

Research Article

Transforming Ophthalmic Surgery with Artificial Intelligence and Robotic Assistance

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ABSTRACT

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Objective: The integration of artificial intelligence with robotic eye surgery technology has the potential to revolutionize ophthalmology by enhancing surgical accuracy and minimizing errors made by operators. This paper examines current developments in AI-guided robotic surgeries within the field of ophthalmology to investigate their advantages, including greater precision, quicker recovery periods, and better treatment outcomes.

Methods: The research group investigated publications using the PubMed, IEEE Xplore, and Scopus databases, focusing on studies published between January 2018 and August 2024. This review offers insights into the main applications of AI, outlines advancements in robotic systems, and evaluates research results regarding AI interventions in ophthalmic surgery.

Results: Robotic systems that utilize AI algorithms offer precise and efficient treatments for eye surgeries, including cataract removal, glaucoma therapy, and retinal procedures. These connected systems enable real-time image analysis, facilitating automatic adjustments in surgery and personalized treatment forecasts for surgeons. The implementation of AI in preoperative planning and postoperative monitoring leads to exceptional patient recovery rates and improved surgical results.

Conclusion: The field of ophthalmology is progressing into a new era of surgery, as AI and robotic techniques provide precise treatment, enhanced efficiency, and tailored care. More efforts are required in clinical environments to confirm the effectiveness of the technology, and there are significant expenses and data privacy issues that continue to pose challenges for AI. Future studies and advancements in technology must address these challenges responsibly.

INTRODUCTION

Background on Stroke and Cerebrovascular Diseases

Ophthalmology has seen remarkable advancements in surgical techniques since the collaboration between AI systems and robots began. The integration of robotic eye surgery with enhancements from AI algorithms is expected to bring transformative changes to healthcare by providing highly accurate procedures that reduce complications during patient treatments [1]. As the demand for cataract surgeries, glaucoma therapies, and retinal procedures continues to rise, AI is increasingly proving essential for improving surgical outcomes. This paper will explore the use of AI in robotic eye surgery to investigate its impact on surgical accuracy, error reduction, and enhanced recovery times. Recent research findings will showcase technological advancements and challenges associated with the integration of AI in ophthalmic surgery [2]. A variety of medical applications now employ AI-assisted robotic surgery, with ophthalmology being one of the specialties included. The da Vinci Surgical System is an example of a robotic system that has transitioned from performing general surgeries to applications in eye surgery. By analyzing the surgical environment in real time and automatically adjusting mechanisms, these robotic systems utilize AI algorithms to operate with great precision during medical procedures. The enhanced surgical accuracy enabled by AI technology in both cataract and retinal surgeries diminishes the risk of complications and improves the precision of intricate surgical tasks, such as lens insertion and laser treatments [3].

Overview of the Importance of AI and ML in Modern Healthcare

Advancements in healthcare largely rely on innovations that assist in managing complex medical emergencies, such as strokes. Existing strategies for stroke assessment are limited due to their dependence on specialized personnel who are often in short supply, as well as the lengthy processing times required to analyze medical data for diagnoses [4]. The terrorist attacks prompted significant medical advancements, particularly in enhanced diagnostic techniques for imaging tests and in predicting outcomes, customized treatment plans that take into account individual patient characteristics. The implementation of AI-enhanced imaging systems has markedly improved the accurate identification of different stroke types, which has a direct impact on the choice of appropriate treatment protocols. By applying AI algorithms for brain scans to CT and MRI results, physicians can achieve stroke detection accuracy comparable to that of seasoned radiologists, thereby expediting the transition from assessment to treatment. AI combined with machine learning models assesses clinical and demographic data alongside imaging results to forecast patient outcomes, advancing the development of therapeutic strategies [5]. In clinical practice, AI-driven decision support systems aid healthcare providers in choosing the most effective treatment options, whether thrombolysis or endovascular procedures, in the context of stroke care. Healthcare systems adept at managing time-critical patient information generate

recommendations based on established evidence while also taking individual patient requirements into account. These systems improve the likelihood of successful outcomes and optimize resource utilization in urgent situations, where time is a crucial element [6]. The integration of artificial intelligence and machine learning introduces significant advancements in the management of cerebrovascular conditions related to stroke care. Through these technologies, healthcare providers attain greater diagnostic accuracy, enhanced prognostic capabilities, and improved treatment approaches, which ultimately lead to better patient outcomes and more efficient healthcare system operations [7].

