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Artificial Intelligence using TOPSIS Method

Praveen Kumar Kumbum[1*], Vijay Kumar Adari[2], Vinay Kumar Chunduru[3], Srinivas Gonepally[4], Kishor Kumar Amuda[5]

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***Corresponding author:** *Praveen Kumar Kumbum, Incredible Software Solutions, Research and Development Division, Richardson, TX, 75080, USA. E-mail: kumbumpraveen@gmail.com*

Abstract

Technology based on artificial intelligence (AI) is a revolutionary force that is changing economies, civilizations, and industries all over the world. AI, which has its roots in computer science and cognitive psychology, is a wide range of tools and methods designed to make robots capable of doing activities that have historically required human intellect. This abstract examines the many facets of artificial intelligence (AI) technology, including its fundamentals, uses, difficulties, and ramifications. Artificial Intelligence (AI) technology comprises several subfields such as robotics, computer vision, natural language processing, machine learning, and expert systems. Particularly, machine learning techniques have propelled incredible progress by allowing computers to learn from data and make judgments or predictions without the need for explicit programming. Natural language processing allows machines to comprehend, interpret, and produce human language, hence facilitating human-computer interaction. Machines can now see, analyze, and interpret visual data from the real world thanks to computer vision technology. Applications of AI technology may be found in a wide range of industries, including manufacturing, healthcare, finance, transportation, agriculture, education, and entertainment. AI-powered solutions help in drug discovery, medical imaging analysis, diagnosis, and customized therapy in the healthcare industry. AI algorithms are used in finance to power automated trading, fraud detection, risk assessment, and customer support. AI makes it possible for transportation to include predictive maintenance, traffic management, and driverless cars. Artificial Intelligence enhances supply chain management, quality assurance, and production processes in manufacturing. AI technology has the potential to revolutionize many industries, but it also comes with dangers and problems. These include privacy concerns, security hazards, ethical dilemmas, issues with prejudice and fairness, and effects on society and employment. Responsible AI methods, legal frameworks, multidisciplinary cooperation, and ethical standards are all necessary to meet these issues. Future prospects for AI technology development include the ability to solve challenging issues, spur creativity, increase productivity, and improve quality of life. But to fully utilize AI, one must take a comprehensive strategy that strikes a balance between the advancement of technology and ethical issues, human values, and social well-being. In summary, artificial intelligence (AI) technology is at the vanguard of innovation, presenting never-before-seen possibilities to transform whole sectors, spur economic expansion, and tackle global issues. AI has the ability to usher in a future of greater human-machine collaboration, innovation, and wealth through the promotion of collaboration, transparency, and ethical stewardship. the Ranking of the Artificial Intelligence using the TOPSIS Method . Interpretable Models is got the first rank whereas is the Ethical AI is having the Lowest rank.

Keywords: Explainable AI (XAI), Interpretable Models, Ethical AI ,Responsible AI, Robustness and Adversarial Defense, Continual Learning, Federated Learning, Human-Centric AI, AI Governance and Policy

Introduction

AI-powered service interactions are becoming more popular as a trend in response to co-creation of service value and SD logic. Determining the responsibilities of participants in service processes and comprehending the characteristics of different interactions are critical to the successful management of AI-infused service encounters. Businesses in the hospitality and tourist industries that aim to stay in business are worried about the variables that affect AI-powered service interactions and the ways in which such interactions result in service results. We developed a conceptual model of the process by which service encounters facilitated by AI technology impact service outcomes by adhering to the idea of social interaction [1].encounters with AI-powered services. While social distancing practices should be employed to stop the spread of viruses, social interaction is also important to counteract depression and loneliness brought on by public health issues. Service interaction is therefore essential to service management in public health settings, and AI solutions might be helpful. Four types of AI-generated, AI-supplemented, AI-mediated, and AI-facilitated service interactions were identified by this study [2]. Healthcare Applications of Artificial Intelligence More than 60 medical devices with AI capabilities have already been approved by the US Food and Drug Administration (FDA), and the active use of AI technology is thought to be a crucial trend for the future of medicine. In the realm of cancer, where clinical applications of medical devices containing AI technology are now underway, mainly in radiography, it is envisaged that AI technology will be positioned as a key core technology [3AI-powered facial recognition technology is being actively used at airports and other venues. AI is also used in a wide range of other areas of daily life, including speech recognition, automated translation, and autonomous driving. In actuality, the US FDA has approved more than sixty AI-enabled medical devices, and it is certain that AI technology will be heavily incorporated into the medical sector in the future. This pattern is also evident in the realm of cancer, where a variety of AI-enabled medical devices—particularly in radiography—are already being used for therapeutic reasons. The medical sector

