Introduction to Industrial Vision

Configuring the Cognex In-Sight SnAPP Vision Sensor

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Cognex In-Sight SnAPP Vision Sensor Overview

SnAPP Sensor Overview

The In-Sight SnAPP Vision Sensor is a user-friendly tool that simplifies the automation of manufacturing processes and quality control tasks for optimal machine performance. This advanced sensor uses pre-trained AI to handle error-proofing applications efficiently and effectively. Some key benefits of the In-Sight SnAPP include:

- Accurate Detection
- Ease of Use
- Versatile Capability

By leveraging AI and image-based analysis, the In-Sight SnAPP surpasses traditional sensors in accuracy and performance, making it ideal for a wide range of inspection tasks. Its advanced features include the ability to detect subtle anomalies, eliminate false positives and negatives, handle variations in parts and features, and locate items regardless of their position.

The In-Sight SnAPP is designed for effortless application solutions, allowing users of all experience levels to automate quality control tasks quickly and easily without the need for coding or specialized knowledge. Its user-friendly design features guided setup, a browser-based UI, no-code training, simple installation and retrofits, and streamlined integration.

This vision sensor can automate various error-proofing tasks across a facility, from basic checks to complex inspections. It offers flexible automation that allows users to create new jobs and automate additional steps in the production process easily. Additionally, adjustments can be made after installation via a web-based UI or VisionView display panel for real-time process improvements.

Key features of the In-Sight SnAPP include:

- Embedded AI for easy setup
- Example-based training for quick job creation
- Web-based user interface for remote operation
- Real-time training feedback for performance verification
- 1-click image optimization for accurate inspections
- Web HMI compatibility for direct monitoring on the factory floor
- Compact size for easy integration
- Fixturing capabilities
- IP67 rating for reliable performance in demanding environments.

In-Sight SnAPP Sensor Models

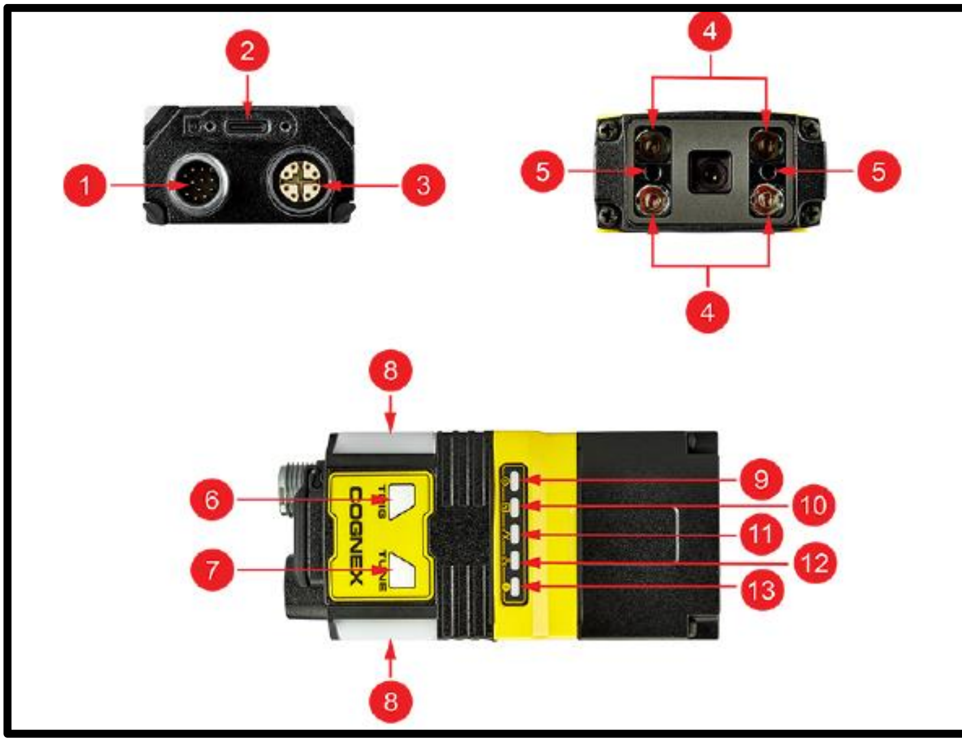
<u>16mm Lens with High-Powered Illumination</u>

Integrated high-power light attachments are available in both RED and WHITE for In-Sight SnAPP vision sensors with the 16mm lens.

<u>6.2mm Lens with Standard Illumination</u>

Standard Integrated light attachments are available in both RED and WHITE for In-Sight SnAPP vision sensors with the 6.2mm lens.

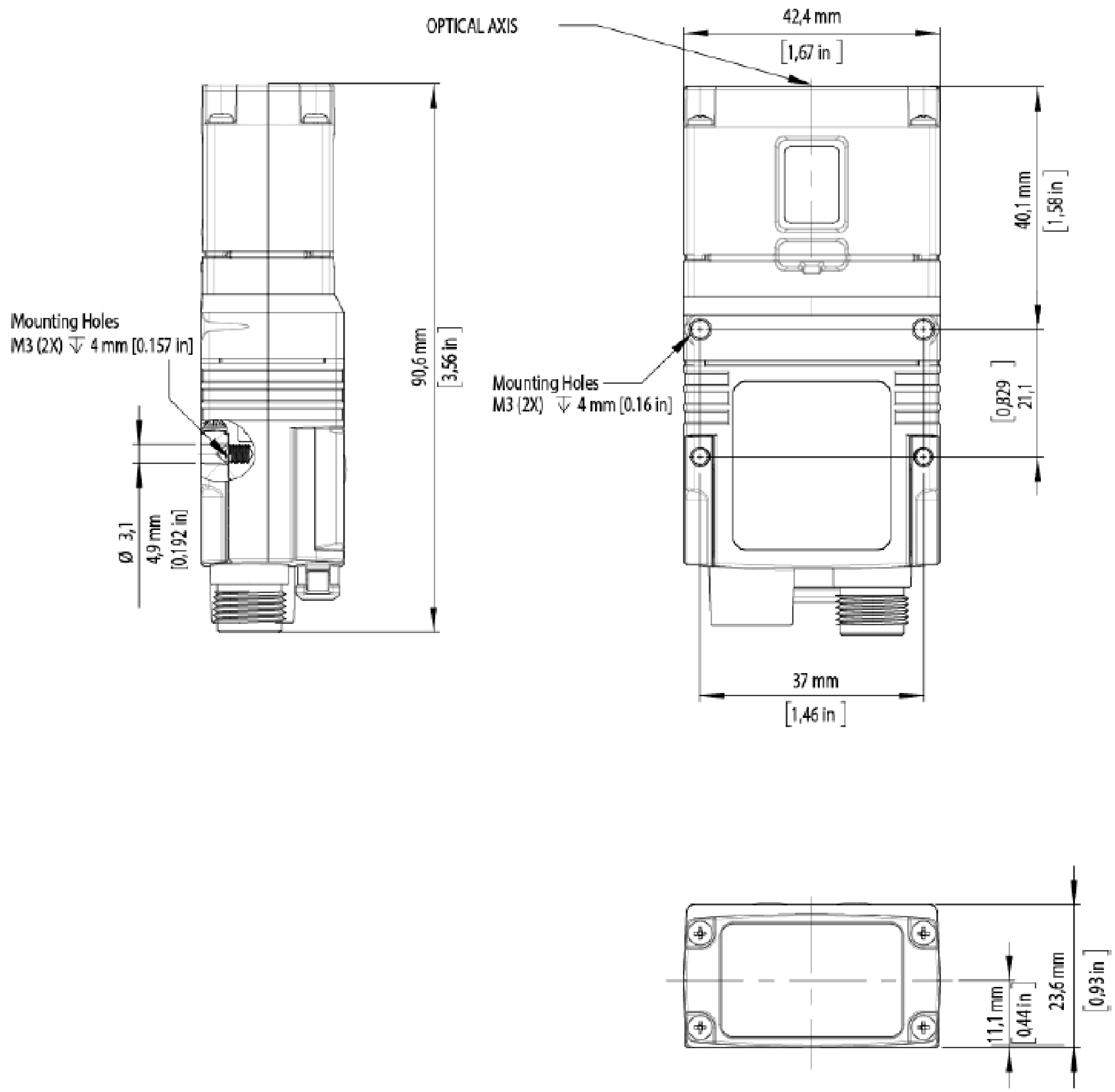
Vision Sensor Layout



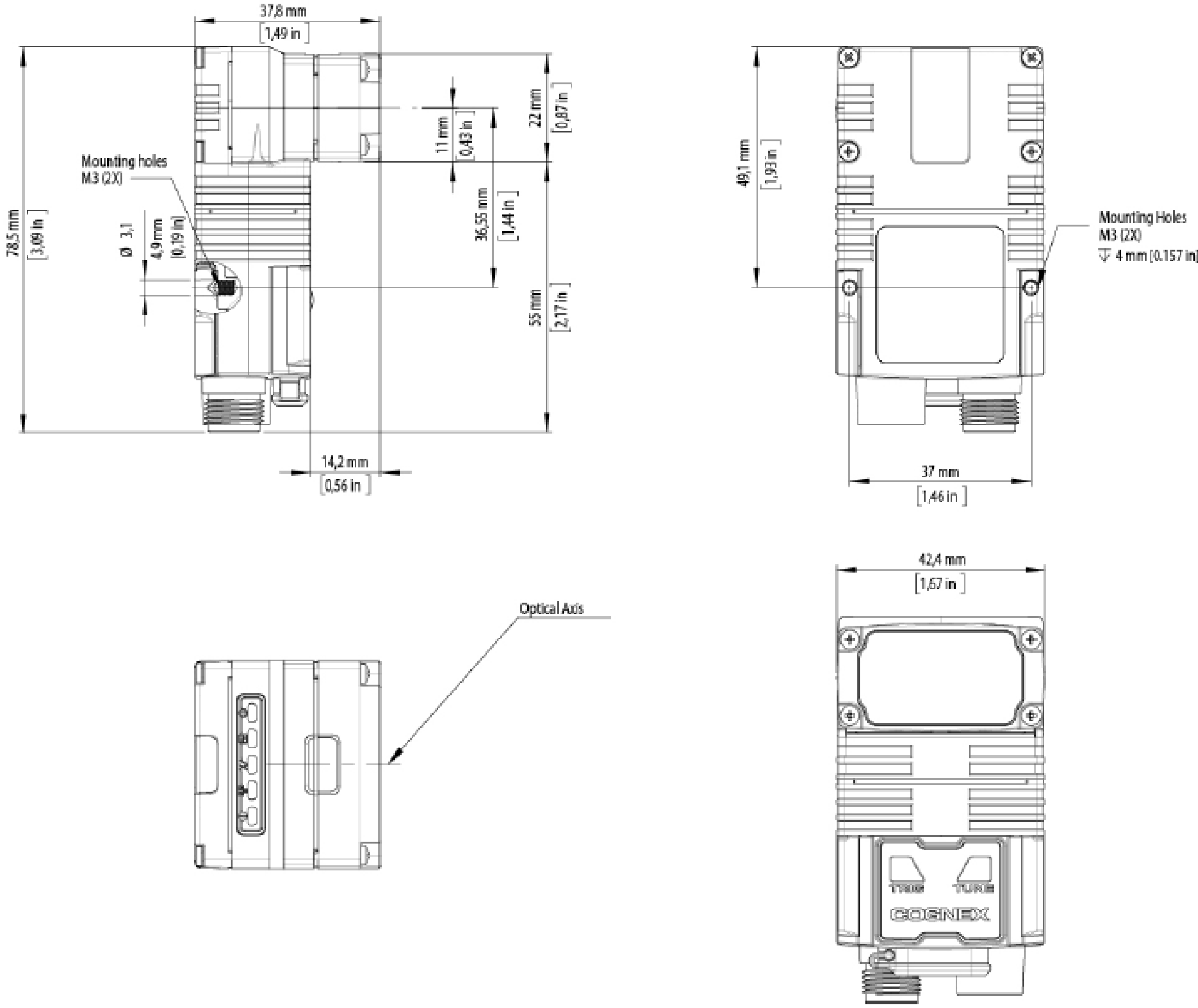
Number	Description
1	Power I/O Breakout Cable Connector
2	USB-C Slot
3	Ethernet Connector
4	Illuminated LEDs
5	LED Aimer
6	Trigger Button
7	Tune Button
8	Indicator LEDs
9	Power LED Indicator
10	Train Status/Trigger Status LED Indicator
11	Good/Bad Inspection LED Indicator
12	Communication LED Indicator
13	Error LED Indicator

In-Sight SnAPP Dimensioning

In-Sight SnAPP with 16mm Lens



In-Sight Snapp with 6.2mm Lens



In-Sight SnAPP Working Distance and Field of View

The **field of view (FOV)** for industrial vision sensors refers to the area that the sensor's camera can capture and analyze at any given time. It's essentially the "window" through which the sensor sees the environment, defining the width and height of the scene that the sensor can observe.

Key Points About Field of View (FOV):

1. **Determines Inspection Area**: The FOV sets the boundaries of the area that the sensor can inspect or monitor. A larger FOV allows the sensor to capture a broader scene, while a smaller FOV provides a more detailed view of a specific part of the scene.

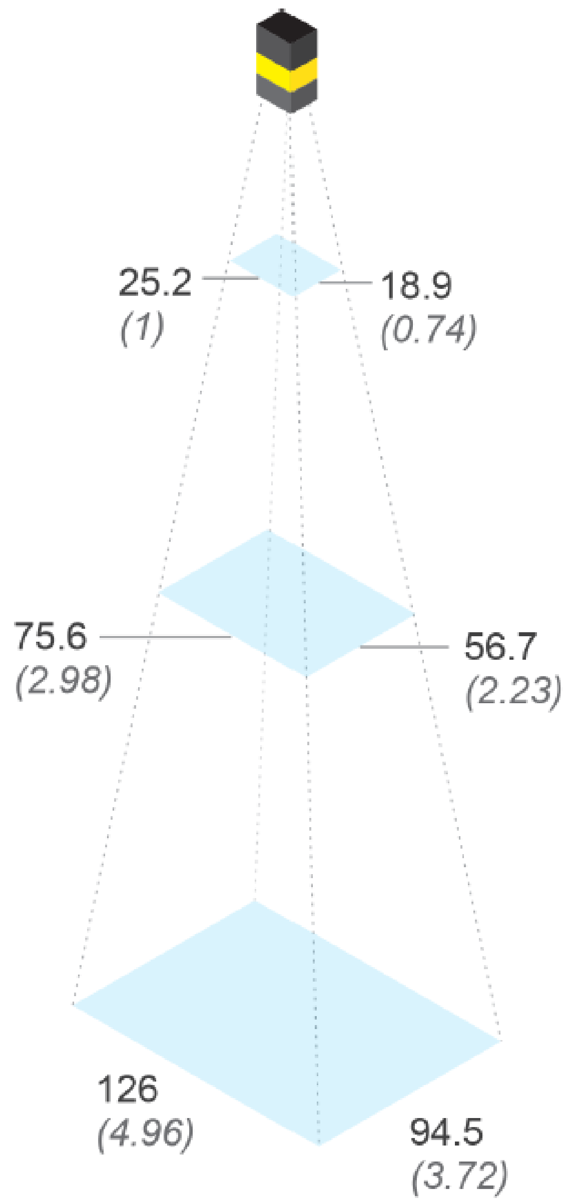
2. **Influences Accuracy and Resolution**: A wider FOV might reduce the resolution of the captured image, as the same number of pixels are spread over a larger area. Conversely, a narrower FOV provides higher resolution, which can be crucial for detecting small details or defects.

3. **Impacts Sensor Placement**: The FOV affects where the sensor can be positioned relative to the objects or processes its monitoring. For example, a larger FOV might allow the sensor to be placed further away, while a smaller FOV might require closer proximity.

4. **Related to Lens and Distance**: The FOV is determined by the sensor's lens and its distance from the object being inspected. Changing the lens or adjusting the distance can alter the FOV, allowing for customization based on specific inspection needs.

