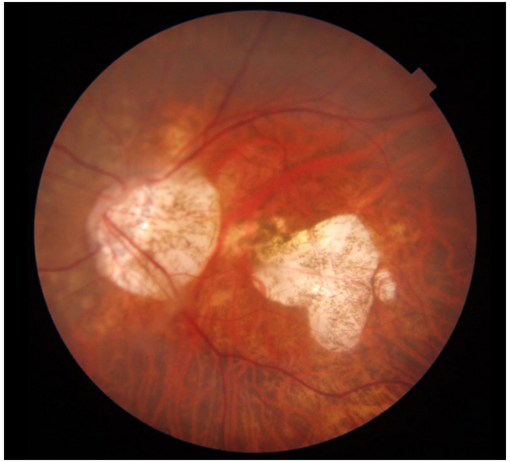


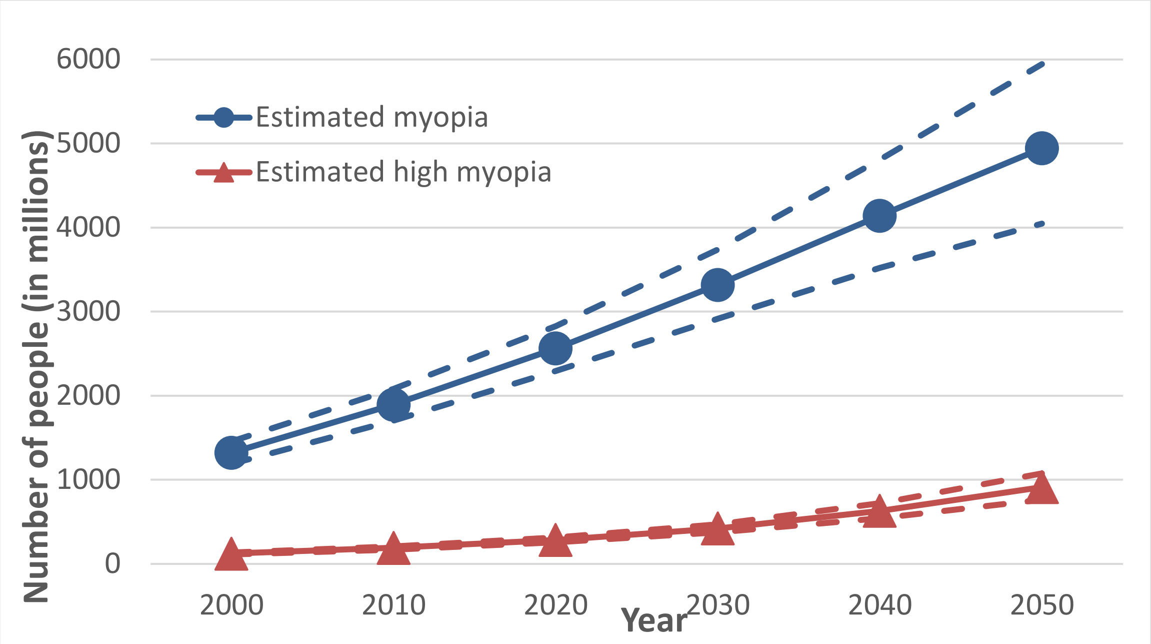
Artificial Intelligence in Myopia

Daniel Ting MD PhD
Associate Professor, Duke-NUS Medical School
Director, AI Office, Singapore Health Service
Head, AI and Digital Innovation, Singapore Eye Research Institute
AAO AI and OTAC Committee
STARD-AI, DECIDE-AI and QUADAS-AI

Financial Disclosure

- Co-inventor, deep learning system for retinal diseases
- Equity holder, EyRIS Pte Ltd, Singapore
- Equity holder, Ocutrx, USA
- Consultant, Bayer
- Consultant, Carl Zeiss
- Consultant, Novartis
- Consultant, Alcon

Problem: Global *burden* of Myopia & High Myopia…



Myopia: 5 Billion

High myopia: 1 Billion

- Hypertension: 1 Billion
- Diabetes: 500 Million
- AMD: 100 Million
- Glaucoma: 80 Million

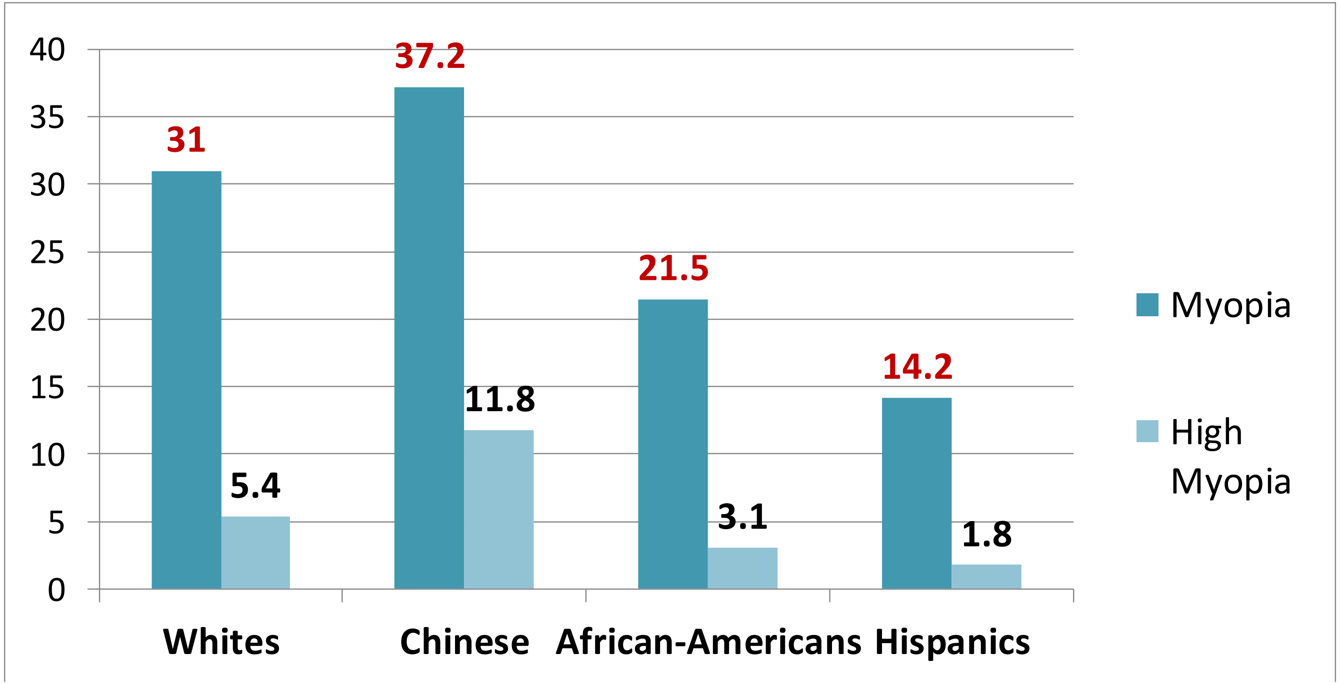
Holden B et al. Ophthalmology 2015

Singapore National Eye Centre
SingHealth

SINGAPORE EYE RESEARCH INSTITUTE

PATIENTS. AT THE HEART OF ALL WE DO.

