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Artificial Intelligence, Computer Science, and Cybersecurity in Critical Sectors: The Case of Healthcare and Food Production with ChatGPT

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ABSTRACT

Artificial intelligence (AI), computer science (CS), and cybersecurity are transforming the most critical areas, especially healthcare and food production. AI contributes to greater diagnostics, personalized medicine, precision agriculture and supply chain optimization, and CS enables the adoption of these systems by providing the computing models and structure. Nonetheless, growing digitalization complicates the attribution of cyber threats by expanding the target area, which substantially increases the risk of data confidentiality, system robustness, and ethical governing practices. ChatGPT and other large language models (LLMs) present both opportunities and threats to cybersecurity in that they can assist, detect threats and communicate, but also be used as a source of manipulation and false information. The review looks at opportunities, challenges and directions, and the importance of sustainable, secure and inclusive technological integration.

INTRODUCTION

Artificial intelligence (AI), computer science (CS), and cybersecurity have become key support poles in the contemporary world due to the hurried change in the global industries. Healthcare and food

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production are only some of the examples of what can be considered as vital to the livelihood and social stability of human representation. Both industries are experiencing historic transformations brought about by the introduction of intelligent systems, automation and data-driven decision making [1]. These developments have boasted of efficiency, narrowing down the human factor aspect in line of error, as well as opening to possibilities of innovation. Yet at the same time they create new sources of weakness, and cybersecurity is an urgent topic. The AI-based solution that has gained particular attention in this context is the ChatGPT and other large language models (LLMs) that help transform not only operational optimization but also the solution of complex security issues [2].

Medicine, which has always been human-based and patient-centric, has become involved in AI developing a range of applications: its implementation in medical diagnostics, predictive analysis, individual treatment planning, and telemedicine have also been actively discussed. The presence of electronic health records (EHRs) and wearable medical devices, as well as interconnected Internet of Medical Things (IoMT) systems has led to the massive creation of sensitive patient data [3]. Although these technologies enhance healthcare access and delivery, they also continue to expose critical systems to possible cyber threats that may include Ransom ware, phishing and unauthorized data breaches. Even a single cyber-attack may be fatal to patient safety, the trust, and cause serious financial losses [4]. It is therefore incumbent that AI and CS join forces with cybersecurity to ensure that healthcare digital infrastructure is secured.

Food production, however, is also quickly changing via the implementation of precision agriculture, intelligent farming, and AI-based supply chain integrity. And sensors in the fields, drones, robotics, and the data analytics tools are being used to monitor soil conditions, predict crop yields, optimize the irrigation process, and food safety [5]. These technological innovations are imperative in order to fulfill increasing demand of food across the globe due to issues of climate change, population and resource limitation. Such cybersecurity vulnerability, however, exists in the digitalization of food production as is present in healthcare [6]. Interdependent food systems and international supply chains have the potential to be targeted by malicious actors who want to exert their control on food supply or a part thereof, to destabilize information, or to create an occurrence of economic instability. Cyber-attacks on food systems can lead not only to losses but put food security at the global and country level at risk [7].

In both areas, ChatGPT and other LLMs can be an incredibly promising means of extending human knowledge and aiding cybersecurity activities. As one example, ChatGPT could be used to analyze logs and identify anomalies, offer suggested cybersecurity policy wording, or offer advice in an incident. In addition, the models can be utilized in the education/training, so that healthcare and food

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industry professionals can be aware of changing threats [8]. Still, their application is not risk-free. Some potential concerns around this, including being biased based on training data, being vulnerable to malicious alteration, or even being maliciously used in their own right help emphasize the need to ethically and responsibly incorporate AI [9].

This review paper will set out to discuss how AI, CS, and cybersecurity converge in a healthcare sector as well as in food production, with emphasis on the new role that ChatGPT plays. The aim is to present a detailed picture of the current understanding of the possibilities of such technologies to be used to improve resilience in critical sectors, present risks, and areas of future study. By highlighting opportunities and challenges, the review aims to contribute to the current debates on the ways of comprehending a secure, sustainable, and equitable process of digital transformation in terms of vitality spheres [10].

ARTIFICIAL INTELLIGENCE IN CRITICAL SECTORS

Artificial Intelligence (AI) has already become one of the most revolutionary technologies of the 21 st century, making the process of automation, predictive modeling, and advanced decision-making available in a variety of fields. In such crucial sectors like healthcare and food production, AI can transform the way they operate and enhance efficiency in solving challenges that were once thought to be adopted without solutions [11]. The introduction of AI into these industries showcases its power to assist humanity in the augmentation of human capacities, eliminating systematic in competencies, and delivering new options to alleviating some of the world problems. Nevertheless, AI deployment brings to the fore data privacy, clear view and ethical application anxieties, which is quite evident in highly sensitive sectors bringing human health and food security to the table [12].

Healthcare is one of the most active areas that use AI. In diagnostic imaging and personalized medicine, AI systems are assuming an increasing role as supplements to medical workers. Data collected by using ML algorithms is able to analyze large amounts of EHRs, lab results, and clinical notes to identify trends that correlate with diseases [13]. As an example, deep learning models have shown to be as accurate as radiologists during the interpretation of medical images in cases of cancer, pneumonia, and fractures. On the same note, predictive AI models are being used to predict patient readmission, or any complications, and even resource allocation within hospitals [14].

A second promising application is precision medicine, where artificial intelligence can be used to process genetic information and lifestyle variables to customize specific treatment plans that apply to specific patients. NLP tools such as ChatGPT are also being utilized as aids in clinical documentation and patient engagement and making clinical decisions. In telemedicine, AI chatbots can deliver a semi-differential diagnosis, triage, and help monitor chronic states. All these applications bring out

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the ability of AI to save costs, increase test accuracy, and extend access to health care [15].

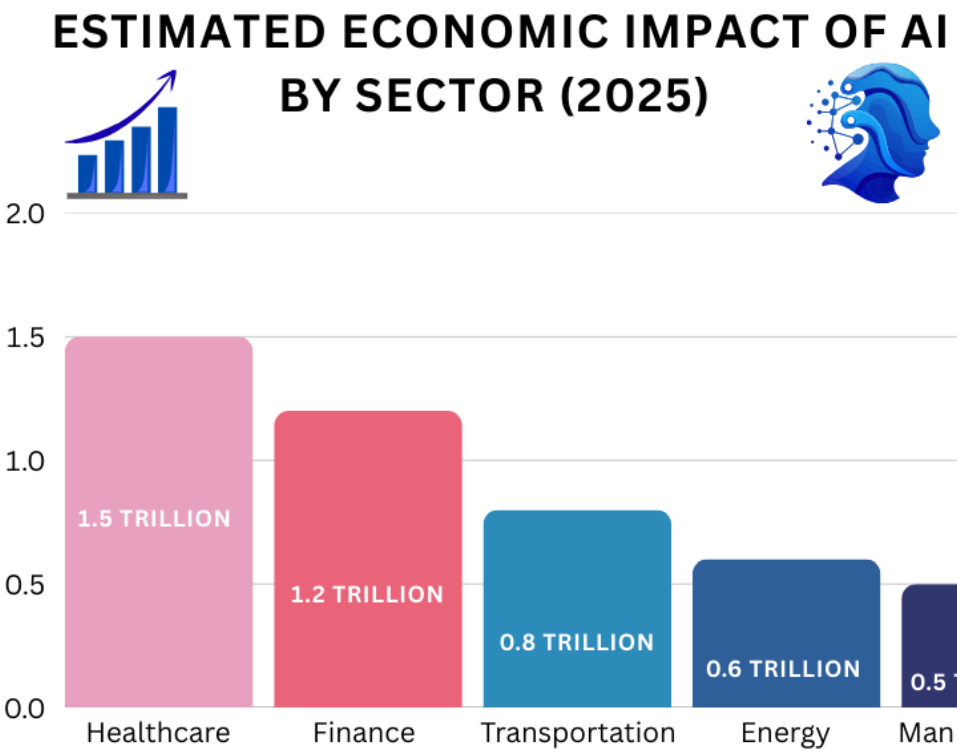

Figure: 1 showing estimated economic impact of AI by sector

Another main sector that is developing rapidly with AI is food production. AI technologies are used to make agriculture more productive, sustainable, and supply chain more resilient, given that global demand is projected to grow significantly. Precision agriculture makes use of AI-empowered drones, sensors, and satellite images to maximize farming [16]. Computer vision models, in turn, can detect pest's infestations or nutrient shortages in crops as early as possible and interventions can be made to prevent waste and increase the crop yield. Also, AI helps in food safety and food quality control. Machine learning systems may be used to identify impurities, check temperature-sensitive shipments, and check safety regulations. Such developments are very instrumental in the prevention of foodborne illnesses and ensuring brand loyalty [17].

