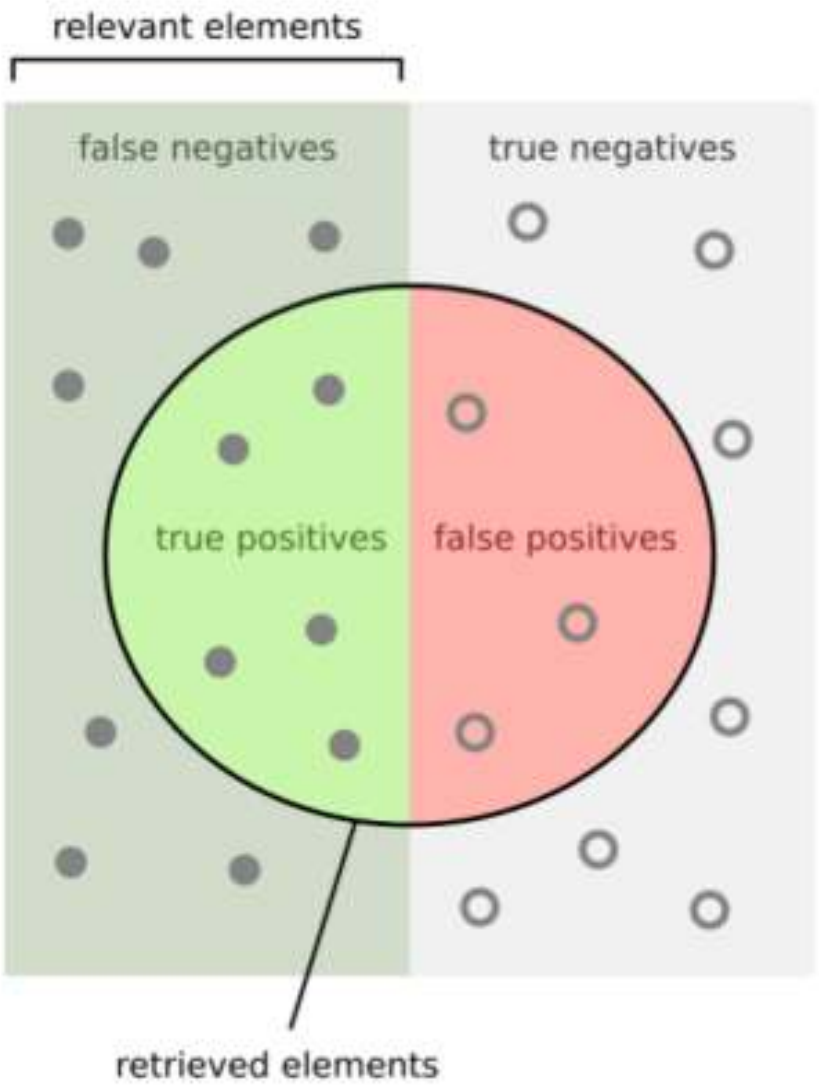
Multi-Class Quantification of Xenopus Frog Embryos

