Team C5
PoolTracker DDR

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Overview

A swimming pool motion tracking system that enables speed, split, and stroke classification at an individual swimmer level

ECE Areas covered:

- Signals and Systems
- Software Systems

Use Case

01	**Recreational Swim Facilities**	• Offer this as a service to individual swimmers • Allow them to track workouts without a coach on deck
02	**Swim Coaches**	• Monitor and build database of all swimmers on team • Analyze data to track swimmers' progress and coach intelligently
03	**College Club Swim Teams**	• Don't have funding to hire a real coach • One-time investment to provide instant feedback to swimmers

Requirements

1. Successfully track a swimmer within the pool
    a. Successfully track multiple swimmers concurrently
    b. Detect limbs on an individual swimmer
2. Classify which stroke each swimmer is performing
    a. Create pattern recognition model
3. Measure distance, speed, and splits of a swimmer
    a. Distinguish between wall touches and rest
4. Create web app interface for data analysis

Solutions Approach

Obtaining footage

- High-definition aerial footage of a pool
- Something similar to footage of Olympics, except with zoomed-out shots of entire pool
- Potentially make our own footage at the CUC pool

Identification of swimmers

- Image processing to determine location of swimmers in pool using OpenCV
- Limb detection, using OpenPose

Classification and tracking

- Identify which stroke a swimmer is swimming
- Track swimmer's progress and collect data about speed, splits, distance, and rest

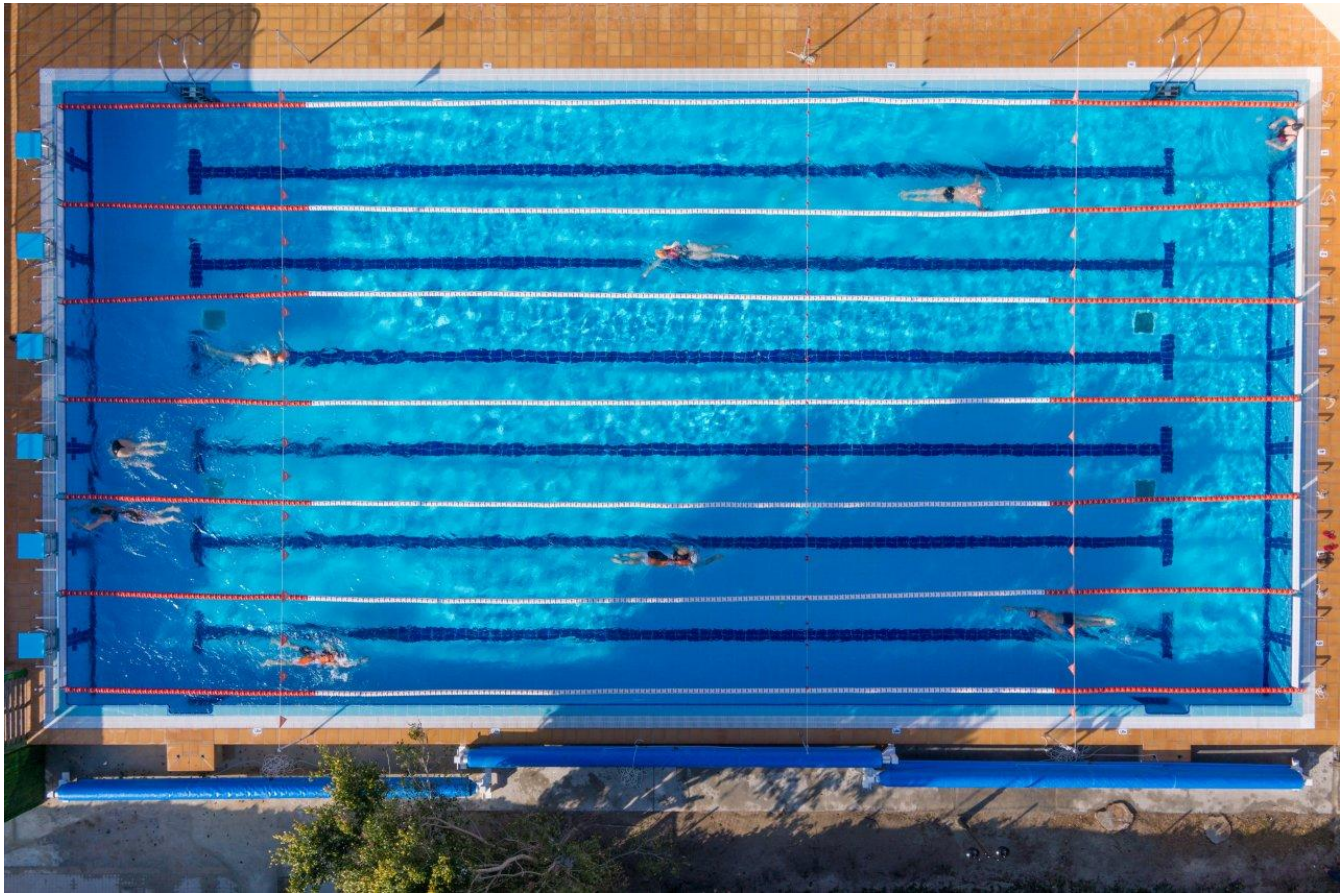
The identification of swimmers and the classification task will require some additional hardware. We plan to use an AWS GPU instance for enhanced computation abilities