The example of the AI-driven transformation in the healthcare sector and food industry vividly reflects the potential and challenges of the digital transformation in essential spheres. AI can provide new technologies to resolve issues connected with the care of patients, the availability of food, and sustainable development, but it requires responsible implementation with attention to risks. AI can be used in the creation of resilience with the advancement in computer science and sound cybersecurity measures being used to support them [18].

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COMPUTER SCIENCE FOUNDATIONS THE ROLE

The amazing developments and use of artificial intelligence (AI) in the field of healthcare and food production is grounded in the ideals and innovations of computer science (CS). Computer science to intelligent systems furnishes both the conceptual frameworks and computational models, and even the technological infrastructures on which intelligent systems have been designed, developed and deployed [19]. AI technologies involve such areas of CS as algorithms and data structures, distributed computing, and human-computer interaction, among others. In areas of critical sectors where reliability, accuracy and security are the main considerations, these foundations gain even more weight in maintaining effective and humane deployment [20].

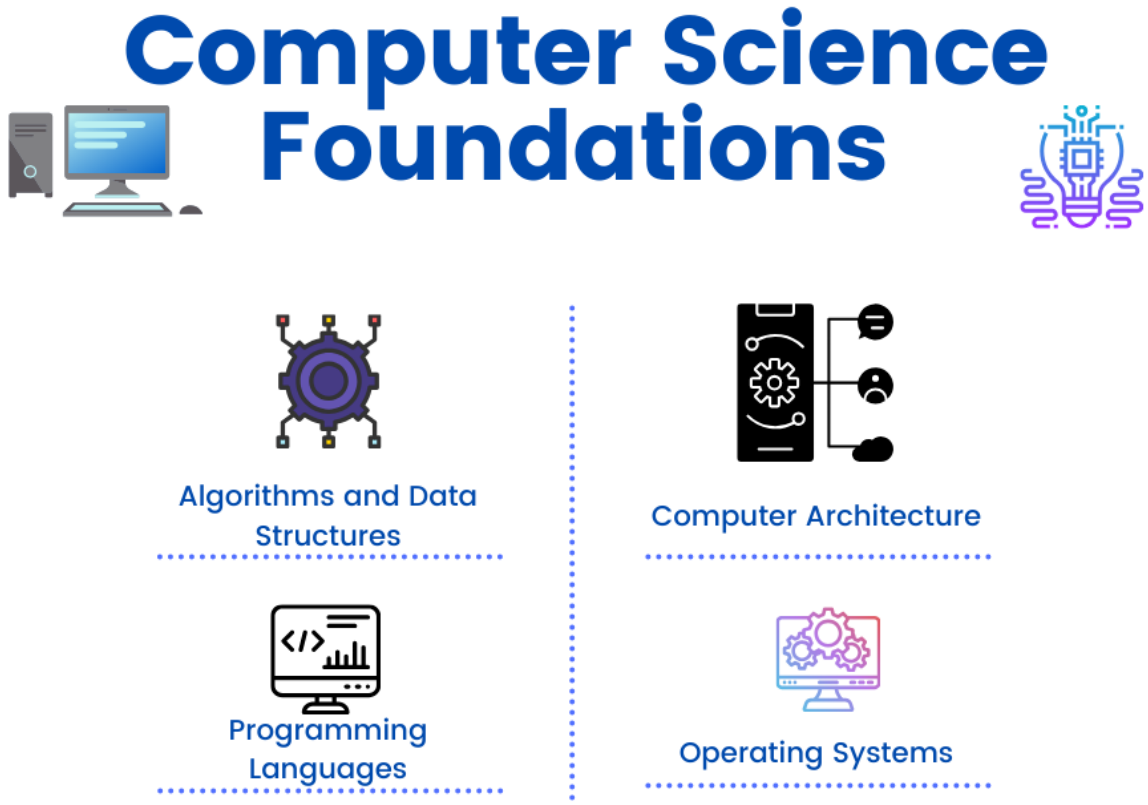

Figure: 2 showing computer science foundations

AI and machine learning are based on effectively processing large amounts of data. Computer science principles, including search algorithms, optimization algorithms and data structures, allow information to be stored at large scale, to be recalled and used. As an example, healthcare systems increasingly rely on optimal algorithms to analyze genome sequences and food production now needs optimal models to plan irrigation and supply chain processing [21]. CS building blocks are needed to achieve the scalability and accuracy of AI-driven solutions. The current generation AI systems relies on strong computational frameworks that have been developed over many decades of CS research

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[22]. Techniques of supervised and unsupervised learning, reinforcement learning and deep learning are some of the techniques developed out of this foundation. This set of techniques can be used to develop apps including disease forecasting in medical systems and crop productivity prediction in agriculture [23]. All these frameworks, including TensorFlow, PyTorch, and Scikit-learn, to name a few, are widely adopted, as they help simplify the compounds AI models development and implementation, thanks to which computer science is also involved in their creation [24].

Healthcare and food production present unprecedented amounts of data--electronic health records and imaging data, satellite images, and sensor readings--to name only a few. Computer science offers the means of integrating data, preprocessing, and analyzing data in order to be assured that AI systems will be able to glean profound insights out of heterogeneous sources [25]. The use of techniques like distributing the databases, parallel processing, and data mining algorithms to achieve real-time analytics is crucial in solutions like outbreak detection in the medical field or climate-adaptive agriculture techniques [26].

The use of AI has also increased due to the presence of infrastructural innovations in CS in crucial sectors. Cloud computing can enable healthcare facilities and agricultural firms to enjoy elastic computing resources to train their AI models on the enormous data without incurring the cost of extensive local infrastructures. Simultaneously, edge computing has become the important trend applicable in time-sensitive operations [27]. In healthcare, the use of edge AI-equipped wearables will be able to monitor vital signs and identify abnormalities in real-time. In food manufacturing, the sending and retrieval of data can be delayed by encapsulating data processing where sensors and autonomous machines process information in order to make real-time decisions like adjusting irrigation levels on the basis of soil moisture readings [28].

The pillars of computer science are the foundation of the AI application in the healthcare and food production spheres. CS can enable the existence of powerful AI systems that are also usable, efficient and adaptable due to their provision of computational models, infrastructures, and their design principles. Whenever these sectors are expected to further develop, the future improvements in the field of CS, i.e., quantum computing, federated learning, and explainable AI, will be needed to handle the increasing complexity of the real-life situations [29].

CYBERSECURITY IN THE HEALTHCARE AND FOOD PRODUCTION: CONCERNS AND CONSEQUENCES

The incorporation of the latest artificial intelligence (AI) and computer science features into the sphere of healthcare and food production is unquestionably more efficient, precise, and accessible. With these benefits also there are great risks associated. The critical infrastructure cybersecurity

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environment is more sophisticated now than ever before, with digital systems interlinked and dependent on sensitive information [30]. Healthcare and food production are two spheres of human life, without which the survival of an individual is impossible, and therefore, they are tempting subjects of attacks by malicious organizations whether they are cybercriminals or state-sponsored. The outcome of the cyber-attacks in these areas can cause not only financial issues but also endangering the safety of people, national security, and the maintenance of stability in the world [31]. Healthcare systems have a very concerning cybersecurity risk picture.