DeVision Team Fall 2024

Louisiana State University

August 2, 2024

Evaluation Metrics-Results



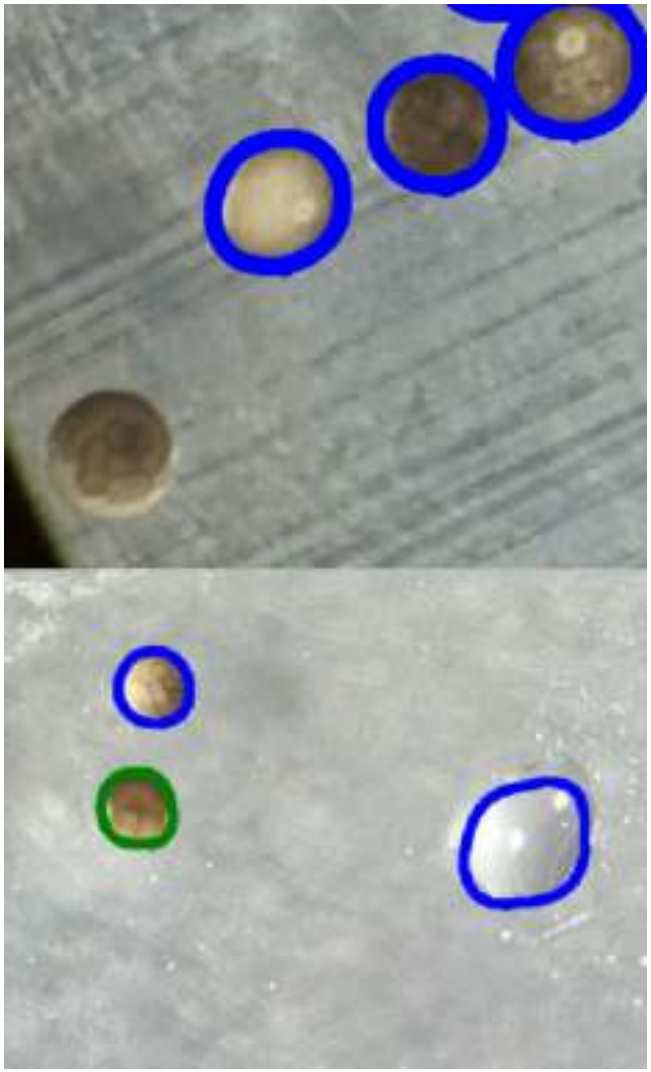


Figure 1: True positive, False positives

Evaluation Metrics-Tests & Results

- Precision = TP / (TP + FP)
- Recall = TP / (TP + FN)
- F1 = (2 × Precision × Recall) / (Precision + Recall)
- Accuracy = TP / (TP + FP + FN)

