YOLO-BS Hockey Player Tracker

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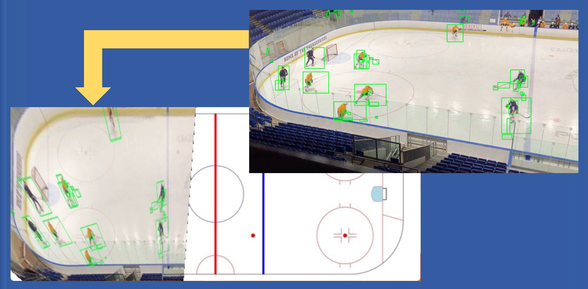
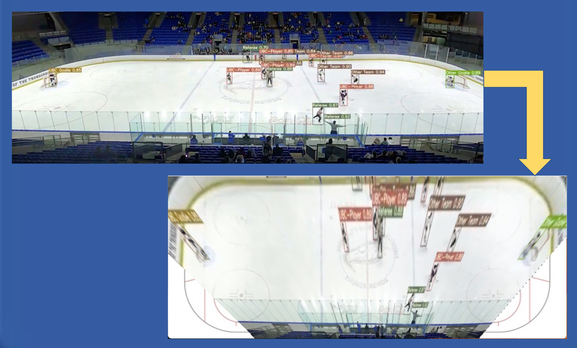
Motivation

- Analytics can provide an objective evaluation of hockey players and teams
- Student volunteers collect data for the UBC Thunderbirds Hockey Team
- Volunteers cannot attend every game
- An automated data collection system would allow the analytics team to absorb volunteer absences more easily
- Computer vision is cheaper and less invasive than physical sensors

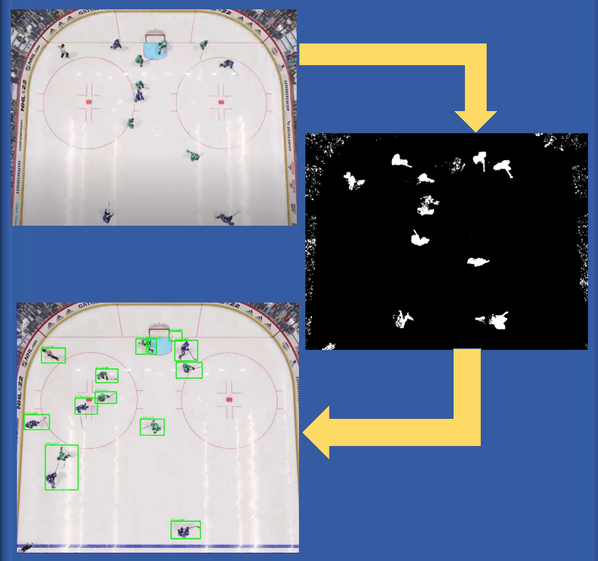
Homography

Homography is a method of perspective transformation that allows us to map any image of the hockey rink to a 2D virtual rink.





BS Method



The Background Subtraction (BS) method works by subtracting RGB color values of the previous frame from the current frame. If any individual pixel changes significantly those pixels are set to white while the others are set to black. Bounding boxes are then drawn around the largest white objects.

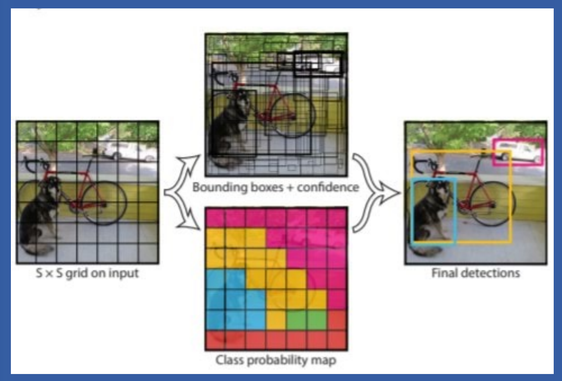
Velocity Data Extraction

To find a player's velocity, you have to track their identity between frames. To do this, we checked the smallest distance between detections over time.

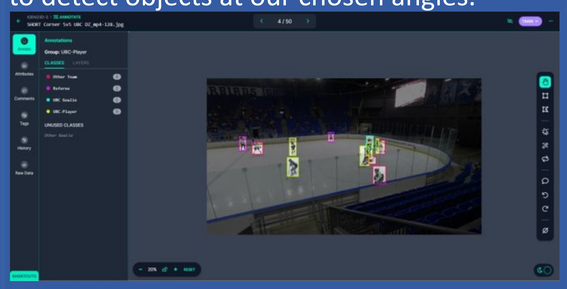
$$V = \frac{\Delta \text{ Distance}}{\Delta\, t_{frame}}$$

YOLO Method

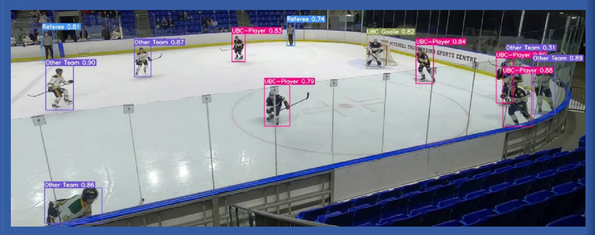
YOLO is an algorithm designed to track objects in a video or image.



Using a machine learning tool, Roboflow, we trained YOLO to distinguish between the UBC players, their opponents, and the referees. Roboflow also allowed to train the algorithm to detect objects at our chosen angles.

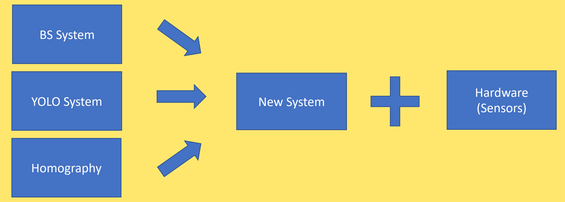


In our YOLO files, we then adjusted the confidence thresholds, box sizes, labels and their positioning, as well as the epochs. This process was repeated for all three selected angles.

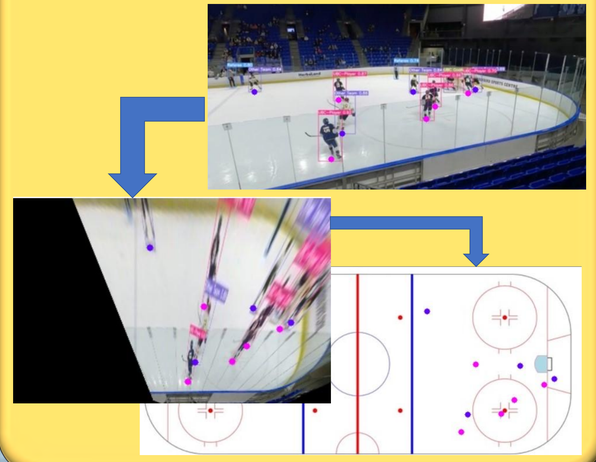


Conclusions & Next Steps

Combining the systems shown below, we can create a new system to increase tracking confidence, working in collaboration with accelerometers.



Mapping side view to top view X-Y coordinates with homography application



Acknowledgements


Dr. Adam Clansey


Dr. Jim Little


Dr. Jon Nakane


Dr. Nobo Yonemitsu


Dr. Lyndia Wu


Dr. Joseph Yan

Special thanks to the UBC Thunderbirds Hockey Team for allowing us to film their games and practices.