 ***Corresponding author email:** kumbumpraveen@gmail.com*

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also makes substantial use of AI technology, and omics analysis and medical image analysis are only two examples of the results that demonstrate its usefulness. In actuality, by 2020, around 60 AI-powered [4]. The fact that the third AI boom is genuinely being used in society is a key distinction from the prior two. These qualities are best embodied in the idea of "tacit knowledge," which has been shown to be crucial for creating a long-lasting competitive advantage. Thus, it seems that the unique qualities of tacit knowledge might prove to be a significant barrier to its application in the context of artificial intelligence technology.[5]. artificial intelligence. The idea of the extended knowledge value-activity cycle, as it is encapsulated, and an evaluation of the possible applications and constraints of artificial intelligence in supporting the EKVAC concept are the main "academic deliverables" that result from this procedure. These have arisen as a result of the grounded research technique, which combines observations and revelations made during the case study phase with the analysis and synthesis of preexisting, ostensibly distinct but connected ideas [6]. Innovations in AI technology (such as knowledge-based, biological, and particular mathematical models). This study aims to shed light on the variables that influence the publishing of AI technology patents according to the kind of technology. We use a framework for decomposition analysis to determine the criteria for awarding patents related to AI technology. To break down the granted AI technology patents, we utilize three indicators: the amount of R&D effort (amount), the value of a particular AI technology relative to all awarded AI tech, and the priority assigned to that technology (PRIORITY). The number of patents awarded for a particular AI technology divided by the overall number of AI patents granted is how we define the PRIORITY indicator. [7].In only two years, from 2015 to 2016, the number of patents awarded for certain mathematical models and other AI technology more than doubled. Based on nation and technology, these two statistics depict the short-term trend of AI patenting. Our goal is to create a brand-new idea for Beyond AI, a general-purpose intelligence cognition technology. In particular, we intend to create an artificial life model with an imagine function dubbed Brain Intelligence (BI), which is capable of generating novel concepts about events even in the absence of personal experience. The industry and market for AI technology are evolving quickly. Apart from conjecture and amplified coverage in the media, several startups and Internet behemoths are vying for AI technology through funding. [8]. According to the Narrative Science Survey, 38% of businesses used AI in 2016[6]. The advantages of artificial life (AL) and AI are combined in the BI intelligent learning model. The current state of deep learning research is on using a deep neural network with several layers to learn expressions that are taken from the most important information found in observational data. There is currently a lack of research on transition studies—which switch the learning outcomes of one task to another—and multitask learning—which involves learning multiple tasks at once. The majority of contemporary AI research focuses on specific domains like auditory discrimination, visual identification, speech understanding, and so forth [9]. There is currently a lack of research on functioning of the full brain. Studies on self-thinking and perceptual understanding models, for instance, are few. Therefore, we will attempt to materialize it as artificial intelligence while also elucidating the mechanics and function of the entire brain in this research. In order to address the social, ethical, and policy concerns raised by AI technology, a multipronged strategy is required. One such strategy is to make accurate information more widely available to the public through fact sheets and ethical value statements on reputable websites. Every article had a code for at least one kind of AI technology, although others had codes for "General AI," which meant they covered AI in general or didn't identify any particular technologies. The media may be to blame for this rise. [10In this regard, it should be mentioned that the public discussion surrounding the ethics of AI effectively conveys both the excitement and the apprehensions resulting from the swift integration of AI technology into society. The rise in media coverage year over year indicates that the public's expectations and worries over the broad use of AI technology are becoming increasingly apparent as a critical issue for society. This is true for both the specifics of implementing AI technology and the ethical frameworks intended to direct its advancement. This implies that authors who don't know enough about AI technology or ethics are writing articles about it [11Consequently, addressing the social, ethical, and policy concerns raised by AI technology requires a multimodal strategy. Lastly, as seen by the numerous proposals addressing AI legislation, there is an immediate need for the USA and other non-EU nations to establish a clear legal framework or policy for AI technology. The use of artificial intelligence (AI) technology has completely changed the way we view, engage with, and use technology to address challenging issues and improve human skills. With its roots in computer science, cognitive psychology, and engineering, artificial intelligence (AI) is a broad field that includes a wide range of techniques, programs, and systems designed to make robots capable of thinking like humans. Another essential component of artificial intelligence is computer vision, which gives robots the ability to detect, process, and interpret visual data from the real world. Technologies for computer vision [12]. Artificial intelligence (AI) has applications in almost every field and business, including manufacturing, healthcare, finance, transportation, agriculture, education, and entertainment. Artificial intelligence (AI) is used in healthcare to help with diagnosis, tailored therapy, medication development, and medical imaging analysis. AI algorithms are used in finance to power automated trading, fraud detection, risk assessment, and customer support. AI makes it possible for transportation to include predictive maintenance, traffic management, and driverless cars. AI in manufacturing improves supply chain management, quality assurance, and production procedures [13]. However, there are significant ethical, cultural, and financial concerns that are brought up by the quick spread of AI technology. Because of worries about security, privacy, prejudice, loss of jobs, and the growing digital divide, ethical AI development and use are essential. It is critical that we promote multidisciplinary cooperation, ethical stewardship, and human-centric design

