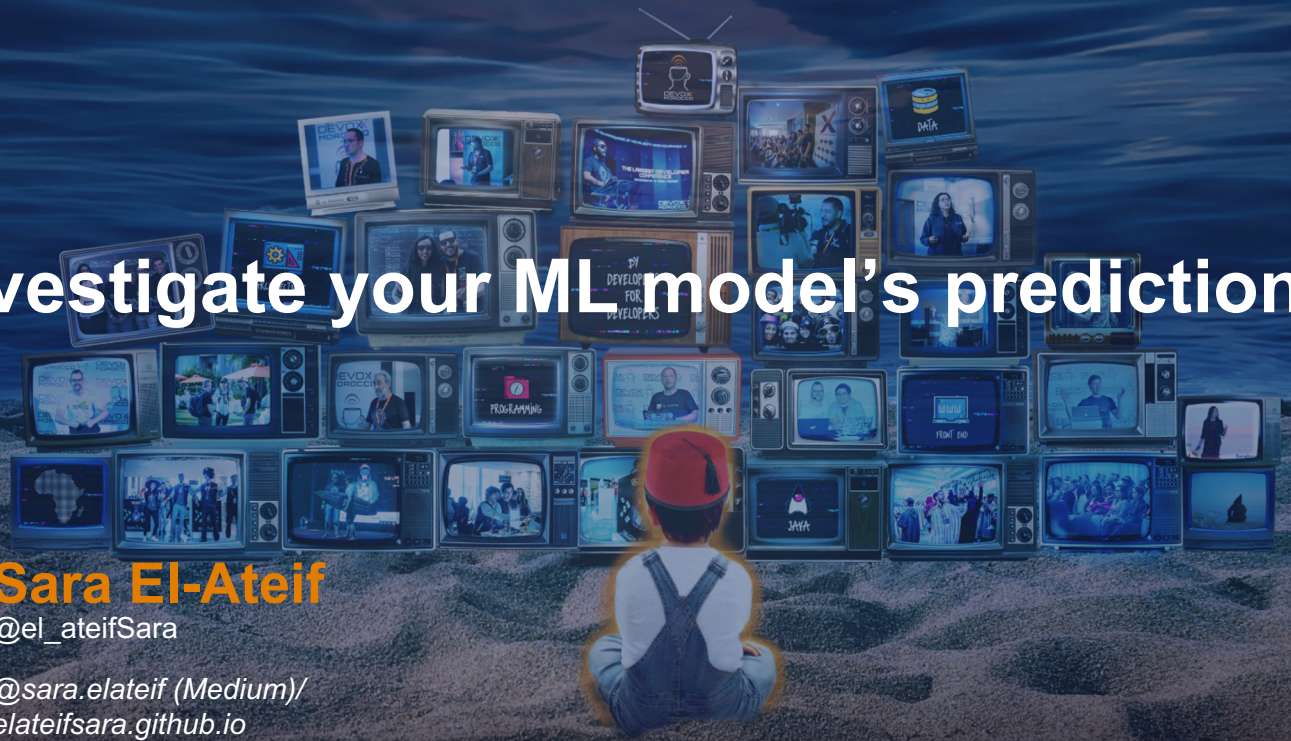
SOUS LE HAUT PATRONAGE DE SA MAJESTE LE ROI MOHAMMED VI

DEVOXX MOROCCO

October 4-6, 2022

Agadir - Morocco

Investigate your ML model's prediction 🔬



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#DevoxxMA

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TFUG Casablanca

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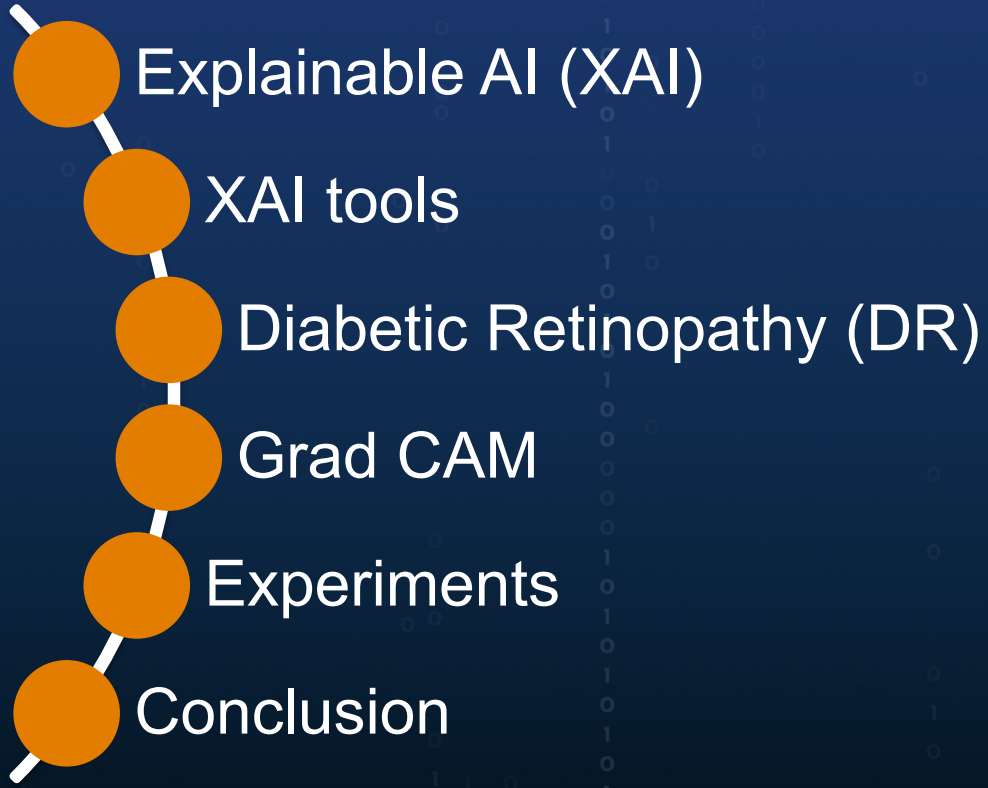
TensorFlow User Group Casablanca (TFUG Casablanca) is a local community of technologists who are interested in advancing their knowledge of TensorFlow, its use cases, and applications. So far, it has reached 1k members in its Facebook group.

Plan


Explainable AI (XAI)
XAI tools
Diabetic Retinopathy (DR)
Grad CAM
Experiments
Conclusion

