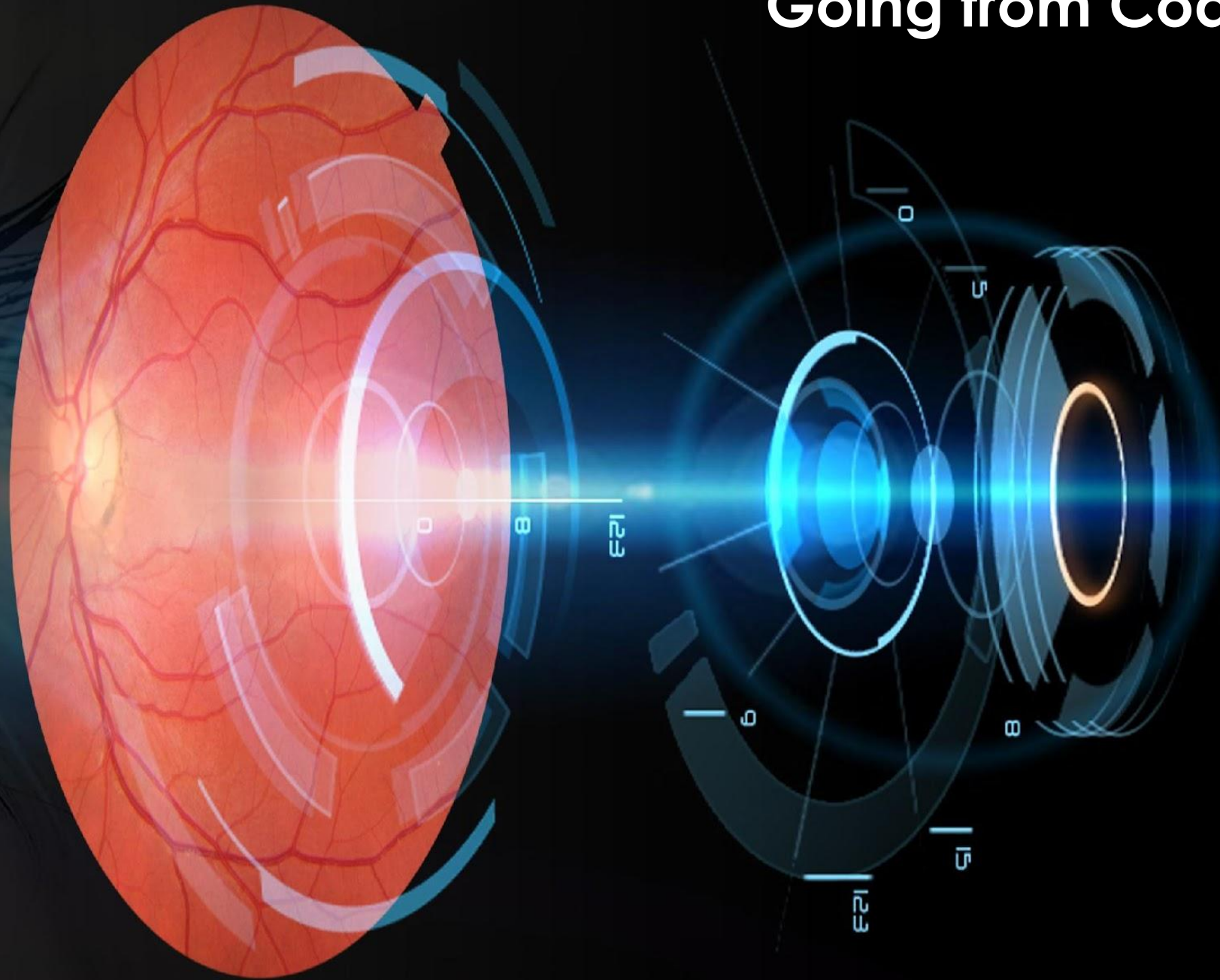
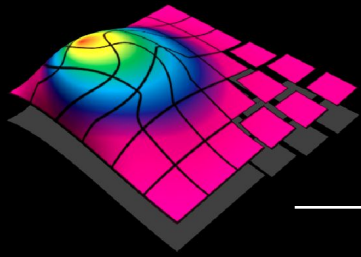


Going from Code to Clinic!