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principles as we negotiate the complexity of AI technology. Responsible AI technology use can open up previously unheard-of possibilities for addressing global issues, fostering innovation, and improving the welfare of people and society everywhere.

Materials And Method

Explainable AI (XAI): The goal of explainable AI is to create models and algorithms that offer rationales or explanations for the judgments and predictions they make. By allowing people to comprehend the reasoning behind AI-driven outcomes, XAI approaches seek to improve transparency, accountability, and trustworthiness in contrast to typical black-box AI models.

Interpretable Models: Models of interpretable AI are intended to be clear and intelligible to people by nature. These models put an emphasis on brevity, readability, and representations that are understandable by humans, which facilitates user interpretation and builds user confidence in AI system judgments.

Ethical AI: In order to ensure that AI technologies are created, implemented, and utilized in a way that respects moral principles, human rights, and the welfare of society, ethical AI comprises a number of frameworks, rules, and principles. Fairness, accountability, transparency, privacy, prejudice reduction, and the effect on disadvantaged populations are among the ethical factors in AI.

Responsible AI: Beyond moral issues, responsible AI takes into account the larger effects that AI technologies will have on society and the environment. It entails creating AI systems that reduce damage, encourage inclusivity and diversity, facilitate communication between humans and AI, and advance sustainable development objectives.

Robustness and Adversarial Defense: The goal of robust AI approaches is to make AI systems more resistant to outside influences, adversarial assaults, and unforeseen inputs. This field of study investigates ways to strengthen AI models' security, dependability, and resilience against malicious and inadvertent attacks..

Continual Learning: The capacity of AI systems to gradually pick up, adjust, and improve their knowledge and abilities over time from sequential or streaming input sources is known as continuous learning. AI models may adapt and perform better in dynamic and changing situations without catastrophic forgetting or deterioration thanks to continuous learning strategies.

Federated Learning: Federated learning is a decentralized method that maintains localized and private data while training machine learning models over dispersed devices or edge nodes. Federated learning approaches alleviate privacy concerns and legal constraints by facilitating cooperative model training without centrally aggregating sensitive data.

Human-Centric AI: AI that is human-centric prioritizes the requirements, interests, and values of humans in the design and development of AI systems. It places a strong emphasis on creating AI systems that support human values and objectives, enhance human skills, and enable human-AI cooperation.

AI Governance and Policy: The goal of AI governance and policy frameworks is to provide rules, guidelines, and standards that will control the creation, application, and usage of AI technology. Data privacy, algorithmic responsibility, transparency, liability, and social effect assessment are just a few of the topics these frameworks cover.