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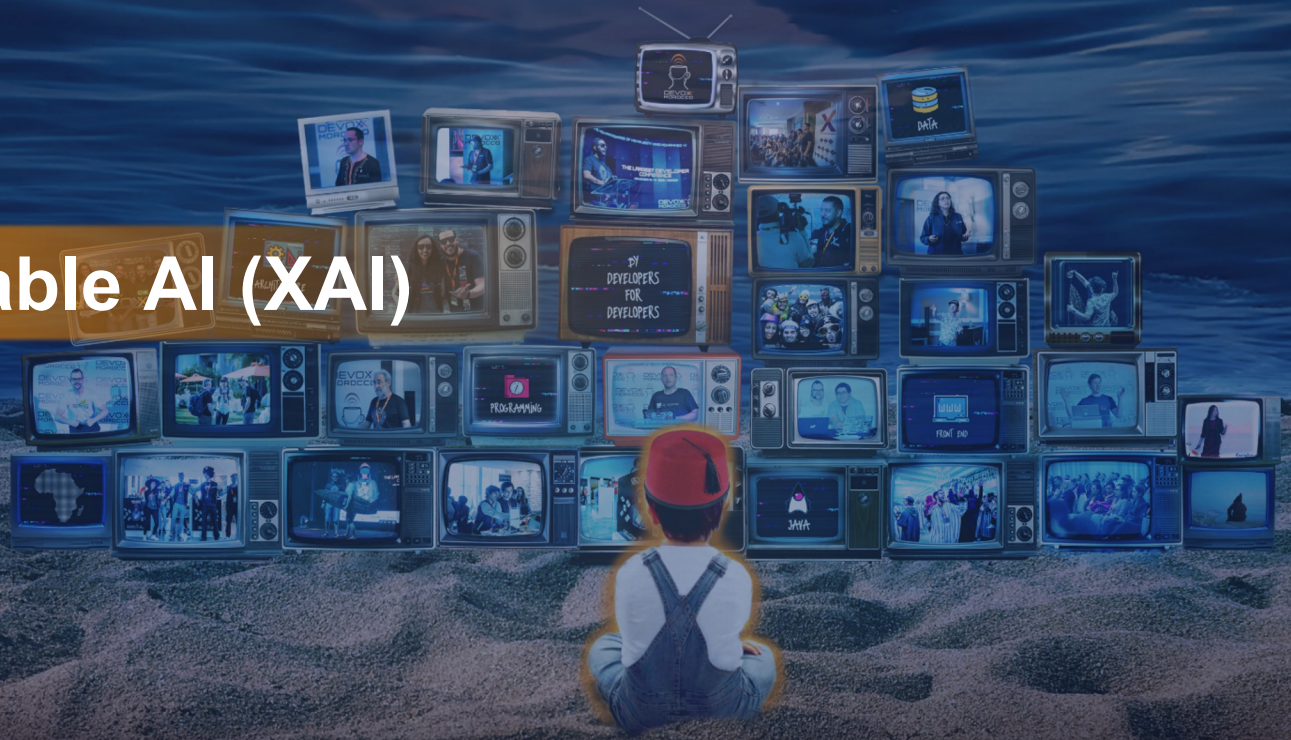
Explainable AI (XAI)



#DevoxxMA

What is XAI?

Explainable AI is a set of tools and frameworks to help you understand and interpret predictions made by your machine learning models. With it, you can debug and improve model performance, and help others understand your models' behavior.

Model Interpretation

Interpretability is the degree to which a human can understand the cause of a decision.

The three most important aspects of model interpretation are:

- Transparency
- The ability to question
- The ease of understanding

Source: Dphi XAI course

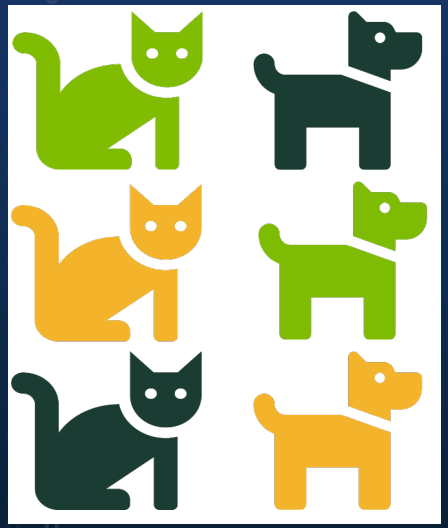
Global & Local interpretation

Global: looking at the entire dataset, some features are the most predictive.

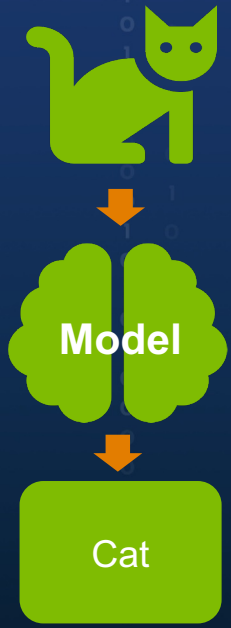
Local: a certain feature (like age) is the most important feature for making a certain prediction.

Why XAI?

Training data



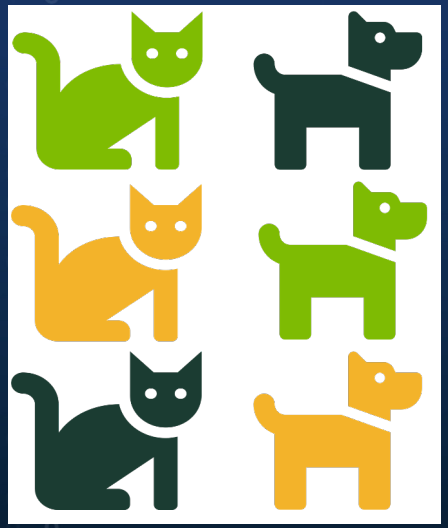
Learning Process



Why did you do that?
Why not something else?
When do you succeed?
When do you fail?
When can I trust you?
How do I correct an error?

Why XAI?

Training data



New learning process

Model

Cat
It has fure, whiskers and claws

I understand why
I understand why not
I know when:
- You will suceed
- You will Fail
- To trust you

I know why you erred

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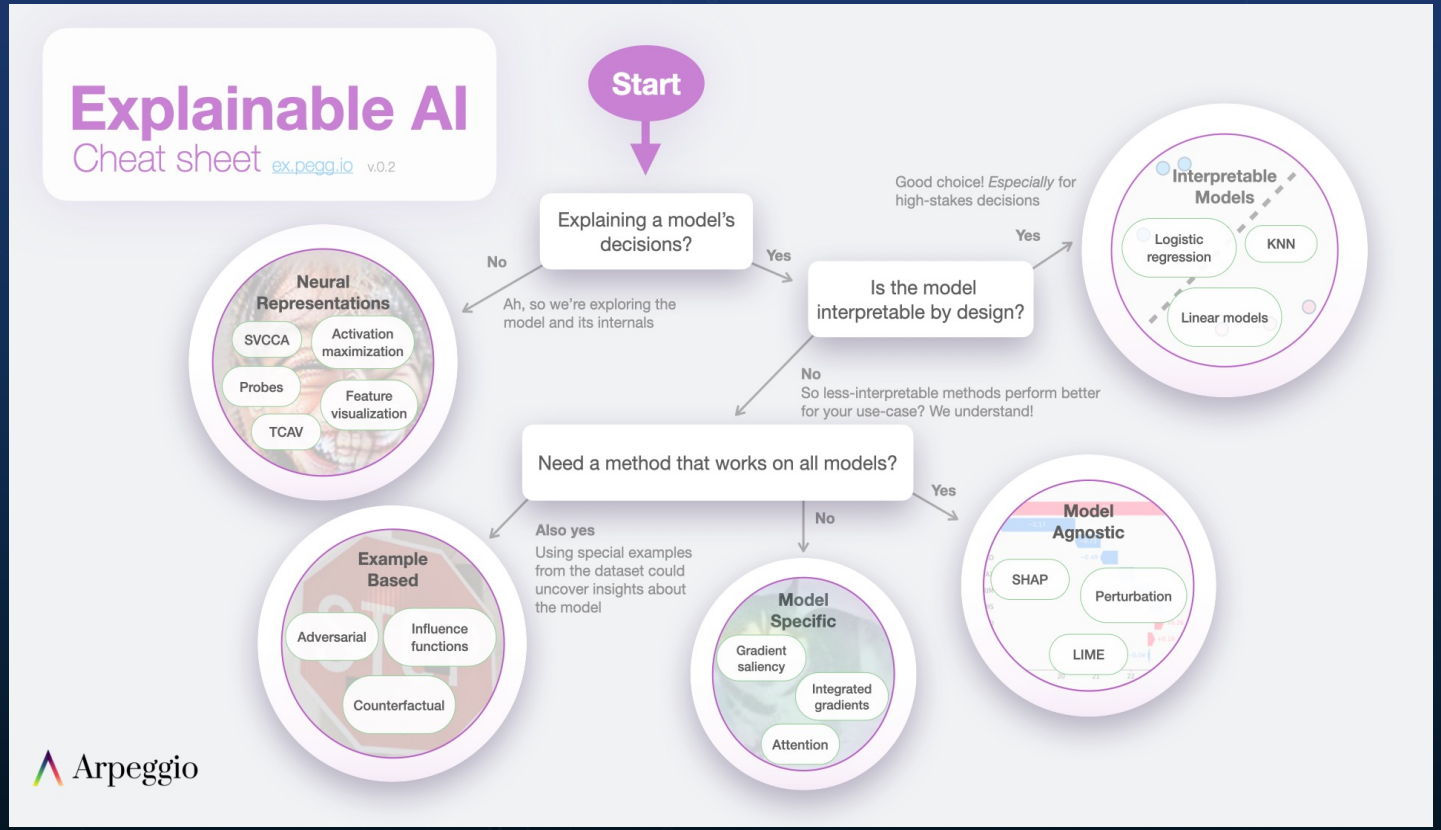
XAI tools/libraries

