OCTane

March 8 2021

Google Health

OCTane

Moorfields Eye Hospital and Google Health (and formerly, DeepMind) have developed groundbreaking AI for OCT ("OCTane"):

- Triaging urgent macular disease - Nature Medicine 2018
- Predicting AMD progression - Nature Medicine 2020

We would like to explore partnership to maximize the impact of this AI in patient care, in a manner consistent with Google and Moorfields values, and in continued research

Our preferred approach:

License OCTane for *re-implementation* by a partner or partners
Partner or partners to commercialize and support further research
Partner agrees to a business model prioritizing patient access, supporting research

Our goal:

Explore this concept with you
Understand how it may fit with your strategy
Determine initial level of interest

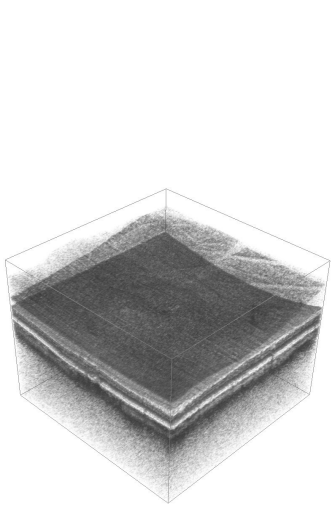
02 Octane background

State-of-art deep learning architecture for tissue diagnosis and referral in retinal OCT

- Google + DeepMind + Moorfields Eye Hospital
- 50+ retinal diseases

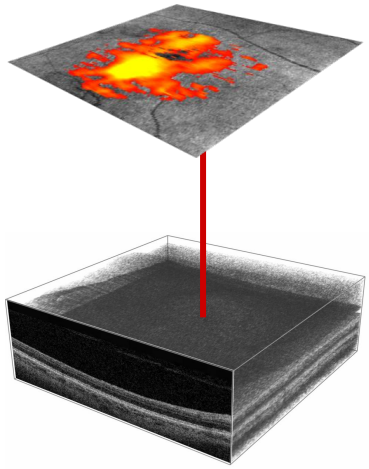
- Matches accuracy of ophthalmologists with over 20 years' experience
- Generalisable across multiple devices
- Interpretable "tissue map"

The two-stage network detects pathology, along with triage urgency and tissue quantification



