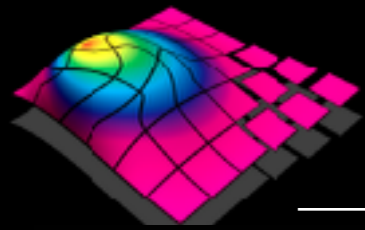


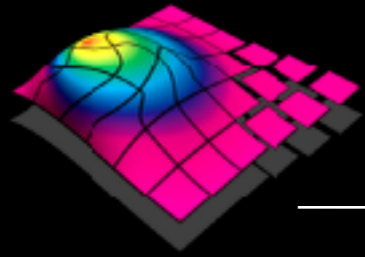
Imaging the Eye



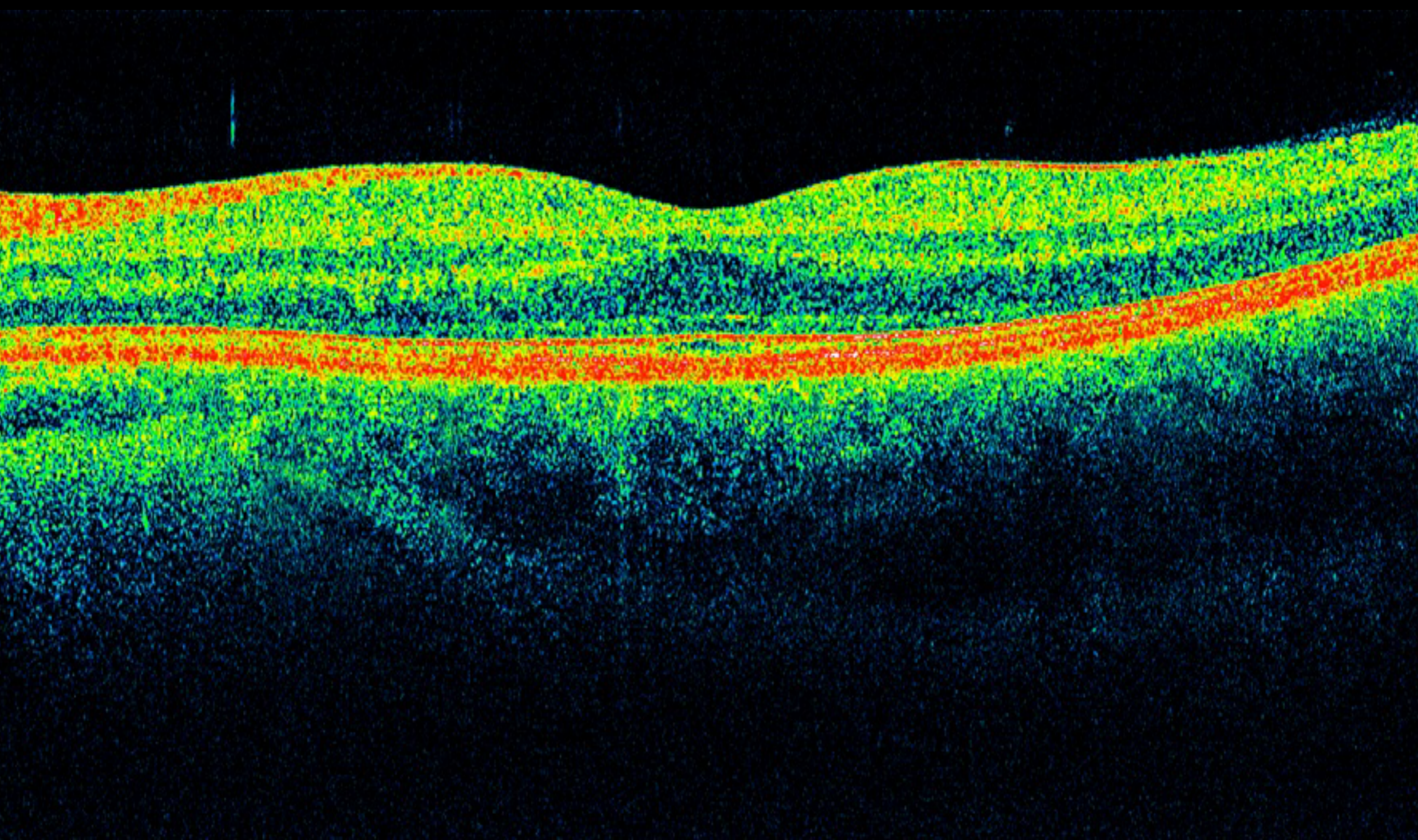


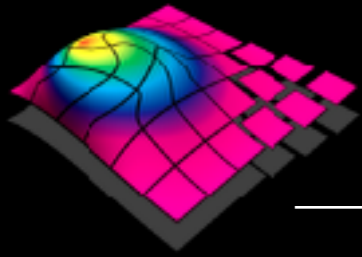
Imaging the Eye





Imaging the Eye



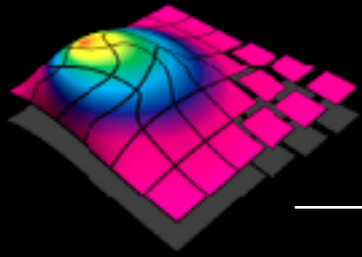


The Problem...



2017

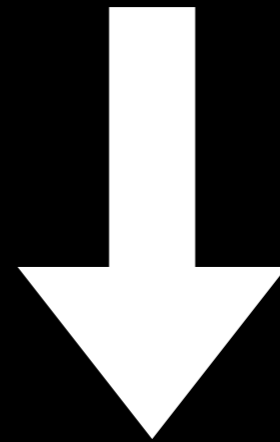
~1000/day!



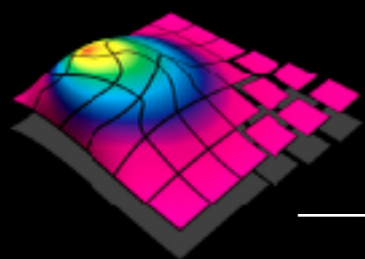
The Problem...



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800



The Problem...



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OCT ROLLOUT IN EVERY SPECSAVERS ANNOUNCED

The multiple will ensure all 740 of its UK practices have an OCT device installed within the next two years

22 May 2017 by [Emily McCormick](#)

Category: [Multiple](#), [OCT](#)

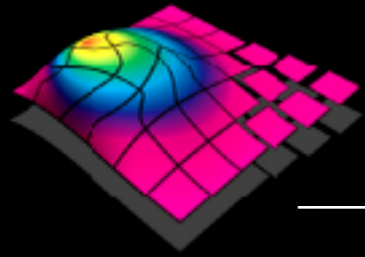


Specsavers has announced a multi-million pound plan to ensure that each of its 740 practices in the UK has an optical coherence tomography (OCT) device installed within the next two years.

The nationwide rollout will begin in June, the multiple said, confirming that 35 of its practices already have the machine in store.



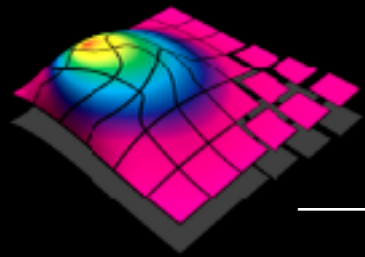
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Artificial Intelligence



