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Lab Exercise 1.1 – Hardware & Connections

At the end of this lab exercise, Participants will be able to:

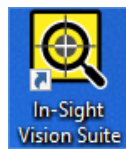
- Connect their In-Sight camera to the network
- Create a new project

The Participant will utilize the following In-Sight Functions to successfully complete this exercise:

- Connect button
- Job Wizard

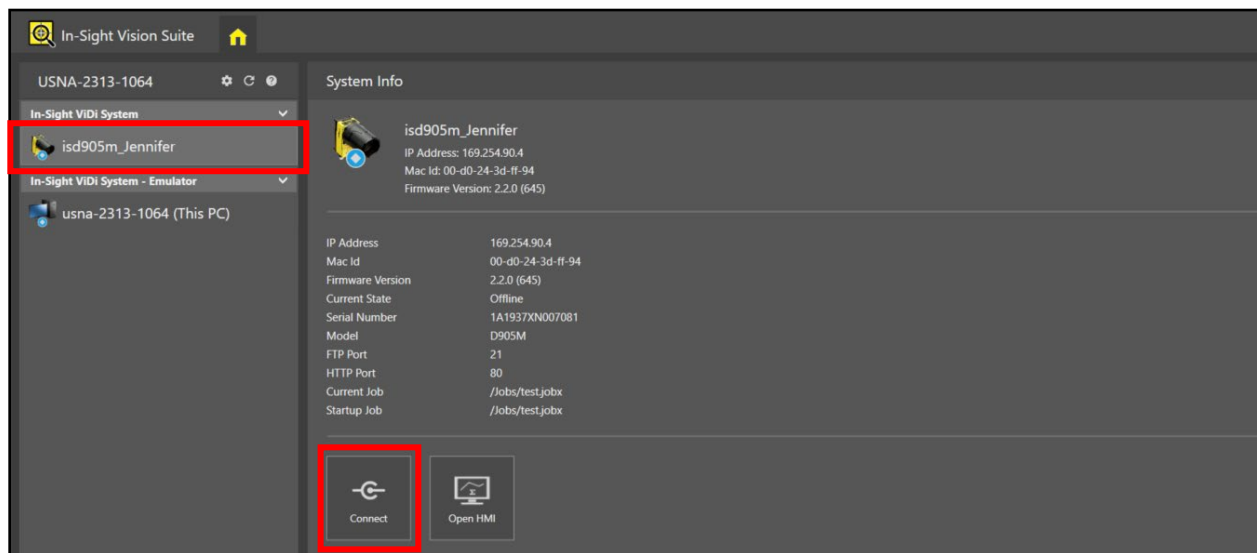
Follow the steps below to connect to the In-Sight Camera:

1. Create a folder on your desktop named **ISVSClass** with the date appended, e.g., **ISVSClass012720**. This is where you will save the jobs you will develop in the lab exercises.
2. Double click the **In-Sight Vision Suite** shortcut icon on your desktop.



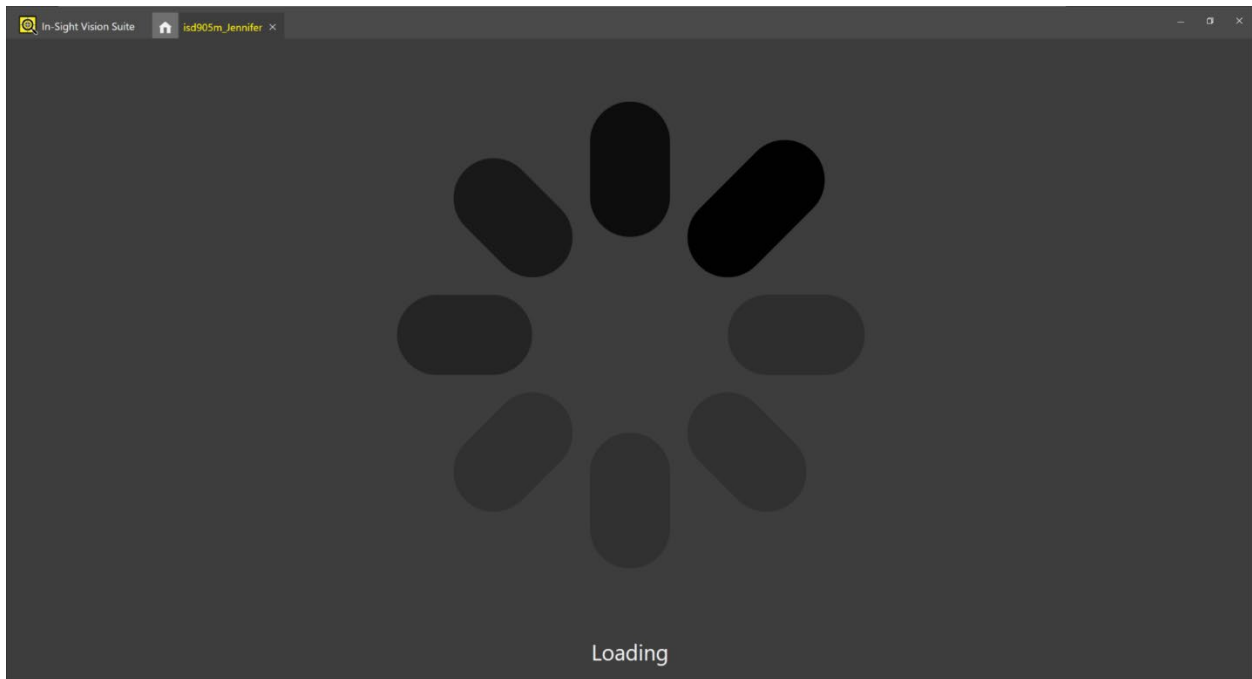
The **In-Sight Vision Suite Launcher** will display. The In-Sight Vision Suite pane displays the host names of the discovered controllers, as well as icons that indicate the model and current state of the controller.

NOTE: When the launcher first starts, it will discover and enumerate all of the In-Sight Vision Systems on the local subnet network in the In-Sight ViDi System pane. In this example there is an In-Sight Vision system and one emulator that have been discovered on the network.

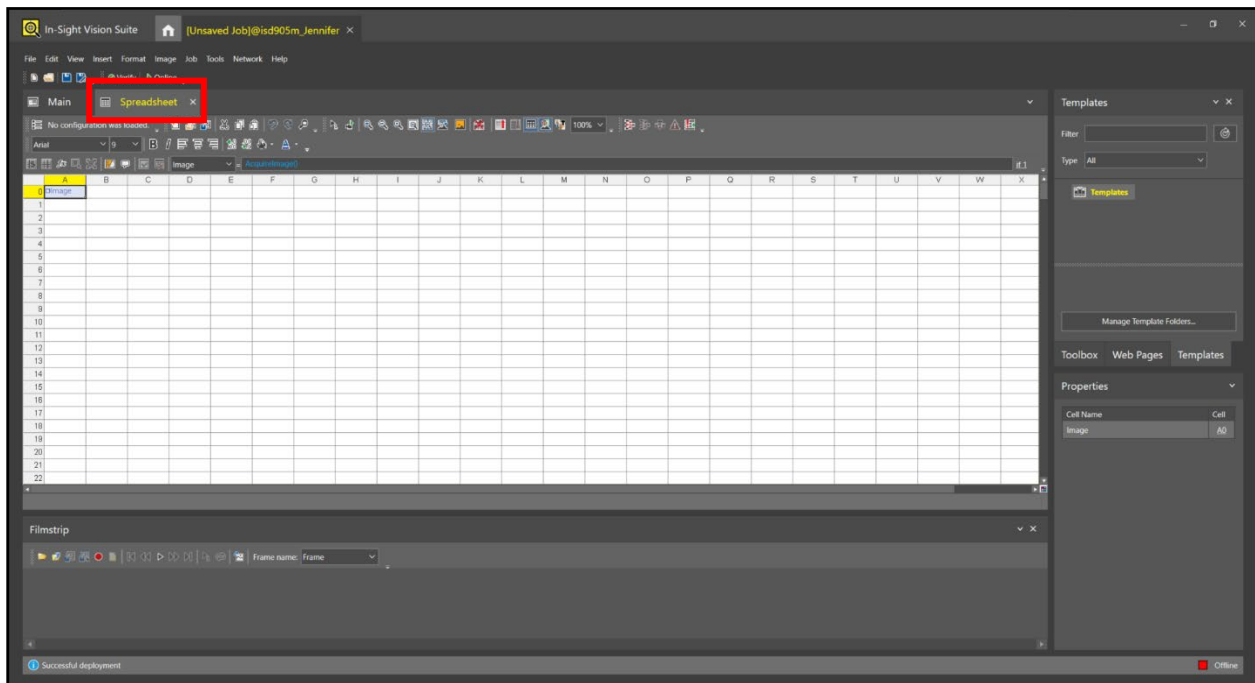


3. Click on the name of your Vision System and click the **Connect** button.

The **Loading** window displays.



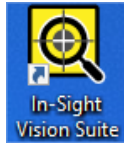
The **Development Environment** displays. Notice a second tab representing the blank spreadsheet displays.



Connecting to the Emulator

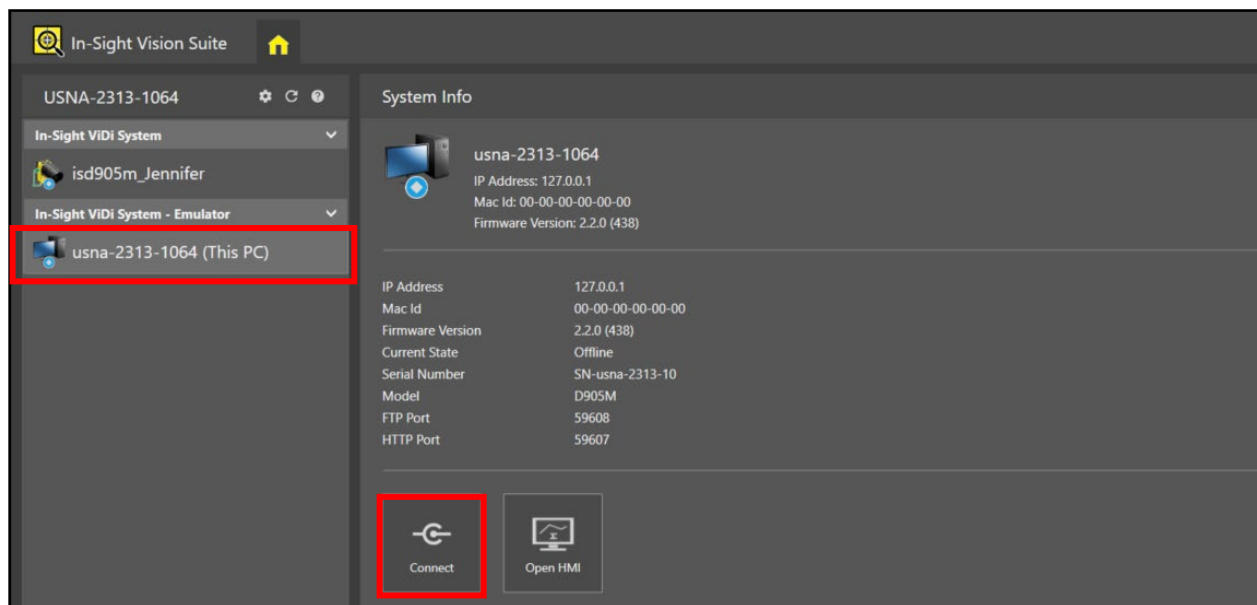
Follow the steps below to connect to the Emulator:

1. Create a folder on your desktop named **ISVSClass** with the date appended, e.g., **ISVSClass012720**. This is where you will save the projects you will develop in the lab exercises.
2. Double click the **In-Sight Vision Suite** shortcut (software version) icon on your desktop.



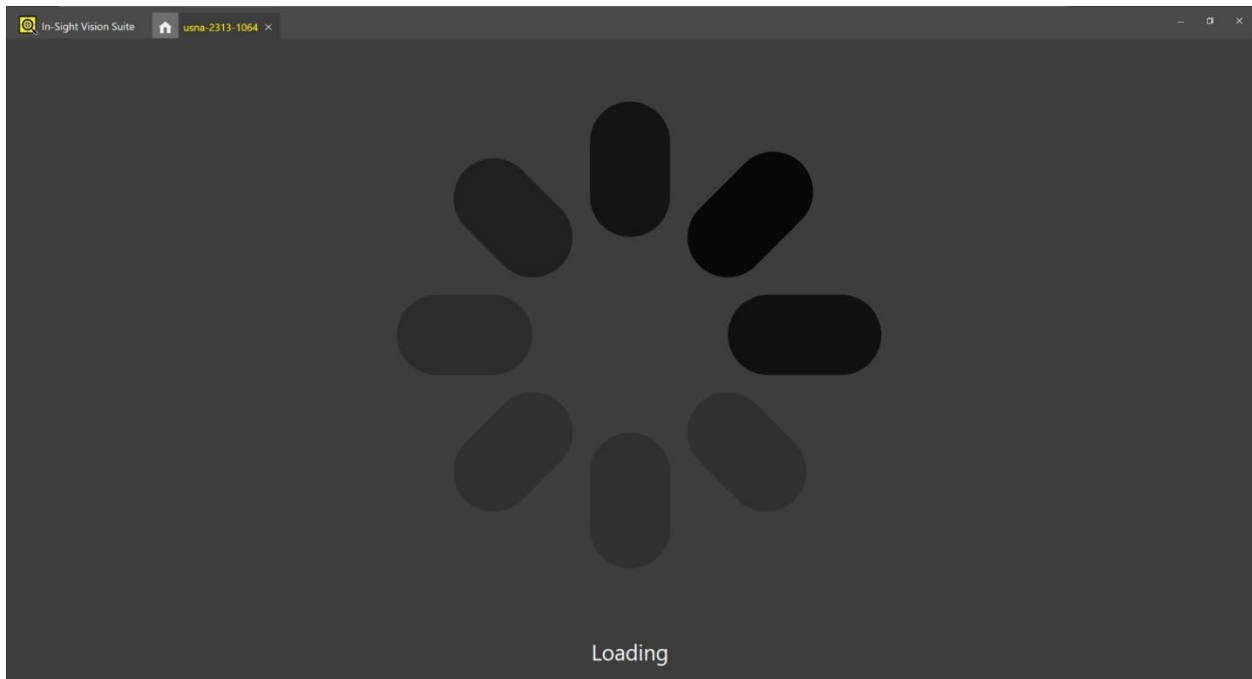
The **In-Sight Vision Suite Launcher** will display. The In-Sight Vision Suite pane displays the host names of the discovered controllers and emulators, as well as icons that indicate the model and current state of the controller.

NOTE: *When the launcher first starts, it will discover and enumerate all of the In-Sight Vision Systems on the local subnet network in the In-Sight ViDi System pane. In this example there is an In-Sight Vision system and one emulator that have been discovered on the network.*

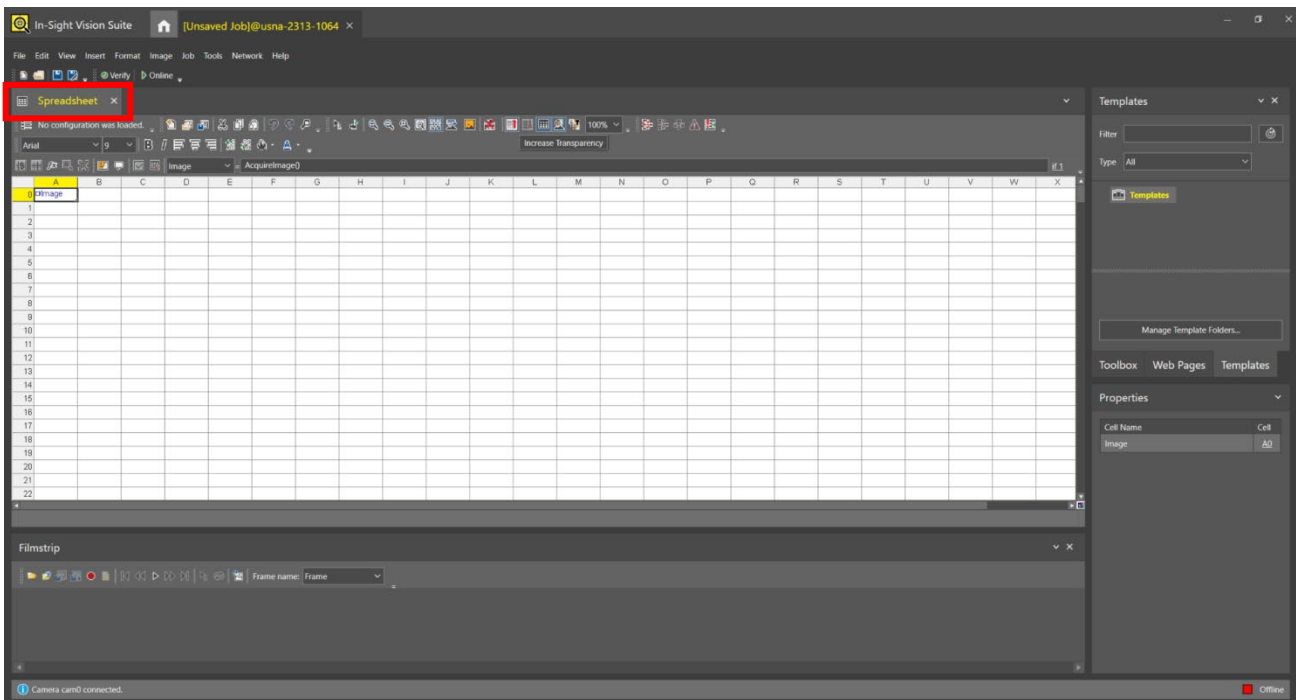


3. Click on the name of your Emulator and click the **Connect** button.

The **Loading** window displays.



The **Development Environment** displays. Notice a tab representing the spreadsheet displays.



Lab Exercise 2.1 – Software & Image Acquisition

At the end of this lab exercise, Participants will be able to:

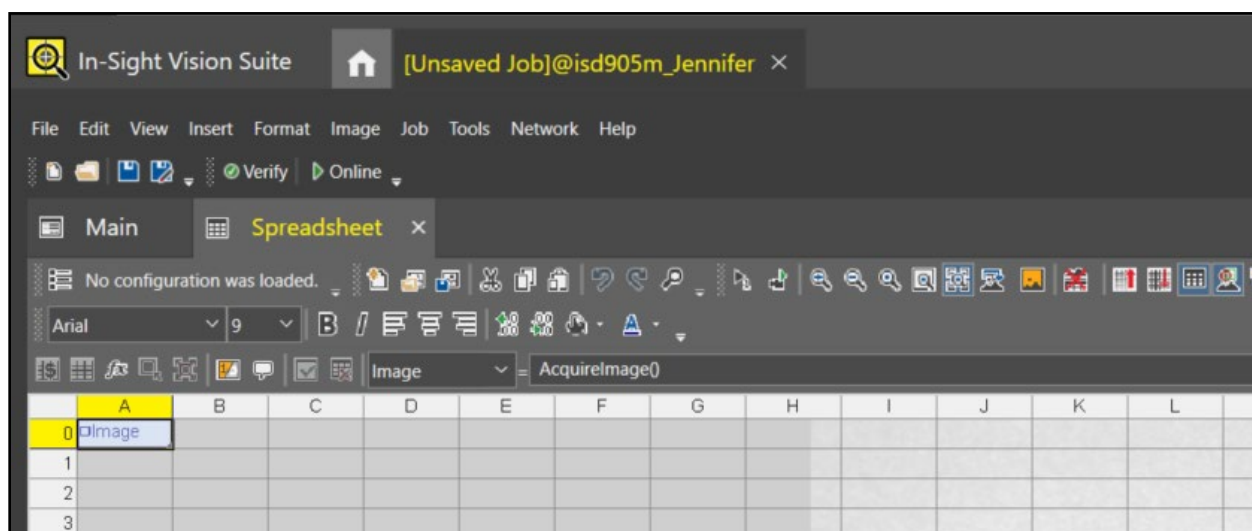
- Create a new project
- Insert Absolute and Relative references into a spreadsheet and observe the differences


The Participant will utilize the following In-Sight Functions to successfully complete this exercise:

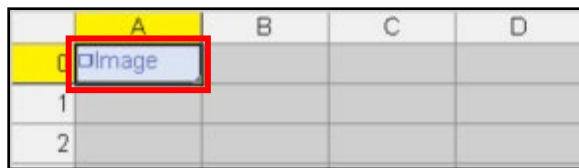
- Connect Button
- Job Wizard
- Absolute and Relative References

Follow the steps below to complete the lab exercise (using your camera):

1. If not connected to your camera, select your camera from the list of cameras and click the **Connect** button.
The **Spreadsheet** view displays.

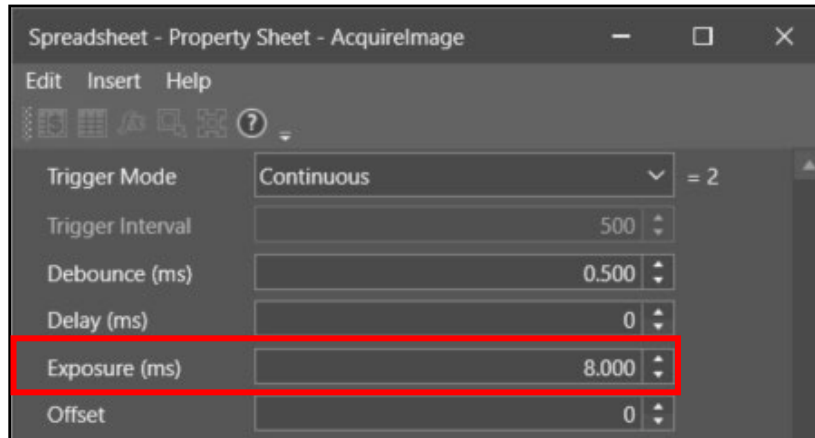


2. Click the **Live Video**  button to start a live image.
3. Move the part under the camera to confirm the image is updating.
4. Click the **Live Video** again to stop the live image.
5. Double-click cell **A0** to access the camera settings.

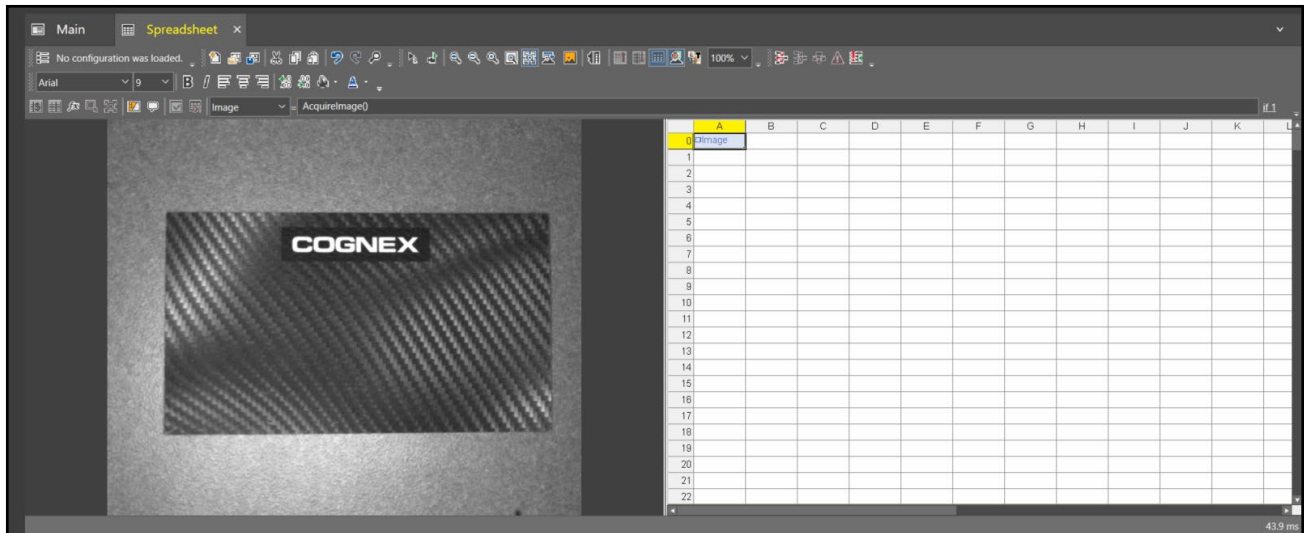



- Adjust the **Exposure** setting to establish light and dark pixels.

NOTE: Increase the exposure setting for a lighter image.


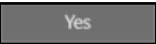


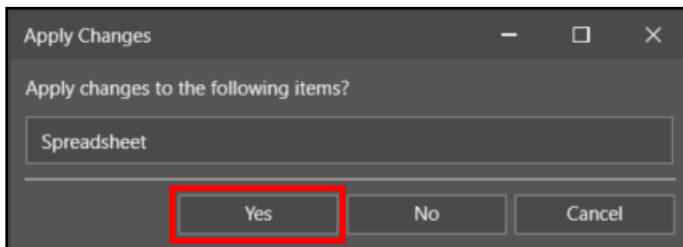
- Click the **OK**  button to close the camera settings.
- Click the **Change Split**  button twice to split the view.

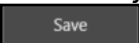


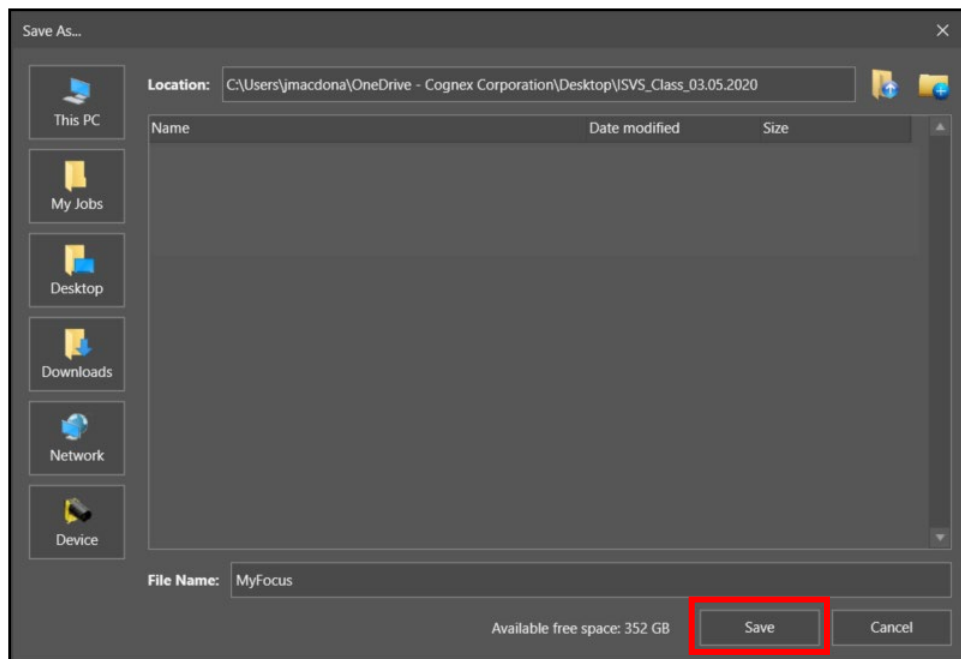
- 9. Click the **Show Image Saturation**  button to verify the writing on the block is dark and the metallic background light on your image.
NOTE: *Too much blue means that the image is too dark and too much red means that the image is too light. To remedy this, adjust the aperture setting, exposure or light control (LEDs).*



- 10. Click the **Save All**  button to save the job. The **Apply Changes** dialog displays.
- 11. Click the **Yes**  button to continue.



- 12. Save the job as *MyFocus* in the folder that you created in Lab #1 and click the **Save**  button.



Absolute References

Follow the steps below to complete the lab exercise:

1. Click the **New Job** button to begin a new job.

The **Job Wizard** displays.

NOTE: We will not be using an image for this lab.

2. Enter *MyCells* in the File Name field, save to the folder created in Lab #1 and click the **Finish**  button.

3. Enter a value of 1.0 in cell **A2**.
4. Enter a value of 2.0 in **A3**.
5. Enter a formula into cell **B2** that adds cells **A2** and **A3** using **Absolute References**.

	A	B
0		
1		
2	1.000	$\$A\$2+\$A\3
3	2.000	

	A	B
0		
1		
2	1.000	3.000
3	2.000	

Relative References

Follow the steps below to complete the lab exercise:

1. Enter a value of -1.0 in cell **A5**.
2. Enter a value of 4.0 in **A6**.
3. Enter a formula into cell **B5** that adds cells **A5** and **A6** using **Relative References**.

4		
5	-1.000	$A5+A6$
6	4.000	
7		

4		
5	-1.000	3.000
6	4.000	
7		

Copying and Pasting Relative References

Follow the steps below to complete the lab exercise:

1. Highlight cell **B2**.
2. Copy and paste it to cell **D2**.
3. Highlight cell **B5**.
4. Copy and paste it to cell **D5**.
5. Examine the formula in cell **D5** and compare it to the original formula in **B5**.

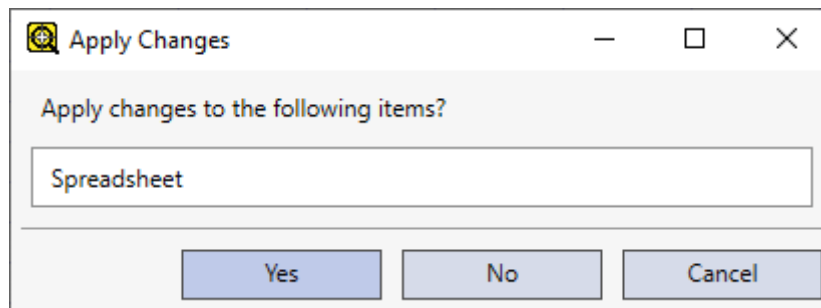
How do they differ? _____

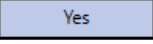
Why do they differ? _____

Why is cell **D2** showing a number? _____

	A	B	C	D
0	Image			
1				
2	1.000	3.000		3.000
3	2.000			
4				
5	-1.000	3.000		0.000
6	4.000			

6. Click the **Save All**  button.
The **Apply Changes** dialog box displays.



7. Click the **Yes**  button to close the dialog box and save the project.

Lab Exercise 3.1 – PatMax RedLine


At the end of this lab exercise, Participants will be able to:

- Utilize the PatMax RedLine tool to locate the Cognex logo in the Field of View
- Report the location based on row, column, and angle
- Apply the location information for fixturing in other vision functions

The Participant will utilize the following In-Sight Vision Suite Functions to successfully complete this exercise:

- TrainPatMaxRedLine
- FindPatMaxRedLine

Follow the steps below to complete the lab exercise:

1. Open the **MyFocus** job from Lab Exercise 2.
2. To verify the card is in the Field of View, click the **Live Video**  button and position the card under the camera so that it is centered in the field of view, as shown below.




NOTE: Make it as large as possible in the FOV for good resolution but leave some room for part movement.

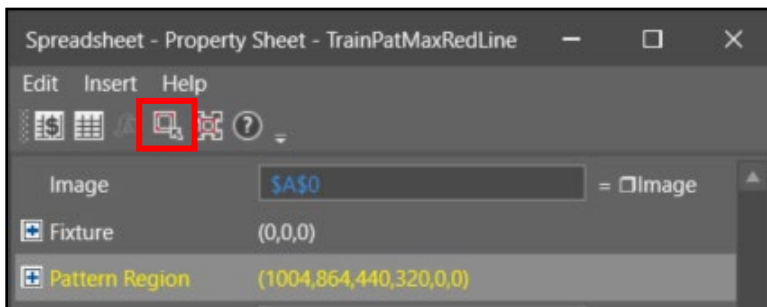
3. Exit Live Video mode.
4. Leave the first 10 spreadsheet rows (numbered 0 – 9) blank (except for A0 – AcquireImage).

NOTE: We will use these rows in a later lab to create an operator interface.

5. Enter the comment *Find the Logo* in cell **B10**. Be sure to start with an apostrophe (').

	A	B	C
8			
9			
10		'Find the Logo	
11			

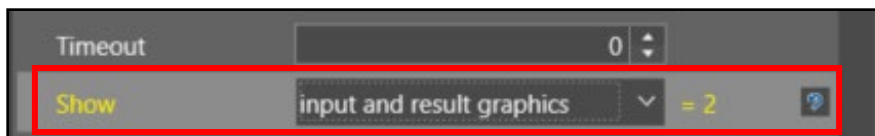
6. Insert a **TrainPatMaxRedLine** tool into cell **C11** of the spreadsheet.
7. Click the **Pattern Region** to highlight and click the **Edit Graphic**  button.
NOTE: *Double-clicking the Pattern Region parameter will also open the region.*

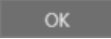



8. Position the Pattern Region around the *Cognex Logo* as shown below and press the **<Enter>** key to return to the Property Sheet.




