**Professional Certificate in Machine Learning and Artificial Intelligence**

Module 20: Transparency and Interpretability

Model Card Analysis Exercise

The questions below will help you provide context for the Pima Indian Diabetes dataset. Provide answers where possible.

**Directions**

Answer the following questions related to these [example model cards](https://modelcards.withgoogle.com/model-reports) provided by Google. Questions 1-6 pertain to the face detection model, and questions 7-10 pertain to the object detection model.

1. What is the output of the face detection model?
   * Answer: For each face detected in a photo or video, the model outputs:

[Bounding box](https://developers.google.com/machine-learning/glossary#bounding-box) coordinates

Facial landmarks (up to 34 per face)

Facial orientation (roll, pan, and tilt angles)

Detection and landmarking confidence scores.

No identity or demographic information is detected.

1. What is the main model architecture?
   * Answer:  [MobileNet](https://ai.googleblog.com/2017/06/mobilenets-open-source-models-for.html) CNN fine-tuned for face detection with a [single shot multibox detector.](https://arxiv.org/pdf/1512.02325v5.pdf)
2. What metric is used to evaluate the model’s performance?
   * Answer: Area under the P-R curve [(PR-AUC)](https://developers.google.com/machine-learning/glossary/#PR_AUC)
3. Mention four limiting factors that may degrade the model’s performance.
   * Answer:

Face size

Face orientation

Lighting

Occlusion

Blur

1. If an image of resolution 1,000 x 1,000 takes ten seconds to process, how long will it take to process an image of resolution 100 x 100?
   * Answer: 0.1 second
2. Report the recall for faces taking one to five per cent of the image area for the Faces Labelled in the Wild (LFW) dataset when the threshold is set to 0.5.
   * Answer: 0.69
3. What is the main model architecture used in the Object Detection model?
   * Answer:  [Single shot detector](https://arxiv.org/pdf/1512.02325.pdf) model with a [Resnet 101](https://arxiv.org/pdf/1512.03385.pdf) backbone and a [feature pyramid network feature map.](https://arxiv.org/pdf/1612.03144.pdf)
4. What performance metrics are reported in the model card?
   * Answer:  model performance across 500+ different object classes and two different performance metrics: Average Precision (“AP”) and Recall at 60% Precision (“Recall@60%”).
5. List three factors that may limit the performance of the model.
   * Answer:

Object size

Things vs stuff

Lighting

Occlusion

Camera positioning

1. Report the average precision (AP) for the Open Images Validation (V4) dataset for each of the following objects:
2. Jet-skis
   * Answer: 0.6-0.7
3. Beer
   * Answer: 0.4-0.5
4. Bow and Arrow
   * Answer: 0.3-0.4
5. Briefcases
   * Answer: 0.3-0.4
6. Pizza
   * Answer: 0.6-0.7