Pearse Keane
Moorfields Eye Hospital and
UCL Institute of Ophthalmology

@pearsekeane



My Background

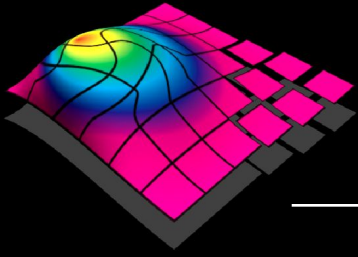


UK Research
and Innovation

Consultancy:

- *DeepMind*
- *Bitfount*
- *Apellis*
- *Roche*
- *Novartis*



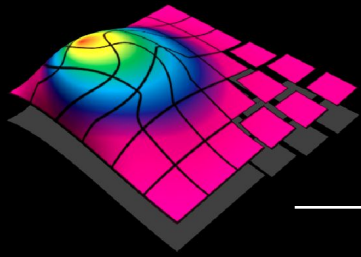


The Problem...

OPHTHALMOLOGY SURPASSES ORTHOPAEDICS IN ANNUAL ATTENDANCE FIGURES

The latest statistics from NHS Digital reveal that ophthalmology outpatient activity was greater than any other specialty in 2017–2018

17 Oct 2018 | by Selina Powell



“Deep Learning”

SUBSCRIBE

SCIENTIFIC
AMERICAN.

English ▾ Cart **0** Sign In | Register

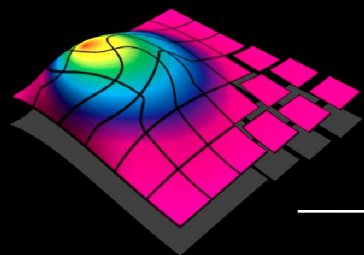
THE SCIENCES MIND HEALTH TECH SUSTAINABILITY EDUCATION VIDEO PODCASTS BLOGS STORE **Q**

THE SCIENCES

World Changing Ideas 2015

10 big advances that will improve life, transform computing and maybe even save the planet

