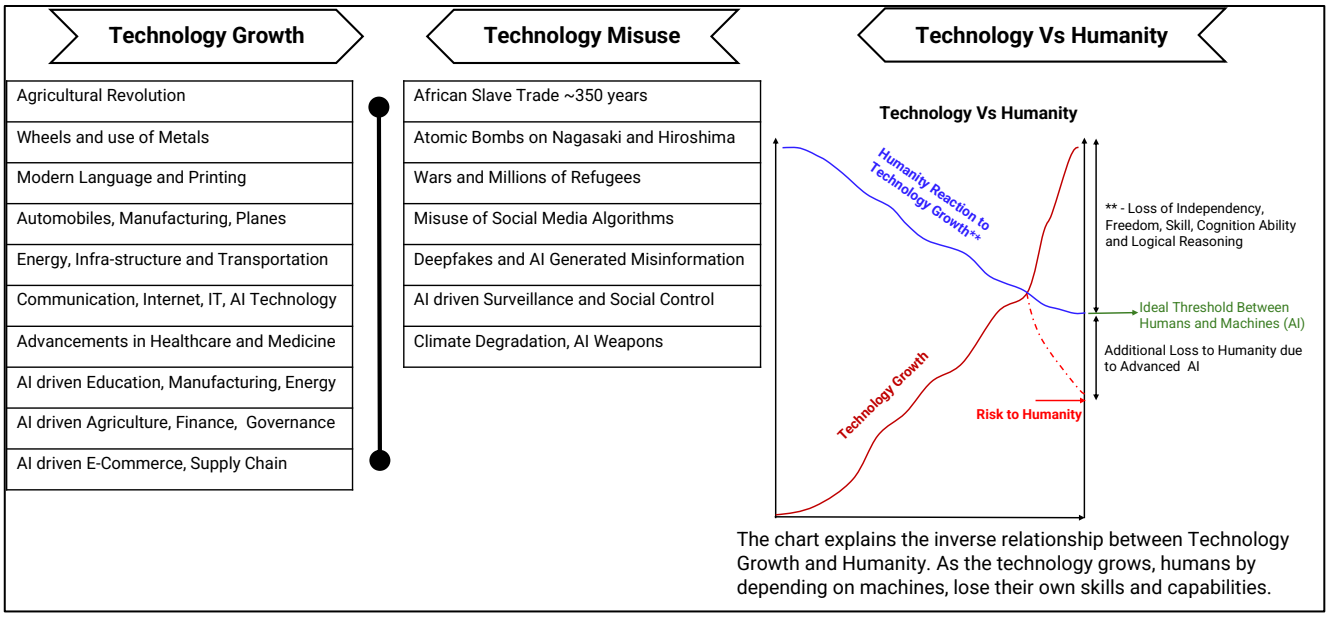


Fig. 10: Technology Growth, Misuse and Humanity

Humans have shown the capability to indulge in merciless violence and cruelty beyond imagination. While technology growth is extraordinary, its misuse stems not from machines but from ethical lapses of human intent. While ethics and morality are critical for AIs, **what is more critical is to ensure humans follow right ethics and moral standards** in a global perspective.

I believe either of the following four things will happen when a true AGI is launched:

Scenario 1: Collaborative Co-Existence with Power Asymmetry

Humans will use AgIs for existence in a collaborative manner instead of being rivals. This will happen more from humans submitting weakly to AgI and not by the power of AgIs. In this scenario,

- Governments will have the power to exercise surveillance, monitor, control, govern and suppress.
- Human dependency on AI will increase such that many hands-on skills will be taken over by machines.
- Civil liberties and rights will be subdued under a new model of social disparity and modern slavery.
- Faith on belief systems will leap to a new higher order as life challenges would escalate.
- Human bias will defeat ideas like eradicating poverty, diseases and social disparity using AI.

This sounds like a doomsday vision but in fact, it is already happening in the world today.

📖 Between world's 1% super rich that holds more than 50% of global wealth and the remaining 99% that share the balance 50%, the disparity is expanding day by day with alarming increase in inequality, prejudices and social differences. With more advanced powerful AIs, this will only increase further.

Scenario 2: Power Dominance with Subdued Existence

AI driven military and technology dominance foster AI misuse to defeat, capture and control leading to global instability, escalated conflict and suppression of civil liberties, rights and equality.

- Democracy will be under serious threat as authoritarian governments will raise.

- Human will search, identify, learn and elevate skills in areas where they would valuable (anf fitting) to AI rather than the other way.
- dependency on AI will increase such that many hands-on skills will be taken over by machines.
- The impact on belief systems will be hard to predict as they may be used to exercise control and manipulate voluntary obedience.
- The disparity would move beyond wealth and social status to intelligence, power and necessity.
- An artificial surface level peace will prevail due to suppression rather than willingness for cooperation.

Scenario 3: Authoritarian Governments and Suppressed Existence

A new version of central control by powerful, authoritative AI architects will be born. The power will shift from standard political and monarchy leaderships to the hands of authority that controls the AIs.

- A new political ideology, doctrine and regime under a new form of AI powered dominion.
- The world would have different geographical boundaries than what it is today.
- AIs will determine the use of humans in areas of its weakness rather than the other way.
- Religions may cease to exist in the current form.
- The fiat currency will be replaced with a new digital currency (or gold).
- Energy, food and water will be under strict control with population nearing ten+ billion.