Google DeepMind



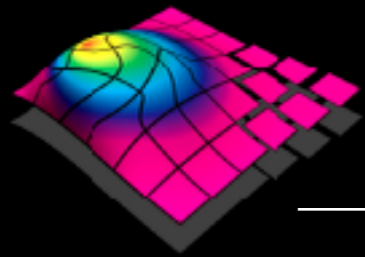
Artificial Intelligence



***>400 of the best AI
research scientists***

***140+ peer-reviewed
publications***

King's Cross, London



Artificial Intelligence

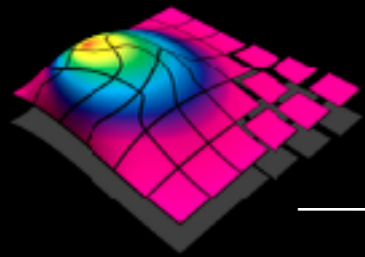


King's Cross, London

***>400 of the best AI
research scientists***

***140+ peer-reviewed
publications***

***Run independently
from Google***



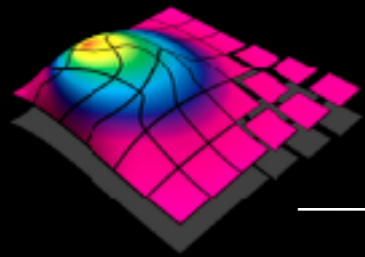
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2015



2016



“Starting from Scratch...”



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Science

Science

Entire human chess knowledge learned and surpassed by DeepMind's AlphaZero in four hours

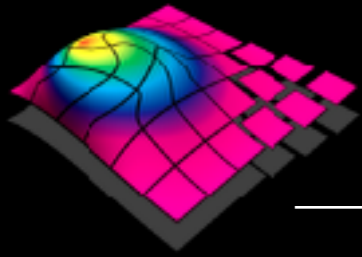
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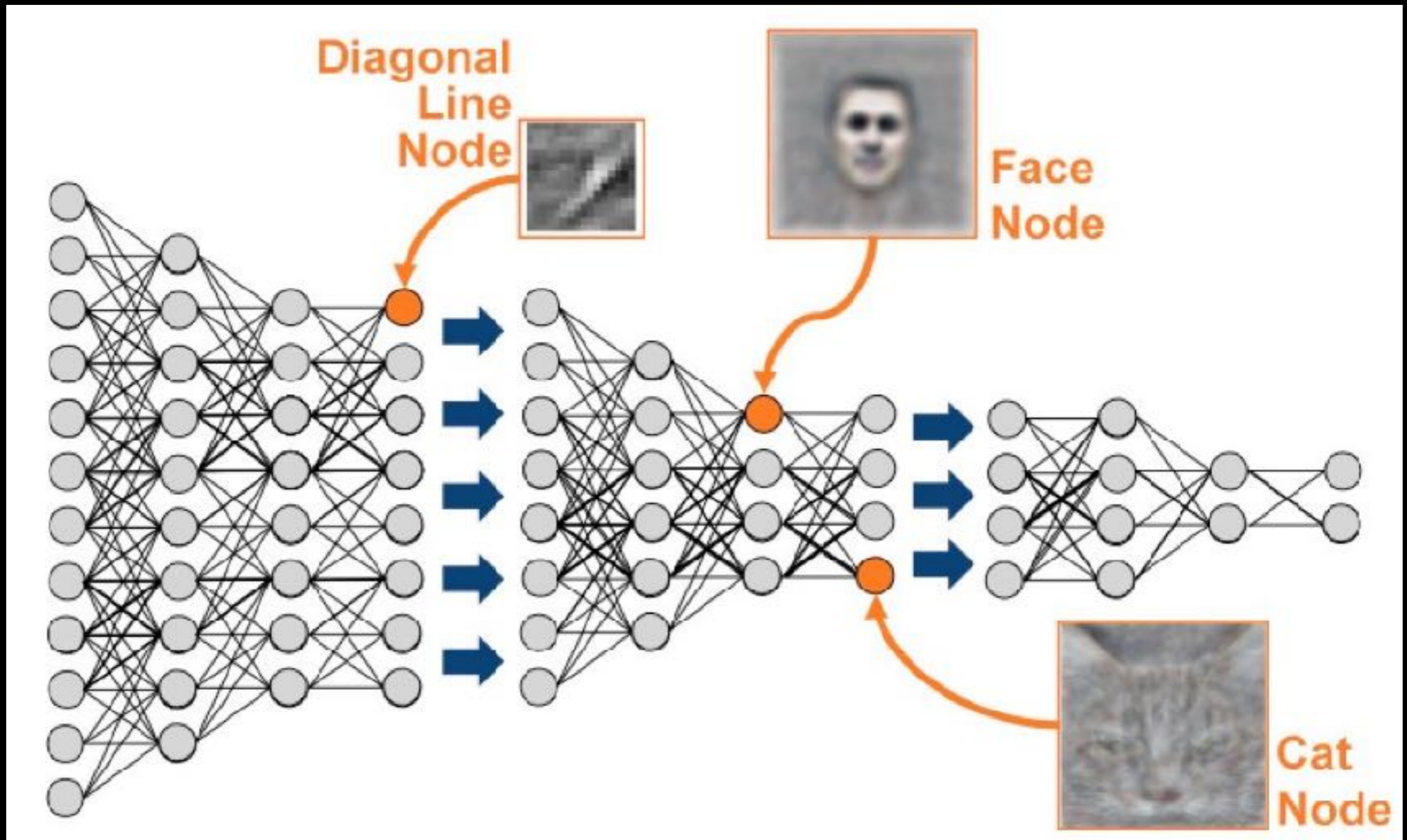
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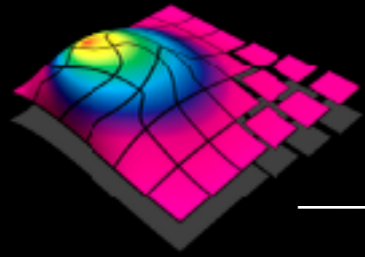
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Artificial Neural Networks