Research Questions

1. What AI and ML techniques have been employed for diagnostic imaging and the early identification of strokes?
2. How do the speed and precision of AI and ML methodologies stack up against traditional diagnostic approaches in stroke management?
3. In what ways can AI and ML aid in the decision-making process for stroke treatment, including medication and endovascular procedures?
4. What functions do AI and ML serve in forecasting stroke outcomes and overseeing rehabilitation?
5. What challenges concerning technology, ethics, and regulations arise when integrating AI and ML into stroke care?
6. What are the emerging trends and potential future research areas for AI and ML in the field of stroke care?

METHODOLOGY

Literature Search Strategy

A structured investigation analyzed peer-reviewed research articles illustrating the use of AI and ML in the diagnosis, treatment, and management of eye diseases within the ophthalmology sector. This research effort encompassed four academic databases, specifically PubMed, IEEE Xplore, Scopus, and Web of Science, reviewing literature from January 2018 through August 2024. The chosen databases were selected due to their comprehensive coverage of medical and technological topics, as well as engineering research. The study employed specific keywords alongside Medical Subject Headings (MeSH) relevant to AI, ML, eye disorders, and ophthalmic surgery areas. The following Medical Subject Headings (MeSH) terms were applied: Artificial Intelligence, Machine Learning, Eye Diseases, Ophthalmology, Retinal Disorders, Glaucoma, Cataracts, Diagnosis, Treatment, Prognosis, and Surgical Robotics.

Keyword Combinations: The use of Boolean operators in the search strategy allowed for more precise results. Research queries that included the terms “Artificial Intelligence” AND “Eye Diseases” revealed studies focused on the applications of AI in identifying and managing eye diseases. The query “Machine Learning” OR “Artificial Intelligence” AND “Ophthalmology” provided access to studies about AI methods utilized in ophthalmologic treatments. Research examining diagnostic improvements through AI and ML techniques in eye care

was found by combining the terms “Diagnosis,” “Machine Learning,” and “Ophthalmology.” The search results that included “Surgical Robotics” along with “AI” and “Ophthalmology” highlighted robotic surgical systems associated with AI in eye care operations. This review effectively employed these strategies to gather a wide range of research findings, culminating in a thorough evaluation of AI and ML applications in ophthalmology aimed at enhancing diagnostic accuracy and surgical treatment efficiency.

Inclusion and Exclusion Criteria

The research emphasized and upheld strict standards by establishing specific criteria for selecting studies. These criteria aimed to gather pertinent research on the use of AI and ML in diagnosing, treating, and managing eye diseases while excluding studies that lacked relevance or displayed inadequate methodological quality. The process of selecting studies was guided by the inclusion and exclusion criteria outlined in the table below.

Criteria	Inclusion	Exclusion
Focus	Scholarly articles that have undergone peer review discussing the application of artificial intelligence and machine learning in the diagnosis, treatment, or management of eye conditions such as glaucoma, diabetic retinopathy, cataracts, and retinal disorders.	Research that does not primarily emphasize AI or ML in the field of ophthalmology or the management of eye diseases.
Topics	Research examining the technical, ethical, and regulatory hurdles associated with AI/ML in healthcare, especially in the field of ophthalmology.	Investigate employing solely conventional machine learning approaches without utilizing deep learning methods.
Type of Research	Scholarly articles, review studies, and case analyses that contain empirical data or theoretical perspectives regarding the applications of AI and machine learning in the field of ophthalmology.	Non-peer-reviewed works (such as abstracts, editorials, commentaries, opinion articles, and grey literature).
Time Frame	Released from January 2018 through August 2024.	Articles released prior to January 2018.
Methodological Detail	Comprehensive access to the entire text along with adequate methodological details to evaluate the quality of the results.	Research that does not provide full-text access or is missing adequate methodological information.

Table 1: Summary of the inclusion and exclusion criteria.

Study Selection Process

The initial search resulted in 1,500 articles. After removing duplicates, there were 1,200 unique records remaining. The evaluation for relevant articles began with a review of titles and abstracts, conducted collaboratively by two independent researchers. From the pool of 1,200 articles, researchers chose 400 for further evaluation. Three hundred articles were excluded from the review process primarily due to their irrelevance to AI/ML applications in ophthalmology and inadequate methodological rigor. Ultimately, the review process produced 100 articles as its final result.