Machine learning: Machine learning (ML) is a branch of artificial intelligence (AI) that focuses on creating statistical models and algorithms that let computers carry out particular tasks without direct human guidance. Put another way, when machine learning algorithms are exposed to more data, they get better at what they do over time by learning from it.

TOPSIS Method: The Technique for Order of Preference by Similarity to Ideal Solution, or TOPSIS, is a multi-criteria decision-making approach that helps identify the optimal option from a range of options. When making judgments that need the simultaneous consideration of several criteria or features, it is very helpful. The first step in the decision-making process is to determine the relevant criteria or qualities. These standards ought to be quantifiable and pertinent to the options you are assessing. Make a decision matrix with the criteria represented in columns and the choices represented in rows. To make sure that every criterion is comparable and on the same scale, normalize the choice matrix.. Usually, normalization entails converting the unprocessed data into a scale with values between 0 and 1.Based on the relative relevance of each criterion, assign weights to each one. Each criterion's weight in the decision-making process is represented by its relative importance. All of the weights added together should equal one. To get the weighted normalized decision matrix, multiply each normalized value by its matching weight. The ideal solution and the anti-ideal solution are the two reference points employed in TOPSIS. For every criterion, the ideal solution indicates the best performance, while the anti-ideal solution represents the poorest performance. Finding the highest and lowest values for each criterion across all options leads to these solutions. Determine the Euclidean distance between the ideal answer and every alternative, as well as the distance between the perfect solution and every anti-ideal option. The formula for the distance between two points in a multidimensional space is used to compute the Euclidean distance. Once the distances have been determined, determine how near each option is to the optimal solution. This is accomplished by dividing the anti-ideal solution's distance by the total of the anti-ideal solution's and ideal solution's distances. After determining each alternative's relative proximity to the ideal answer, arrange them in descending order of similarity. The TOPSIS approach determines which option is the best option based on its highest relative proximity value. To summarise, TOPSIS facilitates the process of decision-making by taking into account several factors such as the degree of proximity to the ideal solution and the avoidance of the anti-ideal option. It offers an organized and methodical approach to making decisions in difficult situations.

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Results And Discussion

Table 1. Artificial Intelligence				
	Robustness and Adversarial	Continual Learning	Federated Learning (approximately	AI Governance and Policy
Explainable AI (XAI)	36.25	132.80	35.26	23.56
Interpretable Models	33.75	147.25	14.52	23.85
Ethical AI	26.32	132.45	52.45	26.43
Responsible AI	57.24	135.23	44.56	23.85
Human-Centric AI	58.12	176.64	79.23	24.56
Machine Learning and AI	15	32	25	10
Table 1 shows the Artificial Intelligence for Analysis using the TOPSIS Method is Robustness and Adversarial, Continual Learning, Federated Learning (approximately), AI Governance and Policy it is Evaluation Parameters. Explainable AI (XAI),Interpretable Models, Ethical AI ,Responsible AI, Human-Centric AI, Machine Learning and AI it is also data set value.				