9. Select **input and result graphics** for the **Show** parameter. Allow the defaults to remain for all other settings.

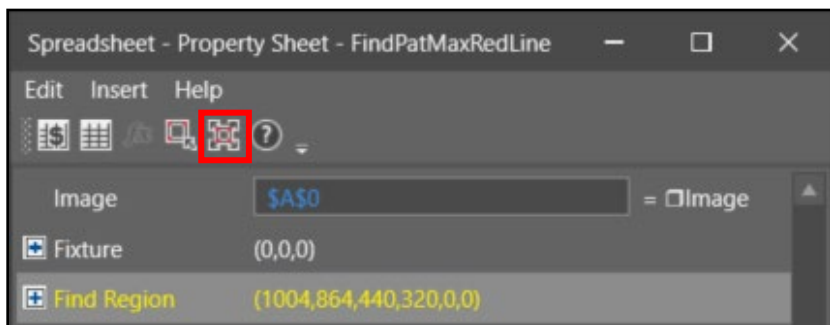


10. Click the **OK**  button to close the Property Sheet. The **Patterns** data structure is added to the spreadsheet.

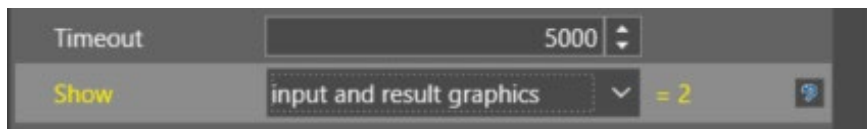
Find the Logo			
	Patterns	1,000	


11. Insert a **FindPatMaxRedLine** tool into cell **C13**.

- Click the **Find Region** to highlight and click the **Maximize Region**  button.



- Double click the **Pattern** setting to open – reference cell **C11** and press the **<Enter>** key.
- Select **input and result graphics** for the **Show** parameter. Allow the defaults to remain for all other settings.



- Click the **OK**  button to close the Property Sheet. A second **Patterns** data structure is added to the spreadsheet.

	A	B	C	D	E	F	G	H	I	J	K
8											
9											
10			Find the Logo								
11			Patterns	1.000							
12			Index	X	Y	Angle	Scale	Score			
13			Patterns	0.000	1275.757	646.390	-0.008	100.000	99.317		


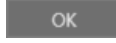
NOTE: You can customize the look of your comment notes by changing the background and font colors.

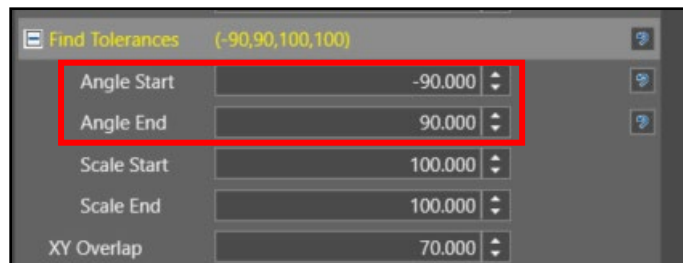



	A	B	C	D	E	F	G	H	I	J	K
8											
9											
10			Find the Logo								
11			Patterns	1.000							
12			Index	X	Y	Angle	Scale	Score			
13			Patterns	0.000	1275.757	646.390	-0.008	100.000	99.317		
14											

Notice the green lines through the Cognex logo



16. Click the **Trigger Once**  button to trigger your camera and move the part around, rotate it (scroll through the images if using a database) and observe the results in the spreadsheet.
17. Observe the *Angle* value in the spreadsheet as you rotate the card.
18. Update the **Angle Start** to *-90* and **Angle End** to *90* and click the **OK**  button.



19. Trigger your camera and notice the changes to the *Angle* value in the spreadsheet.
20. Click the **Save As**  button to save the job as **MyPatterns** in the folder created in lab #1.

Lab Exercise 3.2 – Logic

At the end of this lab exercise, Participants will be able to:

- Utilize logic statements to determine Pass/Fail

The Participant will utilize the following In-Sight Logic Functions to successfully complete this exercise:

- If
- And


Logic – If

Follow the steps below to complete the lab exercise:

1. Start a new job.
2. Enter a value of -1.0 in cell **A2**.
3. Enter a formula into cell **A4** that will display the word *Accept* if the value in cell **A2** is greater than zero, or display *Reject* if the value is less than zero.

HINT: Use the *IF* function under *Mathematics* → *Logic*.

	A	B	C
0	Image		
1			
2	-1.000		
3			
4	if(A2>0,"Accept","Reject")		
5			

4. Click the **green check**  button or press the **<Enter>** key to execute the formula.
5. Change the value in cell **A2** to 1.0 and observe what happens.

	A	B
0	Image	
1		
2	-1.000	
3		
4	Reject	
5		

	A	B
0	Image	
1		
2	1.000	
3		
4	Accept	
5		

Logic – If & And

Follow the steps below to complete the lab exercise:


1. Enter a value of -1.0 in cell **B2**.
2. Enter a formula into cell **A6** that will display the word Accept in **A6** if the two values in cells **A2** and **B2** are both greater than zero, or display Reject if otherwise.
HINT: Use the AND function under Mathematics → Logic as the first parameter in an IF statement.

	A	B	C	D
0	Image			
1				
2	1.000	-1.000		
3				
4	Accept			
5				
6	=If(And(A2>0,B2>0),"Accept","Reject")			
7				

3. Click the **green check** button or press the **<Enter>** key to execute the formula.
4. Change the value in cell **B2** to 2.0 and observe what happens.

	A	B	C
0	Image		
1			
2	1.000	-1.000	
3			
4	Accept		
5			
6	Reject		
7			

	A	B	C
0	Image		
1			
2	1.000	2.000	
3			
4	Accept		
5			
6	Accept		
7			

5. Click the **Save As**  button to save the job as **MyCells** in the folder created in lab #1.

Lab Exercise 4.1 – ViDiDetect Tool

At the end of this lab exercise, Participants will be able to:

- Utilize the ViDiDetect tool to solve their application

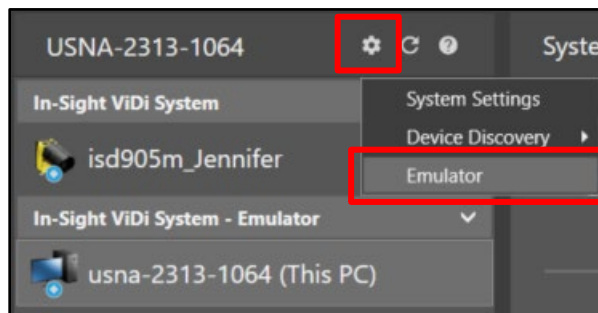
The Participant will utilize the following In-Sight Vision Suite tool to successfully complete this exercise:

- ViDiDetect Tool

Follow the steps below to complete the lab exercise:

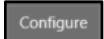
Air Filter Inspection

1. Highlight your Emulator, click the **System Settings** gear and select **Emulator**.

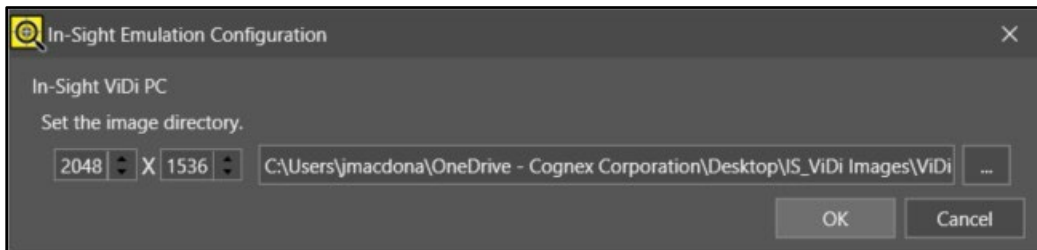


The Emulator Configuration dialog displays.

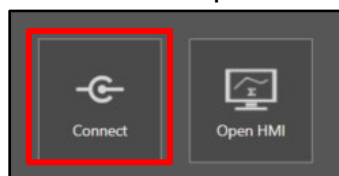
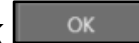
2. Select **In-Sight 905M** from the drop-down box and click the **Configure** button.




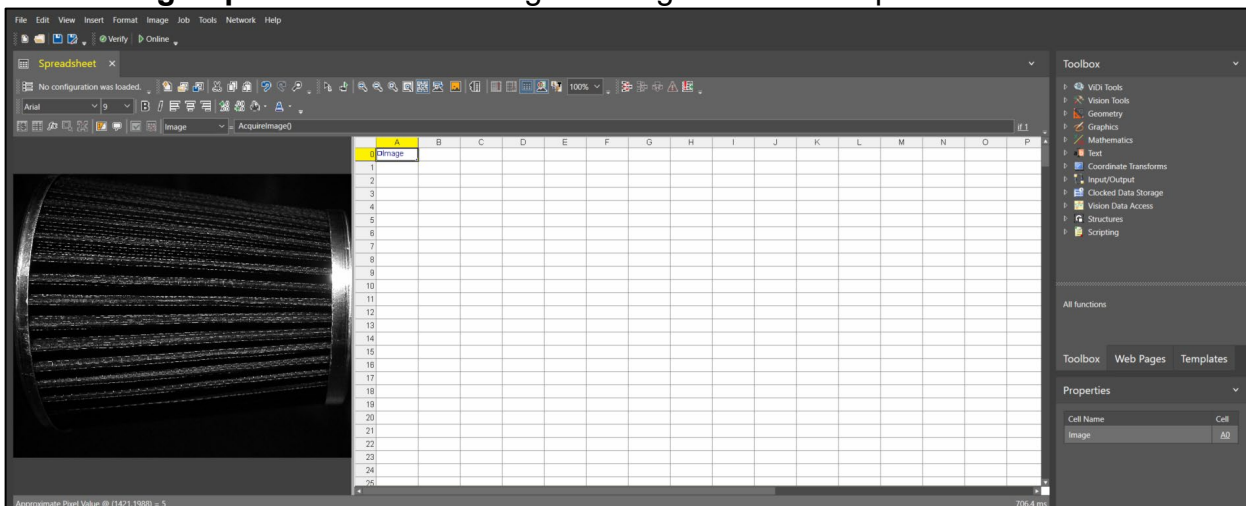
The **In-Sight Emulation Configuration** dialog displays.



3. Point to the **ViDiDetect_AirFilters Runtime** folder and click the **OK** button. **NOTE:** The In-Sight ViDi images can be found in the Student Folder on the desktop of your training computer.
4. Click the **Start** button to start the emulator.
5. Click the **Connect** button to enter the Spreadsheet environment.

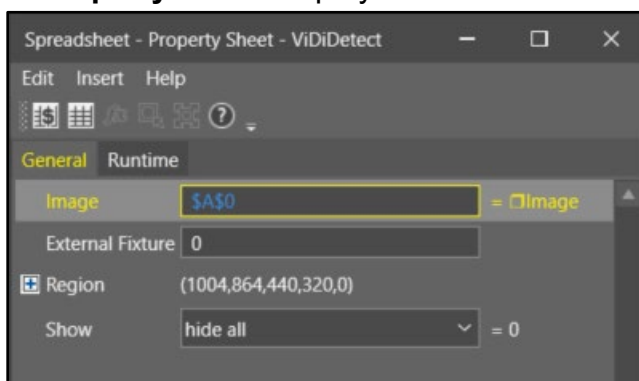


- The Spreadsheet displays with the first image behind the spreadsheet. Click the **Change Split**  button to bring the image next to the spreadsheet.

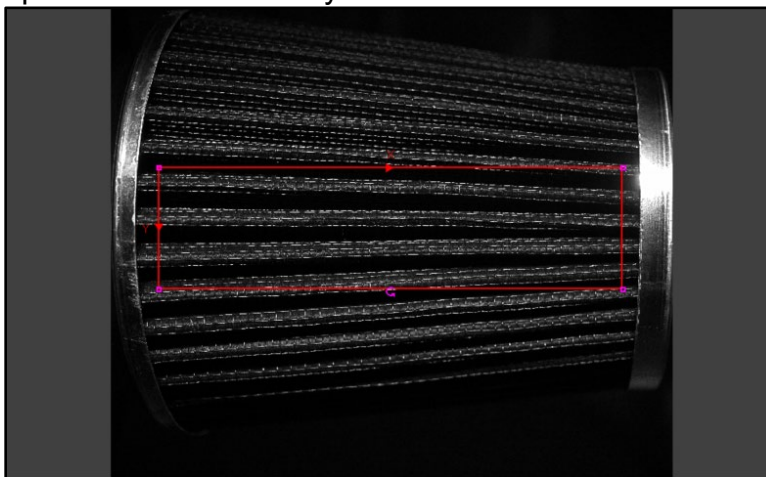



- Add a **ViDiDetect** tool in cell **B3**.

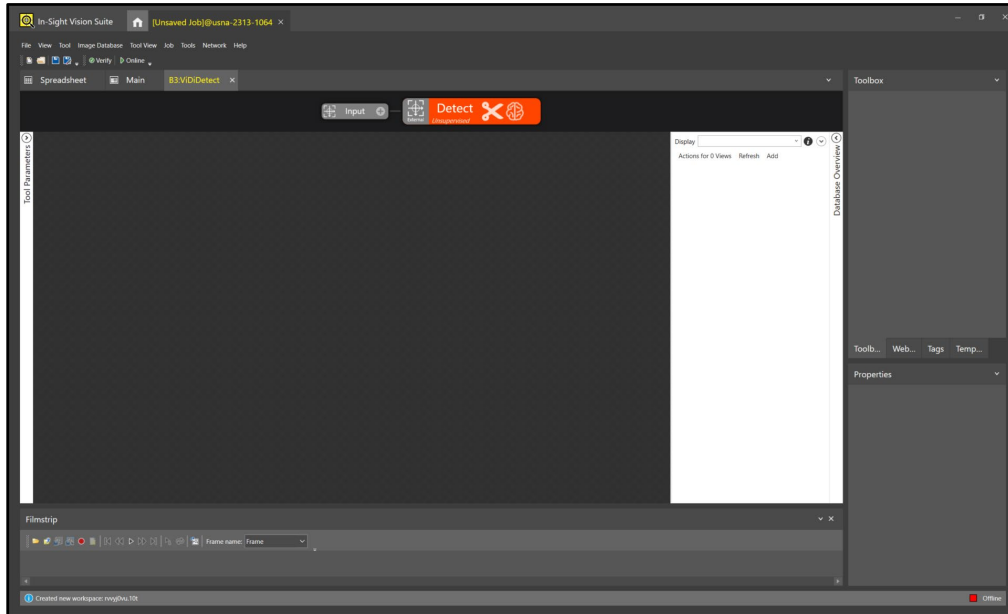
NOTE: The *ViDiDetect* tool is found in the *Toolbox* under *Vision Tools* → *ViDi Tools*. The **ViDiDetect Property Sheet** displays.



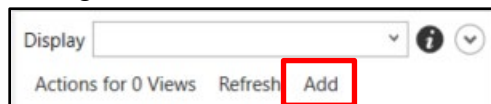
- Double-click the **Region** parameter and position the region on the air filter as shown below and press the **<Enter>** key.

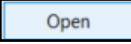


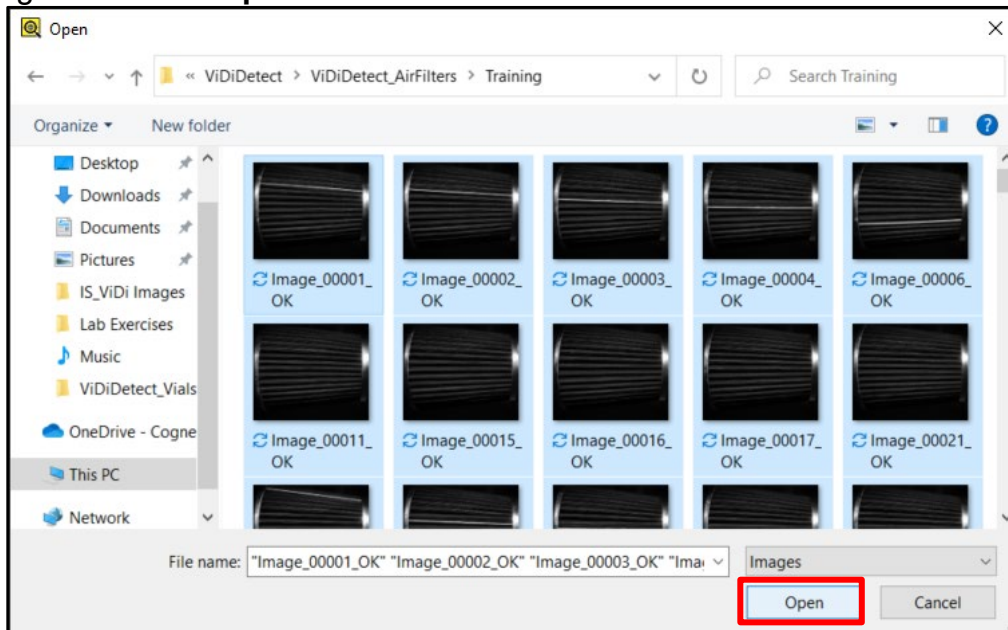
9. Drag the **Show** parameter into cell **B6**.
10. Click the **Open ViDi Editor**  button to enter the ViDiDetect Workspace. The **ViDiDetect Workspace** displays.

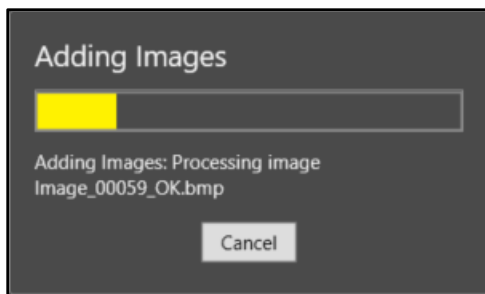


11. Click **Add** to bring the images into the ViDiDetect workspace.

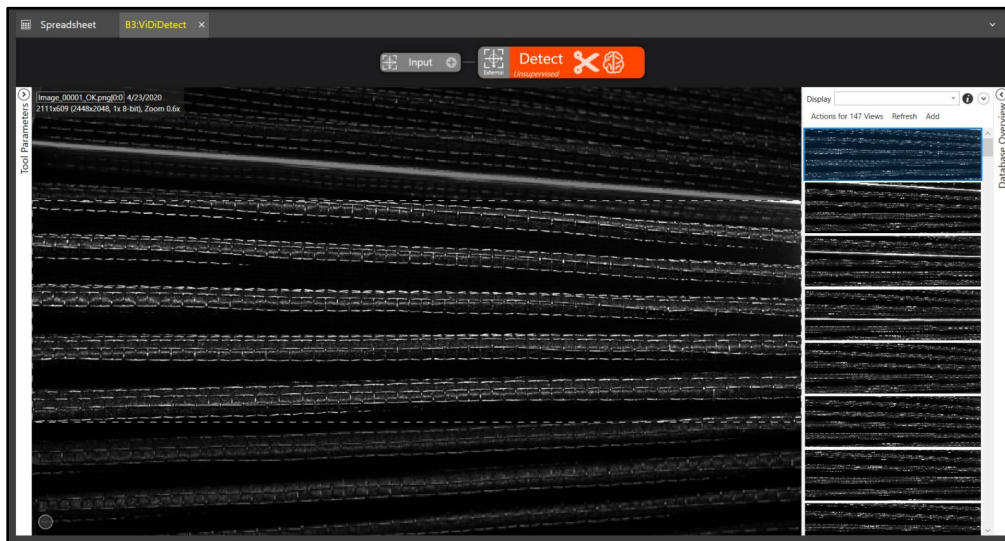


12. Navigate to the **ViDiDetect_AirFilters Training** folder.
13. Select the first image and press **<Ctrl + A>**, this will automatically select all of the images. Click the **Open**  button.





- Once the images have been added, they will appear on the View Panel.



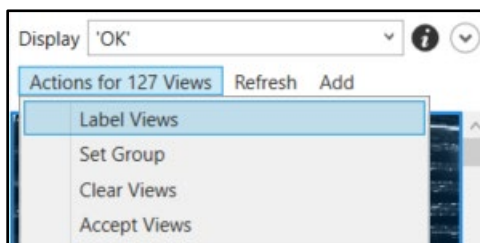
- Right click and select **Edit ROI**, allow the default **External ROI** to remain.



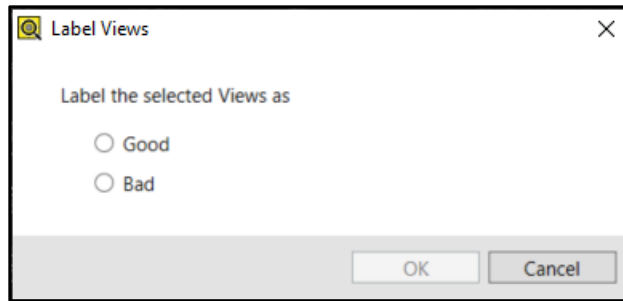
- Click the **Close** button.



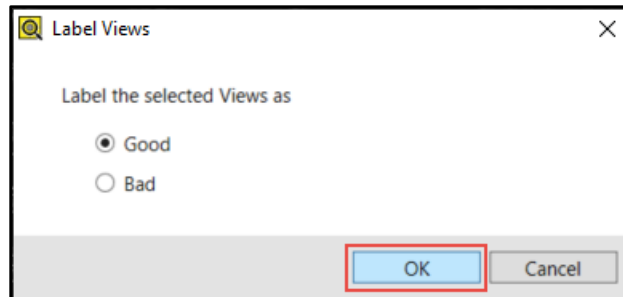
- Enter 'OK' in the **Display** field and press the <Enter> key.
- Click **Actions for 127 Views** and select **Label Views**.



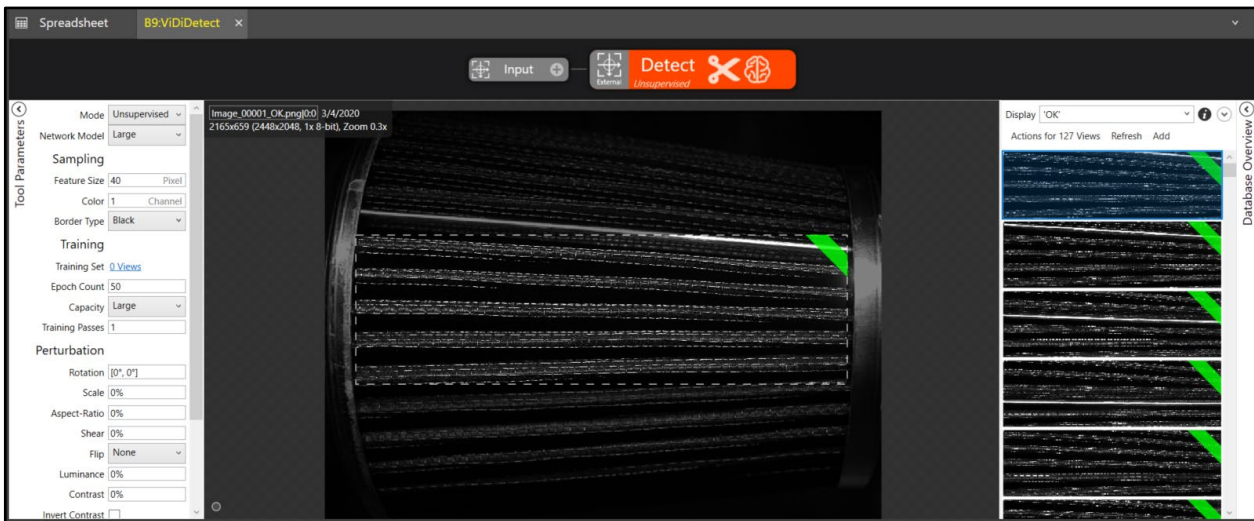
The **Label Views** window displays.



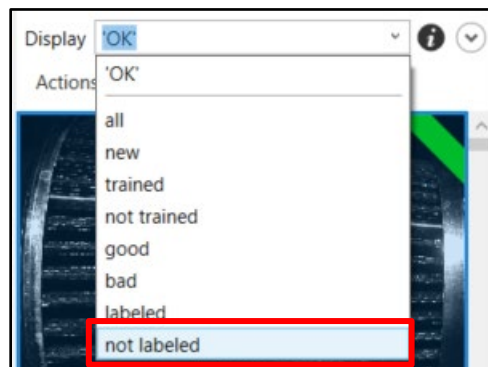
- 19. Label the selected Views as **Good** and click the **OK** button.



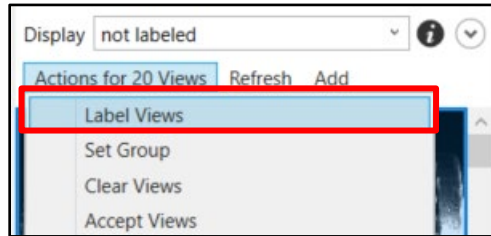
The images are labeled as Good. Notice the green label in the right-hand corner.



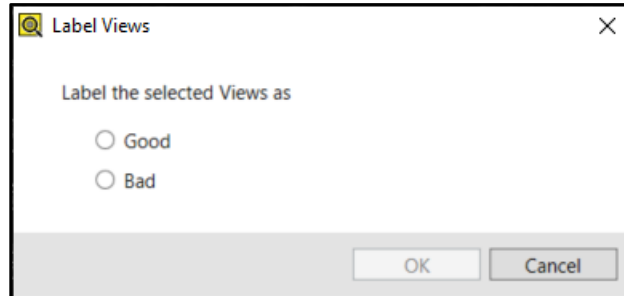
- 20. Select **Not Labeled** from the Display drop-down list.



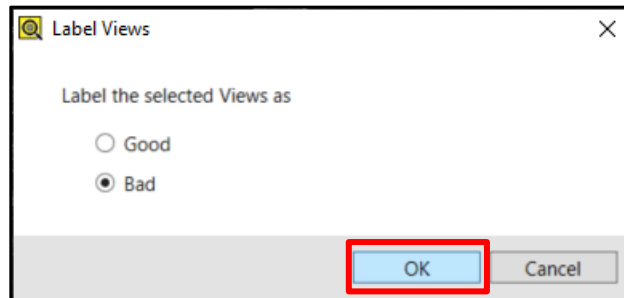
- 21. Click **Actions for 20 Views** and select **Label Views**.



The **Label Views** window displays.

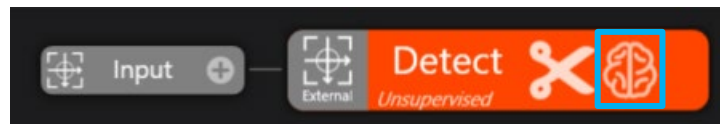


- 22. Label the selected Views as **Bad** and click the **OK** button.

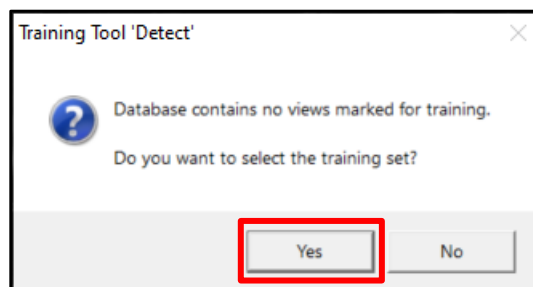


The images are labeled as Bad. Notice the red marking in the right-hand corner.

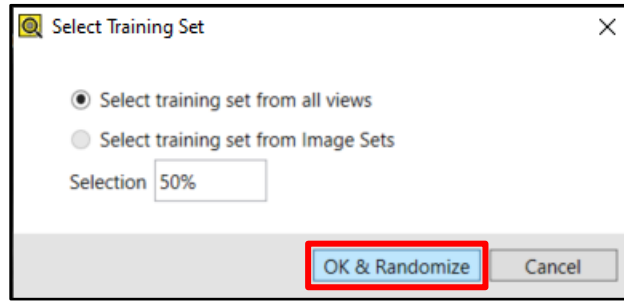
- 23. Train the tool by clicking the **Train** button.



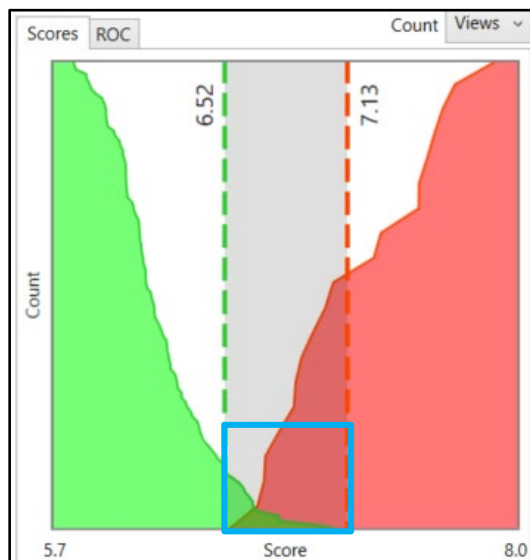
- 24. Click the **Yes** button to select the training set.




- Click the Select training set from all views radio button and click the **OK & Randomize** button.



- When Training is complete, open the **Database Overview** tab and review your results. Notice that there is an area where a score is between Good and Bad and the tool is unable to detect which is which.

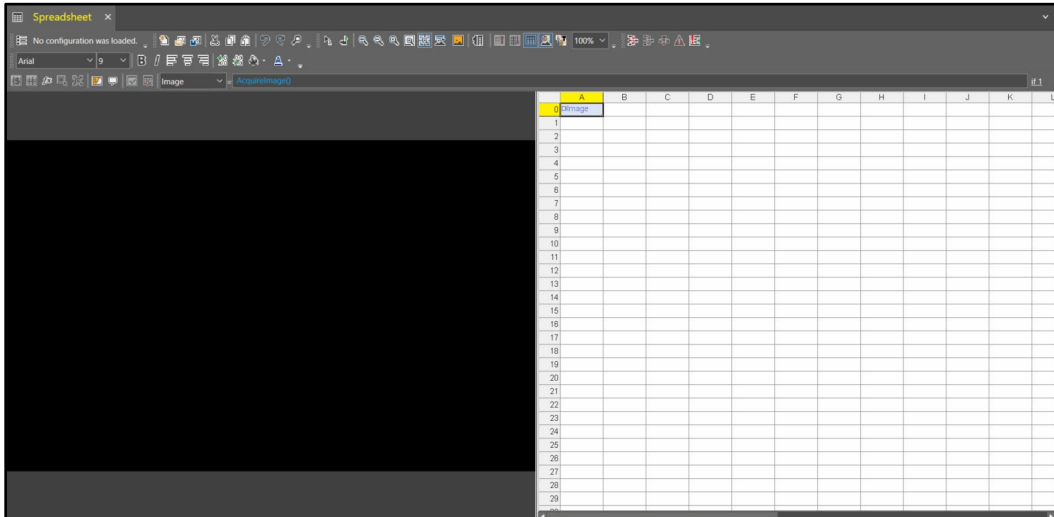


- Adjust the parameters for better results, do not focus on getting 100% accuracy. While it is possible to achieve these results, we are not able to devote enough time during our class. Ensure that you understand how to achieve these results.
- Click the **Save As**  button to save the job as **ViDiDetect_AirFilters** in the folder created in lab #1.

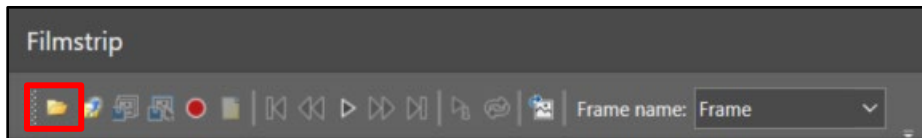
Textile Inspection

NOTE: Your emulator should be configured to emulate the **In-Sight D902M** camera to complete this lab exercise.

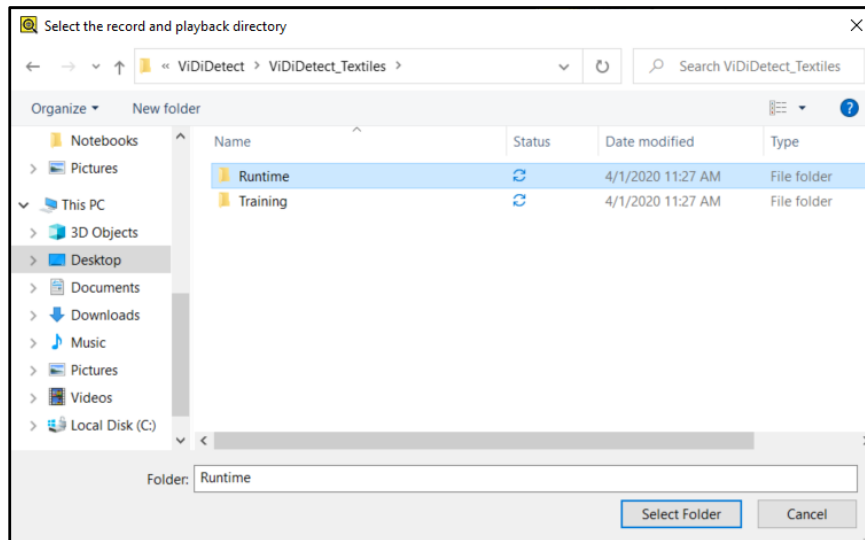
1. Once you have configured your emulator new spreadsheet displays.



