

IHOPE

Newsletter

Conference Edition



IHOPE Conference - Day 1

Day 1 was packed with exhilarating sessions that left attendees inspired and motivated to make a difference. From the insightful LEAP Workshop to thought-provoking discussions on health economics and public health, it was a day filled with valuable knowledge exchange. We strongly believe that collaboration between professionals and passionate individuals can play a crucial role in shaping a promising future for healthcare. This vision became a reality at the highly successful IHOPE Conference 2023, where experts and enthusiasts came together to pave the way for advancements in the field.

LEAP Workshop

Need for Leapfrog in Healthcare

India has been making steady progress in financial, space research and green energy in recent years. There is an urgent need now for India's health system to leapfrog as well. With the goal of 'Leave No One Behind' reflected in the Government of India's message of 'Sabka Saath, Sabka Vikas', India has aligned its flagship national initiatives with the Sustainable Development Goals (SDGs) and translated Agenda 2030 into local actions at all levels, while delivering development gains at scale.¹

Importance of Creating Value for Money in Healthcare

India is currently experiencing a triple burden of disease, that is, rising Non-communicable diseases (NCDs) and the unfinished agenda of infectious and communicable diseases; Rising population with a high share of an ageing population with complex morbidities; Rapidly increasing expenditure on health services on one side and rising expectations/demands from the citizen on the other. There is still a high OOPE (Out-of-Pocket Expenditures on Healthcare (OOPE), and lack of protection against catastrophic health expenditure.

Low public health spend also adds to the burden of disease.

In this backdrop, the uptake of concepts of value for money, value-based health care, cost-effectiveness, and patient-reported outcomes are the need of the hour for creating 'value' in the health system. In the near future, low-cost



private health insurance products could be explored, considering the financial implications of expanding the existing Pradhan Mantri Jan Arogya Yojna (PM-JAY) coverage on the government expenditure for covering the missing middle population. A more vigorous mechanism and capacity for Health Technology Assessment (HTA) in India would accelerate India's progress towards UHC.

New Winning Post: Market Access

Beyond registration of patients, pricing concerns and need for evidence of product value have added hurdles to Market Access. It is important to have therapeutic value that includes safety, efficacy, economic value, and real-world effectiveness. Health Economics and Outcomes Research (HEOR) studies are being conducted and models are being developed to quantify the differential value for a product to facilitate evidence-based policy shaping.

LEAP Workshop

Indian Health Outcomes, Public Health and Economics Research Centre (IHOPE) in collaboration with Novartis India Limited conducted the LEAP - Health Economics to Accelerate Policy Shaping - workshop at the IHOPE annual conference, held at LV Prasad Eye Institute, Hyderabad. Distinguished panelists had a vibrant discussion on “Should India move from “Volume to Value”: How & Why?” Dr. Prashant Garg chaired the panel discussion, while Prof. Anindya Chakrabarti moderated this session with inputs from Dr. Krishna Reddy Nallamalla, Dr. Raja Narayanan, Dr. Chirantan Chatterjee, and Dr. Amit Dang.



Public Health session

The Public Health session at the conference brought together esteemed professionals in the field of public health, with the keynote speech delivered by Dr. B R Hans Limburg. The panelists included Dr. Praveen Vashist and Dr. Shamanna, who brought their expertise and insights to the discussion. The session was expertly moderated by Dr. GVS Murthy and Dr. Varsha Rathi, ensuring a productive and engaging conversation on public health issues of utmost importance.



Health Economics session

The Health Economics session at the IHOPE conference was an insightful and informative discussion led by esteemed experts in the field. The session featured Dr. Gail Davey as the keynote speaker, accompanied by panelists Dr. Nina Yin and Dr. Samarth Gupta. The discussion was moderated by Dr. Anindya Chakrabarti and Prof. Chirantan Chatterjee.

The panel brought together a wealth of knowledge and experience in health economics, offering attendees a unique opportunity to gain valuable insights into this critical area of study. From exploring the impact of healthcare policies on population health outcomes to discussing cost-effectiveness analyses and resource allocation strategies, this session provided a comprehensive understanding of the complex dynamics within health economics.



IHOPE Conference Dinner

We were honored to have hosted US Consul General Jennifer Larson and Deputy British High Commissioner Gareth Wynn Owen at the exclusive IHOPE conference dinner. Their presence added a touch of prestige to our event!

- When esteemed leaders come together, incredible things happen! We were privileged to have US Consul General Jennifer Larson and Deputy British High Commissioner Gareth Wynn Owen join us at the extraordinary IHOPE conference dinner last week.
- Their presence brought even more depth and insight to an already inspiring event. It was a true honor to host such distinguished guests who are dedicated to fostering collaboration and innovation.
- Thank you, US Consul General Jennifer Larson and Deputy British High Commissioner Gareth Wynn Owen, for gracing us with your wisdom and expertise. Your visit has left a lasting impact on our community. Here's to future endeavors together!