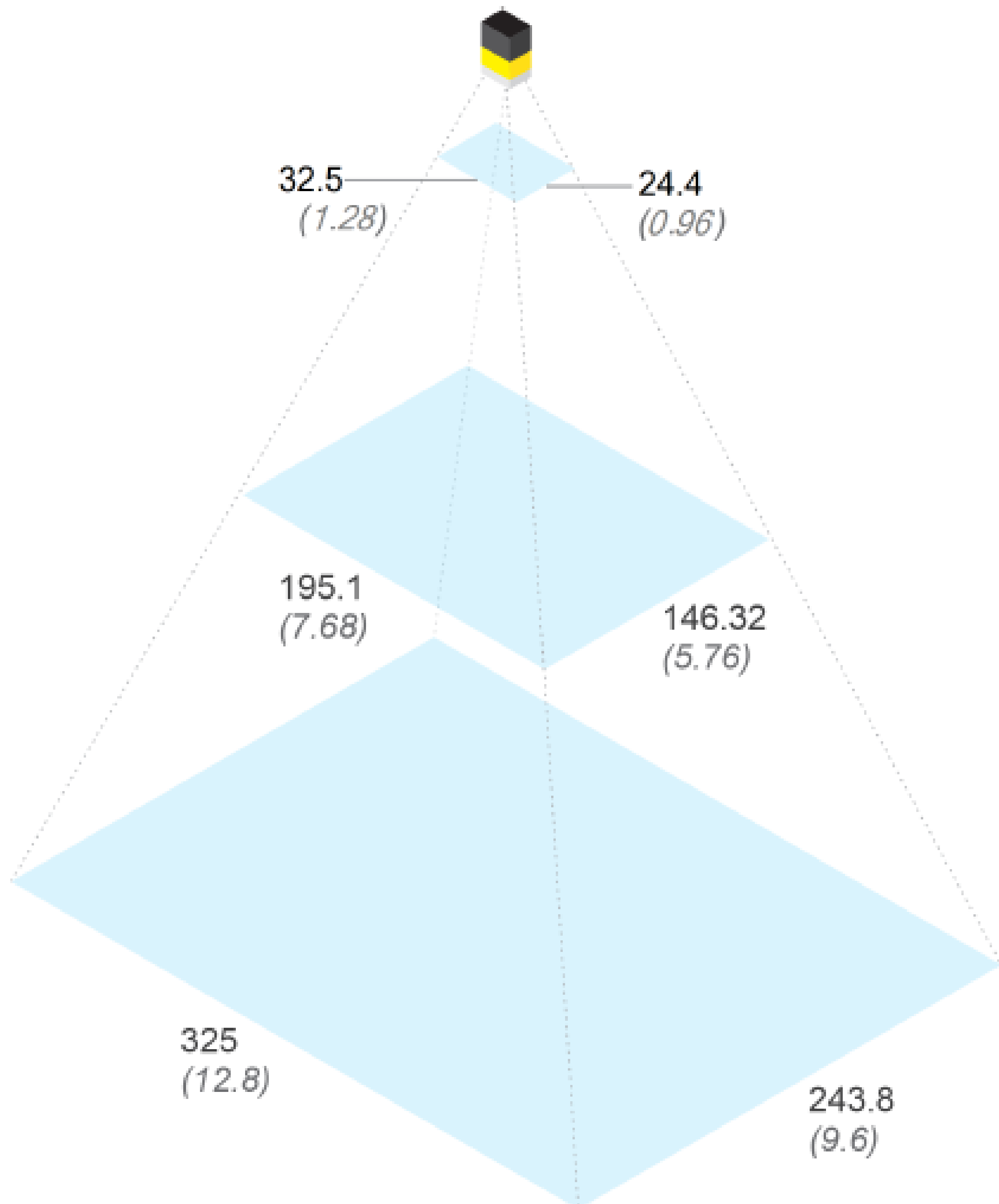
5. **Critical for Application Suitability**: The FOV must match the requirements of the application; for instance, inspecting a large conveyor belt needs a wide FOV, while inspecting fine details on small components may require a narrower, high-resolution FOV

In-Sight SnAPP with 16mm Lens Field of View (FOV)



	Working Distance	Horizontal FOV	Vertical FOV
Minimum	7.87 in (200mm)	1.00 in (25.2mm)	0.74 in (18.9mm)
Midpoint	17.72 in (450mm)	2.98 in (75.6mm)	2.23 in (56.7mm)
Maximum	27.56 in (700mm)	4.96 in (126mm)	3.72 in (94.5mm)

In-Sight SnAPP with 16mm Lens Field of View (FOV)



	Working Distance	Horizontal FOV	Vertical FOV
Minimum	1.97 in (50mm)	1.28 in (32.5mm)	0.96 in (24.4mm)
Midpoint	11.8 in (300mm)	7.68 in (195.1mm)	5.76 in (146.3mm)
Maximum	19.69 in (500mm)	12.8 in (325mm)	9.60 in (243.8mm)

Lab 3: Creating a 2-Class Classifier Program

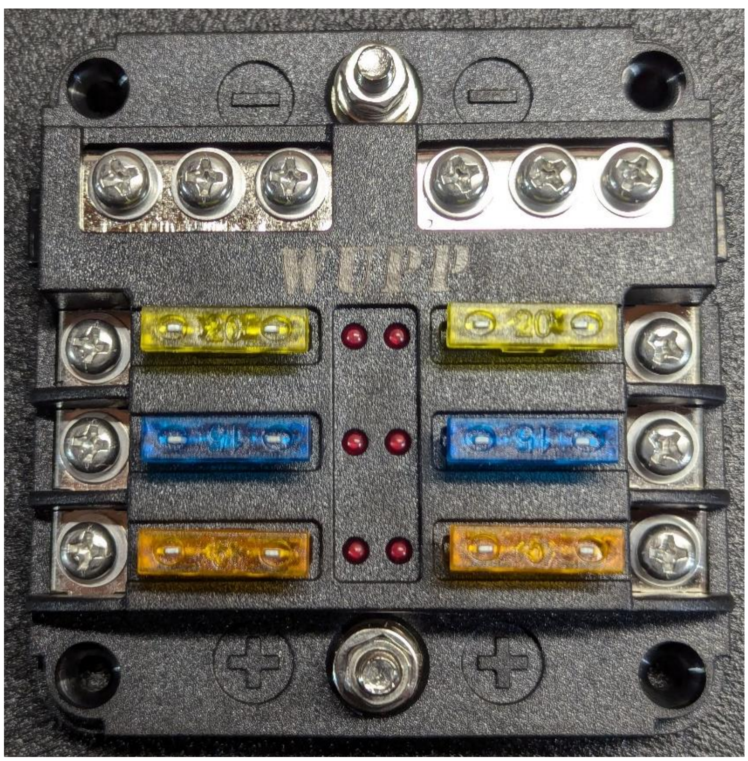
The 2-Class Classifier application sorts parts into either the OK or the Not Good (NG) class.

The bars under the labeling buttons represent the confidence the vision sensor has in correctly labeling the images. Confidence tends to improve as users label more parts. The vision sensor is well-trained once the confidence indicator can suggest labels with two or three bars.

Procedure

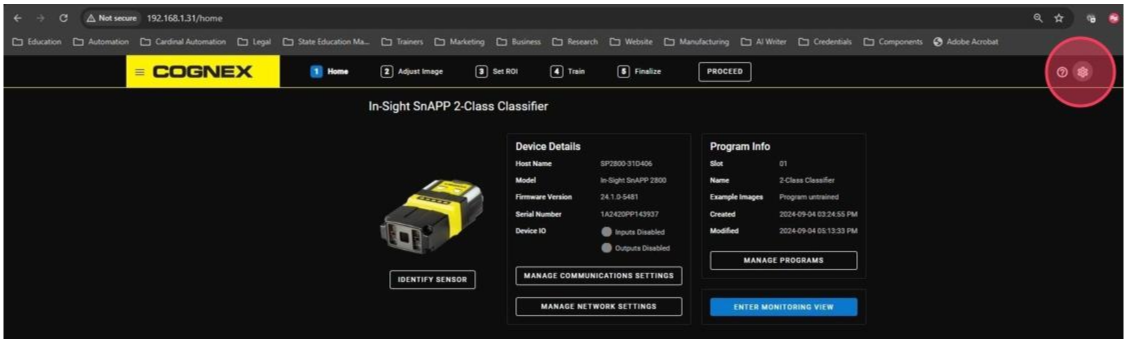
1. Label a minimum of two parts for each class.
2. Label additional parts to improve the confidence of the vision sensor.
3. Continue until satisfied with the inspection results.
4. Click **Proceed**.

Required Equipment

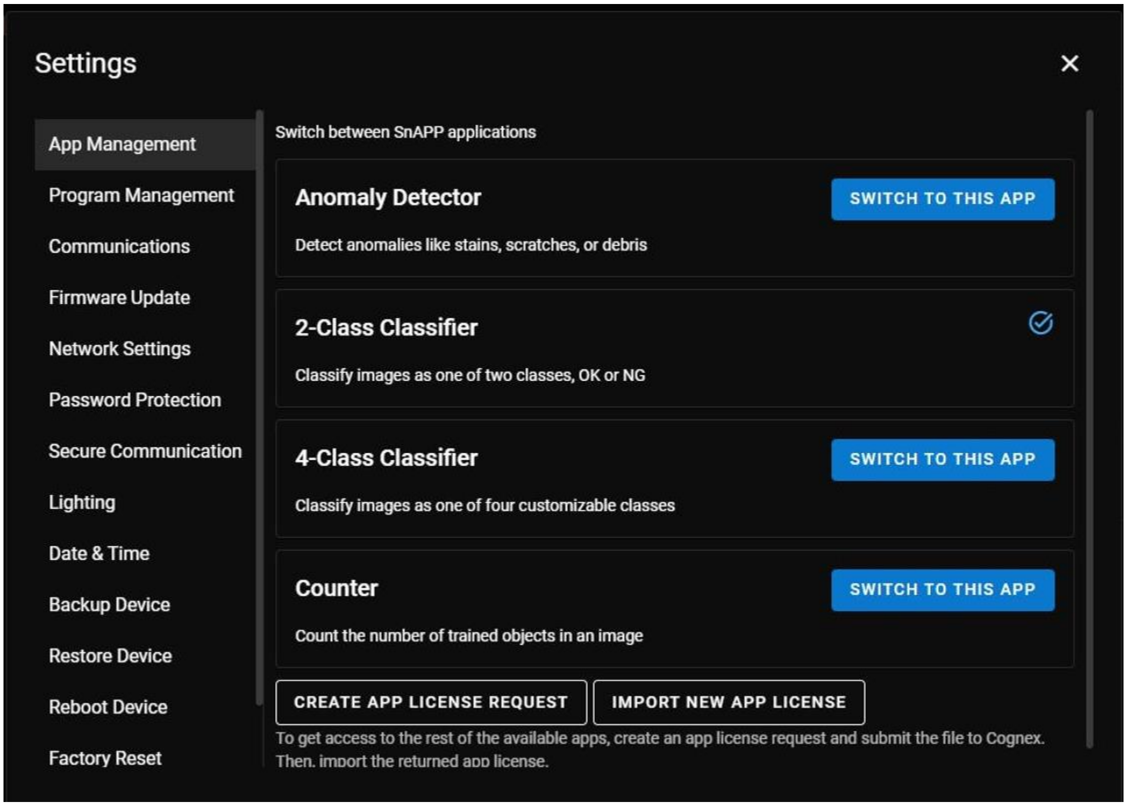


Lab 3.1: Selecting the Program Type

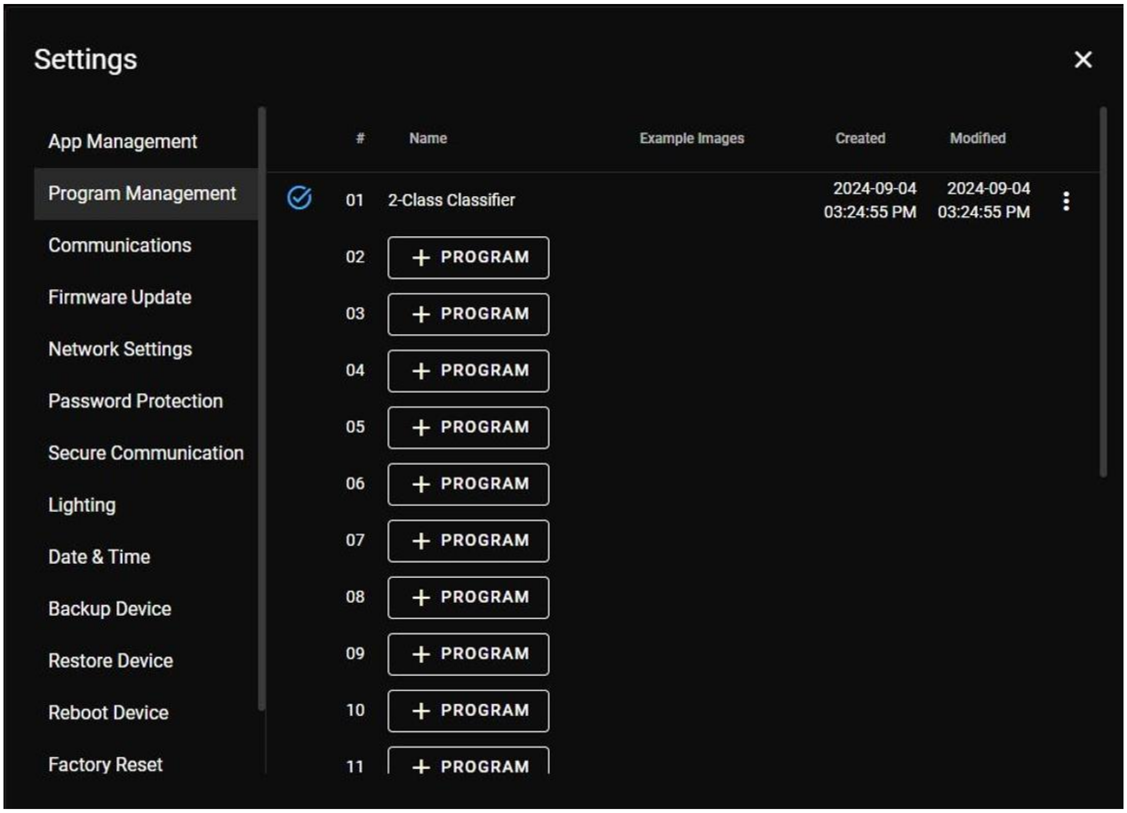
1. In the In-Sight SnAPP Home Menu, Open the settings tab.



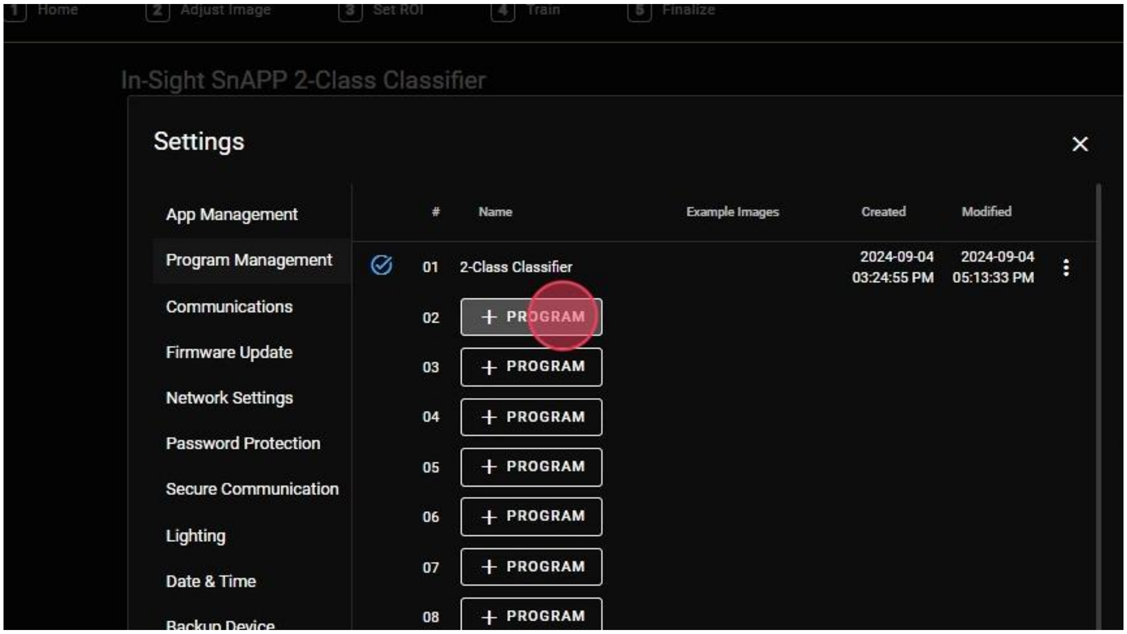
2. In the App Management tab, ensure the 2-Class Classifier application is selected. If the 2-Class Classification application is not selected, Click the Switch To This App button.



