

Leveraging stock assessment survey data and machine learning to advance electronic monitoring programs in the northeast US

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NOAA FISHERIES
Northeast Fisheries Science Center



Project Introduction

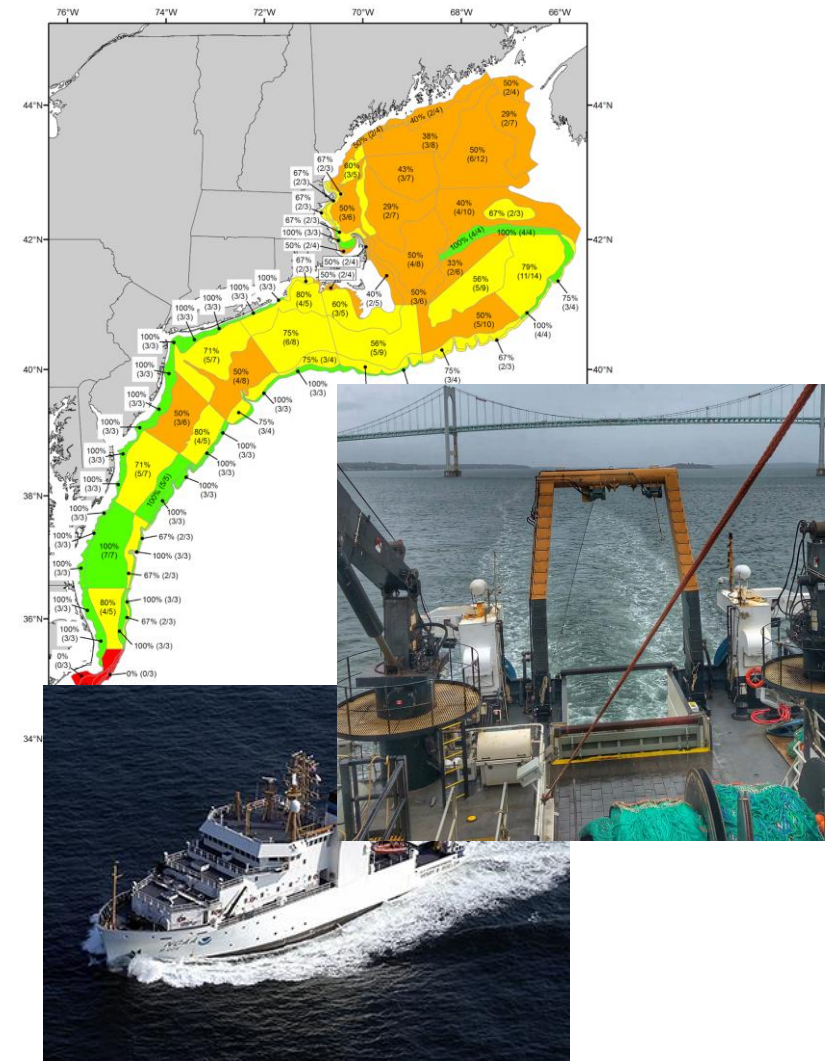


Acknowledgments:

- NEFSC Survey Staff, who do all the hard work to collect the data, as well as cleaning and reporting from the Fisheries Scientific Computer System (FSCS)
- CVision annotation staff for initial box drawing and wrangling
- Brett Alger (NOAA), Chris McGuire (TNC), Nichole Rossi (NOAA), Andy Jones (NOAA) for helping get this project off the ground

Aim: Leverage the bottom trawl survey aboard R/V Henry B. Bigelow to collect a library of videos suitable for training machine learning algorithms

Approach: Install cameras over three sampling stations and conveyor to gather data, matched with ground truth from FSCS software