IHOPE Conference - Day 2

- Day 2 of the highly anticipated IHOPE Conference was nothing short of extraordinary!
- From captivating clinical research sessions to thought-provoking AI discussions, our speakers left no stone unturned in shedding light on the latest advancements in their fields.
- The Policy Panel Discussion was a true eye-opener, as experts dived deep into the implications of current policies and their impact on healthcare.
- And finally, we concluded the day with an exhilarating prize distribution ceremony, honoring those who made significant contributions to the field.



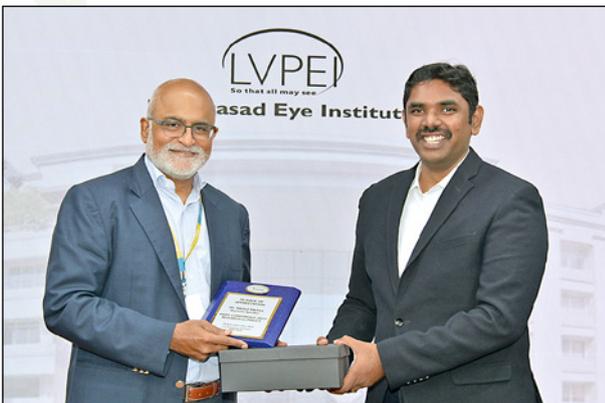
Big Data and AI in Ophthalmology

The second day of the IHOPE conference featured a session on 'Big Data and AI in Ophthalmology' with notable keynote speaker, Dr. Mehul Mehta. The panel for this session included esteemed experts in the field, namely Dr. Harish NL, Dr. Nuzhat Aziz, Dr. Brijesh Chejerla and Dr. Praveen Devarsetty with moderation by Dr. Anthony Vipin Das.

During this session, the speakers and panelists delved into the intersection of big data and artificial intelligence within the field of ophthalmology. They explored various applications and use cases of these technologies in diagnosing eye conditions, analyzing patient data for personalized treatment plans, and improving overall patient outcomes.

Dr. Mehul Mehta provided valuable insights into the advancements being made in utilizing big data and AI to revolutionize ophthalmic practices worldwide. The expertise shared by Dr. Harish NL, Dr. Nuzhat Aziz, Dr. Brijesh Chejerla and Dr. Praveen Devarsetty further enriched the discussion by highlighting their experiences when implementing these technologies in their respective clinics or research settings.

Overall, this session served as a platform to discuss the potential benefits of leveraging big data and AI in ophthalmology while addressing any concerns or challenges associated with their implementation. Attendees gained valuable knowledge about current trends and future directions in this rapidly evolving field at IHOPE Conference's engaging event on day two.



Clinical Research session

The Clinical Research session featured a panel discussion on “Impactful Clinical Trials and Increasing Research Efficiency.” The esteemed panelists included Dr. Niveditha Devasenapathy, Dr. Aparna Mukherjee, Dr. Poongothai Subramani, and Dr. Mohammad Abdul Salam, with panel moderation by Dr. Raja Narayanan and Dr. Brijesh Takkar.

This panel aimed to shed light on the significant role of clinical trials in shaping medical advancements and improving patient care. The experts discussed various aspects of conducting impactful clinical trials, such as trial design, recruitment strategies, data analysis techniques, and ethical considerations.

By sharing their insights and experiences, the panelists provided valuable knowledge on how to enhance research efficiency in the field of clinical research. Their discussion highlighted the importance of collaboration among researchers, healthcare professionals, regulatory bodies, and industry stakeholders.

The engaging discussion facilitated by Dr. Narayanan and Dr. Brijesh Takkar allowed attendees to gain a deeper understanding of the challenges faced in conducting clinical trials while exploring innovative approaches to overcome these obstacles.

Overall, this panel discussion highlighted the significance of impactful clinical trials in advancing medical knowledge. It emphasized the need for continuous improvement in research efficiency within the field of clinical research and called for greater participation in large conferences like IHOPE Conference to stay current, upskill, update and apply new learnings in one’s routine.



Policy session

A notable discussion on policy was conducted during the IHOPE conference by esteemed speakers and panelists. The keynote speakers for this session were Dr Vipul Aggarwal and Dr Anthony Heyes, both renowned experts in their respective fields.