… particularly important in Asia BUT also in the WEST



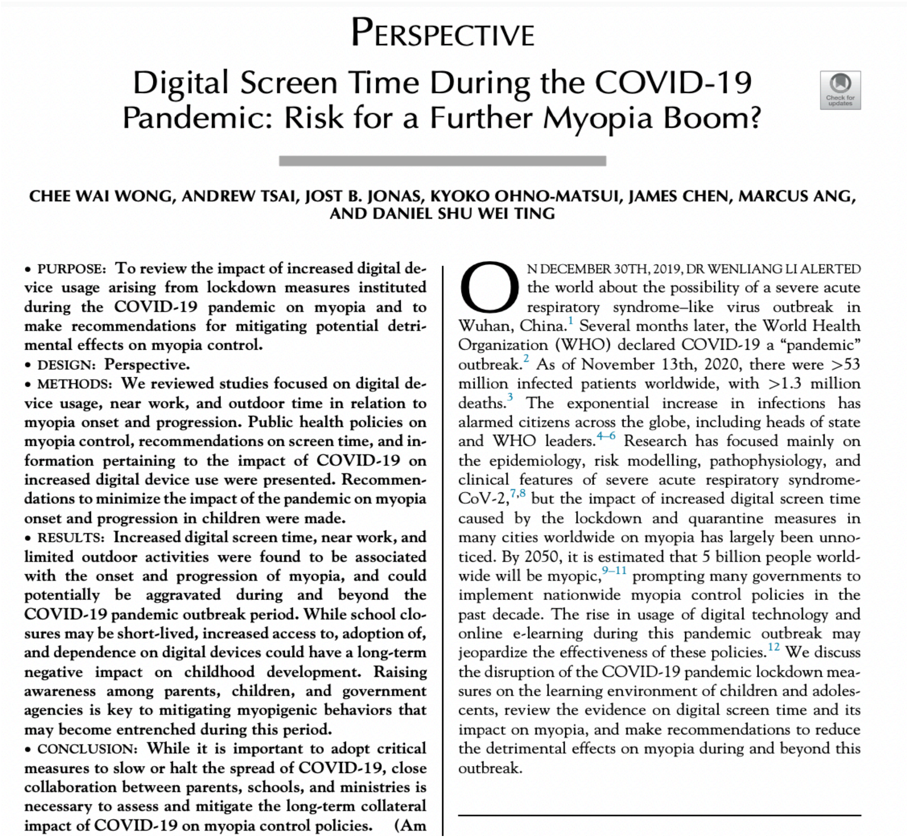
5-10% of Asians have High Myopia.. AND 2-5% of Caucasians

Singapore National Eye Centre SingHealth

SINGAPORE EYE RESEARCH INSTITUTE

PATIENTS. AT THE HEART OF ALL WE DO.

Impact of COVID-19 on Myopia Boom



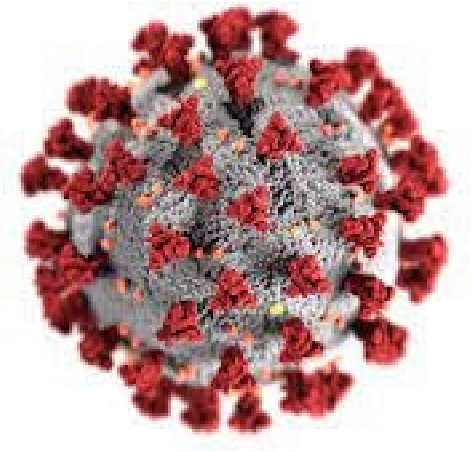
Perspective

Digital Screen Time During the COVID-19 Pandemic: Risk for a Further Myopia Boom?

CHEE WAI WONG, ANDREW TSAI, JOST B. JONAS, KYOKO OHNO-MATSUI, JAMES CHEN, MARCUS ANG, AND DANIEL SHU WEI TING

• PURPOSE: To review the impact of increased digital device usage arising from lockdown measures instituted during the COVID-19 pandemic on myopia and to make recommendations for mitigating potential detrimental effects on myopia control.
• DESIGN: Perspective.
• METHODS: We reviewed studies focused on digital device usage, near work, and outdoor time in relation to myopia onset and progression. Public health policies on myopia control, recommendations on screen time, and information pertaining to the impact of COVID-19 on increased digital device use were presented. Recommendations to minimize the impact of the pandemic on myopia onset and progression in children were made.
• RESULTS: Increased digital screen time, near work, and limited outdoor activities were found to be associated with the onset and progression of myopia, and could potentially be aggravated during and beyond the COVID-19 pandemic outbreak period. While school closures may be short-lived, increased access to, adoption of, and dependence on digital devices could have a long-term negative impact on childhood development. Raising awareness among parents, children, and government agencies is key to mitigating myopigenic behaviors that may become entrenched during this period.
• CONCLUSION: While it is important to adopt critical measures to slow or halt the spread of COVID-19, close collaboration between parents, schools, and ministries is necessary to assess and mitigate the long-term collateral impact of COVID-19 on myopia control policies. (Am

On December 30th, 2019, Dr Wenliang Li alerted the world about the possibility of a severe acute respiratory syndrome–like virus outbreak in Wuhan, China.[1] Several months later, the World Health Organization (WHO) declared COVID-19 a "pandemic" outbreak.[2] As of November 13th, 2020, there were >53 million infected patients worldwide, with >1.3 million deaths.[3] The exponential increase in infections has alarmed citizens across the globe, including heads of state and WHO leaders.[4–6] Research has focused mainly on the epidemiology, risk modelling, pathophysiology, and clinical features of severe acute respiratory syndrome-CoV-2,[7,8] but the impact of increased digital screen time caused by the lockdown and quarantine measures in many cities worldwide on myopia has largely been unnoticed. By 2050, it is estimated that 5 billion people worldwide will be myopic,[9–11] prompting many governments to implement nationwide myopia control policies in the past decade. The rise in usage of digital technology and online e-learning during this pandemic outbreak may jeopardize the effectiveness of these policies.[12] We discuss the disruption of the COVID-19 pandemic lockdown measures on the learning environment of children and adolescents, review the evidence on digital screen time and its impact on myopia, and make recommendations to reduce the detrimental effects on myopia during and beyond this outbreak.



Singapore National Eye Centre
SingHealth
SINGAPORE EYE RESEARCH INSTITUTE

PATIENTS. AT THE HE♥RT OF ALL WE DO.

Impact of COVID-19 on Myopia Boom

NIH
National Eye Institute

NATIONAL ACADEMIES
Sciences
Engineering
Medicine

Rise of AI

nature
International journal of science

Review Article | Published: 27 May 2015

Cited >40,000 times

Deep learning

Yann LeCun, Yoshua Bengio & Geoffrey Hinton

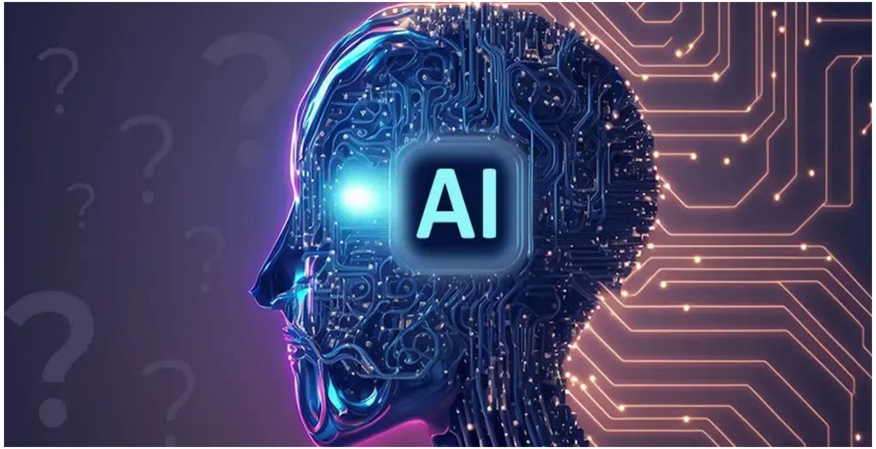
Nature **521**, 436–444 (28 May 2015) | Download Citation

Abstract

Deep learning allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction. These methods have dramatically improved the state-of-the-art in speech recognition, visual object recognition, object detection and many other domains such as drug discovery and genomics. Deep learning discovers intricate structure in large data sets by using the backpropagation algorithm to indicate how a machine should change its internal parameters that are used to compute the representation in each layer from the representation in the previous layer. Deep convolutional nets have brought about breakthroughs in processing images, video, speech and audio, whereas recurrent nets have shone light on sequential data such as text and speech.

'Godfathers of AI' honored with Turing Award, the Nobel Prize of computing

Yoshua Bengio, Geoffrey Hinton, and Yann LeCun laid the foundations for modern AI



PATIENTS. AT THE HE♥RT OF ALL WE DO.

