

Computer Coding Challenge #4

Issue: How to enhance the live stream video of an “urban coral reef” to promote understanding and appreciation of marine species while inspiring the next generation to restore the reefs and protect the planet.

Challenge: Address this issue by harnessing the power of cloud computing, machine learning/artificial intelligence, and image recognition/processing. Create a program that identifies fish species seen in a live video stream coming from an underwater camera.

Live Video Stream: [Coral Morphologic Presents Coral City Camera, http://www.morphologicstudios.com/index.php?/projects/coral-city-camera/](http://www.morphologicstudios.com/index.php?/projects/coral-city-camera/)

Coral Morphologic is driven by a scientific mission to document, aquaculture, and protect Miami’s (and the world’s) coral. Coral Morphologic has installed an underwater camera that provides a 24 hour a day, 7 days a week view of an urban coral habitat along the Port of Miami, Florida. By providing the public with remote access to Miami’s aquatic life, Coral Morphologic aims to generate environmental awareness of, and civic pride for, the city’s remarkable marine biodiversity. Coral Morphologic is partnering with the MATE ROV Competition to challenge teams to identify certain species of common reef fish seen in their live stream video. This is where you come in.

Your challenge is to design a computer program that identifies five species of fish seen commonly on the Coral City camera video and overlay the common name of the fish when they are seen on the video display. The five species of fish for this challenge are:

- Sergeant Major, *Abudefduf saxatilis*
- Bermuda Chub, *Kyphosus sectatrix*
- Yellow Stingray, *Urobatis jamaicensis*
- Striped Parrotfish (male, terminal phase), *Scarus iseri*
- Hogfish, *Lachnolaimus maximum*



Images of Sergeant Major, Bermuda Chub, Yellow Stingray and Hogfish photos from [Wikipedia.org](https://en.wikipedia.org).
Image of the striped parrotfish from reefguide.org.

Note, the striped parrotfish has a number of different coloration patterns depending on sex, life phase, etc. Your program should concentrate on the male striped parrotfish in its terminal phase.

How you choose to identify and name the designated fish on the video is up to you. Your program will not only be judged on how well it identifies the five designated species, but also how you choose to highlight and display the name of the fish. Companies may also be evaluated on any special features they incorporate into the program. For example, your program could focus on identifying other common fish, not just those listed as the five designated fish. Be creative. Consider how any special features you incorporate enhance the coral cam viewing experience. The program should educate the public audience about the species they are seeing without detracting from the overall experience of the livestream. The top three teams will be recognized at the 2021 MATE ROV Competition world championship award ceremony.

NEW FOR THE FINAL CHALLENGE! Unlike previous challenges, MATE is not only going to focus on the effectiveness of your program to identify fish, but also how you package your logic to a customer. When run, the program should display the results. The video submission should be prepared as a marketing pitch to the customer. Showcase your product at work: demonstrate how to use the software, and present the results of your product identifying certain fish. Be creative and be sure to highlight any special features of your program.

As mentioned, your video submission should showcase how your algorithm works (and what went into creating it), and how the customer, Coral Morphologic, will use your program. Companies should present their product in the form of an .exe with a GUI meeting the following requirements:

- 1) the user selects a file to process
- 2) the user selects which fish to detect (any possible combination of the 5 fish listed above)
- 3) the annotated video of the detected fish (similar to challenge #3 deliverables)
- 4) output of the results - total number of each fish detected and time in the video when detected.

Companies should create and test their program using video from the [Coral City Camera](#) livestream. Any submitted videos of the program working will use video clips chosen by the team to highlight their algorithm in action. However, the teams' algorithms and programs will be tested by MATE Competition staff on a different video (taken from the [Coral City Camera](#)) that features occurrences of the five designated species.

Submissions:

Teams undertaking the final round of the Computer Coding Challenge will have 3.5 weeks to create their program and deliver that program, and their video marketing pitch, to MATE ROV Competition officials. The video upload of your marketing pitch should be limited to 10 minutes.

The program, explanation, and video must be submitted no later than 11:59 PM, Hawaii time, July 31. The following naming convention should be used for your submissions: School or organization name_company name_ document type_2021, where document type is the program. The video should be uploaded to YouTube or Vimeo and a link provided to that video.

The program, explanation and video link should be submitted to the [2021 MATE Computer Coding Challenge #4 Submission](#) form.