Water Droplet Impact on Submerged Sediments

1.1 Video Folder: 090320- Without GB experiments/Blue-Nozzle-Largest-one-without GB

Video File Name	Cavity Detection	Sediment Detection
L-40cm-Largest-nuzzle.avi	The model segments the actual cavity pretty good. False detect the very bottom of the video as Cavity. (Black border at the bottom). False detection stops once the actual cavity appears and resumes when the cavity disappears. Could be fixed by properly thresholding the segmentation parameter.	N/A
L-40cm-Largest-nuzzle-30fps.avi	Same as L-40cm-Largest-nuzzle.avi	N/A
L-60cm-Largest-nuzzle.avi	Same as L-40cm-Largest-nuzzle.avi	N/A
L-80cm-Largest-nuzzle.avi	Same as L-40cm-Largest-nuzzle.avi	N/A
L-100cm-Largest-nuzzle.avi	Same as L-40cm-Largest-nuzzle.avi	N/A
L-125cm-Largest-nuzzle.avi	Same as L-40cm-Largest-nuzzle.avi	N/A
L-150cm-Largest-nuzzle.avi	Same as L-40cm-Largest-nuzzle.avi	N/A
L-165.5cm-Largest-nuzzle.avi	Same as L-40cm-Largest-nuzzle.avi	N/A

1.2 Video Folder: 090320- Without GB experiments/Purple-nuzzle-without GB

Video File Name	Cavity Detection	Sediment Detection
L-20cm-20G-nuzzle.aviq	The model detects the actual cavity pretty good. Slightly thinner yet a black border still exists as seen in 090320- Without GB experiments/Blue-Nozzle-Largest-one-without GB videos, but there is no false detection of it. There are instances of false detection of the crown above the air-water interface as "cavity" when the droplet hits the water.	N/A
L-40cm-20G-nuzzle.avi	Same as L-20cm-20G-nuzzle.avi	N/A
L-60cm-20G-nuzzle.avi	The model detects the actual cavity pretty good. There is false detection of the black border at the bottom of the video. False detection of this bar stops when the actual cavity appears and vice-versa. There are instances of false detection of the crown above the air-water interface as "cavity" when the droplet hits the water.	N/A
L-80cm-20G-nuzzle.a	Same as L-60cm-20G-nuzzle.avi	N/A
L-100cm-20G-nuzzle.avi	Same as L-60cm-20G-nuzzle.avi	N/A
L-125cm-20G-nuzzle.avi	Same as L-60cm-20G-nuzzle.avi	N/A

L-150cm-20G-nuzzle.avi	Same as L-60cm-20G-nuzzle.avi	N/A
L-165.5cm-20G-nuzzle.avi	Same as L-60cm-20G-nuzzle.avi	N/A

1.3 Video Folder: 090320- Without GB experiments/Yellow-nuzzle-without GB

Video File Name	Cavity Detection	Sediment Detection
L-14.5cm-20G-nuzzle.avi	The video is way too dark. Too many false detection in the right half of the Water No correct detection of the actual cavity	N/A
L-100cm-20G-nuzzle.avi	The model detects the actual cavity pretty good. There is false detection of the black border at the bottom of the video. False detection of this bar stops when the actual cavity appears and vice-versa. There are instances of false detection of the crown above the air-water interface as “cavity” when the droplet hits the water.	N/A
L-125cm-20G-nuzzle.avi	The model detects the actual cavity pretty good. There is false detection of the black border at the bottom of the video. False detection of this bar stops when the actual cavity appears and vice-versa.	N/A
L-150cm-20G-nuzzle.avi	The model detects the actual cavity pretty good.	N/A

	There is false detection of the black border at the bottom of the video. False detection of this bar stops when the actual cavity appears and vice-versa.	