2. Click the **Folder** icon in the Filmstrip.



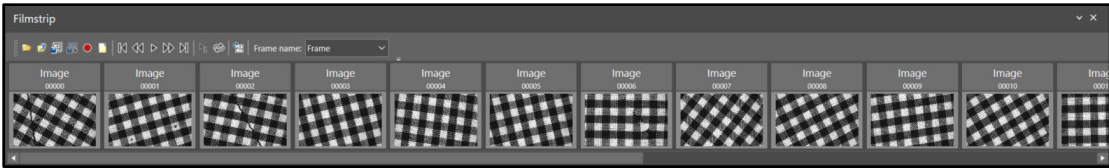
The **Select the record and playback directory** window displays.



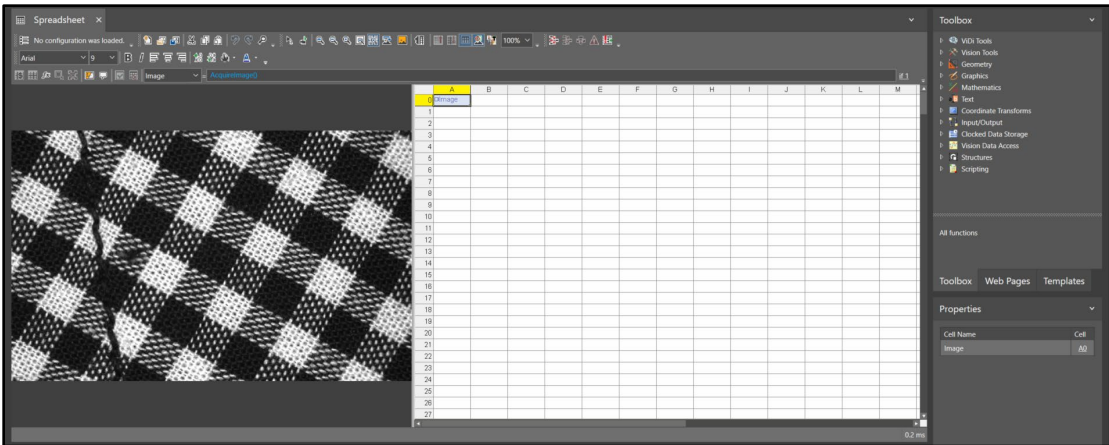
3. Navigate to the **ViDiDetect_Textiles Runtime** folder and click the **Select Folder** button.

NOTE: The **In-Sight ViDi** images can be found in the **Student Folder** on the desktop of your training computer.

The Runtime images display in the Filmstrip.

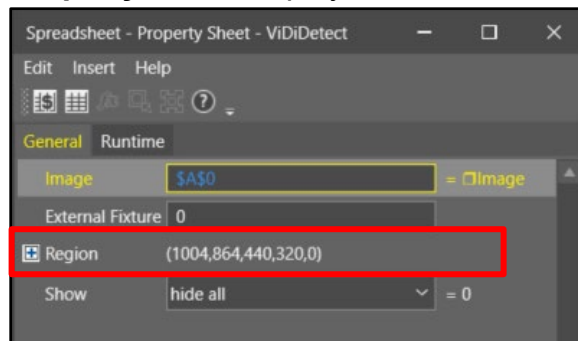


4. Double-click the first image to bring it into the image window.

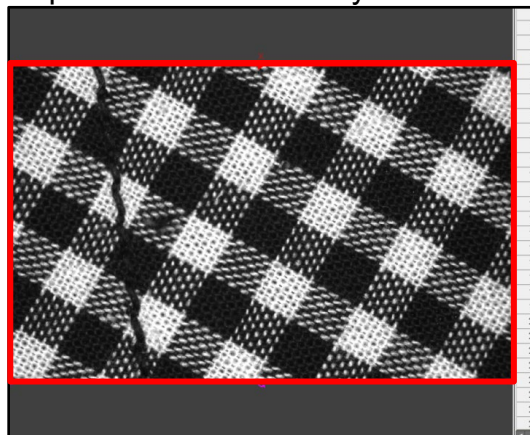


5. Enter a **ViDiDetect** tool in cell **B3**.

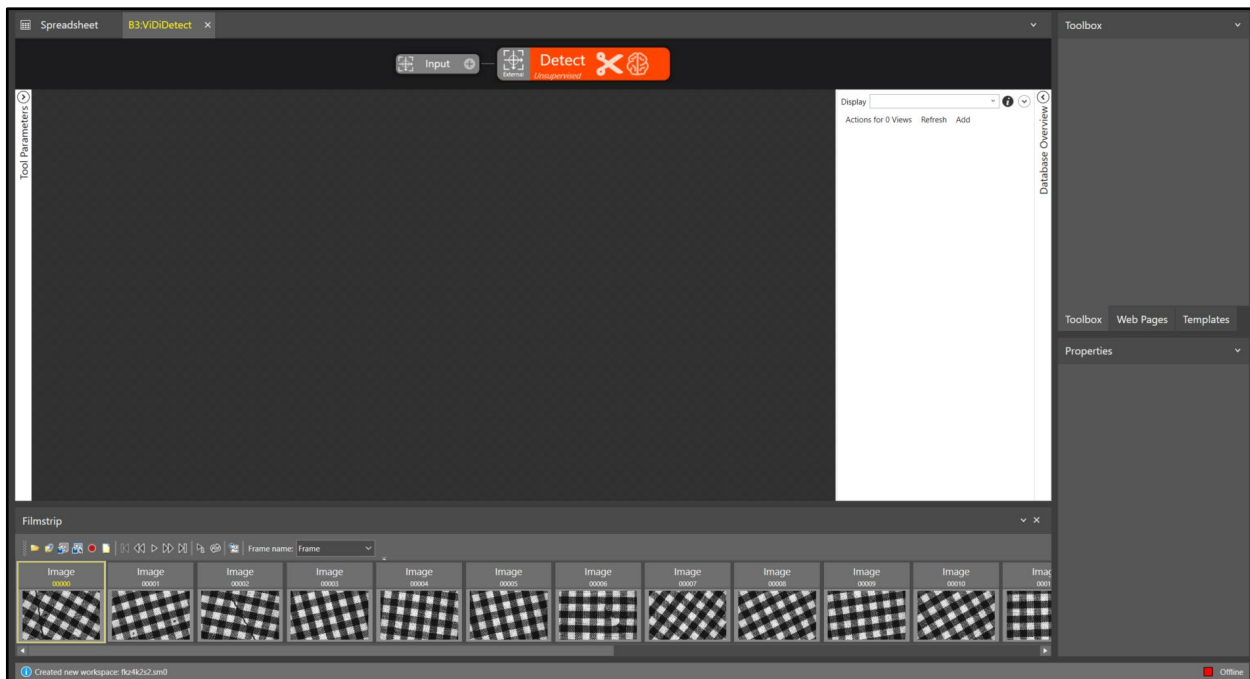
NOTE: The *ViDiDetect* tool is found in the *Toolbox* under *Vision Tools* → *ViDi Tools*. The **ViDiDetect Property Sheet** displays.



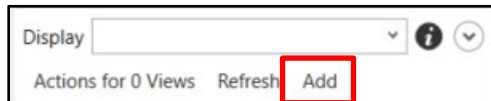
6. Double-click the **Region** parameter and position the region to include the entire ROI as shown below and press the **<Enter>** key.

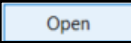


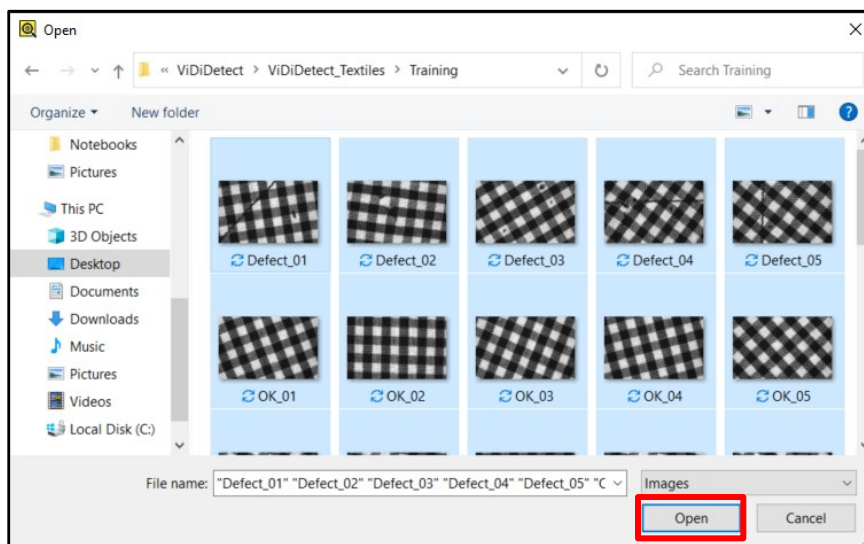
- Click the **Open ViDi Editor**  button to enter the ViDiDetect Workspace. The **ViDiDetect Workspace** displays.

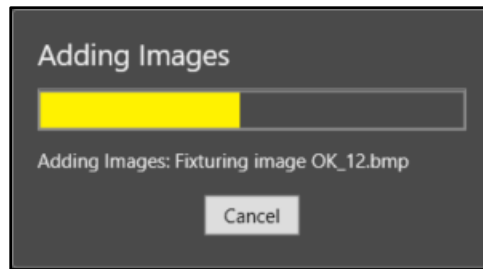


- Click **Add** to bring the images into the ViDiDetect workspace.

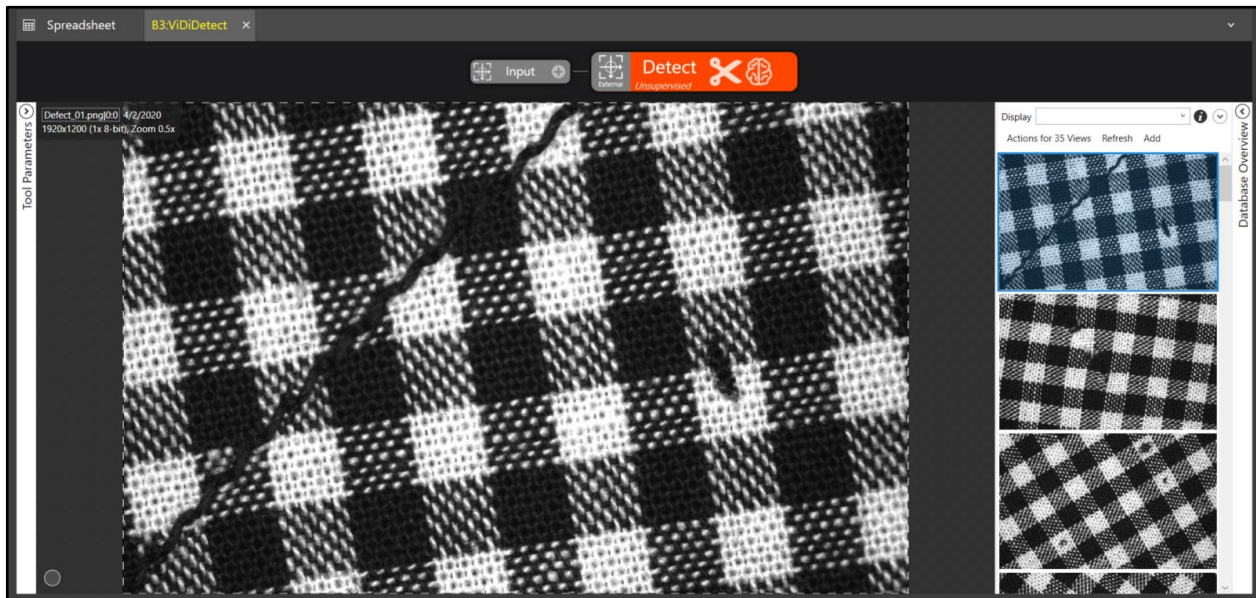


- Navigate to the **ViDiDetect_Textiles Training** folder.
- Select the first image and press **<Ctrl + A>**, this will automatically select all of the images. Click the **Open**  button.

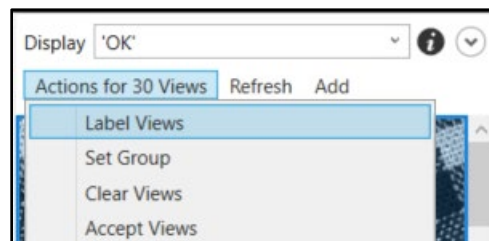




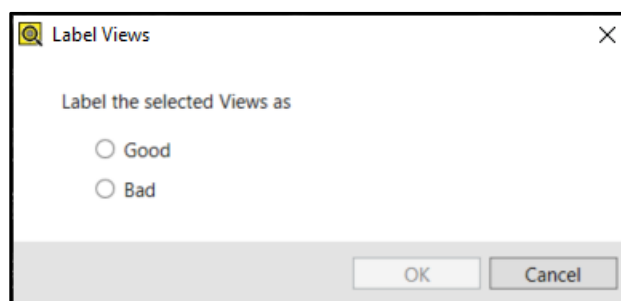
Once the images have been added, they will appear on the View Panel.



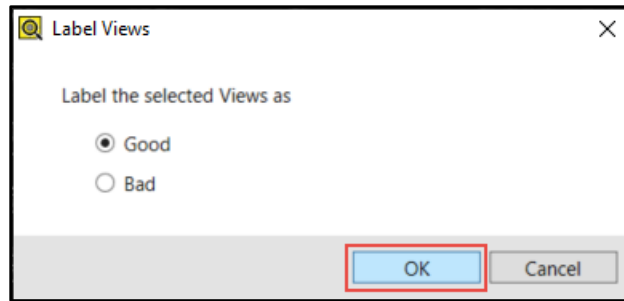
11. Enter 'OK' in the **Display** field and press the <Enter> key.
12. Click **Actions for 30 Views** and select **Label Views**.



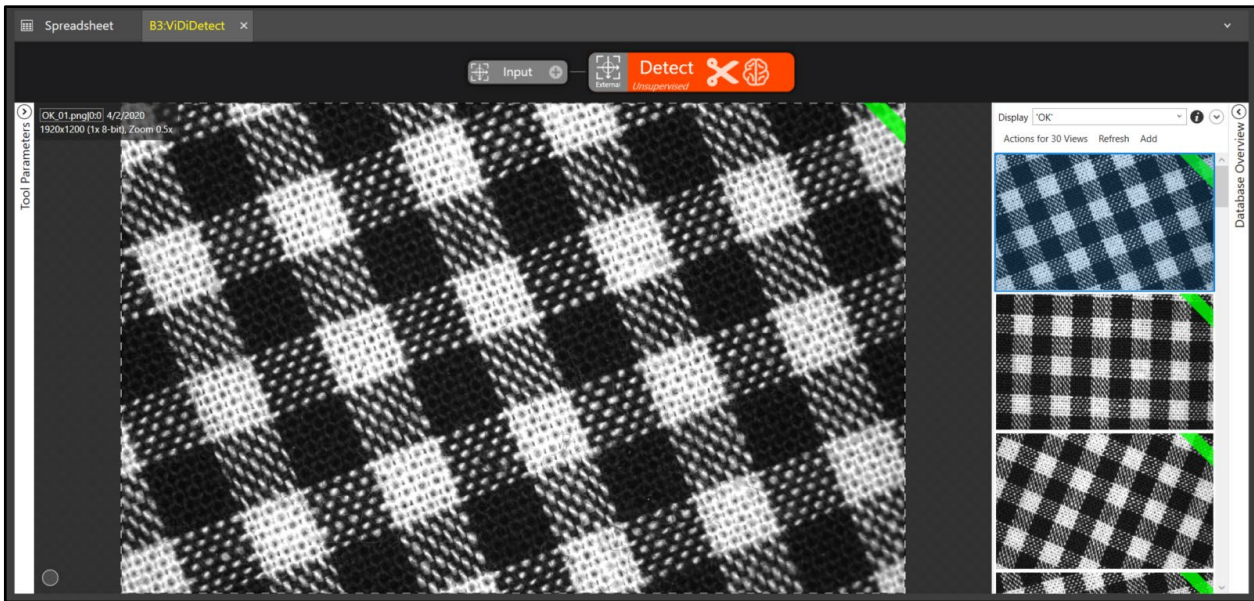
The **Label Views** window displays.



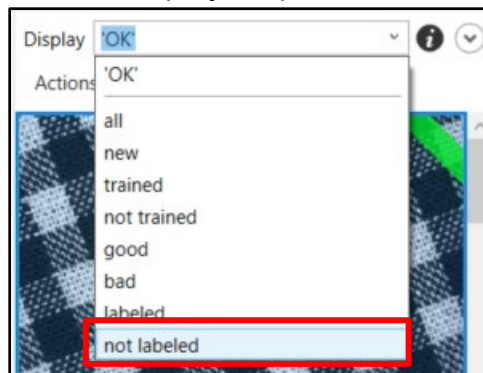
- 13. Label the selected Views as **Good** and click the **OK** button.



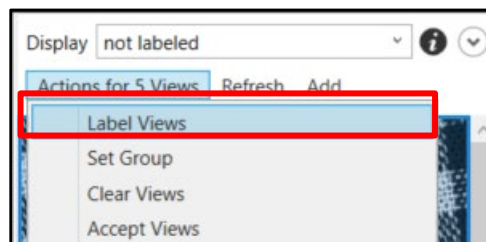
The images are labeled as Good. Notice the green label in the right-hand corner.



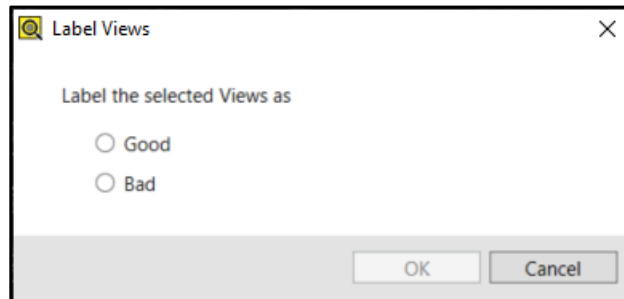
- 14. Select **Not Labeled** from the Display drop-down list.



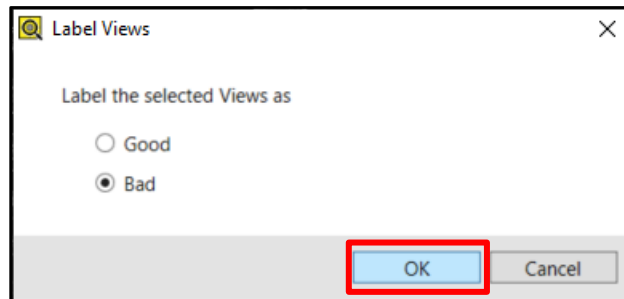
- 15. Click **Actions for 5 Views** and select **Label Views**.



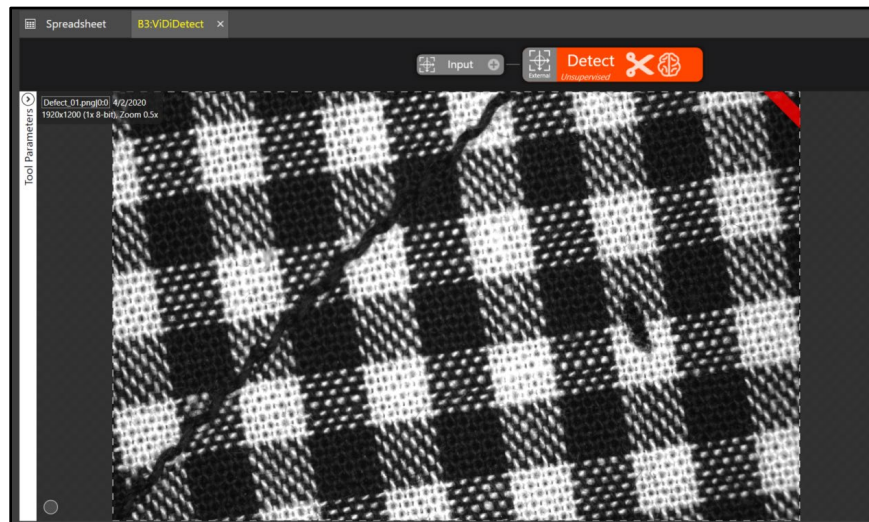
The **Label Views** window displays.



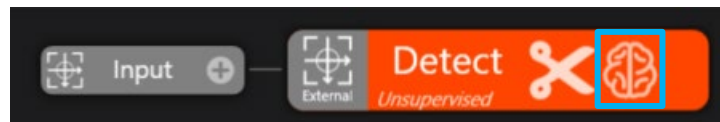
- 16. Label the selected Views as **Bad** and click the **OK** button.



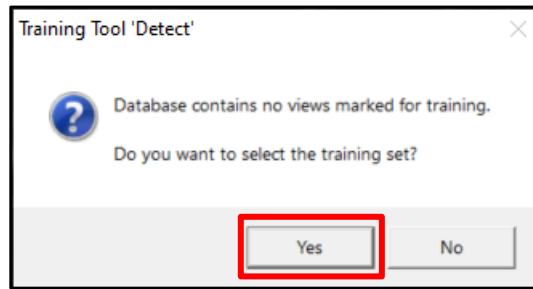
The images are labeled as Bad. Notice the red marking in the right-hand corner.



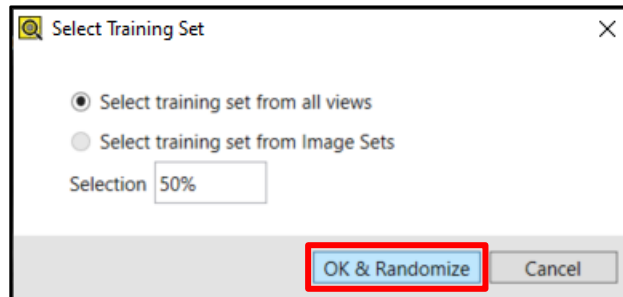
- 17. Train the tool by clicking the **Train** button.



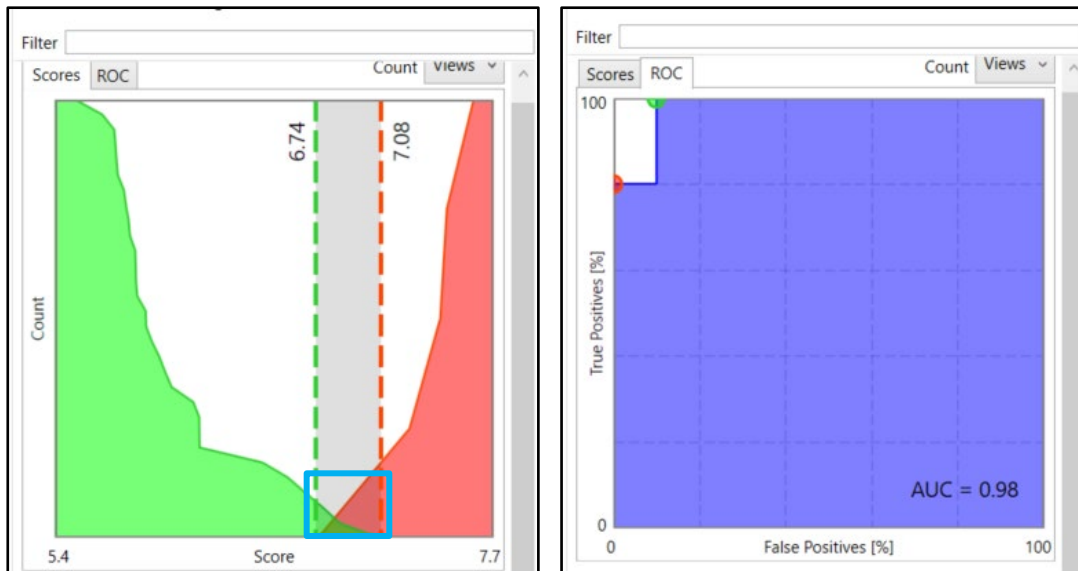
- Click the **Yes** button to select the training set.



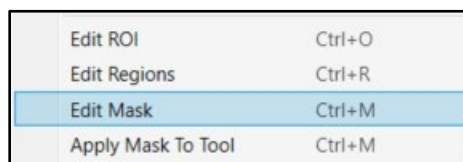
- Click the Select training set from all views radio button and click the **OK & Randomize** button.



- When Training is complete, open the **Database Overview** tab and review your results. Notice that there is an area where a score is between Good and Bad and the tool is unable to detect which is which.



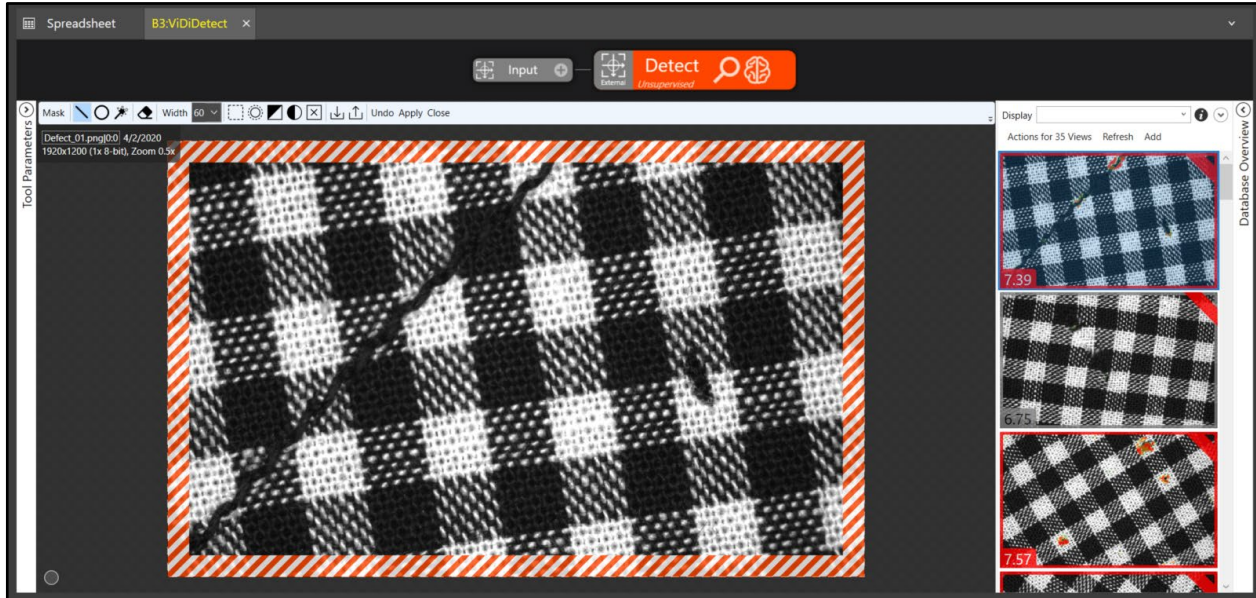
- Right-click on the image and select **Edit Mask** from the fly out list.



22. Change the **Width** to and click the **Add Border** button.

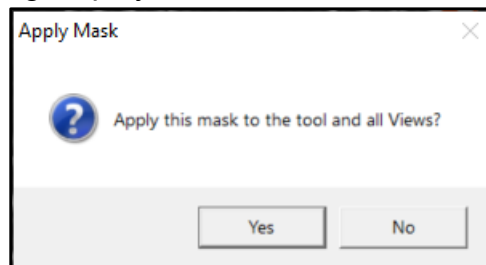


The **Mask** is added to the image.



23. Click **Apply**.

The **Apply Mask** dialog displays.



24. Click the **Yes** button to Apply this mask to the tool and all Views?

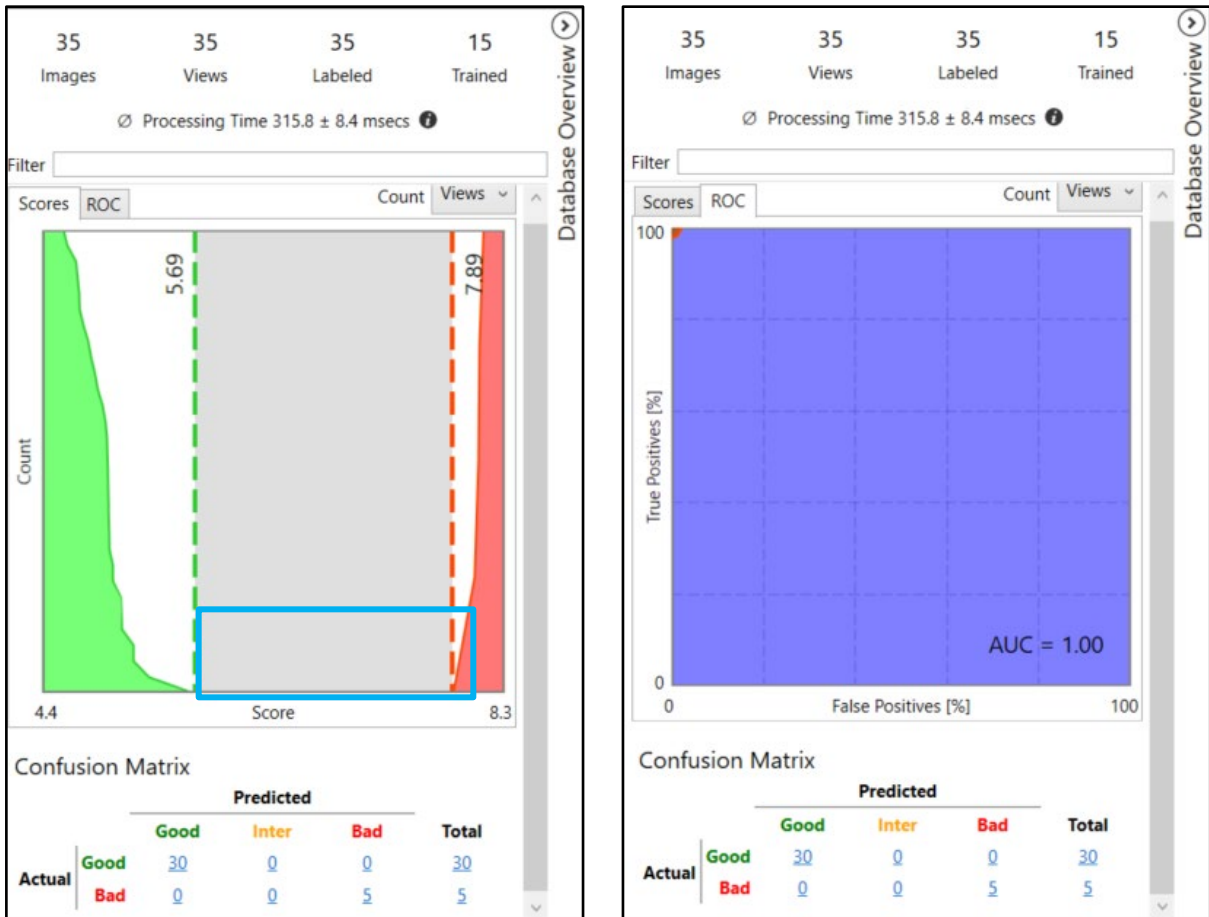
25. Click **Close**.


26. Open the **Tool Parameters** and set the following:

- *Feature Size* = 60
- *Rotation* = 0, 360

27. Click the **Train** button.

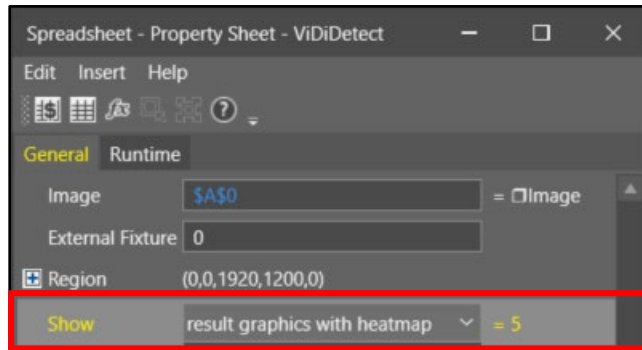
28. Open the **Database Overview** tab and review your results.
 Notice there is no overlap between the good and bad results now.