Hospitals and clinics cannot do without electronic health records (EHRs), telemedicine systems, diagnostic imaging operations, and the Internet of Medical Things (IoMT). Any of these digital assets is another point of entry to cyber threats. Ransom ware attacks, in which hackers encrypt the crucial patient information and demand a ransom to release the data are on the rise [32]. These sorts of incidents have the capability of parlaying entire healthcare facilities, postponing surgeries, diagnostics, and treatments. Theft of patient data is a big issue Medical records also touch on very sensitive information e.g. personal identifiers, medical history, and insurance information that can be misused to commit identity theft, insurance fraud, or sold to the black market [33]. More than data breaches, the attacks against the IoMT create risks to patient safety. Pacemakers and infusion pumps among other networked devices can be controlled remotely, which can cause disastrous effects. The healthcare industry consists of a disjointed digital foundation and failure to include the standardization of security standards that adds to these risks [34].

Agri-food production and agriculture become digitized and digital with the introduction of smart farming applications, precision agriculture, and other automated supply chains. Although these advancements enhance efficiency, they have increased vulnerability of key systems to cyber-attacks. Such things as IOT sensors, drones, and robotic farming equipment are notable areas of exploitation. A weakened irrigation system or channel of distributing fertilizers may lower production levels and affect food supply. Likewise, food products may become contaminated or their distribution may be interfered with on a largescale as a result of tampering with supply chain management systems [35]. This synergetic collection of studies demonstrates an interdisciplinary approach to research by demonstrating the interplay of information technology and control, robotics, and vibration mechanics and coupled sectors of environmental engineering, artificial intelligence, healthcare, food systems, and cyber security to solve challenging real-world problems.

The research uses sophisticated analysis tools including OpenFOAM and MATLAB/Simulink to highlight how mathematical modeling, numerical optimization, and simulation can enhance the performance of a system in a variety of areas [36]. The research of CFD and mesh optimization

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introduces the knowledge of fluid dynamics useful even in environmental processes like sewage and in the healthcare field like cardiovascular flow modeling. The research on mechanisms like ball-and-beam system and robotic manipulators of the Control systems show us the principles of stability, feedback and automation that are evidently used in the intelligent robot in medical applications, automation in food systems and automated industrial processes where artificial intelligence is involved [37].

The study of vibrations provide the basis of finding the stability as well as reliability of the systems, which can be applied in structures as well as in the biomedical devices and signal processing used in AI systems. Addressing the health issue of high BODs as a part of the environmental engineering emphasis brings this field in line with not only environmental sustainability but also into the purview of healthcare regarding sanitation of the population and sustainability in the food system in the form of waste reduction policies [38]. Artificial intelligence can be regarded as the intelligence layer that can further optimize predictive modeling, intelligent, and adaptive control across the latter, and cybersecurity would be the best way to protect sensitive healthcare information, integrity of food chains, stability of interconnected engineering and robotic systems [39].

Collectively this blending envisages an integrated worldview in which simulation, optimization, AI, sustainability, and security will come together to innovate in engineering, healthcare, food systems, and society in general [40]. Food systems become important to the national security on a larger level, hence a target of sabotage or cyber-espionage. Cyber-attacks on farm information, including crop projections or supply chains, have the potential to manufacture havoc at markets and worldwide trade. In addition, small farming businesses tend to have limited cybersecurity systems, which are like chinks that malicious parties can use. Healthcare and food production depend on cyber-physical systems (CPS) with functional integration of digital control with physical deployment [41].

Although CPS technologies make processes more efficient, they also create a grey area between cyber and physical risks. As an example, hospital HVAC may be targeted by the cyber-attack to endanger the safety of the patients in the critical care units; an automated food plant can be targeted to face the risk of contamination. It is therefore imperative to ensure the resilience of CPS on such sectors [42]. There are regulatory frameworks which are used in improving cybersecurity but, these frameworks are highly dependent on places and industries.

In the field of medical care, this aspect is regulated by such regulations as the Health Insurance Portability and Accountability Act (HIPAA) in the United States and the General Data Protection Regulation (GDPR) in Europe. Nevertheless, enforcement has been almost uneven, and achieving compliance is a challenge facing many institutions because it requires considerable resources [43].

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The food industry has not developed as much in cybersecurity laws, so supply chains are especially at risk. Absence of built-in policies leaves loopholes that can be used by the adversaries.

The healthcare and food production sectors are currently experiencing increasing cases of cyber-attacks due to digitization of these processes. Both industries are very sweet targets due to their vital nature and the dependency on the connections. Cyber-attacks may have implications connected not only with the loss of money but also life-threatening and subsequent destabilization of society [44]. The challenges related to these areas cannot be solved by only the technical solution; policy changes, workforce development, and intersectoral cooperation are also essential to become more resilient to an ever-changing threat environment [45].

CHATGPT AND LARGE LANGUAGE MODELS IN CRITICAL SYSTEMS AND SECURITY

The emergence of large language models (LLMs), including ChatGPT, has added another aspect to the use of artificial intelligence in the most vital areas. These models are based on powerful natural language manipulation (NLP) algorithms that have shown unheard of abilities to generate text like humans, interpret context and help make complex decisions. Their possibilities lie beyond mere communication and they are in the forefront of provision of solutions in cybersecurity, healthcare and food production [46]. Nevertheless, their implementation also implies some new risks that will have to be carefully considered.

In healthcare, ChatGPT and other LLMs can be used to assist with cybersecurity operations in one of the following ways. An example is threat intelligence analysis, in which the model can read and summarize high quantities of security reports, disclosures of vulnerabilities, and logs of incidents. In this way, it helps to determine the emerging threats faster that can be targeted to hospital systems or IoMT devices or patient records [47]. ChatGPT also has the opportunity to serve as the virtual assistant of security teams and can be used to draft security policies, generate response playbooks, and can be used in real-time during cyber incidents. As related to the case of a ransomware attack, the model can propose applicable containment methods in regard to the past experience and best practices. Also, during staff training, LLMs can help simulate phishing attempts or a ran scenario that teaches medical employees how to recognize and react to a threat [48].

In food production, ChatGPT can assist with security observation on the supply chain, as well as work in the resilience of operations. By processing the reporting of IoT sensors, logistics platforms and agricultural monitoring systems, LLMs can provide assistance to identify anomalies that might indicate that was cyber intrusion. Such as an unusual pattern of data in the crop yield monitoring system may lead to further investigation of possible interference [49]. ChatGPT has the potential to

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be placed in practice to increase food safety communication. It can help make routine alerts, compliance records, and consumer-facing content in cases of contamination risk or supply disturbances. It also streamlines the communication and helps both on the part of cybersecurity and resilience of the organization in general [50].