AI in Medicine (Segmentation, Classification, Prediction)

Detecting lung cancer from CT Scans

Assess cardiac health from electrocardiograms

Classify skin lesions from images of the skin

Identify retinopathy from eye images

nature medicine

Letter | Published: 20 May 2019

End-to-end lung cancer screening with three-dimensional deep learning on low-dose chest computed tomography

Diego Ardila, Atilla P. Kiraly, Sujeeth Bharadwaj, Bokyung Choi, Joshua J. Reicher, Lily Peng, Daniel Tse, Mozziyar Etemadi, Wenxing Ye, Greg Corrado, David P. Naidich & Shravya Shetty

Nature Medicine **25**, 954–961(2019) | Cite this article

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Large-Scale Assessment of a Smartwatch to Identify Atrial Fibrillation

Marco V. Perez, M.D., Kenneth W. Mahaffey, M.D., Haley Hedlin, Ph.D., John S. Rumsfeld, M.D., Ph.D., Ariadna Garcia, M.S., Todd Ferris, M.D., Vidhya Balasubramanian, M.S., Andrea M. Russo, M.D., Amol Rajmane, M.D., Lauren Cheung, M.D., Grace Hung, M.S., Justin Lee, M.P.H., Peter Kowey, M.D., Nisha Talati, M.B.A., Divya Nag, Santosh E. Gummidipundi, M.S., Alexis Beatty, M.D., M.A.S., Mellanie True Hills, B.S., Sumbul Desai, M.D., Christopher B. Granger, M.D., Manisha Desai, Ph.D., and Mintu P. Turakhia, M.D., M.A.S., for the Apple Heart Study Investigators*

nature

Published: 25 January 2017

Dermatologist-level classification of skin cancer with deep neural networks

Andre Esteva, Brett Kuprel, Roberto A. Novoa, Justin Ko, Susan M. Swetter, Helen M. Blau & Sebastian Thrun

Nature **542**, 115–118(2017) | Cite this article

JAMA

Original Investigation FREE

December 12, 2017

Development and Validation of a Deep Learning System for Diabetic Retinopathy and Related Eye Diseases Using Retinal Images From Multiethnic Populations With Diabetes

Daniel Shu Wei Ting, MD, PhD[1,2]; Carol Yim-Lui Cheung, PhD[1,3]; Gilbert Lim, PhD[4]; et al

Author Affiliations | Article Information

JAMA. 2017;318(22):2211-2223. doi:10.1001/jama.2017.18152

AI and Deep Learning – A New Tool for DR Screening

2018

FDA Clears AI-Based Device to Detect Diabetic Retinopathy

IDx-DR is a software program that uses artificial intelligence to analyze images of the eye taken with the device's camera.

IDx's first product, IDx-DR, is an AI diagnostic system designed to detect diabetic retinopathy and diabetic macular edema in the front lines of care. Image courtesy of IDx.

2020

Eyenuk Announces FDA Clearance for EyeArt Autonomous AI System for Diabetic Retinopathy Screening

businesswire Business Wire

Published Aug 05, 2020 • 6 minute read

Join the conversation

2022

AI For Diabetic Retinopathy Screening Gets U.S. FDA Approval

Gil Press Senior Contributor
I write about technology, entrepreneurs and innovation.

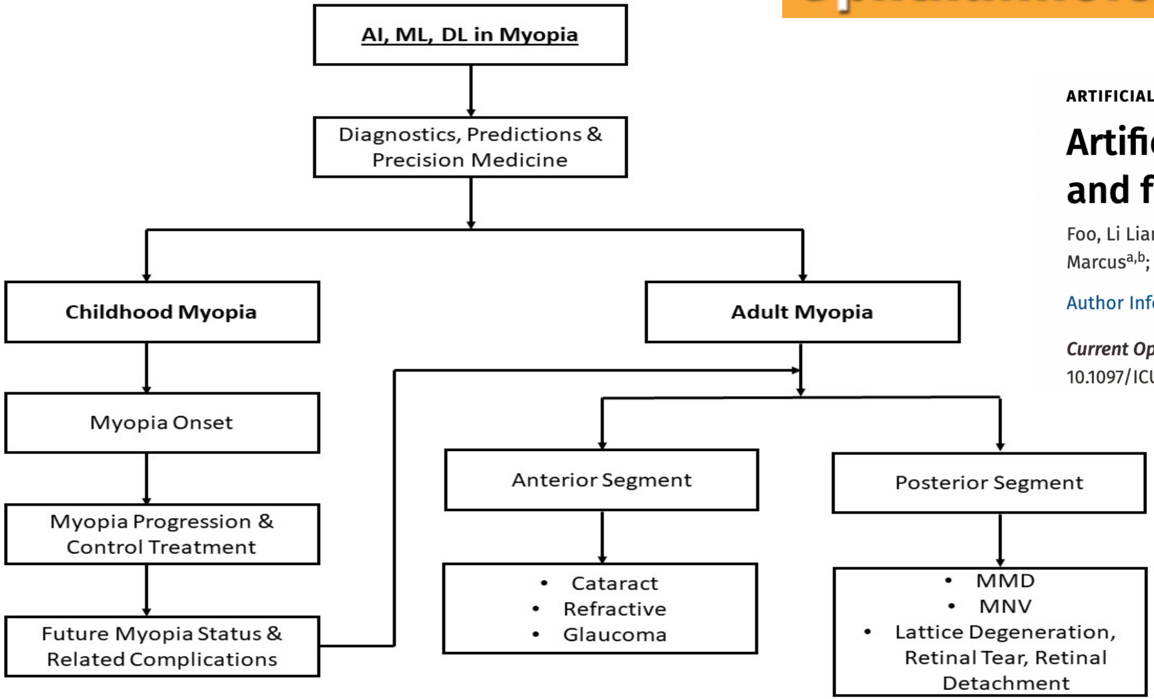
Follow

Nov 15, 2022, 09:00am EST

Listen to article 5 minutes

AI-based retinal imaging and diagnostics startup AEYE Health announced today it received clearance from the FDA to market its diagnostic screening system for diabetic retinopathy.

AI, ML and DL for Myopia



Current Opinion in Ophthalmology

ARTIFICIAL INTELLIGENCE IN RETINA: EDITED BY JUDY E. KIM AND EHSAN RAHIMY

Artificial intelligence in myopia: current and future trends

Foo, Li Lian[a,b]; Ng, Wei Yan[a,b]; Lim, Gilbert Yong San[a]; Tan, Tien-En[a]; Ang, Marcus[a,b]; Ting, Daniel Shu Wei[a,b]

Author Information

Current Opinion in Ophthalmology 32(5):p 413-424, September 2021. | *DOI:* 10.1097/ICU.0000000000000791

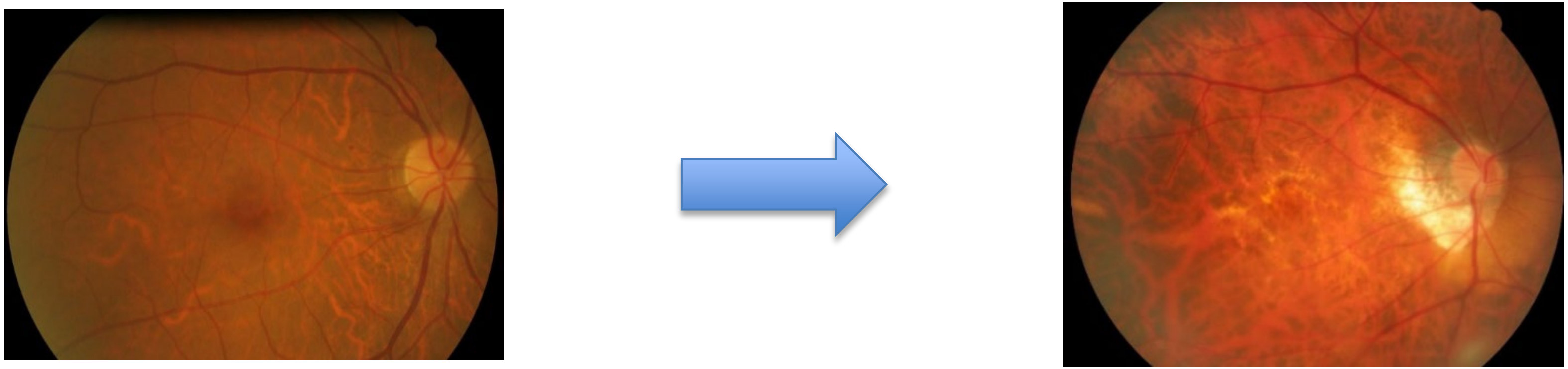
Singapore National Eye Centre
SingHealth

SINGAPORE EYE RESEARCH INSTITUTE

PATIENTS. AT THE HEART OF ALL WE DO.

