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A REVIEW ON HYBRID INTELLIGENCE: BRIDGING HUMAN AND ARTIFICIAL INTELLIGENCE

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Abstract

Hybrid Intelligence (HI) is a new form of intelligence that maximizes the complementary capabilities of human intelligence and artificial intelligence (AI). Human intelligence is notable for its creativity, intuition and ethics; AI for its actionable intelligence, statistical learning and automation abilities. Hybrid Intelligence signifies the power of human and AI in cooperative intelligence that is more efficient, adaptive and human-centric than either human or machine alone. This review considers the concept of Hybrid Intelligence, its applications in areas (health care, business, education, robotics and public policy), challenges and prospects for future. The illustrations and tables of human-AI collaboration are included and demonstrate the nature of our conceptual approach and consequences for practice.

Keywords: Hybrid Intelligence, Human-AI collaboration, cognitive augmentation, machine learning, human-centered AI.

1. Introduction :

The past ten years have witnessed accelerated advancements in Artificial Intelligence movement that have caused monumental disruption in a number of industries including finance, health care, and manufacturing. While there have been significant advancements towards powerful AI, AI remains limited in some very key characteristics including high degrees of creativity, adaptability to new situations, and ethical judgement. Humans may not be as fast or capable of processing as much data as an AI system, but we are far better than an AI system in the areas of creating consistent, repeatable work that requires a significant amount of creativity, empathy, or decision making under uncertain circumstances.

Hybrid Intelligence (HI) as a direction for research will begin to leverage machine capability and human ability. HI is not intended to replace human workers with machines, but to enable machines to address repetitive, high volume, analytical tasks leaving more complex, uncertain tasks to human's creativity, empathy, and decision-making capabilities.

2. The concept and Definition of Hybrid Intelligence Briefly, Hybrid Intelligence can be defined as :

"A collaborative system in which humans and Artificial Intelligence agents work together so that neither one achieves outcomes that they could achieve separately."

It is important to note that, Hybrid Intelligence is not about automation and replacement, but about collaboration, flexibility, and co-decision-making that can ultimately pair the quickest strategies, and the best of both worlds (i.e. Humans and AI).

· **Figure 1:** The Complementary Strengths of Humans and AI with HI

Human Strengths	AI Strengths
Creativity & Innovation	Speed and Scale
Ethical reasoning & Empathy	Data driven decision support
Context based understanding	Pattern Recognition
Problem Solving under uncertainty	Automation of routine tasks

This framework emphasizes that HI is not a competition, but combines the betters of both worlds.

3. Literature Review :

Diverse disciplines have begun to understand Hybrid Intelligence:

- Dellermann et al. (2019): Developed theoretical patterns of HI, focusing on humans and AI working as partners in decision-making roles.
- Jarrahi (2018): Studies HI organizations, showing that human judgment plus AI analytics utilized together lead to better business decision making.
- Jordan & Mitchell (2015): Discussed that machine learning could not reach its full potential without a human being involved.
- Shneiderman (2010): Stressed Human-Centered AI in order to create safety, transparency, and trust.

Other reviews :

- Ahmed, Z. K., & Mehta, B. (2023) This study emphasizes the influence of web-based customer feedback upon consumer decision-making in the home furnishings sector. It emphasizes the growing potency of digital feedback mechanisms within the process of shaping purchase decisions. In import/export business, analysis of crossborder customer feedback via sentiment analysis using AI can provide rich insights into cross-border consumer preferences. Such data can allow exporters to modify product features, prices, and channels of distribution in real-time and thereby contribute to competitiveness in foreign markets.
- Choudhary, P. D., & Madhwani, R. (2013) This research is looking into how world depressions influence tourism and hospitality sectors. Its implications reach the entire economy, foreign trade included, which gets hurt in world downturns. Now, AI software in predictive analytics and forecasting can assist importers as well as exporters to foresee market movements and pre-emptively modify supply chains. Thus, though the paper is centered on tourism, its conclusions echo the potential of AI to act as a shock absorber for import-export industries too.
- Chaplot, D., Ranawat, P., Yadav, A., & Soni, K. (2023). Customer relationship management (CRM) in the era of data analytics research includes the development of CRM with data analytics as a method of showcasing how businesses utilize data in order to establish better connections with customers. Extending this to global trade, AI-driven CRM can help import-export businesses manage cross-border client relationships, track cultural buying habits, and predict future customer demands. By integrating AI with CRM, businesses will be able to

achieve loyalty and international market penetration, which is well-suited for globalized digital trade practices.