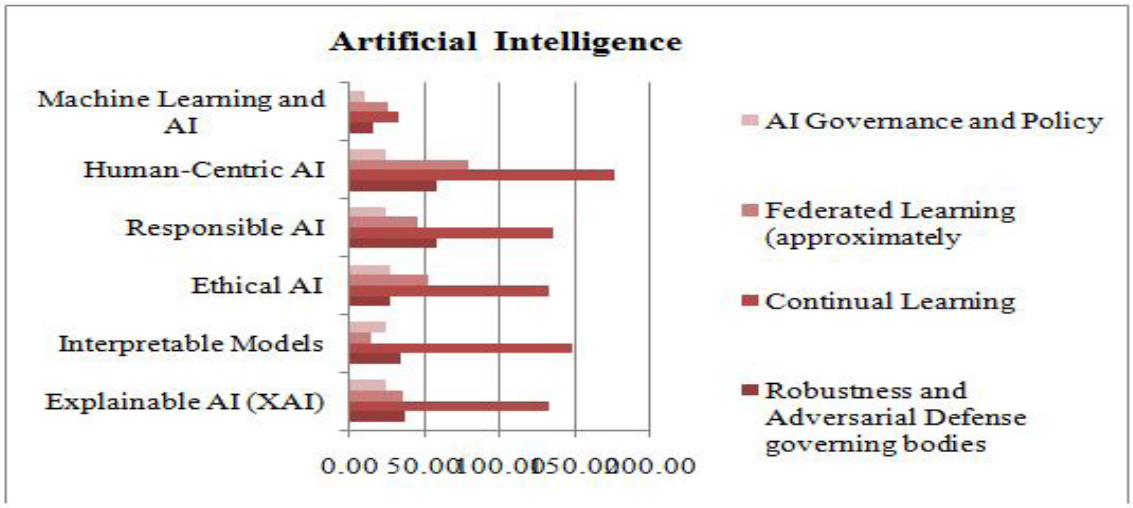

Figure 1 : Artificial Intelligence

Table 2. Normalized Data				
	Normalized Data			
	Robustness and Adversarial	Continual Learning	Federated Learning (approximately	AI Governance and Policy
Explainable AI (XAI)	0.3620	0.405	0.3081	0.4235
Interpretable Models	0.3371	0.449	0.1269	0.4287
Ethical AI	0.2629	0.404	0.4584	0.4751
Responsible AI	0.5717	0.413	0.3894	0.4287
Human-Centric AI	0.5805	0.539	0.6924	0.4415
Machine Learning and AI	0.1498	0.098	0.2185	0.1798

The normalized data in artificial intelligence for analysis using the TOPSIS method is displayed in Table 2 and includes evaluation parameters for robustness and adversarial, continual learning, roughly federated learning, AI governance, and policy. In addition to normalized data values, AI includes Explainable AI (XAI), Interpretable Models, Ethical AI, Responsible AI, Human-Centric AI, and Machine Learning.

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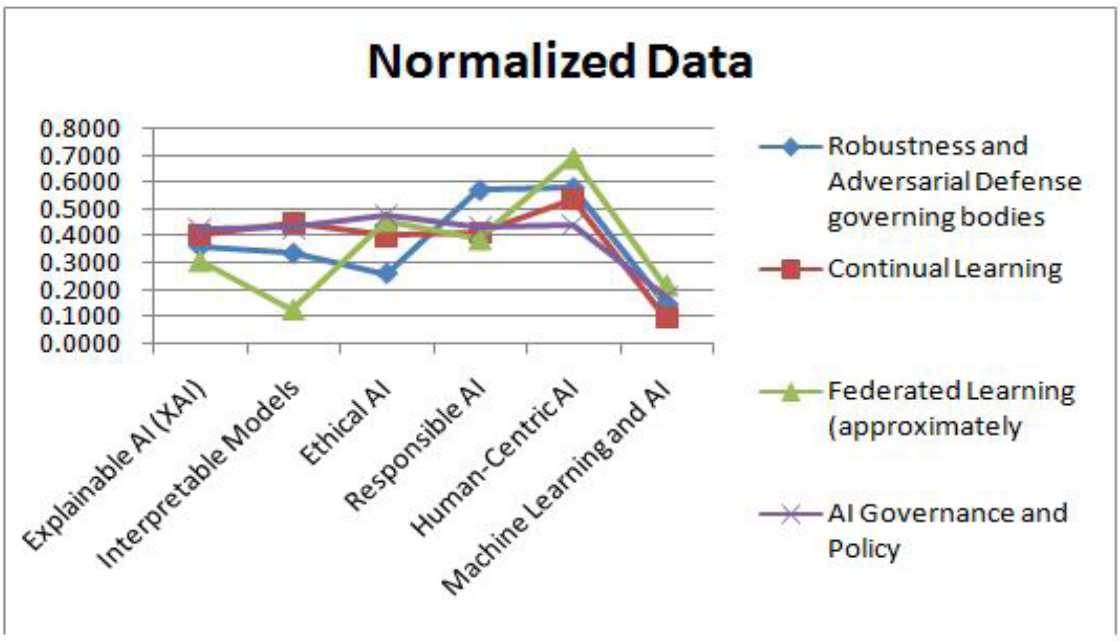

Figure 2 : Normalized Data

Table 3. Weightages			
Weight			
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
Table 3 shows Weightages used for the analysis. We taken same weights for all the parameters for the analysis			