Solutions Approach contd.

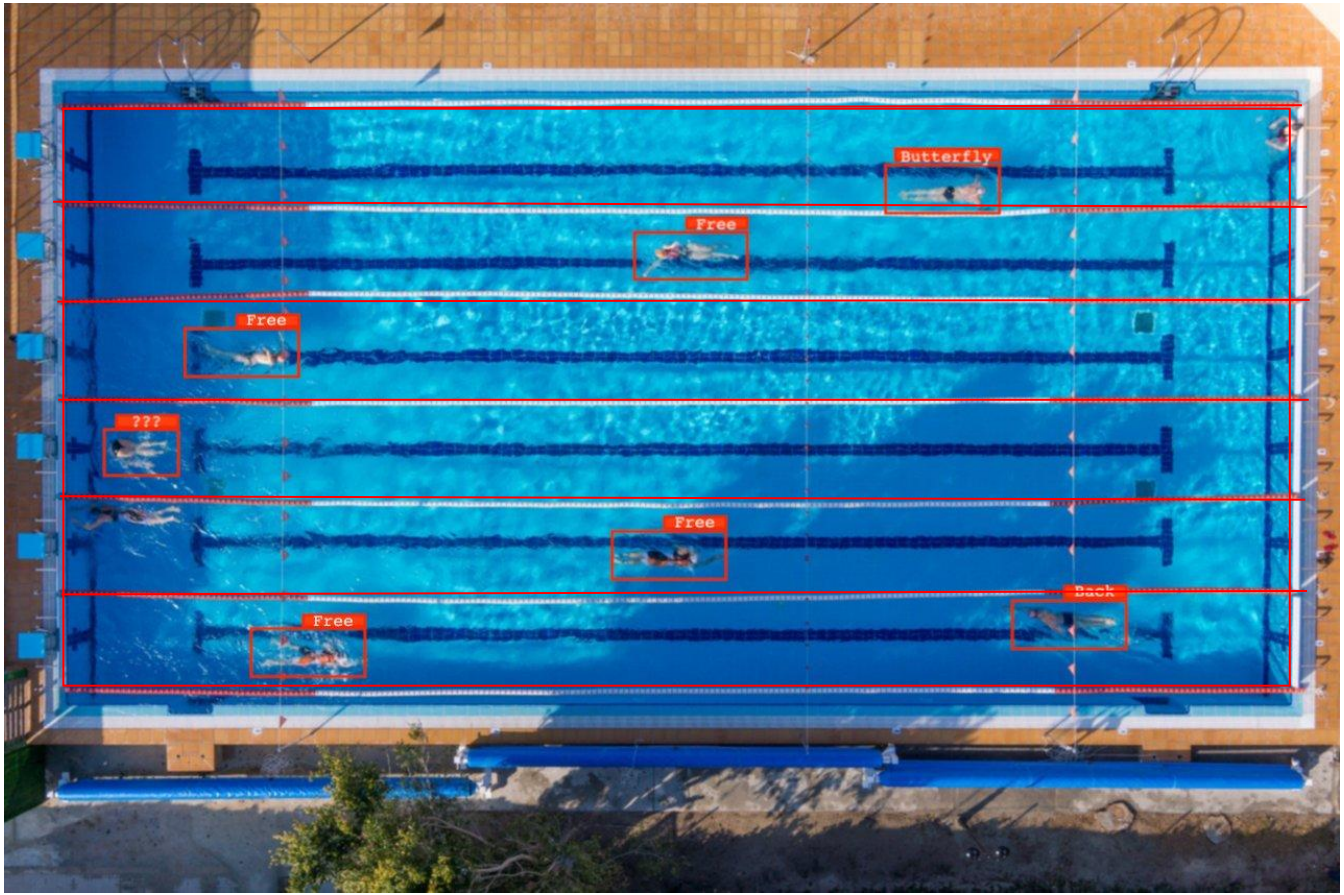
Information Transfer

- Develop django based web app that that presents measured info to user
- Purchase another AWS instance that can host this web-app

Example Input



Example Output



Testing and Verification

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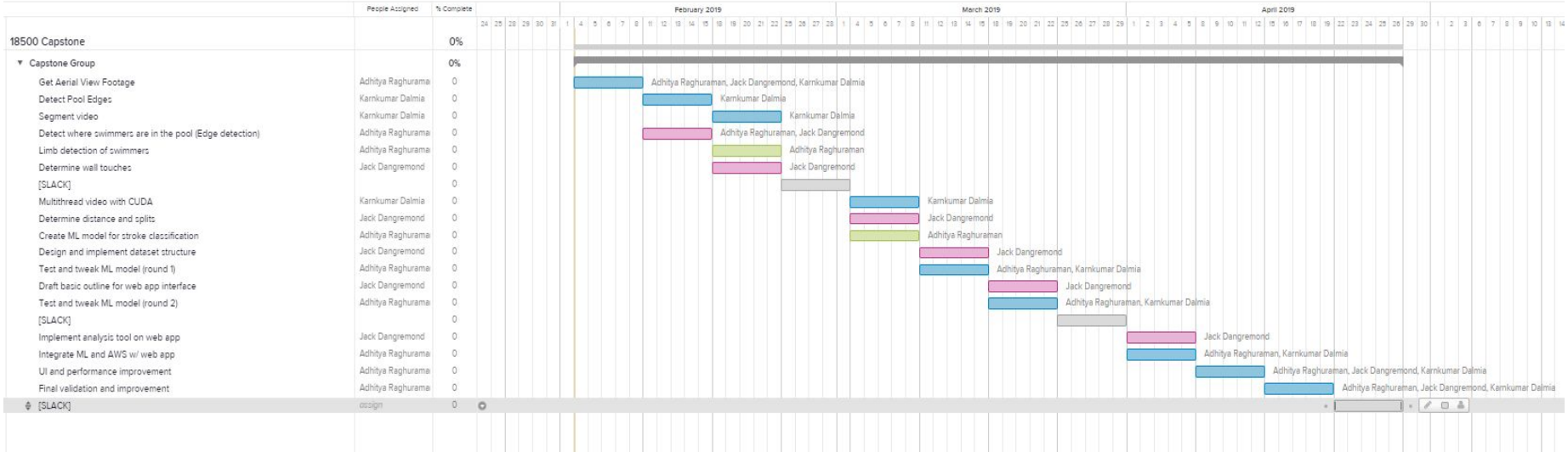
Tests:

1. Check if our algorithm pinpoints location within a foot radius
    a. Same as above. Need to simply check if individual tracking information is accurate.
    b. This is done by manual inspection.
2. Curate a dataset containing limb movement patterns and corresponding classifications, split this into train/test and measure accuracy on test
3. Use data available with the footage as our ground truth (if data not available, need to time manually)
    a. Ensure that our timer doesn't count rest as successive wall touches
4. This is again done by manual inspection

Metrics

- Determine location of a swimmer to within one foot
- Get lap time and rest time to within .5 second accuracy
- Detect limbs on at least 50% of the frames
- Classify the correct stroke for a lap at least 80% of the time

Division of Tasks and Schedule



Q&A