- Dave, K. K., & Paliwal, R. (2016). A study on consumer perception on malted health food drinks in Udaipur ciy explores consumer perceptions and behavior in a specific kind of FMCG category. Its conclusion reflects how local palates influence market success. In import-export, world consumer food and beverage preferences can be predicted through AI-driven market analysis, allowing exporters to access the appropriate markets with the appropriate products. Hence, market research on consumer attitudes, linked with AI tools, is critical in handling world product acceptance.
- Sharma, R., Dadhich, M., & Chauhan, K. (2022). The pandemic effect analysis of financial indicators of the selected BSE listed firms: an in-depth analysis provides a comprehensive view of how COVID-19 interrupted financial performance of leading companies. It reflects the need for robust systems that can handle external shocks. In import and export firms, AI-based financial modeling may help in forecasting risks, handling disruption in supply chains, and optimizing the use of resources during crises. The findings corroborate the relevance of AI in formulating adaptive approaches to international trade in uncertain situations.
- Mehta, A., & Hiran, D. (2023). Change management practice in medium size business organizations of small cities study emphasizes change management practice within mid-sized organizations, particularly in smaller cities. It argues that business continuity requires flexibility and systematic approaches. For import-export, AI facilitatesb smoother change management by offering real-time information, automating rules, and streamlining supply chains. The observations of the paper align with how AI can guide small and medium enterprises (SMEs) in smaller cities to participate confidently in global trade networks.

Gap found: While many studies have investigated the possibility of AI replacing humans, few are concerned with their shared collaboration. Hence, additional interdisciplinary studies are warranted.

4. Applications Of Hybrid Intelligence :

• Where Human-AI Collaboration Actually Works

The most thrilling innovation in AI isn't when machines do everything by themselves, but when they're collaborating with humans. Here's where that collaboration is already transforming how we work:

• Healthcare: The Perfect Diagnostic Dance

In hospitals nowadays, AI has become incredibly skilled at recognizing patterns in scans by doctors and cutting through studies to make treatment suggestions. But the issue is—patients are more than symptom checklists. They are frightened, confused individuals who need someone to sit them down and explain things to them.

Consider IBM Watson's collaboration with oncologists. The computer will review thousands of treatment studies in a matter of minutes and make recommendations, but the choice is up to the doctor. They are the ones who understand that this patient dislikes needles, or that the domestic situation means this particular regimen will never work. The machine gives the information; the human gives the wisdom.

• Business: Reading Between the Data Lines

Machine learning is good at finding patterns in massive sets of data— forecasting trends in the marketplace, optimizing supply chains, seeing potential threats on the horizon before they become issues. Naked forecasting isn't business strategy, however. That is where human managers enter, translating what the numbers are saying to them in the context of what the algorithm can't, making a call on timing and implementation.

Stock trading is a good case in point. AI can chew through news and market data more quickly than any human investor, but the most effective investment firms blend those nanosecond-speed insights with human judgment on matters of market psychology and real-world events not captured by the data but influencing it nevertheless.

• Education: Personalizing at Scale

Adaptive learning programs can monitor exactly where each child is falling behind and adjust teaching accordingly—something a teacher trying to keep track of thirty children can't do. Learning, though, is more than the acquisition of information. Children need to be comforted when they become frustrated, rewarded when they succeed, and someone to believe in them when they lose confidence in themselves.

The mixed model classroom that is evolving in so many schools combines human teachers with AI tutoring software. The AI performs personalized practice and knowledge gap analysis, and the teachers get inspiration, imagination, and the messy beautiful process of getting kids to figure out who they want to be.