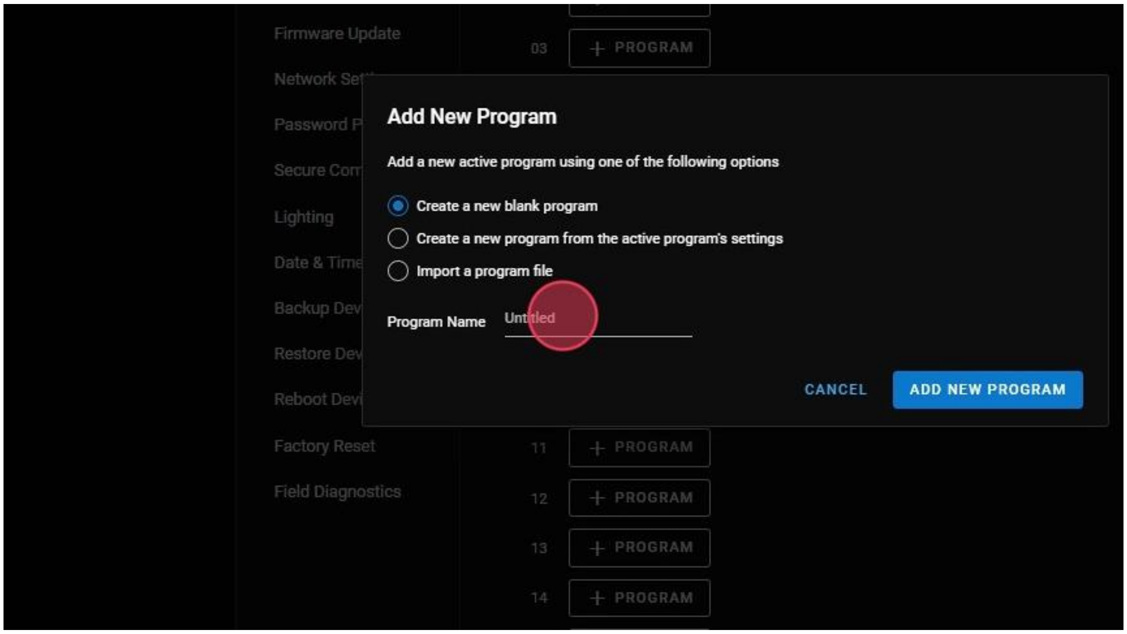
3. Open the Program Management tab. Each of the 20 available program slots will be shown.



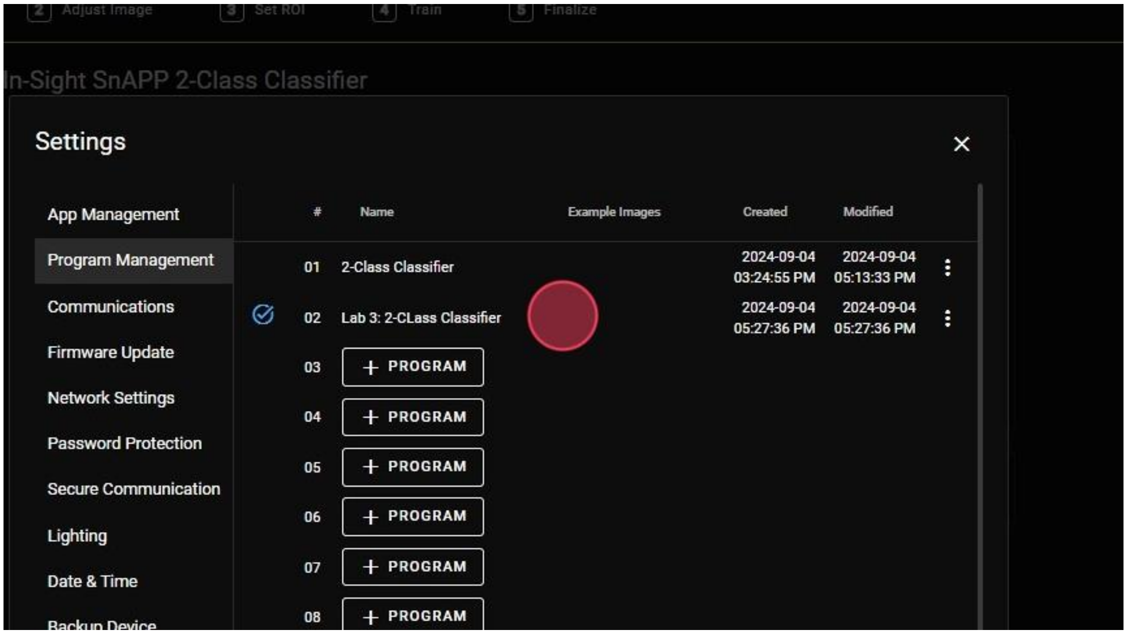
4. Click + Program to create a new program.



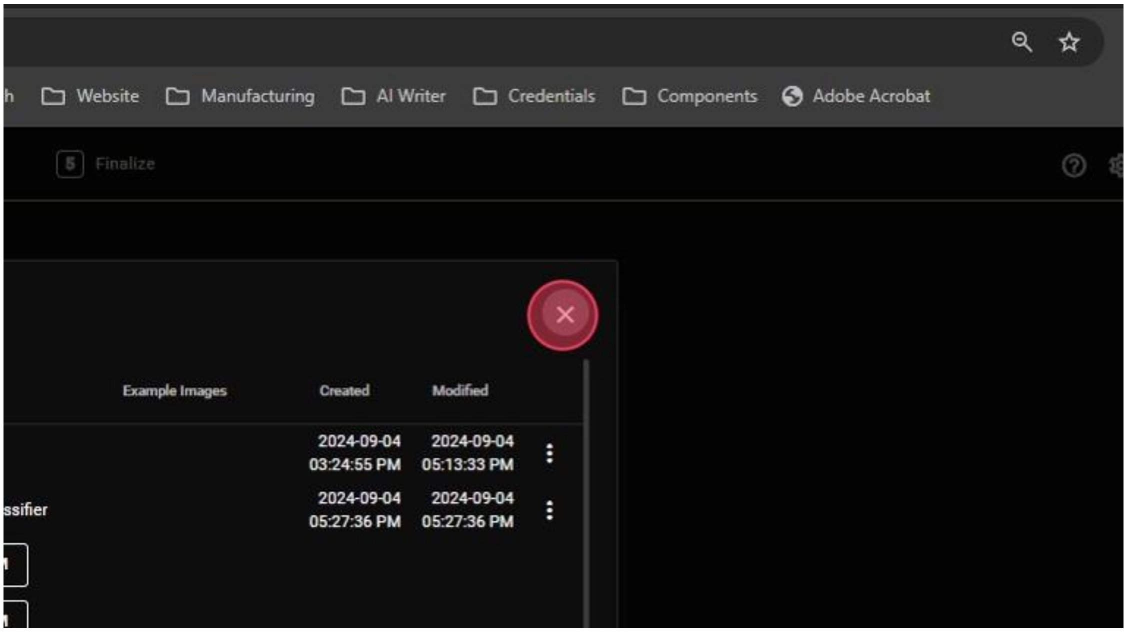
5. Name the Program "Lab 3: 2-Class Classifier" and Click Add New Program.



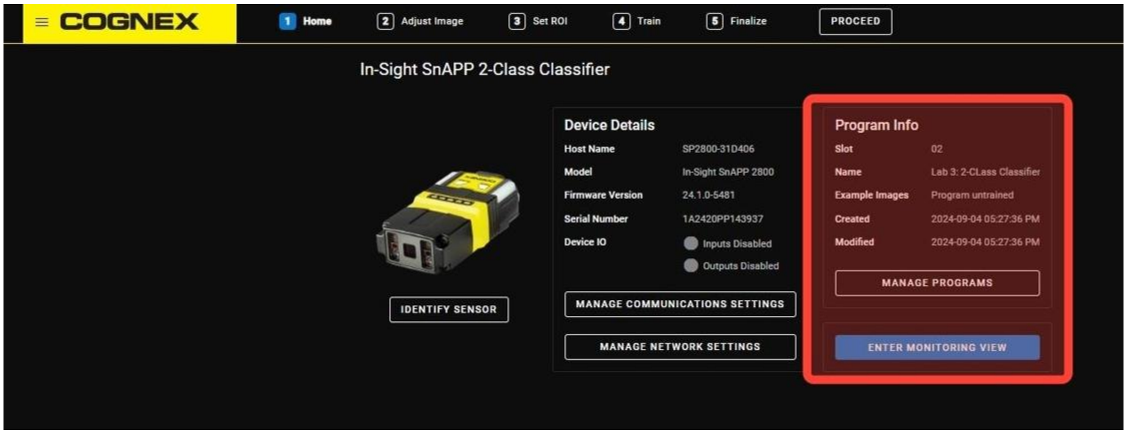
6. The newly created program "Lab 3: 2-Class Classifier" will now be listed in the program list. Ensure the new program is selected with the Blue Checkmark. Notice the Date and Time the program was created is listed on the screen.



7. Exit the Settings Menu.

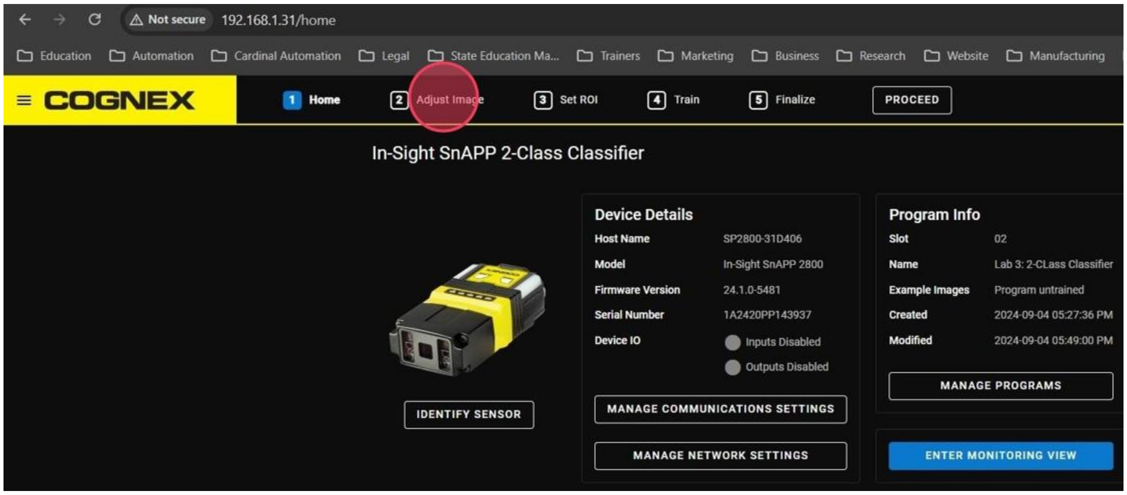


8. Under Program Info on the In-Sight SnAPP Home Menu, notice the newly created program is shown.

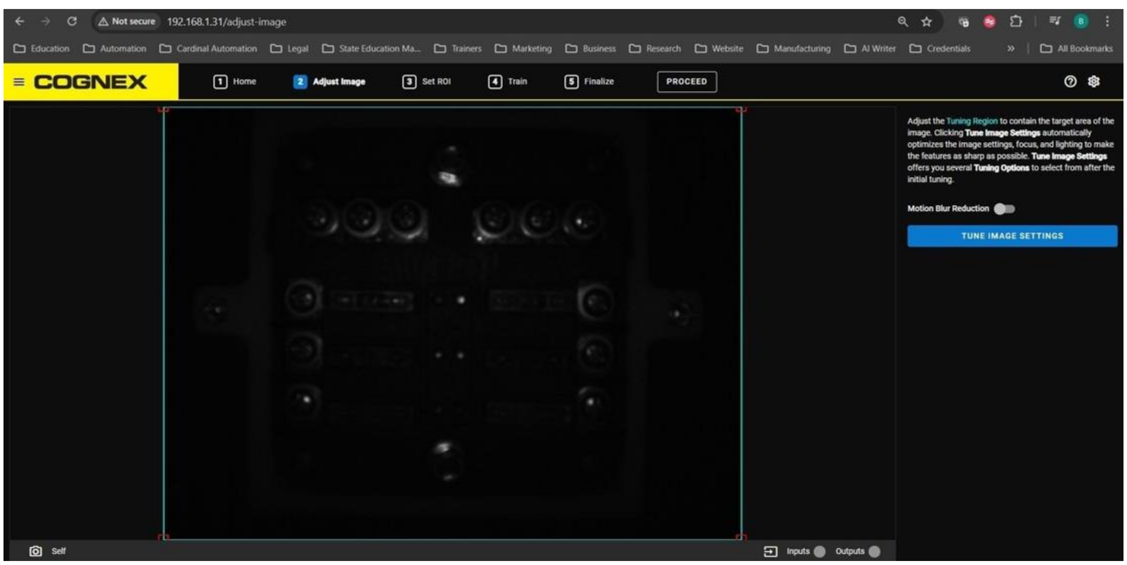


Lab 3.2: Tuning the Image Settings

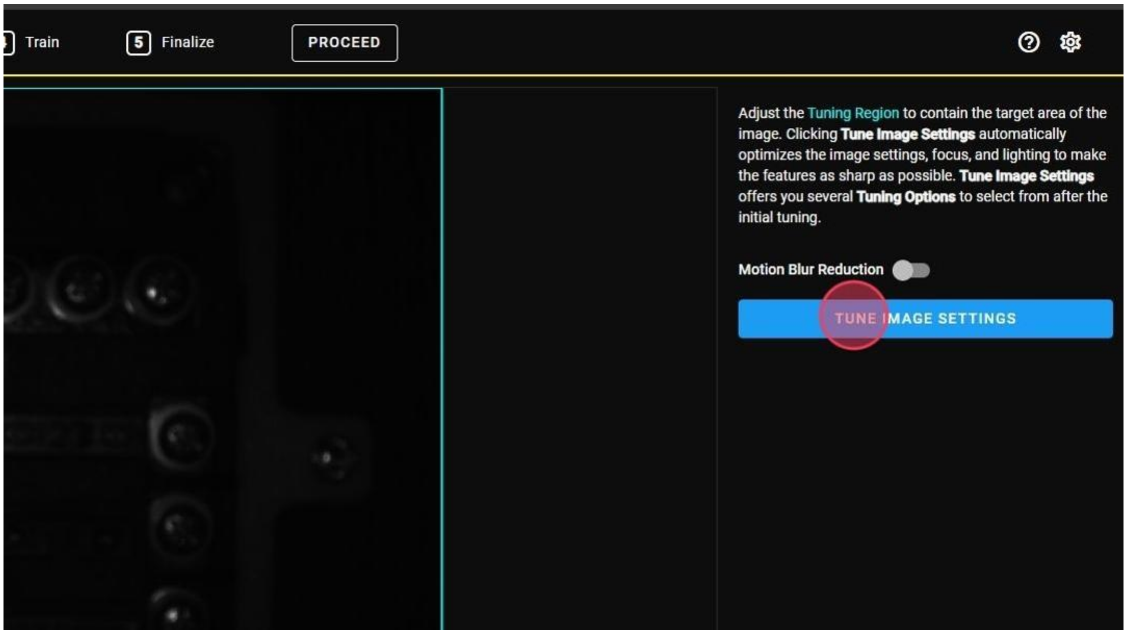
1. In the In-Sight SnAPP Menu Home, Click the Adjust Image tab.



