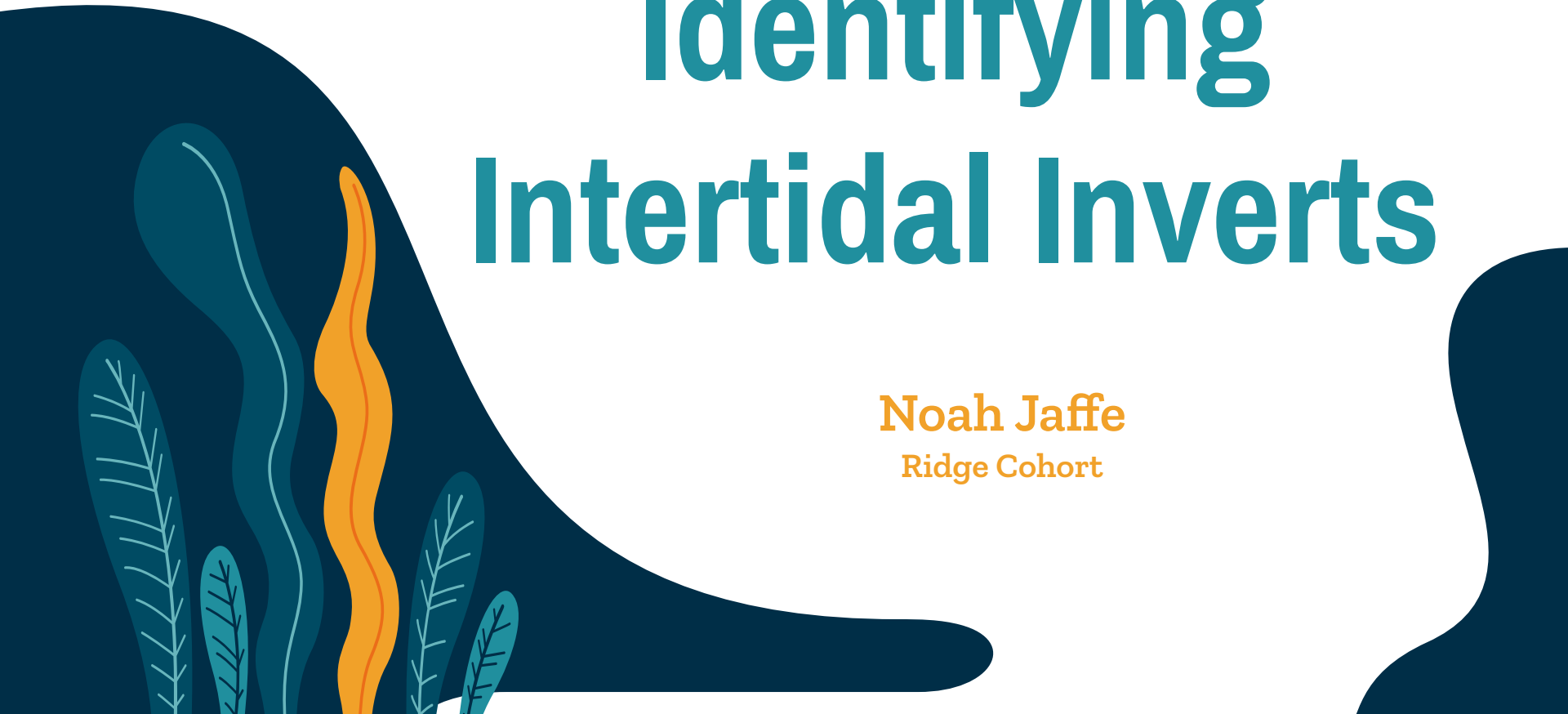
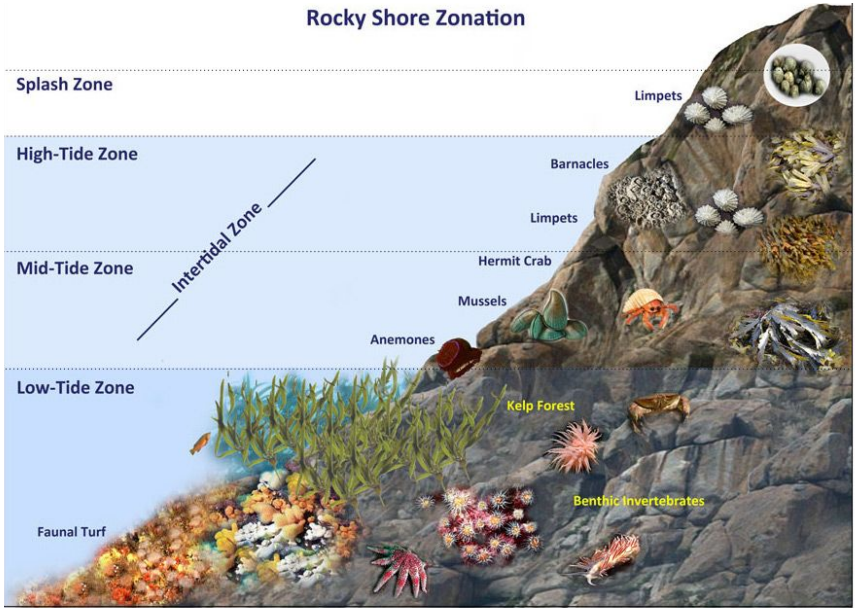
Identifying Intertidal Inverts