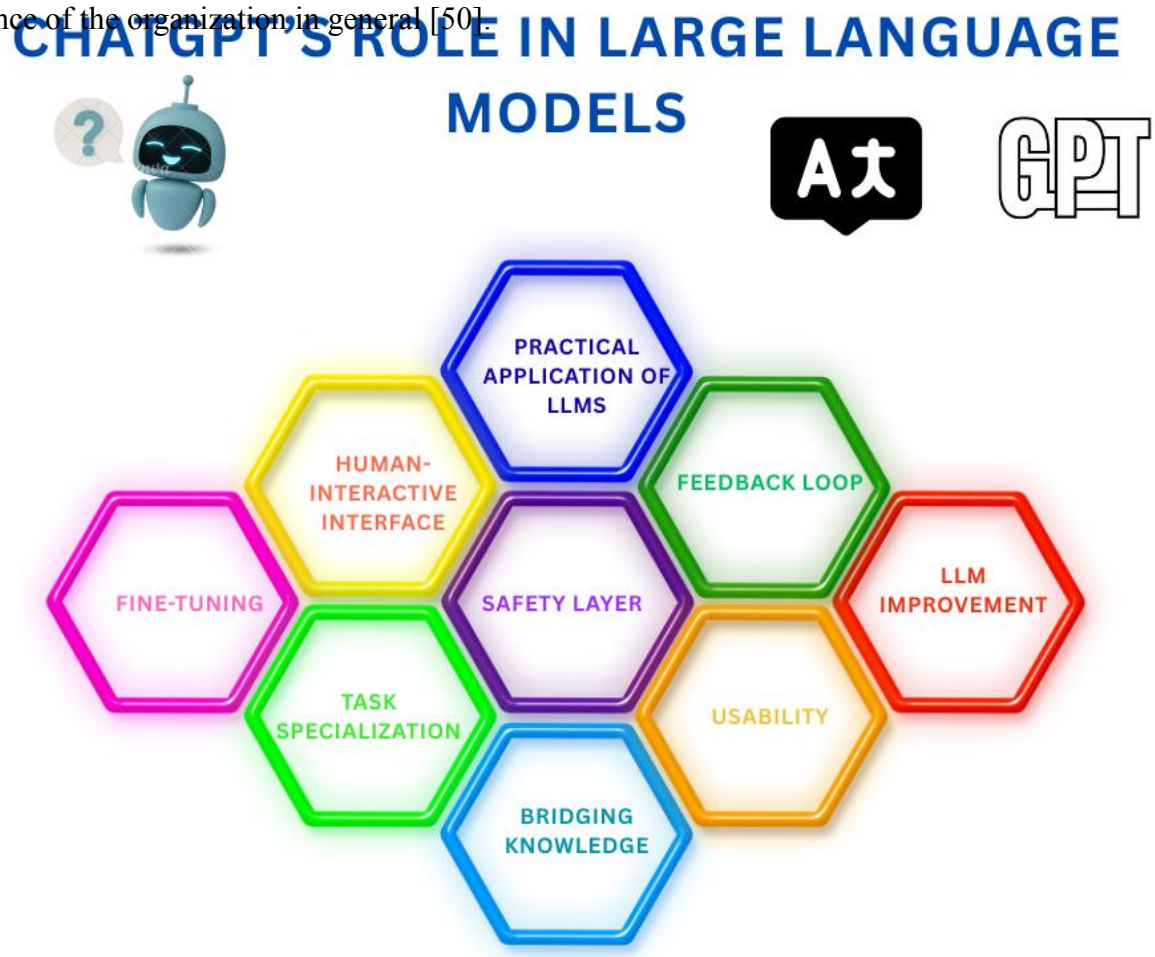

Figure: 3 showing ChatGPT role in large language models

Controlled release, the personalization, and optimization of pharmaceutical innovation have recently been prioritized in several areas of drug delivery research, including the specific tailoring and optimization of nifedipine controlled-release organogels, phytosomes in anticancer therapy, thermosensitive PLGAPEG-PLGA nanomicelles of raloxifene, biodegradable polymeric nanomicelles, and the development of solid supersaturated SMEDDS [51]. These formulations are able to better the advanced polymers, nano carriers and precipitation inhibitors to enhance bioavailability, stability and therapeutic impacts of drugs like nifedipine, raloxifene and itraconazole [52].

In this respect, AI exploration like chat GPT can have a revolutionary impact based on analyzing large literature, predicting formulation behavior, recommending excipient mixtures and design parameters

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in a Quality by Design (QbD) approach. In one example, ChatGPT may help researchers find the most appropriate polymer carriers, surfactants, or nanomicelle mixtures according to molecular features and the desired release characteristics [53]. In addition, it is able to facilitate development of hypotheses in new procedures, including an oral organogel or a self-microemulsifying drug delivery and suggest in-vitro and in-silico characterization techniques [54]. With experimental design combined with AI-driven insights, drug researchers can speed up the development of controlled-release systems, nanocarriers and supersaturable formulations, which have the potential to transform patient outcomes and lead to personalized therapeutic options [55].

Although these applications are promising, there are significant dangers in implementing the use of ChatGPT in systems where an error can be dangerous. Misinformation and hallucinations, when the model provides erroneous or falsified answers can be highly risky, as in areas where decisions influence the lives of humans, their health, and food security. In addition to malicious actors using LLMs to generate malicious code, phishing emails or misleading security directions, their use can also be used in conflicting actor scenarios [56]. The other important issue is that of data privacy Because the equations behind LLMs are trained on huge sets of data, there are queries as to how personal health or agricultural data are handled, and whether they may unintentionally leak. Lastly, LLMs also lack accountability, as they operate mostly opaquely and it is not always easy to track the rationale behind a given generated response [57].

The potential of LLMs such as ChatGPT to improve cybersecurity in food production and healthcare settings is huge, with the technology more likely to increase the speed of analysis, enhance training, and facilitate communication. However, their assimilation should be mindful of transparency, responsible consumption of it, and regulatory support. LLMs have a lot of potential to become excellent assets when it comes to protecting critical infrastructures provided that they are properly managed, but being uncontrolled, they may create additional threats [58].

INTEGRATION OF AI, CS, AND CYBERSECURITY TO ACCOMPLISH RESILIENCE

With the intersection of artificial intelligence (AI), computer science (CS), and cybersecurity, the combination can be used to construct resilient systems in vital industries like healthcare and food production. Individual disciplines have their strengths, but the synergy of multiple disciplines provides a whole picture that is able to cover not only efficiency and innovation but also security and sustainability of digital infrastructures. There can be no other goal than resilience where failure may trigger threats to human life, food security, and trust in the population [59].

The roots of CS - algorithms, computational models, and data management - are the basis on AI technologies are built. These elements, when combined with sound cybersecurity measures, can build

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systems that are intelligent and secure at the same time. As an example, such AI models can be created under the premises of secure coding and cryptographic defenses where the risk of adversarial attacks may reach [60]. In the same way, distributed ledger technologies and block chain, are an advancement to CS and can be used in combination with AI to assure data integrity in sensitive processes such as management of patient records or supply chains in agriculture [61].