AI Myopia for Children

Can we use baseline childhood photo to predict high myopia in 5 years?



Singapore National Eye Centre
SingHealth
SINGAPORE EYE RESEARCH INSTITUTE

PATIENTS. AT THE HEART OF ALL WE DO.

Fundus to Predict High Myopia

npj | digital medicine

ARTICLE OPEN

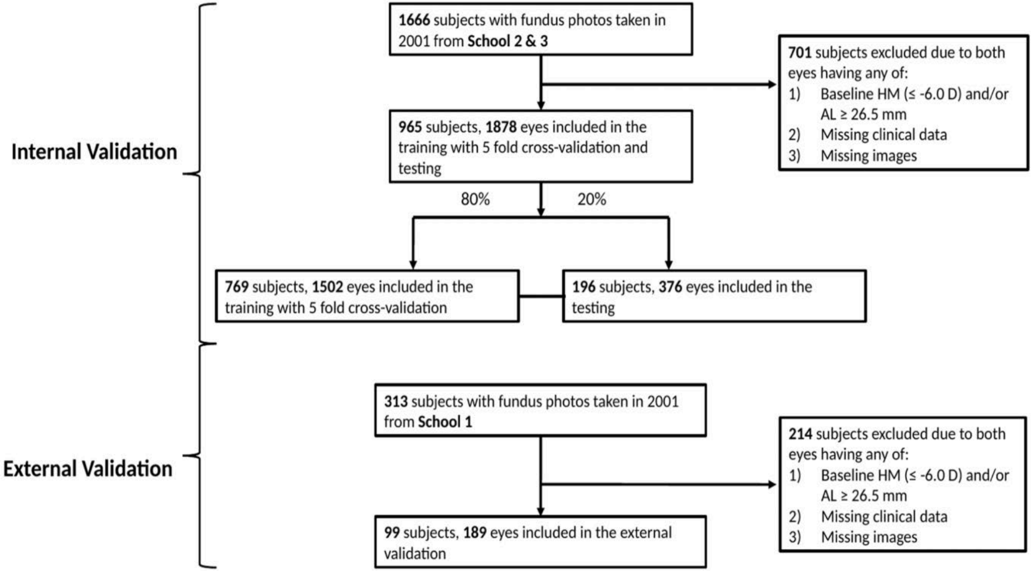
Check for updates

Deep learning system to predict the 5-year risk of high myopia using fundus imaging in children

Li Lian Foo[1,2,13], Gilbert Yong San Lim[1,13], Carla Lanca[3,4], Chee Wai Wong[1,2,5], Quan V. Hoang[1,2,6,7], Xiu Juan Zhang[8], Jason C. Yam[8,9,10,11,12], Leopold Schmetterer[1,2], Audrey Chia[1,2], Tien Yin Wong[1,2], Daniel S. W. Ting[1,2,14], Seang-Mei Saw[1,2,14]✉ and Marcus Ang[1,2,14]✉

Our study aims to identify children at risk of developing high myopia for timely assessment and intervention, preventing myopia progression and complications in adulthood through the development of a deep learning system (DLS). Using a school-based cohort in Singapore comprising of 998 children (aged 6–12 years old), we train and perform primary validation of the DLS using 7456 baseline fundus images of 1878 eyes; with external validation using an independent test dataset of 821 baseline fundus images of 189 eyes together with clinical data (age, gender, race, parental myopia, and baseline spherical equivalent (SE)). We derive three distinct algorithms – image, clinical and mix (image + clinical) models to predict high myopia development (SE ≤ −6.00 diopter) during teenage years (5 years later, age 11–17). Model performance is evaluated using area under the receiver operating curve (AUC). Our image models (Primary dataset AUC 0.93–0.95; Test dataset 0.91–0.93), clinical models (Primary dataset AUC 0.90–0.97; Test dataset 0.93–0.94) and mixed (image + clinical) models (Primary dataset AUC 0.97; Test dataset 0.97–0.98) achieve clinically acceptable performance. The addition of 1 year SE progression variable has minimal impact on the DLS performance (clinical model AUC 0.98 versus 0.97 in primary dataset, 0.97 versus 0.94 in test dataset; mixed model AUC 0.99 versus 0.97 in primary dataset, 0.95 versus 0.98 in test dataset). Thus, our DLS allows prediction of the development of high myopia by teenage years amongst school-going children. This has potential utility as a clinical-decision support tool to identify "at-risk" children for early intervention.

npj Digital Medicine (2023)6:10 ; https://doi.org/10.1038/s41746-023-00752-8



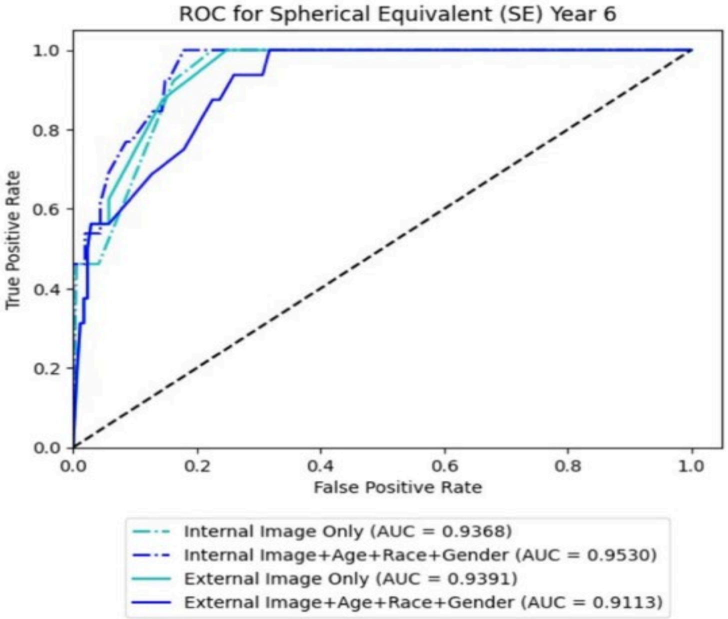
Singapore National Eye Centre SingHealth

SINGAPORE EYE RESEARCH INSTITUTE

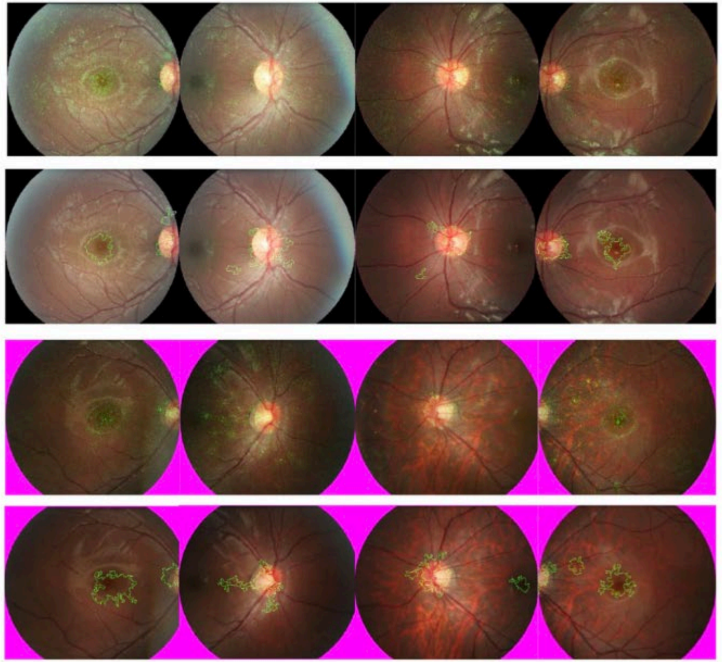
PATIENTS. AT THE HE♥RT OF ALL WE DO.