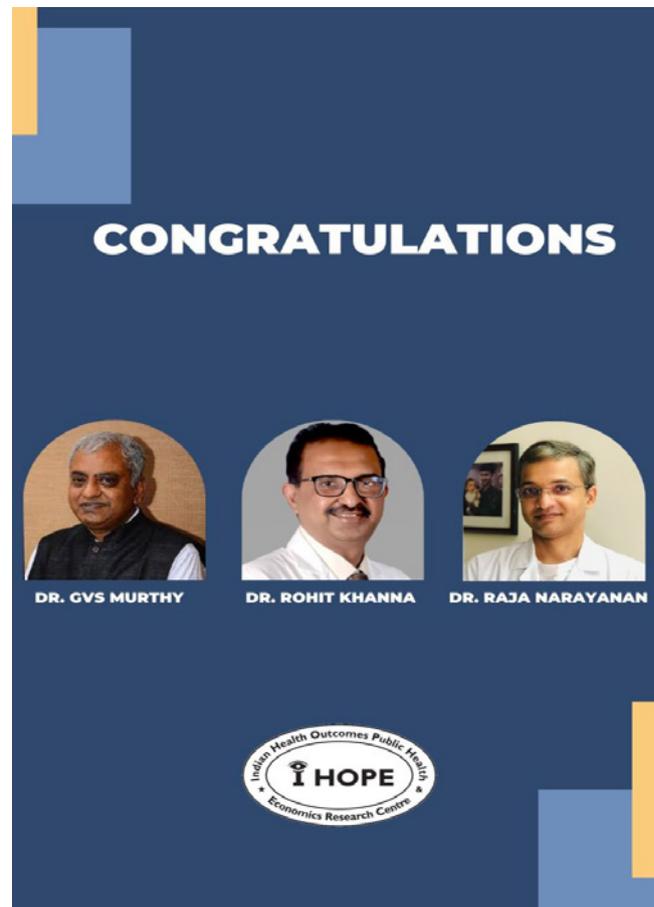
Joining them as panelists were distinguished scholars Dr Yuhang Pan, applied microeconomist, and Dr Aparna Mittal, Founder and CEO at PatientsEngage, who provided valuable insights during the discussion. The session was skillfully moderated by Dr Raja Narayanan and Dr Brijesh Takkar, ensuring a productive dialogue and exchange of ideas.

This policy session at the IHOPE conference served as a platform for experts to discuss pertinent issues and share their expertise, fostering an environment conducive to informed decision-making and impactful policy development.



Celebrating Excellence in IHOPE!

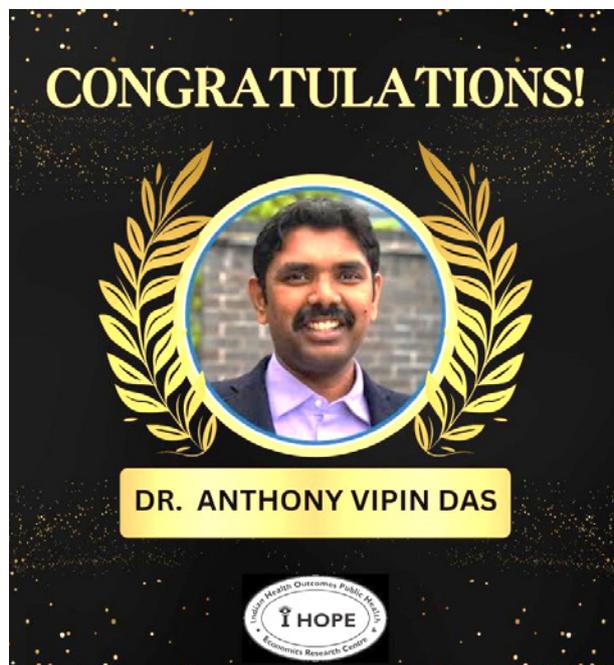
- We are thrilled to announce that the prestigious Stanford University - Elsevier elite list of top-cited global researchers for 2023 is out, and guess what?
- A whopping 40 Indian ophthalmologists have made it onto this esteemed list! But that's not all; THREE of these brilliant minds hail from our very own IHOPE family!
- Join us in congratulating these exceptional individuals for their dedication and groundbreaking work. Source: <https://lnkd.in/eYmHV7Zx>



Celebrating Dr. Anthony Vipin Das' Appointment to the Editorial Board of Nature Scientific Reports

We are pleased to announce that Dr. Anthony Vipin Das, Co-PI at IHOPE, has been selected as an esteemed member of the Editorial Board of Nature Scientific Reports.

This appointment is a testament to Dr. Das' exceptional expertise and contributions to the field of scientific research. As a Co-PI at IHOPE, Dr. Das has played a pivotal role in advancing health outreach initiatives and promoting education in the scientific community.



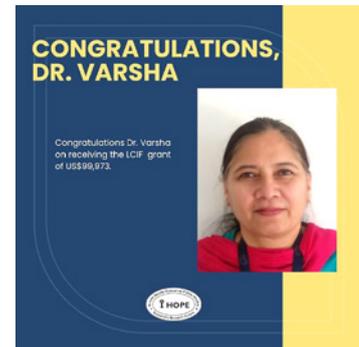
Nature Scientific Reports is renowned for its rigorous peer-review process and high-quality publications across various scientific disciplines. As an Editorial Board Member, Dr. Das will have the opportunity to contribute his vast knowledge and experience to shape the editorial direction of this prestigious journal.

We extend our heartfelt congratulations to Dr. Anthony Vipin Das on this remarkable achievement and look forward to witnessing his valuable contributions in advancing scientific research through Nature Scientific Reports.