3D OCT scan

Segmentation network



Tissue segmentation map

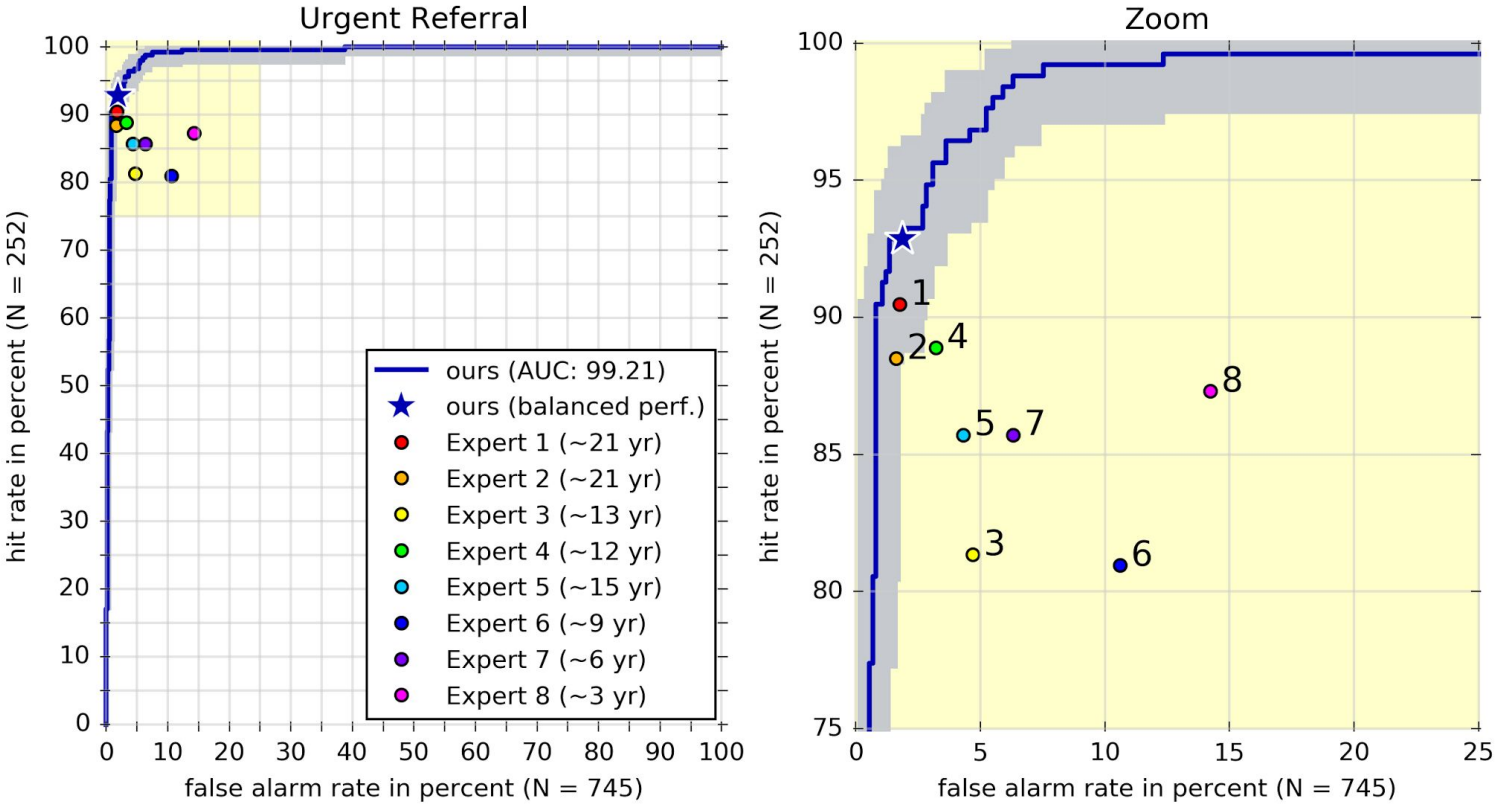
Tissue volumes

Classification network

Triage suggestion

Diseases detected

The algorithm matches accuracy of ophthalmologists with 20+ years experience



03 User studies

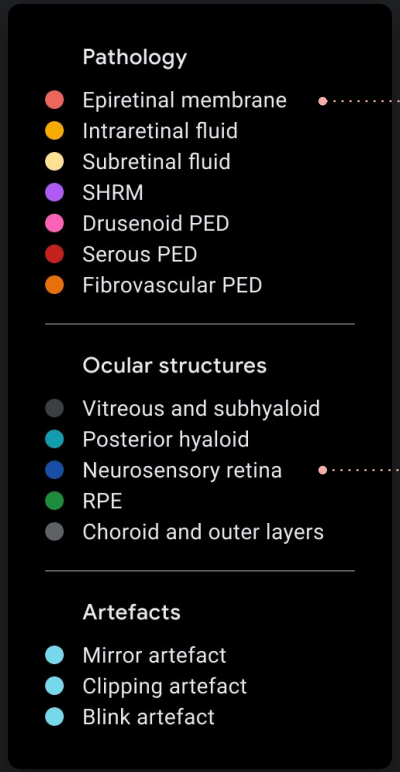
Color principles for visualizations

Similar hues for similar layers

Warm and bright hues for pathological layers to make them stand out on the scan

Cool hues for ocular structures

Same color for all artefacts -- assuming they don't always show up and can be differentiated through tooltips



Contrasting colors for layers usually right next to each other

For example:

- Epiretinal membrane, and
- Neurosensory retina

Brighter tones for thinner layers. Darker tones for thick layers.

