# The Disconnect Between Device Quality Score and Deep Learning based Choroid Segmentation in Retinal OCT

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## INTRODUCTION

- Device-generated Image Quality (IQ) > 15 thresholds are widely used as quality gate for clinical studies.
- This study assesses whether IQ meaningfully correlates with deep learning performance, measured by segmentation accuracy and choroid volume quantification.

## METHODS

- **Dataset:** OCT macular scans:63 healthy subjects (103 volumes) Acquired on a Heidelberg Engineering Spectralis® device using 6 × 6 mm protocol; 496 × 512 × 49 acquisition grid; IQ: 27.65 dB ± 3.86 dB.
- **Segmentation paradigms:**
  - **Deep Learning:** NMI-ChoroidAI, an open-source deep learning model (DGPET)
  - **Image processing:** NMI-ChoroidIP
- **Quality–performance analysis:** Pearson correlation between
  - IQ scores per B-scan and segmentation accuracy (Dice coefficient).
  - Aggregated IQ scores across B-scans within each volume using moment-based (mean, standard deviation) and order-based (minimum, maximum, median, mode, range) statistics and choroid volume error (eChV).

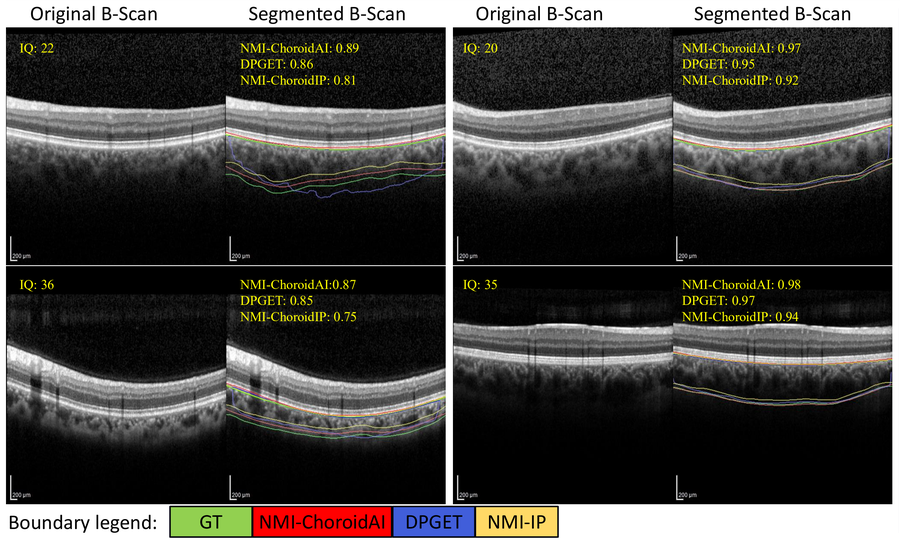
## CONCLUSIONS

- Across segmentation paradigms, errors occur largely independent of input image quality, indicating that device-generated IQ scores are insufficient to predict AI performance and that AI-specific reliability metrics are needed, particularly for quantitative, volume-based outcomes.

## REFERENCES

- Burke, J., et. al (2023). An open-source deep learning algorithm for efficient and fully automatic analysis of the choroid in optical coherence tomography. *Translational Vision Science & Technology*, *12*(11), 27-27.

## RESULTS



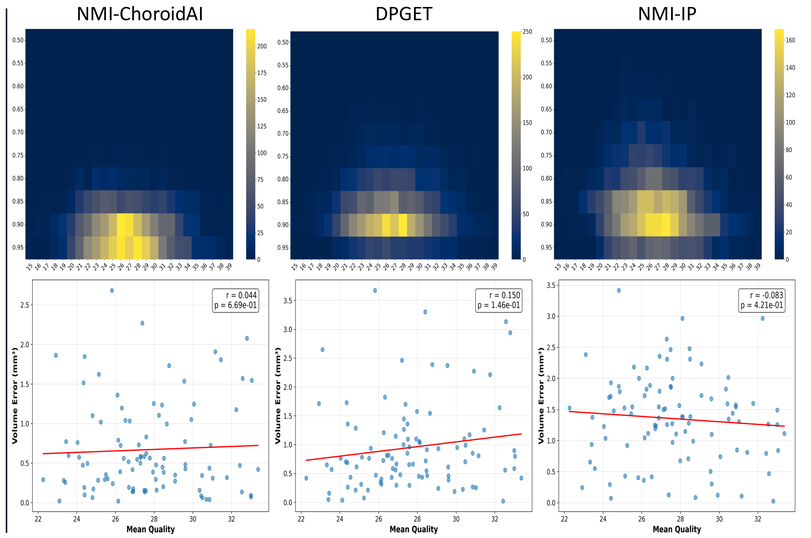




**Figure:** (Left) Representative examples of choroid segmentation illustrating combinations of Image Quality (IQ) and Dice coefficient. (Right-top) Relationship between IQ (x-axis) and segmentation accuracy measured by Dice coefficient (y-axis) for each model; color scale indicates co-occurrence of IQ and Dice values. Panels correspond to NMI-ChoroidAI (left), DGPET (middle), and NMI-ChoroidIP (right). (Right-bottom) Correlation between mean IQ aggregated across B-scans within each volume and choroid volume error (eChV).

- **Segmentation performance:** Mean Dice coefficients were 0.94 ± 0.04 for NMI-ChoroidAI, 0.90 ± 0.05 for DGPET, and 0.89 ± 0.07 for the NMI-ChoroidIP model.
- **IQ–performance correlation:** Pearson correlation coefficients between Image Quality (IQ) and segmentation accuracy were 0.055 (NMI-ChoroidAI), 0.005 (DGPET), and 0.122 (NMI-ChoroidIP), indicating negligible associations (large n; p-values not emphasized).
- **Choroid volume error:** No meaningful relationship was observed between IQ metrics and choroid volume quantification error (eChV) across models. While NMI-IP has the highest mean eChV (1.35 cu. mm) consistent with the low DC, a weak association was noted between maximum IQ and eChV in the DGPET model (r = 0.238, p = 0.020).

| IQ Metric | NMI-ChoroidAI | DGPET | NMI-ChoroidIP |
|---|---|---|---|
| Mean | 0.044 (0.67) | 0.150 (0.15) | -0.083 (0.42) |
| Std. dev. | -0.003 (0.98) | 0.157 (0.13) | -0.141 (0.17) |
| Median | 0.017 (0.87) | 0.131 (0.20) | -0.074 (0.47) |
| Mode | 0.064 (0.54) | 0.153 (0.14) | -0.101 (0.33) |
| Min. | 0.054 (0.60) | 0.016 (0.88) | 0.056 (0.59) |
| Max. | 0.097 (0.35) | 0.238 (0.02) | -0.083 (0.42) |
| Range | 0.040 (0.70) | 0.214 (0.04) | -0.135 (0.19) |

**Table:** Pearson correlation values (p-value, n=103) between the Image Quality (IQ) and the error in choroid Volume across three different segmentation models

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Supported by NIH CORE Grant P30 EY08098 (Dept. of Ophthalmology, University of Pittsburgh), the Eye and Ear Foundation of Pittsburgh, the Shear Family Foundation Grant, and an unrestricted grant from Research to Prevent Blindness, New York, NY.