Tools/Libraries

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Diabetic Retinopathy (DR)
#DevoxxMA

Definition

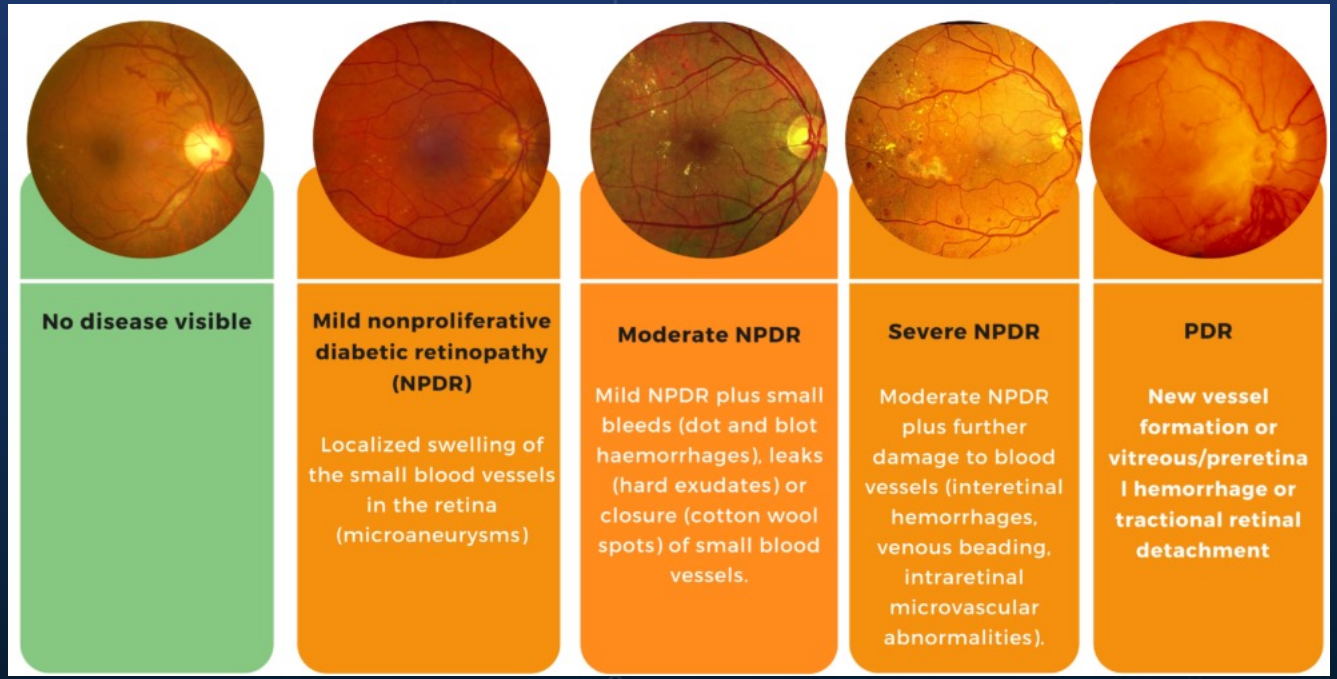
‘Diabetic Retinopathy (DR) is a complication of diabetes, caused by high blood sugar levels damaging the back of the eye (retina). It can cause blindness if left undiagnosed and untreated.’

Source: NHS UK

‘Globally, the number of people with DR will grow from 126.6 million in 2010 to 191.0 million by 2030.’

