FishTrack22: An Ensemble Dataset for Multi-Object Tracking Evaluation

Matt Dawkins[1], Matthew Campbell[2], Jack Prior[2], Robin Faillettaz[3], Julien Simon[3], Matthew Lucero[4], Thompson Banez[4], Benjamin Richards[2], Audrey Rollo[2], Mary Salvi[1], Bryon Lewis[1], Brandon Davis[1], Rusty Blue[1], Anthony Hoogs[1], Aashish Chaudhary[1]

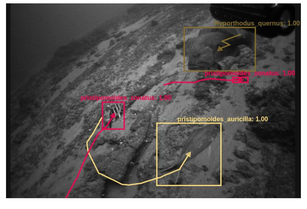
[1]Kitware Inc [2]NOAA Fisheries [3]Ifremer [4]California Department of Fish and Wildlife

Dataset Overview and Goals

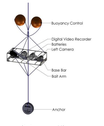
- Contains approximately 1 million frames and boxes across 40k tracks, in csv or json formats, divided into pre-made train/test split
- Useful for comparing different object trackers and motion detectors
- Hosted at viame.kitware.com (Datasets/FishTrack) and IPFS
- Currently contains data from 4 organizations, but planning to expand over next month before final release
- Covers ~250 species, though not all data has species labels

Data Collection and Platforms

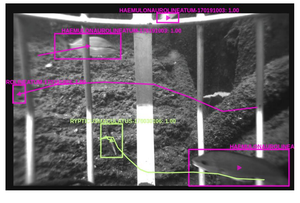
- Mix of off-the-shelf and custom baited or unbaited platforms



NOAA PIFSC MOUSS Camera System

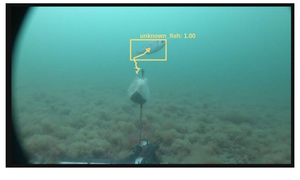


(Hawaii)



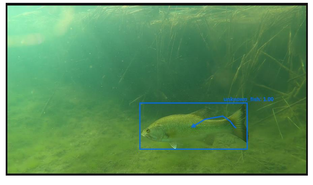
NOAA SEFSC SeaMap Camera System

(Gulf of Mexico)



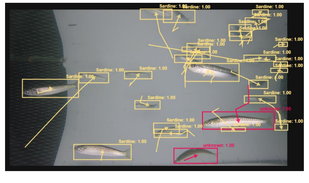
Ifremer Drop Camera

(Gulf of Biscay)



CDFW Drop Camera

(California Lakes)



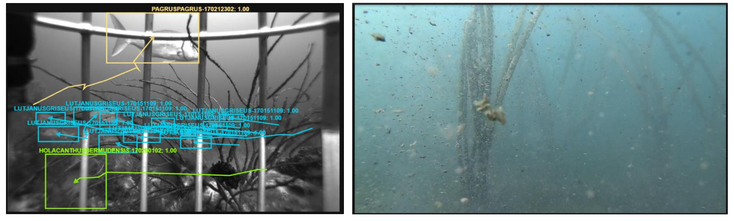
Ifremer Game of Trawl

(Gulf of Biscay)

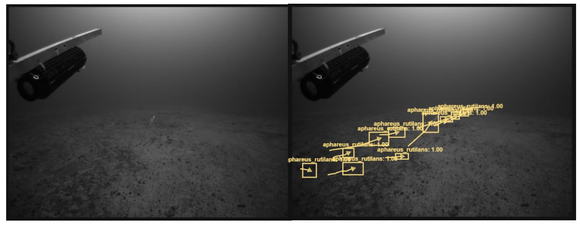
For additional questions: matt.dawkins@kitware.com

Dataset Challenges:

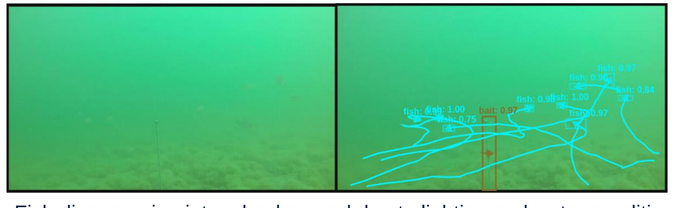
- Mix of color and greyscale imagery



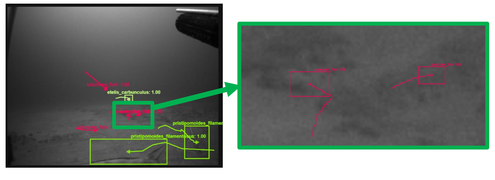
- Schools of fish with many overlapping targets and occlusions (left)
- Other moving objects such as debris, sediment, and marine snow (right)



- Low-contrast movers against dynamic natural backgrounds



- Fish disappearing into a background due to lighting and water conditions



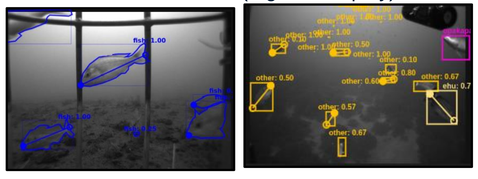
- Very small, low-SNR targets which are usual only observable from a slight motion via moving the video slider back and forth in annotation software

Software Utilities and Baselines

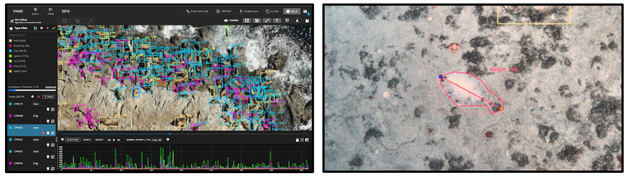
- Included on viametoolkit.org are baseline detectors [1] (only with basic motion channels added) and trackers [2] trained on dataset, alongside scoring and evaluation utilities for evaluating performance
  - Displays metrics such as Pd, FAR, Track Continuity/Purity
- Also included are open-source desktop and web annotators [3] which support either manual annotation or refining algorithm outputs
  - Note: also incorporating data from other annotation tools into set

Future Work

- Add segmentation masks and head-tail positional information
  - Using a combination of automatic (e.g. box to poly) and manual methods



- Add other ensemble datasets (e.g. AnimalsFromTheAir, FishID)



References

[1] Cai, Zhaowei, and Nuno Vasconcelos. "Cascade r-cnn: Delving into high quality object detection." Proceedings of the IEEE conference on computer vision and pattern recognition. 2018.

[2] Sadeghian, Amir, Alexandre Alahi, and Silvio Savarese. "Tracking the untrackable: Learning to track multiple cues with long-term dependencies." Proceedings of the IEEE international conference on computer vision. 2017.

[3] Dawkins, Matthew, et al. "An open-source platform for underwater image and video analytics." 2017 IEEE Winter Conference on Applications of Computer Vision (WACV). IEEE, 2017.