Report Oil Spill Detection

Team Name:

Team-1

Team Members:

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Dataset Used:

Oil Spill Detection Dataset (custom dataset consisting of SAR images of ocean surfaces with oil spills and clean water).

Model Used:

yolo11n-seg (segmentation variant of YOLOv11)

Trained Weights Path:

"C:\Users\leela\OneDrive\Desktop\oil spill detection\runs\detect\train8\weights\best.pt"

Confidence Used:

0.10, 0.25, 0.40 (tested); final chosen: **images → 0.25**, **video → 0.40**

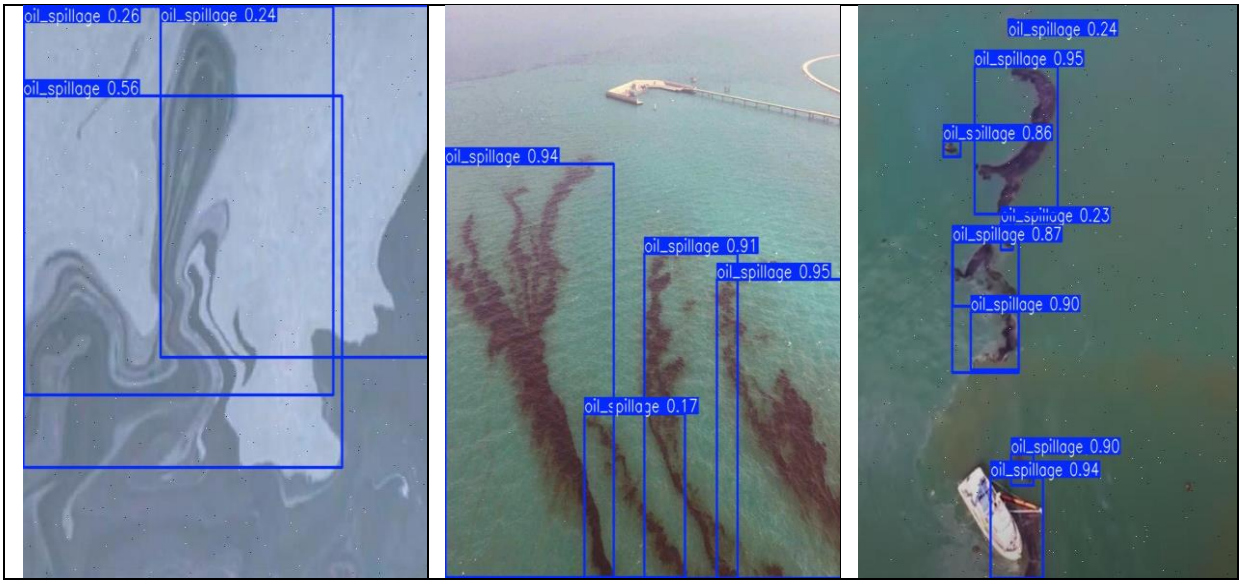
Outputs generated (example folders)

- outputs_conf025/images_annotated/ — annotated images (visual overlays)
- outputs_conf025/masks/ — combined and per-instance masks
- outputs_conf025/metrics/images_summary.csv — image, num_instances, spill_area_ratio
- outputs_conf025/videos_annotated/<video>_ann.mp4 — annotated video
- outputs_conf025/video_hit_frames/<video>/ — frames where oil was detected