LCIF Grant Winner

Congratulations to Dr Varsha Rathi, CRTP Fellow, IHOPE, on her receiving the Lions Club International Foundation grant, a remarkable achievement! She has been awarded the prestigious LCIF Grant for her project on 'Developing a Dynamic Integrated Model for Improving Uptake of Primary Eye Care and Primary Health Care Services in the Indian State of Telangana.'



Webinars in the Last Quarter

Transformation from traditional to decentralized clinical research

The IHOPE conducted a webinar focused on the transformation of traditional clinical research trials to decentralized models. This webinar aimed to shed light on the benefits and challenges associated with decentralization in clinical research, as well as to discuss the potential impact it can have on patient empowerment and participation.



Big Data and Machine Learning in Pharma

The IHOPE webinar on 'Big Data and Machine Learning in Pharma' took place last month, showcasing the growing influence of advanced technologies in the pharmaceutical industry. The discussions at this event shed light on how big data and machine learning are revolutionizing various aspects of drug development, patient care, and research.



Engagements

Dr. Raja Narayanan, PI-IHOPE, recently attended the groundbreaking Eyestem Research conference at – Foresight 2023 summit, India's First Retinal Cell and Gene Therapy Summit, Bengaluru, 17-18 August 2023. With a mission to make cutting-edge technologies accessible to all, this event marked a significant milestone in the field of retinal cell and gene therapy.



AI in Research and Ophthalmology

Author: Yogita Prabhakar Kadam, Clinical Optometrist and Research Associate, eyeStarMT EMR, I HOPE, LV Prasad Eye Institute.

Introduction: The concept of Artificial intelligence (AI) was first introduced by Dartmouth scholar John McCarthy in 1956 which refers to hardware or software that exhibits behavior that appears intelligent. It has been highlighted recently because of new algorithms, specialized hardware, cloud-based services, and big data development. Machine learning (ML) and Deep learning (DL) are subsets of AI. Machine learning (ML) is a set of methods that automatically detect patterns in data and incorporate information to predict future data under uncertain conditions in the 1980s. Deep learning is rapidly increasing technology of ML which has revolutionized the world of AI¹. These technologies have powered many aspects of modern society like object recognition in images, translation of real-time languages, and device manipulation via speech such as Apple's Siri, Amazon Alexa, Microsoft Cortana, etc. It has been used for diagnosing and treating common vision-threatening diseases like diabetic retinopathy (DR), glaucoma, age-related macular degeneration, cataracts, etc.

AI tools have increased in rate since the last 10 years which could transform eye health ranging from facilitating and increasing access to eye care to supporting clinical decision making with an objective, data-driven ach.^{2,3}



Highlights of Research from 2010 to 2023 and their clinical applications

Table 1: Summary of current AI systems with regulatory approval for retinal disease management.⁴⁻¹⁰

AI system	Company	Year Approved	Regulatory authority	Exam analysed	Target	Impact on prognosis	Cloud-based?
Retmarker DR Bio-marker [4]	Retmarker, SA, Taveiro, Portugal	2010	CE, TGA (Australia)	Color fundus images	DR	Identification of the risk of complications	No
Notal Home OCT [5]	Notal Vision, Inc., Manassas, VA, USA	2018	FDA (Breakthrough Device Designation)	OCT	Neovascular AMD	Early detection of fluid	Yes
Notal OCT Analyzer [6]	Notal Vision, Inc., Manassas, VA, USA	2018	FDA (Breakthrough Device Designation)	OCT	Neovascular AMD, DME, RVO	Automated detection of fluid	Yes
RetinAI Discovery [7]	RetinAI Medical AG, Bern, Switzerland	2020	CE, FDA	OCT, color fundus images	AMD, DR, epiretinal membranes, other	Strict follow-up	Yes
VUNO Med-Fundus AI [8]	VUNO Inc., Seoul, Korea	2020	CE, MFDS (Korea), HAS (Singapore)	Color fundus images	AMD, DR, epiretinal membranes, other	Strict follow-up	No
iPredict [9]	iHealth-Screen Inc., Richmond Hill, NY, USA	2021 and 2022	CE, TGA (Australia)	OCT, color fundus images	AMD, DR	Prediction of progression	Yes
RetInSight Fluid Monitor [10]	RetInSight GmbH, Vienna, Austria	2022	CE	OCT	AMD, DME	Automated detection of fluid	Yes

CE=Conformite Europeenne, MFDS=Ministry of Food and Drug Safety of the Republic of Korea, HAS= Hospital Administration Software, TGA=Therapeutic Goods Administration, OCT=Optical Coherence Tomography, AMD=Age-Related Macular Degeneration, DME=Diabetic Macular Edema, DR=Diabetic Retinopathy, FDA=Food and Drug Administration, RVO=Retinal Vein Occlusions

