

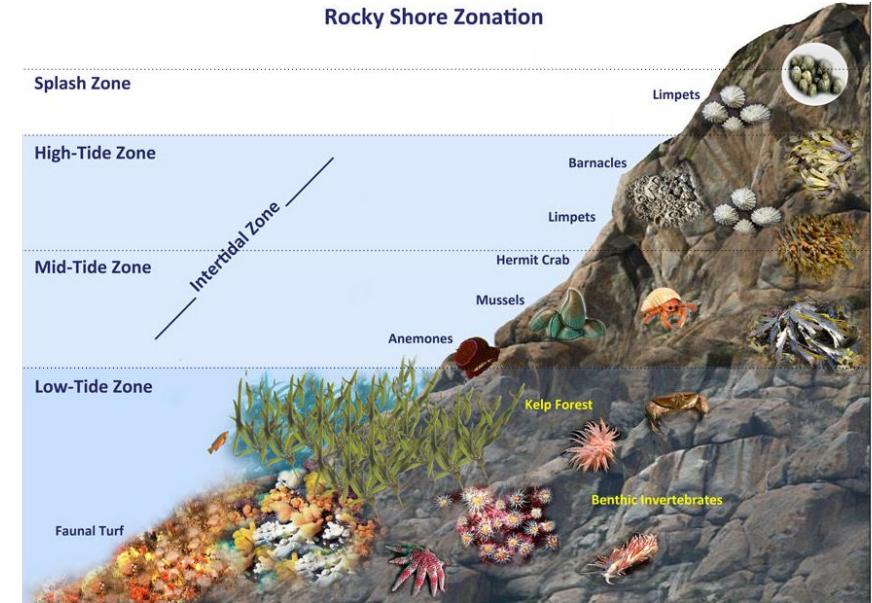


Identifying Intertidal Inverts

Noah Jaffe
Ridge Cohort

Intertidal zone

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



My master's research



Me

My master's research

- Spent lots of time tidepooling, trying to ID organisms



Me

My master's research

- Spent lots of time tidepooling, trying to ID organisms
- Problem suited to ML image detection models



Me

Inspiration: iNaturalist



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- Useful tool, but relies on other users answering queries