2. The Adjust Image Menu Screen allows users the ability to fine tune the image the vision sensor receives. The main purpose of this step is to adjust the image settings, including lighting and focus, in order to capture a visually clear and sharp image with the sensor. Different materials may require different lighting and focus combinations, for example, metal parts may need less contrast compared to matte parts. The Insight Snap sensor can automatically generate the best result for you.

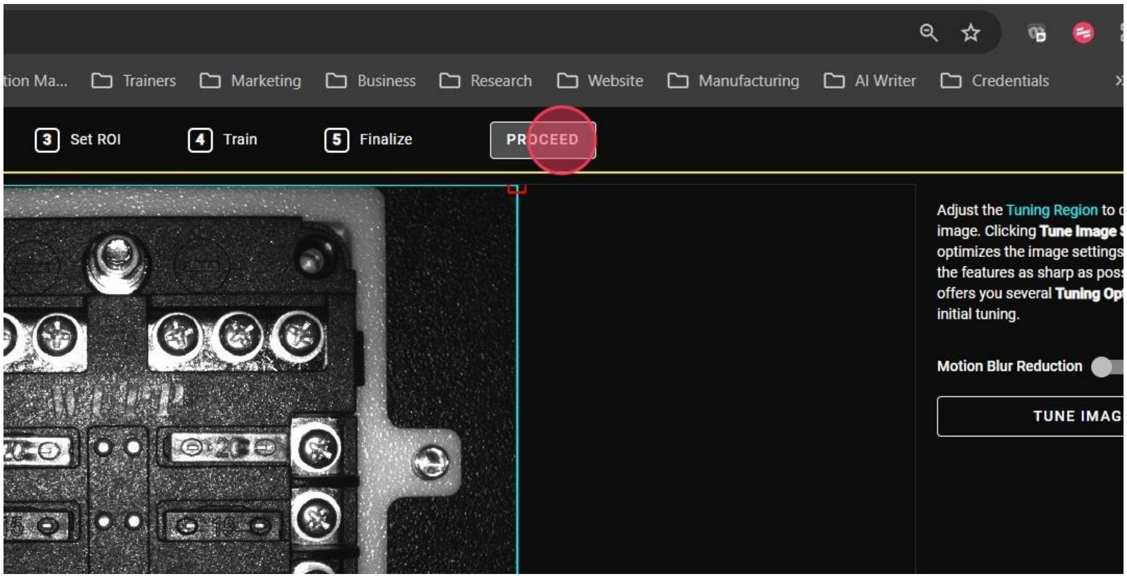


3. To start, place your part within the sensor's frame and adjust the tuning region by resizing the blue box. This directs the sensor to focus on the specified area. Click on the Tune Image Settings button to generate multiple images with different lighting and focus options.



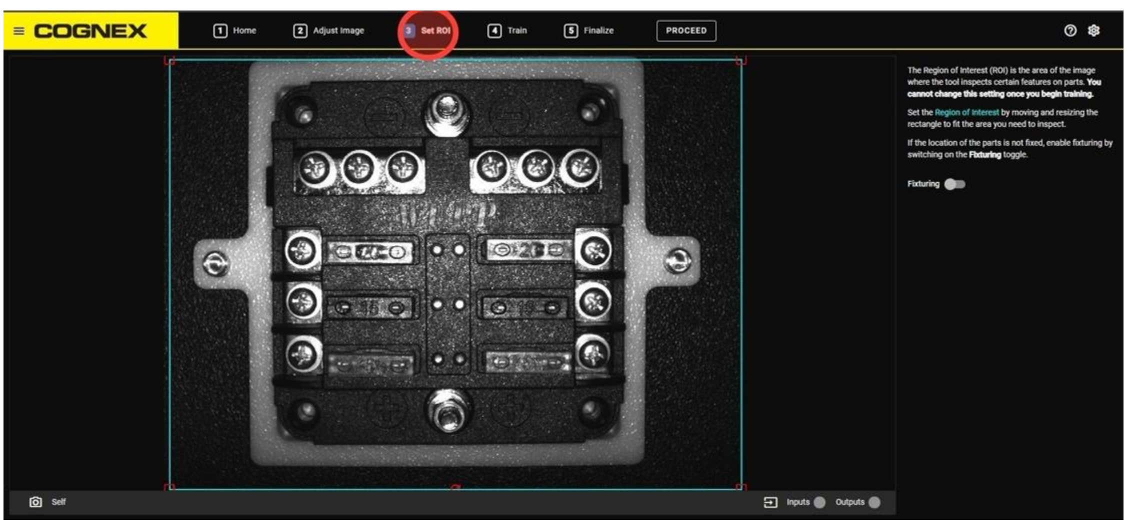
4. Select the best image from the candidates at the bottom of the screen, ensuring optimal lighting and focus for your application. The selected image will provide a sharp and clear image for further processing by the sensor.

5. Once the best image has been selected, Click Proceed.

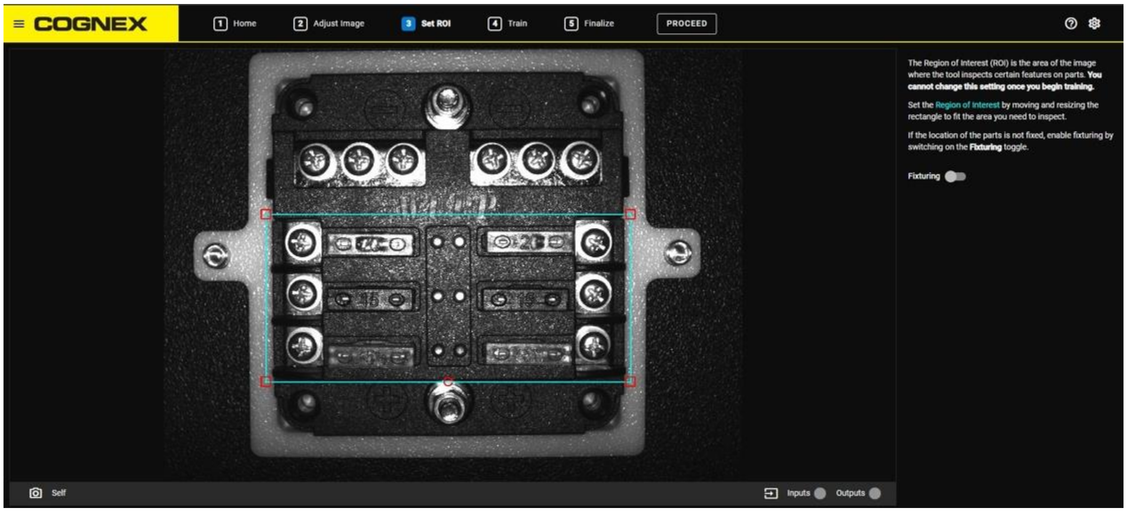


Lab 3.3: Configuring the Region of Interest (ROI)

1. The Set ROI feature in the application enables defining the Region of Interest (ROI) for inspection on each acquisition. Fixture can be enabled, and a separate fixture region can be defined. Once trained, the device automatically adjusts ROI relative to the fixture location.



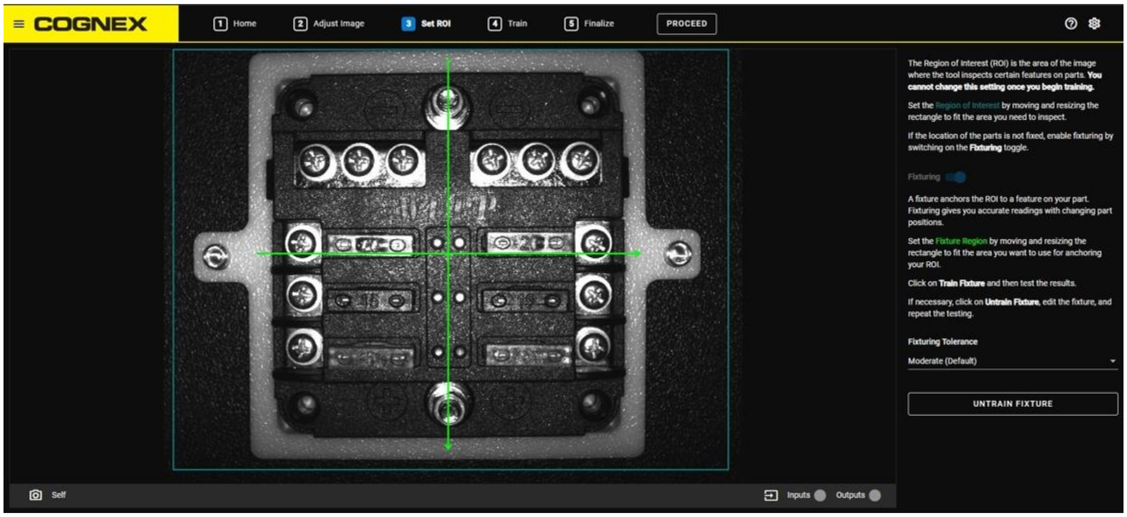
2. The Region of Interest (ROI) is where the application inspects the object in the image. You can set the ROI by moving, resizing, and rotating the cyan rectangle to fit the desired area. If you define the ROI without a fixture, it will inspect the same area on each image. To adjust the ROI, simply click and drag within the cyan rectangle to move, use the corner handles to resize, and the rotate handle to rotate it.



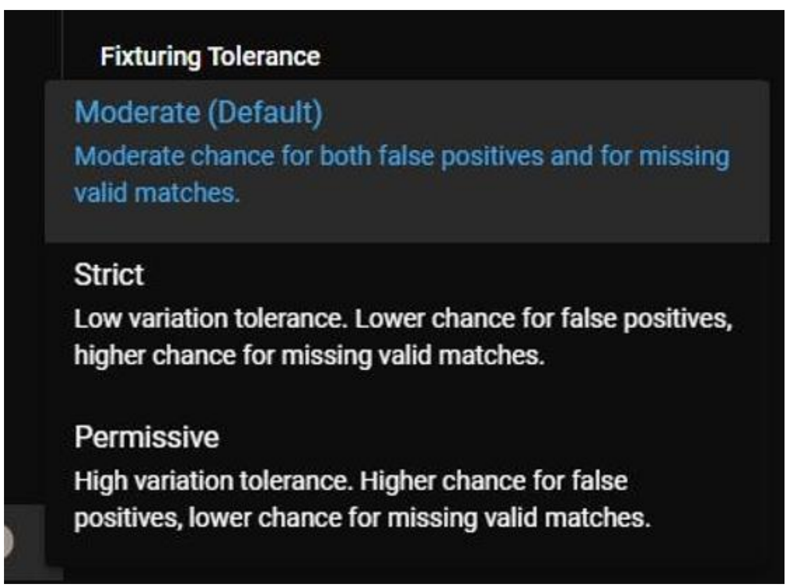
3. Setting up a fixture is essential for anchoring the Region of Interest (ROI) to a specific feature on an object, ensuring more accurate readings even with changing object positions. Once the fixture region is trained, the ROI becomes relative to the fixture location on each image.

When fixturing is enabled, a magenta rectangle appears on the image, allowing you to set the Fixture Region by moving, resizing, and rotating the rectangle to fit the desired anchoring area for the ROI. It's important to note that the application cannot inspect the image if any part of the ROI is moved out of the field of view. For optimal results, use asymmetric and distinct shapes as fixtures, avoid reflective parts, and refrain from using fixturing when inspecting the entire image.

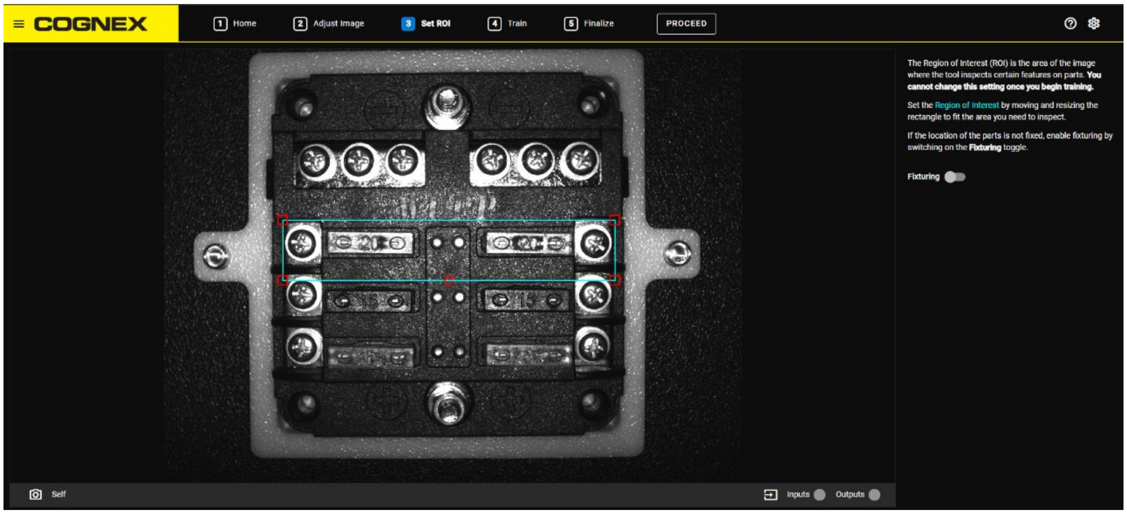
4. After adjusting the Fixture Region, click on Train Fixture. The fixture region will change from a rectangle to a set of crosshairs. To test the fixturing, move the fixtured part around. If it works properly, proceed to the next step. To modify the fixture, click on Untrain Fixture, adjust the Fixture Region, and then Train Fixture again.



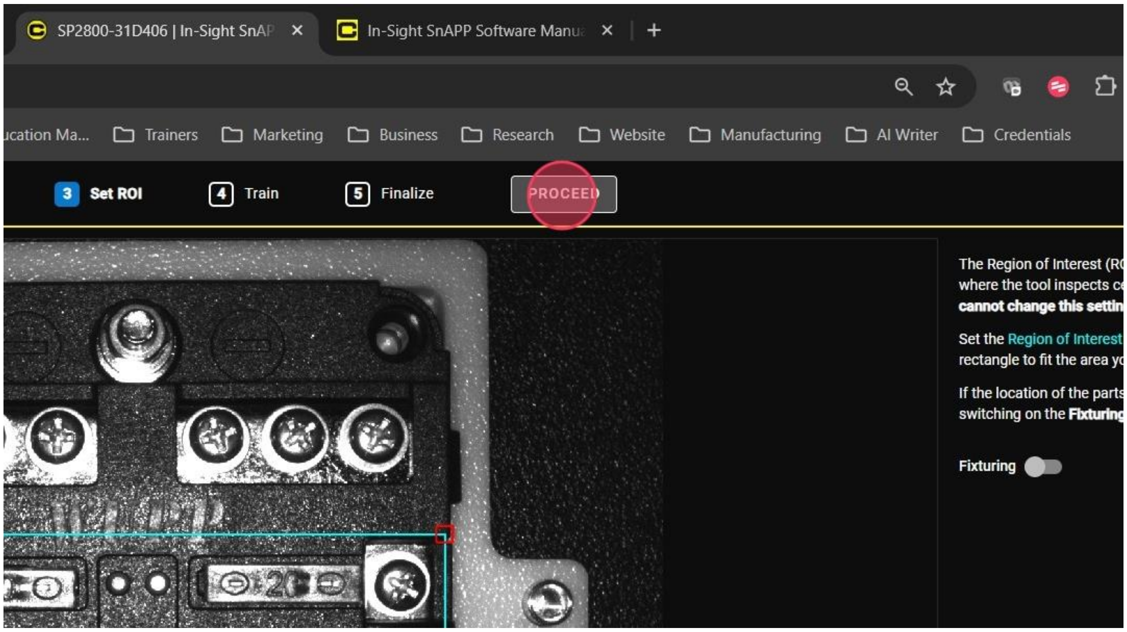
5. The Fixturing Tolerance feature allows you to choose between prioritizing minimizing false positives or reading all valid matches. Options include Moderate (moderate tolerance for variation with chance for false positives), Strict (lower tolerance with lower chance for false positives), and Permissive (higher tolerance with higher chance for false positives).