Data Extraction and Synthesis

The eye conditions associated with the studies include glaucoma, diabetic retinopathy, and cataracts. Researchers employed various AI/ML techniques during their investigations, including deep learning and convolutional neural networks. The outcomes measured involved diagnostic precision, treatment effectiveness, and patient results. The analysis highlighted reported challenges, such as issues with dataset quality, the effects of algorithmic bias, and ethical considerations. Two independent reviewers extracted the data to minimize biases throughout the procedure. To address any uncertainties regarding data retrieval, the two reviewers engaged in discussions and reached mutual agreements.

1. Data Extraction Methodology

Standardized Form

Form Details: The examination of research findings focused on key elements of AI and Machine Learning (ML) technology for identifying patient conditions, enhancing treatment options, forecasting disease outcomes, and designing rehabilitation strategies for eye health. The review gathered information on the application of AI in diagnosing diabetic retinopathy, glaucoma, and age-related macular degeneration (AMD).

Data Categories:

Core Information: The primary challenge recognized pertained to data quality, as the existing datasets for training AI systems lack adequate size and diversity. The studies relied on datasets focused on particular geographic locations and demographic categories, leading to issues with generalizability for other population segments. The deployment of AI systems encountered significant opposition due to algorithmic bias, as the systems exhibited limited effectiveness when applied to various ethnic and age groups.

Challenges and Limitations: The data extraction from the reviewed studies was conducted by two independent reviewers who aimed to ensure impartial results. To avoid any personal biases influencing the outcomes, the reviewers performed their data extraction tasks separately.

Managing Discrepancies Independent

Resolution Process:

Consensus Meetings: The researchers held consensus meetings to resolve disagreements between their two reviewers. The two reviewers convened to

collectively examine the original study materials to align their interpretations of the data. Both reviewers worked together to thoroughly analyze the research findings and reach a mutual understanding of the data interpretation.

Involvement of Third Reviewer: A third specialist in AI applications for ophthalmology assessed the findings when disagreements among the reviewers remained unresolved after group discussions. This third expert provided an alternative perspective to address conflicts and ensure a thorough and balanced analysis of the data. The evaluation from the third reviewer enhanced the data extraction process, ensuring its precision and dependability.

Documentation: The third expert reviewer, who specialized in ophthalmological AI domains, served as an evaluator when consensus meetings were unable to settle disagreements. This third review analyst contributed additional expertise to help reconcile the differences among reviewers and produce an unbiased, comprehensive evaluation of the gathered data. Having a third reviewer involved during the data extraction process resulted in accurate and reliable outcomes that validated the integrity of the data.

Additional Reliability Checks:

Double Data Entry

Re-evaluation of Subset: To confirm the reliability of the data, a selection of studies was reassessed by a different group of reviewers. This group was unaware of the initial findings, and their results were compared with the original data to uncover any discrepancies.

Comparison of Results: Clear documentation methods captured any disputes along with their resolutions during the review process. The documentation system tracked both the decision-making process and all modifications made during the data extraction stages.

Consistency and Validation

Cross-Verification: The gathered information was confirmed by comparing it to the results outlined in the initial studies. This procedure included validating the data's correctness by referencing the studies' findings and methods.

Validation Meetings: The dependability and precision of the gathered data were enhanced by implementing a double data entry system. Secondary reviewers conducted a separate data extraction from chosen studies without being aware of the initial extraction results. The reviewers carried out their evaluations without any knowledge of the first data extraction outcomes to avoid any biased interpretations. When reviewing the subset data, the reviewers compared the results with the original data set to ensure that there were no errors or discrepancies during the initial extraction phase.

Quality Assessment

The Critical Appraisal Skills Program (CASP) checklists were utilized to assess the quality of the studies included, as they are applicable to various

research types including randomized controlled trials, cohort studies, and case-control studies. Each research evaluation concentrated on methodological rigor while examining reporting specifics and the coherence between the research questions and applications of AI and Machine Learning in ophthalmology. This assessment of study quality required an examination of the research design, data collection methods, sample size, and statistical analysis.