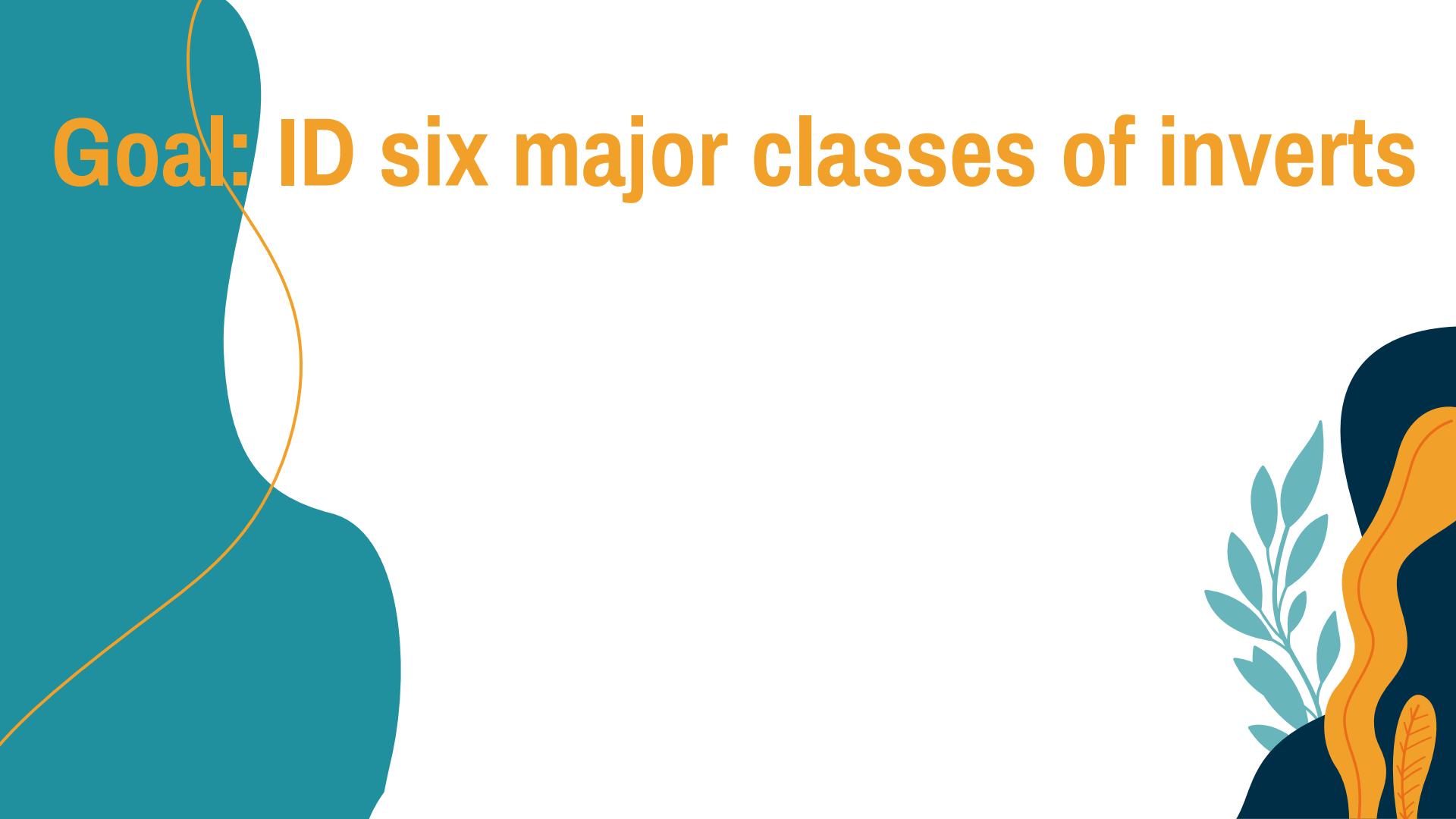


Inspiration: iNaturalist

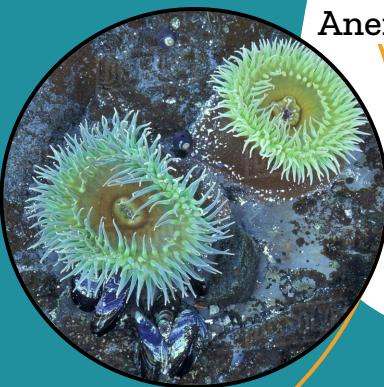
- Useful tool, but relies on other users answering queries
- Problem suited to ML image detection models



