

Assessment Task: Advanced Video Analytics & Sports Evaluation Design

Part 1: Fish Detection in Underwater Video

Objective

Develop an API capable of detecting and tracking fish in an underwater video. The system should handle challenges like poor image quality, occlusion, and motion blur, and it should count the number of fish detected throughout the video.

Requirements

Input: A provided underwater video file (you can share a suitable video or specify that the candidate selects one from publicly available sources).

Output:

1. Detection:

- Detect fish in the video using a suitable pre-trained model (e.g., YOLO, Faster R-CNN, or any open-vocabulary detection model).
- Apply image processing techniques (e.g., contrast adjustment, denoising) to enhance video quality and maximize detection accuracy.

2. Tracking:

- Track detected fish consistently across frames using a tracking algorithm (e.g., DeepSORT, ByteTrack, or similar).
- Ensure robustness against occlusion and movement out of frame.

3. Counting:

- Count the total number of unique fish detected in the video (as much as you can, the exact number is not so important).
- Ensure the system avoids double-counting fish when they reappear after being occluded.

4. Summary Report:

- Include metrics such as:
 - Total number of unique fish detected.
 - Instances of tracking continuity issues (e.g., fish treated as new entries after being occluded).
 - System performance (e.g., FPS).

Implementation:

- **API Development:**

- Use a framework like Flask or FastAPI to create the API.
 - The API should:
 - Accept video files as input.
 - Process the video for fish detection and tracking.
 - Return:
 - A processed video with overlaid bounding boxes and IDs for tracked fish.
 - A summary report (JSON or plain text).
 - Include robust error handling for unexpected inputs or large file sizes.
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Submission:

1. Share your code in a private GitHub repository, granting access to az@see.com.co.
2. Include:
 - A functional API with clear setup instructions in a README file.
 - Documentation of your design decisions, including:
 - Detection and tracking methods chosen.
 - Optimizations for detection, tracking, and image processing.

Part 2: Presentation Task

Objective

You are tasked with designing an evaluation system for swimming performance. Swimming involves a combination of technical precision, physical endurance, and hydrodynamics, requiring a robust system to analyze and improve athlete performance. Create a presentation outlining your approach.

Requirements for the Presentation

Introduction:

- Briefly introduce the objective of building a swimming performance evaluation system.
- Highlight key challenges, such as underwater visibility, swimmer movement tracking, and capturing hydrodynamic metrics.

Project Steps:

- **Metrics to Evaluate:**
 - Define the key performance aspects to be assessed, such as:
 - Stroke efficiency.
 - Swim speed and acceleration.
 - Stroke rate and symmetry.
 - Turns and underwater phases.
 - Include metrics specific to swimming techniques (e.g., freestyle, backstroke).
- **Data Acquisition:**
 - Detailed methods for sourcing data, such as underwater cameras, wearable sensors, or other devices.
 - Address how to handle data availability issues, like relying on publicly available videos or simulated data.
- **Data Annotation:**
 - Discuss methods for annotating swimming data, ensuring accurate labeling for key elements like body positions, stroke phases, and turns.
- **Model Training:**
 - Outline your plan for using computer vision or biomechanical models to analyze swimming-specific metrics.
 - Discuss whether pre-trained models (e.g., for pose estimation or motion analysis) could be adapted.

- **Deployment Considerations:**

- Explain how the system would be implemented in real-world settings, such as:
 - Use in training pools with cameras.
 - Real-time feedback systems for athletes and coaches.
 - Post-training analysis via cloud-based tools.

Challenges and Solutions:

- Identify technical and practical challenges, such as:
 - Poor underwater visibility affecting data quality.
 - Handling occlusions caused by splashing or other swimmers.
 - Managing computational demands for real-time processing.
- Propose solutions for these challenges, such as advanced image enhancement, multi-camera setups, or lightweight models.

Closing Slide:

- Summarize your approach and its expected impact on improving swimming performance analysis.
- Highlight any innovative features or methods in your system.

Format:

- Submit the presentation as a PowerPoint or PDF file.
- Focus on clarity, depth of analysis, and practicality.

Deadline

You have one week to complete this task.

Support

In case of any issues or inquiries, please contact me directly via LinkedIn or email at az@see.com.co.

Submission

Once you have completed the task, please share your code and presentation, then schedule a review meeting using the following link:

<https://vsg9vtf0m5to.larksuite.com/scheduler/1f985c007e376894>

Good luck!