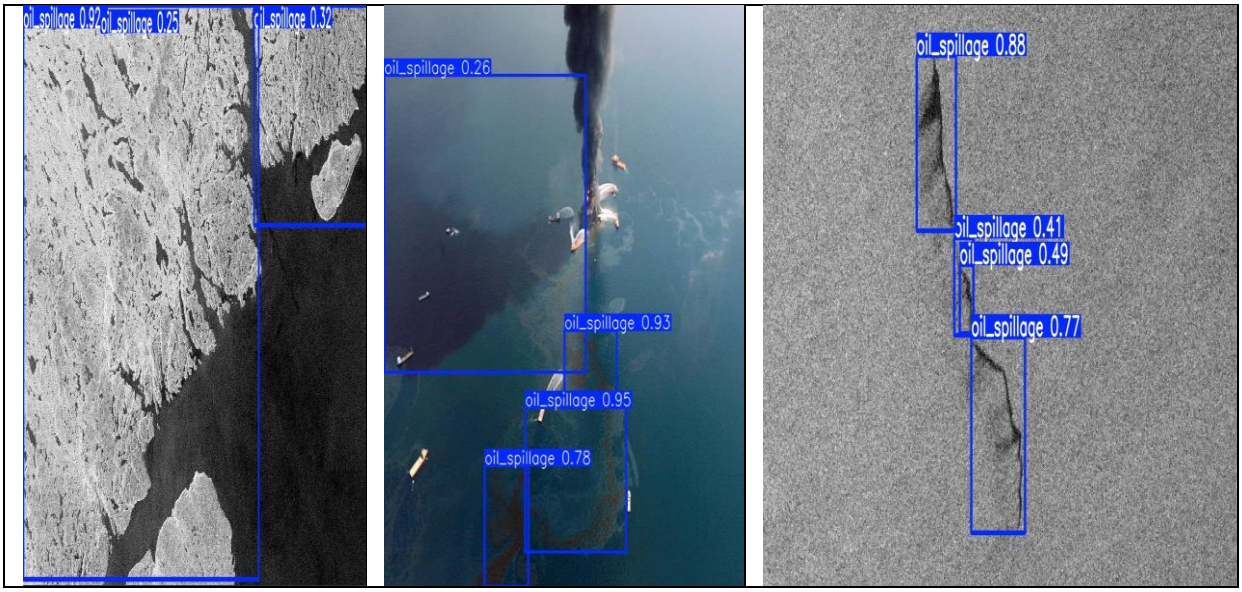
Example Good Detections:

Images:

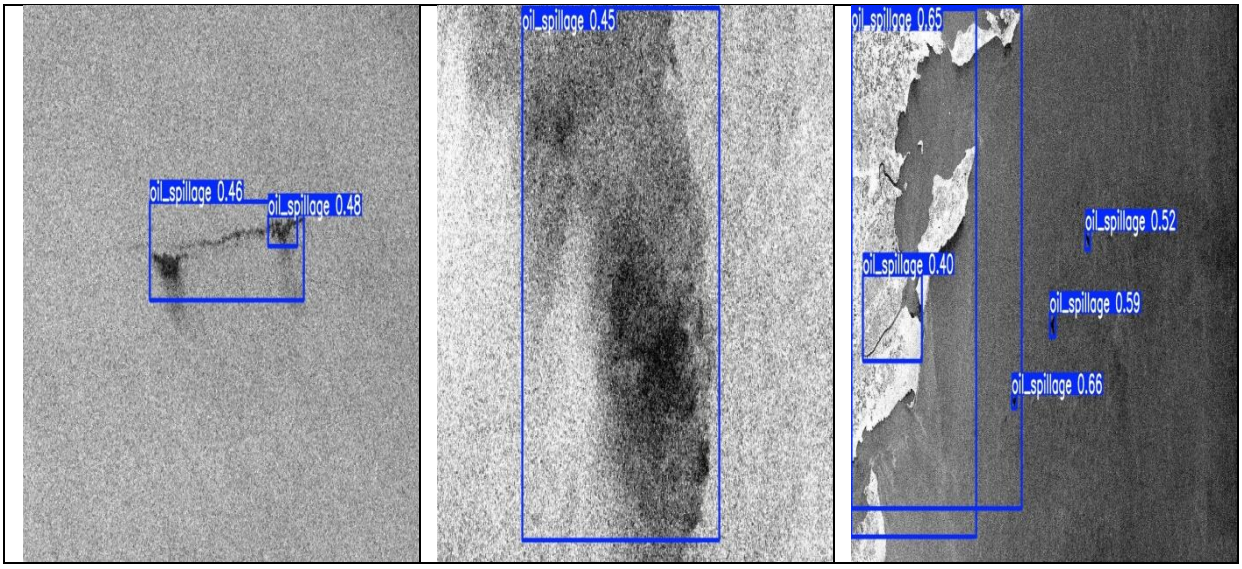
Confidence 0.10: -



Confidence 0.25: -