By THE EDITORS on December 1, 2015

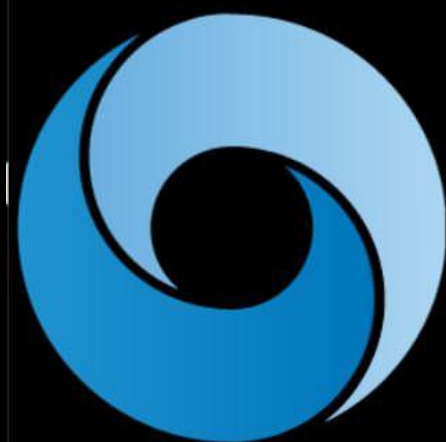


July 2016

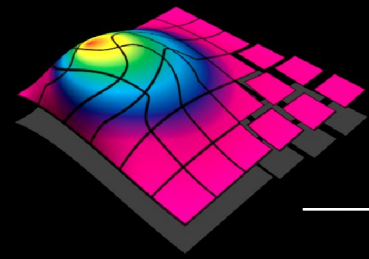
Moorfields Eye Hospital



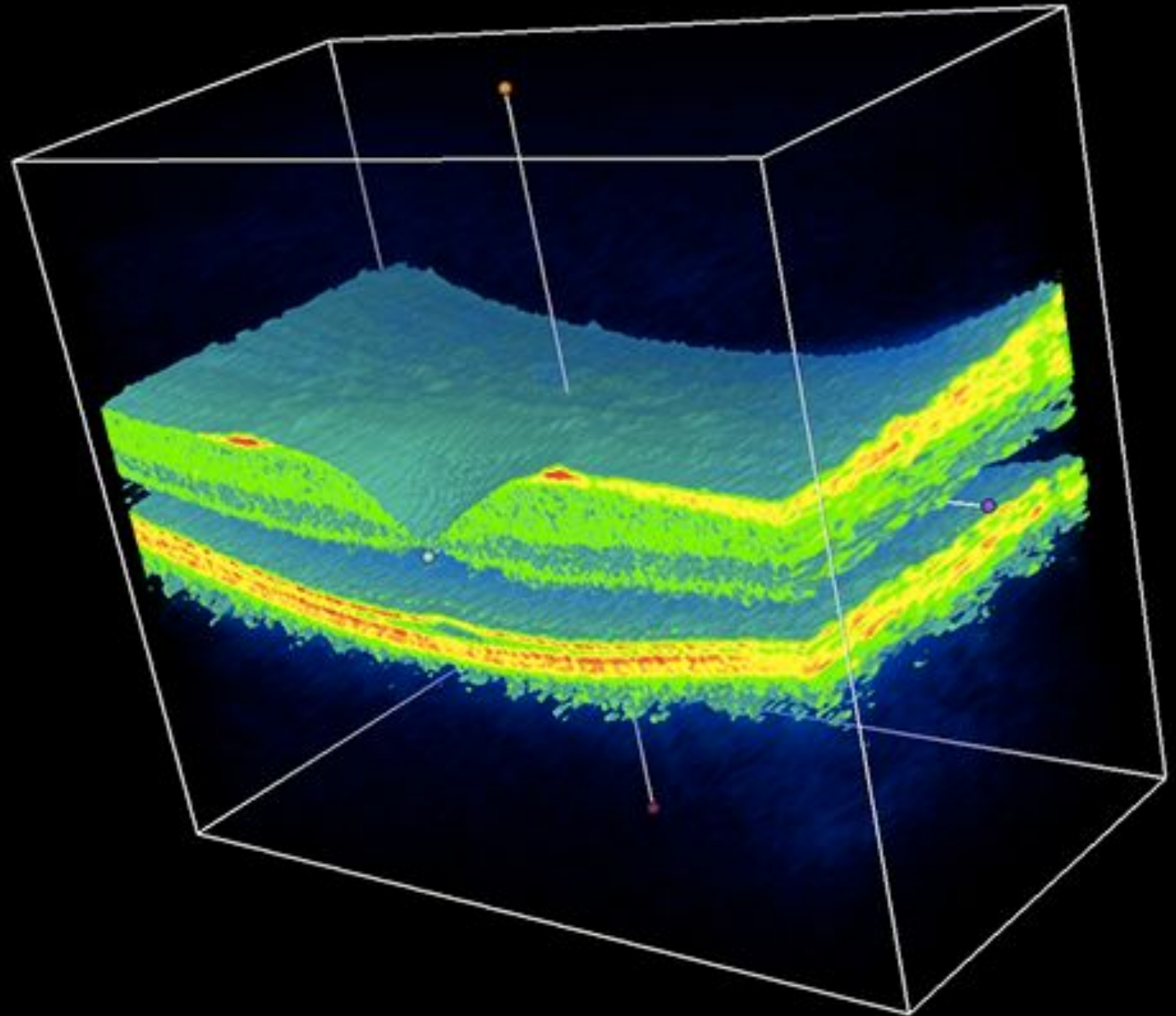
NHS Foundation Trust



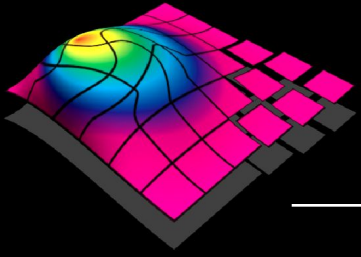
DeepMind



Applications in Ophthalmology?



OCT

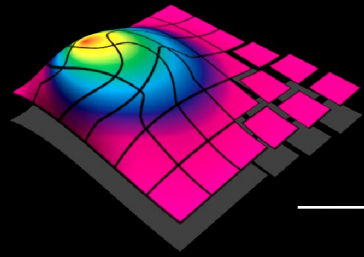


July 2015



1. **Datasets Quantity and Quality**
2. **Technical Feasibility**
3. **Ethical / Governance Requirements**

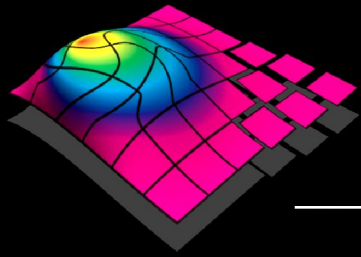




When all questions answered...

SHARING DATA SHARING

*Research
Collaboration
Agreement*



Website

Home > Your eye health > DeepMind Health research partnership > DeepMind Health Q&A

DeepMind Health
research partnership

DeepMind Health Q&A

Latest updates -
DeepMind Health

Partnership video -
DeepMind Health

Eye conditions


Looking after your eyes


Yes EYE Can


Yes Eye Did

Anatomy of the eye

DeepMind Health Q&A

How did the partnership come about? 

What will the project involve? 

What is the project trying to achieve? 


How long will the project last? 

How much data has DeepMind been given access to? 

Do patients have to give their consent for their data to be used? 