Fundus to Predict High Myopia

npj | digital medicine

(a) Non-high myopia



(b) High myopia

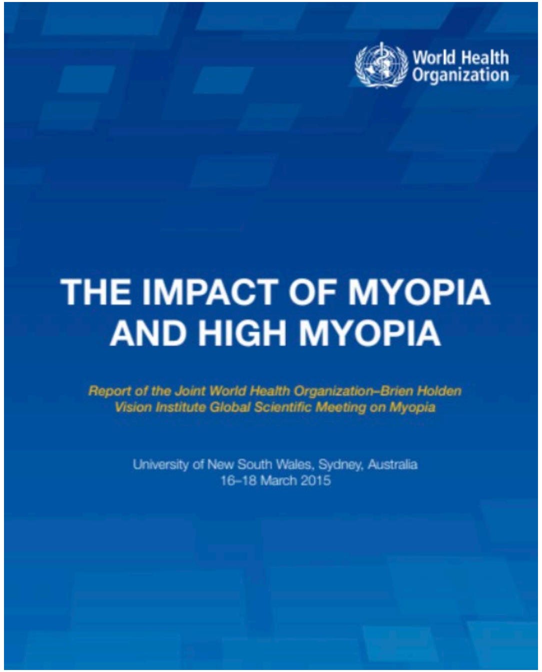
Singapore National Eye Centre
SingHealth

SINGAPORE EYE RESEARCH INSTITUTE

PATIENTS. AT THE HE♥RT OF ALL WE DO.

Clinical Significance of Myopic Macular Degeneration

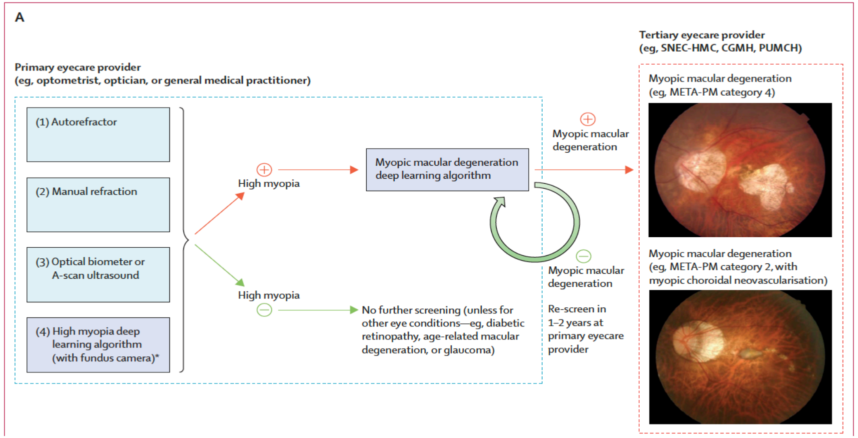
Myopic Macular Degeneration (MMD) should be used “research” and “clinically” in the real-world settings



AI Fundus to Detect High Myopia Related Complications

Retinal photograph-based deep learning algorithms for myopia and a blockchain platform to facilitate artificial intelligence medical research: a retrospective multicohort study

Tien-En Tan, Ayesha Anees*, Cheng Chen*, Shaohua Li†, Xinxing Xu†, Zengxiang Li†, Zhe Xiao, Yechao Yang, Xiaofeng Lei, Marcus Ang, Audrey Chia, Shu Yen Lee, Edmund Yick Mun Wong, Ian Yew San Yeo, Yee Ling Wong, Quan V Hoang, Ya Xing Wang, Mukharram M Bikbov, Vinay Nangia, Jost B Jonas, Yen-Po Chen, Wei-Chi Wu, Kyoko Ohno-Matsui, Tyler Hyungtaek Rim, Yih-Chung Tham, Rick Siow Mong Goh, Haotian Lin, Hanruo Liu, Ningli Wang, Weihong Yu, Donald Tiang Hwee Tan, Leopold Schmetterer, Ching-Yu Cheng, Youxin Chen, Chee Wai Wong, Gemmy Chui Ming Cheung, Seang-Mei Saw, Tien Yin Wong‡, Yong Liu‡, Daniel Shu Wei Ting‡*



- 226,686 images
- 6 countries
  - Singapore (Train and validate)
  - China (Test)
  - Taiwan (Test)
  - India (Test)
  - Russia (Test)
  - UK (Test)
- 10 different retinal cameras

Singapore National Eye Centre
SingHealth

SINGAPORE EYE RESEARCH INSTITUTE

Results – MMD and High Myopia

	Detection of myopic macular degeneration			Detection of high myopia							
				By SE criterion			By AL criterion			Combined model	
	AUC	Sensitivity	Specificity	AUC	Sensitivity	Specificity	AUC	Sensitivity	Specificity	Sensitivity	Specificity
Primary validation											
Singapore*	0·975 (0·970–0·981)	91·4 (87·3–95·0)	94·2 (93·4–95·0)	0·978 (0·968–0·987)	91·3 (86·9–95·4)	94·5 (93·7–95·2)	0·954 (0·938–0·969)	85·1 (79·6–90·0)	91·3 (90·3–92·3)	88·0 (84·7–92·7)	90·2 (89·2–91·2)
External testing											
Test dataset 1	0·969 (0·959–0·977)	96·8 (92·1–100)	87·3 (86·2–88·5)	0·966 (0·918–0·994)	92·7 (83·6–100)	95·5 (94·8–96·2)	0·969 (0·947–0·984)	94·4 (88·1–100)	88·1 (86·7–89·5)	95·2 (89·8–98·2)	91·4 (90·6–92·1)
Test dataset 2	..	..	..	0·951 (0·928–0·970)	86·6 (79·7 – 93·2)	88·5 (87·7–89·3)	0·956 (0·930–0·977)	97·8 (91·3–100)	76·4 (75·1–77·5)	89·6 (83·0–95·3)	72·9 (70·5–75·1)
Test dataset 3	0·972 (0·938–0·994)	98·4 (97·3–99·3)	85·5 (74·3–94·9)	0·949 (0·937–0·959)	90·1 (87·6–92·5)	85·4 (84·6–86·1)	..	..	..	..	..
Test dataset 4	0·988 (0·980–0·994)	94·2 (90·3–97·4)	95·9 (94·1–97·5)	..	..	..	..	..	..	..	..
Test dataset 5†	..	..	..	0·913 (0·906–0·920)	85·3 (83·3–87·1)	80·8 (80·4–81·3)	..	..	..	..	..

Data in parentheses are 95% CI. AL=axial length. AUC=area under the receiver operating characteristic curve. SE=spherical equivalent. *Singapore dataset consists of the Singapore Epidemiology of Eye Disease (SEED) and Singapore National Eye Centre High Myopia Clinic (SNEC-HMC) cohorts. †Data shown for test dataset 5 are from the deep learning algorithm developed on the UK Biobank dataset, due to a substantial difference in original image resolution between the UK Biobank dataset and the testing and primary validation datasets.

Table 2: Performance of deep learning algorithms for detection of myopic macular degeneration and high myopia

DLA performance across all datasets for MMD and High Myopia

- ALL >90% AUC and sensitivity
- Specificity: 72.9% - 95.9%

Singapore National Eye Centre
SingHealth
SINGAPORE EYE RESEARCH INSTITUTE
PATIENTS. AT THE HEART OF ALL WE DO.

