

OPTOMED PRESENTATION 2020

# EyRIS SELENA+

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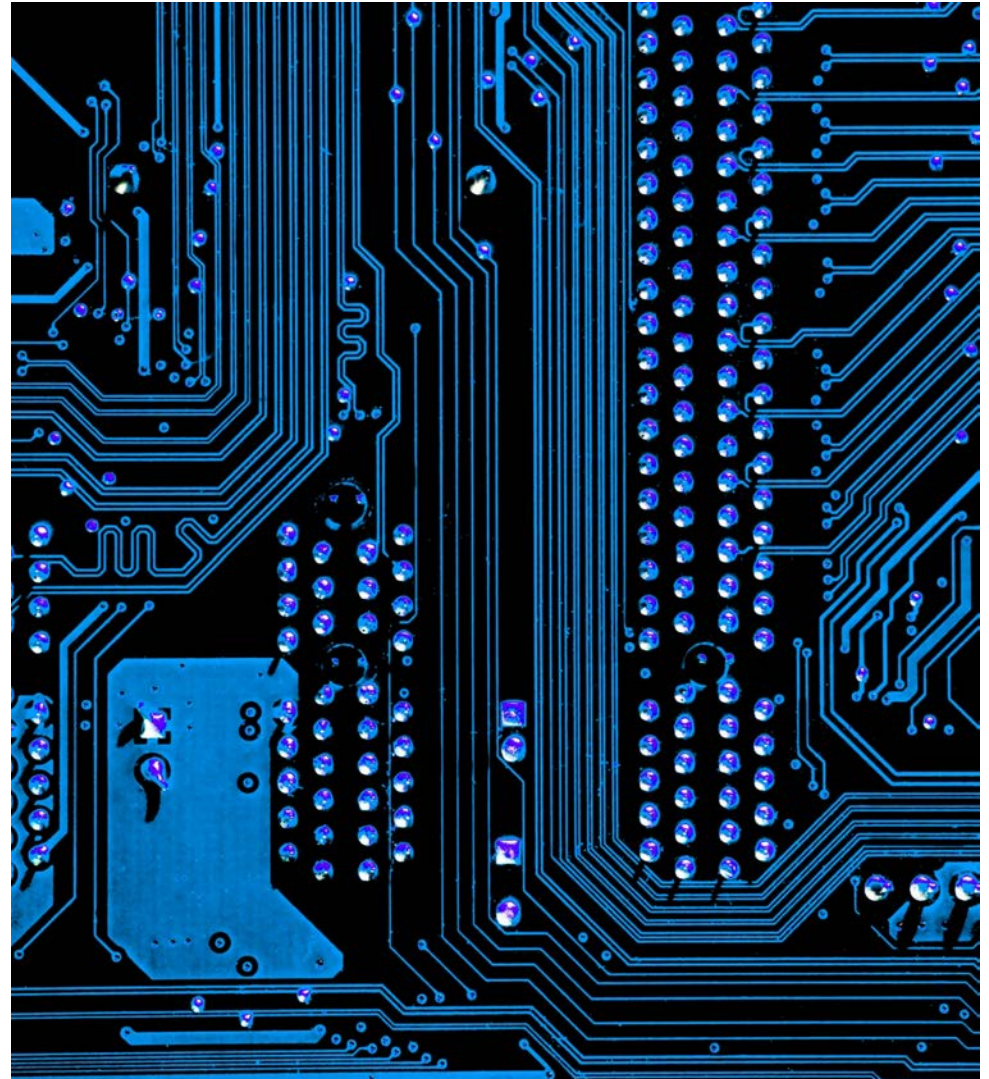
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ICDRS Chart

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# EyRIS

## Revolutionizing the detection of eye diseases

- Singapore-based; [www.eyris.io](http://www.eyris.io)
- Spin-off company of SERI and NUS
  - SERI Singapore Eye Research Institute
  - NUS National University of Singapore
- SERI is one of the leading eye-research institutes globally, #1 in Asia
- EyRIS' AI algorithm: SELENA+