<http://www.nefsc.noaa.gov/esb/>

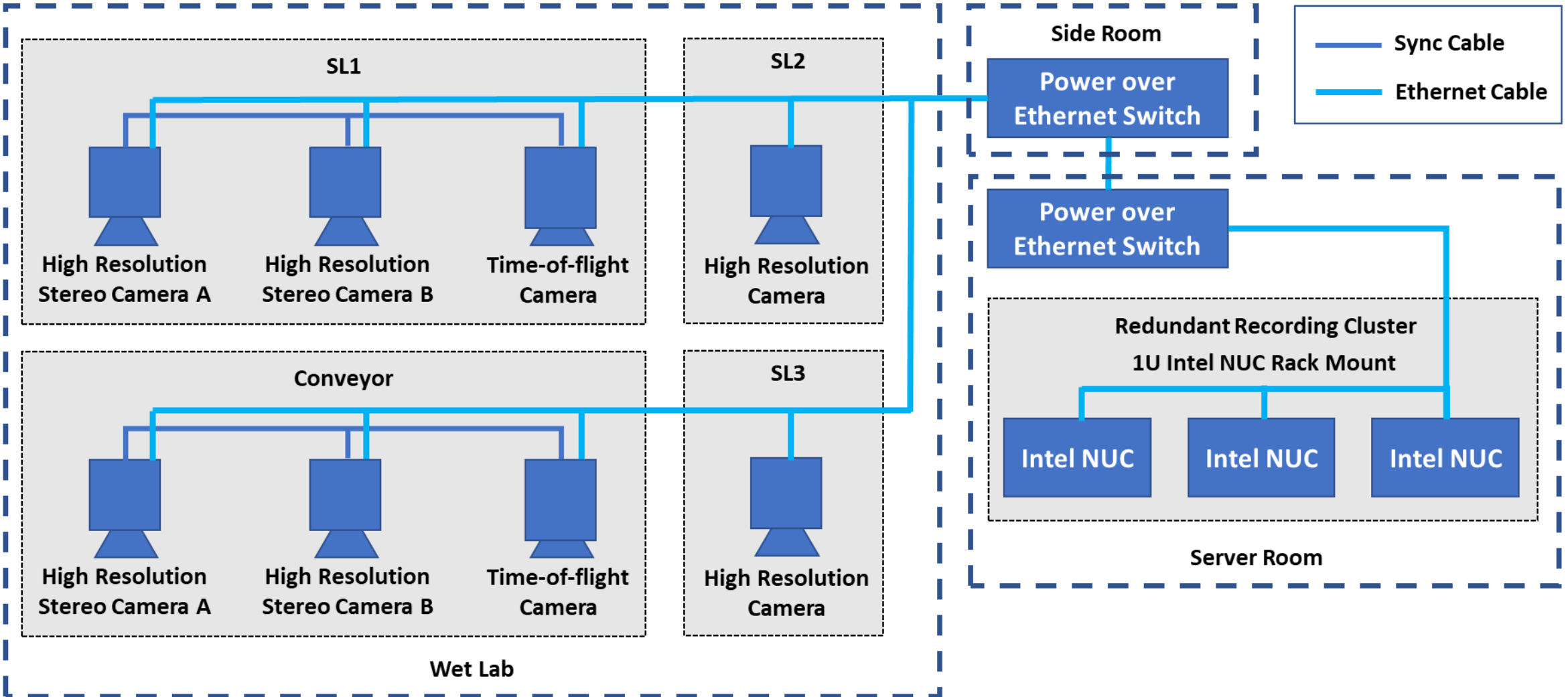
Sampling stations (converting to collect video)