Table 2: Summary of representative works of AI in ophthalmology¹

Year	Reference	Topic	Dataset	AUC	SE	SP
2016	Abramoff MD et al.	DR	CFPs, 1748 images	0.98	96.80%	87.00%
2017	Gargeya R et al.	DR	CFPs, 75,137 images	0.97	94%	98%
2017	Ting DSW et al.	DR, glaucoma, and AMD	CFPs, 494,661 images	0.931-0.958	90.5%-100%	87.2%-91.6%
2020	Pan X et al.	DR lesions classification	FFAs, 4067 images	0.870-0.965	79.7%-98.0%	82.7%-99.5%
2022	Gao Z et al.	DR grading	FFAs, 11,214 images	0.922-0.994	/	/
2020	Varadarajan AV et al.	DME OCT-grading	CFPs, 7072 images	0.89	85%	80%
2019	Liu H et al.	Glaucoma	CFPs, 274,413 images	0.996	96.20%	97.70%
2021	Sun S et al.	Glaucoma	OCTs, 777 sets	0.957	89.60%	95.20%
2020	Thompson AC et al.	Glaucoma	OCTs, 20,806 images	0.96	81%	95%
2019	Phene S et al.	Glaucoma	CFPs, 86,618 images	0.945	80.00%	90.20%
2019	Asaoka R et al.	Glaucoma	OCTs, 4316 images	0.937	82.50%	93.90%
2019	Wen JC et al.	Forecast future Visual Fields	VFs, 32,443 VFs	/	/	/
2022	Huang X et al.	Glaucoma visual field grading	VFs, 16,356 VFs	0.93	/	/
2017	Burlina PM et al.	AMD	CFPs, 213,997 iamges	0.96	88.40%	94.10%
2019	Peng Y et al.	AMD grading	CFPs, 59,302 images	0.94	59.00%	93.00%
2020	Yan Q et al.	AMD progression prediction	CFPs, 31,262 images	0.85	/	/
2018	Kermany DS et al.	AMD	OCTs, 207,130 images	0.999	97.80%	97.40%
2020	Schmidt-Erfurth U et al.	Quantification of Fluid Volumes to AMD	OCTs, 24,362 images	/	/	/
2021	Yan Y et al.	AMD	OCTs, 56,091 images	0.940-0.992	80.0%-96.5%	/
2021	Zhang G et al.	Detect and quantify geographic atrophy	OCTs, 5049 images	/	/	/
2021	Xu Z et al.	AMD, PCV	CFPs and OCTs, 1099 CFPs, 821 OCTs	0.939	88.80%	95.60%



2022	<u>Jin K et al.</u>	Identification of choroidal neovascularization activity in AMD	OCTs and OCTAs, 462 image pairs	0.98	89.60%	95.60%
2011	<u>Cheung CY et al.</u>	Cataract	Slit-lamp photographs, 5547 images	/	/	/
2021	<u>Li Z et al.</u>	Keratitis	Slit-lamp photographs, 6567 images	0.998	97.70%	98.20%
2021	<u>Ye X et al.</u>	Myopic maculopathy	OCTs, 2342 images	0.927-0.974	73.9%-92.8%	84.8%-94.0%
2019	<u>Yoo TK et al.</u>	Identify candidate patients for corneal refractive surgery	Multi-instrument data, 13,201 subjects	0.983	/	/
2020	<u>Wang L et al.</u>	Eyelid malignant melanoma	Pathological patches, 225,230 images	0.989	94.70%	95.30%

Table 3: Description and notification of current AI systems¹³

AI system	Description and notification
IRIS (Intelligent Retinal Imaging Systems, Pensacola, FL, USA)	IRIS is an FDA class II cleared medical system that has a moderate risk to consumers and must demonstrate that it is 'substantially equivalent' to similar products. The IRIS program is a cloud-based platform to screen for vision-threatening DR, with sensitivity and specificity of 66.4% and 72.8%, respectively.
ARDA (Google LLC, Mountain View, CA, USA)	ARDA is a DL algorithm developed by Google Health from >128 000 retinal photographs of patients from the United States and India and validated in >10 000 photographs from the UK to detect referable and sight-threatening DR. The validation study of ARDA was the first showing robust performance of DL to detect referable DR with >95% of both sensitivity and specificity. Later, ARDA was prospectively validated in India and a nationwide screening program in Thailand.
	