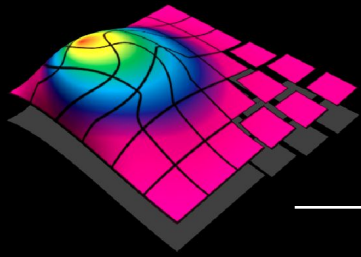
What are the data protection measures in place for this project? 

Will any further patient information be shared between Moorfields and DeepMind in future? 

How can patients be sure that no identifiable data is being shared with DeepMind? 

What processes are in place to ensure the data transferred to DeepMind is only ever seen by the research team? 

What approvals has DeepMind been given for this research project? 



Research Protocol

F1000Research

F1000Research 2016, null:null Last updated: 10 JUN 2016



STUDY PROTOCOL

Automated analysis of retinal imaging using machine learning techniques for computer vision

Jeffrey De Fauw¹, Pearse Keane¹, Nenad Tomasev¹, Daniel Visentin¹,
George van den Driessche¹, Mike Johnson¹, Cian O Hughes¹, Carlton Chu¹,
Joseph Ledsam¹, Trevor Back¹, Tunde Peto², Geraint Rees³, Hugh Montgomery⁵,
Rosalind Raine⁴, Olaf Ronneberger¹, Julien Cornebise¹

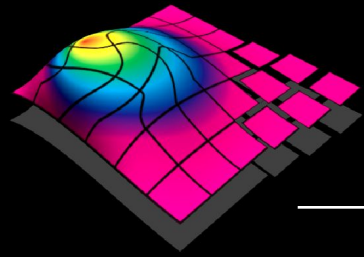
¹Google DeepMind, London, EC4A 3TW, UK

²Moorfields Eye Hospital NHS Foundation Trust, London, EC1V 2PD, UK

³Alexandra House University College London, Bloomsbury Campus, London, WC1N 3AR, UK

⁴Department of Applied Health Research, University College London, London, WC1E 7HB, UK

⁵Institute of Sport, Exercise and Health, London, W1T 7HA, UK



Patient-Centred Research

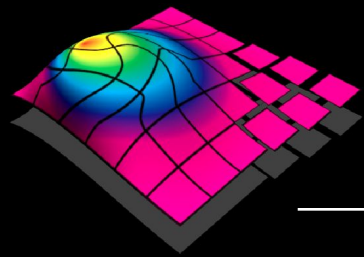


Macular Society

***Royal National
Institute for the Blind***

Fight For Sight UK

Patient Engagement Event, Sept 2016



August 2018

nature medicine

SEPTEMBER 2018 VOL 24 NO 9
www.nature.com/naturemedicine



AI accelerates diagnosis
NAD⁺ biosynthesis and high-risk hospitalizations
Targeted microbiome therapy for thrombosis