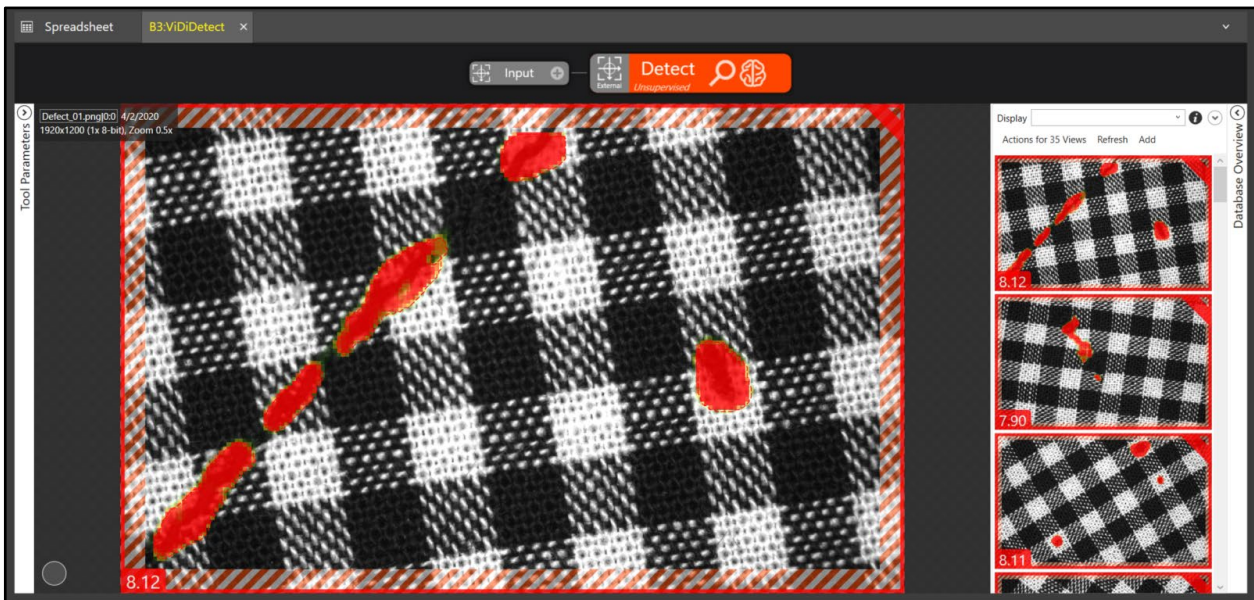
29. Click the **Save As**  button to save the job as **ViDiDetect_Textiles** in the folder created in lab #1.

If Time Allows:
Show Pass/Fail Results

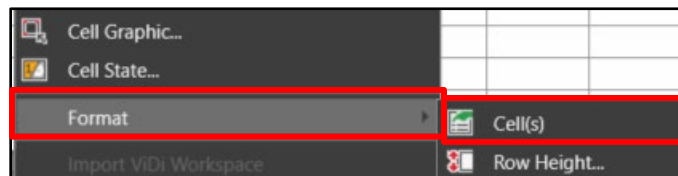
1. Click to **Spreadsheet** tab to return to the spreadsheet.
2. Double-click the **ViDiDetect** tool to open the Property Sheet.
3. Select **result graphics with heatmap** from the Show dropdown list and click the **OK** button.



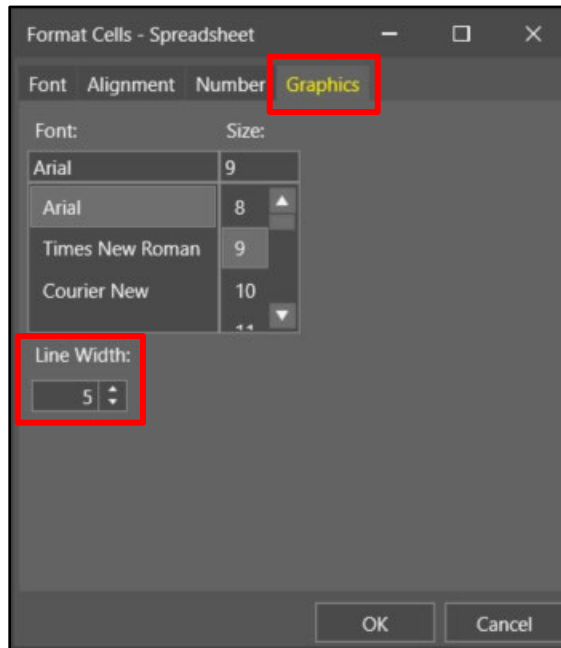
4. Click the **ViDiDetect** tab and notice the heatmap markings on the image.




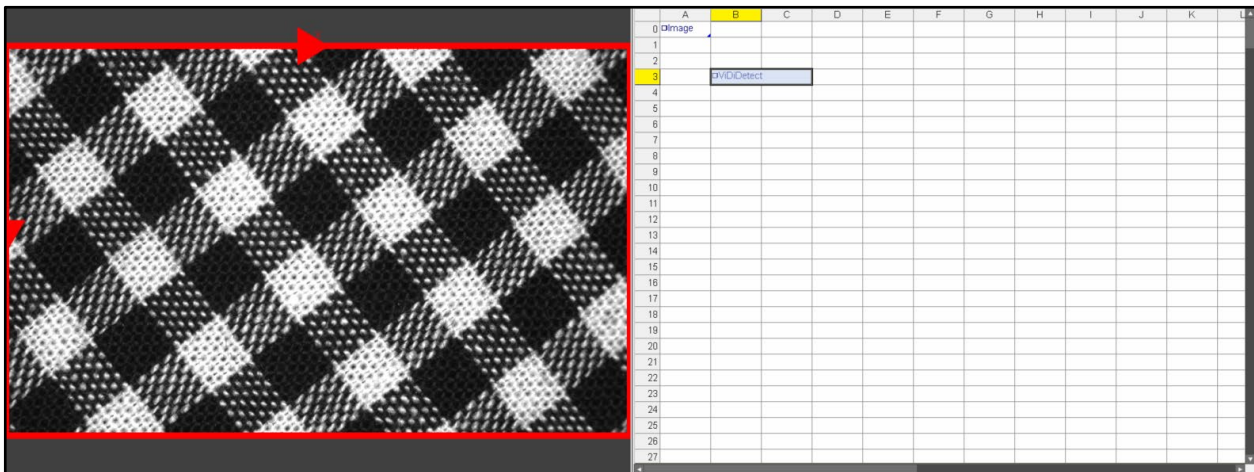
5. Click the **ViDiDetect** tab and notice the heatmap markings on the image.
6. Return to the **Spreadsheet** tab, right-click on the ViDiDetect function and select **Format** → **Cells** from the list.



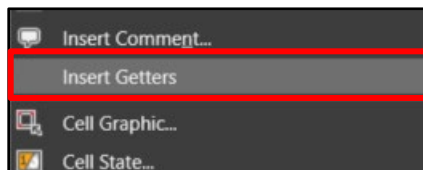
- Click the **Graphics** tab and increase the **Line Width** setting to 10 (or desired width).



- Click the **OK**  button.
The image now has a 10-pt. red border.



- Right-click on the **ViDiDetect** function and select **Insert Getters**.



This inserts the most commonly used ViDi getter functions into the spreadsheet.

1												
2		View	Index	Score	Lower Thre:	Upper Thre:	Passed	Region Cou	Region Inde	Score	Area	
3		ViDiDetect	ViDiDetect	0.000	4.930	5.694	7.89	1.000	0.000	0.000	#ERR	#ERR
4												

Notice that there is a Passed getter – we will add an IF statement to set a color based on whether the ViDiDetect tool passed or failed.

- In cell **B6** enter the following IF statement, `If(H3,0x00FF00, 0xFF0000)` and press the <Enter> key.

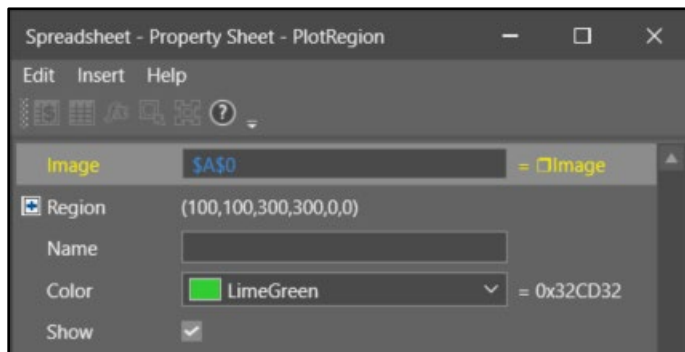
NOTE: Cell H3 is referencing the Passed getter and 00FF00 = green, and FF0000 = red.

5												
6								<code>If(H3,0x00FF00, 0xFF0000)</code>				
7												

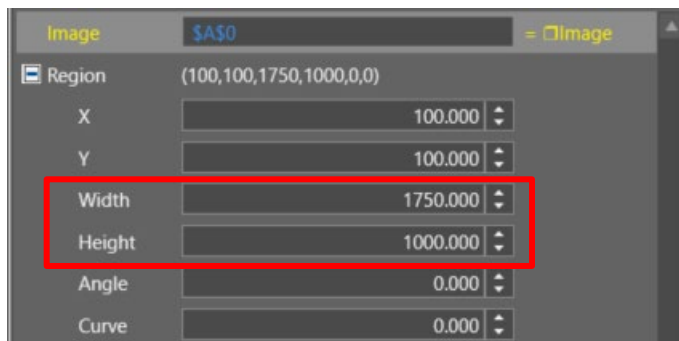
- Insert a **PlotRegion** function in cell **B8**.

NOTE: The *PlotRegion* function is found under **Toolbox** → **Image** → **PlotRegion**.

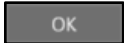
The **PlotRegion** Property Sheet displays.



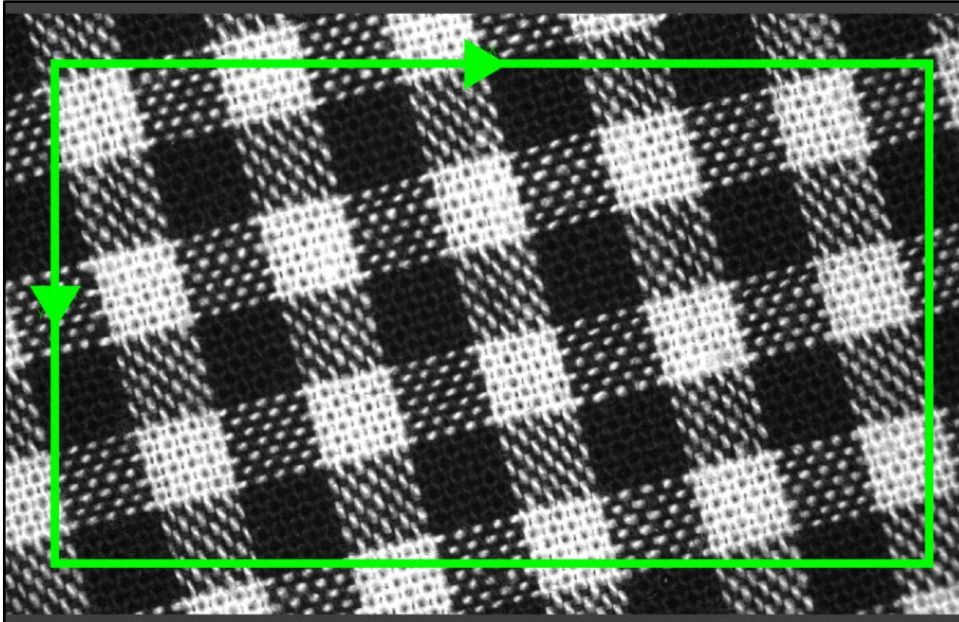
- Open the **Region** property and set the Width to 1750 and the Height to 1000.



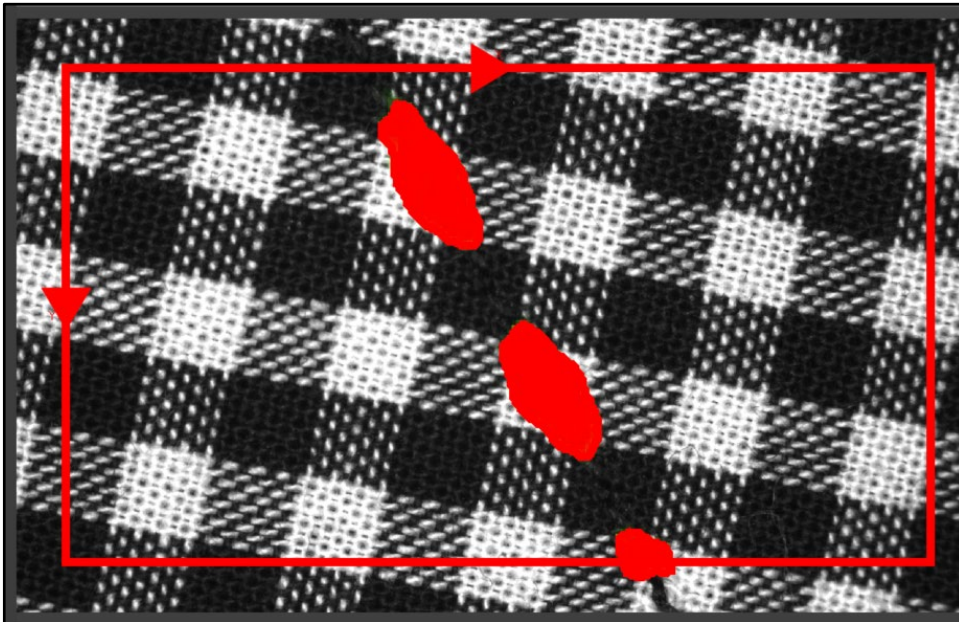
- Set the **Color** property to reference the *If* statement in cell **B6** and click the **OK** button.

14. Adjust the **Line Width** of the PlotRegion function to *10* and click the **OK**  button.
15. Scroll through the Filmstrip images and review the results.

Pass:



Fail:



16. Click the **Save All**  button to save the job.

Lab Exercise 5.1 – ViDiCheck Tool

At the end of this lab exercise, Participants will be able to:

- Utilize the ViDiCheck tool to solve their application
- Create a Layout Model to verify that all parts are present and correct

The Participant will utilize the following In-Sight Vision Suite tool to successfully complete this exercise:


- ViDiCheck Tool
 - Layout Model

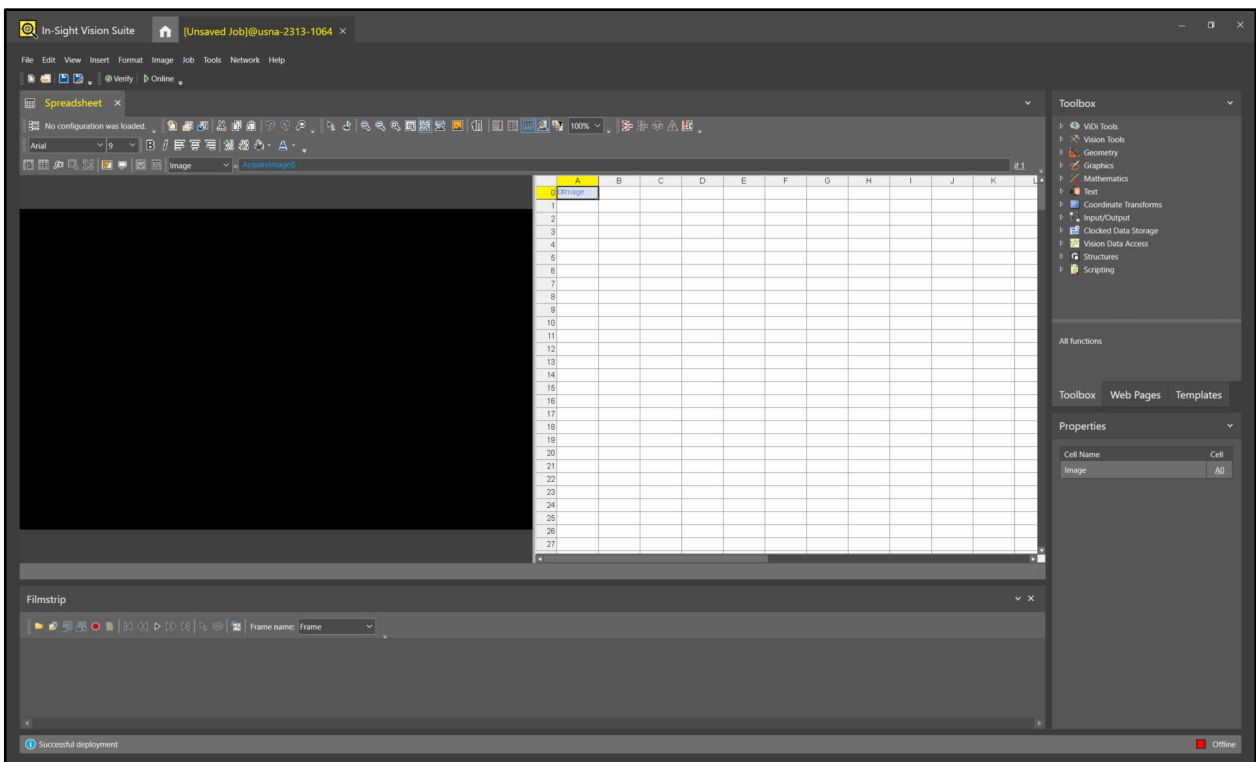
Follow the steps below to complete the lab exercise:

Chocolate Assortment Inspection

NOTE: Your emulator should be configured to emulate the **In-Sight D905M** camera to complete this lab exercise.

Direct the image folder to the `ViDiCheck_Chocolates Runtime` folder.

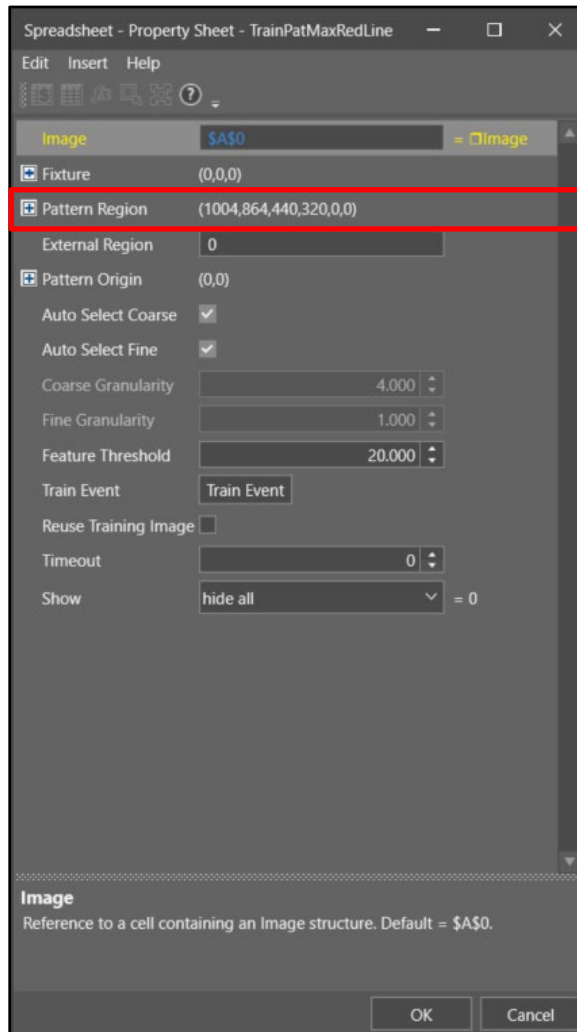
1. Click the **New Job**  button.
A new spreadsheet displays.



2. Enter a **TrainPatMaxPattern** tool in cell **B3**.

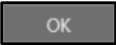
NOTE: The *TrainPatMaxRedLine* tool is found in the *Toolbox* under *Vision Tools* → *Pattern Match*.

The **TrainPatMaxRedLine Property Sheet** displays.



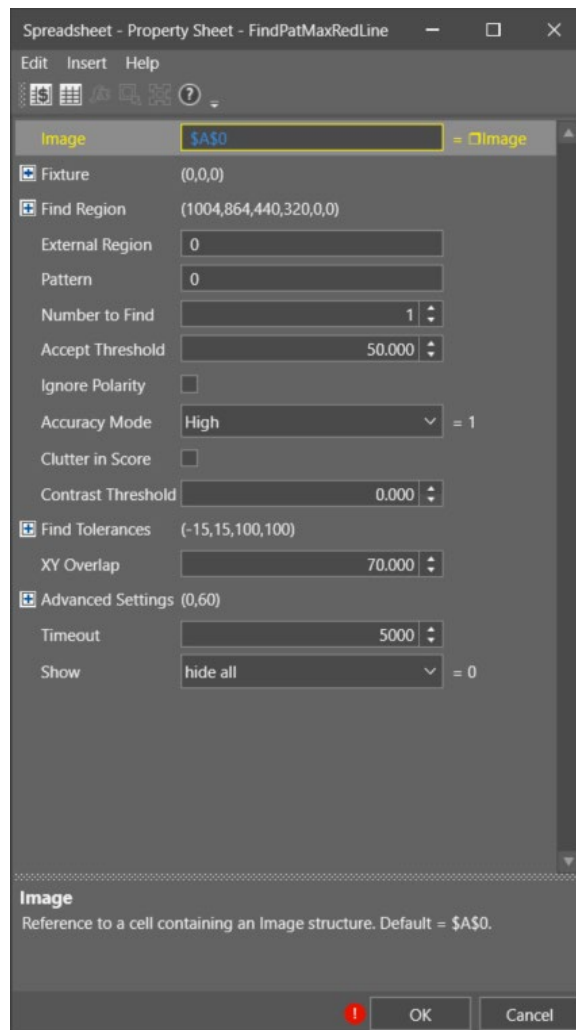
3. Double-click the **Pattern Region** parameter and position the region on the chocolate assortment as shown below and press the **<Enter>** key.



- Click the **OK**  button to close the TrainPatMaxRedLine Property Sheet. The **Pattern** is found.

	A	B	C	D	E	F	G	H	I	J	K	L
0	Image											
1												
2												
3		Patterns	1.000									
4												

- Enter a **FindPatMaxRedLine** tool in cell **B6**.
NOTE: The FindPatMaxRedLine tool is found in the Toolbox under Vision Tools → Pattern Match.
 The **FindPatMaxRedLine Property Sheet** displays.



- Double-click the **Find Region** parameter and position it around the box of chocolates, then press the **<Enter>** key.

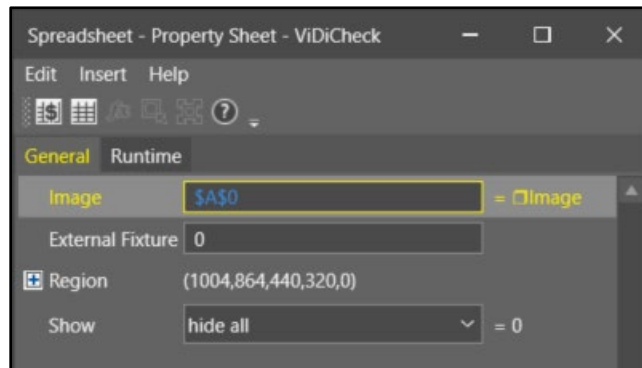


The **Property Sheet** displays.

- Double-click the **Pattern** parameter and reference the TrainPatMaxRedLine pattern in cell **B3**.
Set the **Find Tolerances** parameters – *Angle Start = -45, Angle End = 45*.
- Click the **OK** button to close the FindPatMaxRedLine Property Sheet.
The FindPatMaxRedLine Pattern is found.

4													
5		Index	X	Y	Angle	Scale	Score						
6		Patterns	0.000	1561.112	1099.706	-0.001	100.000	97.991					
7													


- Next, enter a **ViDiCheck** tool in cell **B9**.
NOTE: *The ViDiCheck tool is found in the Toolbox under Vision Tools → ViDi Tools.*
The **ViDiCheck Property Sheet** displays.

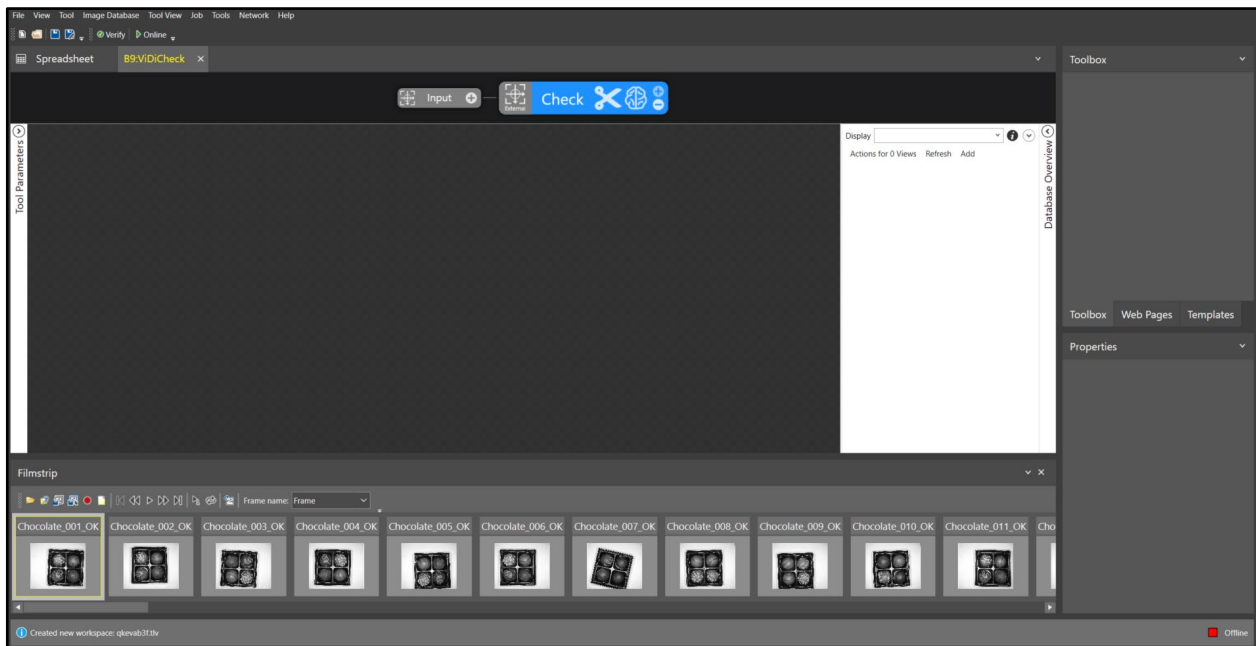


- Double-click the **External Fixture** parameter and reference the FindPatMaxRedLine pattern in cell **B6** and press the **<Enter>** key.

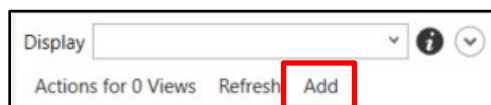
- Double-click the **Region** parameter and position the region to include the box of chocolates as shown below and press the **<Enter>** key.



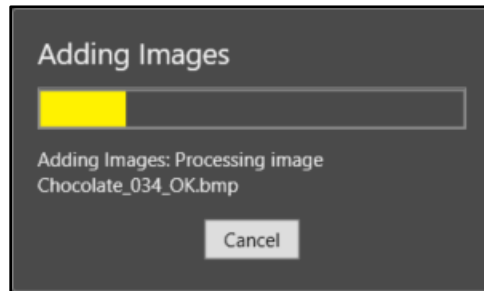
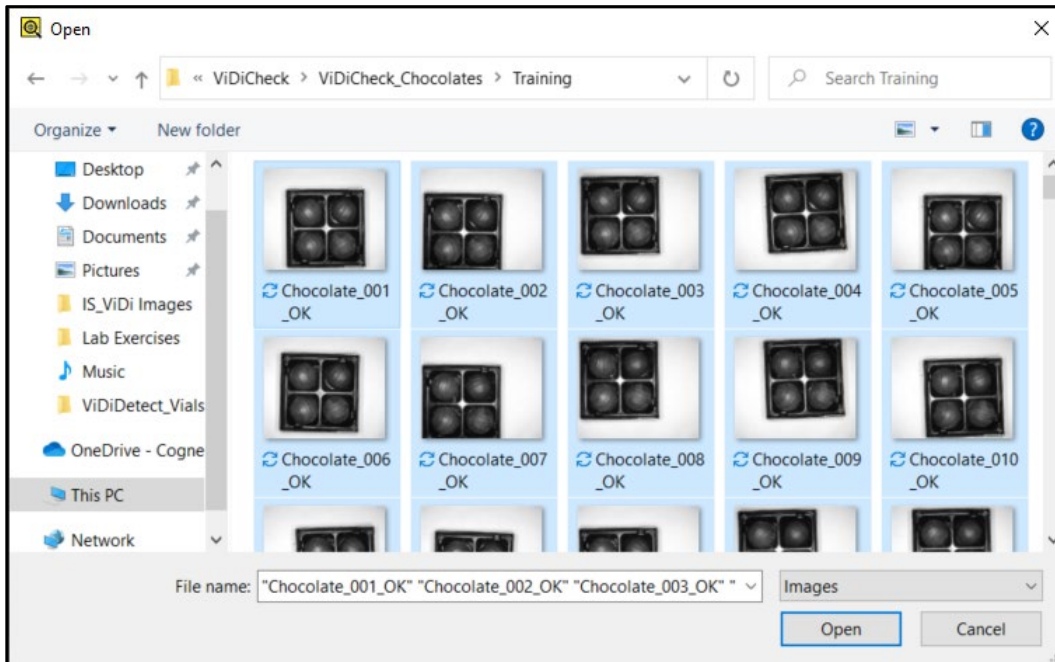
- Click the **Open ViDi Editor**  button to enter the ViDiCheck Workspace. The **ViDiCheck Workspace** displays.



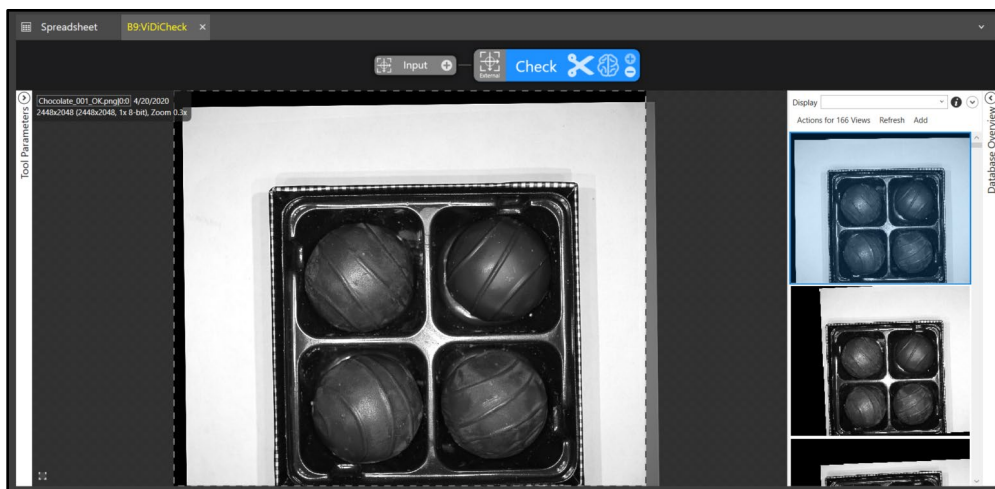
- Click **Add** to bring the images into the ViDiCheck workspace.



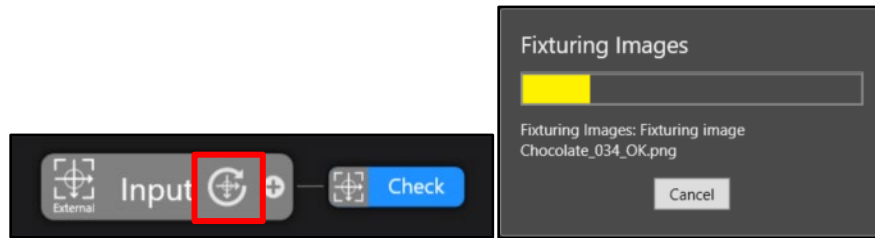
14. Navigate to the **ViDiCheck_Chocolates Training** folder.
15. Select the first image and press **<Ctrl + A>**, this will automatically select all of the images. Click the **Open** button.



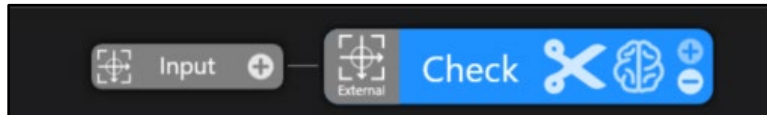
Once the images have been added, they will appear on the View Panel.



- Click the **Update Views with External Fixture** button to fixture the images.

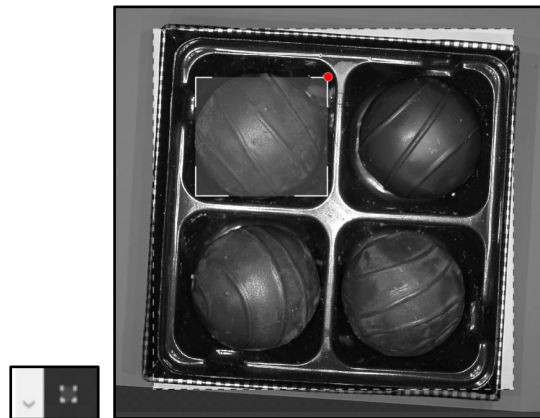


- Return to the **Check** tool.