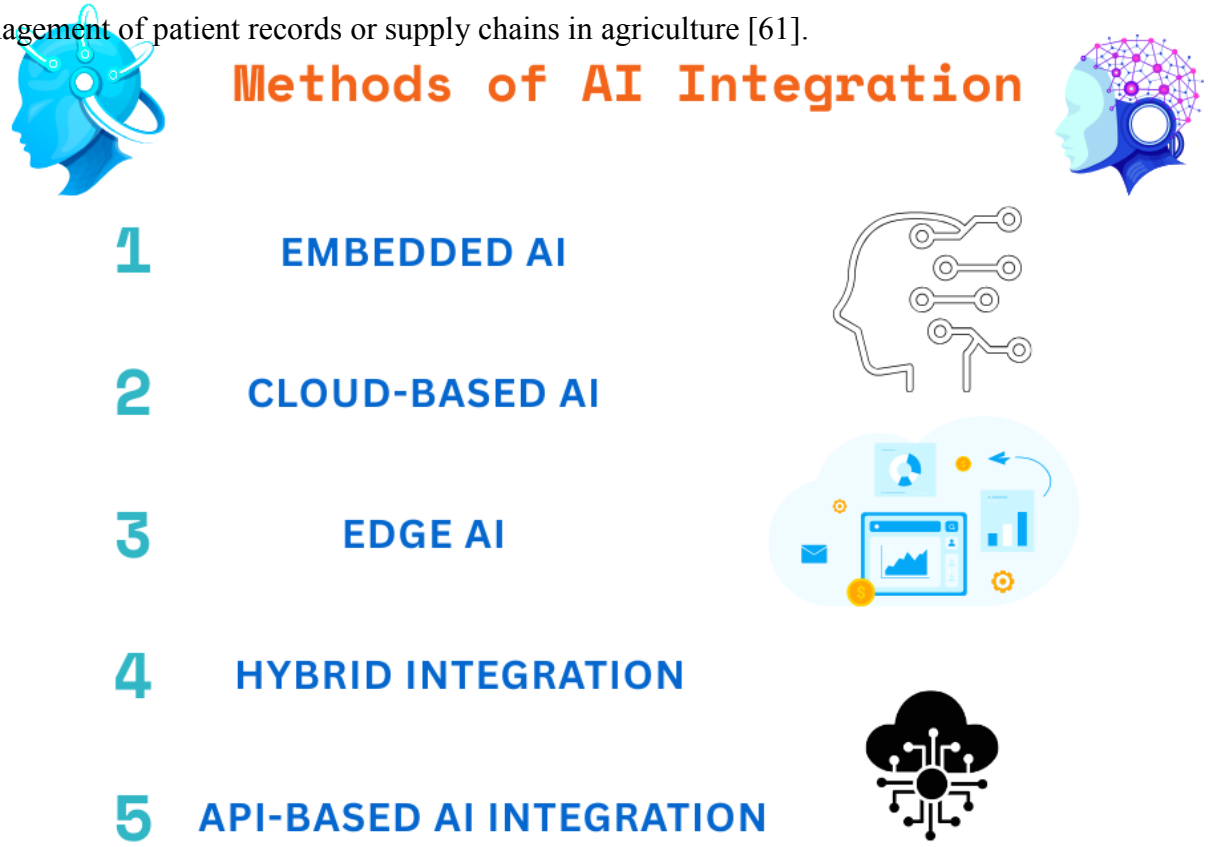

Figure: 4 showing methods of AI integration

The convergence of new solutions in cancer treatment and herbal medicine, artificial intelligence (AI) and computer science (CS) is disrupting the course of contemporary healthcare. Computational modeling enabled with AI can be used to analyze mass-scale biological and pharmacological data to predict potential anticancer properties of promising plant-derived compounds and make drug discovery faster, cheaper, and safer [62]. Predictive modeling and machine learning algorithms can be used to maximize treatment regimes, drug combination simulations, and individualize treatments relying on the patient-specific molecular profile. Besides, CS methods will allow creating databases, virtual screening systems, and in-silico analysis tools that will facilitate a systematic approach to screening herbal compounds and new drug candidates [63]. The integration of phytochemicals with computational methods can lead to highly effective, specific, and harmless oncologic therapy because by using AI, scientists will be able to design individualized drug candidates that react with specific

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protein targets, leading to the development of personalized medicines that can be used in cancer treatment with maximum efficacy, minimum side effects and toxicity [64].

Security mechanisms may also be strengthened using AI itself. ML models can parse large quantities of network traffic in order to find anomalies that may represent intrusions or malware. In healthcare, it can come in the form of monitoring IoMT devices against any unusual patterns of behavior, or in agriculture, it can include tracking data and sensors and drones to alert of possible tampering. The integration of AI into the creation of systems has forced the integration of cybersecurity into the system design process with cybersecurity no longer being an after-thought or add on [65].

AI brings in adaptive defense mechanisms, something the conventional cybersecurity tools do not provide. Intrusion detection systems (IDS) further augmented with AI mean that they are able to adapt and develop over time, detecting and responding to new attack vectors with minimal intervention. ChatGPT and other large language models add more value to security teams since they can help them respond to incidents in real-time, offer suggestions and human-readable descriptions of complex security events [66]. In healthcare, this level of integration is especially helpful as digital infrastructure becomes more complicated. The AI-powered monitoring systems can be used by hospitals with hundreds or thousands of connected devices so that any vulnerability can be pinpointed before it is used by an attacker. The same can be applied to food production, where predictive models enabled by AI technology can monitor risks throughout the entire supply chain globally and determine which risks can be mitigated prior to increasing [67].

The nature of healthcare and food production is different in operational context; however, they have a common ground on challenges of cybersecurity, especially when it comes to cyber-physical systems (CPS) and dependence on supply chains. Practices in one field can be used to teach practices in another. An example is that the focus on patient data security policies in healthcare due to governance regulations such as the HIPAA can influence more security of food production, as food production governance policies on cybersecurity have not yet reached maturity [68]. Inversely, the agricultural sector that is using block chain based trace mechanism may also contribute to the healthcare sector in ensuring the pharmaceutical supplies are traceable and counterfeit drugs are evaded [69].

The combination of AI, CS, and cybersecurity should also deal with more holistic social, ethical, and legal concerns. Explainable AI and transparency will also be important to trust where the AI system is focused on life-and-death decisions or food distribution. Laws and policies will need to be developed to address the novel risks introduced by the use of AI-based systems, and ethical codes should work towards ensuring that the gains of digitization are shared in a fair way so that there is no marginalization of groups that are already vulnerable, including small farmers and underserved

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patient populations [70].

The combination of AI, CS, and cybersecurity gives a guide to creating robust digital ecosystems in healthcare and food supply and control. There are synergies of intelligent automation, computational innovation, and robust defense strategies that can give the possibility to predict and survive changing threats [71]. But, real resilience would need technical integration and beyond merely technical consideration, such as ethical foresight, regulation and cooperation across sectors. An integrated approach can enable societies to secure the critical infrastructures which support human life and wellbeing in the modern world filled with digital and other multiplying connections [72].

FUTURE DIRECTIONS

The incorporation of artificial intelligence (AI), computer science (CS), and cybersecurity in health care and food production is a path to just one of the series of revolutionary changes ahead. As the digital infrastructures are developed, new advances will be required to meet the new challenges and seize the available opportunities to achieve resilience, efficiency, and sustainability. Some of the emerging trends and research topics have the potential to transform the purpose of intelligent technologies in the area of the critical protections [73].

Quantum computing is one of the brightest areas that can transform the sphere of AI and cybersecurity. Quantum AI algorithms have the potential to train complicated models much faster, and they are more useful in the analysis of large data sets like genomic data or satellite images in agriculture [74]. Quantum computing can be seen as a benefit to cybersecurity as well as a risk: not only does the technology provide the potential of increasing the strength of encryption, but it also holds the risk of causing well-established cryptographic methods to become ineffective [75]. It will be a priority to prepare healthcare and food systems to be ready about in a post-quantum world.

The other trend that is worth mentioning is federated learning because it is a decentralized approach that enables AI models to be trained on distributed data without exposing any sensitive information. Federated learning has the potential to allow the sharing of information between hospitals in different locations without compromising the privacy of the patients [76]. It may enable farmers and agricultural organizations to exchange knowledge without revealing other competitive or proprietary data in food production. This solution mitigates cybersecurity threats of centralizing the storage of data and provides innovation by sharing intelligence [77].

One of the most pertinent issues about the deployment of AI in critical spheres is the issue of the black-box character of most algorithms. The future of AI in healthcare and food production will hinge on the next development of explainable AI (XAI), the aspect that aims to provide transparency in the model decision-making process in a way that is comprehensible to users [78]. The other important

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aspect is that clinicians need not only promising predictions but also the explanations behind the AI-recommended practices [79]. In the same manner, food producers should know what prompted the AI-driven supply chain decisions. Development of study on XAI and human-AI communication will, therefore, play a critical role in addressing trust and accountability [80].

Large language models (LLMs) such as ChatGPT will keep evolving, with new possibilities of application in cybersecurity, communication, and decision support. In the future, it should be worked out with multimodal capabilities, where text would be analyzed, but also medical images, genomic sequences, or agricultural drone footage [81]. Such intelligence could be utilised heavily in the areas of diagnostic assistance in healthcare, or food production through crop monitoring. But as they grow in strength, they will create greater dangers of misuse and misinformation and adversarial exploitation. Recent studies will continue to be urgently needed to develop safeguards, ethical principles, and governance systems around LLMs [82].

Future directions also expand outside technology into the areas of policy and governance. A variety of initiatives on the global level will be necessary to reach a mutual understanding of cybersecurity rules, develop an ethical framework in relation to AI implementation, and introduce equal opportunities to access technological innovations [83]. International standards (e.g. post-quantum cryptography), inter-sector (e.g. a cross-sector task force coordinating response to a cyber incident in healthcare and food supply chains) planning and modifications, can be coordinated by international agreements [84]. Notably, equity and inclusion should be considered, as small-scale farmers, rural hospitals, and underserved population should not be left out of the digital transformation [85].