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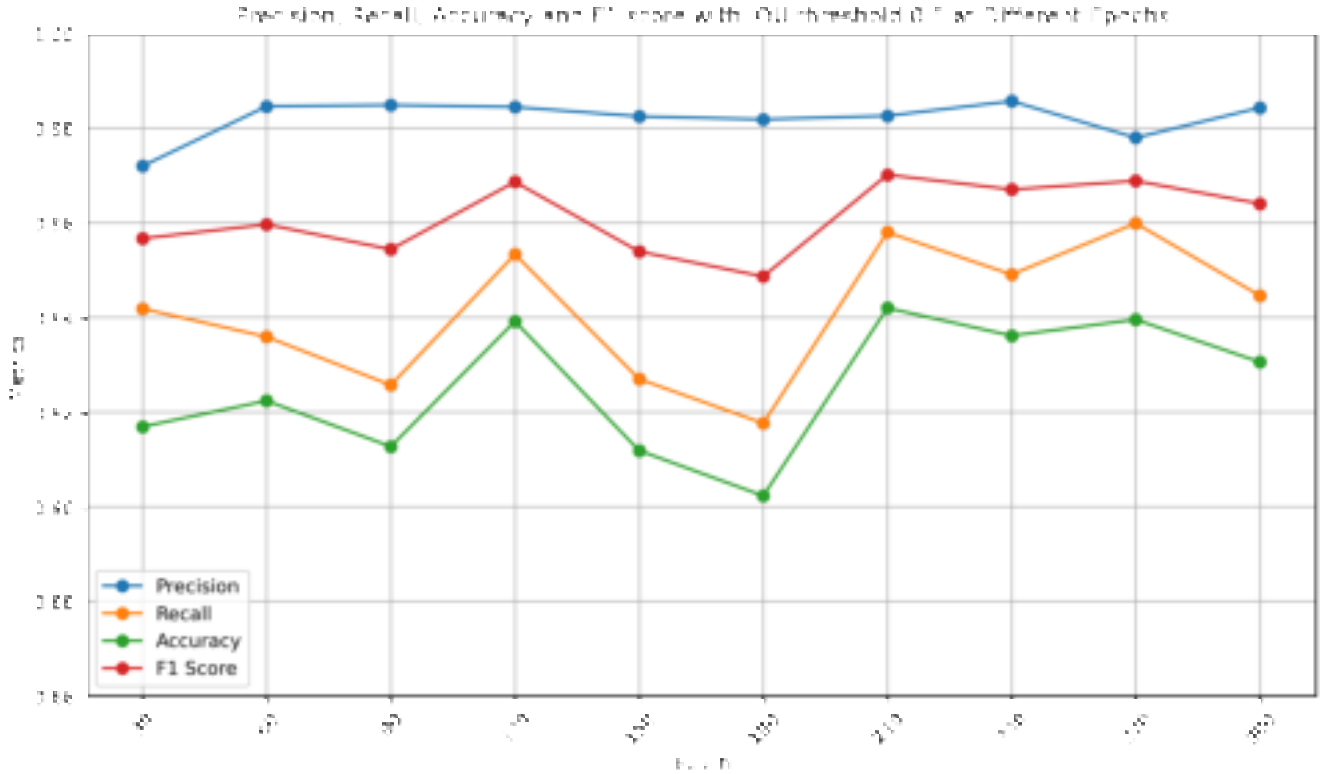
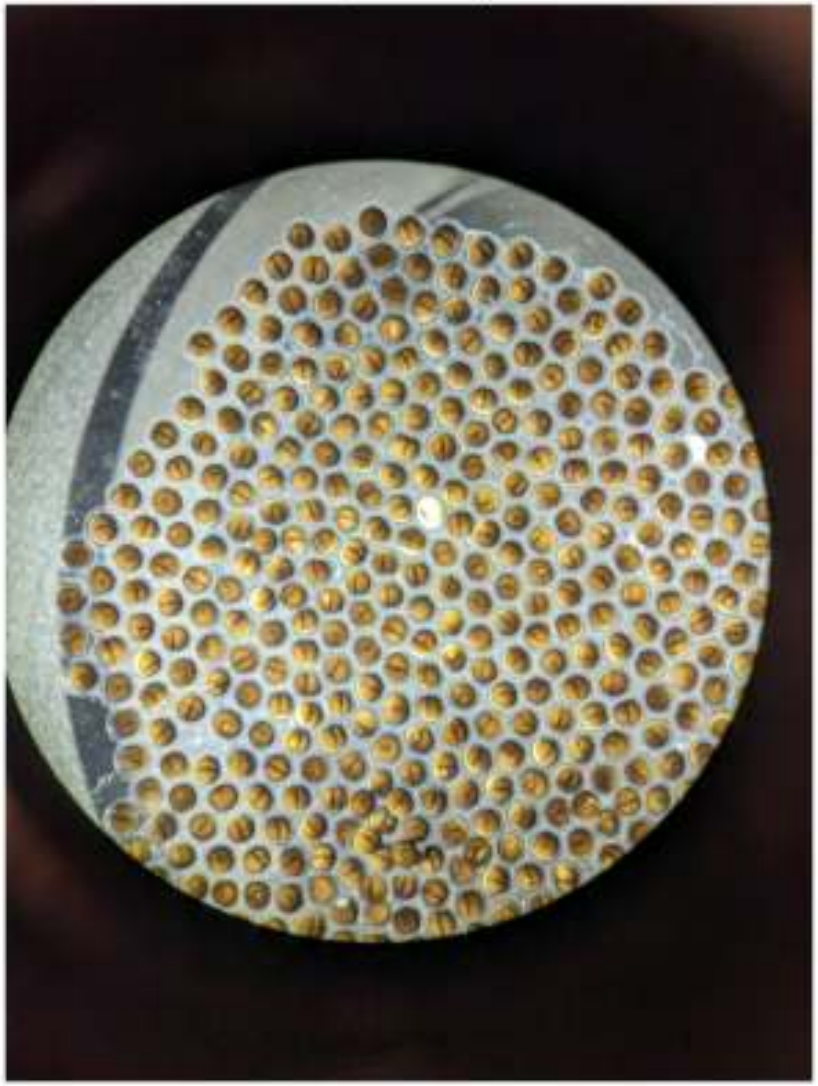