Goal: ID six major classes of inverts

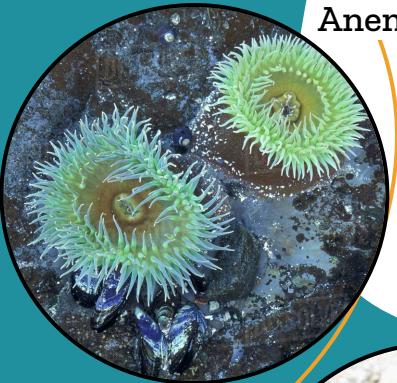


Goal: ID six major classes of inverts



Anemone

Goal: ID six major classes of inverts

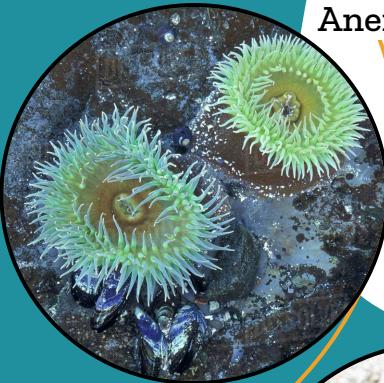


Anemone



Bivalve

Goal: ID six major classes of inverts



Anemone



Barnacle



Bivalve

Goal: ID six major classes of inverts



Anemone



Barnacle

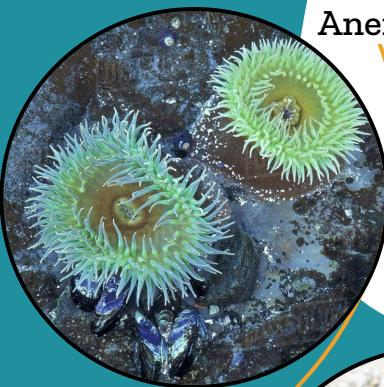


Bivalve



Starfish

Goal: ID six major classes of inverts



Anemone



Barnacle



Crab



Bivalve



Starfish

Goal: ID six major classes of inverts



Anemone



Barnacle