Table. 4 Weighted normalized decision matrix				
Explainable AI (XAI)	0.1013	0.1013	0.0770	0.1059
Interpretable Models	0.0843	0.1123	0.0317	0.1072
Ethical AI	0.0657	0.1011	0.1146	0.1188
Responsible AI	0.1429	0.1032	0.0974	0.1072
Human-Centric AI	0.1451	0.1348	0.1731	0.1104
Machine Learning and AI	0.0375	0.0244	0.0546	0.0449
TABLE 4: Artificial Intelligence for Analysis Using the TOPSIS Method's Weighted Normalized Decision Matrix Evaluation parameters include robustness and adversarial learning, continuous learning, roughly federated learning, AI governance, and policy. AI that is human-centric, ethical, responsible, interpretable models, machine learning, and AI are all examples of explainable AI (XAI). Normalized weighted decision matrix value.				

Table 6. SI Plus, Si Negative and Ci				
	SI Plus	Si Negative	Ci	Rank
Explainable AI (XAI)	0.0938	0.1392	0.5974	3
Interpretable Models	0.0899	0.1733	0.6585	1
Ethical AI	0.1406	0.1005	0.4168	6
Responsible AI	0.0958	0.1523	0.6138	2
Human-Centric AI	0.1558	0.1544	0.4978	4
Machine Learning and AI	0.1559	0.1396	0.4725	5

The final results of the Artificial Intelligence for Analysis utilizing the TOPSIS Method are displayed in Table 6 and include evaluation parameters for robustness and adversarial, continual learning, roughly federated learning, AI governance, and policy. Interpretable Models, Ethical AI, Responsible AI, Human-Centric AI, Explainable AI (XAI), Machine Learning, and AI Machine learning and artificial intelligence have a higher value in Si positive, whereas interpretable models have a lower value. Interpretable models have a higher value in Si Negative, but ethical AI has a lower value. In Ci, ethical AI has a lower value whereas interpretable models have a higher value.

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Table 5. Positive and Negative Matrix								
	Positive Matrix				Negetive matrix			
Explainable AI (XAI)	0.1451	0.1348	0.0317	0.0449	0.0375	0.0244	0.1731	0.1188
Interpretable Models	0.1451	0.1348	0.0317	0.0449	0.0375	0.0244	0.1731	0.1188
Ethical AI	0.1451	0.1348	0.0317	0.0449	0.0375	0.0244	0.1731	0.1188
Responsible AI	0.1451	0.1348	0.0317	0.0449	0.0375	0.0244	0.1731	0.1188
Human-Centric AI	0.1451	0.1348	0.0317	0.0449	0.0375	0.0244	0.1731	0.1188
Machine Learning and AI	0.1451	0.1348	0.0317	0.0449	0.0375	0.0244	0.1731	0.1188

The Artificial Intelligence Positive and Negative Matrix for Analysis Using the TOPSIS Method is displayed in Table 5 Evaluation parameters include robustness and adversarial learning, continuous learning, roughly federated learning, AI governance, and policy. AI that is human-centric, ethical, responsible, interpretable models, machine learning, and AI are all examples of explainable AI (XAI). are diversely favorable The matrix's greatest value is 0.1451, while its minimum value is 0.0317, 0.0449 matrix70, and the minimal value selected is Neg0070. A maximum of 0.1731 and 0.1188 are selected.