The degree of existence of humans under the authority of this new world order cannot be imagined.

Scenario 4: AGI Takes Over to Existential Threat

Humans lose control to AGI leading to existential threat.

- Such a threat does not seem practical based on current AI research and technology. However, if breakthroughs are achieved, the possibility of AIs surpassing humans in all aspects cannot be ignored.
- However, as the utilization of human brain with respect to memory, cognition and perception would decline due to AI dominance of human life, an evolutionary paradigm shift to brain's functional design is a distant possibility.

  Future generations may have a different type of brain, elevated or humbled, tuned to exist under AIs.

Conclusion:

The most likely scenario that might happen within the next 10-20 years is Scenario 1 with a low probability for Scenario 2. Scenarios 3 is a distant possibility whereas Scenario 4 is undeterminable.

The current AI regulatory practices is still approaching the issue in a conventional manner suitable for linear and predictable systems through assessments, mitigation and strategies. As AgIs (eventually AGI) can be complex adaptative systems (CAS) like human intelligence, such linear approach may not be helpful. If AIs are allowed to operate independently with their own thinking without human control, they can become non-linear, random and uncontrollable. That is why the unified approach of Section 4.4 and roadmap to AgI in Section 4.6 are essential to ensure appropriate and adequate governance and control to sustain human safety.

6.0 A Reality Check: AI Vulnerable and Resilient Jobs

This paper is not designed to discuss AI proof jobs but a brief discussion for reality check is essential. As the AIs capability graph is dynamically changing and advancing rapidly, it is hard to forecast the AI proof jobs. However, Table 1 is produced charting the capabilities AgI^{T}, AgI^{P} and AgI^{A-S} against human job profiles.

Table 1: Vulnerable and Resilient Jobs against advanced AIs (2025-2032)

Vulnerable Jobs	Resilient Jobs
Repetitive routine rule based jobs	High stake human interaction
Linear and flat profile jobs	Deep intuitive creativity and strategic thinking
Predictable standardized jobs	Complex decision making
Low emotional and intuitive creativity related jobs	Strategic leadership and management

Cost sensitive jobs (which makes automation cheaper than humans)	Managing unpredicted unstructured environments
Assembly line workers where reliance on humans is low	Moral and ethical grounds
Basic cognitive, analytical and research works	Hands-on physical dexterity and craftsmanship
Low quality SEO type content writing and routine journalism	Hands-on physical dexterity and craftsmanship
Social interactions without genuine understanding	High level of physical contact
	Special education experts
	Educators for children (kindergarten)
	Philosophers, psychologists and high skill medical professionals
	Niche performers

Conclusion:

Most AI proof jobs will be where a combination of the following is needed:

(1) human skills like empathy, deep creativity, adaptability, emotional intelligence, strategic evaluation and judgement, emergence etc,

(2) environments that are hard to standardize and unpredictable for problem solving

Advanced AIs will not be able to replace humans where jobs rely on deep human traits, complex real world dynamics, and cross-domain adaptability. To remain resilient, people should focus on such traits and be prepared to use the advanced AIs as tools rather than presenting themselves as a replacement.

7.0 Conclusions

The race towards AI supremacy will continue unabated and relentlessly, regardless of growing concerns over moral dilemma and ethical violations, existential risks and threats to humanity. The utilitarian value of advanced AI driven by dominance, commercial gain and ambition is likely to overshadow its potential shortcomings. Consequently the true risk to humanity does not arise from machines themselves but from the humans who build, deploy and exploit them.

Only through collective foresight, global coordination and ethical resolve from corporations (both creators and users), governments, regulatory bodies, international monitoring and control forums, investors, stakeholders and civil society, we can steer the emergence of AgI (and eventually AGI) toward a future that safeguards human dignity, equity, and survival.

The immediate next step is to generate and operationalize the framework outlined in the unified approach to AgI and to pursue consensus building and alignment with key stakeholders. Our flagship initiative to develop an advanced expert level AgI^{T} (Section 4.7) is a concrete step in that direction.

Author's Note:

While the unified approach (Section 4.4), the roadmap to achieve AgI (Section 4.6) are designed to be pragmatic and implementable, their success depends on overcoming the repelling forces such as fragmented, competitive and siloed nature of current AI research and development efforts. AgI may soon achieve functional equivalence to humans in narrow domains, but it will lack what truly makes us human, the compassion, empathy, emotional depth and ethical consciousness, all of which arise from subjective experience.

It is our collective responsibility to ensure that these human virtues are not surrendered to AIs in favour of commercial profit, control and dominance. The benevolence of humanity must not be sacrificed on the altar of commerce.

For further discussions, deliberations and collaboration including research and implementation, please contact the Author at jmk@yadhumagi.com.

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This paper draws references from a lot of papers, books, podcasts and LLMs (especially ChatGPT and Grok 3). Some of the important references are provided below. I thank all the authors, and contributors for such a wealth of knowledge including references if any are missed inadvertently in the list below.

** - Special acknowledgement for the usefulness of ChatGPT and Grok 3 to expand my research.

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