Noah Jaffe
Ridge Cohort



Intertidal zone

- Area where ocean meets land
- During low tide, aquatic habitats are uncovered



My master’s research

Me

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- Spent lots of time tidepooling, trying to ID organisms

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- Problem suited to ML image detection models

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Inspiration: iNaturalist

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- Useful tool, but relies on other users answering queries

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Goal: ID six major classes of inverts

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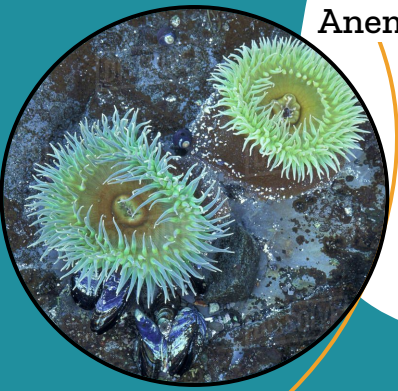
Anemone



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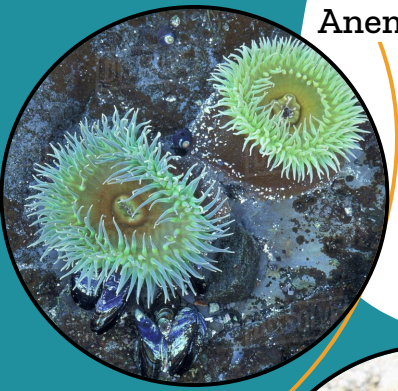

Bivalve

Goal: ID six major classes of inverts

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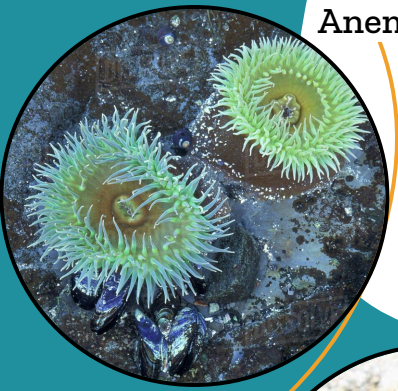

Barnacle

Bivalve

Goal: ID six major classes of inverts

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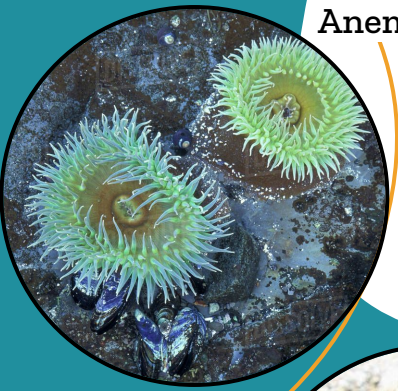