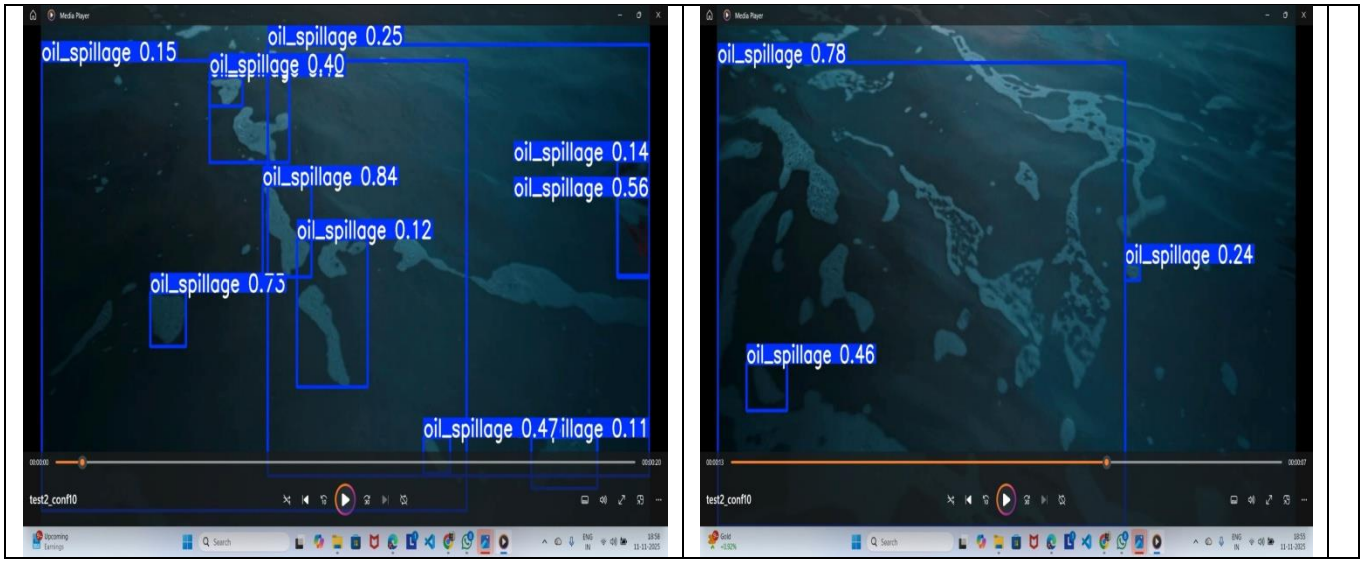


Confidence 0.40: -

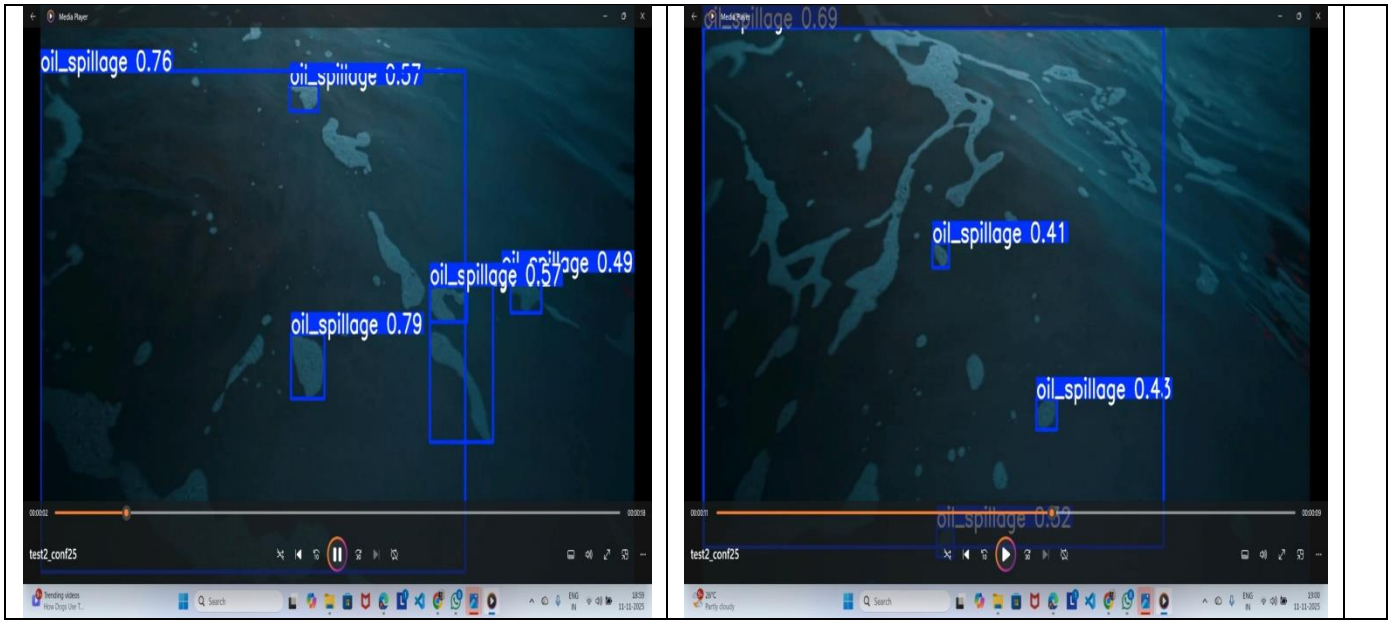


Video frames:

Confidence 0.10: -



Confidence 0.25: -

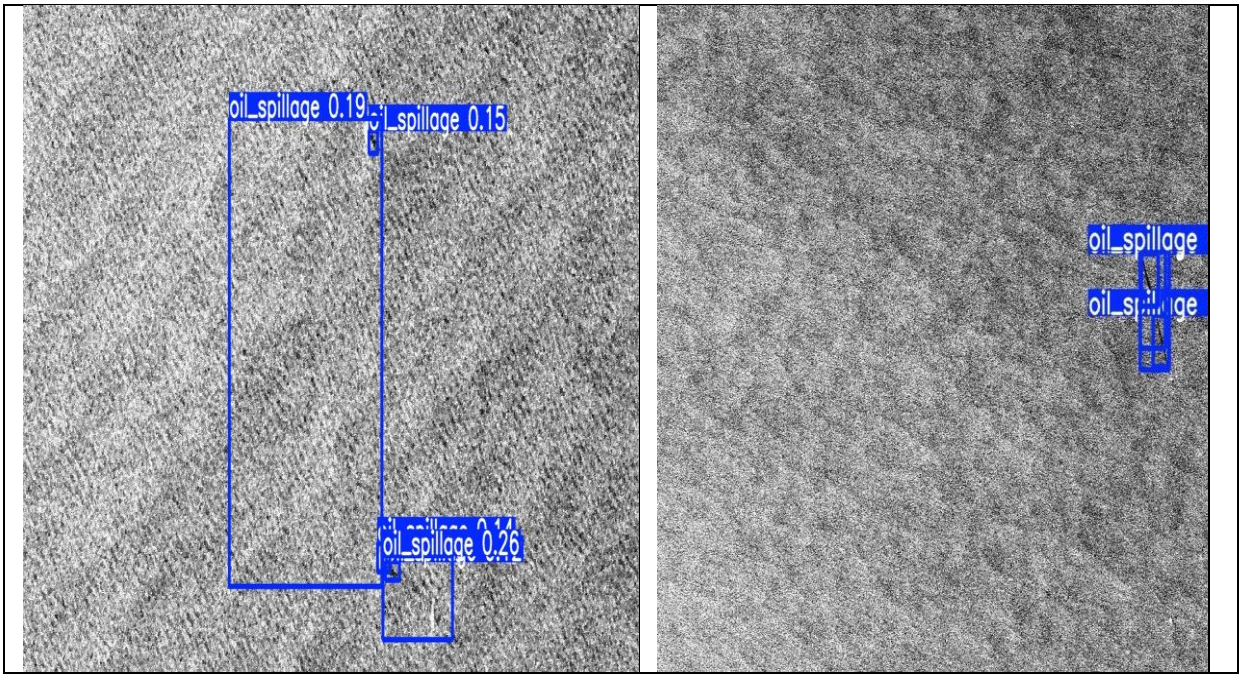


Confidence 0.40: -

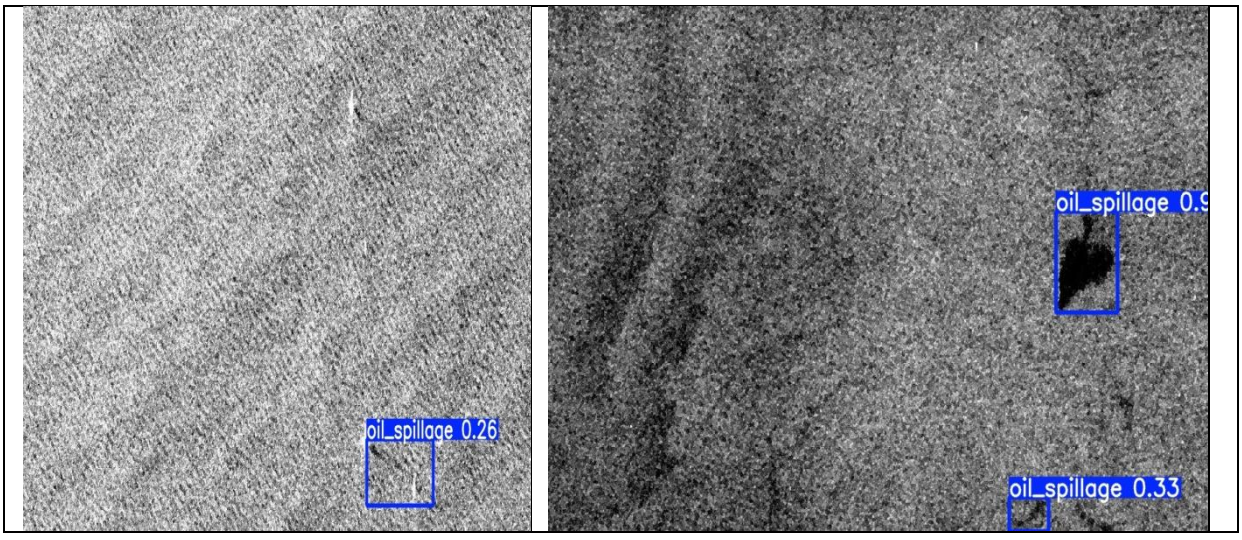
Example Weak/Failed Detections:

Images:

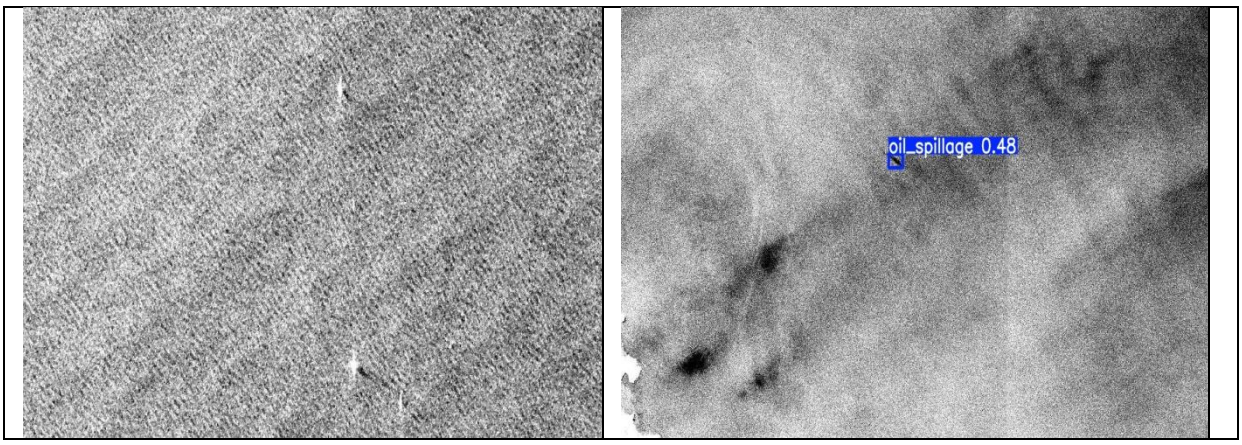
Confidence 0.10: -



Confidence 0.25: -

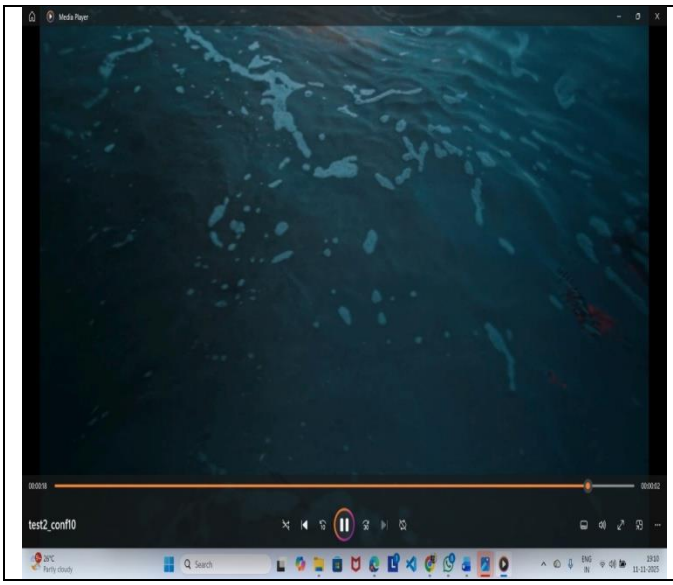


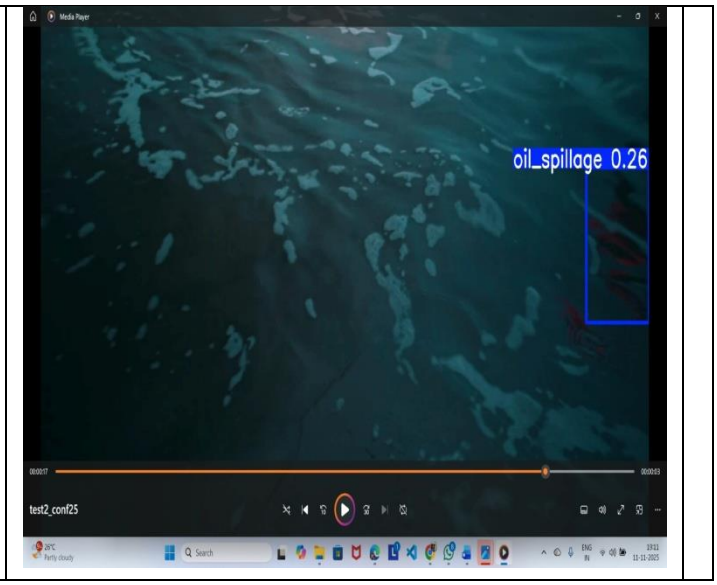
Confidence 0.40: -

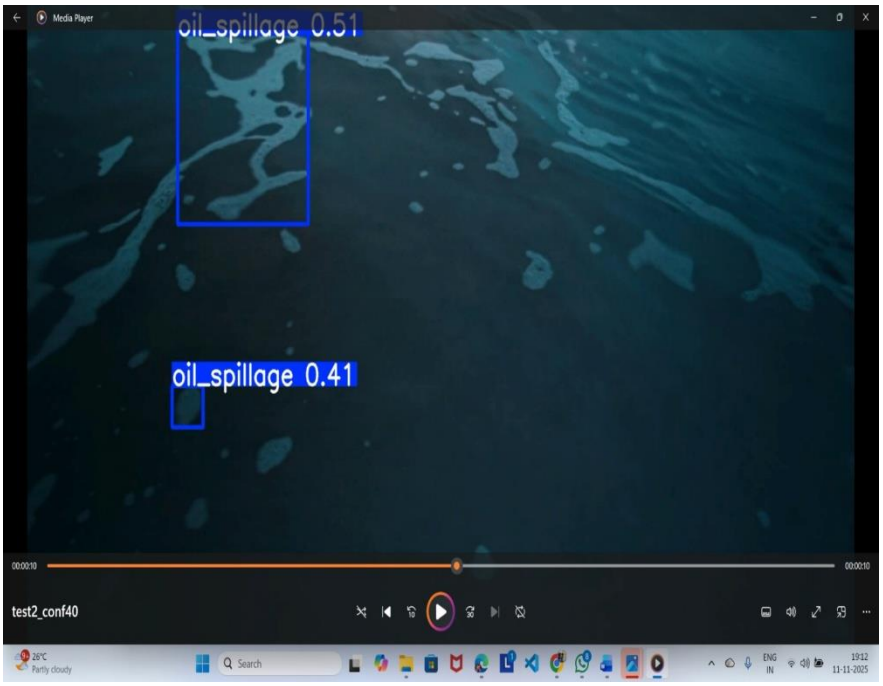


Video frames:

For all confidence values : -







Observations

Works well when:

- Oil spill area is clearly visible with high contrast against water.
- Image resolution is good and lighting conditions are clear.
- Background is less complex or uniform (open sea regions).

Struggles when:

- Spill area is very small or mixed with wave reflections.
- Cloudy or low-light images reduce segmentation accuracy.
- Background clutter and noise confuse the model.

Confidence-level summary & rationale

- **At 0.10**: The model detected almost everything, but there were many false detections.
- **At 0.25**: The results were better, with fewer wrong detections and most oil spills correctly identified.
- **At 0.40**: The detections became more accurate and cleaner, though a few smaller spills were missed.

Final:

- **Images — best confidence:** `0.25`
- **Video — best confidence:** `0.40`

Key Takeaway:

The YOLO11 segmentation model effectively detects oil spills in marine images, especially with clear boundaries. Further dataset expansion and fine-tuning can improve performance on noisy or low-quality images.