Crab



Bivalve



Starfish



Nudibranch

Training: Google images

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

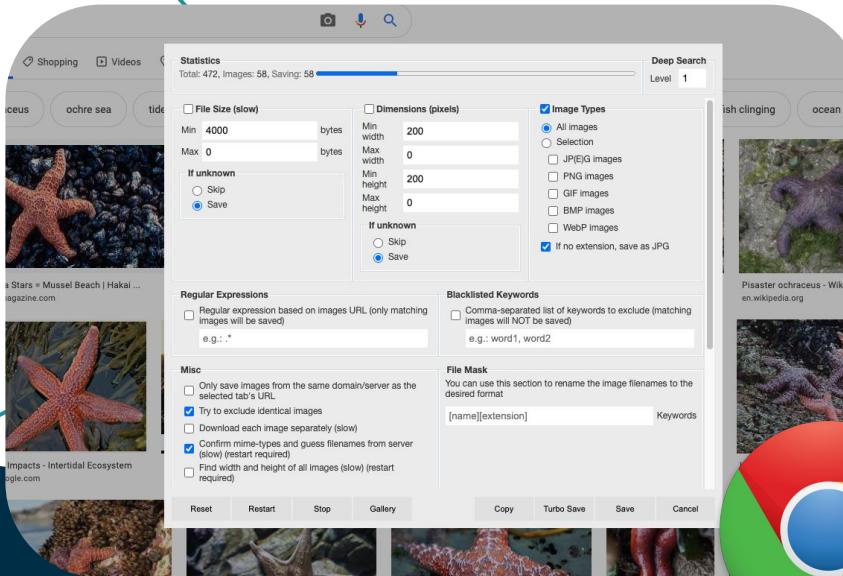


Image classification modeling

- Used pre-trained YOLO v3 model CNN

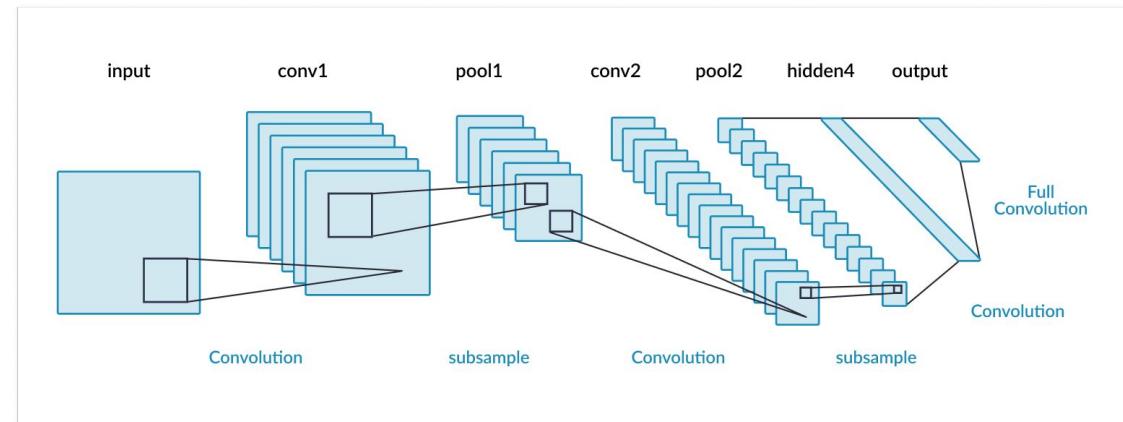


Image classification modeling

- Used pre-trained YOLO v3 model CNN
- Darknet framework

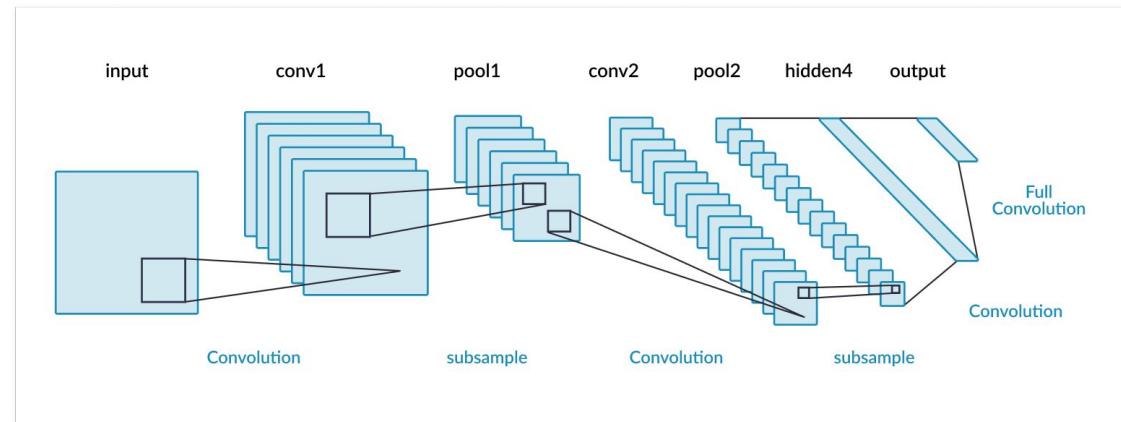


Image classification modeling

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

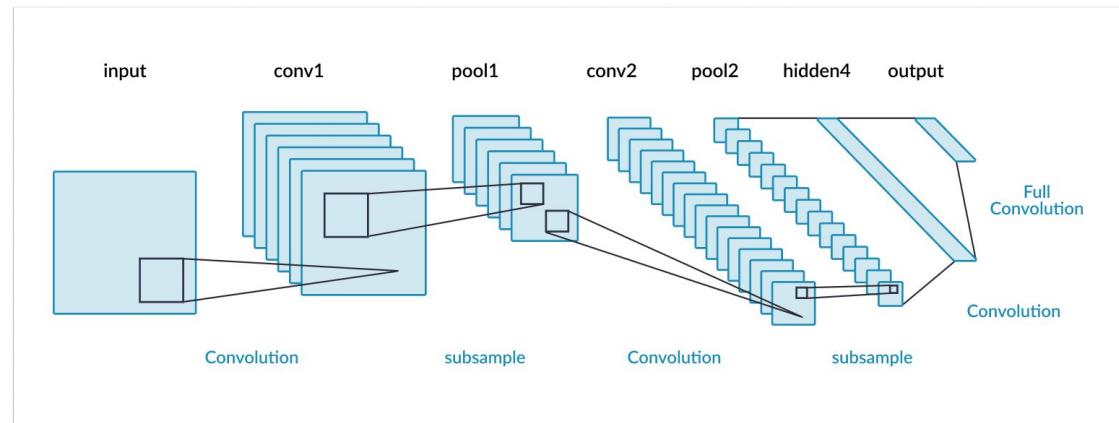
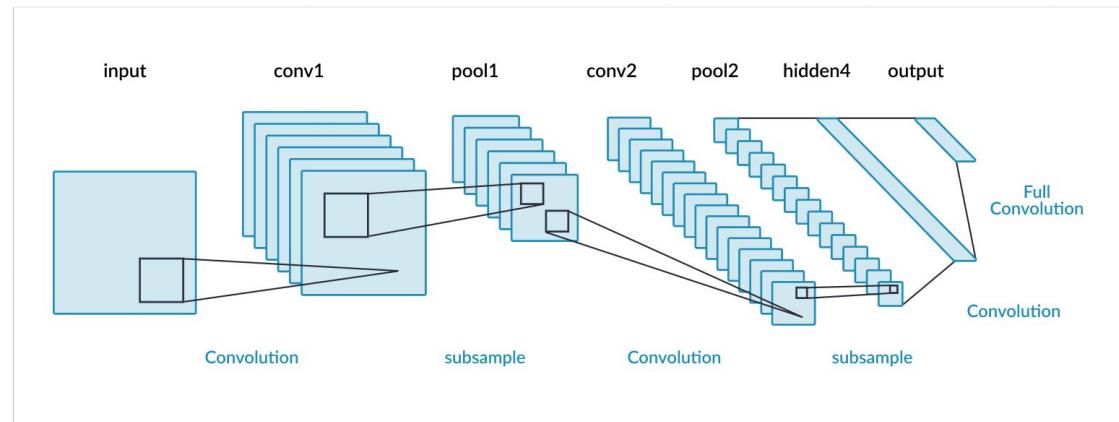