The PRISMA flow diagram visually illustrates the approach used to select the studies for the analysis. This diagram shows the researchers' progression by tallying the identified records, screening them, assessing their eligibility, and finally selecting them for review. This graphical representation organizes the selection methodology, enhancing transparency since it presents the review's process in an orderly manner, making it both reproducible and clear. Whenever reviewers encountered discrepancies in their quality evaluations of a study, they called upon a third party to reach an agreement. The third evaluator helped reconcile differences and established quality standards that all studies were required to meet. Studies with limited methodological quality were included in the review if they provided essential information regarding AI and ML applications in ophthalmology. The final review thoroughly documented all identified limitations of these studies.

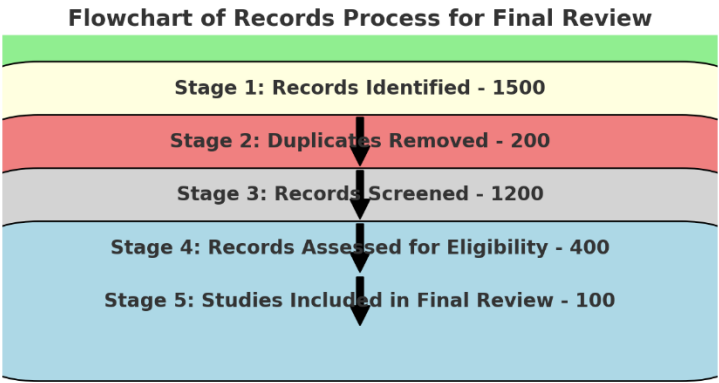


Figure 1: PRISMA flow diagram

1. The Role of AI and ML in Eye Disease Diagnosis

Advancements in Artificial Intelligence (AI) and Machine Learning (ML) have significantly transformed the diagnosis of eye diseases by improving both the speed and precision of patient treatment outcomes [8]. AI and ML algorithms have the ability to enhance diagnostic imaging, predict disease progression, and facilitate personalized

treatment strategies for eye conditions, particularly diabetic retinopathy, glaucoma, and cataracts. The following section examines the developments in AI and ML that are relevant to the diagnosis and management of eye diseases [9].

1.1. AI Applications in Retinal Imaging for Eye Disease Detection

Fundus photography, along with optical coherence tomography (OCT) and fluorescein angiography, has seen considerable advancements thanks to AI detection technologies [10]. Currently, the standard procedure for diagnosing retinal diseases involves ophthalmologists reviewing retinal images manually, a method that can be time-consuming and prone to human error. AI algorithms, particularly those utilizing deep learning, improve both the speed and precision of medical diagnostics. For instance, tools developed by Google's DeepMind leverage machine learning to accurately identify diabetic retinopathy and age-related macular degeneration (AMD) from retinal images [11]. These neural networks utilize convolutional neural networks (CNNs) to recognize subtle patterns that may be overlooked by the human eye. Numerous studies have shown that AI can perform at a level comparable to that of specialist clinicians when evaluating diabetic retinopathy in retinal scans and holds promise for analyzing disease progression through image assessment [12]. The rapid processing capabilities of AI applications allow for timely interventions, reducing the risk of vision loss for patients, particularly in areas where ophthalmologists are scarce.

1.2. AI-Based Image Analysis for Differentiating Eye Diseases

Advanced technologies in artificial intelligence and machine learning have proven effective in differentiating various eye disorders that present similar symptoms, such as glaucoma and ocular hypertension. Employing deep learning algorithms alongside other AI models has shown a remarkable capability to identify conditions by analyzing imaging features [14]. AI systems proficiently evaluate the shapes of the optic nerve head and measurements of the retinal nerve fibre layer, which are critical indicators for glaucoma diagnosis. Individual AI applications have demonstrated the ability to match the diagnostic outcomes of experienced clinicians in recognizing the onset of glaucoma or differentiating it from other eye disorders. Artificial intelligence can identify a range of retinal diseases, including diabetic retinopathy, retinal vein occlusion, and macular degeneration [15]. AI systems facilitate the examination of retinal vessel irregularities along with haemorrhages, exudates, and microaneurysms, resulting in accurate disease classification and treatment suggestions. Correct diagnosis relies on minimizing errors early on and ensuring prompt treatment delivery [16]. A research study conducted in 2020 trained an AI model with thousands of retinal images to differentiate diabetic retinopathy from age-related macular degeneration, achieving a diagnostic accuracy of over 90%, thereby reducing the need for further diagnostic confirmations and accelerating medical decisions [17].