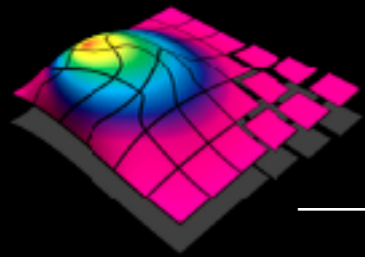




Artificial Neural Networks

Learns from Experience

Not Pre-designed or Pre-Specified



Clinical and Scientific Applications?



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日本語要約

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

[Affiliations](#) | [Contributions](#) | [Corresponding authors](#)

Nature 542, 115–118 (02 February 2017) | doi:10.1038/nature21056
Received 26 June 2016 | Accepted 14 December 2016 | Published online 25 January 2017

Editor's summary العربية

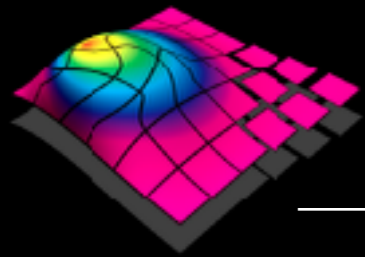
Andre Esteva et al. used 129,460 clinical images of skin disease to train a deep convolutional neural network to classify skin lesions. The result is an algorithm that can classify lesions from photos...