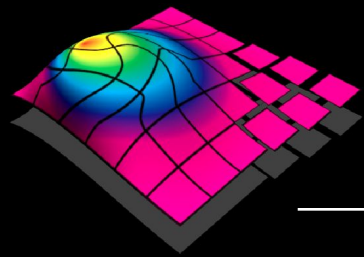
ep le
isea

no Rome
m¹, Xavi
Balaji Lak
ub¹, Reer
nd Raine
mery^{1,3},
n¹, Julier

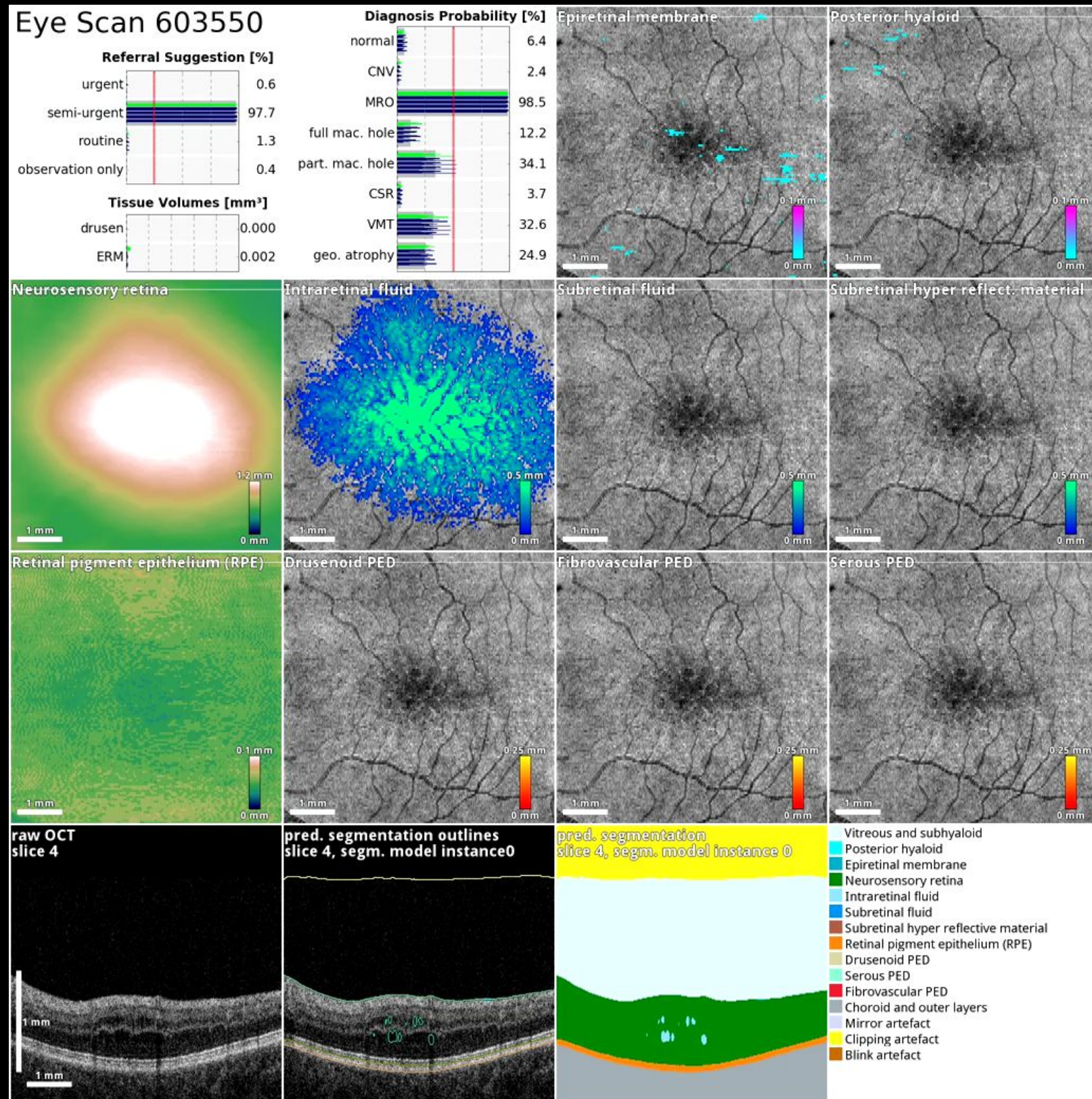
sing at a p
classifying
nages. Unt
ensional d
eous set o
trate perfor
g retinal di
our archite

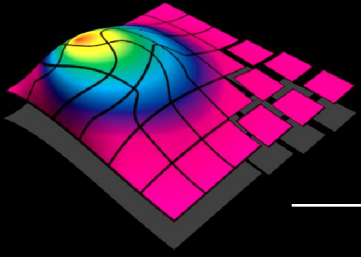
from a different type of device. Our work removes previous barriers to
ments across multiple pathologies in a real-world setting.





Diabetic Eye Disease





Now in 2022?



The Economist



Kenneth Cukier ✓
@kncukier



AI is a fraud! I went to @Moorfields for emergency eye surgery and instead of @DeepMind's cool algorithms diagnosing me and robot surgeons, I had to accept the excellent, skilled, thoughtful care of human medical staff.

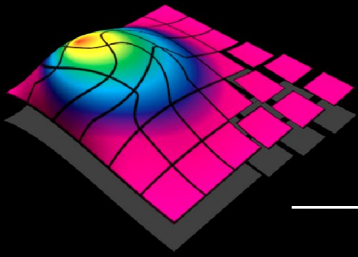
What a disappointment!

Listen at:

economist.com/podcasts/2021/...