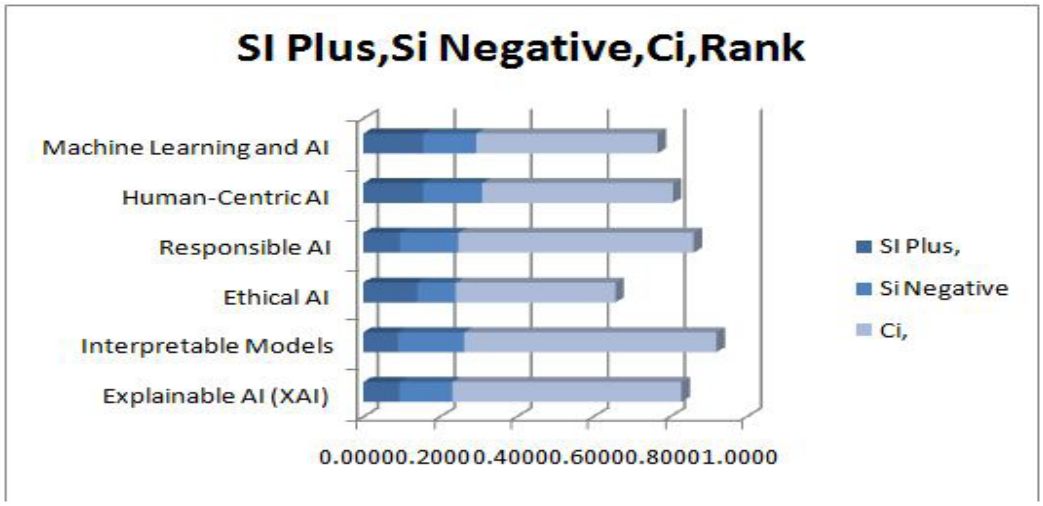

Figure 3 : SI Plus, Si Negative and Ci

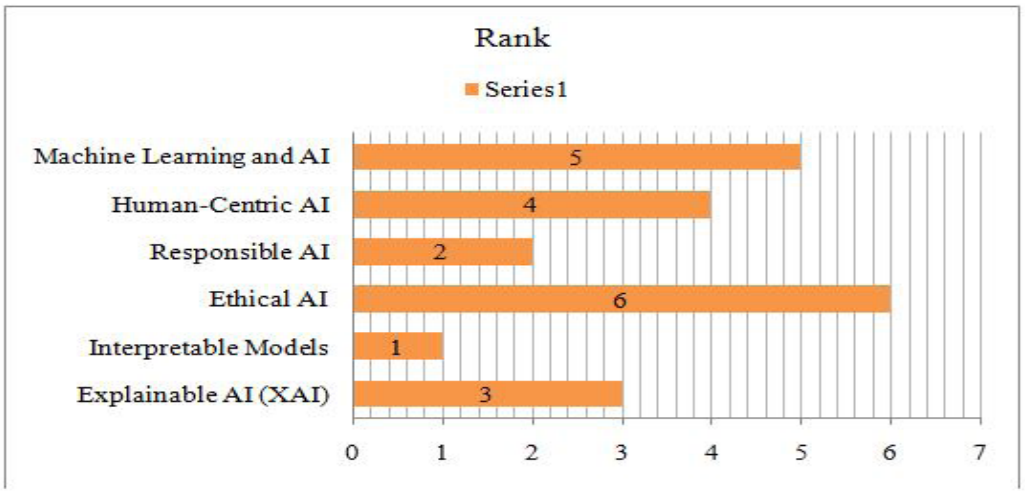

Figure 4 : Rank

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Conclusion

Natural language processing allows machines to comprehend, interpret, and produce human language, hence facilitating human-computer interaction. Machines can now see, analyze, and interpret visual data from the real world thanks to computer vision technology. Applications of AI technology may be found in a wide range of industries, including manufacturing, healthcare, finance, transportation, agriculture, education, and entertainment. AI-powered solutions help in drug discovery, medical imaging analysis, diagnosis, and customized therapy in the healthcare industry. AI algorithms are used in finance to power automated trading, fraud detection, risk assessment, and customer support. In summary, artificial intelligence (AI) technology is at the vanguard of innovation, presenting never-before-seen possibilities to transform whole sectors, spur economic expansion, and tackle global issues. AI has the ability to usher in a future of greater human-machine collaboration, innovation, and wealth through the promotion of collaboration, transparency, and ethical stewardship. the Ranking of the Artificial Intelligence using the TOPSIS Method . Interpretable Models is got the first rank whereas is the Ethical AI is having the Lowest rank. . All of the weights added together should equal one. To get the weighted normalized decision matrix, multiply each normalized value by its matching weight. The ideal solution and the anti-ideal solution are the two reference points employed in TOPSIS. For every criterion, the ideal solution indicates the best performance, while the anti-ideal solution represents the poorest performance. Finding the highest and lowest values for each criterion across all options leads to these solutions. Determine the Euclidean distance between the ideal answer and every alternative, as well as the distance between the perfect solution and every anti-ideal option

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