Results – MMD and High Myopia

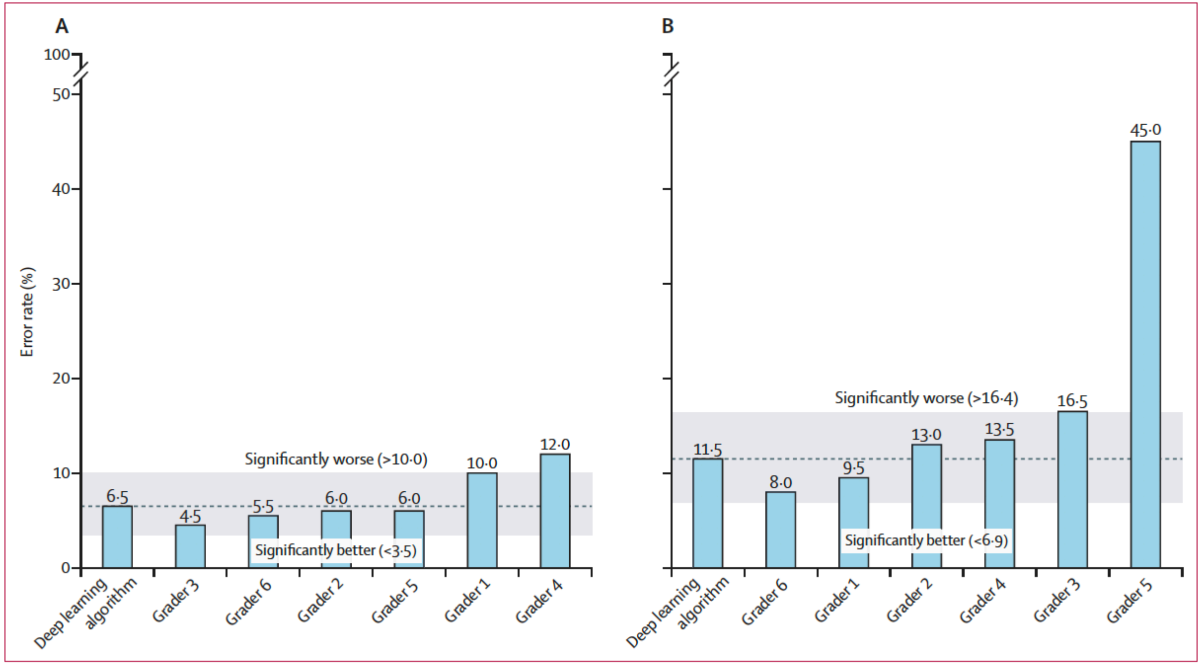


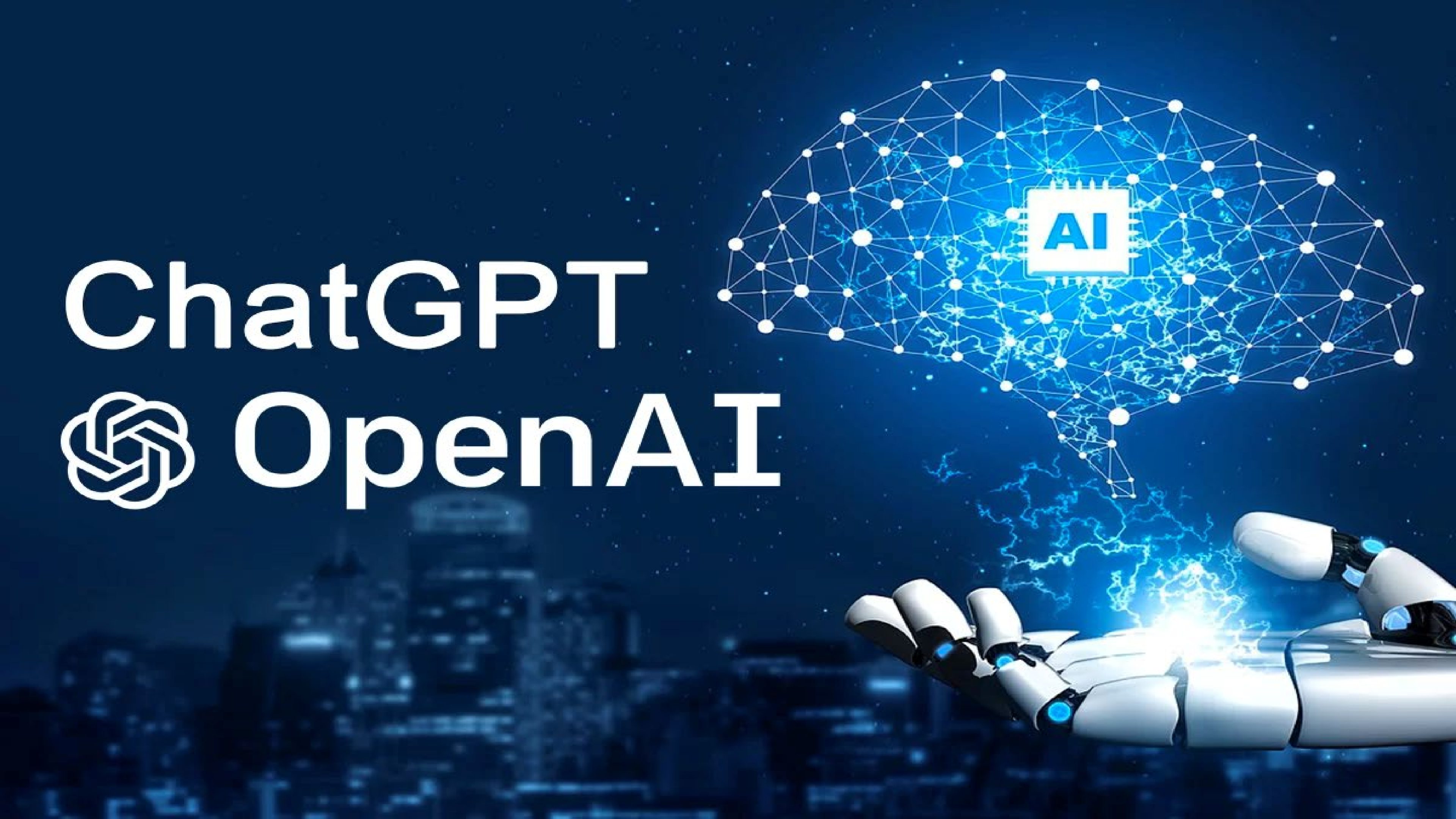
Figure 3: **Comparison of performances of deep learning algorithms and human expert graders for detection of myopic macular degeneration (A) and high myopia (by spherical equivalent criterion; B)**
Comparison of error rates (with a lower rate indicating better performance) for the deep learning algorithms against six human expert graders. The horizontal dotted lines indicate the performance of the deep learning algorithms, and the shaded grey areas show the upper and lower bounds of the 95% CI of the error rates for the deep learning algorithms. The human graders are sorted in descending order of performance (lowest to highest error rate).

Independent test dataset of 400 images:

DLAs outperformed all 6 retinal specialists in terms of AUC

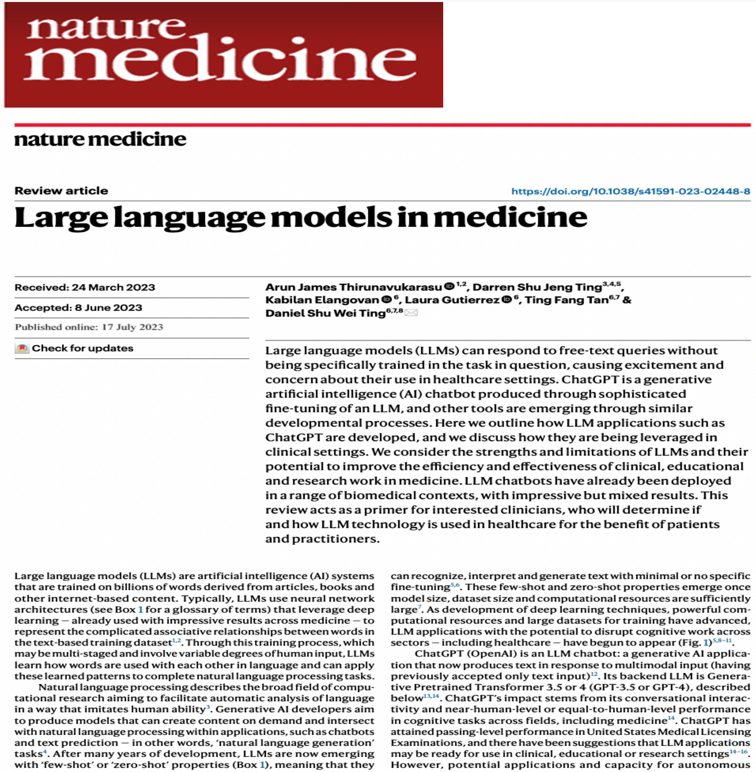
Error rates of MMD and high myopia DLAs at least as good as 6 retinal specialists

Singapore National Eye Centre
SingHealth
SINGAPORE EYE RESEARCH INSTITUTE
PATIENTS. AT THE HEART OF ALL WE DO.