Image classification modeling

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

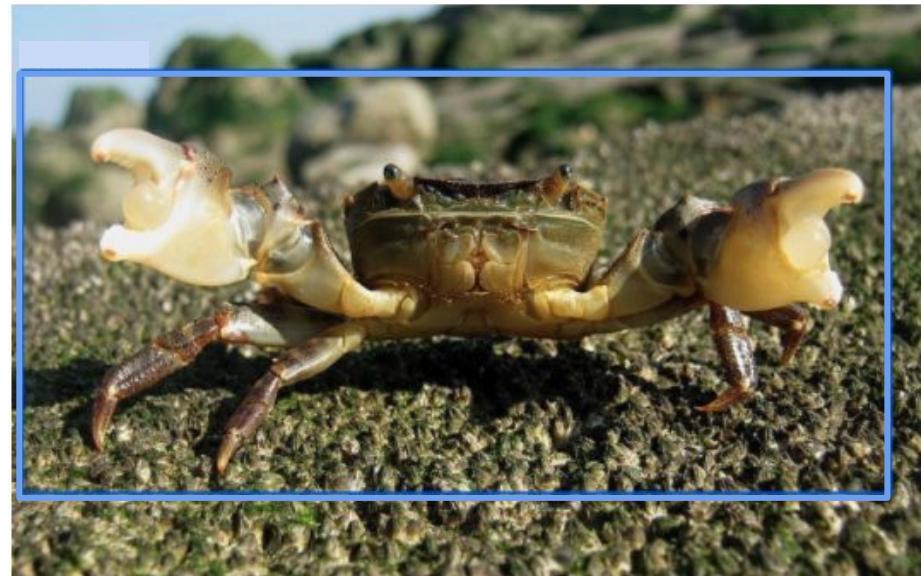


High performance on some classes

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



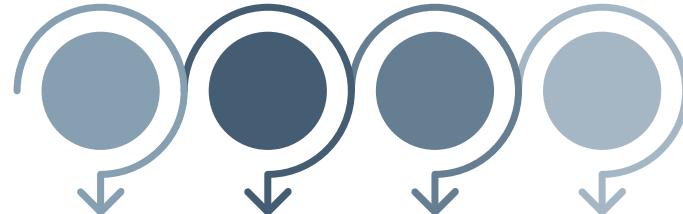
Pycnopodia helianthoides

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:

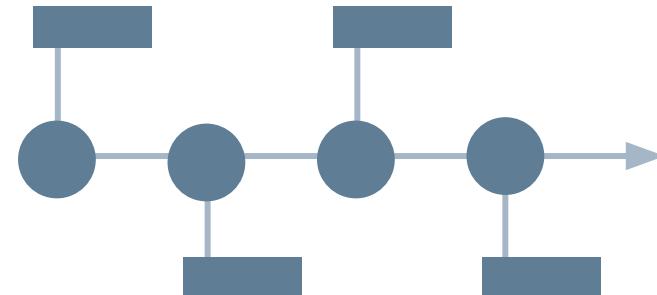
Takeaways

- 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**



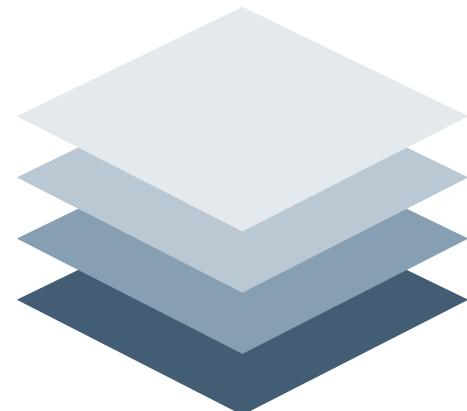
Takeaways

- 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



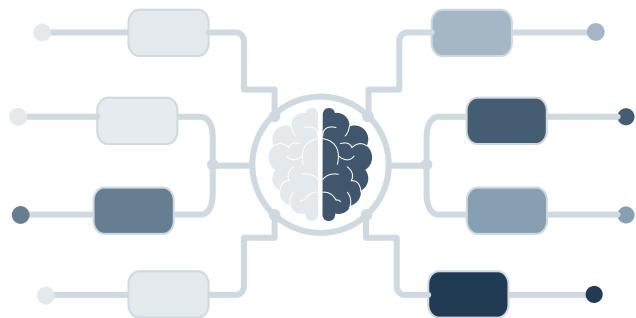
Takeaways

- 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

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- ID lower classification (order, family, genus) or even ID specific organisms

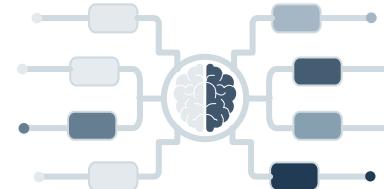
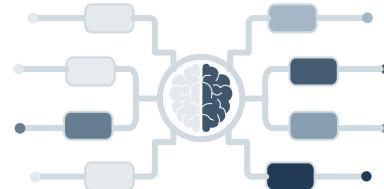
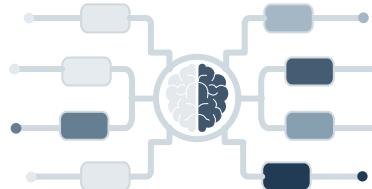


VS



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



Streamlit demo!



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>
- <https://ncqsk.weebly.com/21-investigation.html>
- <https://www.gcv.org/explore/nature-center/inaturalist-at-gcvm/>
- <https://dissolve.com/stock-photo/USA-Washington-Olympic-National-Park-Rialto-Beach-Giant-green-royalty-free-image/101-D256-12-338>
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- <https://www.seattleaquarium.org/animals/purple-shore-crabs>
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