Thin layers

- Epiretinal membrane
- RPE

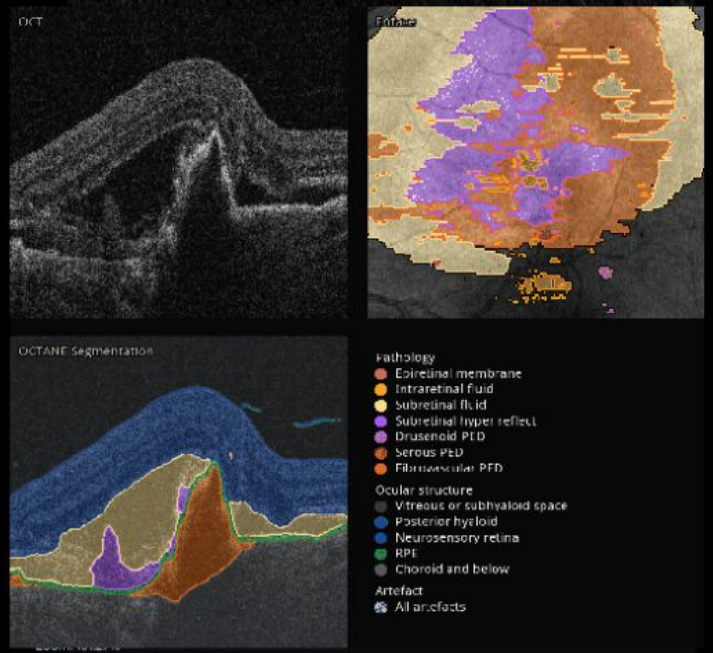
Thick layers

- Vitreous and subhyaloid
- Neurosensory retina
- Choroid and outer layers

Patient Notes:
Study Id: 603353, Age: 46, Sex: M, VA: 6/5, Ethnicity: Other
Correction: n/a, Pinhole acuity: n/a, Clinical Vignette: n/a

Fundus

OCT and AI Assistant Referral



Zoom: 30.11%

Adequate quality OCT image

No | Yes

Most urgent diagnosis (* Required)

- Normal
- CNV
- MRO
- Full thickness macular hole
- Partial thickness macular hole
- Drusen
- CSR
- VMT
- ERM
- Geographic atrophy
- Suspected Abnormality - unsure of diagnosis
- Other

Referral urgency (* Required)

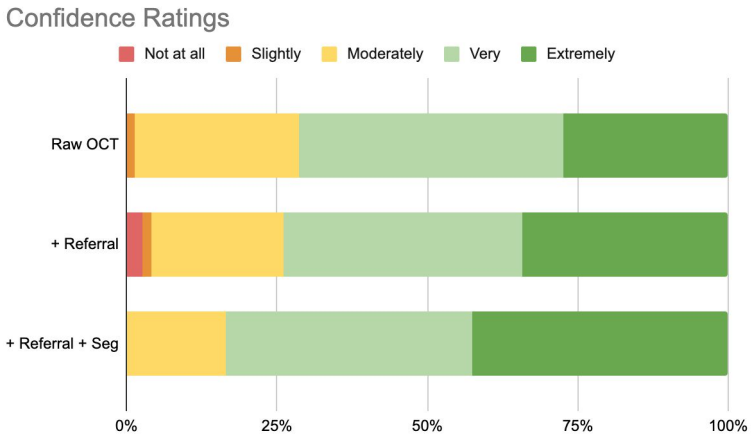
- Urgent
- Semi-urgent
- Routine
- Observation only (no referral)

How confident are you in your referral decision? (* Required)

- Extremely

Users generally felt more confident with the model particularly with segmentations

- Value was perceived when new information was revealed by OCTane that impacted the referral decision e.g. unexpected referral level or overlooked abnormal tissue
- Optoms generally felt the model increased their confidence and even **appreciated the model when it merely increased their confidence**
- Confidence increased when both the referral and segmentation were presented



Segmentations were a top feature

Segmentations (slice and map) were appreciated by most of the participants because they helped optoms

- **Interpret** why the model had made a particular referral decision (and on occasion recover from model errors)
- **Identify pathologies** they were unaware of in the raw OCT e.g. fluid, PEDs, ERM
- **Quantify the pathologies** and judge severity e.g. fluid on the map, PEDs
- Hone in on pathologies quickly

“The enface showed more fluid than I could see so better to err on the side of caution and refer more urgently.” - P5