Ultimate promise of AI, CS, and cybersecurity in healthcare and food productions is situated at the nexus of technological advancement, moral conscience and transnational collaboration. Newer trends like quantum computing, federated learning and explainable AI and better advanced LLMs will redraw neither capabilities nor risks [86]. Such developments are already powerful when guided by the prioritization of transparency, resilience, and inclusivity, which can help build powerful digital backbones in industries instrumental to human survival. To meet this future, not only technical know-how is needed, but also active policy patterns and a common international purpose of safe and sustainable innovation [87].

CONCLUSION

The recent rapid adoption of artificial intelligence (AI), computer science (CS), and even cybersecurity technologies and techniques in the domains of healthcare and food production are among the most far-reaching technological changes of our era. These are essential sectors to human survival and social stability, and digitalizing them will be transformative-in ways that have never been

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seen before-with regard to increasing patient outcomes or providing sustainable food systems, to one example. At the same time the change comes with new vulnerabilities that should be addressed to prevent pulling down trust, safety, and resilience.

This review has positioned the role of AI in transforming healthcare to diagnose diseases at more sophisticated levels, perform precision medicine, and provide patient centric care and in food production to provide precision farming, smart supply chains, and food safety surveillance. None of the given advancements could be possible without the basis that was laid by computer science and the development of computational frameworks, data management systems, and other infrastructure solutions that make intelligent systems possible. However, with the growth in these technologies, growth in the chances of cyber threats also becomes imminent and thus strict cybersecurity becomes a necessity.

The analysis also showed that cybersecurity is highly multifaceted both in the healthcare and in food production. In the healthcare sector, ransom ware, hacking of sensitive healthcare data and weaknesses in Internet of Medical Things (IoMT) devices all present direct threats to patient safety. In food production, cyber-attacks on smart farming systems or supply chains can also incapacitate food availability potentially even destabilizing the markets. Both sectors have to deal with the balancing between innovations versus securing more and more connected cyber-physical systems.

The advent of ChatGPT and other large language models (LLMs) demonstrates once again the two-sided nature of technological innovation, as was witnessed with the advent and perfection of the printing press and the emergence and refinement of nuclear energy. On the one hand, these models provide very powerful tools used in threat intelligence analysis, policy development, real time security advice, and training of the workforce. Conversely, they bring up issues of misinformation, adversarial manipulation and data privacy.

The extent of responsibility their role in the critical sectors is taken over by them will determine how responsibly they are designed, managed, and incorporated. The way ahead is to consider AI, CS, and cybersecurity integration as an interdisciplinary concept of resilience. The integration of AI flexibility, what CS offers in computational rigor, and the protection available in cybersecurity can build resilient systems that can anticipate, withstand, and heal through cyber-attacks. Besides, cross-sectorial lessons are crucial: the regulatory system of healthcare can be applied to enhance better governance of food production, whereas agrarian block chain-based traceability can serve as an example of securing pharmaceutical supply.

These are additional potential directions and opportunities that will change this even more (like quantum computing, federated learning, explainable AI, and multimodal LLMs). Technology

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however cannot be used alone. Ethical, legal, and social considerations should not be left behind. Equitable access to innovations, transparency, and accountability will decide whether digital transformation becomes a building block to global resilience or whether it fragments global resilience. An equally important thing is the necessity of international cooperation, where cybersecurity standards, data governance policies, and the AI safety aspects will be aligned to be consistent across individual countries.

The way ahead is to be a party with innovation yet remain vigilant In sectors that are vital to life since people cannot live without them, healthcare and food production, it is not the outcome of insecure or inequitable digital systems. By combining AI, CS, cybersecurity, and foresight, responsibility, and collaboration, societies can develop infrastructures, which not only can keep up with the challenges of present-day threats but are also prepared to rise to the uncertainties of the future. In the end, more than technological improvement will be necessary; we must have a safe, sustainable, and inclusive digital environment that secures and maximizes human wellbeing.

REFERENCES

[1]. Neoaz N, Shah HH, Zainab H. AI in Personalized Medicine: Transforming Treatment Plans through Precision Health. Global Journal of Emerging AI and Computing. 2025 Jan 23;1(1):34-50.

[2]. Reddy S, Rogers W, Makinen VP, et al. Evaluation framework to guide implementation of AI systems into healthcare settings. BMJ Health Care Inform 2021; 28: e100444.

[3]. Javeedullah M. Using Health Informatics to Streamline Healthcare Operations. American Journal of Artificial Intelligence and Computing. 2025 Apr 7;1(1):24-44.

[4]. Shihab SR, Sultana N, Samad A. Revisiting the use of ChatGPT in business and educational fields: Possibilities and challenges. BULLET: Jurnal Multidisiplin Ilmu. 2023;2(3):534-45.

[5]. Moreira MWL, Rodrigues JJPC, Korotaev V, AlMuhtadi J, Kumar N. A comprehensive review on smart decision support systems for health care. IEEE Syst J 2019; 13:3536-3545.

[6]. Shehzad K, Ali U, Munir A. Computer vision for food quality assessment: Advances and challenges. Available at SSRN 5196776. 2025.

[7]. Manduva VC. A Comprehensive Literature Review on the Most Recent AI Developments in Healthcare. International Journal of Social Trends. 2023 Dec 31;1(1):129-53.

[8]. Singh A. Evolution of Computer Science: A Historical and Technological Overview. American Journal of Artificial Intelligence and Computing. 2025 Jul 23;1(2):62-86.

ISSN : 3079-5761
Volume 1, Number 3, 2025
https://doi.org/10.70445/gtst.1.3.2025.220-243

[9]. Khan M, Sherani AM, Bacha A. The Neurological Nexus: Exploring EEG, Facial Recognition, and Graph Algorithms in Mental Health AI. Global Insights in Artificial Intelligence and Computing. 2025 Jan 26;1(1):47-56.

[10]. Chustecki M. Benefits and risks of AI in health care: Narrative review. Interactive Journal of Medical Research. 2024 Nov 18;13(1):e53616.

[11]. Bacha A. Unveiling Frontiers: Hybrid Algorithmic Frameworks for AI-Driven Mental Health Interventions. AlgoVista: Journal of AI and Computer Science. 2025;2(1):1-8.

[12]. Bacha A, Zainab H. AI for Remote Patient Monitoring: Enabling Continuous Healthcare outside the Hospital. Global Journal of Computer Sciences and Artificial Intelligence. 2025 Jan 23;1(1):1-6.

[13]. Abbasi N, Nizamullah FN, Zeb S, Fahad M, Qayyum MU. Machine learning models for predicting susceptibility to infectious diseases based on microbiome profiles. Journal of Knowledge Learning and Science Technology ISSN: 2959-6386 (online). 2024 Aug 25; 3(4):35-47.

[14]. Neoaz N, Amin MH. Advanced AI Paradigms in Mental Health: An In-depth Exploration of Detection, Therapy, and Computational Efficacy. Global Insights in Artificial Intelligence and Computing. 2025 Jan 25;1(1):40-6.

[15]. Sokolova M, Japkowicz N, Szpakowicz S. Beyond accuracy, F-score and ROC: A family of discriminant measures for performance evaluation. Lecture Notes in Computer Science. New York: Springer, 2006; 1015-1021. 530 S. S. SINGH RANA ET AL.

[16]. Javeedullah M. Integrating Health Informatics Into Modern Healthcare Systems: A Comprehensive Review. Global Journal of Universal Studies.;2(1):1-21.

[17]. Shehzad K, Munir A, Ali U. Modern Trends in Food Production: the Role of AI in Smart Food Factories. Global Journal of Emerging AI and Computing.;1(2):1-30.

[18]. Javeedullah M. Role of Health Informatics in Public Health Surveillance and Response. American Journal of Artificial Intelligence and Computing. 2025 Apr 21;1(1):70-86.

[19]. Samad A, Jamal A. Transformative Applications of ChatGPT: A Comprehensive Review of Its Impact across Industries. Global Journal of Multidisciplinary Sciences and Arts. 2024;1(1):26-48.