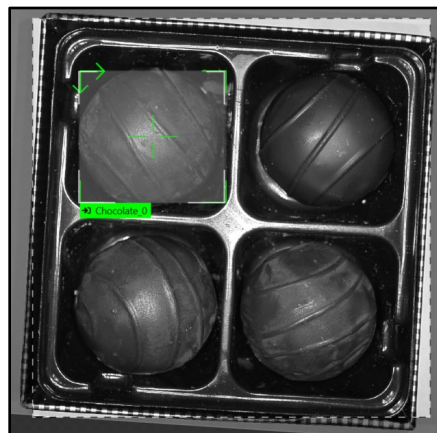


- Move the **Feature Size** box over the first chocolate. Drag the red circle to the desired size (approximately the same size as the chocolate) and move it to be centered over the first chocolate.

NOTE: *The Feature Size box is found in the lower left-hand side of the Workspace.*

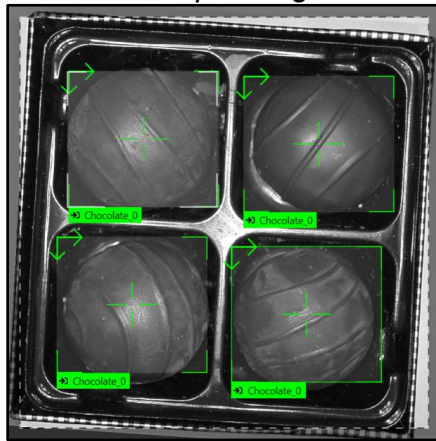


- Click on the image outside of your feature size box. A green rectangle the same size as your feature size box displays.
- Move the box over the first chocolate and click the **0** to open the text box. Label this chocolate *Chocolate_0* and press the **<Enter>** key.

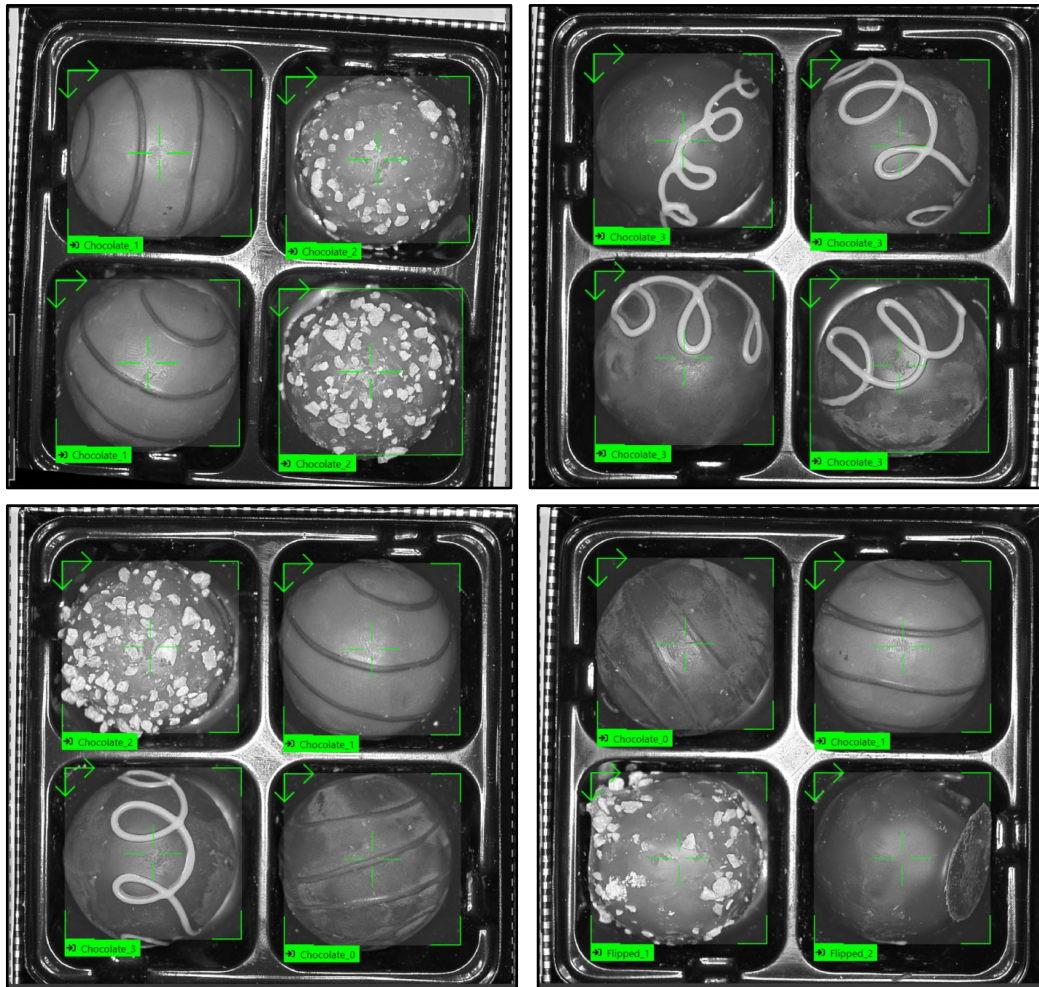


- Click on the remaining chocolates in the box to label.

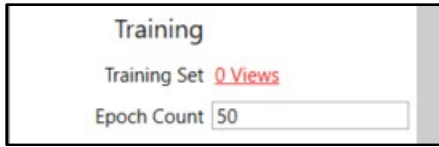
NOTE: As you click on each chocolate the labeled box will display – make sure that each one is centered over the corresponding chocolate.



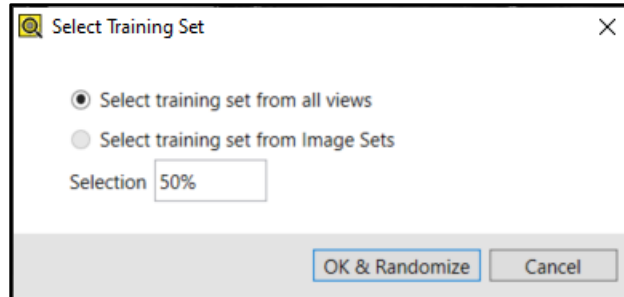
- Label at least three images with the names of each chocolate.
- Move onto the next chocolate assortments in your image database and label at least five assortments with the names of each chocolate as shown below.



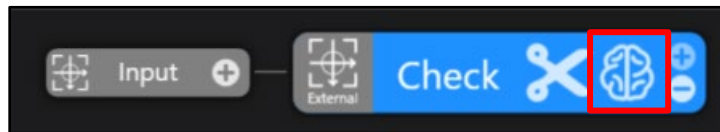
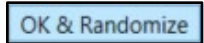
24. Select the **Training Set** by clicking the Training Set parameter.



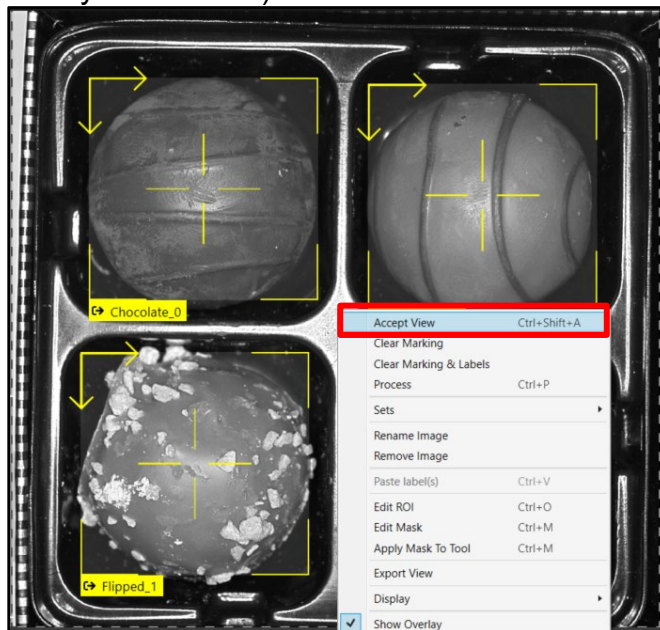
The **Select Training Set** dialog displays.



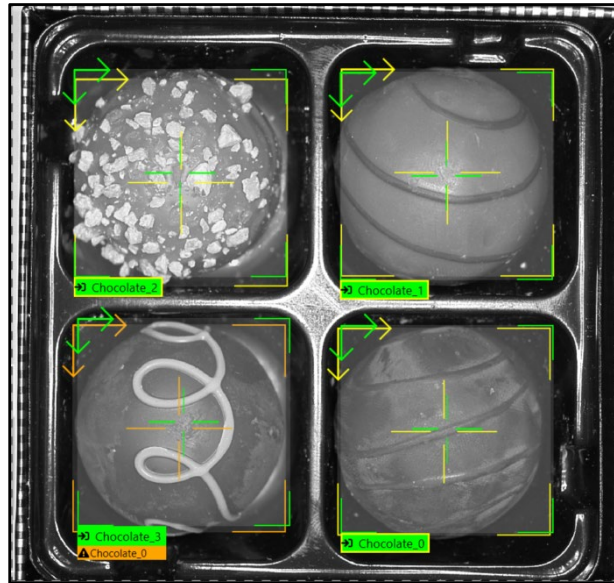
25. **Select training set from all views** and click the **OK & Randomize** button.
26. Click the **Train** button to train.



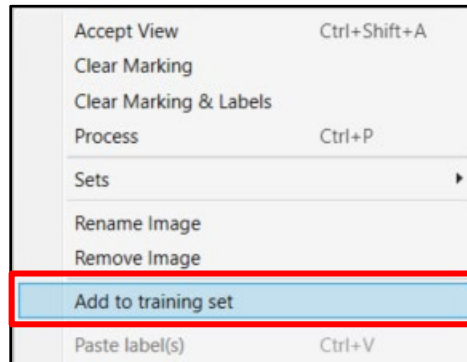
27. Once the training is complete scroll through your images to view the results. Notice on the images in addition to the green labels there are also yellow markings recognizing the different chocolates.
28. Confirm that all chocolates are marked correctly and label any chocolates that are not marked. Right-click and **Accept View** for the views that are marked in yellow, (make any necessary corrections).



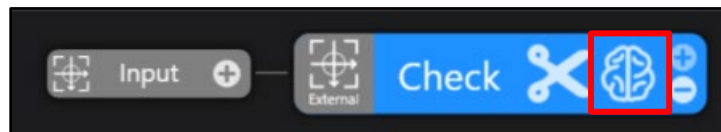
In-Sight ViDi may mark a feature in orange – this means that there is a mismatch between what you labeled and what ViDi found.



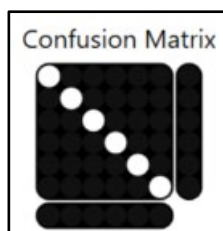
29. If there is a mismatch, or ViDi has marked a chocolate incorrectly, right-click on the image select **Accept View**, (make any necessary corrections) right-click and select **Add to training set**.



30. Once you are done labeling, click the **Train** button to train.



31. Review your results.

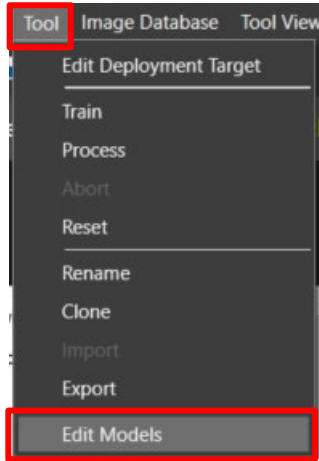


Feature	Found	Train	Labeled	Recall	Precision	F-Score
Chocolate_0	241	82	110	100.0	100.0	100.0
Chocolate_1	90	50	64	100.0	100.0	100.0
Chocolate_2	70	46	58	100.0	100.0	100.0
Chocolate_3	215	103	113	100.0	100.0	100.0
Flipped_1	7	4	6	100.0	100.0	100.0
Flipped_2	21	11	13	100.0	100.0	100.0
	644	296	364	100.0	100.0	100.0
∅ (6 classes)				100.0	100.0	100.0

Build the Models for the Chocolate Assortments



Follow the steps below to complete the lab exercise:

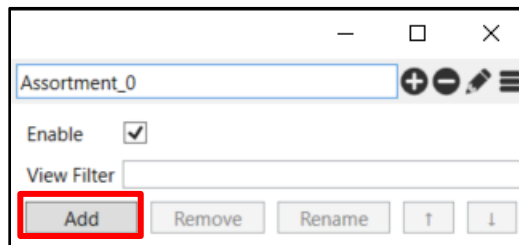
1. Select the first assortment with four different chocolates and then select **Edit Models** from the Tool menu.



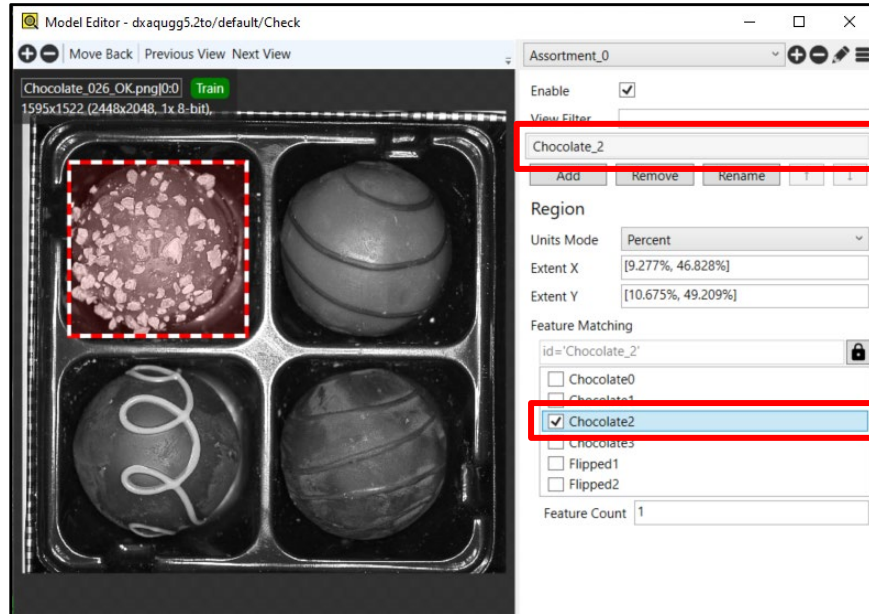
The **Model Editor** displays.



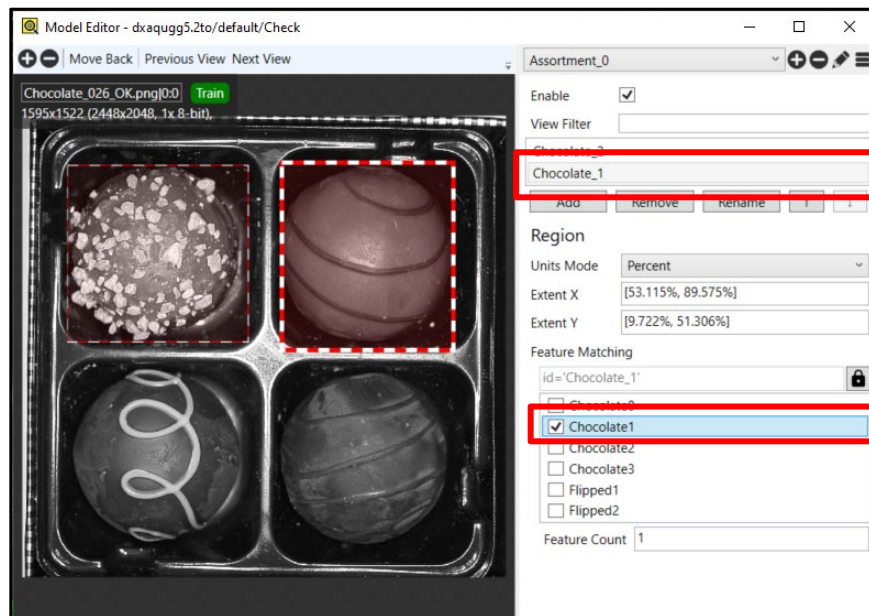
2. Click the **pencil**  icon to rename the model *Assortment_0* and press the **<Enter>** key.
3. Click the **Add**  button.



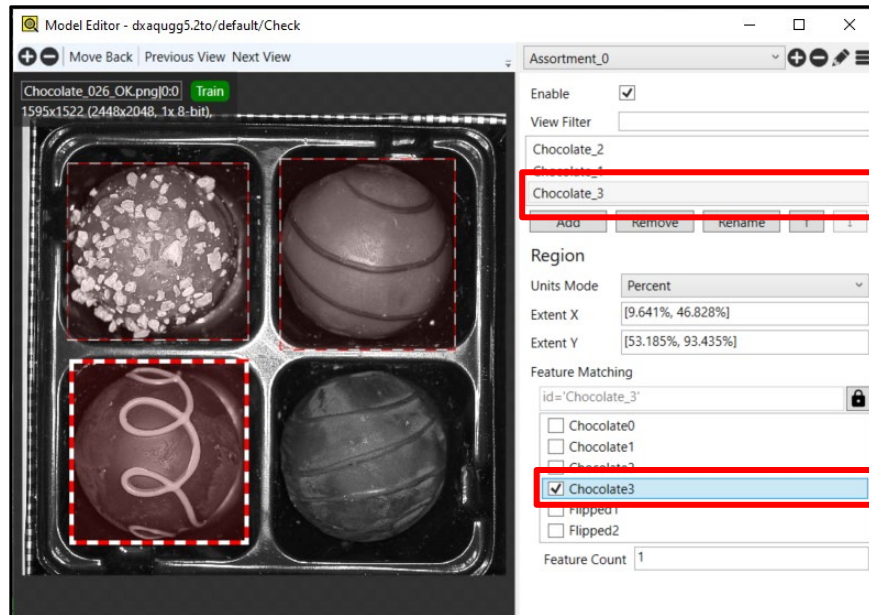
4. Move the ROI to outline the first chocolate. Rename the Region to *Chocolate_2* and check the *Chocolate2* checkbox.



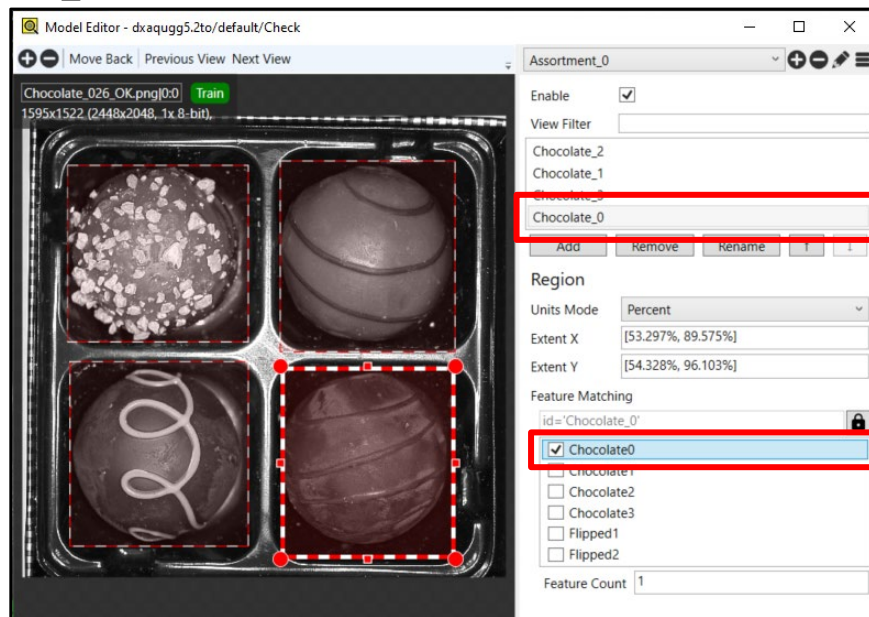
5. Repeat for the remaining 3 chocolates.
Chocolate_1



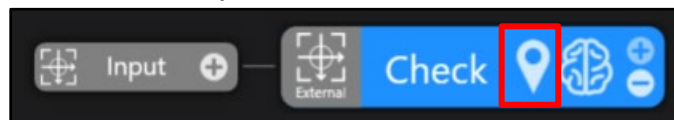
Chocolate_3



Chocolate_0

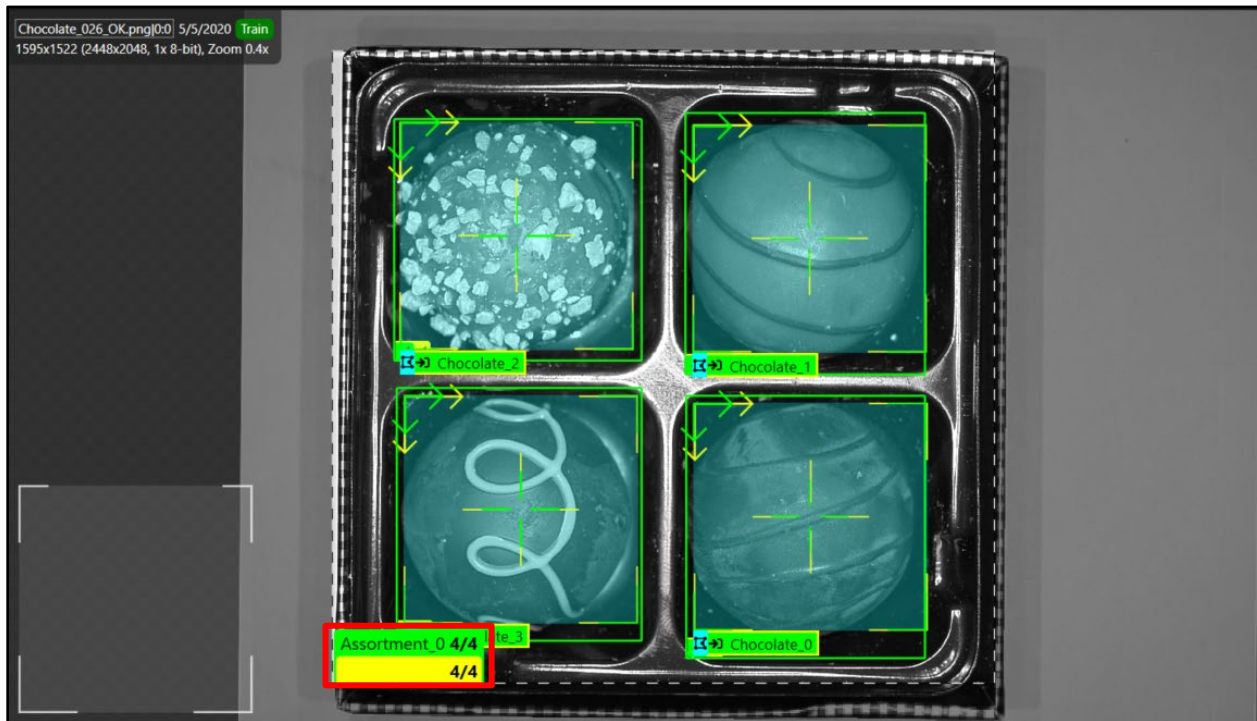


6. Close the Model Editor and process the model.

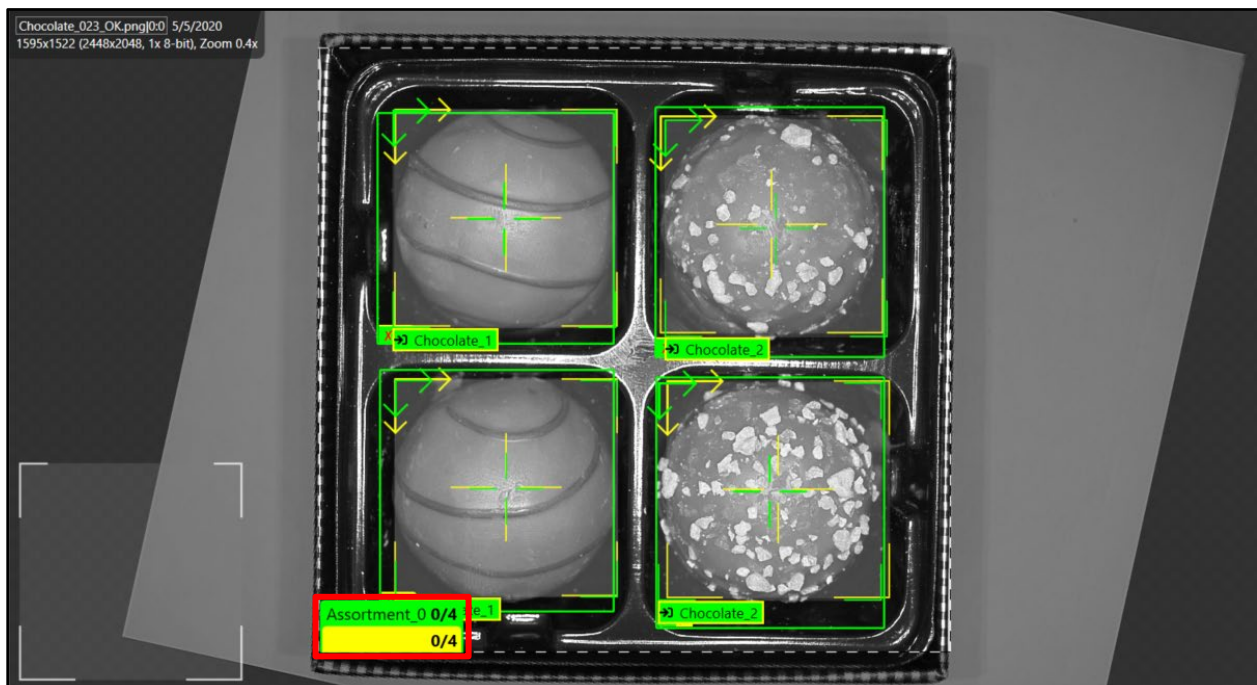


7. Review the Results.

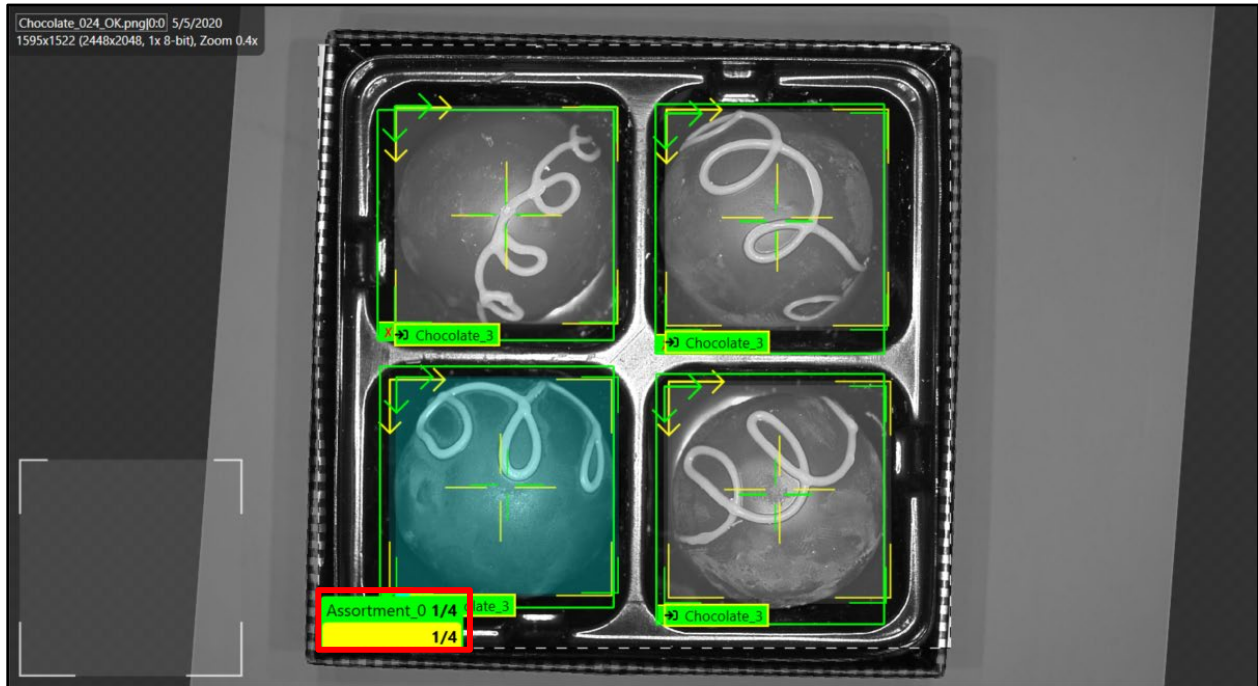
When the chocolates are all in the proper slots the results will display **4/4**.




When none of the chocolates are in the proper slots the results will display **0/4**.




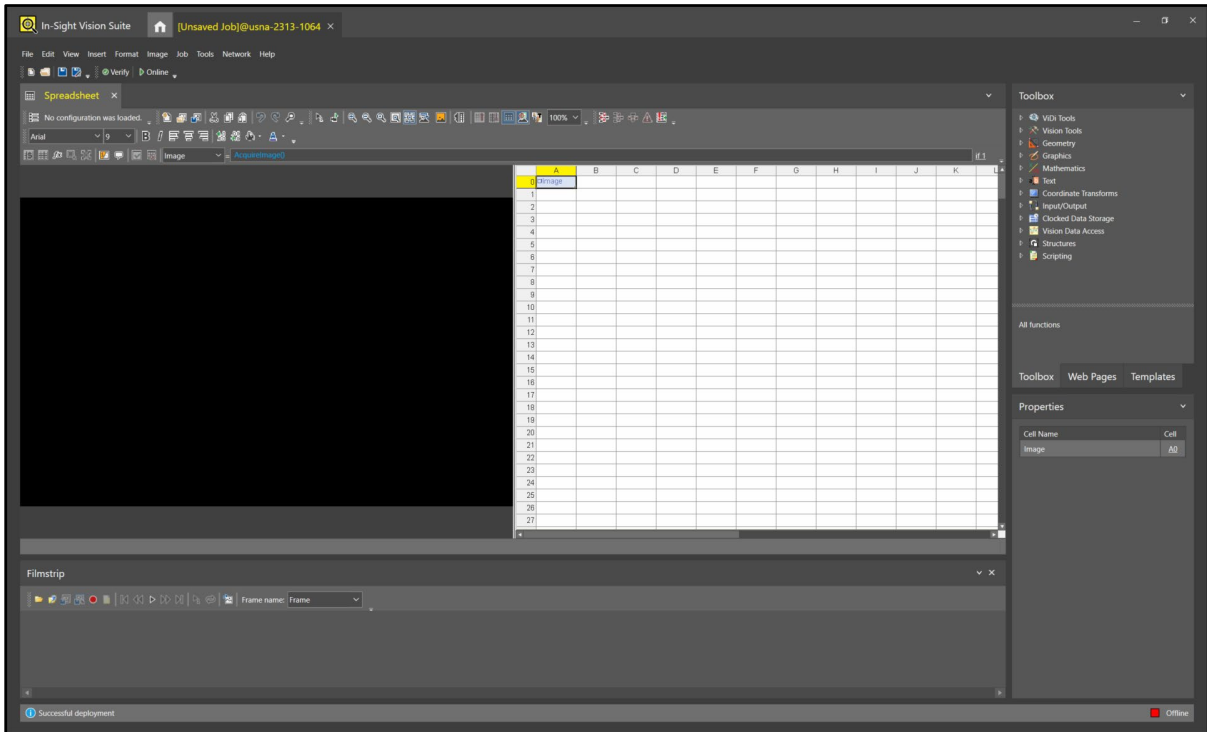
When one of the chocolates is in the proper slot the results will display **1/4**.



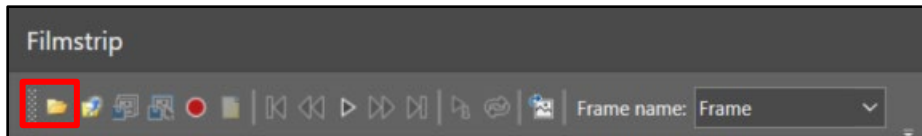
8. Click the **Save As**  button to save the job as **ViDiCheck_Chocolates** in the folder created in lab #1.