AI system	Description and notification
SELENA+ (EyRIS Pte Ltd, Singapore)	The Singapore Eye Research Institute and Singapore National Eye Center has developed a DL-based algorithm, SELENA+, to screen for referable DR, vision-threatening DR, DR-related vascular risk factors, suspected glaucoma, and late-stage AMD. It is a multicenter collaborative research effort with half a million retinal images from people of different ethnicities such as Caucasians from Australia and the United States, and Singapore Chinese, Malaysians, Indians, Chinese, individuals from Hong Kong, Mexicans, Hispanics, and African Americans. Real-world application and clinical translation of SELENA+ has been integrated into the Singapore Integrated Diabetic Retinopathy Programme in recent years. SELENA+ has significant diagnostic performance in DR, with sensitivity of 91%, specificity of 90%, and area under the curve of 0.93.
IDx-DR (Digital Diagnostics Inc., Coralville, IA, USA)	IDx-DR was the first FDA-approved ophthalmic device to autonomously detect DR, including DME. It can analyze retinal images, detect vision-threatening DR, and provide referral recommendations. The external validation to detect referable DR showed sensitivity and specificity of 91% and 84%, respectively.
<p data-bbox="172 824 507 920">FDA permits marketing of LumineticsCore™ (formerly known as IDx-DR) for automated detection of diabetic retinopathy in primary care</p> 	
Medios AI (Remidio Innovative Solutions Pvt Ltd., Karnataka, India)	Medios AI is an integrated offline system with a Remidio smartphone-based, nonmydriatic retinal camera to detect referable DR. The fundus images can be captured by minimally trained healthcare providers. The sensitivity and specificity of diagnosing referable DR were 100% and 88.4%, respectively.
RetCAD (Thirona Retina BV, Nijmegen, Netherlands)	This commercially available DL algorithm can determine referable DR and AMD based on a dataset of CFPs to reduce the workload of screening programs by up to 96%, with sensitivity of 90.53% and specificity of 97.13%. Patients' CFPs can be captured by camera and then transferred to the Thirona server for analysis. The examination report will provide referable suggestions and visualization of heatmaps.
EyeArt (Eyenuk, Inc., Woodland Hills, CA, USA)	This cloud-based autonomous AI system can detect more-than-mild DR and vision-threatening DR by submitting fundus photography to the platform. It is designed to work with various types of retinal cameras. It assesses the quality of uploaded images and explains the reasons behind grading. This algorithm can provide the grading of DR and report the results for each eye based on the UK National Health Service diabetic eye screening program scale. The sensitivity and specificity showed 96% and 98%, respectively.



AI system	Description and notification
	
<p>VUNO Med-Fundus AI (VUNO Inc., Seoul, Korea)</p>	<p>The AI-based VUNO Med-Fundus AI analyzes CFP to detect multiple retinal lesions (areas under receiver operating characteristic curves for all findings were at 96.2%). The area under the receiver operating characteristic curves for DR-related findings was 95%. It was approved as a class III medical device by the Ministry of Food and Drug Safety in Korea.</p>
<p>THEIA (Toku Eyes, Auckland, New Zealand)</p>	<p>The New Zealand company Toku Eyes developed THEIA, an AI platform for cloud-based multimodal image analysis of referable DR and AMD. The THEIA system was developed from two of the largest screening data sets in Auckland, New Zealand: the Auckland District Health Board and the Counties Manukau District Health Board. It can analyze color fundus images, OCT, and OCT-A to provide results about referable DR (sensitivity of 93% and specificity of 63%) and intermediate dry AMD (accuracy of 96%). This AI system is considered to be useful in reducing the workload in the New Zealand National Diabetic Retinopathy Screening Program.</p>
<p>iPredict (iHealthScreen Inc., Richmond Hill, NY, USA)</p>	<p>The iPredict AI Eye Screening System offers fully automated diagnosis of referable DR (maculopathy and/or proliferative DR) (sensitivity of 97.0% and specificity of 96.3%) and AMD (sensitivity of 86.6% and specificity of 92.1%) by analyzing CFPs.</p>
<p>Notal Home OCT (Notal Vision, Inc., Manassas, VA, USA)</p>	<p>Notal Home OCT, the first FDA-cleared in-home OCT device, which includes an AI algorithm and monitoring center, is designed to detect AMD. The imaging quality showed great correlation with in-office OCT for detecting the presence of fluid in 95% agreement with human graders. A patient's ability to use an in-home setting for self-imaging without training demonstrated good capacity with a 95% success rate.</p>
<p>OphtAI (Evolucare/ADCIS, Villers-Bretonneux, France)</p>	<p>OphtAI DR is a semiautomatic AI algorithm that assesses the pathologic lesions and grading of DR and detects AMD and glaucoma. In a multicenter, head-to-head, real-world validation study to compare different algorithms in detecting DR, the OphtAI DR algorithm provided better results (sensitivity of 80.47% and specificity of 81.28%) than an ophthalmologist. It is also deemed clinically safe and economically efficient in reducing the costs by more than U.S. \$15 per patient.</p>
	
<p>Retmarker (Retmarker, SA, Taveiro, Portugal)</p>	<p>This AI technology can provide screening for DR and AMD by annotating pathologic lesions, such as microaneurysms, drusen, hypopigmentation, hyperpigmentation, and geographic atrophy. The sensitivity in classifying DR is 73.0% for any DR, 85.0% for referable DR, and 97.9% for proliferative DR. The screening performance of Retmarker appeared to vary with patients' age, ethnicity, and camera type. In economic analysis, the Retmarker was more cost effective than manual grading.</p>