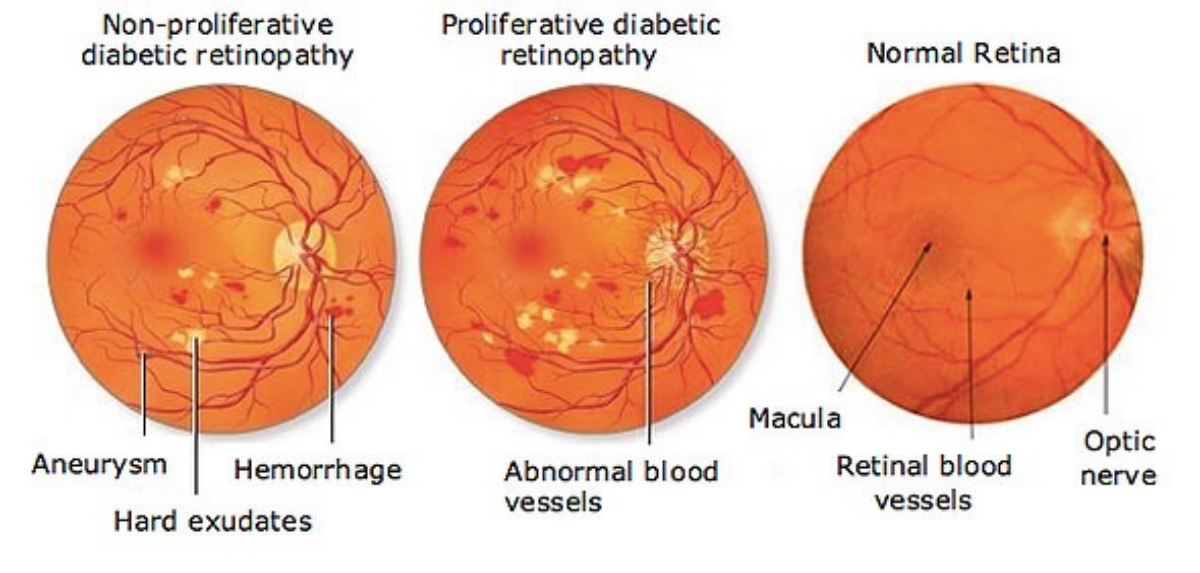
Source: 10.4103/0301-4738.100542

Symptoms by grade



Source: https://www.ophthalytics.com/our-technology/diabetic-retinopathy/

Symptoms by grade



Source: https://lowvisionaids.org/diabetic-retinopathy/

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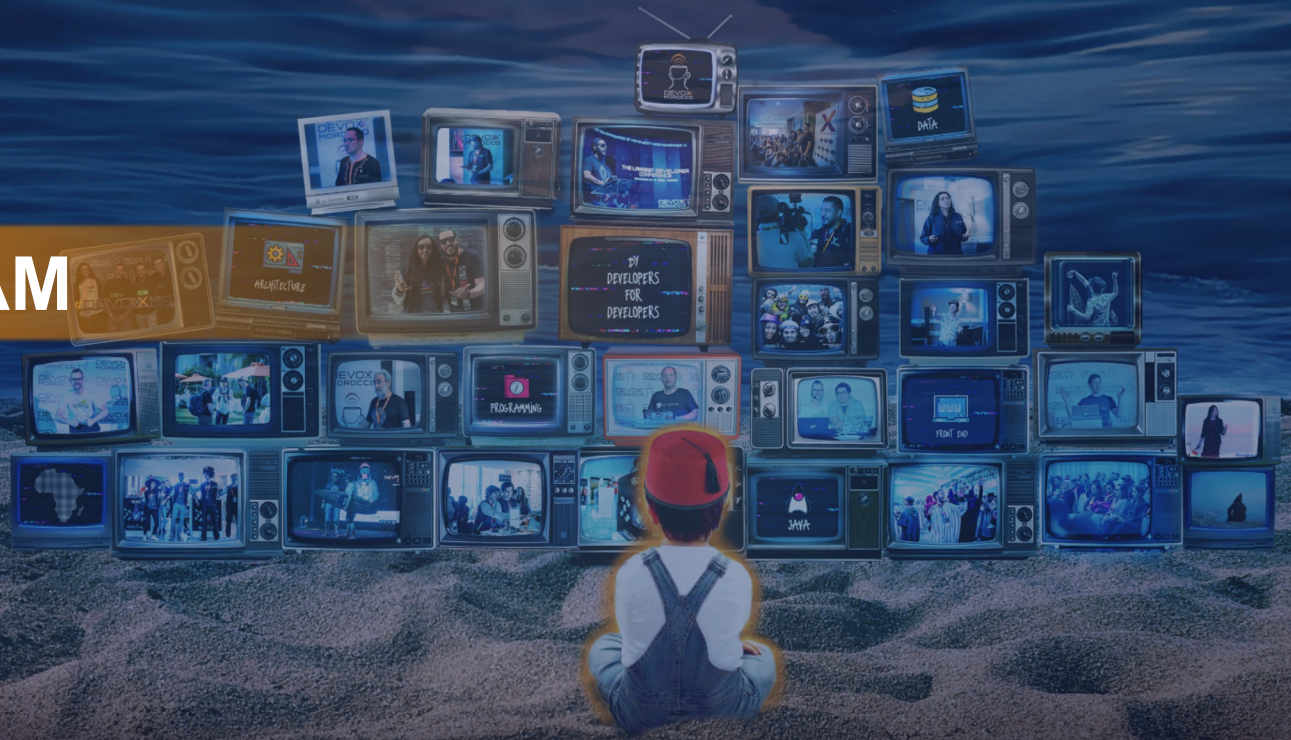
Grad CAM

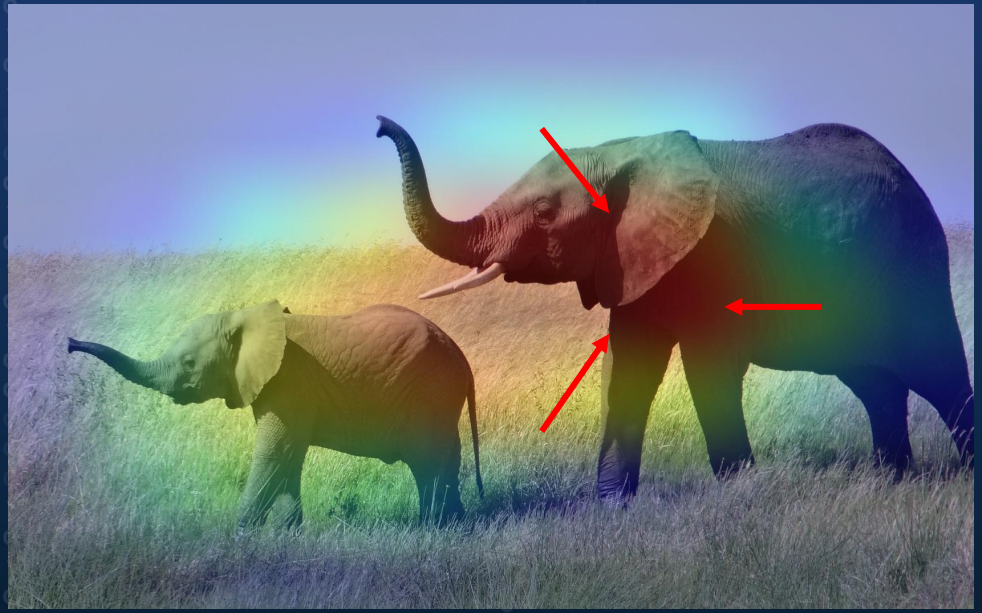


#DevoxxMA

Definition

Gradient-weighted Class Activation Mapping (Grad-CAM), uses the gradients of any target concept, flowing into the final convolutional layer to produce a coarse localization map highlighting important regions in the image for predicting the concept.

Source: arXiv:1610.02391



Source: https://keras.io/examples/vision/grad_cam/

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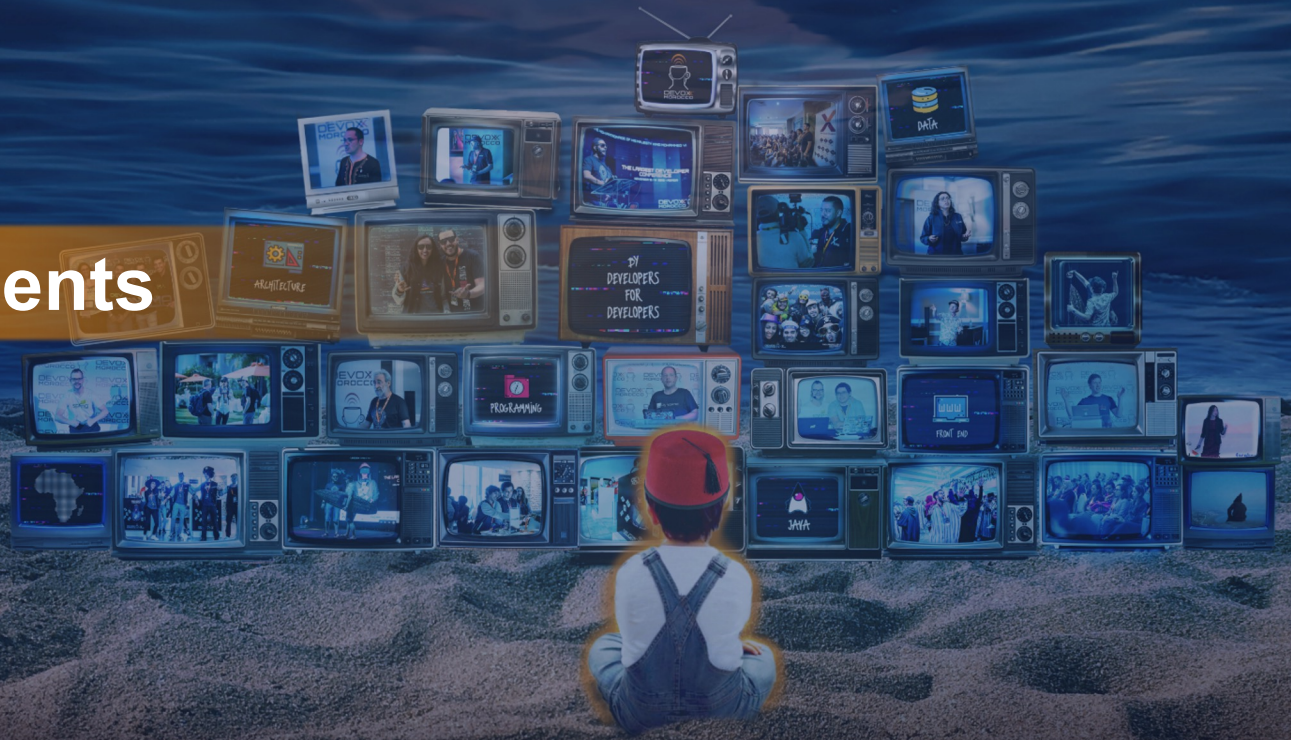
Experiments