Spark Plug Inspection

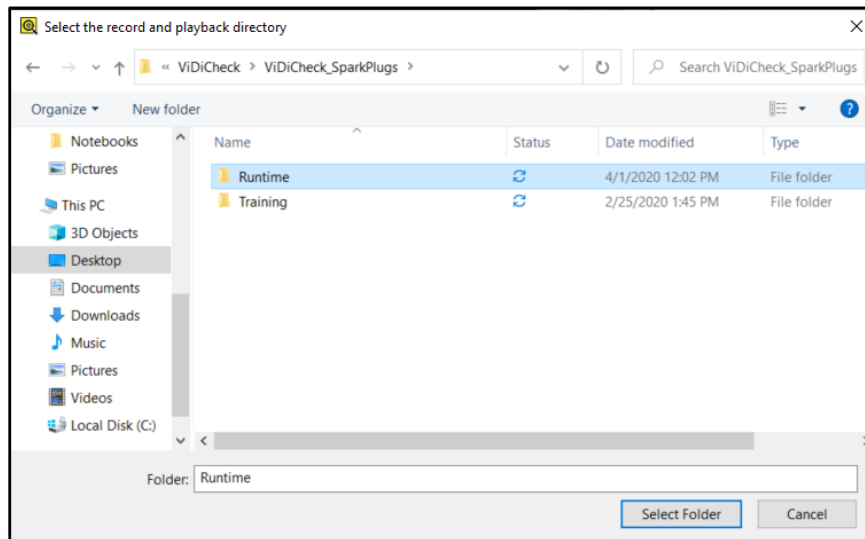
1. Click the **New Job**  button.
A new spreadsheet displays.



2. Click the **Folder** icon in the Filmstrip.



The **Select the record and playback directory** window displays.



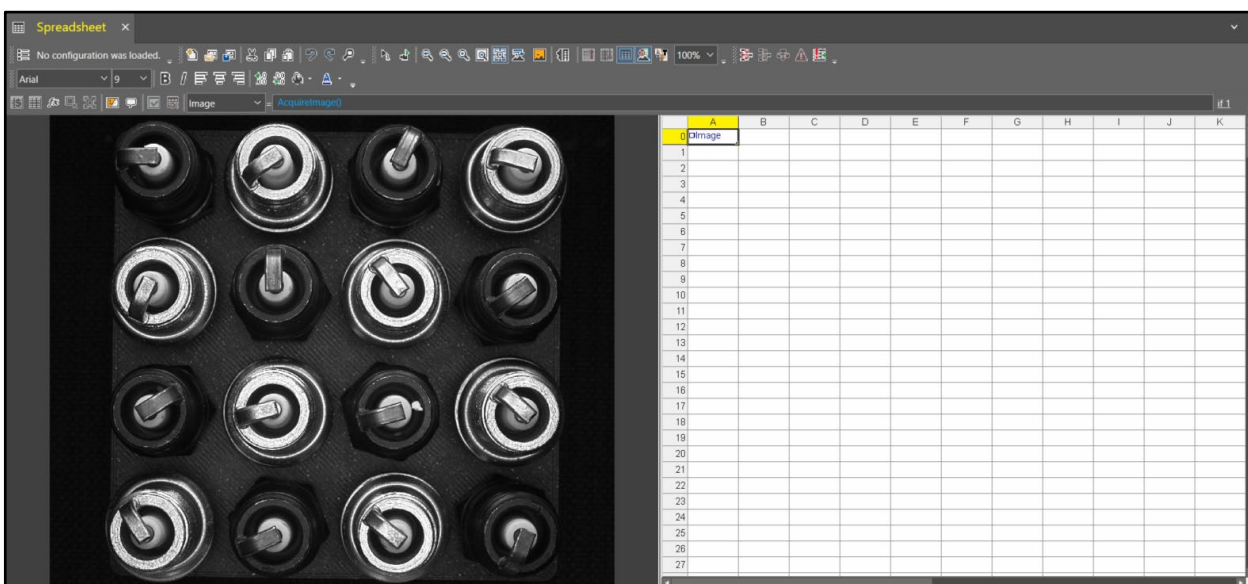
3. Navigate to the **ViDiCheck_SparkPlugs Runtime** folder and click the **Select Folder** button.

NOTE: *The In-Sight ViDi images can be found in the Student Folder on the desktop of your training computer.*

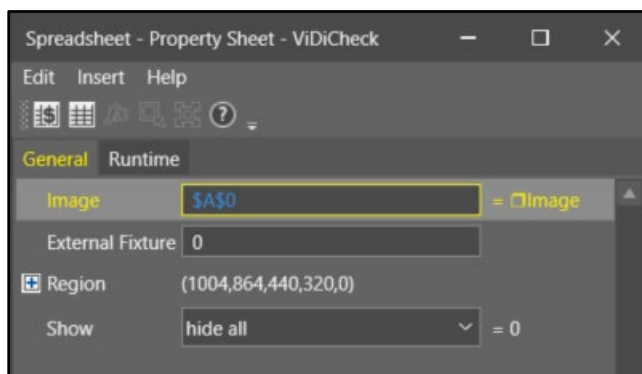
The Runtime images display in the Filmstrip.



4. Double-click the first image to bring it into the image window.

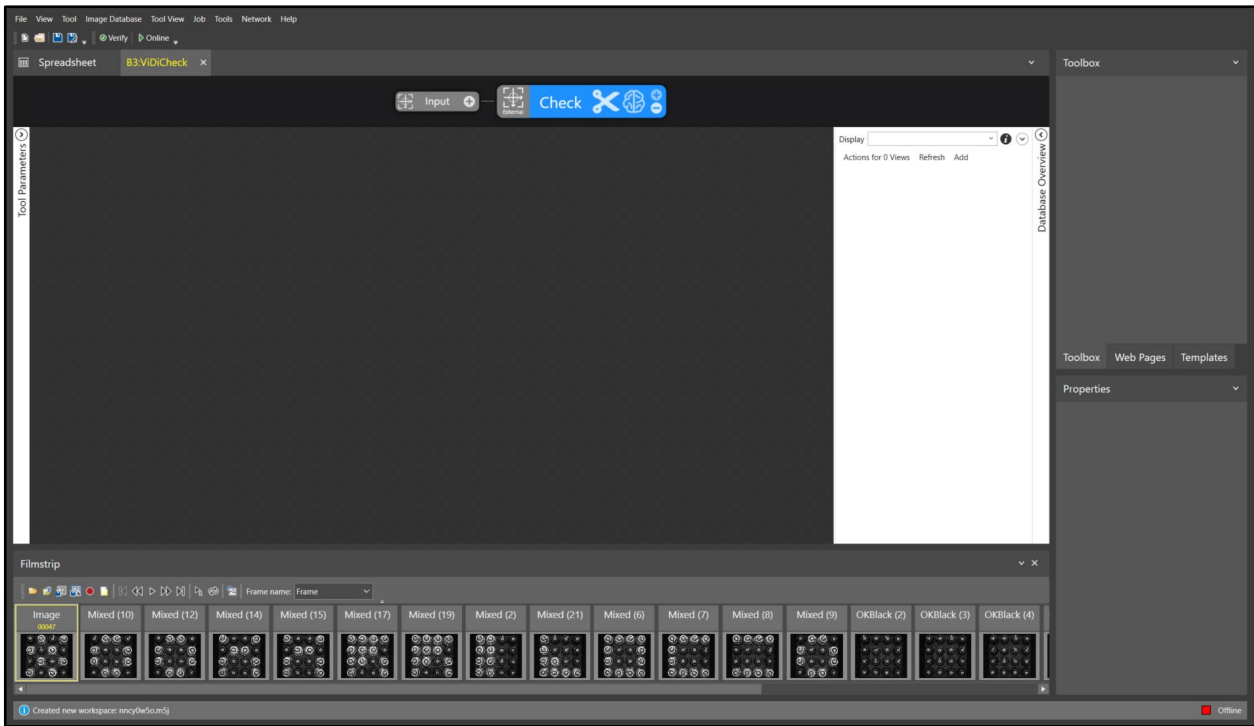


5. Enter a **ViDiCheck** tool into cell **B3**.
The **ViDiCheck Property Sheet** displays.

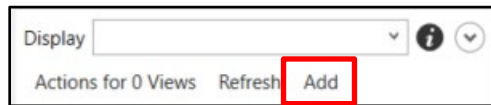


6. Position the region to include all of the sparkplugs and click the **Open ViDi Editor** button to enter the ViDiCheck Workspace.

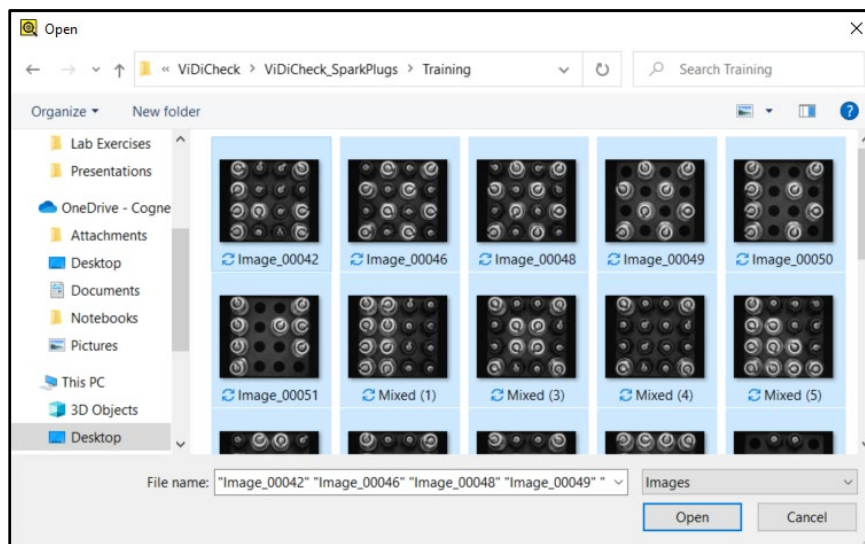
The ViDiCheck Workspace displays.



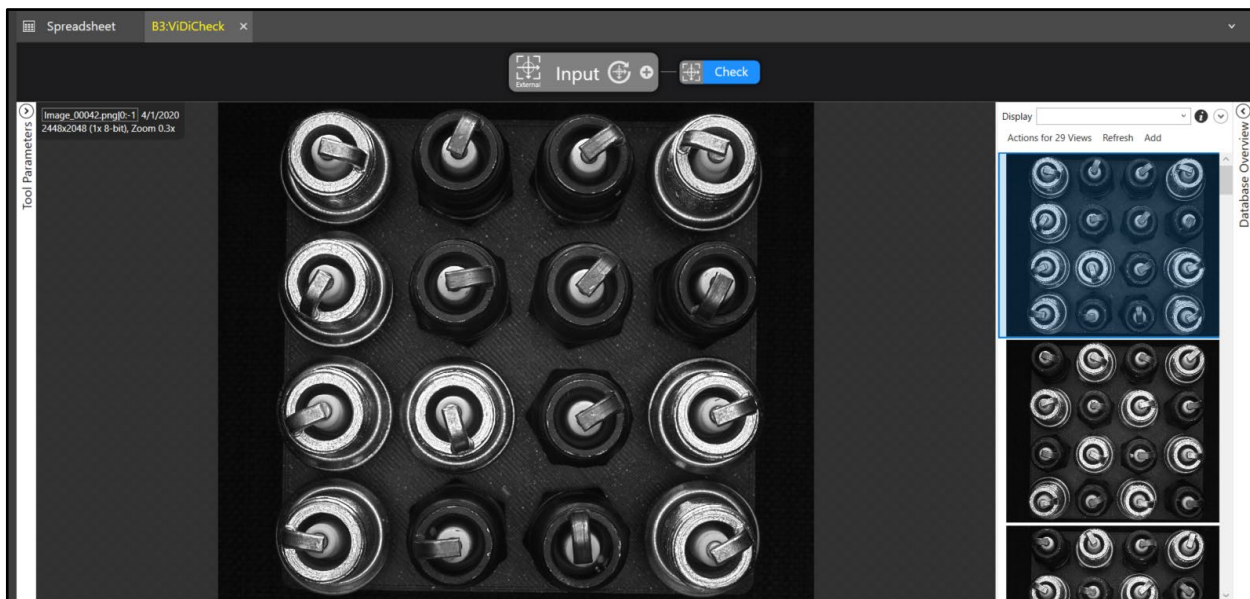
- Click **Add** to bring the images into the ViDiCheck workspace.



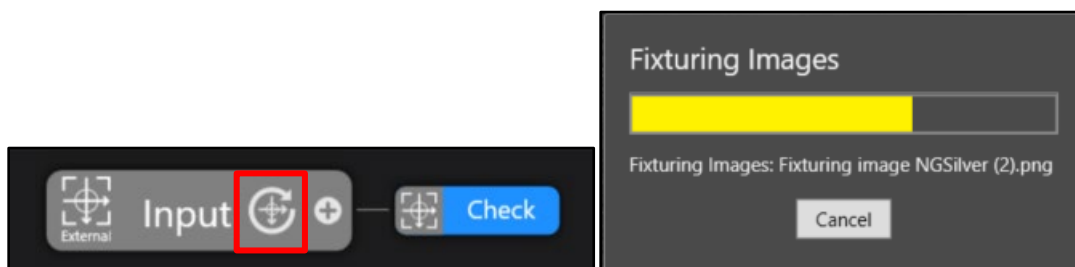
- Navigate to the **ViDiCheck_SparkPlugs Training** folder.
- Select the first image and press **<Ctrl + A>**, this will automatically select all of the images. Click the **Open** button.



- Once the images have been added, they will appear on the View Panel. Click an image to select.



- Click the **Update Views with External Fixture** button to fixture the images.

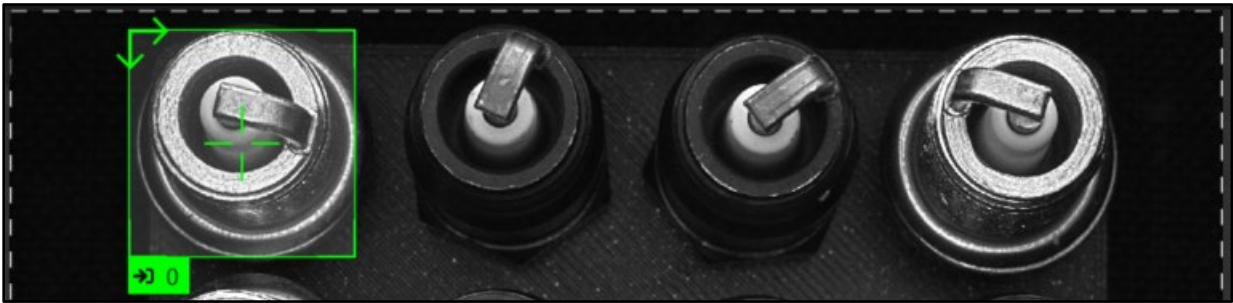


- Right-click on the image and select Edit ROI to define the Region of Interest.
- Allow the default of **External ROI** to remain and click **Close**.

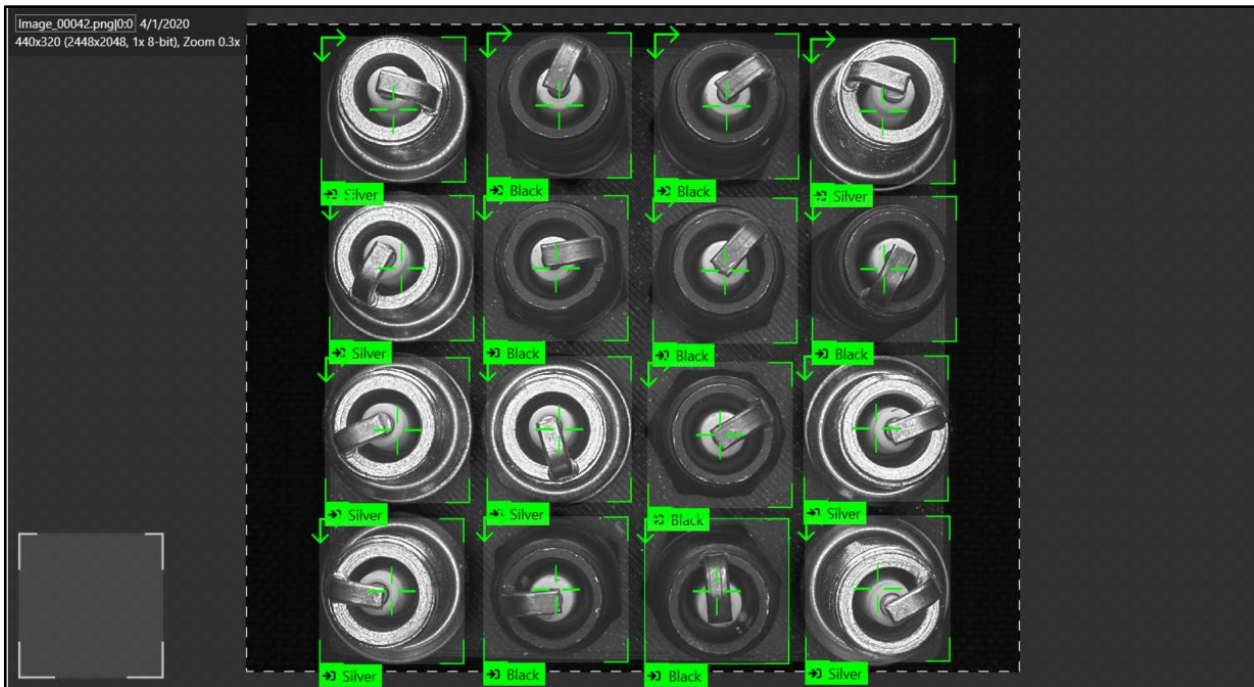


- Open the **Tool Parameters** and set the following:
 - Feature Size* = 460
 - Detail* = 4
 - Epoch Count* = 150
 - Rotation* = -180, 180
 - Luminance* = 5%
 - Contrast* = 5%
 - Sampling Density* = 3

- Click on the image and center the green **Feature Size** box over the first sparkplug, as shown below.



- Click the **0** to open the text box. Label this sparkplug *Silver* and press the **<Enter>** key.
- Label the remaining sparkplugs in the image.



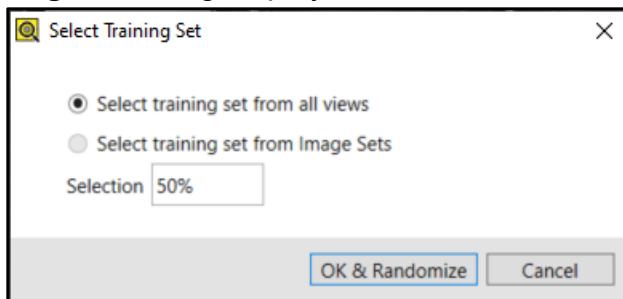
- Label at least 75 of each sparkplug. Open the Database Overview to confirm the number of each sparkplug labeled.

Feature	Found	Train	Labeled	Recall	Precision	F-Score
Black		0	81			
Silver		0	75			
	0	0	156	0.0		
∅ (2 classes)				0.0		

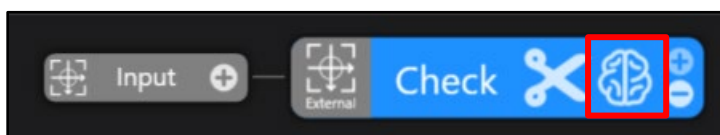
- Select the **Training Set** by clicking the Training Set parameter.



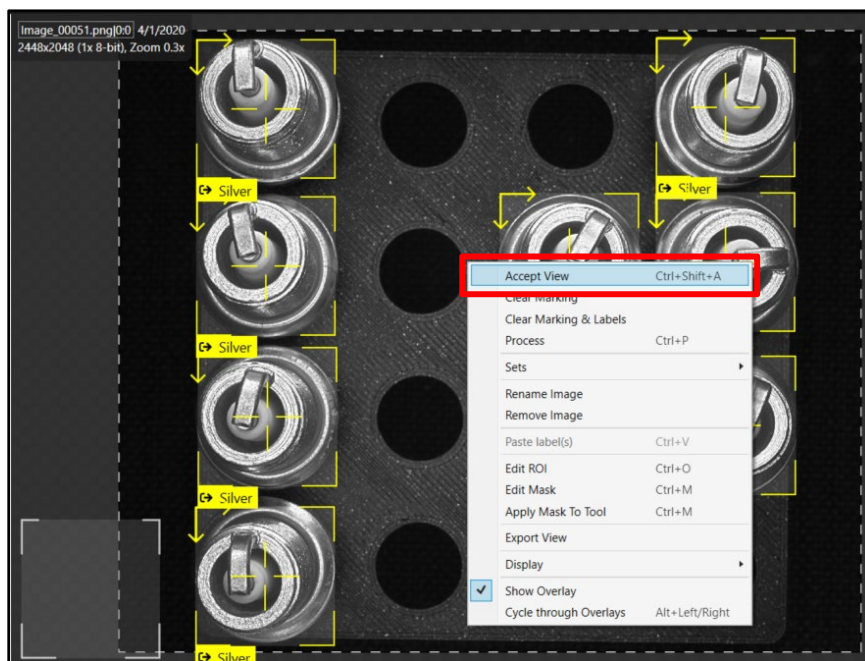
The **Select Training Set** dialog displays.



20. **Select training set from all views** and click the **OK & Randomize** button.
21. Click the **Train** button to train.

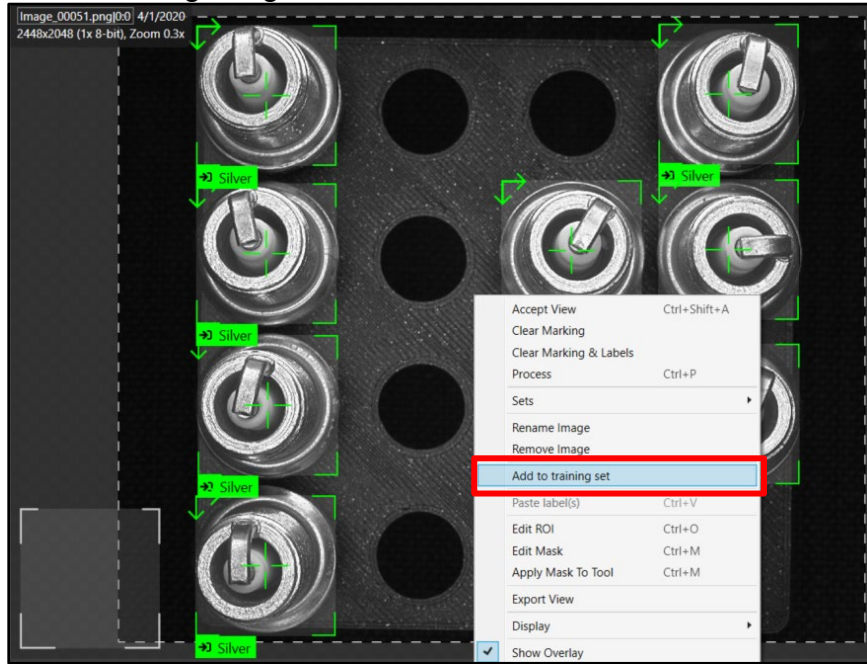


22. Once the training is complete scroll through your images to view the results. Notice on the images in addition to the green labels there are also yellow markings recognizing the different sparkplugs.
23. Confirm that all sparkplugs are marked correctly and label any sparkplugs that are not marked. Right-click and **Accept View** for the views that are marked in yellow and are correct.

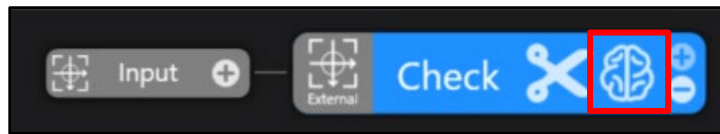


- The marking will change from yellow to green, right-click and select **Add to training set**.

Review the remaining images.



- Click the **Train** button to train.

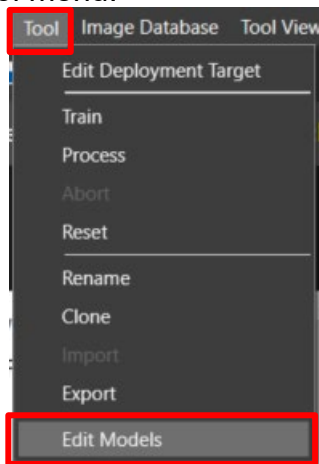


- Review your results.

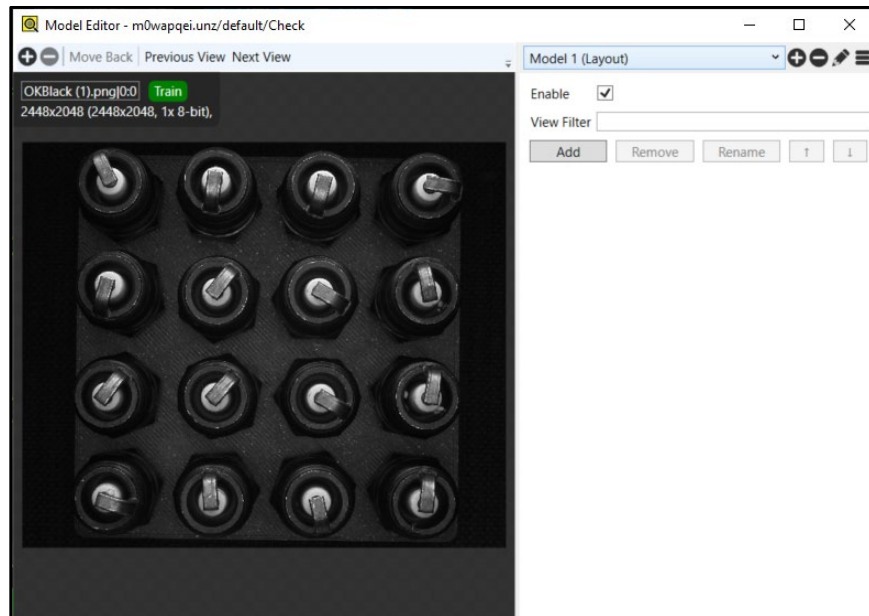
Feature	Found	Train	Labeled	Recall	Precision	F-Score
Black	205	115	205	100.0	100.0	100.0
Silver	221	113	221	100.0	100.0	100.0
	426	228	426	100.0	100.0	100.0
Ø (2 classes)				100.0	100.0	100.0
Model	Found	Train	Labeled	Recall	Precision	F-Score
Model 1 (La	0	0	0			



Build the Layout Model for the Sparkplugs

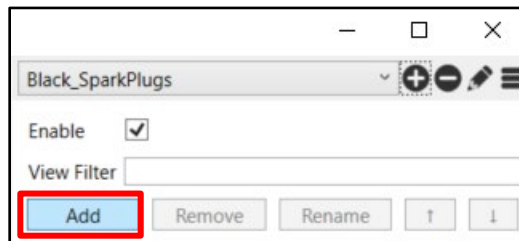
1. Find a sparkplug assortment that has a black sparkplug in each spot and then select **Edit Models** from the Tool menu.



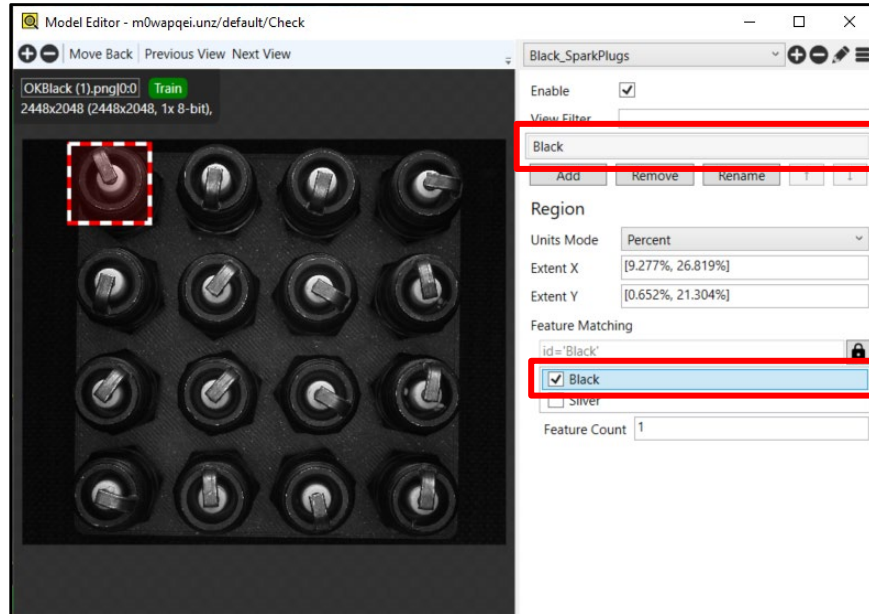
The **Model Editor** displays.



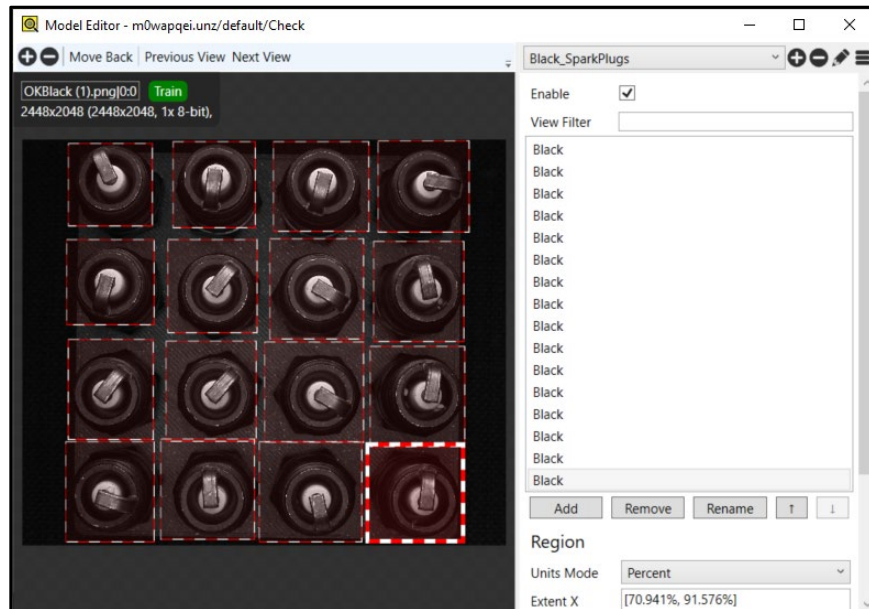
2. Click the **pencil**  icon to rename the model *Black_SparkPlugs* and press the **<Enter>** key.
3. Click the **Add**  button.



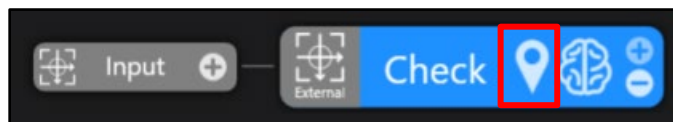
4. Move the ROI to outline the first sparkplug. Rename the Region to *Black* and check the *Black* checkbox.



5. Repeat for the remaining sparkplugs in the assortment.




6. Close the Model Editor and process the model.



7. Review the Results.

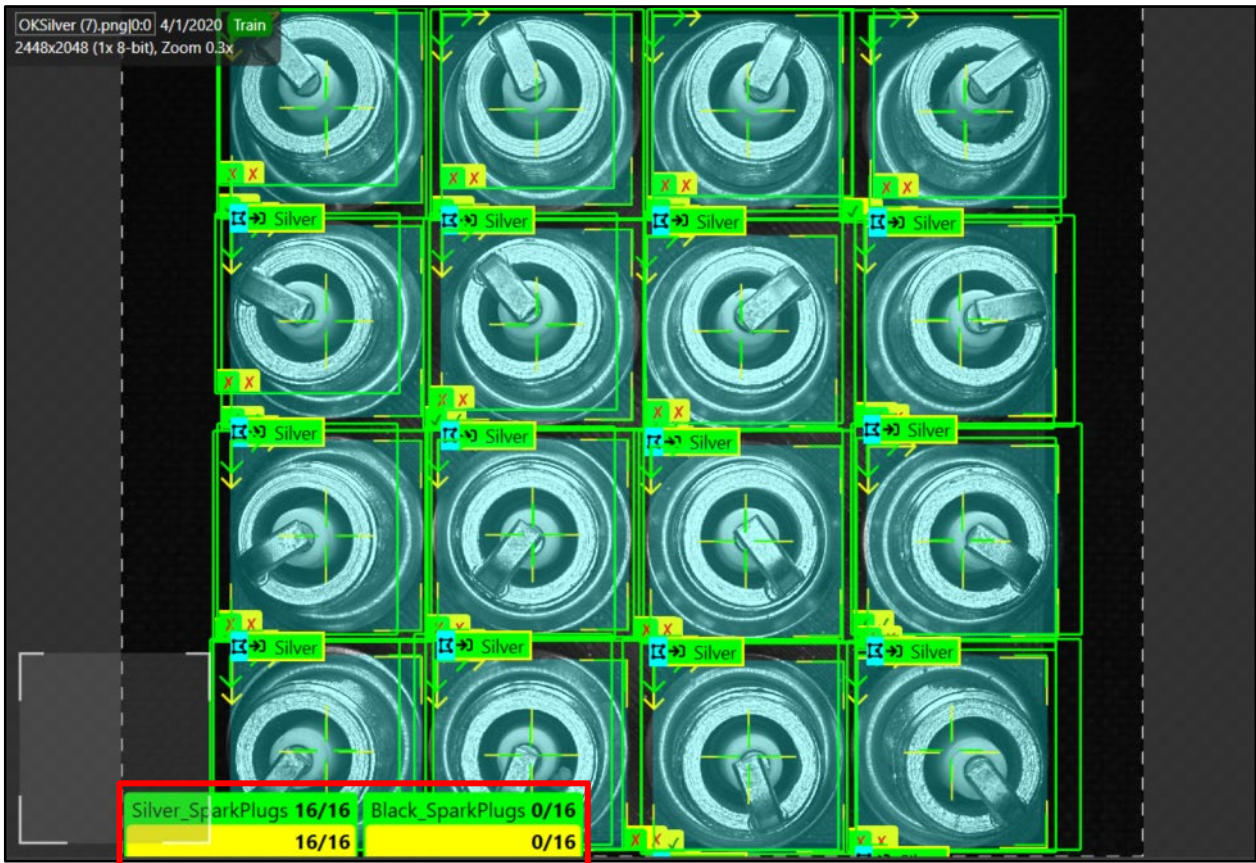
When there are black sparkplugs in every spot the results will display **16/16**.