Barnacle

Bivalve

Starfish

Goal: ID six major classes of inverts

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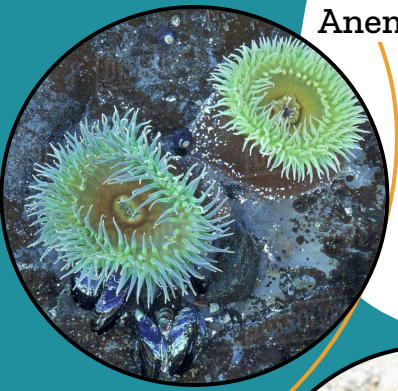

Barnacle

Crab

Bivalve

Starfish

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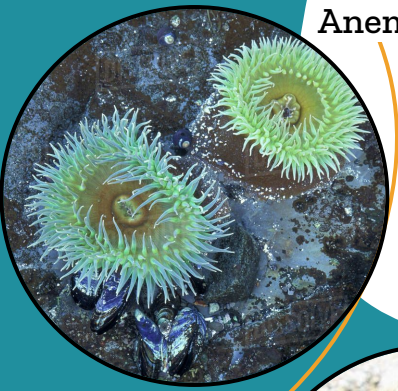

Barnacle

Crab

Bivalve

Starfish

Nudibranch

Training: Google images

- **1102 training images** across 6 classes
- Labeled images one by one in **labelImg**