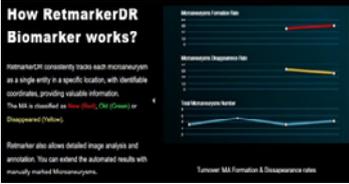
AI system	Description and notification
 <p>How RetmarkerDR Biomarker works?</p> <p>RetmarkerDR consistently tracks each microaneurysm as a single entity in a specific location, with identifiable coordinates, providing valuable information. You will be notified via email, SMS, WhatsApp or Telegram.</p> <p>Retmarker also allows detailed image analysis and annotation. You can extend the automated results with manually marked microaneurysms.</p> <p>Tel Aviv, Israel</p>	
<p>Retinalyze (Retinalyze System A/S, Hellerup, Denmark)</p>	<p>The Retinalyze system is a screening software that can detect DR on nonmydriatic CFPs (sensitivity of 89.9% and specificity of 85.7%). It can detect DR lesions, including microaneurysms and minor hemorrhages (specificity of 71.4%). It can also evaluate biological aging and hemoglobin on optic disc photographs.</p>
<p>RetinAI Discovery (RetinAI Medical AG, Bern, Switzerland)</p>	<p>The Discovery platform can analyze medical data and ophthalmic images such as OCT scans and CFP from a variety of devices. It can help automatically detect the location of the fovea (mean total location error of 0.101 mm), the quantification of pathologic fluid, and the segmentation of atrophic retina on OCT in patients with geographic atrophy. It can detect and quantify fluid from DR, DME, AMD, and RVO. The performance of the AI system showed that the accuracy, specificity, and sensitivity for intraretinal fluid was 0.87, 0.88, 0.84 and 0.93, 0.95, 0.93 and for subretinal fluid was 0.93, 0.93, 0.93 and 0.95, 0.95, 0.95 in the AMD and DME cohorts, respectively.</p>
 <p>RetinAI receives FDA Clearance for RetinAI Discovery®</p>	



Table 4: Comparison of features in ophthalmologic datasets¹¹

DATASET	EYEPACS	ODIR	APTOS	DR 1 & 2	IDRiD	JICHI	ROD Rep	Messidor 2	Tsukazaki	PALM
Images	88702	8000	5590	1597	516	9939	1120	1748	13047	1200
Country	USA	China	India	Brazil	India	Japan	Netherland	France	Japan	China
Grading	ICDR	ICDR	ICDR	None	ICDR	Mod Davis	Non Specified	ICDR	None	Non-applicable
Sex	No	No	No	No	No	No	Yes	No	Yes	No
Age	No	Yes	No	No	No	No	Yes	No	Yes	No
Quality Control	No	No	No	No	No	No	No	Yes	No	No
Social	No	No	No	No	No	No	No	No	No	No
Ethnicity	No	No	No	No	No	No	No	No	No	No

The above mentioned software's are commercially available diabetic retinopathy screening AI platforms.

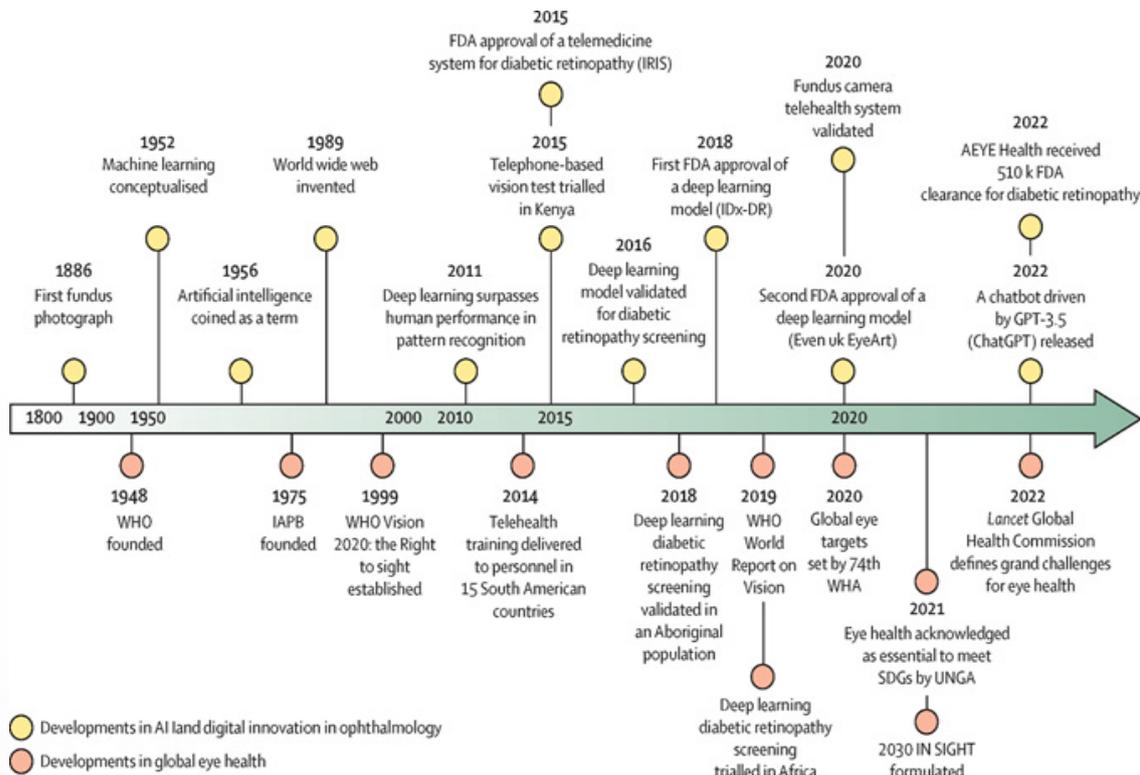


Figure 1: Timeline of the progress of global eye health initiatives (bottom, orange circles), compared with the development of digital health and artificial intelligence applications in eye health (top, yellow circles).¹²