2.1 092920-Blue-and-Yellow-Nozzle-with-Coarse-Glass-Beads-Regime I/yellow-nozzle

Video File Name	Cavity Detection	Sediment Detection
L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	The video is very dark. Needs better contrast. The model detects the actual cavity most of the time, but there are also a lot of false detections in the right half of the water.	The model did not detect any sediments.
L1-54.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	The model did not detect any sediments.
L1-74.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	The model did not detect any sediments.
L1-94.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	The model did not detect any sediments.
L1-114.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	The model did not detect any sediments.
L1-134.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	The model did not detect any sediments.
L1-154.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	The model did not detect any sediments.

2.2 092920-Blue-and-Yellow-Nozzle-with-Coarse-Glass-Beads-Regime I

Video File Name	Cavity Detection	Sediment Detection
L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	The video is very dark. Needs better contrast. The model detects the actual cavity most of the time, but there are also a lot of false detections in the right half of the water.	The model did not detect any sediments.
L1-54.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	The model did not detect any sediments.
L1-74.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	The model did not detect any sediments.
L1-94.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Saw a few instances of sediment detections.
L1-114.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	The model did not detect any sediments.
L1-134.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	The model did not detect any sediments.
L1-154.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Mostly false/wrong detections.	The model did not detect any sediments.
L1-174.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Mostly false/wrong detections.	

3.1 100820- Fine Glass Beads-Regime I\

Video File Name	Cavity Detection	Sediment Detection
L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	The video's contrast is very low. Continuously false detects water as cavity before the actual cavity appears. Actual Cavity Detection is decent.	Sediments are very small. No detection
L1-114.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Not many false detections, but the cavity detection is also not great. Starts to detect the water as cavity especially in the later part of the video	Sediments are very small. No detection
L1-134.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Not many false detections, but the cavity detection is also not great. Starts to detect the water as cavity especially in the later part of the video	Sediments are very small. No detection

3.2 100820- Fine Glass Beads-Regime I\Large-blue-nozzle-with-contrast

Video File Name	Cavity Detection	Sediment Detection
L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Much Better Contrast. Cavity Detection is decent.	Sediments are very small. No detection
L1-54.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Sediments are very small. No detection
L1-74.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Sediments are very small. No detection

L1-94.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Sediments are very small. No detection
L1-114.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Sediments are very small. No detection
L1-134.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Sediments are very small. No detection
L1-154.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Sediments are very small. No detection
L1-174.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle-1.avi	Sediments are very small. No detection

3.3 100820- Fine Glass Beads-Regime I\Yellow-nozzle

Video File Name	Cavity Detection	Sediment Detection
L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Video contrast is low, still decent Cavity Detection. Detection does tend to break a lot especially when the cavity is touching the sediment layer	Sediments are very small. No detection
L1-54.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Sediments are very small. No detection
L1-74.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Sediments are very small. No detection
L1-114.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Sediments are very small. No detection

L1-134.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.aviq	Same as L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Sediments are very small. No detection
L1-154.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Sediments are very small. No detection
L1-174.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Same as L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Sediments are very small. No detection

4. 102220-Blue-Nozzle-with-fine-Glass-Beads- Regime I

Video File Name	Cavity Detection	Sediment Detection
L1-34.2cm-H1-4.2cm-d50-200-um-Blue-nozzle.avi	Great Contrast. Cavity Detection is very good except for when the cavity is touching the sediments. The model starts to detect some part of the sediment layer right underneath the water as cavity	Sediments are very small. No detection
L1-74.2cm-H1-4.2cm-d50-200-um-Blue-nozzle.avi	Great Contrast. Cavity Detection is very good except for when the cavity is touching the sediments. The model starts to detect some part of the sediment layer right underneath the water as cavity	Sediments are very small. No detection
L1-94.2cm-H1-4.2cm-d50-200-um-Blue-nozzle.avi	Great Contrast. Cavity Detection is very good except for when the cavity is touching the sediments. The model starts to detect some part of the sediment layer right underneath the water as cavity	Sediments are very small. No detection