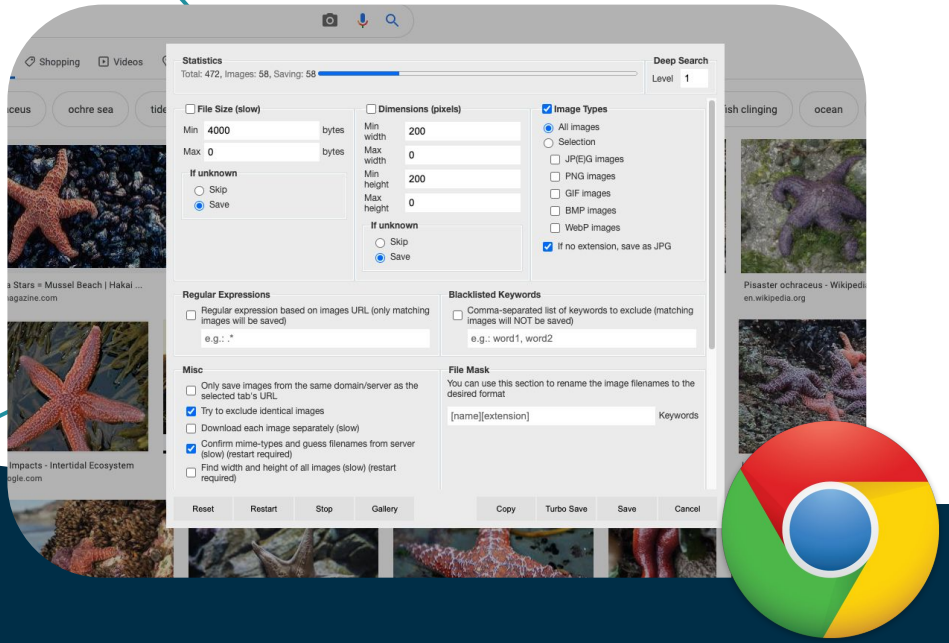

Image classification modeling

- Used pre-trained YOLO v3 model CNN

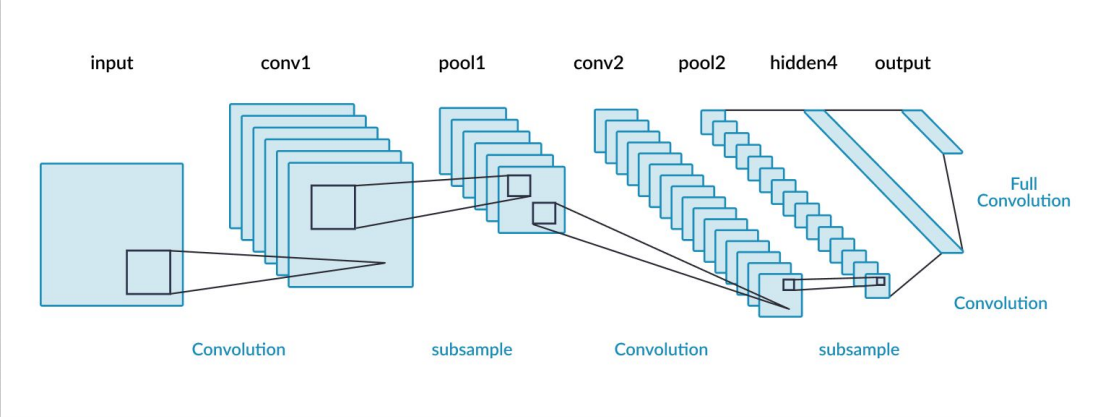

Image classification modeling

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- Darknet framework

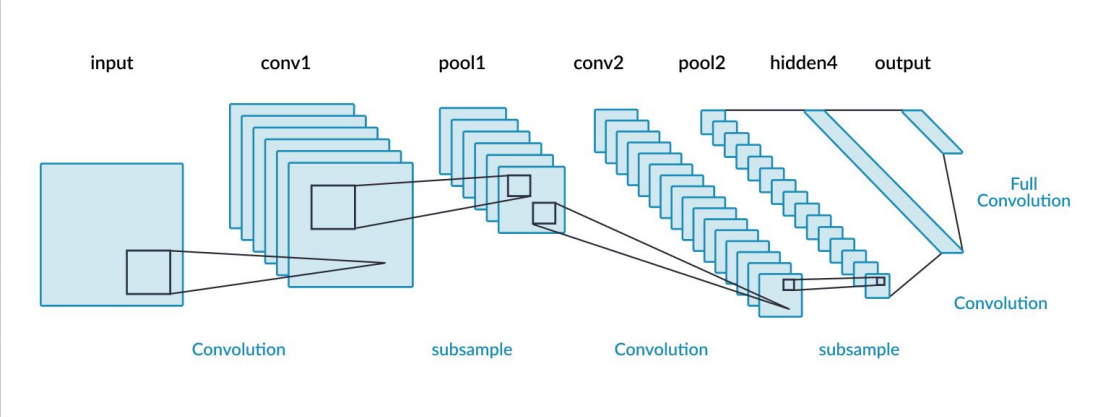

Image classification modeling

- Used pre-trained YOLO v3 model CNN
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- openCV module