# SELENA+

## Deep Learning System (DLS)

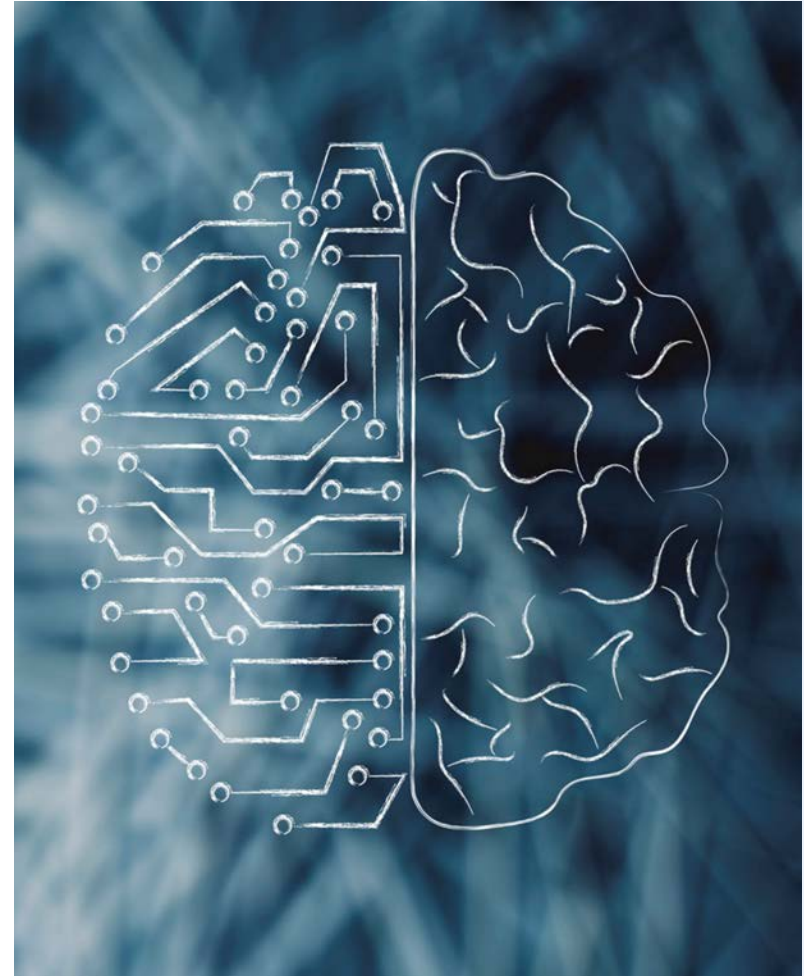
### Developed using

- ~500'000 retinal images
- Several ethnic groups & retinal cameras
- Original reference Ting et al. JAMA 2017; 318(22): 2211-2223

### Recognizes characteristics of:

- Referable diabetic retinopathy (DR)
- Referable glaucoma suspect
- Referable age-related macular degeneration suspect (AMD)

**Regulatory approvals: CE, HSA (Singapore),  
Anvisa (Brazil)**





# SELENA+

## Image Assessment Result Options for DR

### 1. Non-referable

No apparent retinopathy/ Mild non-proliferative DR

### 2.Referable

### 3.Ungradable

Images with insufficient quality for assessment

### Criteria for “Referable DR”

- DR severity level of moderate non-proliferative DR or worse; or diabetic macular edema
- Vision-threatening DR defined as severe non-proliferative DR and proliferative DR
- DR classification is based on ICDRS

*ICDRS International Classification Diabetic Retinopathy Scale*

# SELENA+

## Result Options for glaucoma and AMD

### 1. Non-referable

### 2. Referable

### 3. Ungradable

Images with insufficient quality  
for assessment

#### Criteria for “Referable possible glaucoma”:

- Ratio of vertical cup to disc diameter of 0.8 or greater
- Focal thinning or notching of the neuroretinal rim
- Optic disc hemorrhages
- Localized retinal nerve fiber layer defects

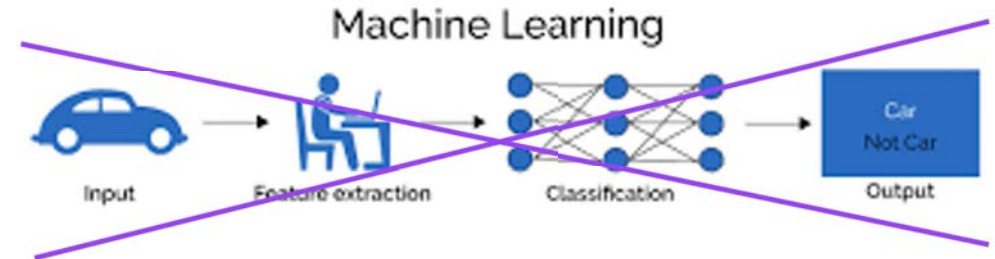
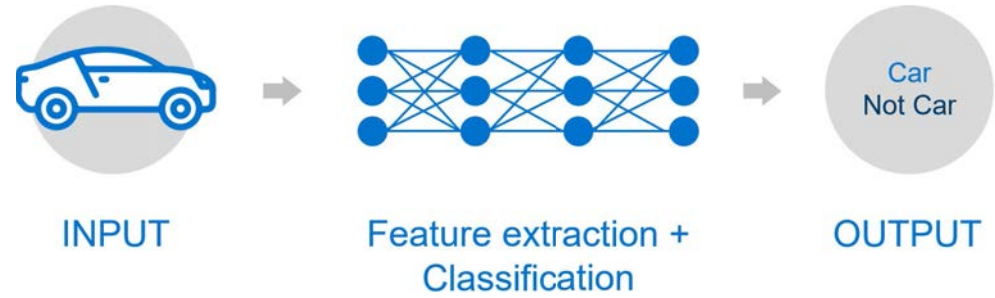
#### Criteria for “Referable AMD”:

- Presence of advanced AMD according to the
- AREDS grading system

*AREDS Age-Related Eye Disease Study*

# Deep Learning System - Reminder

- Deep Learning System (DLS) recognizes the features implicitly
- Developer does NOT specify, which features to look for
- Therefore the result does NOT contain statements about “why the image is referable”, which is the case with Machine Learning



# Intended Use

SELENA+ is used in conjunction with a data management system, by healthcare professionals, as a decision-making aid in screening diabetic patients at risk of vision loss. SELENA+ provides automatic referable/non-referable recommendations to identify patients for signs of more than mild diabetic retinopathy (DR) using the International Clinical Diabetic Retinopathy Disease Severity Scale (ICDRSS) and diabetic macular edema (DME), referable/non-referable glaucoma suspect and referable/non-referable age-related macular degeneration (AMD).

*Source: EYRIS / EyScan Interface Technical Manual, Chapter 3.2; Rev. 00, 27 Sep 2019*



# Indication for Use

SELENA+ is an automated system through analysis of color retinal images that identifies signs of more than mild diabetic retinopathy using the ICDRSS and diabetic macular edema (DME) in adult patients with diabetes. SELENA+ also provides automatic results for detection of glaucoma suspect features based on abnormalities found in the optic disc in adult diabetic patients. For adult diabetic patients above 50 years old of either sex, SELENA+ detects referable signs of age-related macular degeneration based on Age Related Eye Disease Study (AREDS) classification. SELENA+ is an executable file that is used in conjunction with a data management system or equivalent.

*Source: EYRIS / EyScan Interface Technical Manual, Chapter 3.3; Rev. 00, 27 Sep 2019*



# Disclaimer

The assessment findings in this report are derived using an intelligent deep learning system to perform automated image analysis of retinal image for the detection of diabetic retinopathy, glaucoma and age-related macular degeneration. These are provisional findings and do not constitute a definitive diagnosis. The retinal photographs only display features from a specific part of the eye. Other eye conditions such as glaucoma cannot be accurately detected from retinal photographs. Normal looking photographs do not guarantee that you are or will be free from eye complications. You are advised to consult a doctor immediately should you have any significant eye symptoms such as sudden decrease in vision. As with all other screening tests, this report cannot be regarded as exhaustive.

*Source: EyRIS EyeSCAN Retinal Photography Report*



# International Classification for DR

Measure	Score	Observable Findings
<b>ICDR severity level</b>		
No apparent retinopathy	0	No abnormalities (Level 10 ETDRS)
Mild non-proliferative diabetic retinopathy	1	Microaneurysm(s) only (Level 20 ETDRS)
Moderate non-proliferative diabetic retinopathy	2	More than just microaneurysm(s) but less than severe non-proliferative diabetic retinopathy (Level 35, 43, 47 ETDRS)
Severe non-proliferative diabetic retinopathy	3	Any of the following: > 20 intra-retinal haemorrhages in each of 4 quadrants, definite venous beading in $\geq 2$ quadrants, prominent intra-retinal microvascular abnormalities in $\geq 1$ quadrant, or no signs of proliferative retinopathy. (Level 53 ETDRS: 4-2-1 rule)
Proliferative diabetic retinopathy	4	One or more of the following: neovascularization and/or vitreous or preretinal haemorrhages. (Levels 61, 65, 71, 75, 81, 85 ETDRS)
<b>Macular oedema severity level</b>		
No macular oedema	0	No exudates and no apparent thickening within 1 disc diameter from fovea
Macular oedema	1	Exudates or apparent thickening within 1 disc diameter from fovea

Abbreviations: ETDRS, Early Treatment Diabetic Retinopathy study; ICDR, International Clinical Diabetic Retinopathy

doi:10.1371/journal.pone.0139148.t001

# International Classification for AMD

	Brief description	Clinical features	Visual acuity
Category 1	Free of AMD in both eyes	<5 small drusen in one or both eyes	20/32 or better in both eyes
Category 2	Mild to borderline AMD in one or both eyes	Multiple small or intermediate drusen in one or both eyes Pigment abnormalities in one or both eyes	20/32 or better in both eyes
Category 3	Absence of advanced AMD in both eyes	Intermediate or large drusen Geographical atrophy Features not involving central macular	20/32 or better in better eye
Category 4	Advanced AMD in one eye	Advanced AMD or geographical atrophy in worse eye No such features in better eye	20/32 or better in better eye

*Key:* Small drusen, <63 µm in diameter (disc diameter around 1500 µm); intermediate drusen, 63–124 µm in diameter; large drusen, >125 µm in diameter; pigment abnormalities refer to either hyperpigmentation or depigmentation

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