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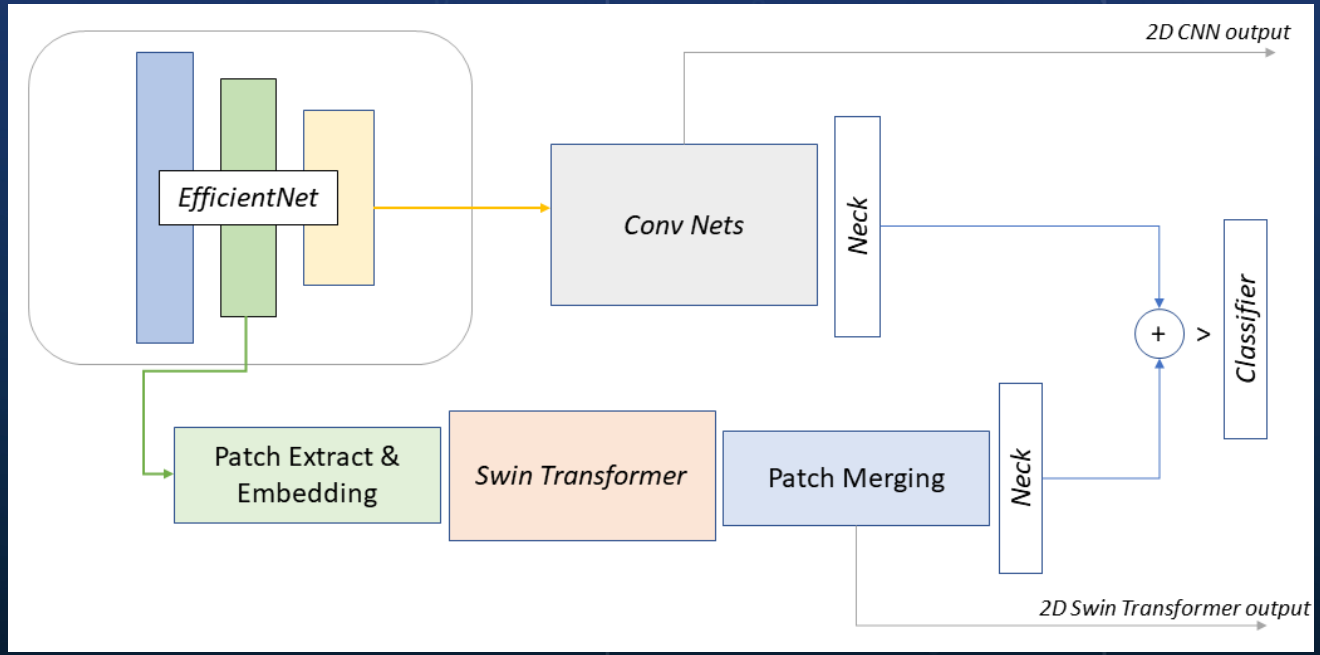
Model

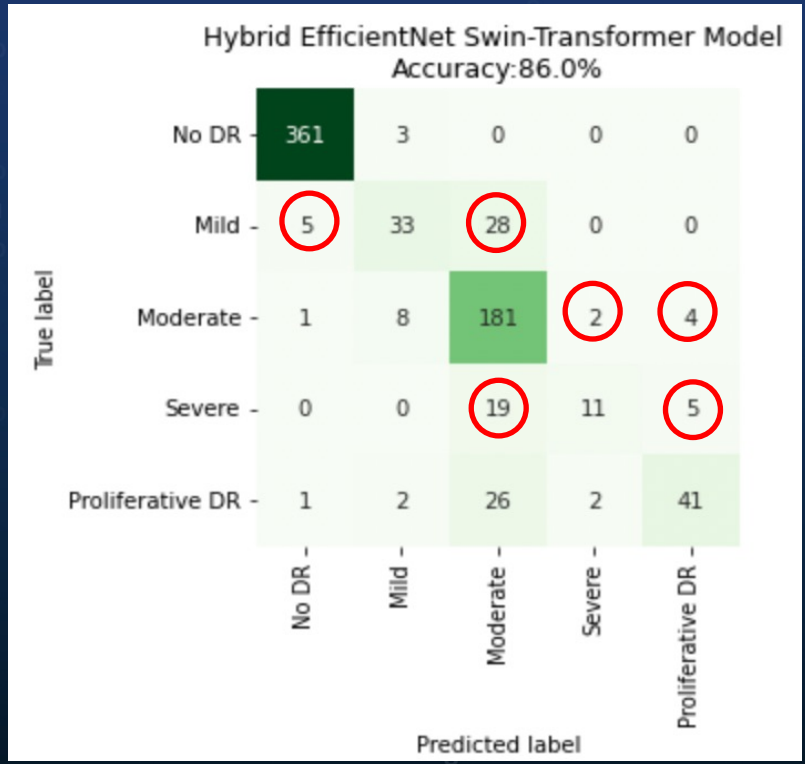


Source: https://www.kaggle.com/code/ipythonx/tf-hybrid-efficientnet-swin-transformer-gradcam/notebook

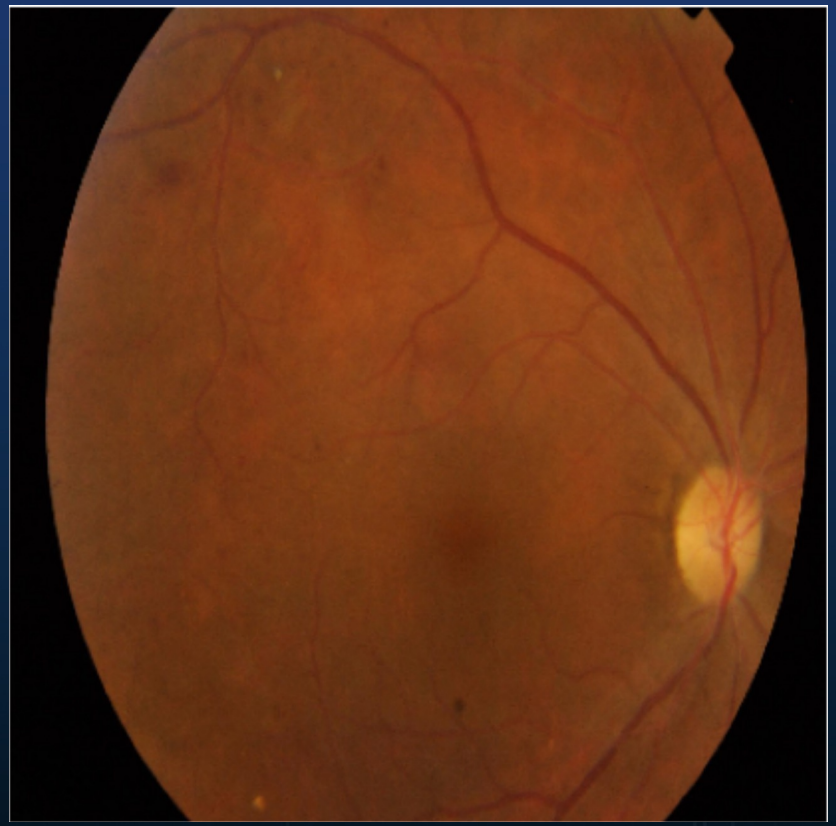
Confusion Matrix

In brief:

- No DR confused as Mild
- Mild confused as No DR and Moderate
- Moderate confused as (mainly) Mild, Severe and PDR
- Severe confused as Moderate and PDR
- PDR confused (mainly) as Mild, Moderate and Severe

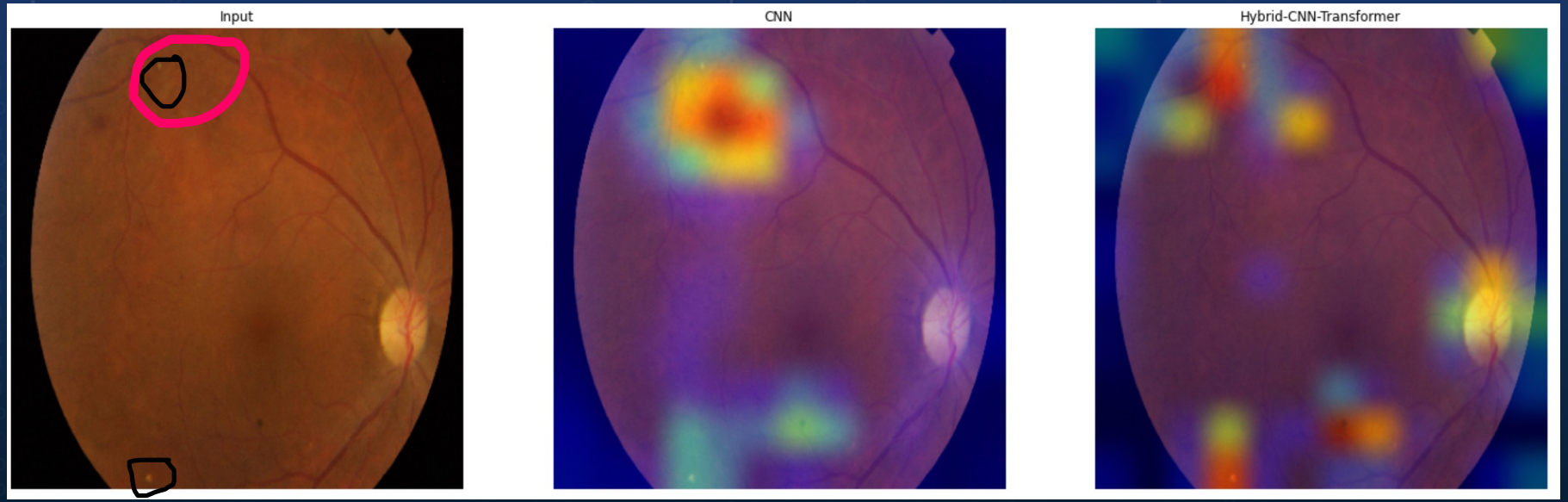


Understand the model: Failures



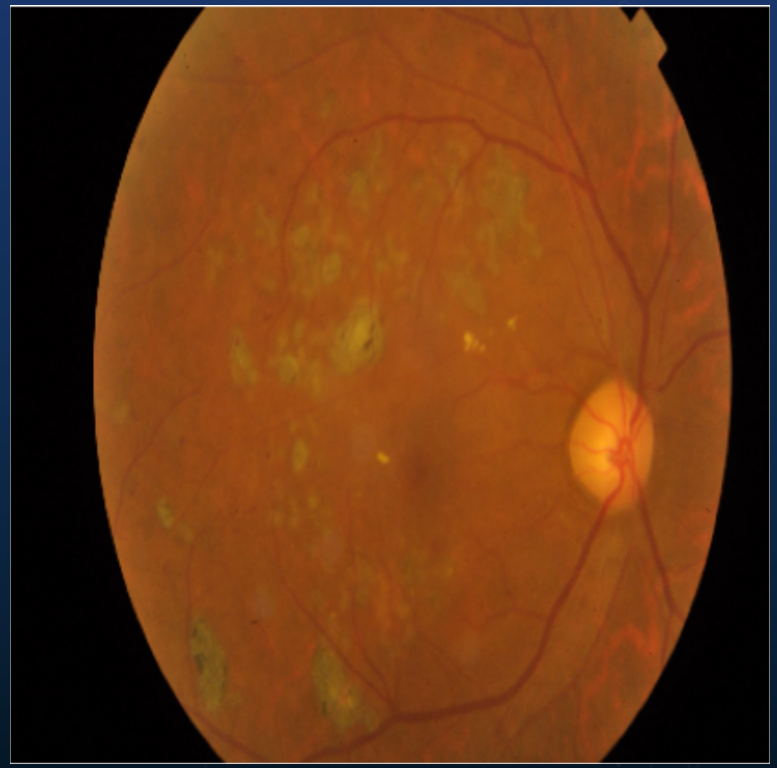
Mild mistaken as Moderate DR

Understand the model: Failures



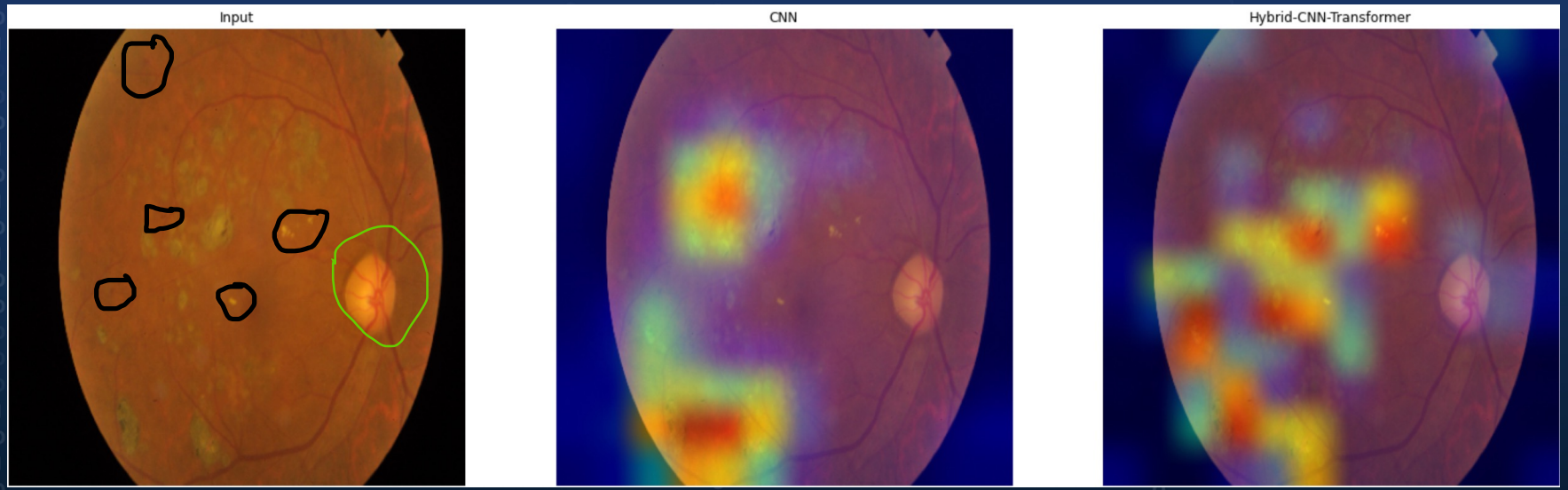
Mild mistaken as Moderate DR