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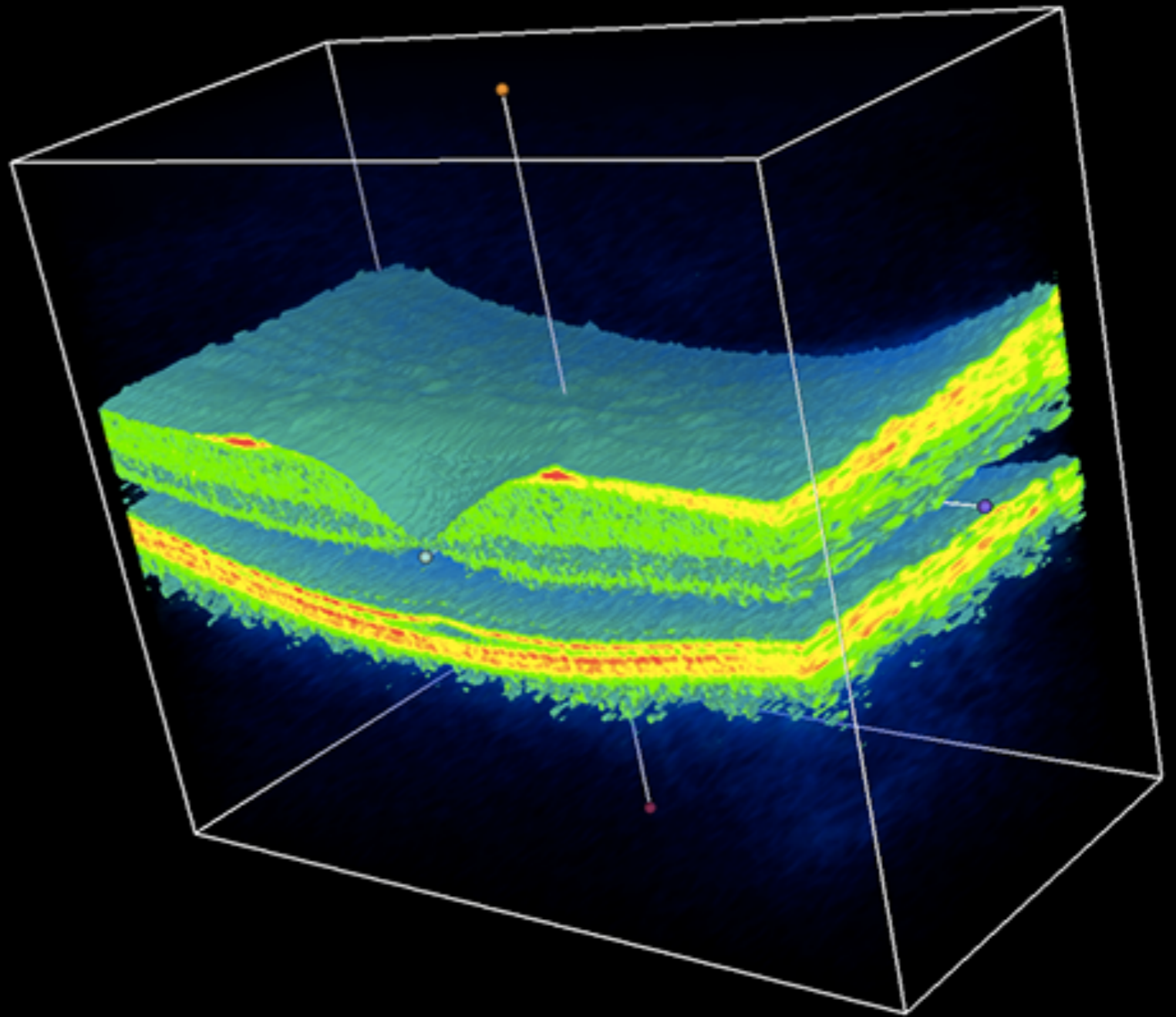
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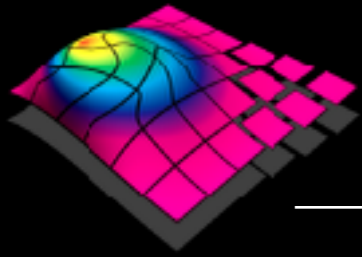
Digital doctor: AI singles out skin cancer from photos



Role in Ophthalmology?



OCT



July 2016

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Alex Hern

@alexhern

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Save for later

Google's DeepMind Health partners with Moorfields Eye Hospital to use artificial intelligence to detect blindness

- Eye scans are complex to interpret
- Google's DeepMind Health partners with Moorfields Eye Hospital
- Moorfields will share records with Google
- The AI will scan these records

By Abigail Beall For Mailonline

PUBLISHED: 18:41, 6 July 2016 | UPDATED: 13:52, 5 JUL 2016



Across the world there is an estimated 285 million people who are blind.