AI
ChatGPT
OpenAI


Time to Reach 100M Users
Months to get to 100 million global Monthly Active Users
Uber
78
70
61
55
41
30
9
2
Google Translate
Uber
Telegram
Spotify
Pinterest
Instagram
TikTok
ChatGPT
Source: UBS / Yahoo Finance
@EconomyApp
APP ECONOMY INSIGHTS

Large Language Model in Medicine



nature medicine

nature medicine

Review article

https://doi.org/10.1038/s41591-023-02448-8

Large language models in medicine

Received: 24 March 2023

Accepted: 8 June 2023

Published online: 17 July 2023

Check for updates

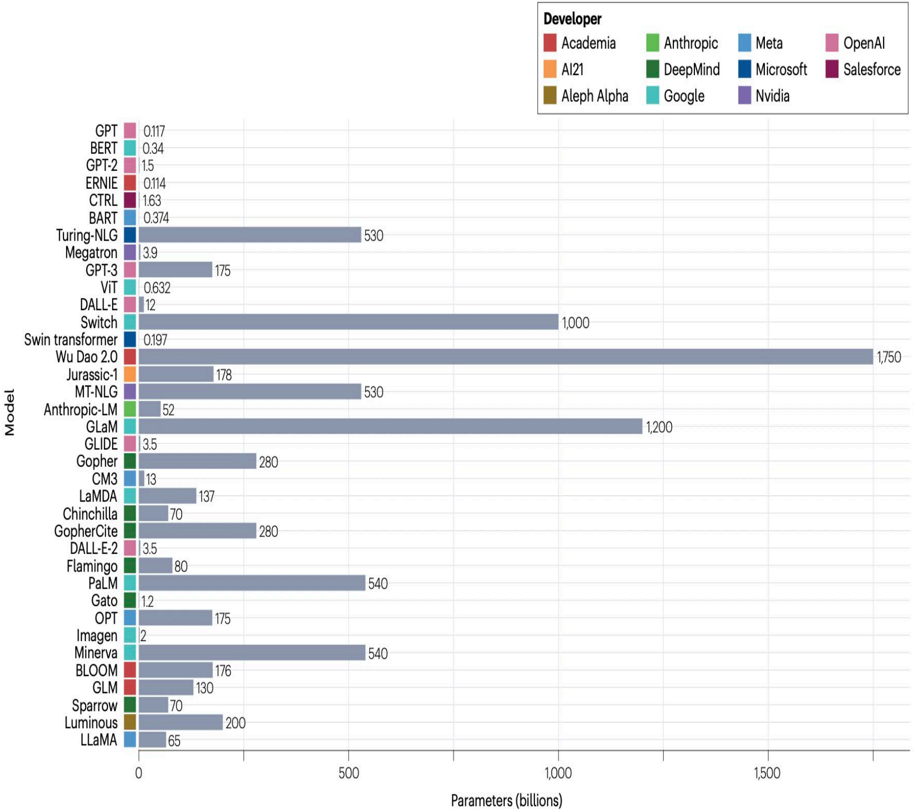
Arun James Thirunavukarasu [1,2], Darren Shu Jeng Ting [3,4,5], Kabilan Elangovan [6], Laura Gutierrez [6], Ting Fang Tan [6,7] & Daniel Shu Wei Ting [6,7,8]

Large language models (LLMs) can respond to free-text queries without being specifically trained in the task in question, causing excitement and concern about their use in healthcare settings. ChatGPT is a generative artificial intelligence (AI) chatbot produced through sophisticated fine-tuning of an LLM, and other tools are emerging through similar developmental processes. Here we outline how LLM applications such as ChatGPT are developed, and we discuss how they are being leveraged in clinical settings. We consider the strengths and limitations of LLMs and their potential to improve the efficiency and effectiveness of clinical, educational and research work in medicine. LLM chatbots have already been deployed in a range of biomedical contexts, with impressive but mixed results. This review acts as a primer for interested clinicians, who will determine if and how LLM technology is used in healthcare for the benefit of patients and practitioners.

Large language models (LLMs) are artificial intelligence (AI) systems that are trained on billions of words derived from articles, books and other internet-based content. Typically, LLMs use neural network architectures (see Box 1 for a glossary of terms) that leverage deep learning — already used with impressive results across medicine — to represent the complicated associative relationships between words in the text-based training dataset[1,2]. Through this training process, which may be multi-staged and involve variable degrees of human input, LLMs learn how words are used with each other in language and can apply these learned patterns to complete natural language processing tasks.

Natural language processing describes the broad field of computational research aiming to facilitate automatic analysis of language in a way that imitates human ability[3]. Generative AI developers aim to produce models that can create content on demand and intersect with natural language processing within applications, such as chatbots and text prediction — in other words, 'natural language generation' tasks[4]. After many years of development, LLMs are now emerging with 'few-shot' or 'zero-shot' properties (Box 1), meaning that they can recognize, interpret and generate text with minimal or no specific fine-tuning[5,6]. These few-shot and zero-shot properties emerge once model size, dataset size and computational resources are sufficiently large[7]. As development of deep learning techniques, powerful computational resources and large datasets for training have advanced, LLM applications with the potential to disrupt cognitive work across sectors — including healthcare — have begun to appear (Fig. 1)[5,8–11].

ChatGPT (OpenAI) is an LLM chatbot: a generative AI application that now produces text in response to multimodal input (having previously accepted only text input)[12]. Its backend LLM is Generative Pretrained Transformer 3.5 or 4 (GPT-3.5 or GPT-4), described below[13,14]. ChatGPT's impact stems from its conversational interactivity and near-human-level or equal-to-human-level performance in cognitive tasks across fields, including medicine[14]. ChatGPT has attained passing-level performance in United States Medical Licensing Examinations, and there have been suggestions that LLM applications may be ready for use in clinical, educational or research settings[14–16]. However, potential applications and capacity for autonomous

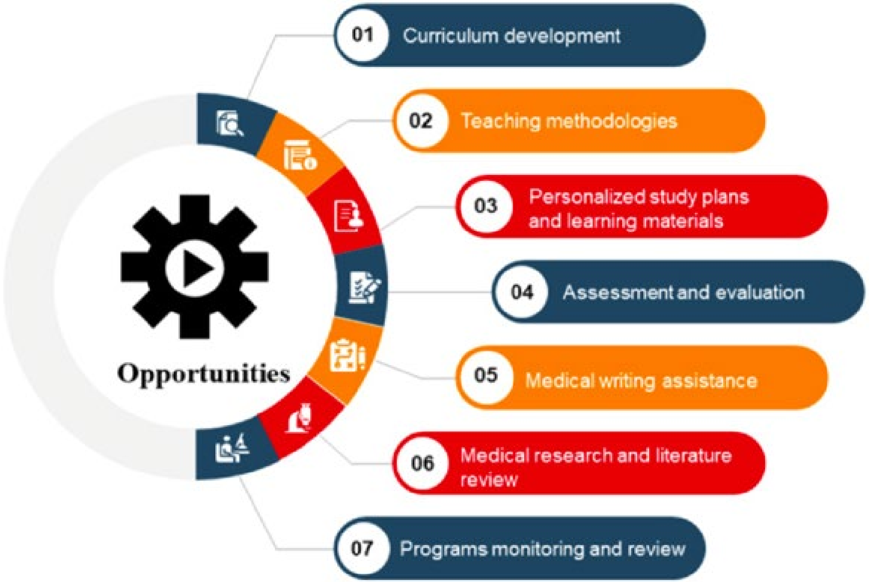


Large Language Model in Medicine

- Highly **complex deep neural networks** trained on massive text datasets, often with billions of parameters.