L1-114.2cm-H1-4.2cm-d50-200-um-Blue-nozzle.avi	Great Contrast. Cavity Detection is very good except for when the cavity is touching the sediments. The model starts to detect some part of the sediment layer right underneath the water as cavity	Sediments are very small. No detection
L1-134.2cm-H1-4.2cm-d50-200-um-Blue-nozzle.avi	Cavity Detection is very good throughout the video except few in frames where the model detects some part of the sediment bed as cavity	Sediments are very small. No detection
L1-154.2cm-H1-4.2cm-d50-200-um-Blue-nozzle.avi	Cavity Detection is very good throughout the video except few in frames where the model detects some part of the sediment bed as cavity	Sediments are very small. No detection
L1-174.2cm-H1-4.2cm-d50-200-um-Blue-nozzle.avi	Cavity Detection is very good throughout the video except few in frames where the model detects some part of the sediment bed as cavity	Sediments are very small. No detection

5. 102420-Blue-Nozzle-with-Coarse-Glass-Beads- Regime I (These frames are part of the dataset used to train the model)

Video File Name	Cavity Detection	Sediment Detection
L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Really Good	No Detection
L1-54.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Really Good	No Detection
L1-74.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Really Good	No Detection
L1-94.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Really Good	No Detection

L1-114.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Really Good	No Detection
L1-134.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Really Good	Some detection of the beads. In a few instances, a large area of the top sediment layer was detected as sediment.
L1-174.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Really Good	Some detection of the beads. In a few instances, a large area of the top sediment layer was detected as sediment.

6.1 102520- Coarse GB- Regime I (These frames are part of the dataset used to train the model)

Video File Name	Cavity Detection	Sediment Detection
L1-34.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Really Good	No Detection
L1-54.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Really Good	No Detection
L1-74.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Really Good	No Detection
L1-94.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Really Good	No Detection
L1-114.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	A darker area in the water was initially detected as the cavity, but for the rest of the video, the cavity detection was really good.	No Detection
L1-134.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Really Good	No Detection
L1-154.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Really Good	Very few detections
L1-174.2cm-H1-4.2cm-d50-600-um-yellow-nozzle.avi	Really Good	Very few detections

7. 1025250(3)- Coarse GB- Regime I (These frames were part of the dataset used to train the model)

Video File Name	Cavity Detection	Sediment Detection
L1-34.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Really Good	No Detection
L1-54.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Really Good	No Detection
L1-74.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Really Good	No Detection
L1-94.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.a	Really Good	No Detection
L1-114.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Really Good	Few Detections
L1-134.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Really Good	Few Detections
L1-154.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Really Good	Few Detections
L1-174.2cm-H1-4.2cm-d50-600-um-Blue-nozzle.avi	Really Good	No Detection

8. Regime II (These frames were part of the dataset used to train the model)

Video File Name	Cavity Detection	Sediment Detection
L1-70cm-H1-6-cm-d-600um-D-3.9mm-max-nuz.avi	Really good except in the later part of the cavity where it deteriorates.	Sediments did not appear in the video.
L1-75cm-H1-5.6-cm-d-600um-D-3.9mm-max-nuz.avi	Really good except in the later part of the cavity where it deteriorates.	Really Good. The model was able to detect most of the sediment beads that flung off into the water.
L1-80cm-H1-6-cm-d-600um-D-3.9mm-max-nuz.avi	Really good.	Good. The model was able to detect most of the sediment beads that flung off into the water.

L1-90cm-H1-5.6-cm-d-600um-D-3.9mm-max-nuz.avi	Really good.	Really Good. The model was able to detect most/all of the sediment beads that flung off into the water.
L1-90cm-H1-6-cm-d-600um-D-3.9mm-max-nuz.avi	Really good.	Really Good. The model was able to detect most/all of the sediment beads that flung off into the water.
L1-90cm-H1-6-cm-d-600um-D-3.9mm-max-nuz_segmented.mp4	Really good except some overlapping detection of the same cavity.	Really Good. The model was able to detect most/all of the sediment beads that flung off into the water.

The dataset needs more annotated images of the cavity from various videos. The current dataset has about 500 properly annotated from only two sets of videos.

Maybe it’s a good idea to look into other frameworks for Instance Segmentation. YOLO is good, but it's not up to date with the latest developments especially for Segmentations tasks. Meta’s Detectron2 is the gold standard but a bit more complex to implement.