6. Untrain the Fixture and turn off the Fixturing option. Modify the ROI to mimic the image below.



7. Once satisfied with ROI, click Proceed to continue.



Lab 3.4: Training the Classifier

1. This app classifies your parts into either the OK or Not Good (NG) categories. The confidence level of the vision sensor in labeling images is indicated by the bars under the buttons and improves as more parts are labeled. A well-trained vision sensor will suggest labels with two or three bars. The guidance text below the buttons in your browser informs you of your progress and advises when to proceed or adjust.

2. Click the OK button to train the first OK image. Notice both fuses are present in this image with the numbers oriented correctly.

3. Assign at least two categories to each part using the vision sensor. The Confidence Indicator indicates the sensor's certainty in the suggested category. Enhance the sensor's confidence by labeling additional parts until you are content with the outcomes.

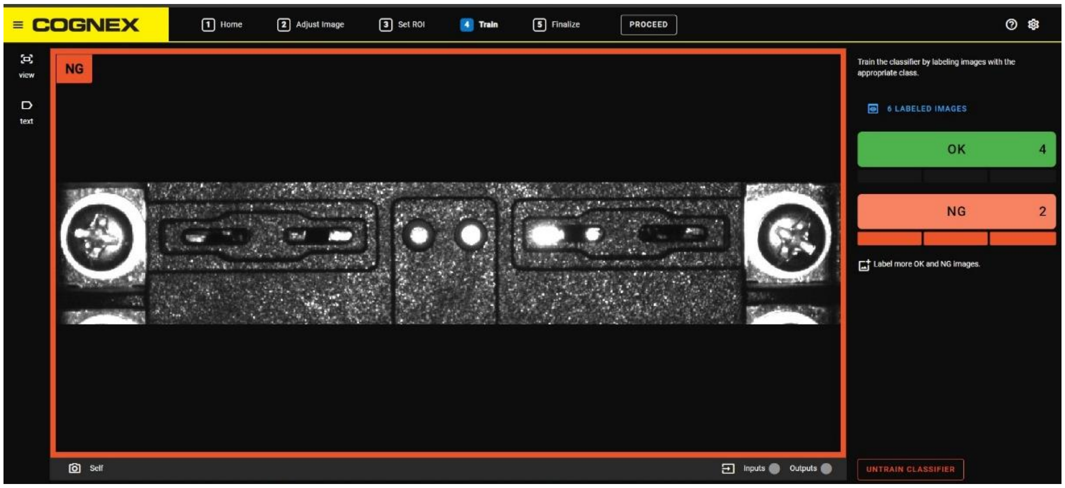
Click the OK button to train the second OK image. Notice both fuses are present in this image with both numbers inverted.

4. Click the OK button to train the third OK image. Notice both fuses are present in this image with one set of numbers inverted.

4. Click the No Good (NG) button to train the first NG image. Notice only 1 of the 2 fuses are present in this image.

5. Click the No Good (NG) button to train the second NG image. Notice only 1 of the 2 fuses are present in this image.

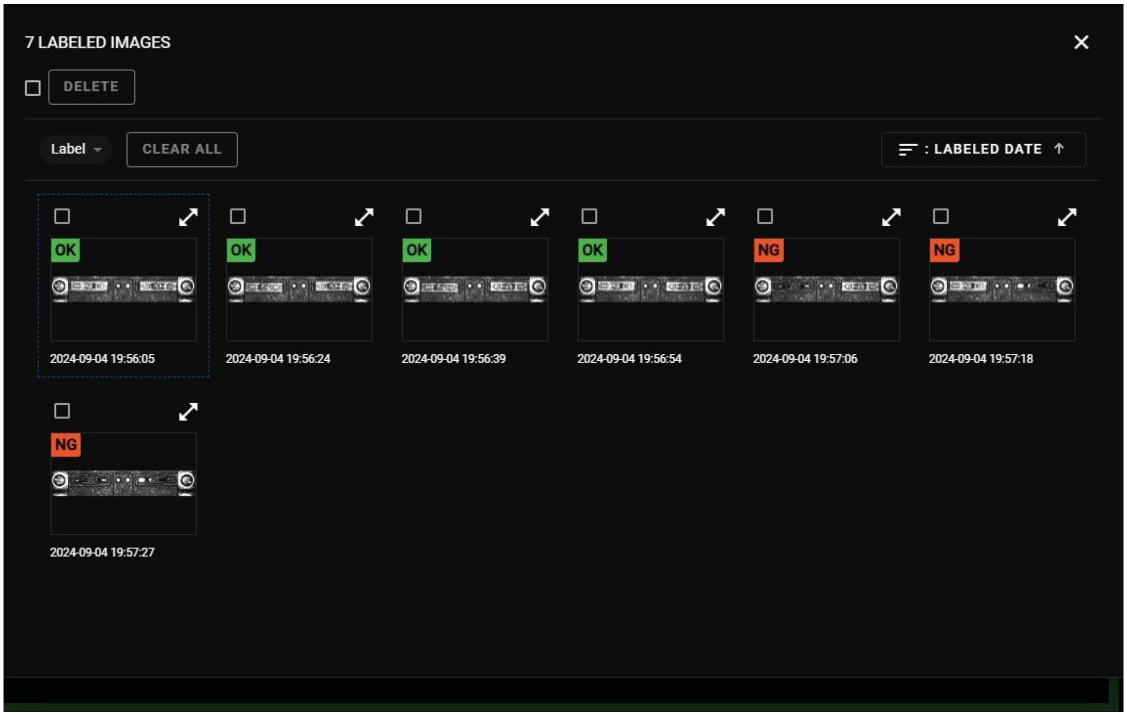
6. Click the No Good (NG) button to train the third NG image. Notice neither fuse is present in this image.



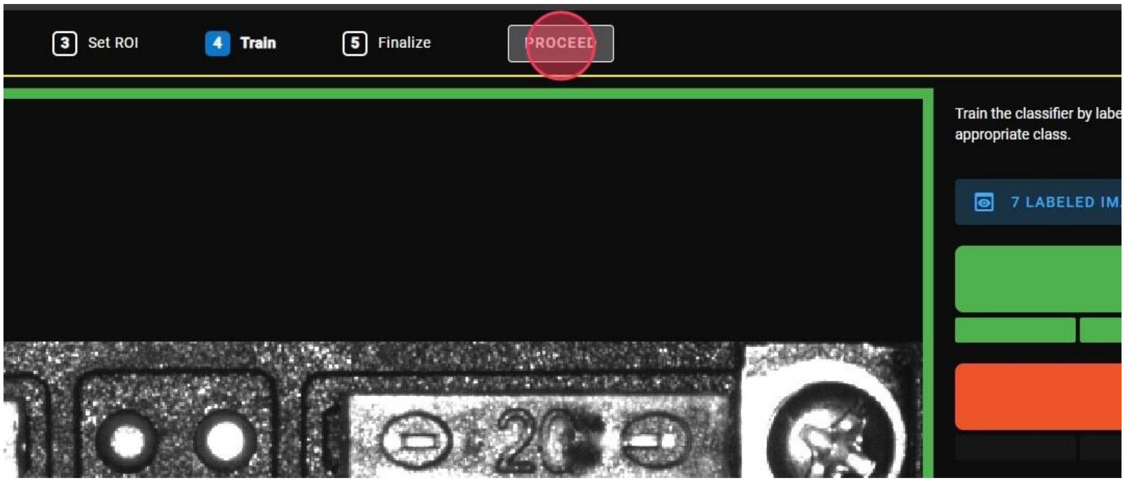
7. Continue to train additional ND images until satisfied with the results.

8. Click the Labeled Images button to view all OK and NG images recorded.

9. In the Labeled Images window, all images taken during the Training process are shown and can be deleted if desired. Remember, the sensor needs a minimum of 2 OK and 2 NG images to properly function.



10. Exit the Labeled Images window and Click the Proceed button.



Lab 5: Creating a Counter Program

The Counter application counts the number of similar-size objects in an image.

Procedure

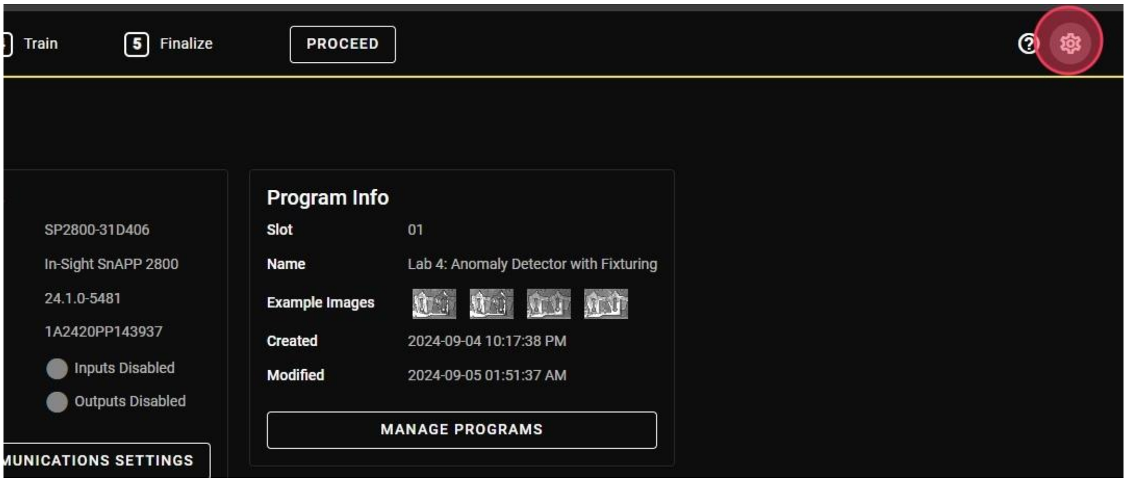
1. Mark all the objects in the ROI.
2. Click **Train**.
3. Review the objects the app counts.
4. Click **Label Image** to make corrections.
5. Mark objects and click **Train** to continue training the tool.
6. Set the **Counter Pass Range** to define how many counted objects is a Pass. The Pass Range can be a single value or any range between 0 and 100.
7. Continue to label images until the counter is trained and users are satisfied with the results.
8. Click **Proceed**.

Required Materials

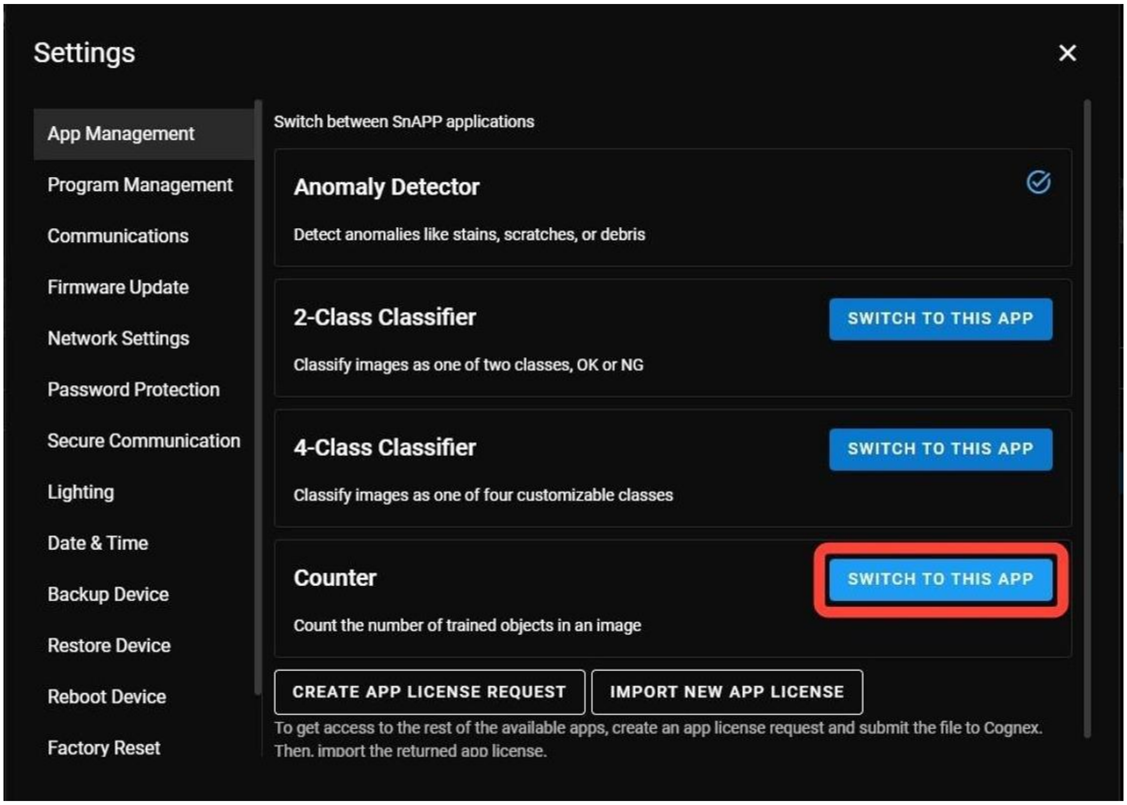
Lab 5: Creating a Counter Program

1. In Lab 5, users will be using the Counting app to count the total value shown on the dice below.

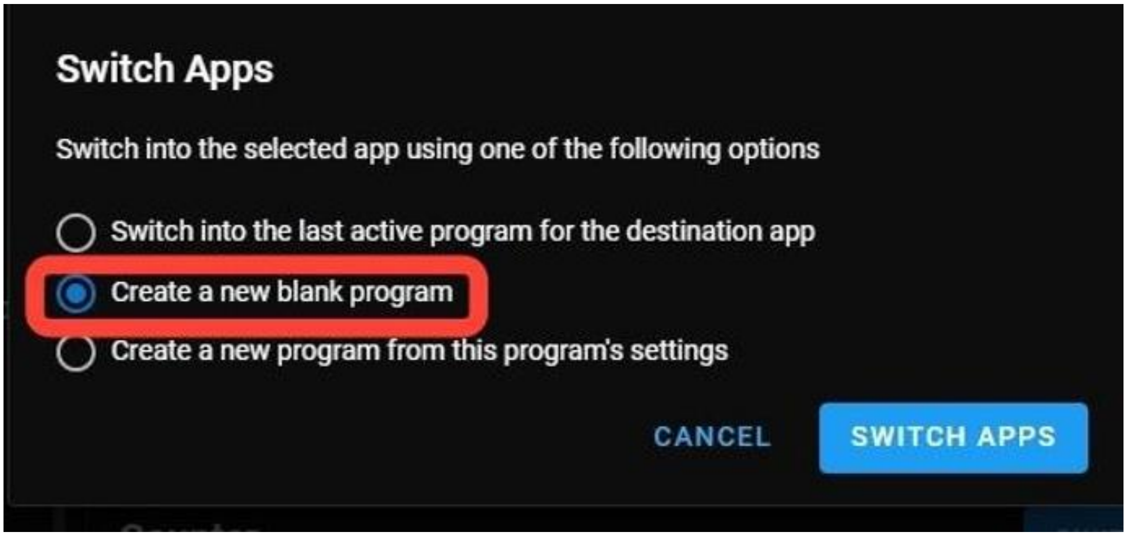
2. From the In-Sight SnAPP Home Menu, open the Settings Menu.