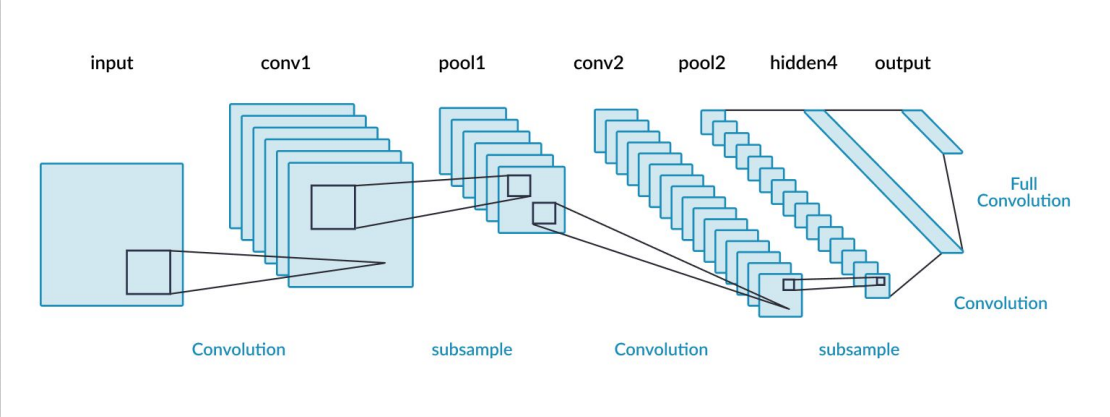
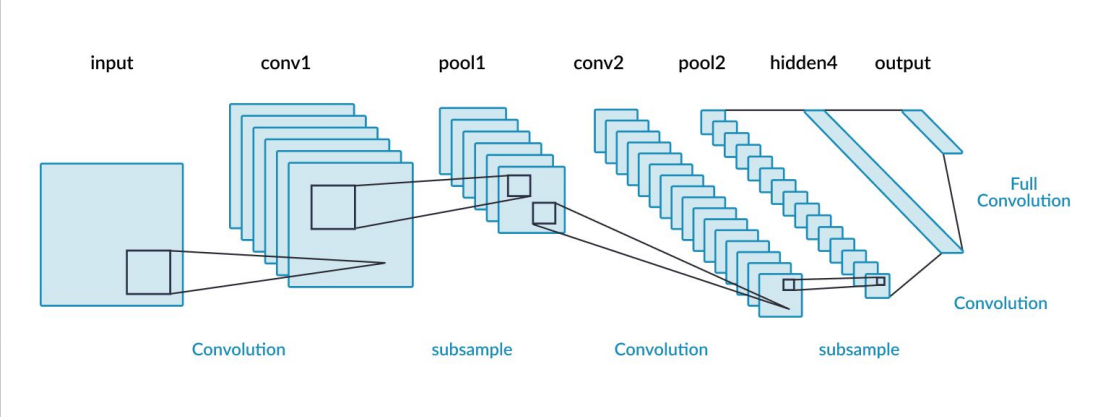


Image classification modeling

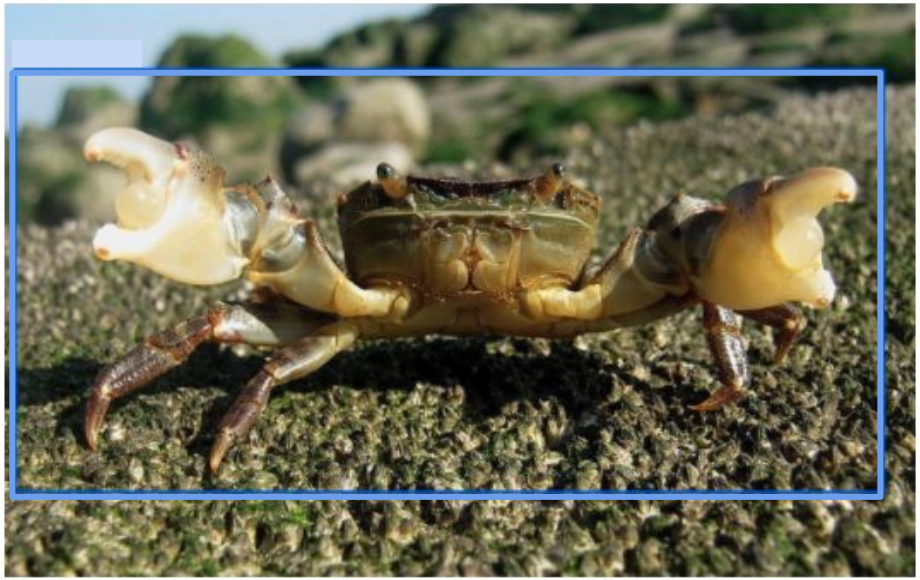
- Used pre-trained YOLO v3 model CNN
- Darknet framework
- openCV module
- Approx 700 epochs



High performance on some classes

Starfish 0.916

Crab 1.000



High performance on some classes

WOW!