- Click the **Save As**  button to save the job as **ViDiCheck_SparkPlugs** in the folder created in lab #1.

If Time Allows:

1. Create a Layout Model named *Silver_SparkPlugs* for the sparkplug assortment that has a silver sparkplug in each spot.



2. Click the **Save All**  button to save the job.

Lab Exercise 6.1 – ViDiRead Tool

At the end of this lab exercise, Participants will be able to:

- Utilize the ViDiRead tool to solve their OCR application


The Participant will utilize the following In-Sight Vision Suite tool to successfully complete this exercise:

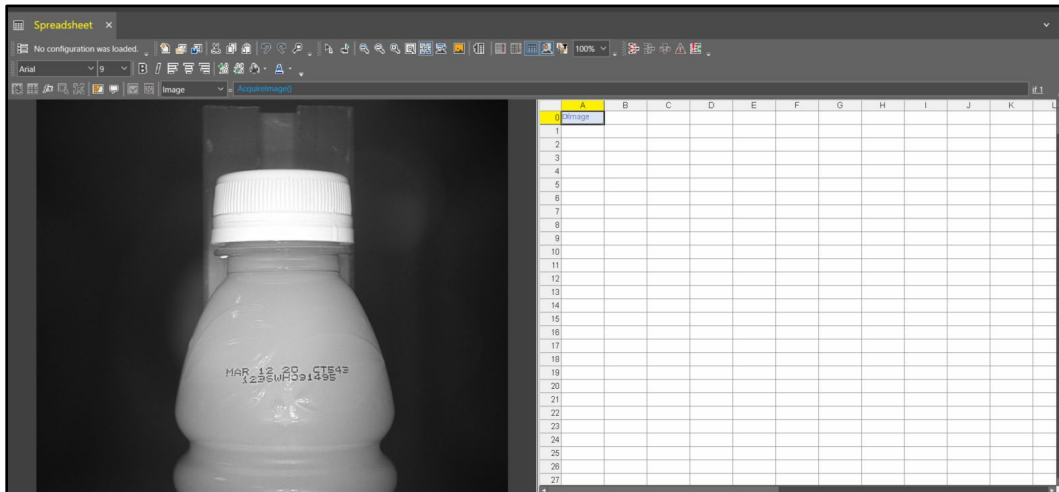
- ViDiRead Tool

Date Code OCR

NOTE: Your emulator should be configured to emulate the **In-Sight D905M** camera to complete this lab exercise.

Point to **ViDiRead_DateCodeOCR Runtime** image folder. You will be prompted to **Restart your Emulator**.

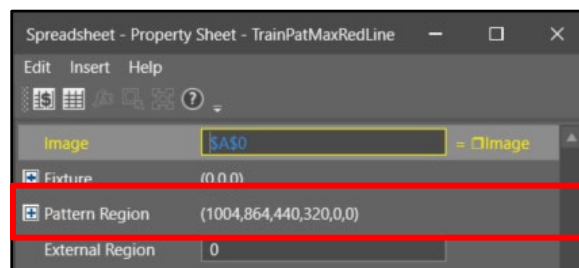
1. The Spreadsheet displays with the first image behind the spreadsheet. Click the **Change Split**  button to bring the image next to the spreadsheet.



2. Enter a **TrainPatMaxRedLine** tool in cell **B3**.


NOTE: The **TrainPatMaxRedLine** tool is found in the **Toolbox** under **Vision Tools** → **Pattern Match**.

The **TrainPatMaxRedLine Property Sheet** displays.



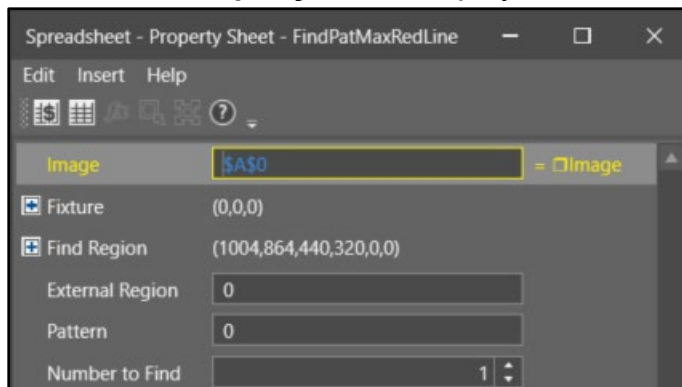
- Double-click the **Pattern Region** parameter and position the region around the bottle cap as shown below and press the **<Enter>** key.





- Click the **OK**  button to close the TrainPatMaxRedLine Property Sheet. The **Pattern** is found.

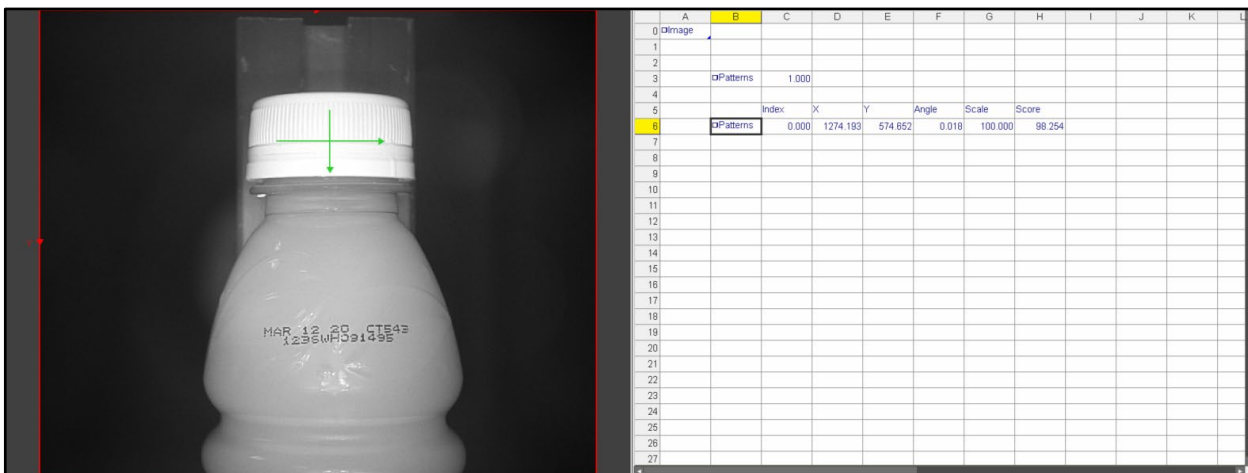
	A	B	C	D	E	F	G	H	I	J	K	L
0	Image											
1												
2												
3		Patterns	1,000									
4												

- Enter a **FindPatMaxRedLine** tool in cell **B6**.
NOTE: The FindPatMaxRedLine tool is found in the Toolbox under Vision Tools → Pattern Match.
 The **FindPatMaxRedLine** Property Sheet displays.




- Double-click the **Find Region** parameter and click the **Maximize Cell Region**  button to utilize the entire Region of Interest and press the **<Enter>** key.
- Double-click the **Pattern** parameter and reference the TrainPatMaxRedLine pattern in cell **B3**.
- Click the **OK**  button to close the FindPatMaxRedLine Property Sheet.

The FindPatMaxRedLine Pattern is found.



9. Enter a **Fixture** tool in cell **B9**.

NOTE: Type *Fixture* (in the cell and the tool will display).

10. Open the Fixture parameter, click the **Insert Relative Reference**  button and reference cells **D6**, **E6** and **F6**, press the **<Enter>** key.

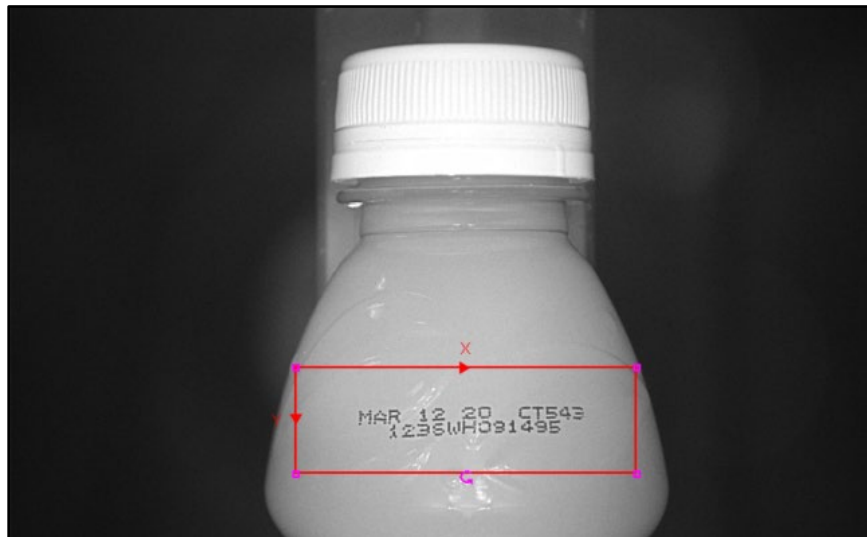
4								
5		Index	X	Y	Angle	Scale	Score	
6		oPatterns	0.000	1274.193	574.652	0.018	100.000	98.254
7								
8		X	Y	Angle				
9		oFixture	0.000	0.000	0.000			
10								

11. Click the **OK**  button to close the Fixture tool. Notice the red crosshairs on the bottle cap.

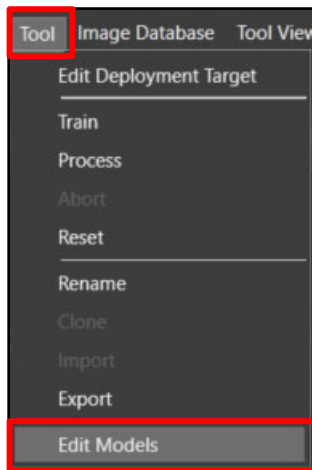


12. Enter a **ViDiRead** tool in cell **B12**.
13. Double-click the **External Fixture** parameter and reference the Fixture tool in cell **B9**.

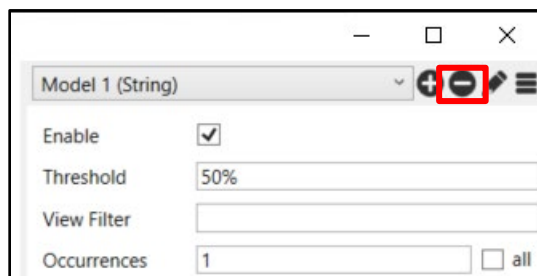
- Double-click the **Region** parameter and position it as shown below and press the **<Enter>** key.



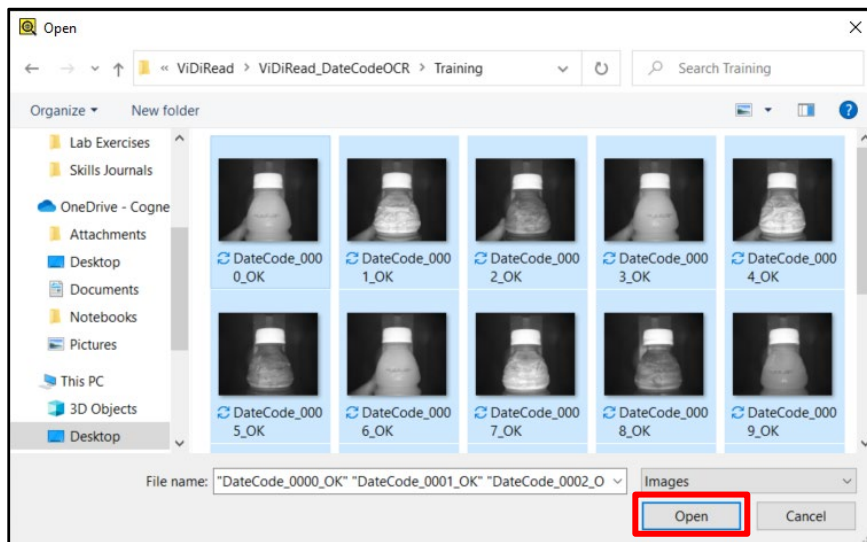
- Click the **Open ViDi Editor**  button. The **ViDiRead Workspace** opens.
- From the toolbar select **Tool** → **Edit Models**.



- The **Model Editor** dialog displays. Click the Minus  button to remove the current model.



18. Click the **OK** OK button to remove model from the tool and close the Model Editor dialog.
19. Click **Add** to bring the images into the workspace.
20. Navigate to the **ViDiRead_DateCodeOCR Training** folder.
21. Select the first image and press **<Ctrl + A>**, this will automatically select all of the images. Click the **Open** button.



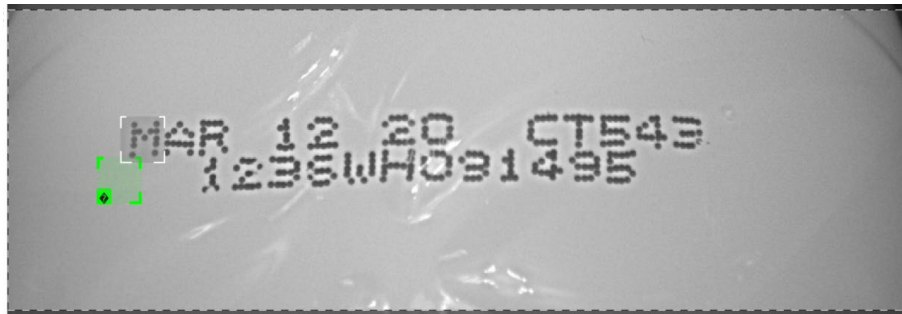
The images display.

Notice that the ViDiRead tool has identified some of the characters and marked them in yellow.

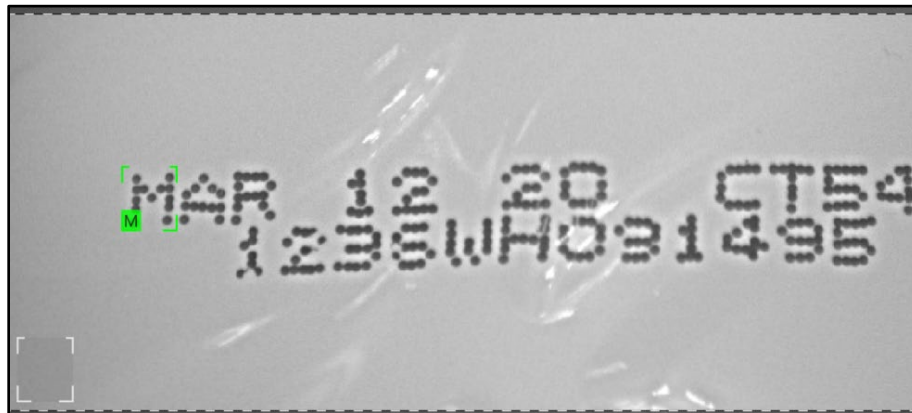


22. In the **Tool Parameters** set the following:
 - *Epoch Count* = 100
23. Move the **Feature Size** box over the first character. Drag the red circle to the desired size (approximately the same size as the character).
24. Click on the image outside of your feature size box.

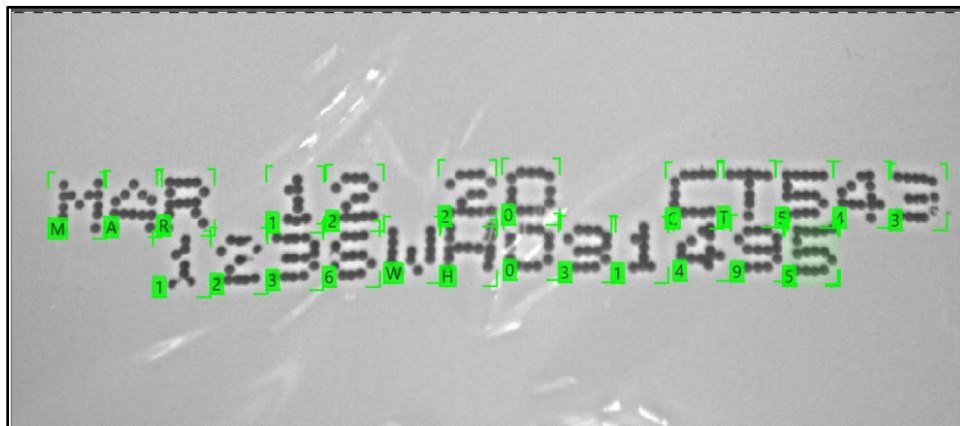
A green rectangle the same size as your feature size box displays.




25. Move the box to the first letter, click the ? to open the text box. Label this character **M** and press the **<Enter>** key.

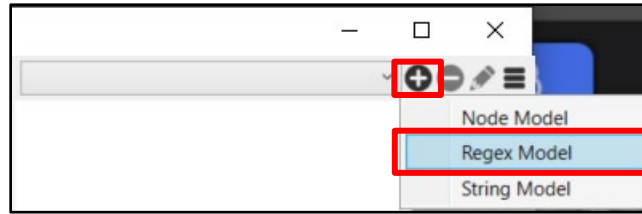


26. Scroll out to confirm that all characters are visible and add the labels to the remaining characters.



27. Repeat for more bottles.
28. From the toolbar select **Tool** → **Edit Models**.

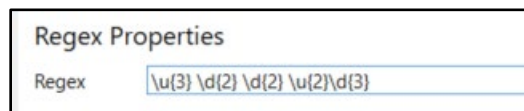
29. The **Model Editor** dialog displays. Click the **Plus**  button to add a **Regex Model**.




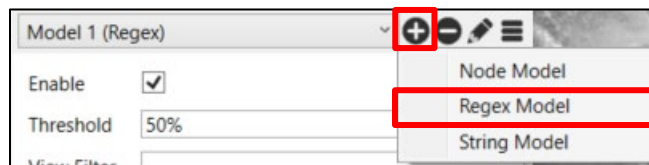
NOTE: *There are two lines on each bottle, so we will enter 2 Regex Models.*

30. Line 1 is the date code, enter `\u{3} \d{2} \d{2} \u{2}\d{3}` in the Regex Properties **Regex** field and uncheck the Angle checkbox.

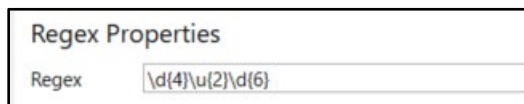
NOTE: *\u = upper case letter and \d = digit.*



31. Click the **Plus**  sign to enter a new **Regex Model**.

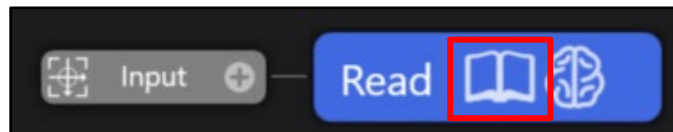


32. Enter `\d{4}\u{2}\d{6}` in the Regex Properties **Regex** field and uncheck the Angle checkbox.

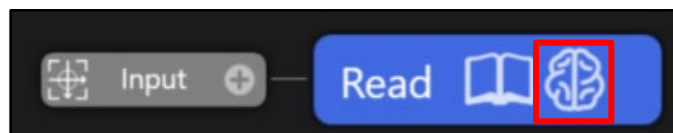


33. Click the **X** in the upper-right hand corner to close the Model Editor dialog.


34. Click the **Book** to process the models.

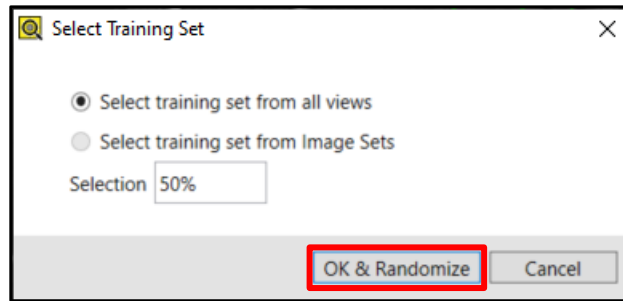



35. Confirm the models are found and click the **Train** (brain) button.



36. Click the **Yes**  button to select your training set.

37. Click the **OK & Randomize**  button to select the training set.

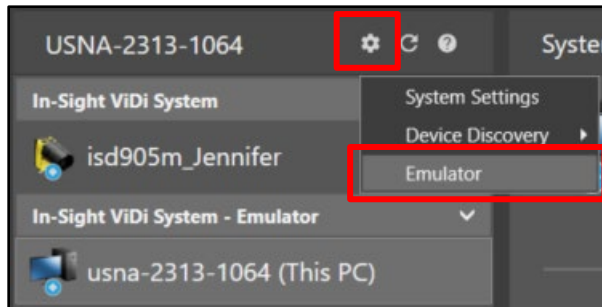


38. Once the training is complete scroll through the images to view your results.
39. Adjust the parameters for better results, do not focus on getting 100% accuracy. While it is possible to achieve these results, we are not able to devote enough time during our class.
40. Click the **Save As**  button to save the job as **ViDiRead_DateCodeOCR** in the folder created in lab #1.

Spice Bottles OCR

Follow the steps below to complete the lab exercise:

1. Highlight your Emulator, click the **System Settings** gear and select **Emulator**.

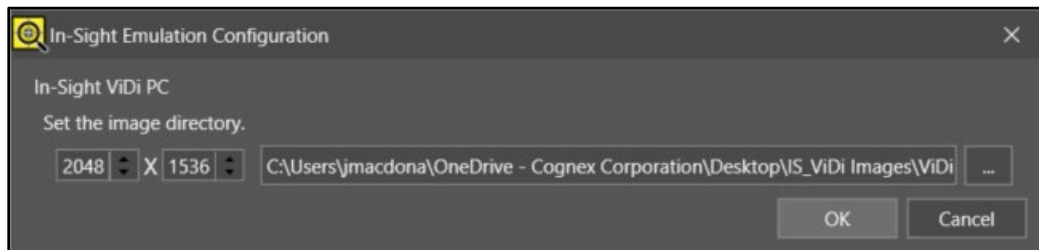


The Emulator Configuration dialog displays.

2. Select **In-Sight ViDi PC** from the drop-down box and click the **Configure** button.



The **In-Sight Emulation Configuration** dialog displays.



3. Point to the **ViDiRead_SpiceBottlesOCR Runtime** folder and click the **OK** button.

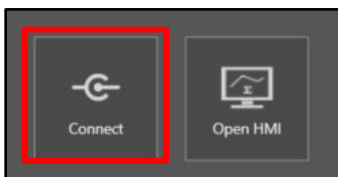



4. Click the **Start** button to start the emulator.

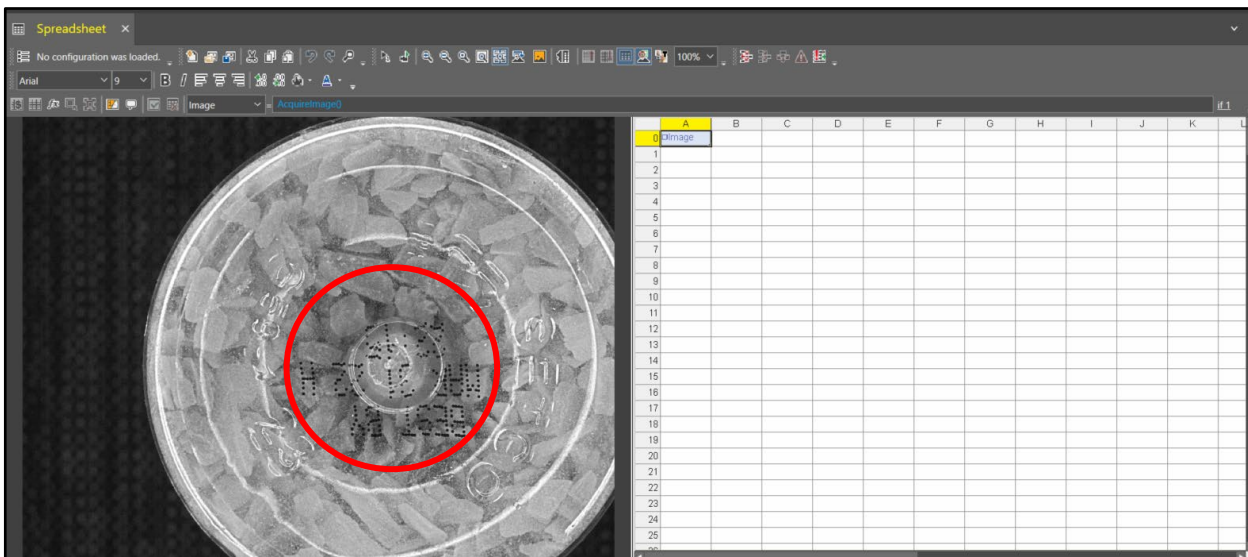


NOTE: If the emulator is already running the *In-Sight ViDi PC* the start button will have a *Stop* button in its place. Click the *X* in the upper-right hand corner to close the *Emulator Configuration* dialog.

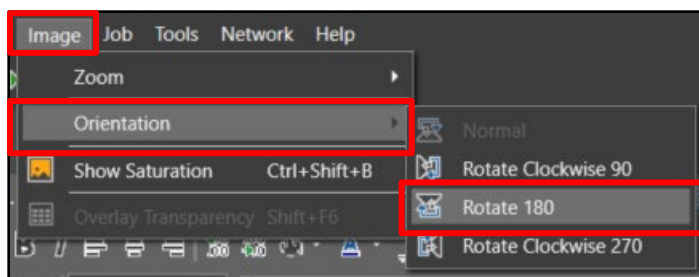
5. Click the **Connect** button to enter the Spreadsheet environment.



- The Spreadsheet displays with the first image behind the spreadsheet. Click the **Change Split**  button to bring the image next to the spreadsheet.




- Notice that the date stamp is upside down on the spice bottle cap. From the toolbar select **Image** → **Orientation** → **Rotate 180**.



The image rotates 180°.

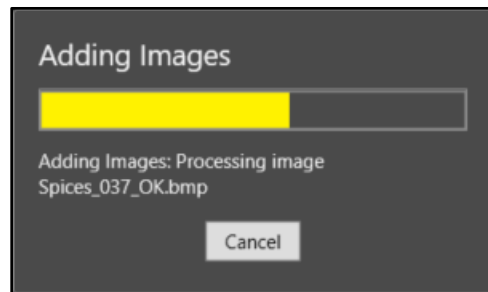
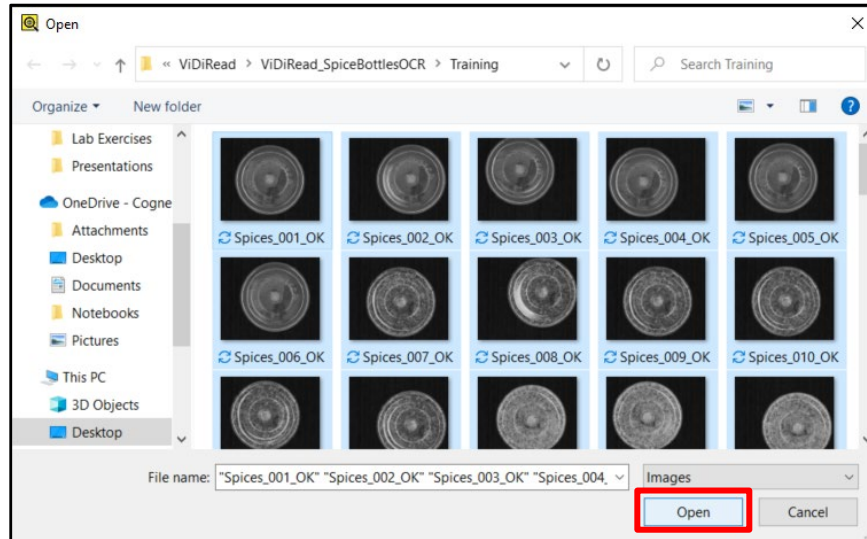


- Add a **ViDiRead** tool to cell **B3**.
- Maximize the region and click the **Open ViDi Editor**  button. The **ViDiRead Workspace** opens.

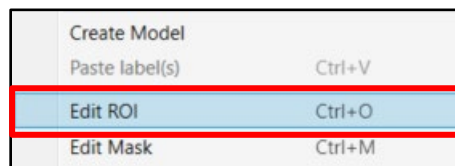
- Click **Add** to bring the images into the workspace.



- Navigate to the **ViDiRead_SpiceBottlesOCR Training** folder.
- Select the first image and press **<Ctrl + A>**, this will automatically select all of the images. Click the **Open** button.



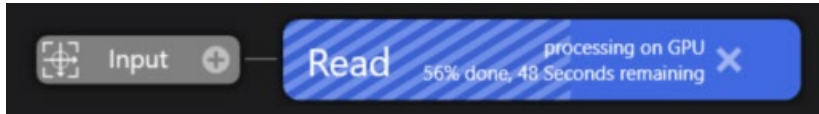
- Scroll out so that the complete image is in the view.
- Right-click and select **Edit ROI** from the list.



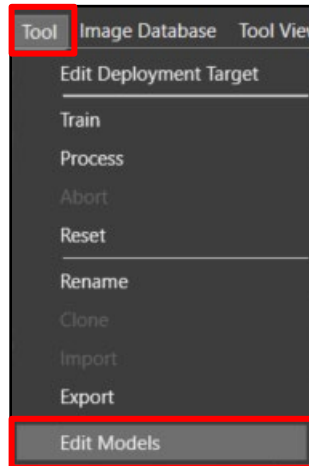
15. Change the ROI to **Internal** and set the following parameters:
 - *Offset* = -100%, -100%
 - *Size* = 100%x100%
 - *Rotation* = 180%
 Click **Apply** and **Close**.




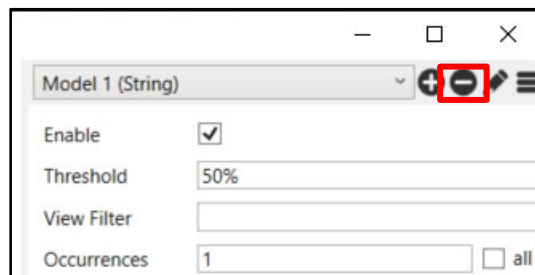
The ViDiRead tool will process on the GPU.



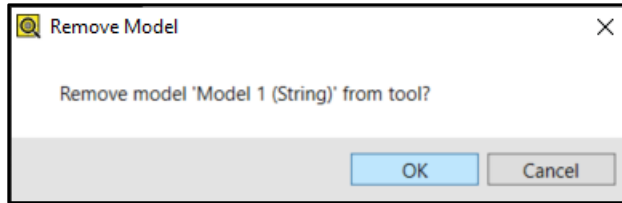
16. In the **Tool Parameters** set the following:
 - *Feature Size* = 70x130
 - *Angle Range* = -45,45
17. From the toolbar select **Tool** → **Edit Models**.



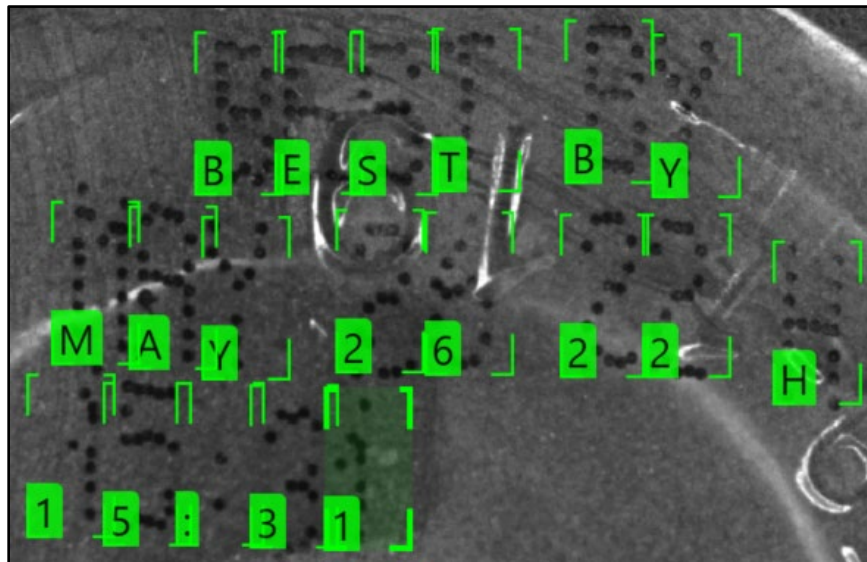
18. The **Model Editor** dialog displays. Click the Minus  button to remove the current model.