- In 2017, Google introduced the breakthrough **"Transformer" architecture**

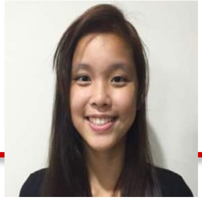
- The sheer scale of data and parameters allows LLMs to understand and generate **human-like text**, making them a powerful tool for various applications, including in the field of healthcare



Singapore National Eye Centre
SingHealth
SINGAPORE EYE RESEARCH INSTITUTE

PATIENTS. AT THE HEART OF ALL WE DO.

Large Language Model in Ophthalmology



Editorial | Published: 27 June 2023

ChatGPT in ophthalmology: the dawn of a new era?

Darren Shu Jeng Ting, Ting Fang Tan & Daniel Shu Wei Ting

Eye (2023) | Cite this article

2438 Accesses | **1** Citations | **9** Altmetric | Metrics

> *"Those who can imagine anything, can create the impossible."*
>
> *-Alan Turing*

Generative Artificial Intelligence for ChatGPT and Other Large Language Ophthalmology: Clinical Applications and Challenges

Ting Fang Tan[1]

Arun James Thirunavukarasu[2,3]

J Peter Campbell[4]

Pearse A Keane[5]

Louis R. Pasquale[6]

Michael D Abramoff[7,8,9]

Jayashree Kalpathy-Cramer[10]

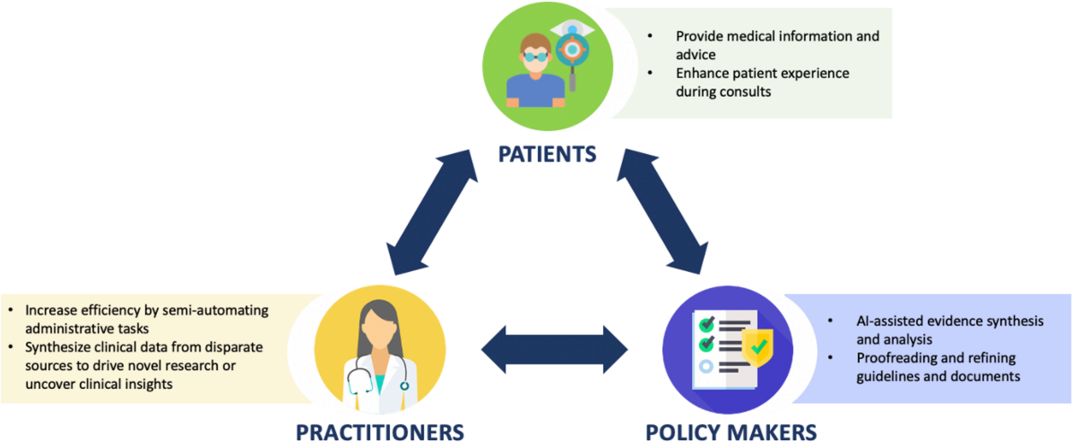
Judy E Kim[11]

Sally L Baxter[12,13]

Daniel Shu Wei Ting[1,14]

On behalf of the American Academy of Ophthalmology AI Committee

Tan et al, Ophthalmology Science, In Press



SingHealth DUKE NUS ACADEMIC MEDICAL CENTRE

Framework	H20 LLM Studio (Default Settings)				OpenAI
Model	Llama2-7b	Llama2-7b-chat	Llama2-13b	Llama2-13b-chat	GPT-3.5-Turbo
GPT-4 Score	0.79	0.85	0.87	0.93	0.96
GPT-4 Rank	5	4	3	2	1
Clinician Rank (LY)	4	5	3	2	1
Alignment					

Future Directions for Myopia AI

- Personalized multi-modal AI algorithms to
  - Screen for stable/low vs fast progressors
  - Types of myopia treatment
    - Atropine drops vs ortho K vs DIMS or other lenses
  - How to start, how to taper
  - AI-based nudging technologies, remote monitoring devices & gamification
- Health Economics Studies
- Large language models for myopia care
- Safe and Responsible AI

'Godfather of AI' Geoffrey Hinton quits Google and warns over dangers of misinformation

The neural network pioneer says dangers of chatbots were 'quite scary' and warns they could be exploited by 'bad actors'

Dr Geoffrey Hinton, the 'godfather of AI', has left Google. Photograph: Linda Nylind/The Guardian

PATIENTS. AT THE HE♥RT OF ALL WE DO.

AI Health Economic Analysis

THE LANCET *Regional Health* Western Pacific

Log in

COMMENT | VOLUME 23, 100476, JUNE 01, 2022

Digital health in medicine: Important considerations in evaluating health economic analysis

Ann Kwee • Zhen Ling Teo • Daniel Shu Wei Ting

Open Access • Published: May 08, 2022 • DOI: https://doi.org/10.1016/j.lanwpc.2022.100476 •

Check for updates

PlumX Metrics

THE LANCET Global Health

Log in

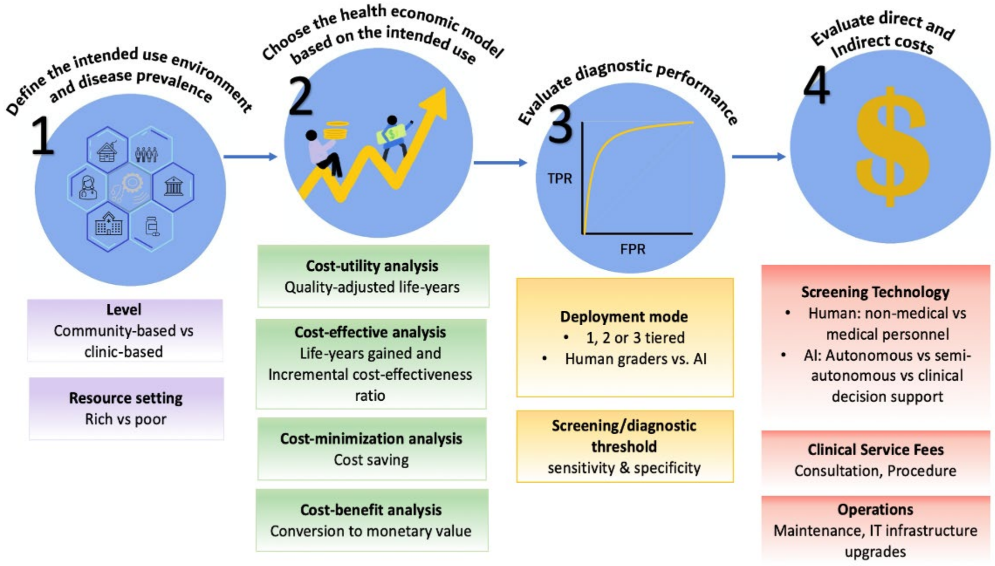
COMMENT | ONLINE FIRST

AI telemedicine screening in ophthalmology: health economic considerations

Zhen Ling Teo • Daniel Shu Wei Ting

Open Access • Published: January 23, 2023 • DOI: https://doi.org/10.1016/S2214-109X(23)00037-2 •

Check for updates



Singapore National Eye Centre SingHealth

SINGAPORE EYE RESEARCH INSTITUTE

Towards

UTOPIA
OR
DYSTOPIA?

Resulting from AI/Big Data

Thank You!

Email address:
Daniel.ting45@gmail.com

Singapore National Eye Centre
SingHealth

SINGAPORE EYE RESEARCH INSTITUTE

PATIENTS. AT THE HEART OF ALL WE DO.