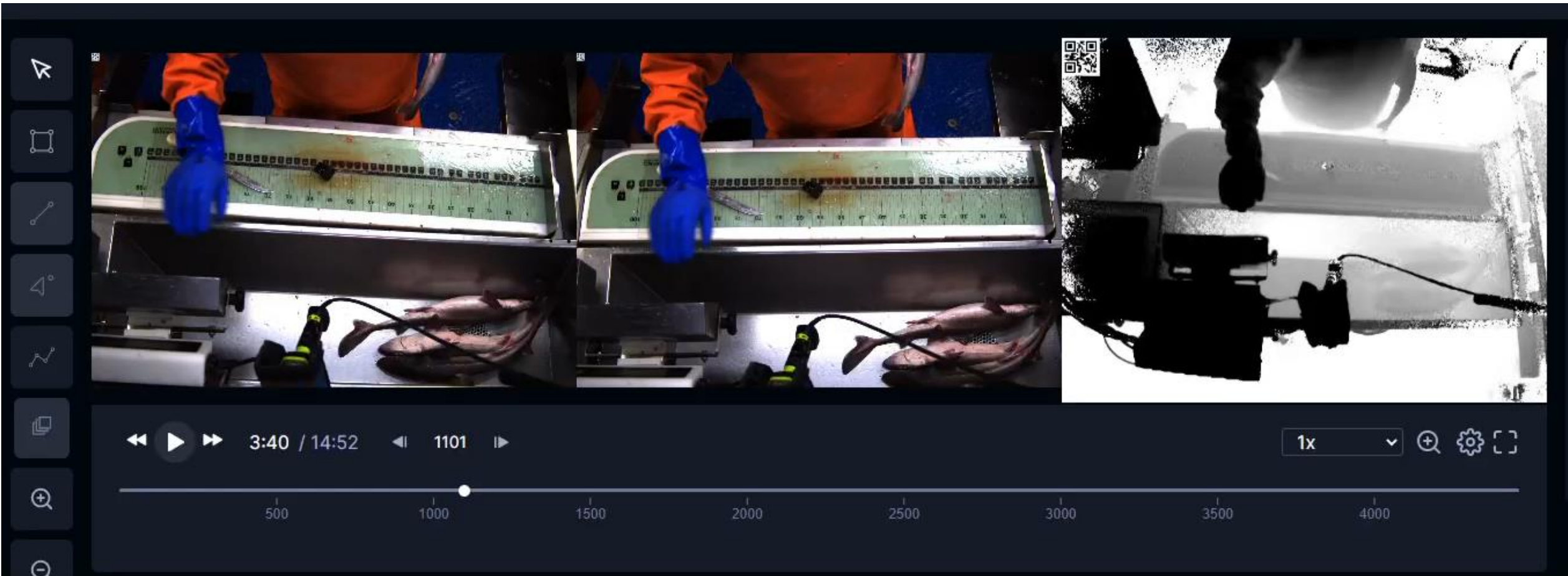
- **Goal:** Capture images of samples as they are being processed (length and other information in being taken)
- **Focus:** Getting views of fish that are lateral like the views being generated by EM data
- **Bonus:** View of conveyor that is similar to conveyors carried by commercial vessels