...but still some work to be done

Nudibranch 0.904

Takeaways

- Pre-trained YOLO model was effective for this problem

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Pisaster ochraceus

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Leptasterias aequalis

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Pisaster ochraceus

Leptasterias aequalis

Pycnopodia helianthoides

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- Other possibilities for improved performance of YOLO:

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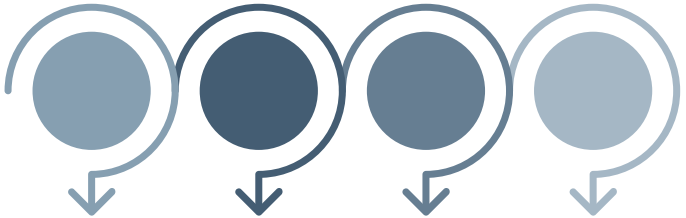
  - Hyperparameter tuning



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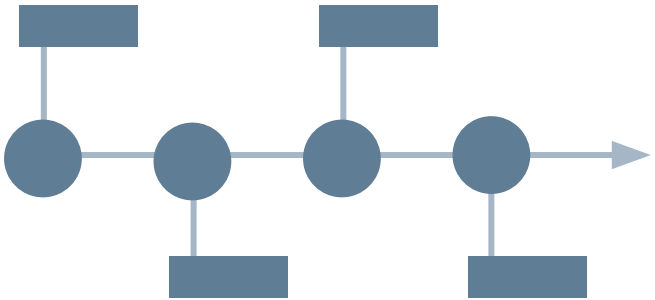
- Pre-trained YOLO model was effective for this problem
  - However, possibly overfit to specific species in train set
- Other possibilities for improved performance of YOLO:
  - Hyperparameter tuning
  - Layer addition

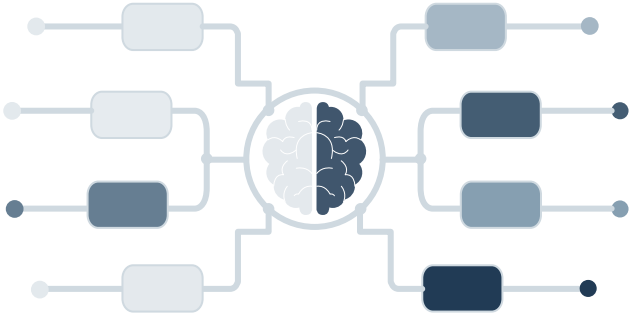


Takeaways

- Pre-trained YOLO model was effective for this problem
  - However, possibly overfit to specific species in train set
- Other possibilities for improved performance of YOLO:
  - Hyperparameter tuning
  - Layer addition
  - Image resampling

Future work

- Other image detection models could also be effective



Future work

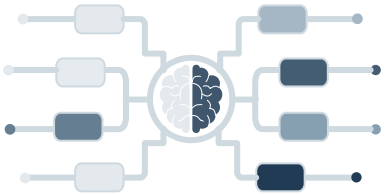
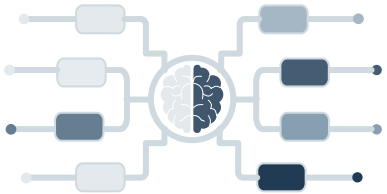
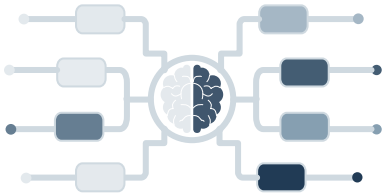
- Other image detection models could also be effective
- ID lower classification (order, family, genus) or even ID specific organisms

vs

Future work

- Other image detection models could also be effective
- ID lower classification (order, family, genus) or even ID specific organisms
- Or, different model for each phylum and the user would have to determine phylum before using



Thanks for watching!

Special thanks to:

- Brian McGarry
- Richard Chiou
- Ryan Werth
- Neda Saleem

Any questions?

Images

- https://oceanservice.noaa.gov/facts/intertidal-zone.html
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