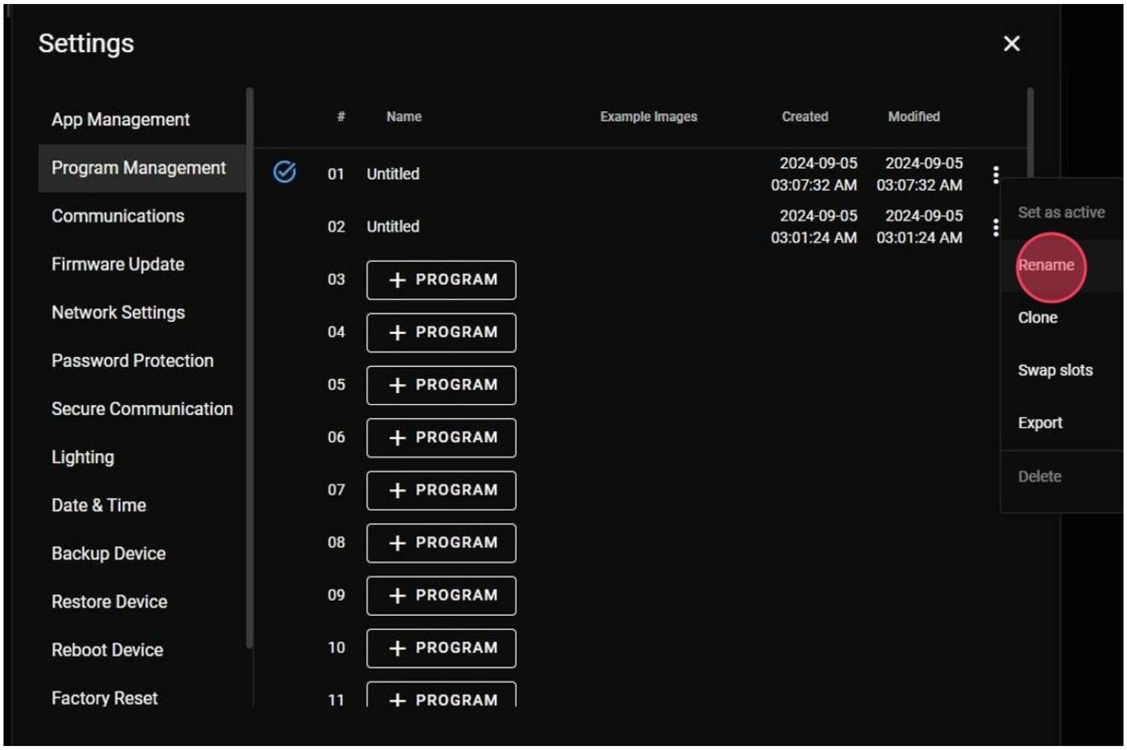
3. Open the App Management tab and under Counter, select **Switch To This App.**



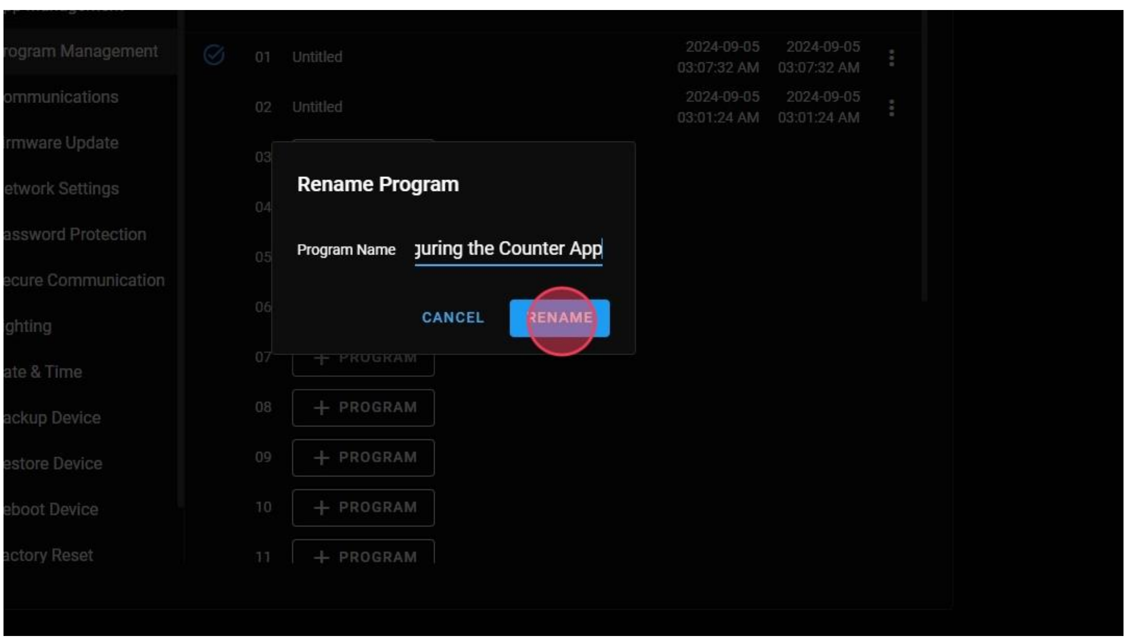
4. Users will be prompted to either create a new program or open the last Counter program created. For this lab, select Create a New Blank Program and Click Switch Apps.



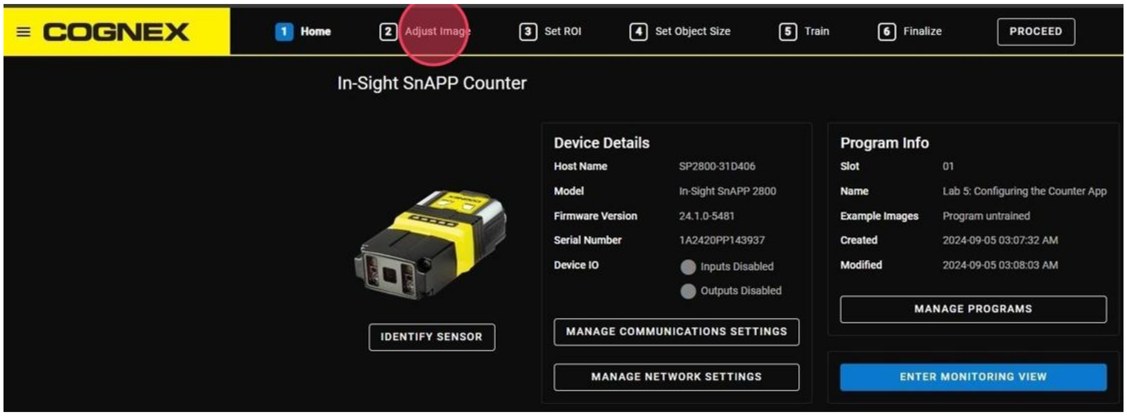
5. Open the Program Management tab and click the three dots next to the newly created program and select Rename.



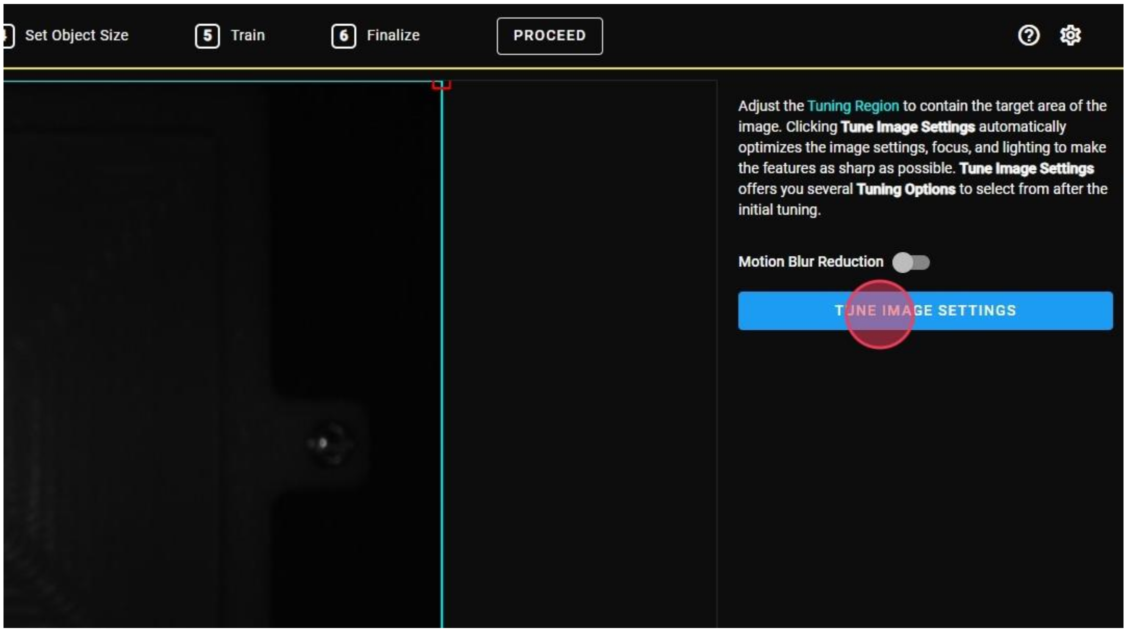
6. Rename the program Lab 5: Configuring the Counter App and Click Rename.



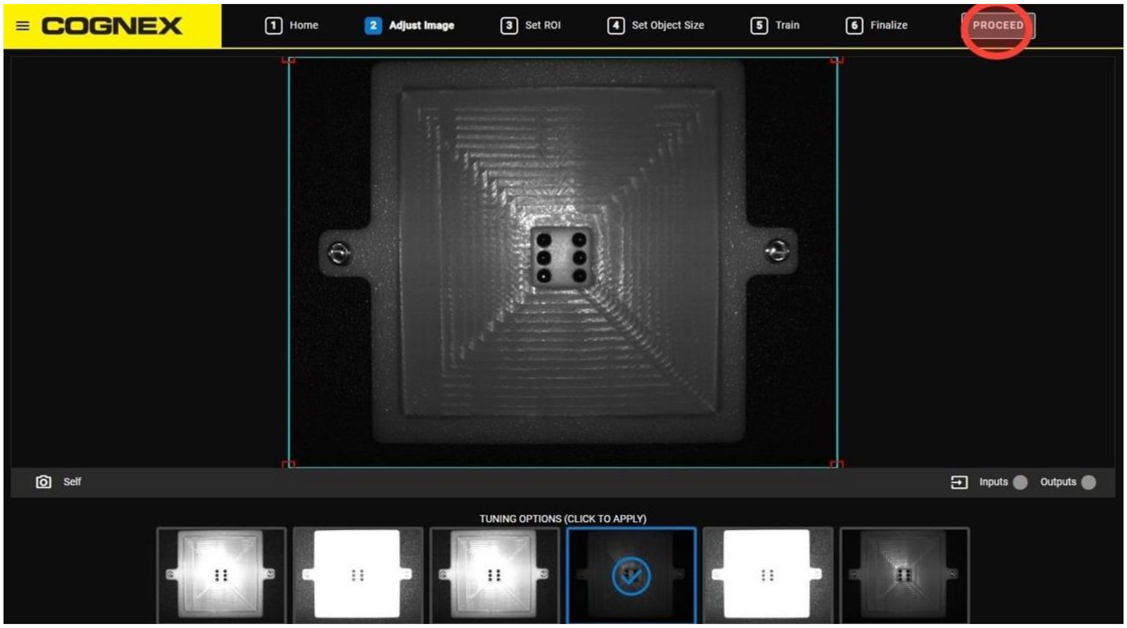
7. Exit the Setting Menu and Click Adjust Image.



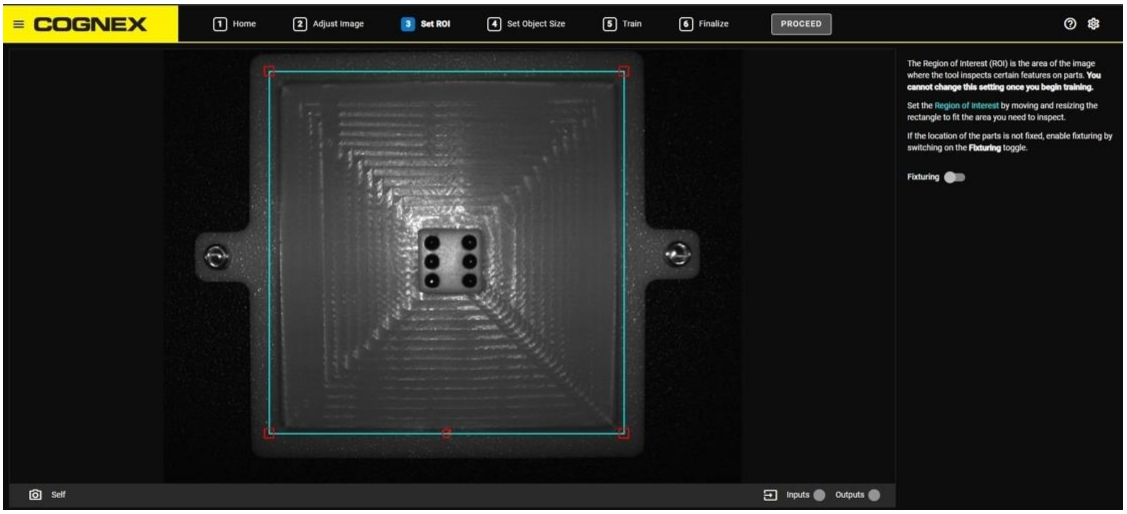
8. Ensure the part used for this lab is in the field of view and Click Tune Image Settings. This process will automatically adjust the vision sensor to the ideal focus and lighting to provide the sharpest image possible.



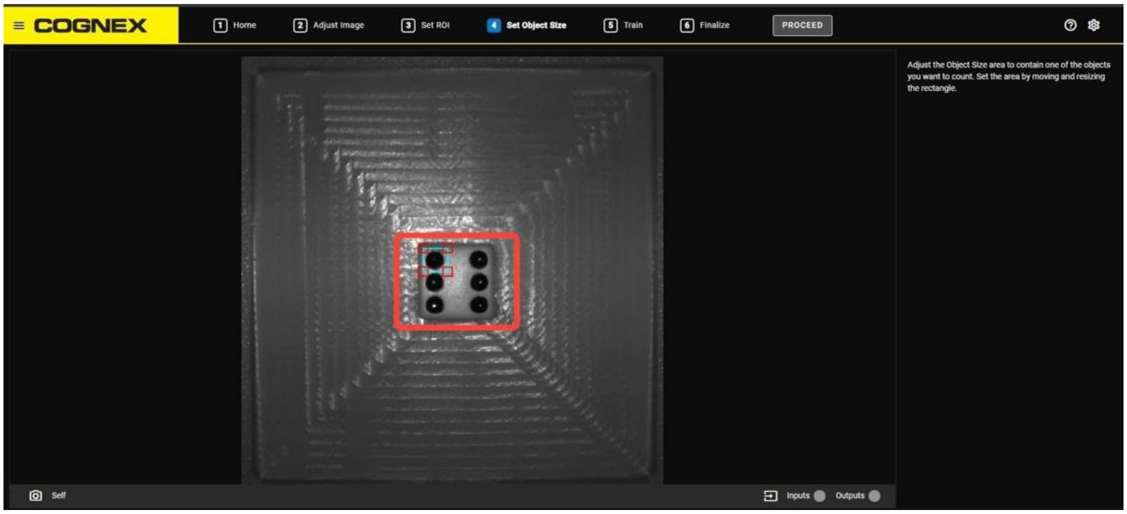
9. Select the clearest image available and Click Proceed.