AI=artificial intelligence. GPT=generative pre-trained transformer. IAPB=International Agency for the Prevention of Blindness. IRIS=International Repository for Information Sharing. SDG=Sustainable Development Goal. WHA=World Health Assembly.

Originally from link: <https://www.sciencedirect.com/science/article/pii/S2214109X23003236>



AI disruption in ophthalmology is revolutionizing the field especially in primary care and remote areas. Early detection tools like Artelus India founded in 2015 helps in screening diabetic retinopathy patients making eye health care more accessible.

Remidio has integrated AI with smartphones for eye screening. Their non mydriatic fundus tool captures eye images and generates automatic reports on the phone. It enhances accessibility and convenience for screening, particularly for conditions like referable diabetic retinopathy.

The AlzEye research study by Professor Pearse Keane suggests that the human eye, which can be used as a window to see the rest of the body, has been supercharged by the combination of big data, latest advances in AI software and hardware and advances in retinal imaging technology such as optical coherence tomography (OCT). Signs of retinal degeneration in the retinal tissue may be seen in patients with dementia. We hope to show changes in the inner layers of the retina that may detect early signs of neurodegeneration.

The artificial retina is surgically implanted into the eye of patients who have lost their sight due to conditions like age-related macular degeneration (ARMD) or retinitis pigmentosa (RP). The artificial retina has a tiny camera mounted on glasses worn by the patient, which captures visual information from the surroundings and further transmits the images to a microprocessor. It interprets the visual data and converts it into signals that can stimulate the microelectrodes on the artificial retina. The purpose of implanting an artificial retina into the eye is to restore restricted vision by allowing people to read when moving (walking, running or sitting in a moving car or other vehicle), improve one's vision and help recognize individuals.



Challenges and future directions of AI in research:

AI algorithms require vast amounts of high quality data to train effectively, and obtaining these well-annotated datasets can be challenging. The AI algorithms need clinical validation to prove their safety and effectiveness. Integration of AI systems into present clinical workflows and Electronic Health Record (EHR) systems can be complex where seamless interoperability is crucial. Data biases can be present in the existing training data which can lead to biased AI algorithms. Gaining approval for AI-based medical devices is a complex process, for which strict regulations are being developed to ensure safety and efficacy of patient data. Data transfers between research collaborators, especially for international collaborators are often limited because of patient privacy and data security. Ensuring patients' trust in clinicians and support staff and clinical pathways and procedures is also essential.

Tailoring interventions for diseases like glaucoma and age-related macular degeneration can enable more personalized treatment plans based on each patient's unique profile. Telemedicine is an important tool which helps to enhance early detection of disease and remote monitoring of patients who come from areas. Integration of multimodal imaging like optical coherence tomography, (OCT), fundus photography and angiography can provide a comprehensive view of eye health which includes the tools to predict disease progression and assess the risk of developing certain eye and systemic conditions.^{1,2} AI algorithms can be useful to accelerate drug discovery for retinal diseases by analyzing large datasets to identify potential therapeutic targets.^{1,2} Establishing a global digital eye health task force with country-level representatives from every region in the world could facilitate organised coordination of efforts and progress toward integrating these digital health tools into eye health systems. The financing of eye health services is a critical aspect of healthcare planning striking a balance between operational costs and reimbursements. Present, research on economic analysis of digital health tools and AI in ophthalmology is scarce and mostly restricted to diabetic retinopathy screening in high income countries, though many other eye and related systemic diseases exert a higher burden of disease around the world. There is utmost requirement for greater understanding of cost effectiveness and resources required for new digital health tools, in the unique settings of different countries with varying resource capacities.¹²

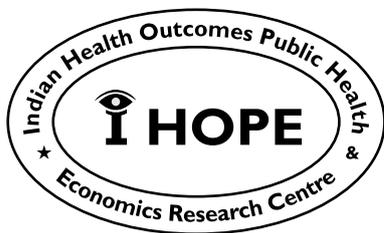


AI is tremendously helpful to the scientific research community, but there are some concerns about the application of such technology, ranging from plagiarism, ethical issues, replicating human biases or spreading wrong information.¹³ To make sure AI is used in the right way, researchers and other teams need to work together to guarantee that AI driven research systems are constructed in a responsible way and used ¹⁴. Also a study by AAO in journal Ophthalmology found that the doctor-AI team is more effective than work that struggles to separate the two ¹⁵.

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