System Diagram



Stereo + Time of Flight Footage



New England Groundfish Dataset Statistics



1622

Total hours of video
w/activity

363

Species
represented

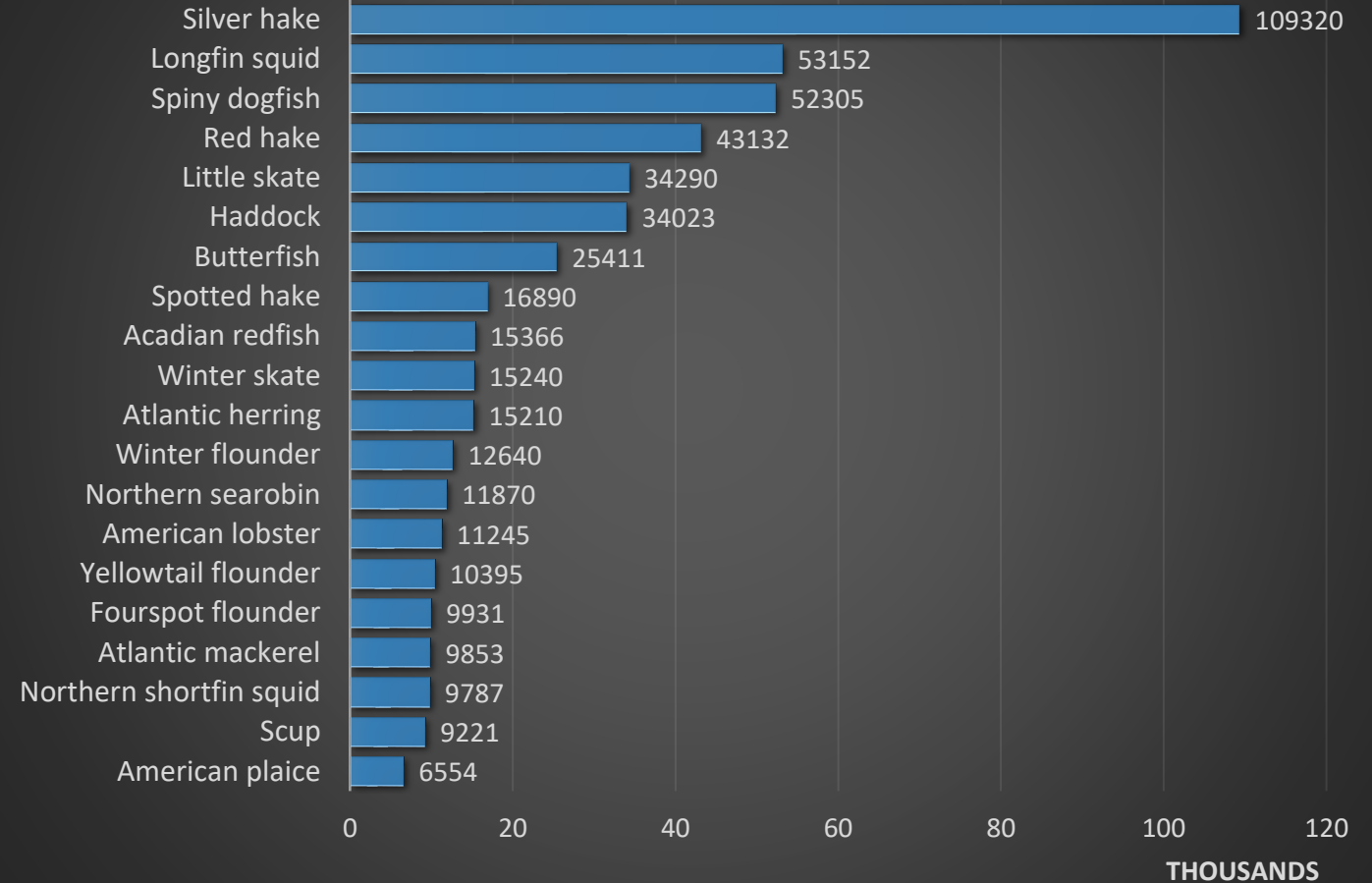
657k

Correlated measurement
events

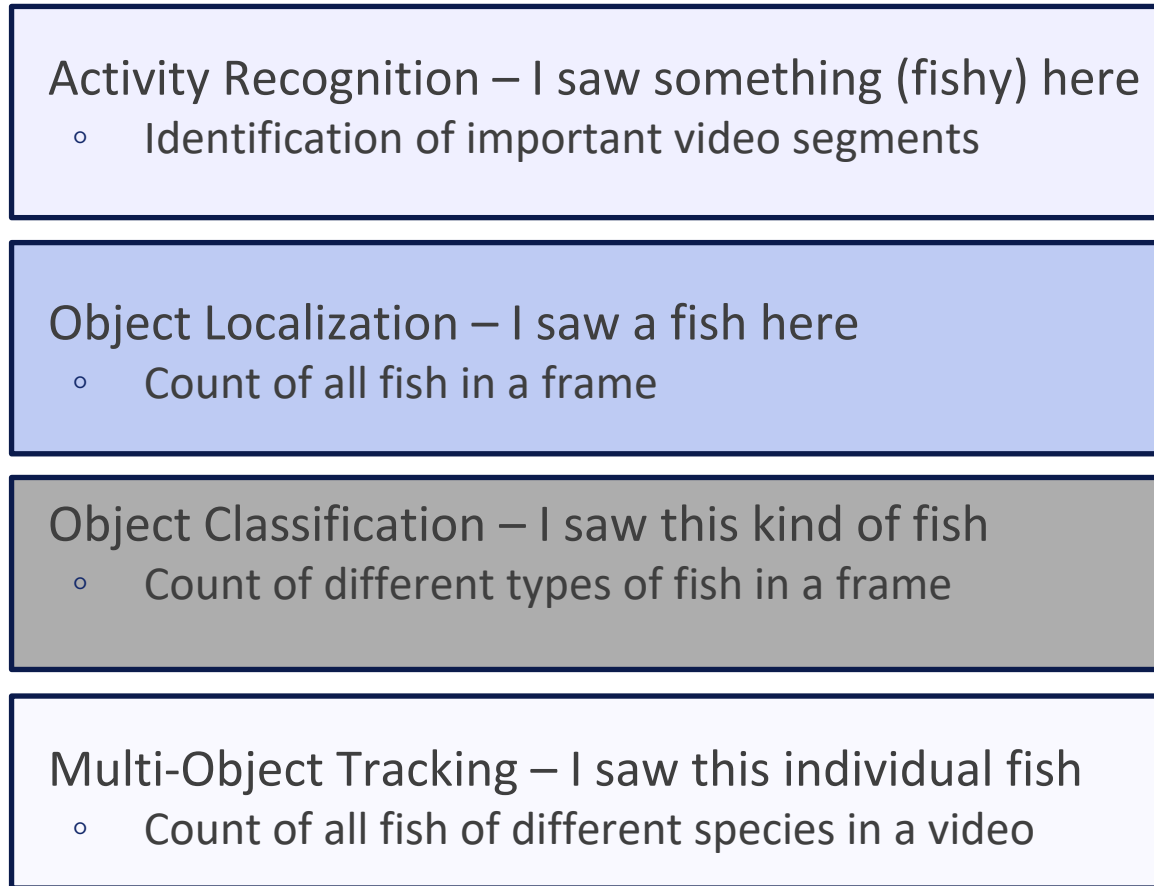
34

Prioritized
species

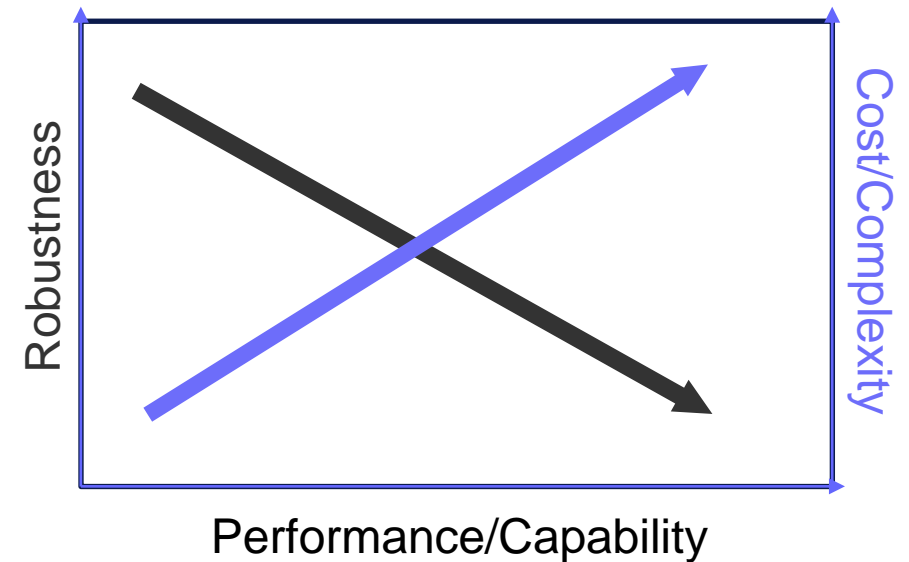
Top 20 Correlated Species



Hierarchy of Video Analysis Automation



- Increasing Cost, Complexity, Data Requirements
- Decreasing Robustness, Generalization



Every step in the hierarchy to be automated reduces the review burden on human analysts

Footage - Tracking



Footage - Blur



Footage - Tools



The video player displays a scene where a person wearing blue gloves is measuring several small fish on a green ruler. The ruler has markings from 15 to 80. The person is also wearing a grey hoodie and a green shirt. A white bucket is visible on the right side of the frame. The video player interface includes a left sidebar with various tool icons (arrow, crop, lasso, pan, zoom, etc.), a top right corner with a 'Hide' button, a date '2022-04-2', and a list of metadata fields: 'Station', 'Has activity', 'Role', 'Serial', and 'Entities'. The bottom of the player shows a progress bar with a play/pause button, a time indicator '0:01 / 14:52', a volume icon, a '7' icon, a '1x' speed control, and a settings gear icon.

Outcomes



- Gathered data that can be correlated to FSCS events for rich ground truth
- Demonstrate pipeline for turning video data into a curated library for machine learning
- Demonstrate advanced collection modalities such as stereo or Time of Flight (ToF) to tie into efforts such as length measurement from other use cases, e.g. better tracking
- Demonstrate algorithms
 - Object detection
 - Classification
 - Multi-object tracking
 - Activity recognition



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