Conditions like age-related macular degeneration, glaucoma and diabetic retinopathy are the most common causes of blindness.

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Science - Google

Moorfields Eye Hospital partners with Google to use artificial intelligence to detect blindness

13:52, 5 JUL 2016 | UPDATED 13:52, 5 JUL 2016 | BY JINNE KUREK

The hospital has partnered with the tech giant to create an AI that can detect blindness from eye scans

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Moorfields Eye Hospital

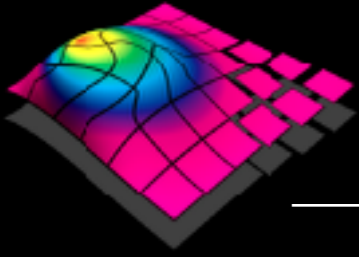
thebmj

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Making machines as clever as doctors

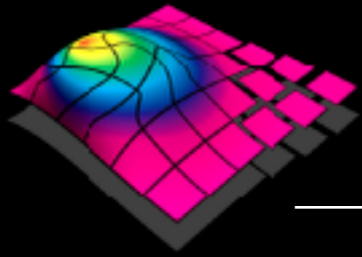
thebmj.com



July 2015...



1. **Datasets Quantity and Quality**
2. **Technical Feasibility**

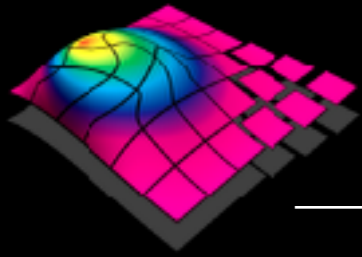


July 2015...



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

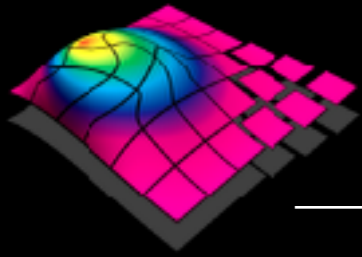




When all questions answered...



*Research
Collaboration
Agreement*



Website

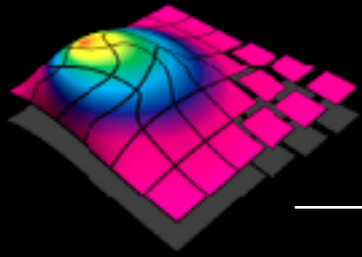
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- Yes Eye Did
- Anatomy of the eye





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**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?

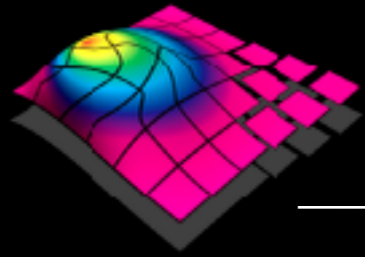


What processes are in place to ensure the data transferred to DeepMind is only ever seen by the research team?



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

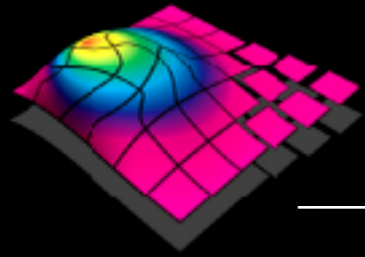
¹Google DeepMind, London, EC4A 3TW, UK

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

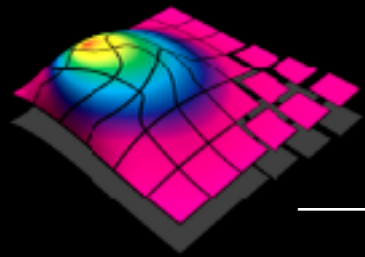


Macular Society

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

Fight For Sight UK

Patient Engagement Event, Sept 2016



Goals for 2018?

1. Real World “Use Case”

2. AI-assisted Science

3. Prospective Validation!!!

10+ / 50+

pearse.keane@moorfields.nhs.uk