Understand the model: Failures



Moderate mistaken as Proliferative DR

Understand the model: Failures

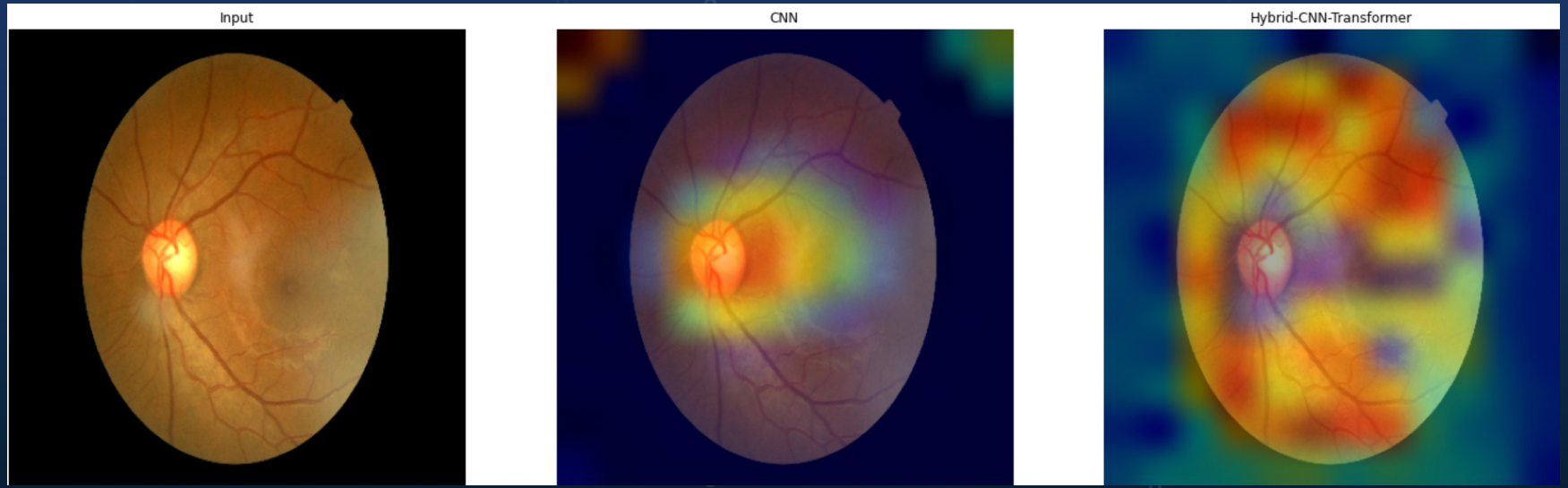


Moderate mistaken as Proliferative DR

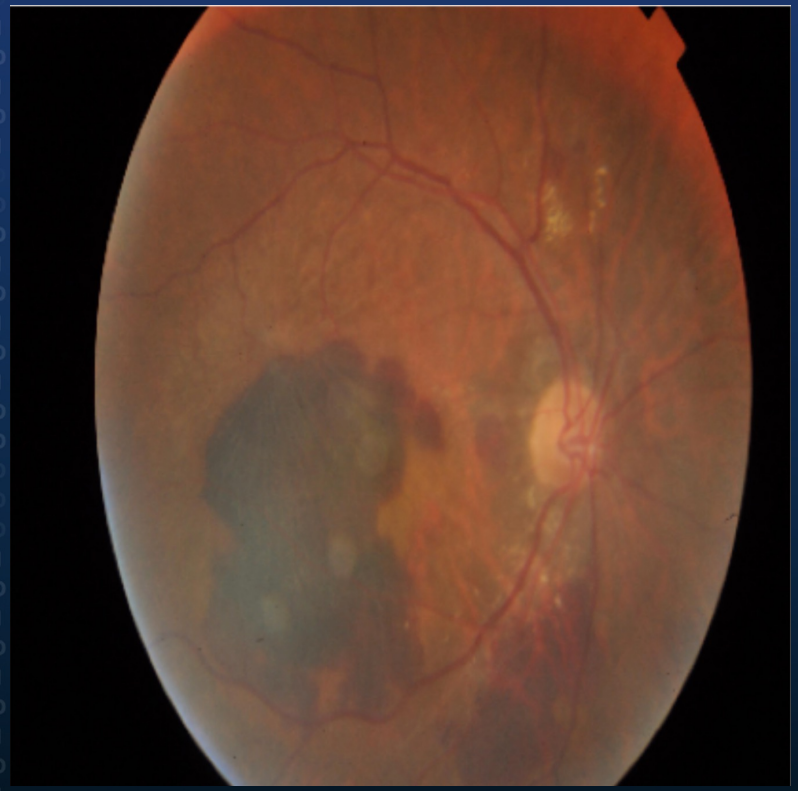
Understand the model: Success

No DR

Understand the model: Success

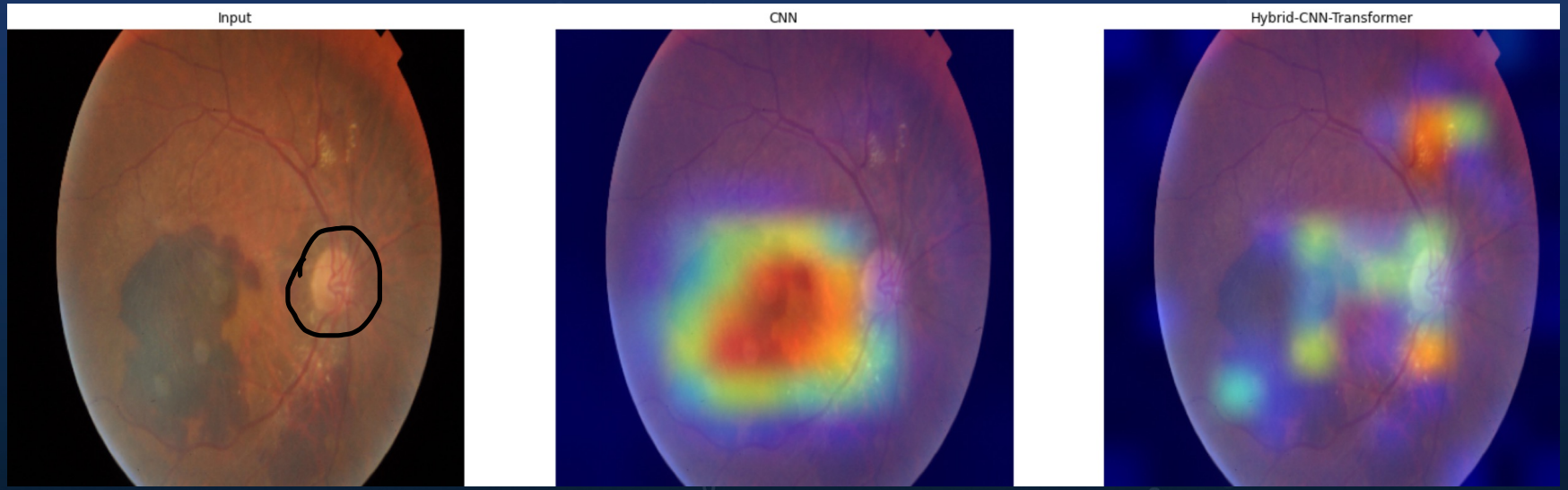


Understand the model: Success

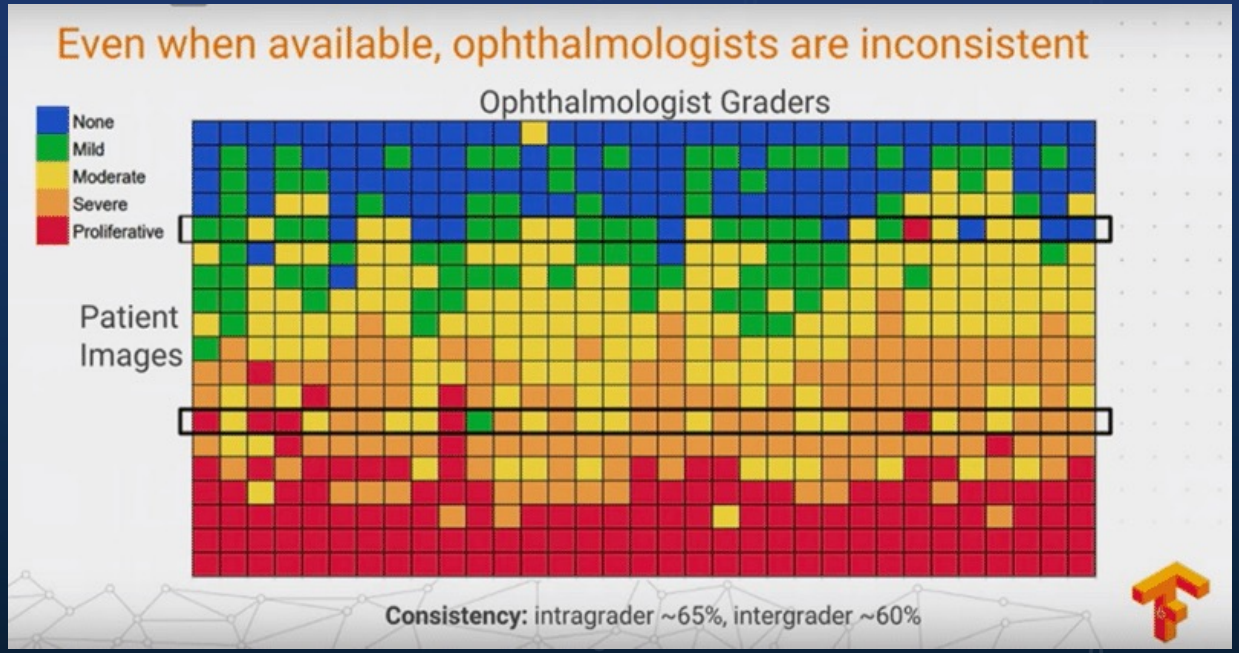


PDR

Understand the model: Success

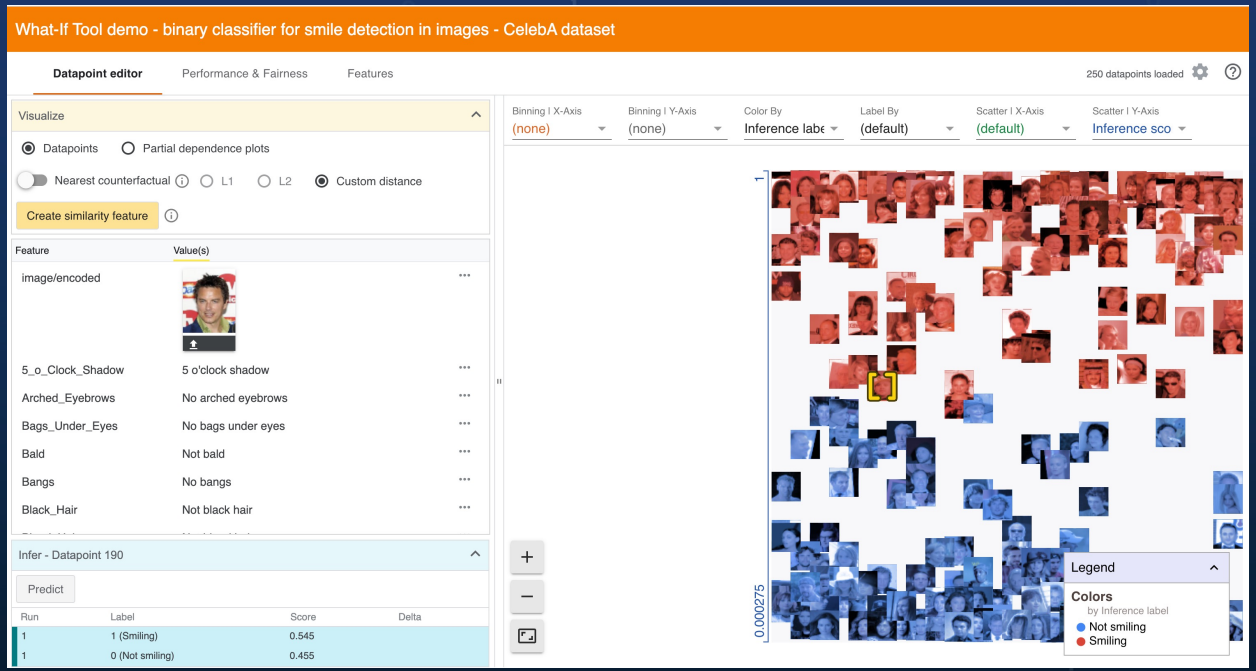