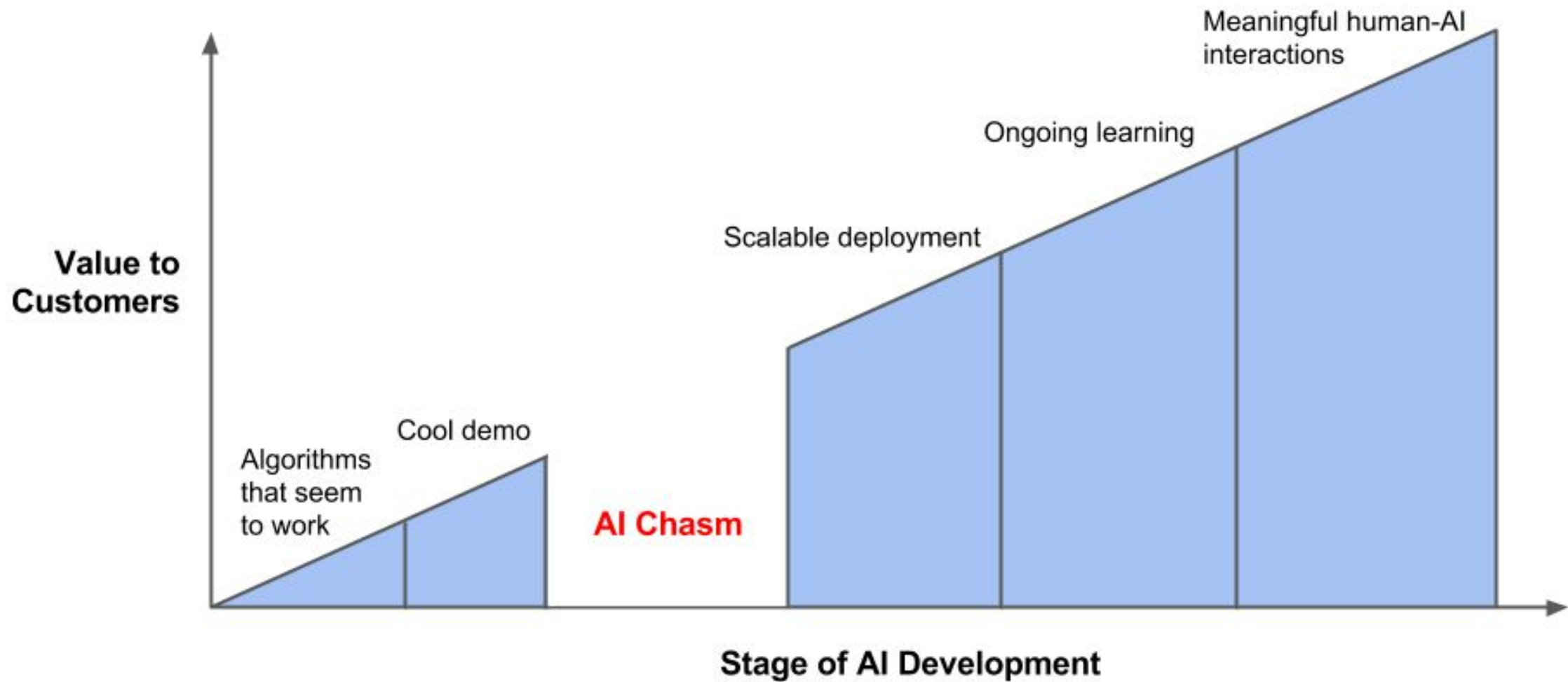


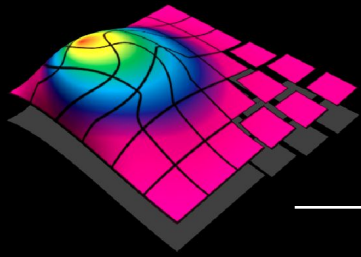
6:41 PM · Mar 4, 2021 · Twitter Web App



Bridging the “AI Chasm”?

Where is the AI chasm?





Technical Maturity?



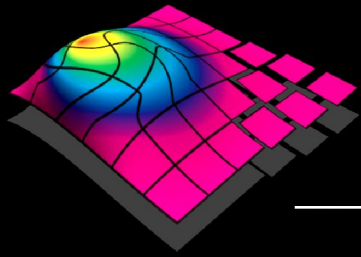
The Lancet Digital Health
@LancetDigitalH

Live demo of AI for AMD diagnosis by @alan_karhi able to recommend referral to an expert, and give diagnosis probabilities of 10 different parameters