• Manufacturing: precision meets problem-solving

New production facilities increasingly use collaborative robots—"cobots"—that work alongside human employees at close distances. The robots handle the precise, repetitive functions they're designed to perform, with human workers dealing with the unexpected problems, creative solutions, and quality judgment challenges that require experience and intuition.

It Is not about automating our jobs, it is about allowing each to do the best it can. The machine will never tire or mis-measure. The human senses the sense that something is "wrong" even if they can't yet put their finger on why.

• Governance: Data-Driven Policy with Human Values

Government agencies increasingly employ AI to crunch all sorts of data, from traffic flows to trends in public health, examining datasets too massive for human analysts to sort through alone. But translating data into policy takes seeing into communities, balancing competing demands, and making moral decisions about fairness and priority—tasks with a very human touch.

The best public policy results when AI gives the general reasoning and humans give values, context, and democratic accountability citizens demand from their leaders.

· **Figure 2:** Applications of Hybrid Intelligence Across Industries

Sector	Human Role	AI Role
Healthcare	Ethics, empathy, final decisions	Diagnosis, data analysis
Business	Strategic planning, leadership	Predictive analytics, automation
Education	Motivation, mentoring	Personalized tutoring systems
Robotics	Creativity, supervision	Precision manufacturing tasks
Public Policy	Justice, fairness, context	Data-driven policy modeling

5. Challenges And Limitations :

Hybrid Intelligence is a promising concept but ultimately faces a number of hurdles.

1. Trust & Transparency – One reason why it's hard to trust an AI's decision is that there is no possibility of explaining or justifying the result.

2. Ethical Issues – Making life- and death-decisions (i.e. health care and self-driving cars) introduces serious ethical question on moral responsibility when leaving decision-making to AI.

3. Privacy Issues – Merging sensitive personal data could cause serious compromise of privacy.

4. Knowledge Gaps – Using AI means that an individual could lose knowledge skills and their ability to think independently.

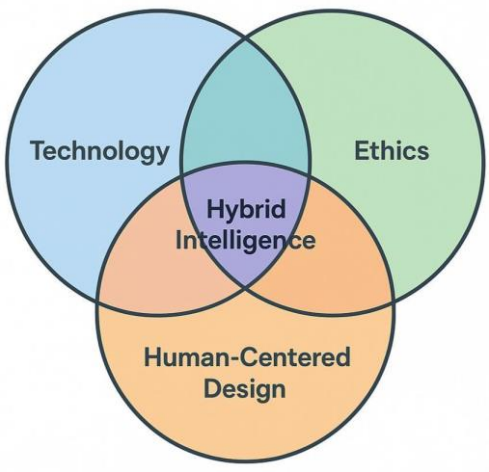
5. Cost – Designing and effectively implementing Hybrid Intelligence systems will likely be expensive and time-consuming.

6. Future Scope :

We will see fast development of Hybrid Intelligence quidelines in these areas;

- Explainable AI (XAI) which will enable transparency of AI decisions.
- Brain–Computer interfaces (BCI) which will provide for a more direct arrangement for a human's brain to cooperate with AI.
- Collaborative robotics (cobots) in creating, more potentially safer, human-friendly robots.
- Work in Ethical AI which will create governance models to ensure fairness, accountability & inclusivity.
- We will develop interdisciplinary – as we create collaboration/research in computer science, psychology, management, ethics

· **Figure 3:** Future roadmap of Hybrid Intelligence (a diagram of three intersecting circles (e.g., Technology, Ethics, Human-Centered Design, with Hybrid intelligence in the center).



7. Conclusion :

Hybrid Intelligence presents a disruptive opportunity for our future of work, education, health care, and governance. Hybrid intelligence is produced by bringing together to utilize the holistic speed, clarity, and reproducibility of AI together with the energy, creativeness, courage and compassion of human beings, which can generate outcomes far greater than either could manage alone. In order for Hybrid Intelligence to be effective, it needs to practice transparency, trust, ethics, and inclusivity.

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