[20]. Sharma, G. D., Yadav, A., & Chopra, R. (2020). Artificial intelligence and effective governance: A review, critique and research agenda. Sustainable Futures, 2, 100004.

[21]. Shehzad K. Predictive AI Models for Food Spoilage and Shelf-Life Estimation. Global Trends in Science and Technology. 2025 Feb 17;1(1):75-94.

ISSN : 3079-5761
Volume 1, Number 3, 2025
https://doi.org/10.70445/gtst.1.3.2025.220-243

[22]. Zeb S, Nizamullah FN, Abbasi N, Qayyum MU. Transforming Healthcare: Artificial Intelligence's Place in Contemporary Medicine. BULLET: Jurnal Multidisiplin Ilmu. 2024;3(4):592385.

[23]. Neoaz N, Husnain A. Deciphering the AI Healthcare Evolution: Opportunities, Risks, and the Path Forward. Global Trends in Science and Technology. 2025 Mar 30;1(1):121-42.

[24]. Bacha A, Shah HH. AI-Enhanced Liquid Biopsy: Advancements in Early Detection and Monitoring of Cancer through Blood-based Markers. Global Journal of Universal Studies.;1(2):68-86.

[25]. Shankar, K., Perumal, E., Díaz, V. G., Tiwari, P., Gupta, D., Saudagar, A. K. J., & Muhammad, K. (2021). An optimal cascaded recurrent neural network for intelligent COVID-19 detection using Chest X-ray images. Applied Soft Computing, 113, and 107878.

[26]. Javeedullah M. Big Data and Health Informatics: Managing Privacy, Accuracy, and Scalability. Global Trends in Science and Technology. 2025 Jul 3;1(3):29-47.

[27]. Neoaz N. Role of Artificial Intelligence in Enhancing Information Assurance. BULLET: Jurnal Multidisiplin Ilmu. 2024;3(5):749-58.

[28]. Sim, S., & Cho, M. (2021). Convergence model of AI and IoT for virus disease control system. Personal and Ubiquitous Computing, 1-11.

[29]. Samad A, Jamal A. Alternative Meats–Revolutionizing the Future of Sustainable Food Systems. Global Journal of Agricultural and Biological Sciences. 2024 Nov 20;1(1):1-4.

[30]. Bacha A, Sherani AM. AI in Predictive Healthcare Analytics: Forecasting Disease Outbreaks and Patient Outcomes. Global Trends in Science and Technology. 2025 Jan 24; 1(1):1-4.

[31]. Shah HH, Bacha A. Leveraging AI and Machine Learning to Predict and Prevent Sudden Cardiac Arrest in High-Risk Populations. Global Journal of Universal Studies.;1(2):87-107.

[32]. Bacha A, Sherani AM. AI in Predictive Healthcare Analytics: Forecasting Disease Outbreaks and Patient Outcomes. Global Trends in Science and Technology. 2025 Jan 24; 1(1):1-4.

[33]. Neoaz N, Shah HH, Zainab H. AI in Personalized Medicine: Transforming Treatment Plans through Precision Health. Global Journal of Emerging AI and Computing. 2025 Jan 23; 1(1):34-50.

[34]. Shehzad K, Munir A, Ali U. AI-Powered Food Contaminant Detection: A Review of Machine Learning Approaches. Global Journal of Computer Sciences and Artificial Intelligence.;1(2):1-22.s

[35]. Kabeer MM. Utilizing Machine Learning for Continuous Process Improvement in Lean Six Sigma. Global Trends in Science and Technology. 2025 May 7;1(2):49-63.

ISSN : 3079-5761
Volume 1, Number 3, 2025
https://doi.org/10.70445/gtst.1.3.2025.220-243

[36]. Asif SM. Analysis of Key Parameters and Mesh Optimization in Computational Fluid Dynamics Using Open FOAM. BULLET: Jurnal Multidisiplin Ilmu.;1(2):592455.

[37]. Asif SM. Design and Control of A Ball and Beam Balancing Mechanism Using MATLAB/Simulink. Global Journal of Multidisciplinary Sciences and Arts.;1(2):1-34.

[38]. Asif SM. Investigation of Elementary Vibrations: Derivation, Experimental Analysis, and Key Findings. BULLET: Jurnal Multidisiplin Ilmu.;3(6):744-53.

[39]. Asif SM. Mitigation of High BOD Levels in Sewage Treatment Plants Using Outfall Storage Solutions. International Journal of Social, Humanities and Life Sciences.;1(1):48-61.

[40]. Asif SM. Simulation of A Two Link Planar Anthropomorphic Manipulator. BULLET: Jurnal Multidisiplin Ilmu.;1(03):539-52.

[41]. Javeedullah M. Future of Health Informatics: Bridging Technology and Healthcare. Global Trends in Science and Technology. 2025 Apr 4;1(1):143-59.

[42]. Abid N, Neoaz N, Amin MH. AI-Driven Approaches to Overcoming Tumor Heterogeneity in Breast Cancer: Modelling Resistance and Therapy Outcomes. Global Journal of Universal Studies.;1(2):591050.

[43]. Neoaz N. Harnessing Artificial Intelligence for Cybersecurity in Healthcare and Food Processing: A Review of Emerging Trends and the Role of Generative Models like ChatGPT. Global Trends in Science and Technology. 2025 Jul 24;1(3):144-62.

[44]. Abbasi N, Nizamullah FN, Zeb S. Ai in healthcare: Using cutting-edge technologies to revolutionize vaccine development and distribution. JURIHUM: Jurnal Inovasi dan Humaniora. 2023 Jun 14;1(1):17-29.

[45]. Xames MD, Shefa J. ChatGPT for research and publication: Opportunities and challenges. Journal of Applied Learning and Teaching. 2023 Apr 3;6(1):390-5.

[46]. Bacha A. Artificial Intelligence in Healthcare, Cybersecurity, Machine Learning, and Food Processing: A Cross-Industry Review. American Journal of Artificial Intelligence and Computing. 2025 Jul 24;1(2):87-104.

[47]. Hazzan O, Lapidot T, Ragonis N. Guide to teaching computer science. Springer International Publishing; 2020.

[48]. Abbasi N, Nizamullah FN, Zeb S. AI in healthcare: integrating advanced technologies with traditional practices for enhanced patient care. BULLET: Jurnal Multidisiplin Ilmu. 2023 Jun 13;2(3):546-6.

ISSN : 3079-5761
Volume 1, Number 3, 2025
https://doi.org/10.70445/gtst.1.3.2025.220-243

[49]. Li J, Dada A, Puladi B, Kleesiek J, Egger J. ChatGPT in healthcare: a taxonomy and systematic review. Computer Methods and Programs in Biomedicine. 2024 Mar 1;245:108013.

[50]. Kabeer MM. Next-Generation Food Manufacturing: AI as a Catalyst for Productivity and Quality Enhancement. Global Food Research. 2025 Jul 15;1(1):1-8.

[51]. Dave P, Kariya S, Dudhat K. Tailoring and optimization of nifedipine controlled release organogel via quality by design approach. Journal of Pharmaceutical Innovation. 2024 Aug;19(4):47.

[52]. Dave P, Jani R, Chakraborthy GS, Jani KJ, Upadhye V, Kahrizi D, Mir MA, Siddiqui S, Saeed M, Upadhyay TK. Phytosomes: A promising delivery system for anticancer agents by using phytochemicals in cancer therapy. Cellular and Molecular Biology. 2023 Dec 20;69(14):1-8.

[53]. Dave P, Raval B, Pujara N, Gohil T. FORMULATION AND EVALUATION OF ORAL SUPERSATURABLE SELF MICRO EMULSIFYING DRUG DELIVERY SYSTEM ITRACONAZOLE.

[54]. Dave P, Patel D, Raval B. An oral organogel-novel approach for controlled drug delivery system. International Journal of Drug Delivery Technology. 2022;12(1):437-45.