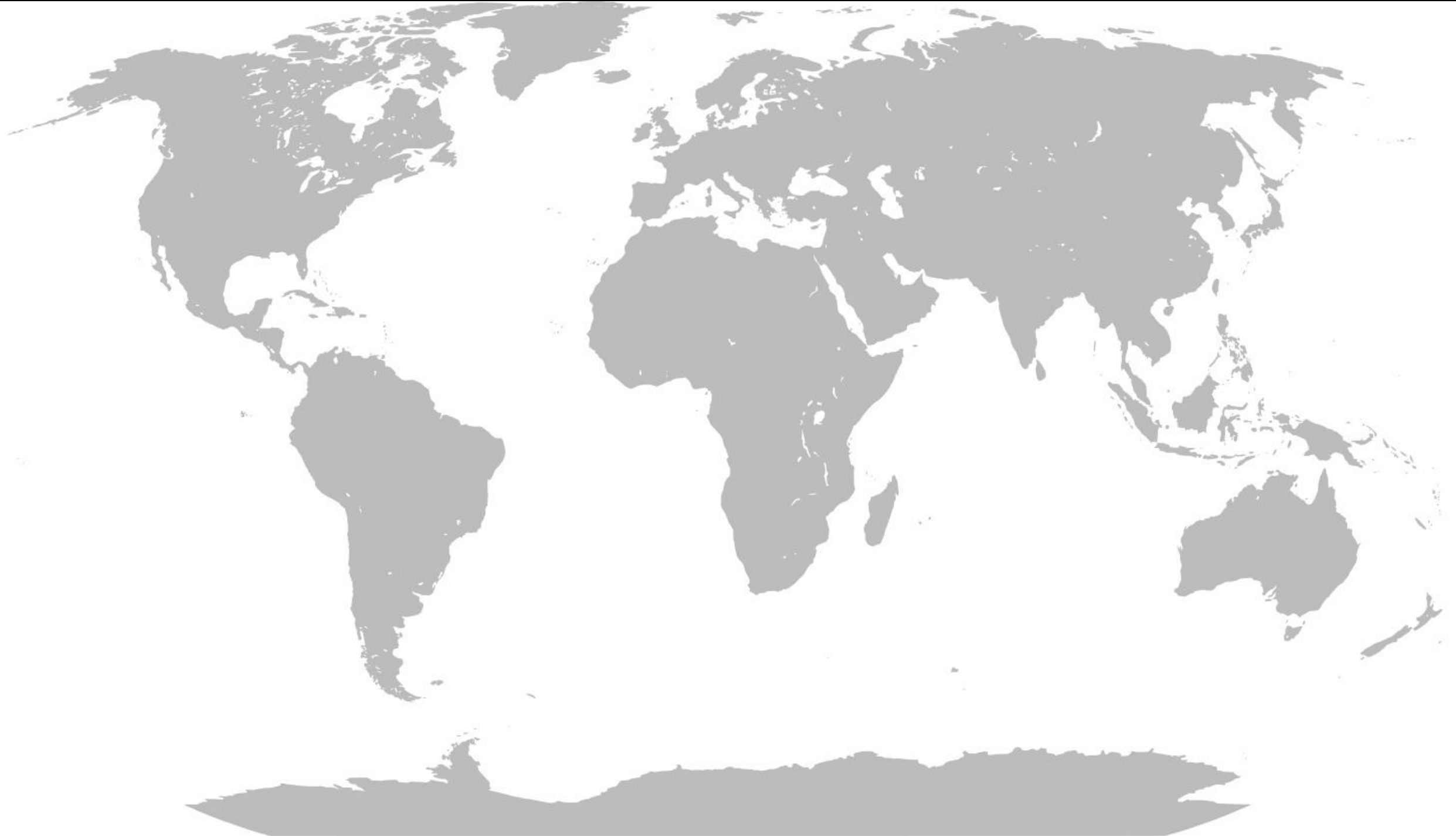
@pearsekeane "Ophthalmology is going to be the first medical discipline that will be fundamentally transformed by AI" #wiredhealth

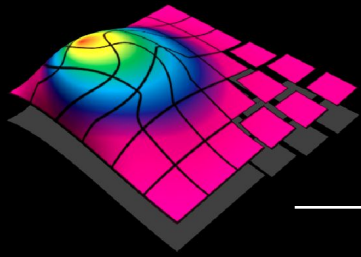


“Wired Health” March 2019



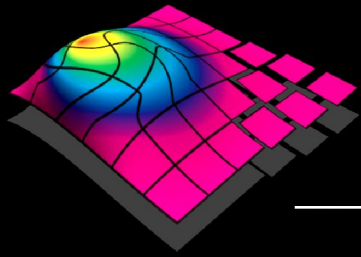
Global Validation?