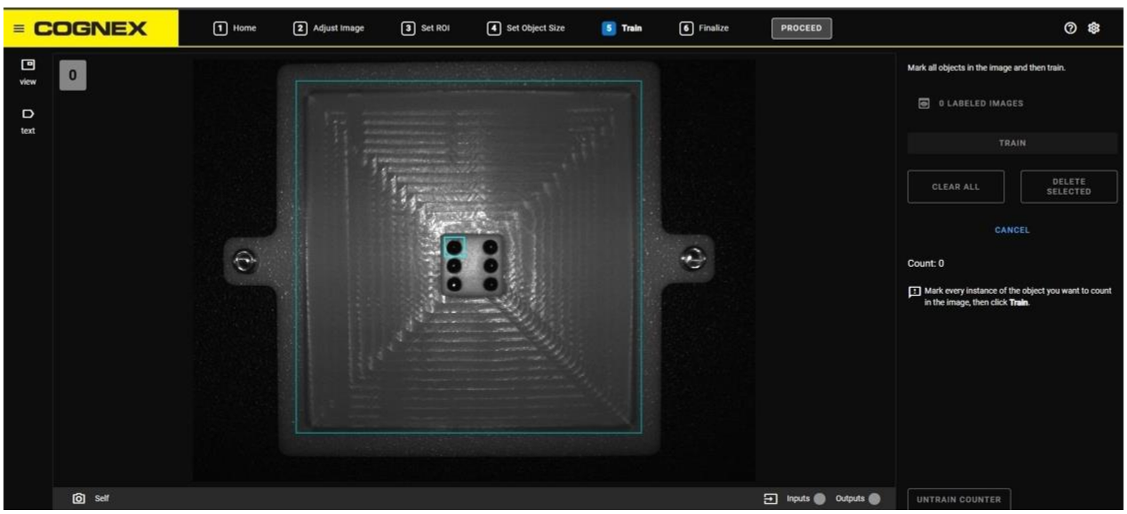
10. Users will need to train the Region of Interest (ROI). This is done by moving the Cyan box around the detection field. For this lab users will focus the ROI on the open part box. Once satisfied with the ROI, Click Proceed



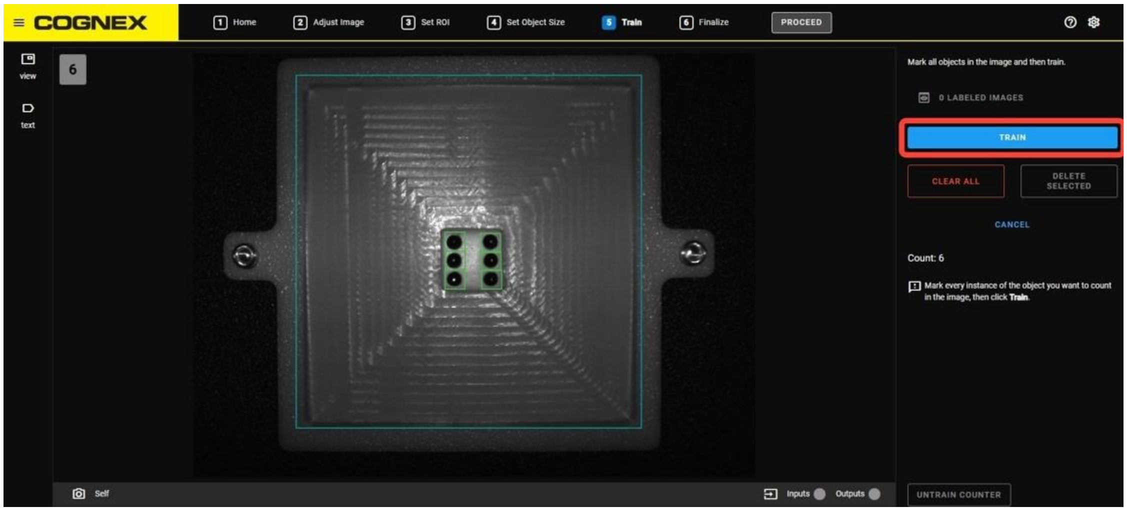
11. Under the Set Object Size Menu, configure the Cyan box around one of the dots on the dice. This will set the object size of the dots to be trained. Once finished, Click Proceed.



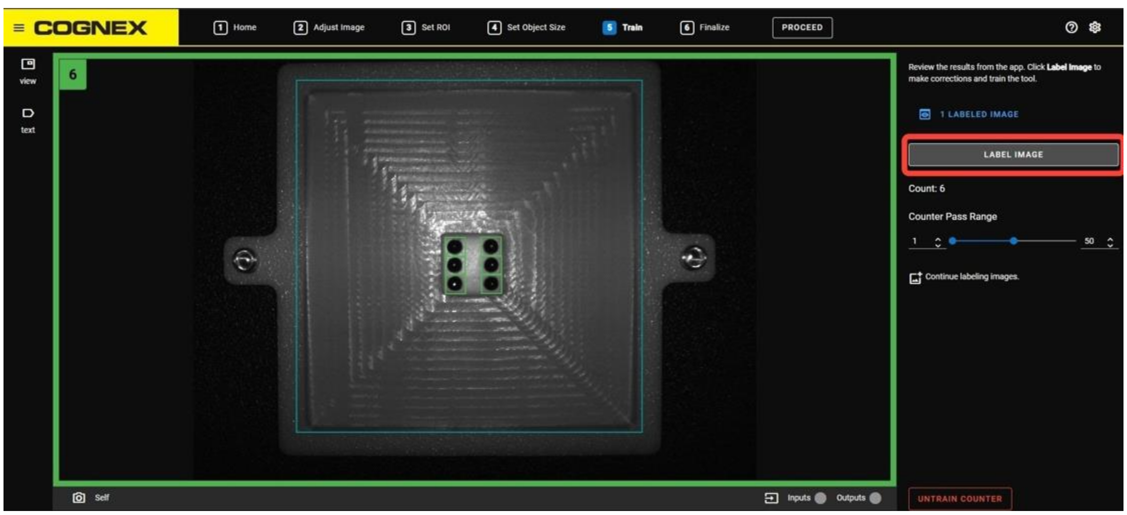
12. In the Train Menu, click each of the dots shown on the dice. This will help train the vision sensor to recognize the number of dots shown in the FOV.



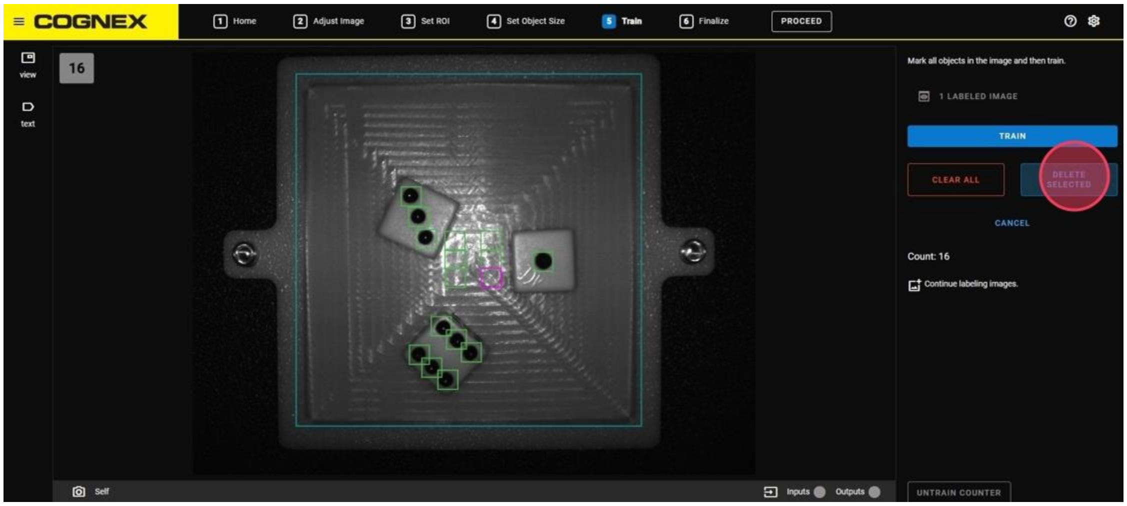
13. Click each of the dots shown on the dice to set up the image for training. A green box will appear around each dot after it has been selected. Once all the dots have been selected, Click Train.



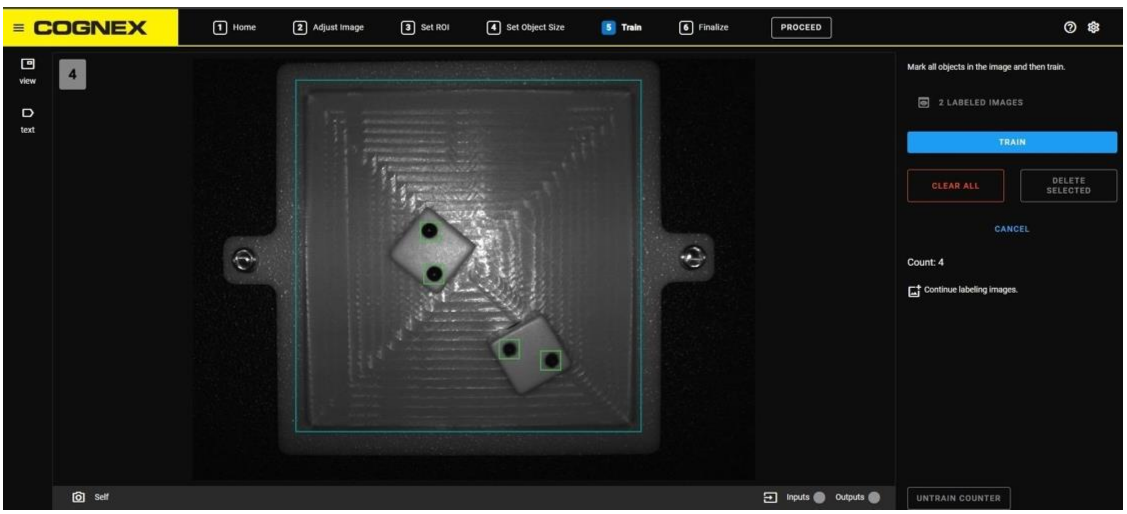
14. Once the first image has been trained, Click the Label Image button to train additional images. Add additional dice and repeat the previous steps to train 2 more images.



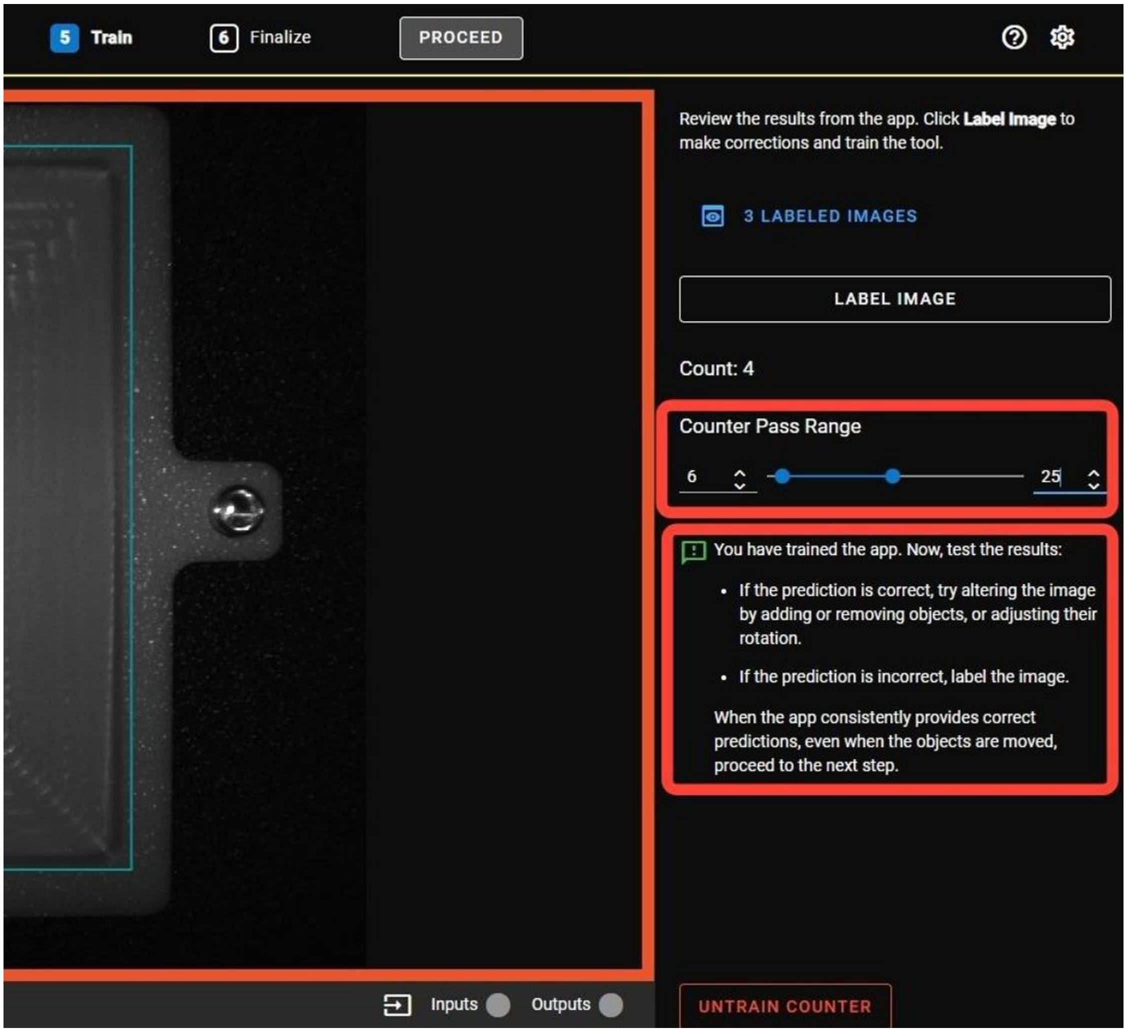
15. If the dice move between training images, select the misplaced green squares and Click the Delete Selected button. This will remove any extra selection boxes. Once the excess boxes are removed, Click the Train button.



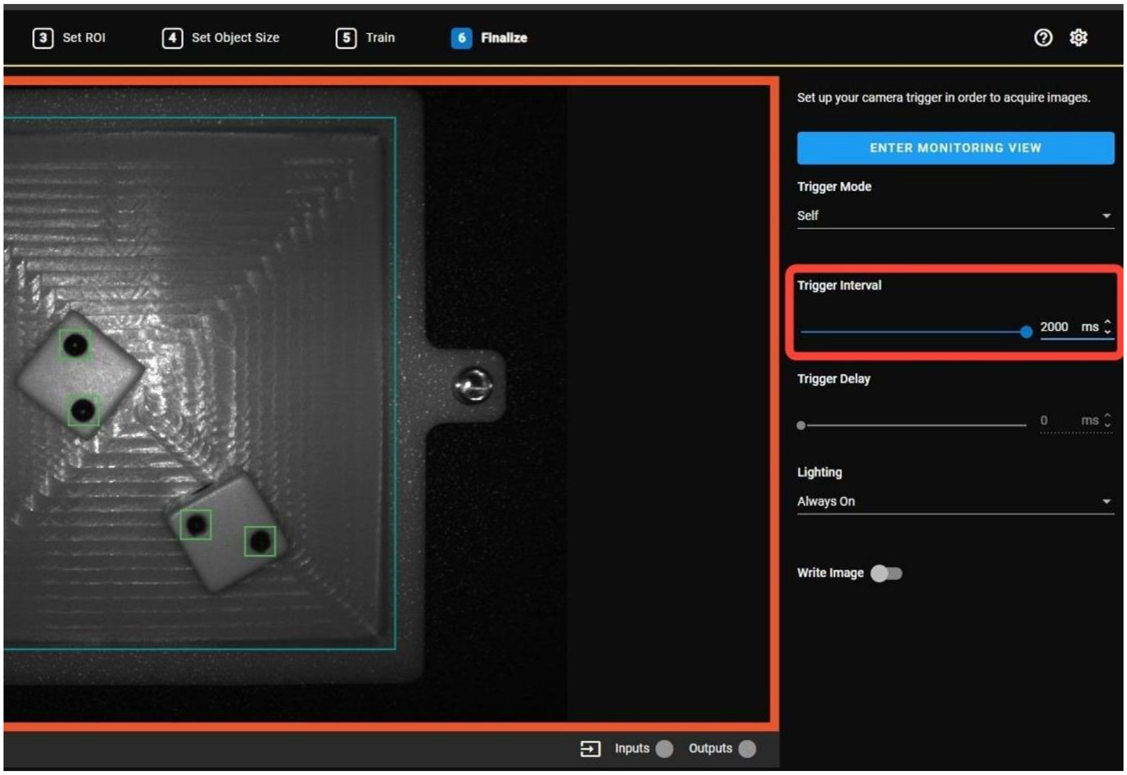
16. Repeat the previous steps and train a third image.