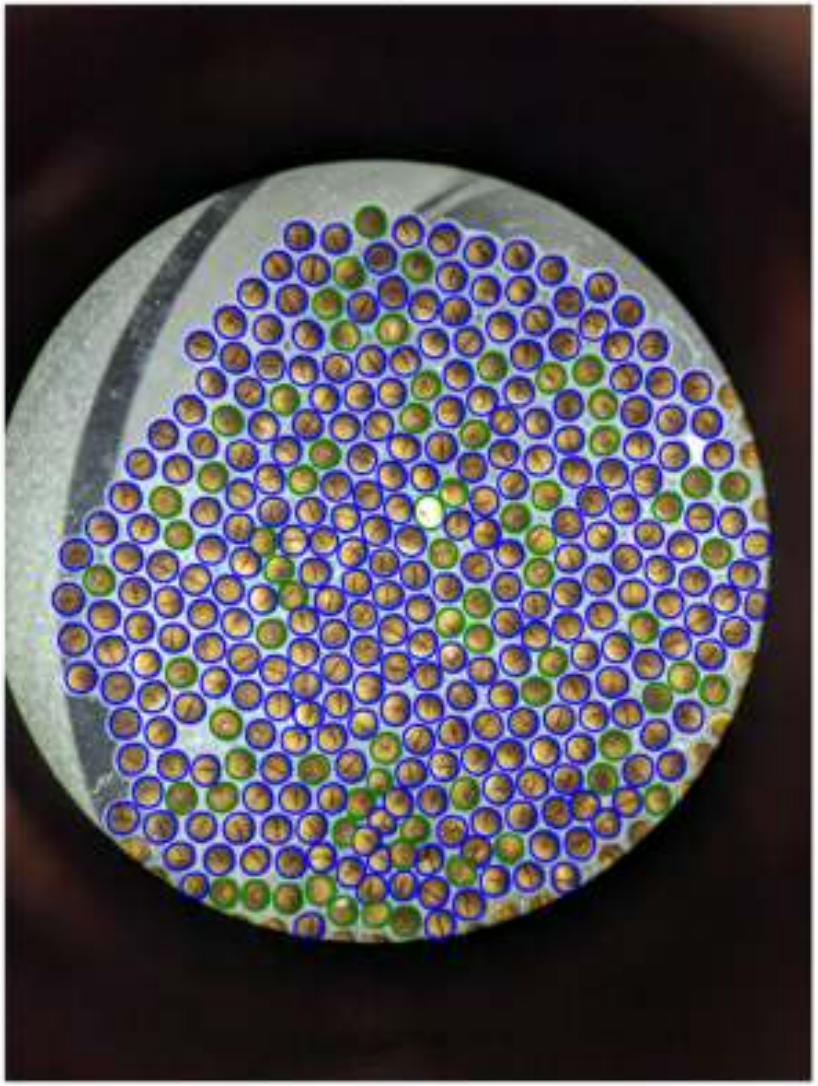
Figure 3: Metrics with IOU 0.5 at Different Epochs

Multi Class Prediction

Input image



Predicted label instances
Predicted objects: 346
(Class 1: 71, Class 2: 275)



Accuracy Results

File	Count	Pred	TP	FP	FN	Accuracy
Img_0	225	226	225	1	0	99.56%
Img_1	134	136	134	2	0	98.53%
Img_2	283	283	283	0	0	100.00%
Img_3	346	346	346	0	0	100.00%
Img_4	242	229	229	0	13	94.63%
Img_5	350	349	349	0	1	99.71%
Img_6	294	294	293	1	1	99.32%
Img_7	180	177	174	3	6	95.08%
Img_8	292	290	290	0	2	99.32%
⋮	⋮	⋮	⋮	⋮	⋮	⋮
Img_18	205	205	205	0	0	100.00%
Img_19	198	199	198	1	0	99.50%
Img_20	176	172	172	0	4	97.73%
Img_21	221	219	219	0	2	99.10%
Img_22	193	193	193	0	0	100.00%
Img_23	196	193	193	0	3	98.47%
Img_24	232	228	228	0	4	98.28%
Total	**5467**	**5436**	**5421**	**15**	**46**	**98.89%**

Future Work in Fall 2024

- We aim to use the VGG Image Annotator to effectively label embryos as fertilized or unfertilized.
- Labeling these embryos as such will allow us to train the Mask RCNN model to effectively classify the fertilization status.
- In contrast to the Summer 2024 project that used ImageJ and Stardist to annotate and train the model, we will be using VGG and Mask RCNN for our Fall 2024 project.
- The code we used for this project was an old model of RCNN with outdated packages. Our plan for the future is to figure out how to import the older Python packages so that they are compatible with the RCNN model that we are working with.

Acknowledgements

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  - Dr. Yue Liu, Assistant Director
  - Dr. Jack Koch
- MBL
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- Nikkos Svoboda, Computer Analyst -high-performance computing system "Chaos".

Thank You for Listening!