Regulatory Approval?

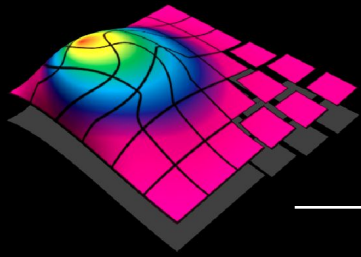




Payors?

NICE National Institute for
Health and Care Excellence



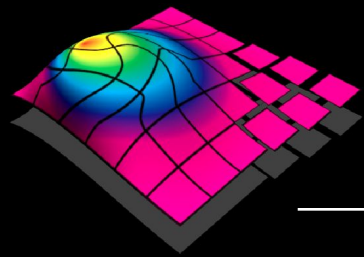


From Code to Clinic?



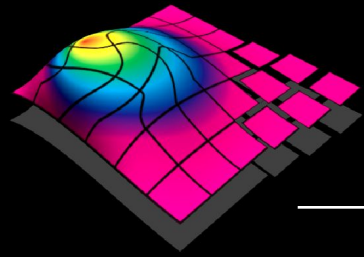
New pathways of care...





An Opportunity?



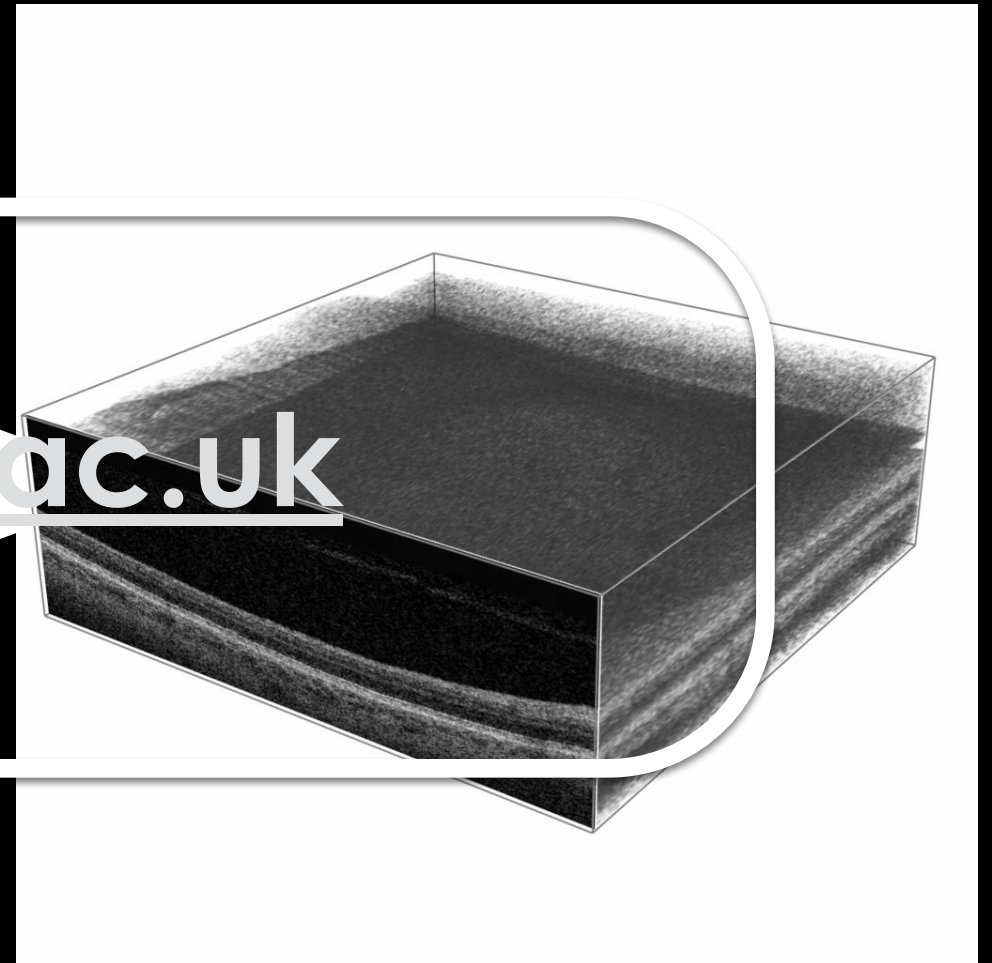


Reinventing the Eye Exam!



1911

p.keane@ucl.ac.uk



21st Century