Challenges



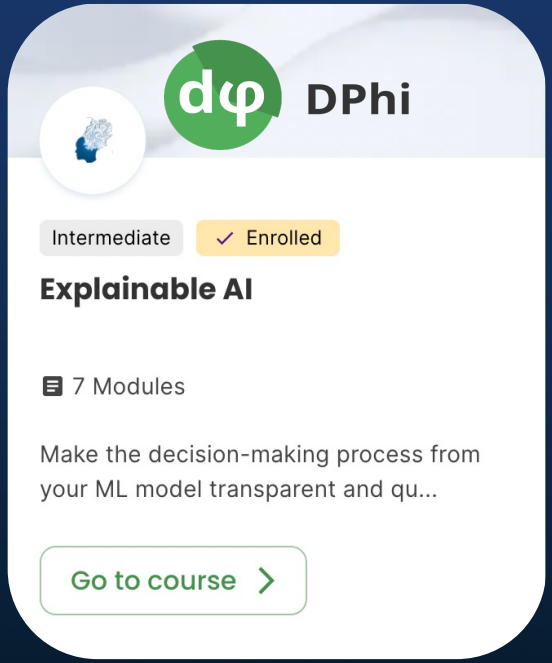
Google showed that ophtalmologists' diagnoses differ for same fundus image. *Source: (Krause et al., 2017)*

What-If



Source: https://pair-code.github.io/what-if-tool/get-started/

Resources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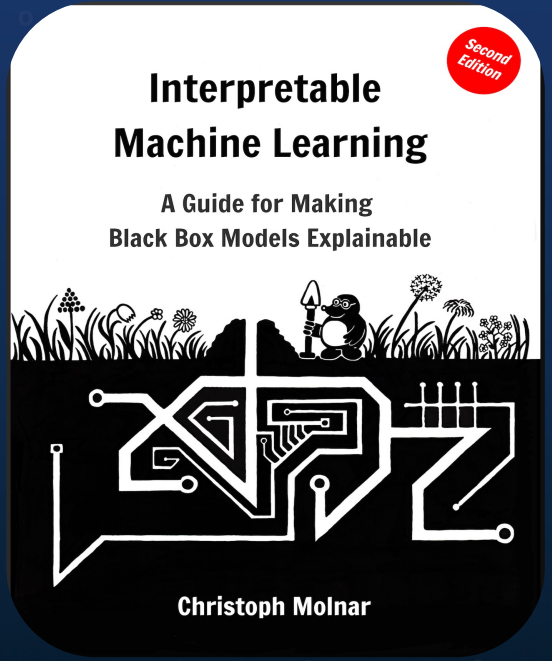
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Thank you! Questions?
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