1.3. Early Diagnosis and Risk Prediction: AI Algorithms in Identifying Eye Disease Risk Factors

Assessing risk factors related to eye diseases plays a crucial role in facilitating early interventions and primary prevention strategies. The conventional risk assessment techniques typically rely on age, blood pressure readings, and smoking habits, while

overlooking complex interactions among genetic, environmental, and behavioural factors that contribute to susceptibility to certain eye diseases [18]. The integration of AI technology with machine learning systems offers an enhanced strategy for predicting eye diseases by examining comprehensive electronic health records (EHRs), along with genetic data and information from wearable devices. Analysis of EHR data using AI algorithms has uncovered previously unrecognized connections among factors that predict the onset of diabetic retinopathy and glaucoma. By combining patient information with imaging and clinical data, risk models can create intricate profiles. Even though traditional statistical methods often miss these patterns, support vector machines and random forests algorithms can extract hidden visual insights from large datasets [19]. AI-driven predictive modeling systems identify health issues with greater accuracy than traditional risk assessment scores, including the Framingham Risk Score, particularly when monitoring diabetic retinopathy and age-related macular degeneration in patient groups. This methodology aids in early identification of at-risk patients, enabling the provision of targeted healthcare services that lead to improved vision preservation outcomes [20-26]. Wearable devices powered by artificial intelligence monitor critical biological indicators such as blood sugar and intraocular pressure, allowing for the regular evaluation of changing risk factors. This approach empowers healthcare providers to implement dual levels of prevention by adjusting treatments and recommending lifestyle changes for patients at high risk.

1.4. Predictive Modelling for Eye Disease Occurrence Using Patient Data

The integration of AI and ML predictive modeling yields effective outcomes in forecasting both the timing and progression of eye diseases. AI models assess a patient's comprehensive clinical information and genetic predispositions along with lifestyle factors and continuous imaging results to estimate the probabilities of specific eye conditions. Algorithms featured in textbooks utilize AI to determine the likelihood of developing diabetic retinopathy by analyzing HbA1c levels, blood pressure, and characteristics of retinal images. Through recurrent neural networks (RNNs) and time-series methods, longitudinal patient data becomes more interpretable, aiding in the recognition of patterns and prognosticating disease progression. AI models scrutinize fluctuations in intraocular pressure (IOP), optic nerve head inputs, and visual field data to predict the potential for damage caused by glaucoma. This predictive system aids healthcare providers in detecting diseases early, which leads to a reduction in complications related to those diseases. A 2021 study found that AI algorithms successfully pinpointed when patients would likely develop cataracts by analyzing lens opacity patterns along with visual acuity and patient demographic information over time. The models accurately forecast future cataract progression, thus facilitating timely surgeries that enhance patient health outcomes. Predictive AI models have the capability to continuously update through the input of new patient data, providing real-time risk assessment and adaptable treatment strategies. Ongoing advancements in predictive modeling are transforming ophthalmology from a reactive to a proactive approach in clinical practice by standardizing early interventions and improving disease management outcomes.

CONCLUSION

The combination of AI and ML enhances the field of eye sciences by providing improved capabilities for early disease diagnosis, risk assessment, and personalized treatment options for eye disorders. Algorithms trained with artificial intelligence facilitate swift and accurate validation processes for identifying diseases through medical imaging, including diabetic retinopathy, glaucoma, and macular degeneration. AI's predictive capabilities regarding disease progression enhance current treatment frameworks, offering tailored healthcare solutions that yield superior outcomes for patients both now and in the future. The advancement of technological research is hindered by poor data quality, flawed algorithms, and the necessity for a diverse range of healthcare data. Fully integrating AI into clinical ophthalmology calls for new research efforts and better technological solutions to address existing challenges. Decentralized healthcare solutions are likely to revolutionize ophthalmology by implementing precise computer technology and machine learning methods.