[55]. Dave P, Raval B, Dudhat K. Cubosomes: Next-Generation Nanocarriers for Versatile Drug Delivery System for Cancer Therapy and Other Applications. Biomedical Materials & Devices. 2025 Jun 5:1-32.

[56]. Bacha A, Shah HH, Abid N. The Role of Artificial Intelligence in Early Disease Detection: Current Applications and Future Prospects. Global Journal of Emerging AI and Computing. 2025 Jan 20; 1(1):1-4.

[57]. Zhang D, Wang J, Zhao X. Estimating the uncertainty of average F1 scores. In: Proceedings of the 2015 International Conference on the Theory of Information Retrieval. New York: Association for Computing Machinery, 2015; 317-320.

[58]. Lodhi SK, Zeb S. Ai-Driven Robotics and Automation: The Evolution of Human-Machine Collaboration. Journal of World Science. 2025 May 13;4(4):422-37.

[59]. Akinci D'Antonoli T, Tejani AS, Khosravi B, Bluethgen C, Busch F, Bressem KK, Adams LC, Moassefi M, Faghani S, Gichoya JW. Cybersecurity Threats and Mitigation Strategies for Large Language Models in Health Care. Radiology: Artificial Intelligence. 2025 May 14;7(4):e240739.

[60]. Abbasian M, Khatibi E, Azimi I, et al. Foundation metrics for evaluating effectiveness of healthcare conversations powered by generative AI. NPJ Digit Med 2024; 7:82.

ISSN : 3079-5761
Volume 1, Number 3, 2025
https://doi.org/10.70445/gtst.1.3.2025.220-243

[61]. Neoaz N. Big Data Analytics Study the implications of big data analytics on decision-making processes in organizations. Author Nahid Neoaz. 2025 Jan 20.

[62]. Algarni AM, Thayananthan V. Cybersecurity for Analyzing Artificial Intelligence (AI)-Based Assistive Technology and Systems in Digital Health. Systems. 2025 Jun 5;13(6):439.

[63]. Javeedullah M. Security and Privacy in Health Informatics: Safeguarding Patient Data in A Digital World. AlgoVista: Journal of AI and Computer Science.;2(3):52-68.

[64]. Shi, F., Wang, J., Shi, J., Wu, Z., Wang, Q., Tang, Z., Shen, D. (2020). Review of artificial intelligence techniques in imaging data acquisition, segmentation and diagnosis for covid-19. IEEE Reviews in Biomedical Engineering.

[65]. Neoaz N. Human Factors in Information Assurance: A Review of Behavioral and Cultural Aspects. International Journal of Multidisciplinary Sciences and Arts. 2024;3(4):235-42.

[66]. Jamal A. Novel approaches in the field of cancer medicine. Biological times. 2023;2(12):52-3.

[67]. Jamal A. Embracing nature's therapeutic potential: Herbal medicine. International Journal of Multidisciplinary Sciences and Arts. 2023 Aug 5;2(3):117-26.

[68]. Neoaz N, Amin MH. Advanced AI Paradigms in Mental Health: An In-depth Exploration of Detection, Therapy, and Computational Efficacy. Global Insights in Artificial Intelligence and Computing. 2025 Jan 25;1(1):40-6.

[69]. J. Bajwa, U. Munir, A. Nori, B. Williams, Artificial intelligence in healthcare: transforming the practice of medicine, Future Health J. 8 (2) (2021) e188–e194, https://doi.org/10.7861/fhj.2021-0095.

[70]. Bacha A. Healing with Algorithms: The Future of AI-Driven Diagnostics and Treatment. American Journal of Artificial Intelligence and Computing. 2025 May 9;1(1):103-18.

[71]. A., Ziaee, & E., Çano, "Batch Layer Normalization A new normalization layer for CNNs and RNNs", In Proceedings of the 6th International Conference on Advances in Artificial Intelligence (pp. 40-49), 2022, October, DOI: https://doi.org/10.1145/3571560.3571566

[72]. Kabeer MM. Leveraging AI for Process Optimization: The Future of Quality Assurance in Lean Six Sigma. American Journal of Artificial Intelligence and Computing. 2025 May 7;1(1):87-103.

[73]. Shehzad K, Ali U, Munir A. Role of AI in Food Production and Preservation. Global Insights in Artificial Intelligence and Computing. 2025 Feb 19;1(2):1-7.

ISSN : 3079-5761
Volume 1, Number 3, 2025
https://doi.org/10.70445/gtst.1.3.2025.220-243

[74]. Chakraborty C, Nagarajan SM, Devarajan GG, Ramana TV, Mohanty R. Intelligent AI-based healthcare cyber security system using multi-source transfer learning method. ACM Transactions on Sensor Networks. 2023 May 15.

[75]. J., Yang, H., Jin, R., Tang, X., Han, Q., Feng, H., Jiang, S., Zhong, B., Yin, & X., Hu, "Harnessing the power of llms in practice: A survey on chatgpt and beyond", ACM Transactions on Knowledge Discovery from Data, 18(6), pp. 1-32, 2024, DOI: https://doi.org/10.1145/3649506

[76]. Nizamullah F, Fahad M, Abbasi N, Qayyum MU, Zeb S. Ethical and legal challenges in AI-driven healthcare: patient privacy, data security, legal framework, and compliance. Int. J. Innov. Res. Sci. Eng. Technol. 2024;13:15216-23.

[77]. Mosaddeque A, Rowshon M, Ahmed T, Twaha U, Babu B. The Role of AI and Machine Learning in Fortifying Cybersecurity Systems in the US Healthcare Industry. Inverge Journal of Social Sciences. 2022;1(2):70-81.

[78]. Javeedullah M. Interoperability Solutions for Efficient Health Informatics Systems. Global Trends in Science and Technology. 2025 Apr 22;1(1):176-94.

[79]. S., Naseem, "Advancing Health Literacy Through Generative AI: The Utilization of Open-Source Large Language Models (LLMS) for Text Simplification and Readability", Master thesis, Michigan Technological University, 2024, DOI: https://doi.org/10.37099/mtu.dc.etdr/1762

[80]. Zeb S, Lodhi SK. AI for predictive maintenance: Reducing downtime and enhancing efficiency. Enrichment: Journal of Multidisciplinary Research and Development. 2025 May 13;3(1):135-50.

[81]. Cartwright AJ. The elephant in the room: cybersecurity in healthcare. Journal of Clinical Monitoring and Computing. 2023 Oct;37(5):1123-32.

[82]. J. L., Ba, J. R., Kiros, & G. E., Hinton, (2016). Layer normalization. arXiv: 1607.06450. Retrieved December 12, 2024, from https://arxiv.org/abs/1607.06450

[83]. Kabeer MM. Artificial Intelligence in Modern Manufacturing: Opportunities and Barriers. Global Trends in Science and Technology. 2025 Jul 16;1(3):83-100.

[84]. A., Vaswani, N., Shazeer, N., Parmar, J., Uszkoreit, L., Jones, A. N., Gomez, L., Kaiser, & I., Polosukhin, (2017). Attention is all you need. Advances in Neural Information Processing Systems, arXiv (Cornell University), 30, pp. 5998– 6008. Retrieved December 12, 2024, from https://arxiv.org/pdf/1706.03762v5

ISSN : 3079-5761
Volume 1, Number 3, 2025
https://doi.org/10.70445/gtst.1.3.2025.220-243

[85]. Zeb S, Lodhi SK. AI and Cybersecurity in Smart Manufacturing: Protecting Industrial Systems. American Journal of Artificial Intelligence and Computing. 2025 Apr 7;1(1):1-23.

[86]. Virk A, Alasmari S, Patel D, Allison K. Digital Health Policy and Cybersecurity Regulations Regarding Artificial Intelligence (AI) Implementation in Healthcare. Cureus. 2025 Mar 16;17(3).

[87]. Arefin S, Simcox M. AI-Driven Solutions for Safeguarding Healthcare Data: Innovations in Cybersecurity. International Business Research. 2024 Nov;17(6):1-74.