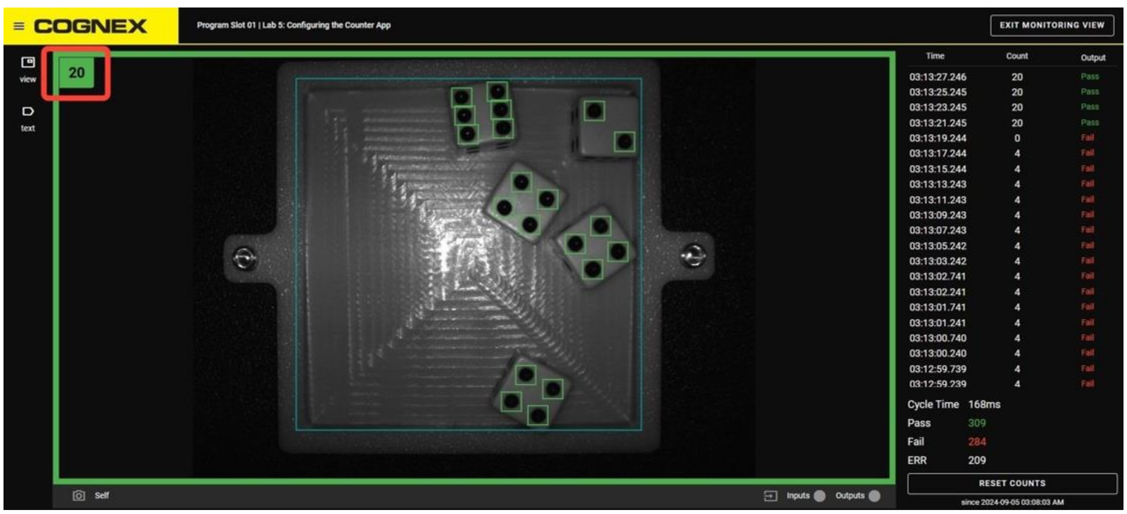
17. Once the counter application is satisfied with the number of trained images, the app will notify the user that the app has been trained. Before proceeding to the next step, set the Counter Pass Range to accept between the value of 6-25. Any number lower than 6 and higher than 25 will result in a failed test. Once set, Click Proceed.



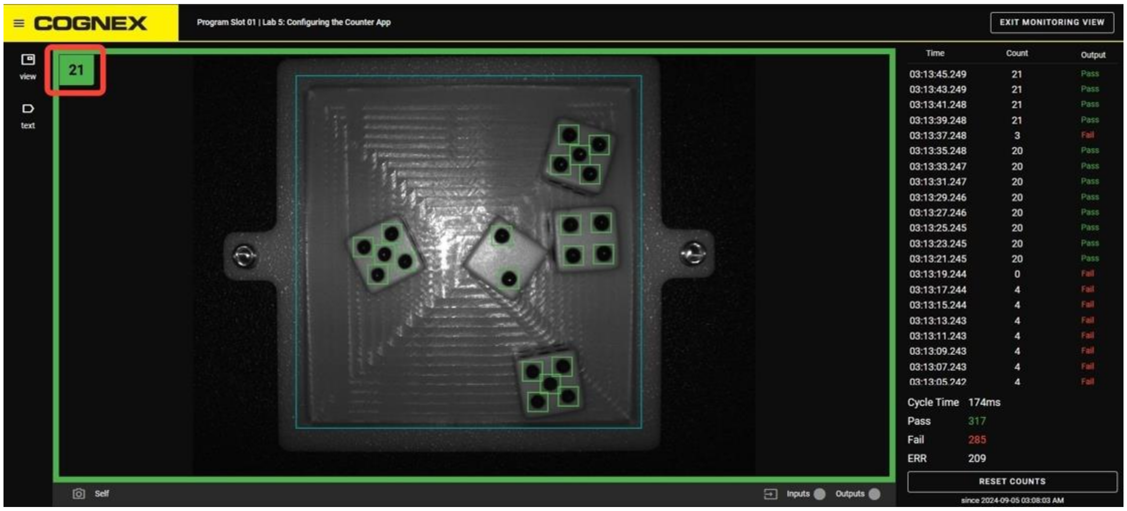
18. Set the Trigger Interval value to 2000ms. This will instruct the vision sensor to take one image every 2 seconds. Once set, Enter the Monitoring View.



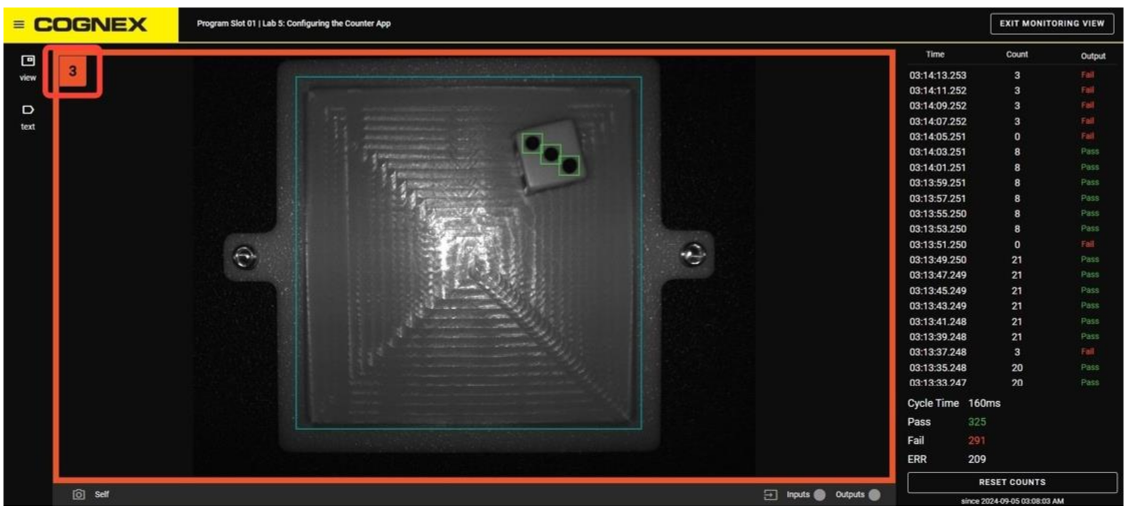
19. In the Monitoring View, notice how the counter application tracks the value of the dice roll and displays the value in the upper left-hand corner of the screen. Because the value is between 6-26, the test passes.



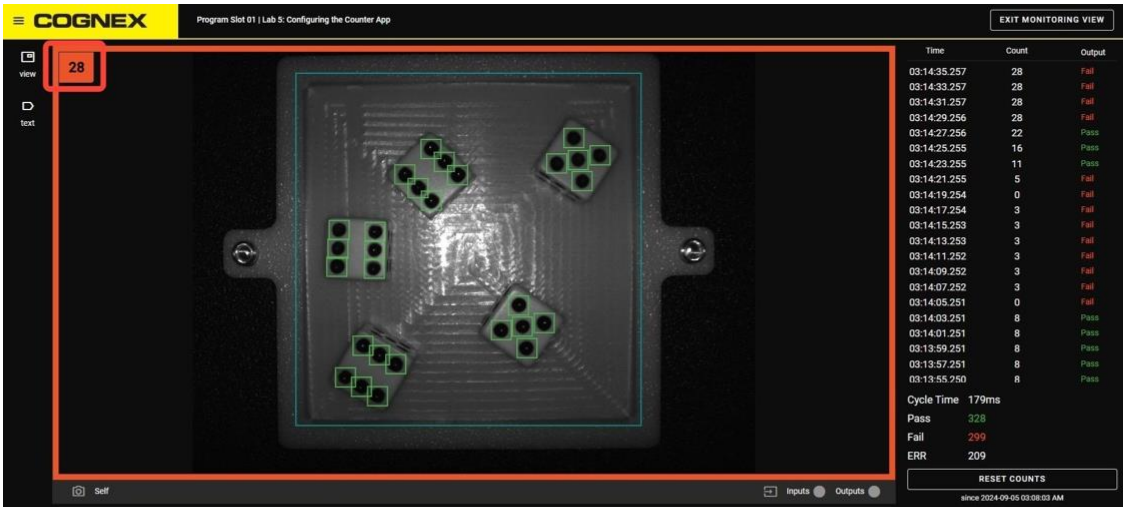
20. Reroll the dice and notice the value changes each time the dice are rolled.



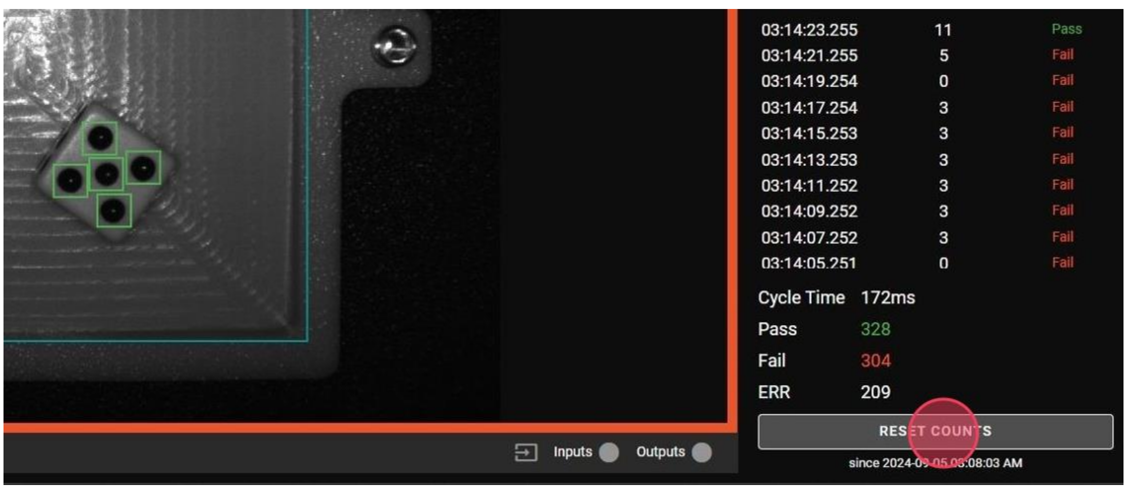
21. Because the value of the dice roll is below the lower limit of 6, the test fails.



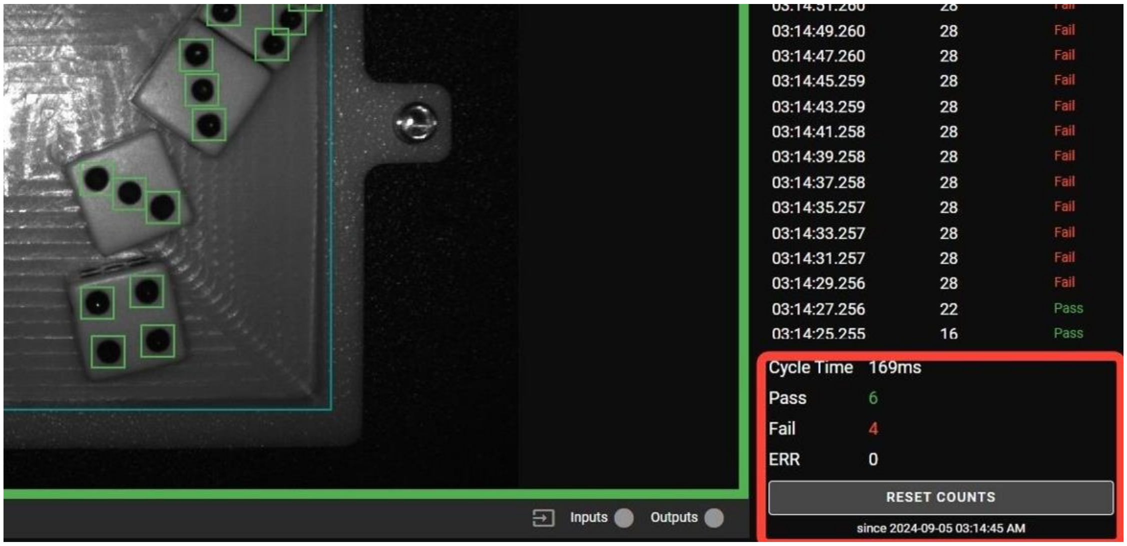
22. Likewise, when the value exceeds the upper limit of 25, the test also fails. regardless of the Pass/Fail result, the counter application will always display the actual count.



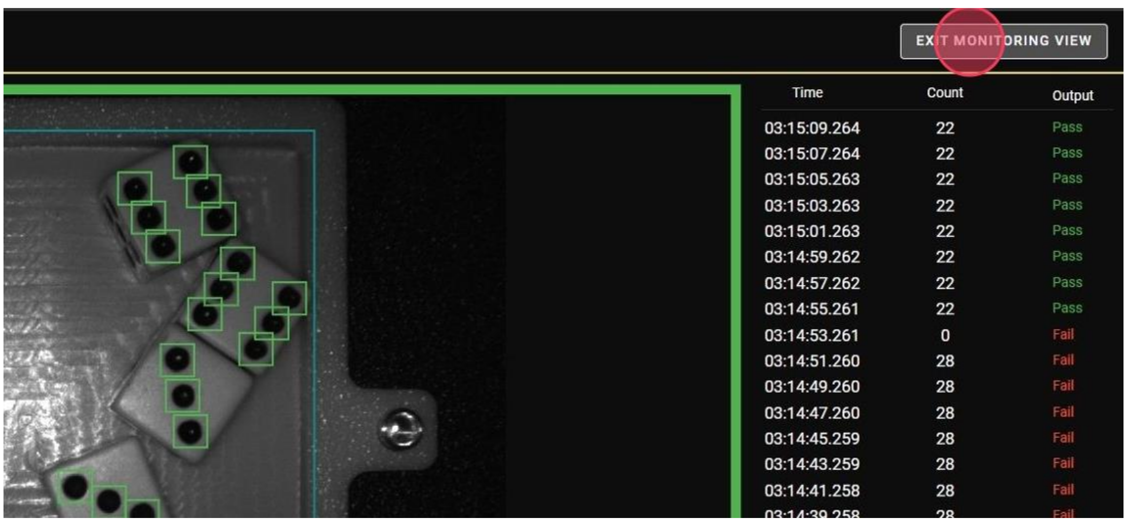
23. At any time during the Monitoring process the counts can be reset by Clicking the Reset Counts button.



24. Once the Reset Counts button is pressed, the Pass, Fail, and ERR fields will instantly start recording again.



25. Users can now Exit Monitoring View. The program will continue to run in the background and users can reopen Monitoring View to observe the results Realtime.



Notes

Cardinal Automation, LLC

About Us

Cardinal Automation, LLC was created by former university instructors and industry professionals to provide custom automation training and equipment to meet the needs of your program.

Cardinal Automation, LLC is committed to providing a quality training platform to those looking to expand their knowledge in industrial automation.

- Our courses offer a concise curriculum taught online and in-person through step-by-step guides to teach real-world industrial equipment.
- We provide custom training options to assist the employees in your facility.
- The automation trainers we build are constructed with industrial grade components that will bridge the gap to industry.

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