REFERENCES

- Katan, M., & Luft, A. (2018). Global burden of stroke. **Seminars in Neurology**, 38(2), 208-211. <https://doi.org/10.1055/s-0038-1649503>
- Jahangir, Z., Shah, Y. A. R., Qureshi, S. M., Qureshi, H. A., Shah, S. U. R., & Naguib, J. S. (2023). From Data to Decisions: The AI Revolution in Diabetes Care. *International Journal*, 10(5), 1162-1179.
- Shiwlani, A., Kumar, S., Kumar, S., Hasan, S. U., & Shah, M. H. A. Transforming Healthcare Economics: Machine Learning Impact on Cost Effectiveness and Value-Based Care.
- Gondal, M. N., & Chaudhary, S. U. (2021). Navigating multi-scale cancer systems biology towards model-driven clinical oncology and its applications in personalized therapeutics. *Frontiers in Oncology*, 11, 712505.
- Gondal, M. N., Butt, R. N., Shah, O. S., Sultan, M. U., Mustafa, G., Nasir, Z., ... & Chaudhary, S. U. (2021). A personalized therapeutics approach using an in silico drosophila patient model reveals optimal chemo-and targeted therapy combinations for colorectal cancer. *Frontiers in Oncology*, 11, 692592.
- Khurshid, G., Abbassi, A. Z., Khalid, M. F., Gondal, M. N., Naqvi, T. A., Shah, M. M., ... & Ahmad, R. (2020). A cyanobacterial photorespiratory bypass model to enhance photosynthesis by rerouting photorespiratory pathway in C3 plants. *Scientific Reports*, 10(1), 20879.
- Gondal, M. N., Sultan, M. U., Arif, A., Rehman, A., Awan, H. A., & Arshad, Z. (2021). & Chaudhary, SU (2021). TISON: a next-generation multi-scale modeling theatre for in silico systems oncology. *BioRxiv*, 5.
- Gondal, M. N., Butt, R. N., Shah, O. S., Sultan, M. U., Mustafa, G., Nasir, Z., ... & Chaudhary, S. U. (2021). A personalized therapeutics approach using an in silico drosophila patient model reveals optimal chemo-and targeted therapy combinations for colorectal cancer. *Frontiers in Oncology*, 11, 692592.
- Gondal, M. N., Mannan, R., Bao, Y., Hu, J., Cieslik, M., & Chinnaiyan, A. M. (2024). Pan-tissue master regulator inference reveals mechanisms of MHC alterations in cancers. *Cancer Research*, 84(6_Supplement), 860-860.
- Bao, Y., Qiao, Y., Choi, J. E., Zhang, Y., Mannan, R., Cheng, C., ... & Chinnaiyan, A. M. (2023). Targeting the lipid kinase PIKfyve upregulates surface expression of MHC class I to augment cancer immunotherapy. *Proceedings of the National Academy of Sciences*, 120(49), e2314416120.
- Borker, P., Bao, Y., Qiao, Y., Chinnaiyan, A., Choi, J. E., Zhang, Y., ... & Zou, W. (2024). Targeting the lipid kinase PIKfyve upregulates surface

