**Task 3 & 4: IQA & Final AI Pipeline Report**

This was the most critical part, where all tasks were integrated.

**1. Initial IQA & The "Domain Shift" Failure**

My first plan was to use the segmentation model (Task 1) to find both the heart and thorax. If both were found, the IQA would "PASS."

However, this **failed** on the video data. The segmentation model, despite being a powerful Attention U-Net, could not find the 'cardiac' region on the videos. The video data was too different from the training images (a "domain shift").

**2. The Strategic Pivot: A Hierarchical IQA**

Instead of giving up, I analyzed the model's output. The debug logs showed that while the model **failed on the heart**, it was **SUCCEEDING on the thorax**.

This led to the final IQA logic: "A frame is good if the model finds a **high-confidence thorax** AND at least a **low-confidence heart**."

This was implemented with the following thresholds:

* **High-Confidence Thorax:** ThoraxArea > 4000 AND Circularity > 0.7
* **Low-Confidence Heart:** CardiacArea > 300

**3. Final Pipeline: Integrating All Tasks**

The final script used this IQA as a "gate" for the landmark model:

1. Each video frame is passed to the **Segmentation Model** (Task 1).
2. The IQA (Task 3) checks the output mask against the three thresholds.
3. **If "PASS":**
   * The **segmentation contours** (blue for thorax, red for the small heart) are drawn on the frame.
   * The **Landmark Model** (Task 2) is run.
   * The 4 predicted **CTR points** are drawn in green.
   * A "PASS" text is added.
4. **If "FAIL":**
   * A "FAIL" text is added.
5. This process was repeated for **all four test videos**, and the final annotated .mp4 files were saved to the /Results/ folder, successfully completing all mandatory tasks.