CHALLENGE PROVIDER:

ITS

FIND THE BLOOD VESSELS IN THE EYE

3RD CHALLENGE

General information

SCOPE:

ML, Computer Vision, Python, Deep Learning

BRIEF DESCRIPTION:

Develop a machine learning model that automatically segments blood vessels in human eyes using images from a slit-lamp

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Problem statement

Given:

→ **A dataset of slit-lamp eye photographs and corresponding GeoJSON annotations marking capillary regions.**

Task:

→ **To build a model that accurately segments blood vessels from the raw images.**

Goal: To enhance ophthalmologists' workflow by enabling automated vessel segmentation for diagnostic and analytic purposes. Manual vessel annotation is time-consuming and error-prone.

Pain points

- High variability in image quality and illumination.
- Small size and complex shapes of capillaries.
- Manual annotation is resource-intensive and subjective.
- Lack of standard benchmarks in slit-lamp capillary segmentation.
- Limited real-world automation in ophthalmology diagnostics.

Solution requirements

1. Use the provided dataset (images + GeoJSON annotations).
2. Train a model that segments vessels on new, unseen images.
3. Convert annotations into segmentation masks for training.
4. Optimize for the F1 Score as the evaluation metric.
5. Ensure the model generalizes well to various lighting and anatomical conditions.

Output: the binary masks identifying vessel areas, aligned with the GeoJSON annotations.

Deliverables

1. Teaser: A short description of the solution in few sentences

2. Problem Brief (PDF): Slides to present the solution

3. Prototype Repository (GitHub link)

- → Source Code
- → README.md

4. Screencast (link): A short video demonstrating the end-to-end flow (how to install, run, and the final result).

5. Demo (optional, link)

Assessment / Criteria

EVALUATION CRITERIA:

- ➔ Innovation and creativity
- ➔ Technical execution
- ➔ Relevance to the chosen challenge
- ➔ Presentation quality
- ➔ Potential impact

TOTALS:

The team's final score will be calculated by averaging the scores given by all jury members

Author's Tips

STACK:

Consider pre-trained models for semantic segmentation

(e.g., U-Net, DeepLabV3)

ADDITIONAL DATA, CLARIFICATIONS:

- ➔ Carefully handle label conversion from GeoJSON to pixel masks.
- ➔ Monitor overfitting — small datasets require strong regularization.
- ➔ Validate on a diverse subset of images for robust generalization.

About

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