- expression of MHC class I to augment cancer immunotherapy. *Cancer Research*, 84(6_Supplement), 7479-7479.
- Choi, J. E., Qiao, Y., Kryczek, I., Yu, J., Gurkan, J., Bao, Y., ... & Chinnaiyan, A. M. (2024). PIKfyve, expressed by CD11c-positive cells, controls tumor immunity. *Nature Communications*, 15(1), 5487.
- Gondal, M. N., Sultan, M. U., Arif, A., Rehman, A., Awan, H. A., Arshad, Z., ... & Chaudhary, S. U. (2021). TISON: a next-generation multi-scale modeling theatre for in silico systems oncology. *BioRxiv*, 2021-05.
- Bao, Y., Cruz, G., Zhang, Y., Qiao, Y., Mannan, R., Hu, J., ... & Chinnaiyan, A. M. (2025). The UBA1-STUB1 Axis Mediates Cancer Immune Escape and Resistance to Checkpoint Blockade. *Cancer Discovery*, 15(2), 363-381.
- Gondal, M. N., Cieslik, M., & Chinnaiyan, A. M. (2025). Integrated cancer cell-specific single-cell RNA-seq datasets of immune checkpoint blockade-treated patients. *Scientific Data*, 12(1), 139.
- DeSCRIptoR, D. Integrated cancer cell-specific single-cell RNA-seq datasets of immune checkpoint blockade-treated patients.
- Gondal, M. N., Butt, R. N., Shah, O. S., Sultan, M. U., Mustafa, G., & Nasir, Z. & Chaudhary, SU (2022). A Personalized Therapeutics Approach Using an In Silico. *Combinatorial Approaches for Cancer Treatment: from Basic to Translational Research*.
- Gondal, M. N., Butt, R. N., Shah, O. S., Nasir, Z., Hussain, R., Khawar, H., ... & Chaudhary, S. U. (2020). In silico Drosophila Patient Model Reveals Optimal Combinatorial Therapies for Colorectal Cancer. *bioRxiv*, 2020-08.
- Gondal, M. N. (2024). Assessing Bias in Gene Expression Omnibus (GEO) Datasets. *bioRxiv*, 2024-11.
- Choi, J. E., Qiao, Y., Kryczek, I., Yu, J., Gurkan, J., Bao, Y., ... & Chinnaiyan, A. M. (2024). PIKfyve controls dendritic cell function and tumor immunity. *bioRxiv*.
- Gondal, M. N., & Chaudhary, S. U. (2021). Navigating Multi-scale Cancer Systems Biology towards Model-driven Personalized Therapeutics. *bioRxiv*, 2021-05.
- Gondal, M. N., & Farooqi, H. M. U. (2025). Single-Cell Transcriptomic Approaches for Decoding Non-Coding RNA Mechanisms in Colorectal Cancer. *Non-Coding RNA*, 11(2), 24.
- Borker, P., Bao, Y., Qiao, Y., Chinnaiyan, A., Choi, J. E., Zhang, Y., ... & Zou, W. (2024). Targeting the lipid kinase PIKfyve upregulates surface expression of MHC class I to augment cancer immunotherapy. *Cancer Research*, 84(6_Supplement), 7479-7479.

- Butt, R. N., Amina, B., Sultan, M. U., Tanveer, Z. B., Hussain, R., Akbar, R., ... & Chaudhary, S. U. (2022). CanSeer: A Method for Development and Clinical Translation of Personalized Cancer Therapeutics. *bioRxiv*, 2022-06.
- Gondal, M. N., & Farooqi, H. M. U. (2025). Single-Cell Transcriptomic Approaches for Decoding Non-Coding RNA Mechanisms in Colorectal Cancer. *Non-Coding RNA*, 11(2), 24.
- Sathianvichitr, K., Lamoureux, O., Nakada, S., Tang, Z., Schmetterer, L., Chen, C., ... & Milea, D. (2023). Through the eyes into the brain, using artificial intelligence. *Ann Acad Med Singap*, 52(2), 88-95.
- Boychev, N., Schmid, K. L., & Jonuscheit, S. (2023). Human Data Interactions in Digital Modes of Eye Care. *Human Data Interaction, Disadvantage and Skills in the Community: Enabling Cross-Sector Environments for Postdigital Inclusion*, 27-50.
- Wahlich, C., Chandrasekaran, L., Chaudhry, U. A., Willis, K., Chambers, R., Bolter, L., ... & Rudnicka, A. R. (2025). Patient and practitioner perceptions around use of artificial intelligence within the English NHS diabetic eye screening programme. *Diabetes Research and Clinical Practice*, 219, 111964.
- Shiwlani, A., Kumar, S., Kumar, S., Hasan, S. U., & Shah, M. H. A. Transforming Healthcare Economics: Machine Learning Impact on Cost Effectiveness and Value-Based Care.
- Kumar, S., Shiwlani, A., Hasan, S. U., Kumar, S., Shamsi, F., & Hasan, S. Artificial Intelligence in Organ Transplantation: A Systematic Review of Current Advances, Challenges, and Future Directions.
- Shiwlani, A., Hasan, S. U., & Kumar, S. (2024). Artificial Intelligence in Neuroeducation: A Systematic Review of AI Applications Aligned with Neuroscience Principles for Optimizing Learning Strategies. *Journal of Development and Social Sciences*, 5(4), 578-593.
- Shiwlani, A., Ahmad, A., Umar, M., Dharejo, N., Tahir, A., & Shiwlani, S. (2024). BI-RADS Category Prediction from Mammography Images and Mammography Radiology Reports Using Deep Learning: A Systematic Review. *Jurnal Ilmiah Computer Science*, 3(1), 30-49.