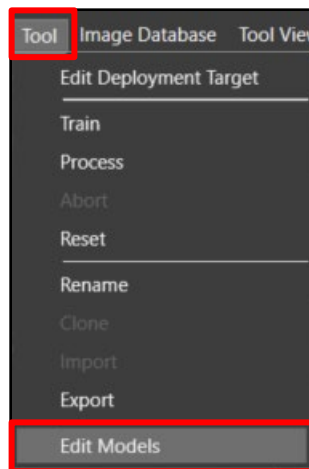
- Click the **OK**  button to remove model from the tool.




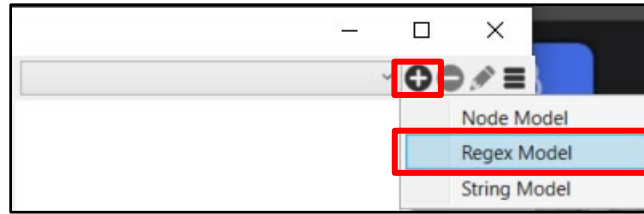
- Click on the first letter of the string to add the green Feature Size box, click the ? to open the text box. Label this letter **B** and press the **<Enter>** key.
- Click on the remaining characters to add the labels.



- Repeat for more bottle caps.
NOTE: *There should be a minimum of 5 of each character labeled. Open the Database Overview tab to see the count.*
- From the toolbar select **Tool → Edit Models**.




24. The **Model Editor** dialog displays. Click the **Plus**  button to add a **Regex Model**.

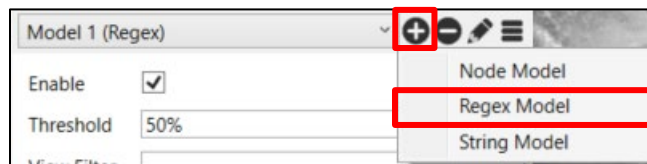


NOTE: *There are three lines on each bottle cap, so we will enter 3 Regex Models.*

25. Line 1 always has **BEST BY** so enter that into the Regex Properties **Regex** field.

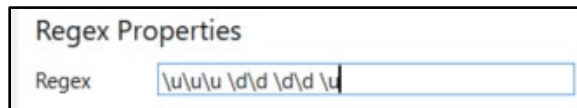



26. Click the **Plus**  sign to enter a new **Regex Model**.

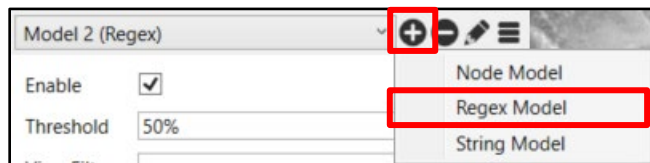


27. Line 2 is the date code. Enter `\u\u\u\u \d\d \d\d \u` in the Regex Properties **Regex** field.

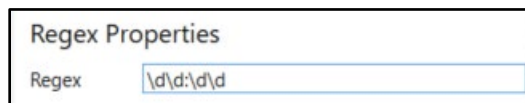
NOTE: *\u = upper case letter and \d = digit.*



28. Click the **Plus**  sign to enter a new **Regex Model**.

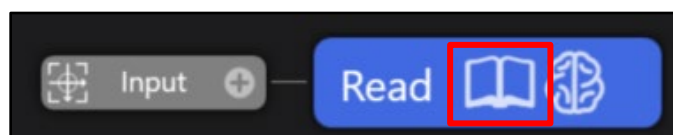


29. Line 3 is the time code. Enter `\d\d:\d\d` in the Regex Properties **Regex** field.



30. Click the **X** in the upper-right hand corner to close the Model Editor dialog.

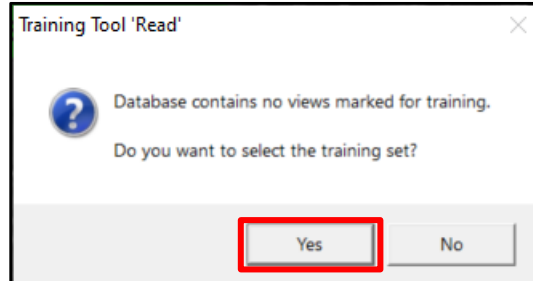
31. Click the **Book** to process the models.



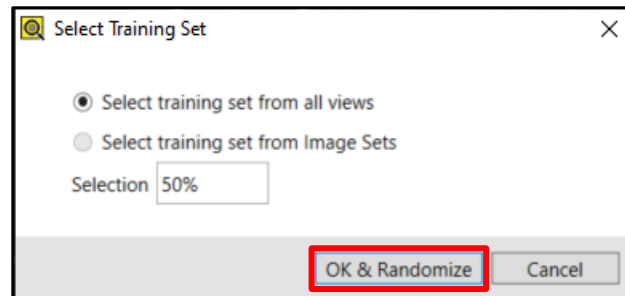
- Confirm the models are found and click the **Train** (brain) button.




- Click the **Yes** button to select your training set.



- Click the **OK & Randomize** button to select the training set.



- Once the training is complete scroll through the images to view your results.
- Adjust the parameters for better results, do not focus on getting 100% accuracy. While it is possible to achieve these results, we are not able to devote enough time during our class.

38. Click the **Save As**  button to save the job as **ViDiRead_SpiceBottles** in the folder created in lab #1.

Lab Exercise 7.1 – Inputs/Outputs & Network Functions

At the end of this lab exercise, Participants will be able to:

- Use the TCPClient to define a spreadsheet cell as a TCP/IP client, initiating the communication with another TCP/IP device for sharing data over the network

The Participant will utilize the following In-Sight Vision Suite tools to successfully complete this exercise:

- TCPClient
- Format String
- HyperTerminal

Follow the steps below to complete the lab exercise:

1. Open a new job and capture an image of the Cognex business card.
2. Enter a **TrainPatMaxRedLine** tool in cell **B3**, set the **Pattern Region** to find the Cognex Logo.

The **Pattern** is found.

2					
3	Patterns	1.000			
4					

3. Enter a **FindPatMaxRedLine** tool in cell **B6**, set the **FindRegion** to the entire Region of Interest, and set the **Pattern** to reference cell **B3**.

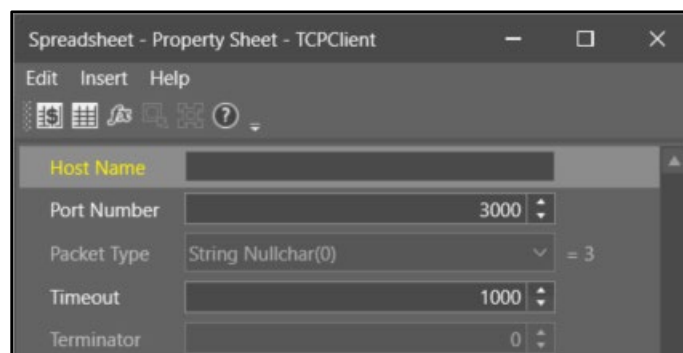
The **PatMaxRedLine** pattern is found.


2							
3	Patterns	1.000					
4							
5		Index	X	Y	Angle	Scale	Score
6	Patterns	0.000	1489.792	304.706	0.009	100.000	97.776
7							

4. Enter a **TCPClient** function in cell **B9**.

NOTE: The *TCPClient* function is found in the *Toolbox* under *Input/Output* → *Network* → *TCPClient*.

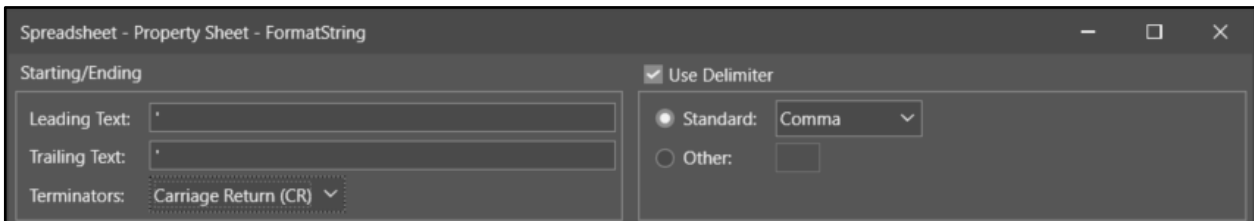
The **TCPClient Property Sheet** displays.



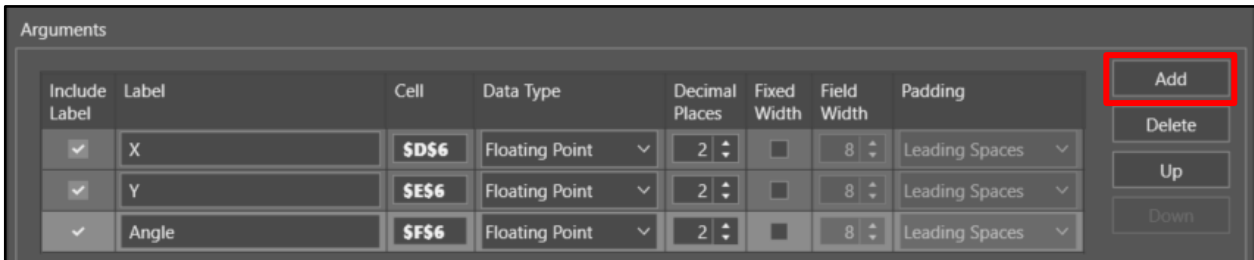
- Enter your computer's *IP Address* in the **Host Name** field and **3000** in the **Port Number** field.
- Click the **OK**  button.
The **TCPClient** information is entered into the spreadsheet.


	Device	Write	Test string	

- Enter a **FormatString** function in cell **B12**.
The FormatString Property Sheet displays.
- Enter the following information in Starting/Ending section of the Property Sheet:
 - Leading Text = ' (single quote)
 - Trailing Text = ' (single quote)
 - Terminators = Carriage Return (CR)
 - Use Delimiter = check the checkbox

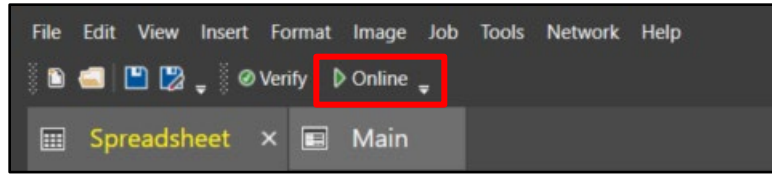


- Click the **Add** button to enter the following information in the Arguments section of the Property Sheet:
 - Line 1 = Check the **Include Label** checkbox, enter **X (space)** in the Label field, reference the X parameter in the FindPatMaxRedLine tool, 2 decimal places
 - Line 2 = Check the **Include Label** checkbox, enter **Y (space)** in Label field, reference the Y parameter in the FindPatMaxRedLine tool, 2 decimal places
 - Line 3 = Check the **Include Label** checkbox, enter **Angle (space)** in the Label field, reference the *Angle* parameter in the FindPatMaxRedLine tool, 2 decimal places



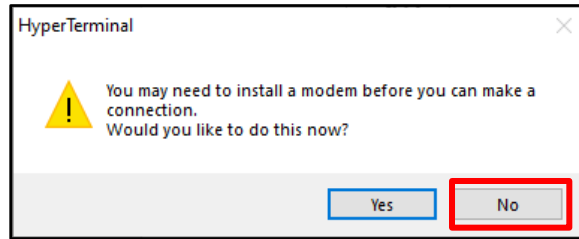
- Click the **OK**  button.
- Open the *WriteDevice* function in cell **C9**, change the formula to reference the FormatString function in cell **B12** (`WriteDevice(A0,B9,B12)`).

- 12. Click the **Online** button to Online.

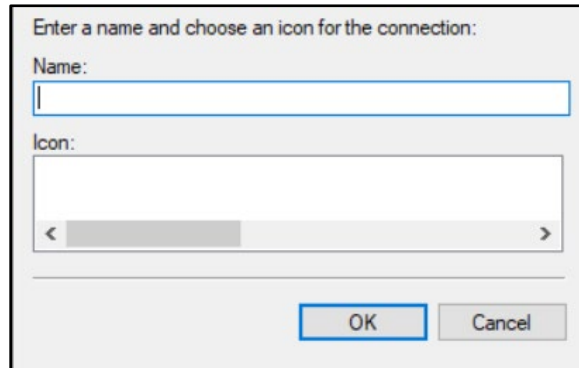


Setting up HyperTerminal

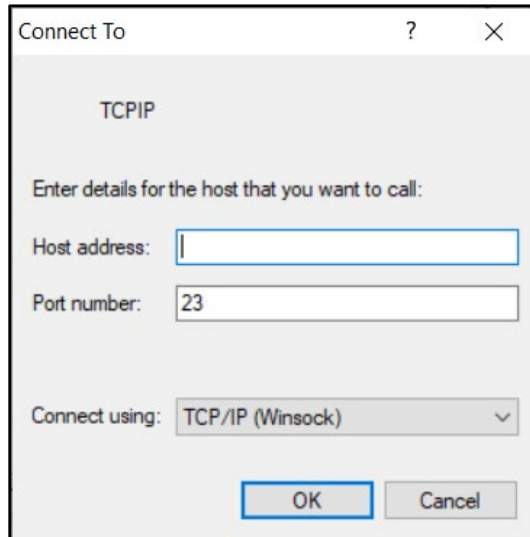
- 13. Start HyperTerminal.
- 14. The HyperTerminal warning displays. Click the **No** button to continue.



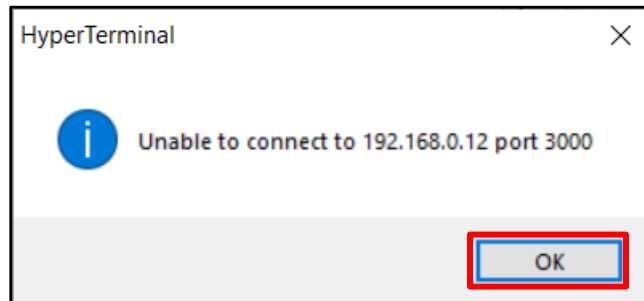
The **Connection Description** dialog displays.



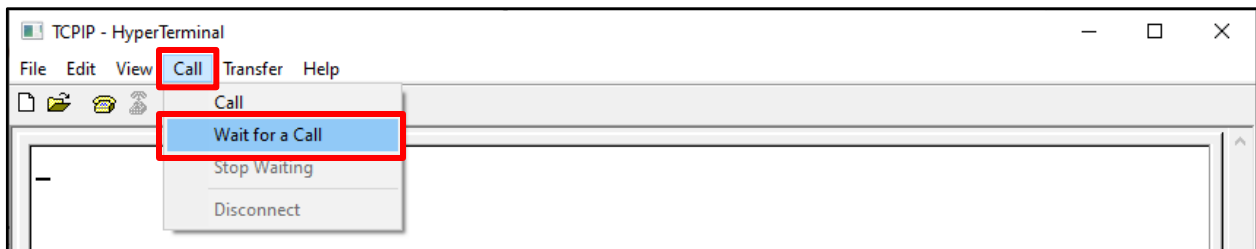
- 15. Name the new Connection **TCPIP** and click the **OK** button.
The **Connect To** dialog displays.



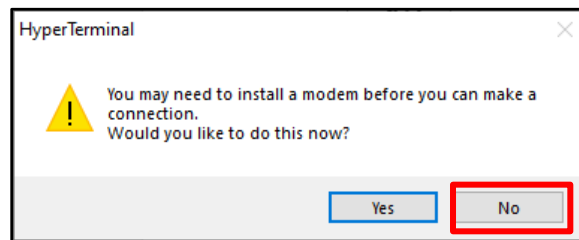
16. Enter the *IP Address* of your camera in the **Host address** field and enter *3000* in the **Port number** field.
NOTE: *The port number must be the same as the port number that was entered in the TCPClient function.*
17. *Connect using: TCP/IP (Winsock)* and click the **OK** button.
18. Click the **OK** button to continue.
19. The **HyperTerminal warning dialog** displays. Click the **OK** button to continue.



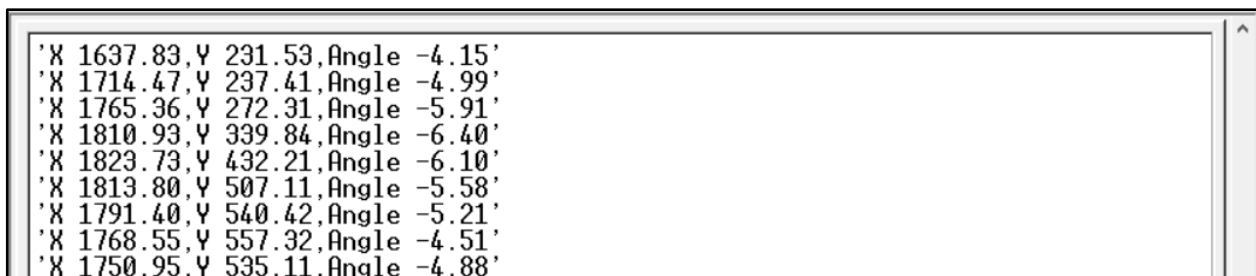
20. From the Call menu in the Toolbar select **Wait for a Call**.



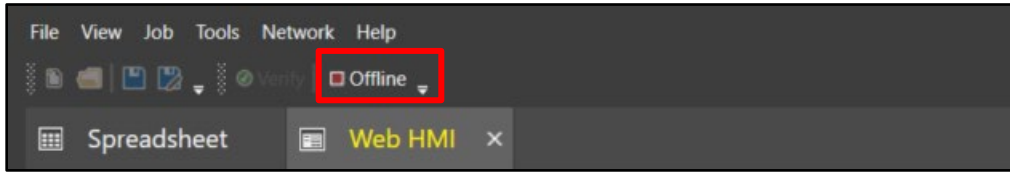
21. The **HyperTerminal warning dialog** displays. Click the **No** button to continue.



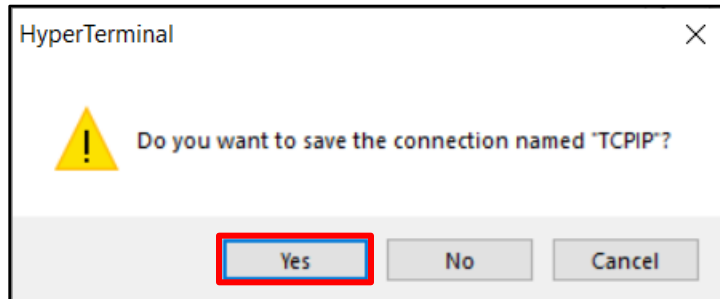
The results display in HyperTerminal.



- 22. Move the business card in the FOV, review your results and click the **Offline** button to go Offline.



- 23. Save your job as **TCPClient** in the In-Sight Vision Suite folder created in Lab #1.
- 24. Close HyperTerminal and click the **Yes** button save the TCPIP connection



Lab Exercise 8.1 – Operator Interface (HMI)

At the end of this lab exercise, Participants will be able to:

- Create a custom interface accessible from other devices, including status indicators, inspection results and interactive controls to view and affect the vision application

The Participant will utilize the following In-Sight Vision Suite tool to successfully complete this exercise:

- Tags
- WebPages
- User Inputs

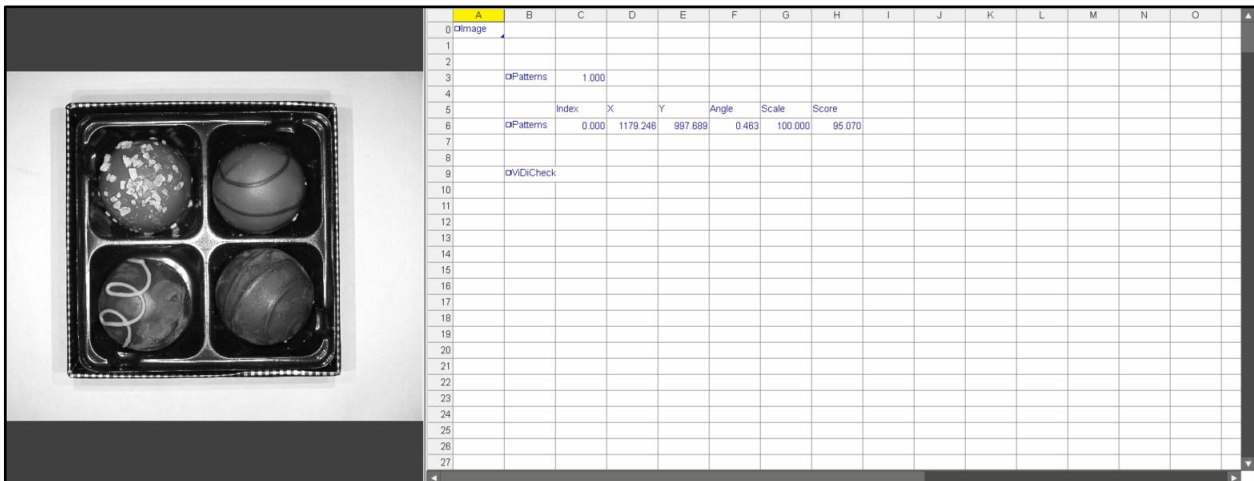
Follow the steps below to complete the lab exercise:

ViDiCheck_Chocolates HMI

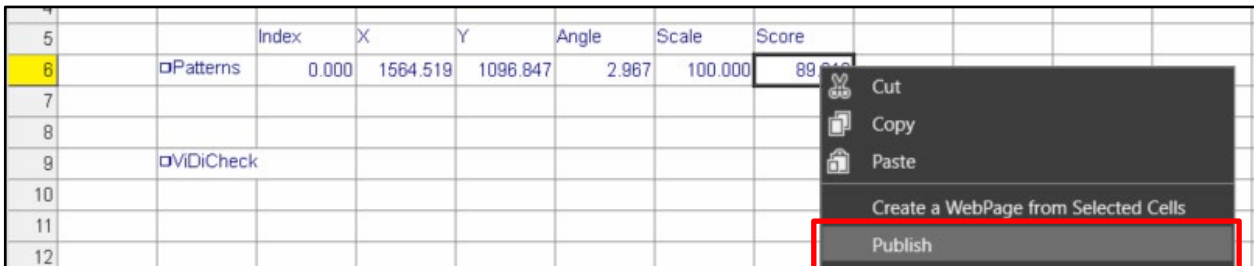
NOTE: *In order for the chocolate images to display in the HMI your emulator should be configured to emulate the In-Sight D905M camera and directed to the ViDiCheck_Chocolates Runtime folder.*

1. Open the **ViDiCheck_Chocolates** job from lab exercise #5.

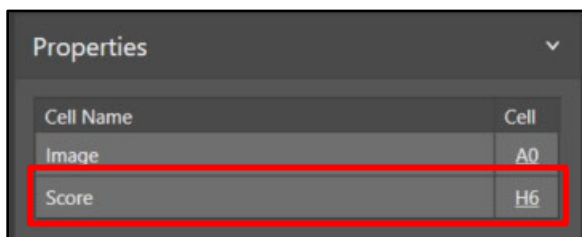
The **ViDiCheck_Chocolates** job displays.



2. Highlight cell **H6** (the PatMax RedLine score), right-click and select **Publish** from the fly-out list.

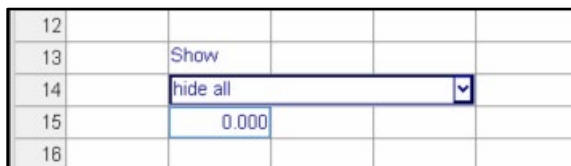


A new Tag named **Score** displays in the *Properties* panel.

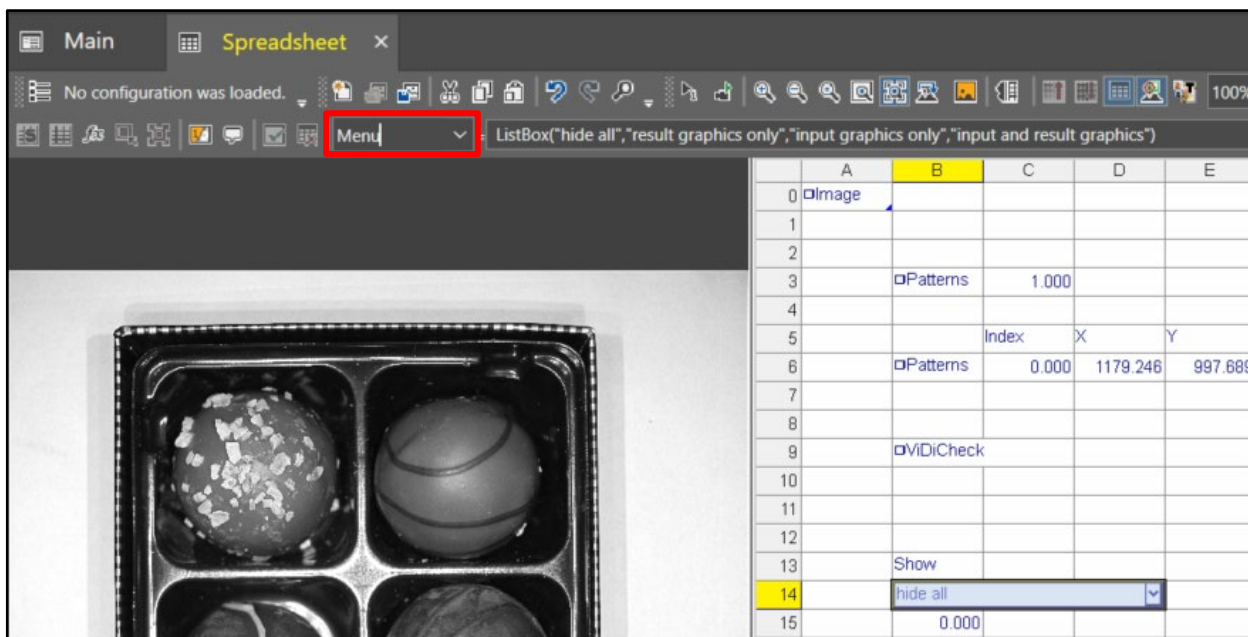


- Open the **ViDiCheck** tool and drag the **Show** parameter into cell **B13**. Close the ViDiCheck tool.

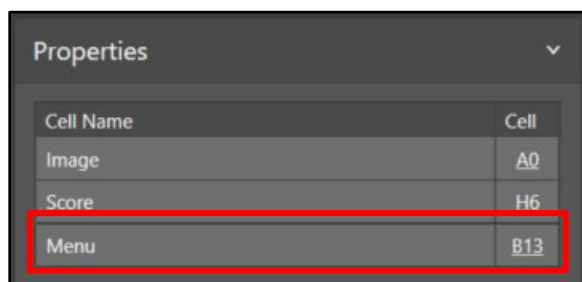
The **Show** parameter displays.



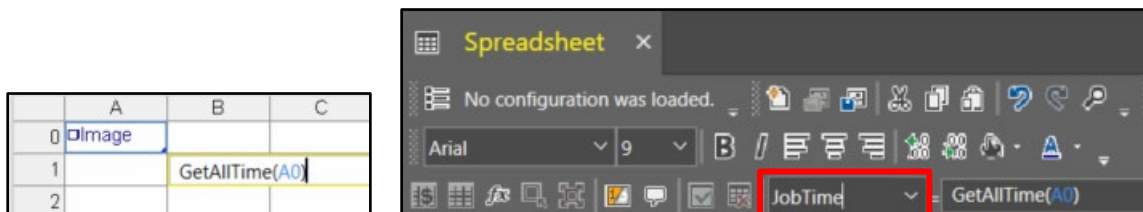
- Highlight cell **B14** and type *Menu* in the textbox of the Edit Toolbar.



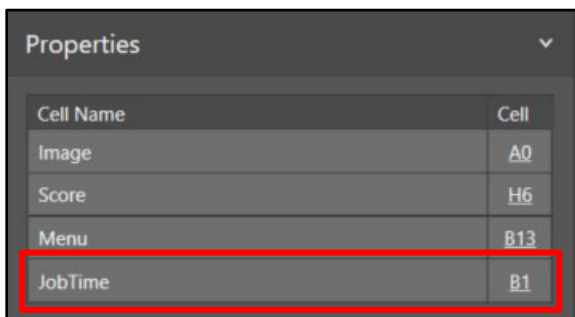
A new Tag named **Menu** displays in the *Properties* panel.



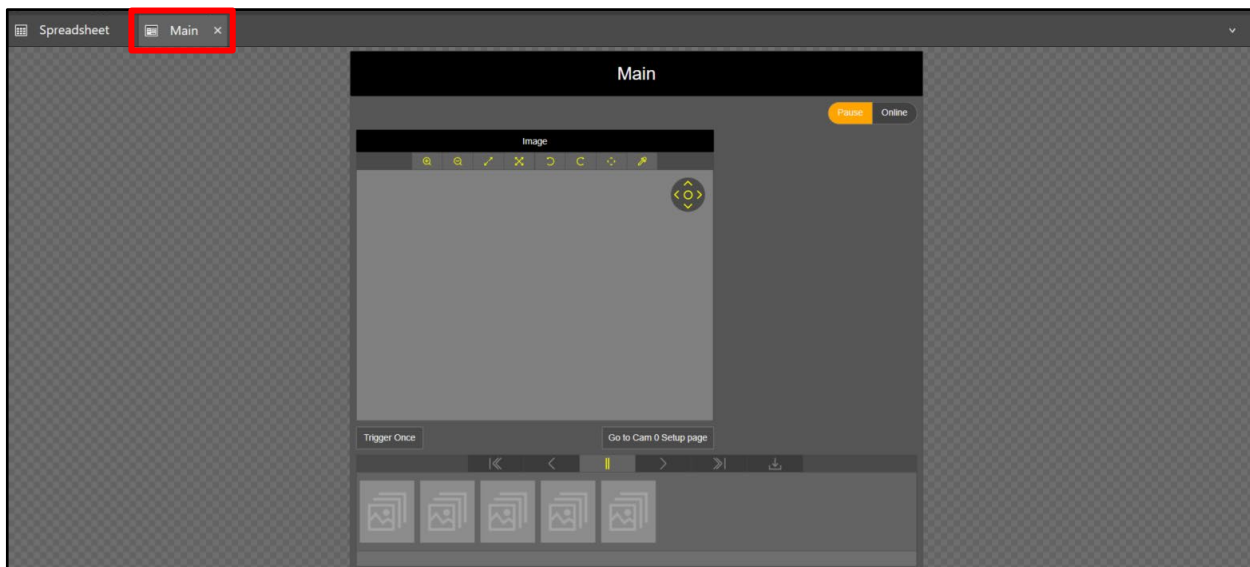
5. Add a **GetAllTime** function in cell B1 and reference cell **A0** type *JobTime* in the textbox of the Edit Toolbar.



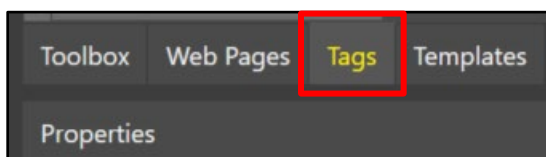
A new Tag named **JobTime** displays in the *Properties* panel.



6. Double-click the **Main** WebPage in the Address panel to open.
The **Main** WebPage opens in a new tab.

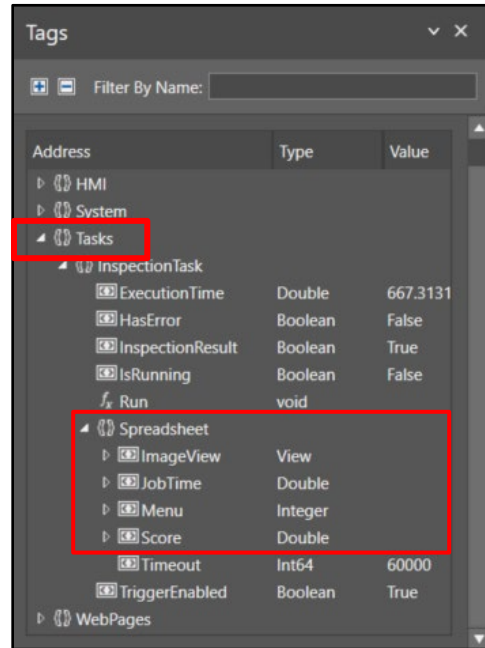


7. Open the Tags menu by clicking the **Tags** tab.

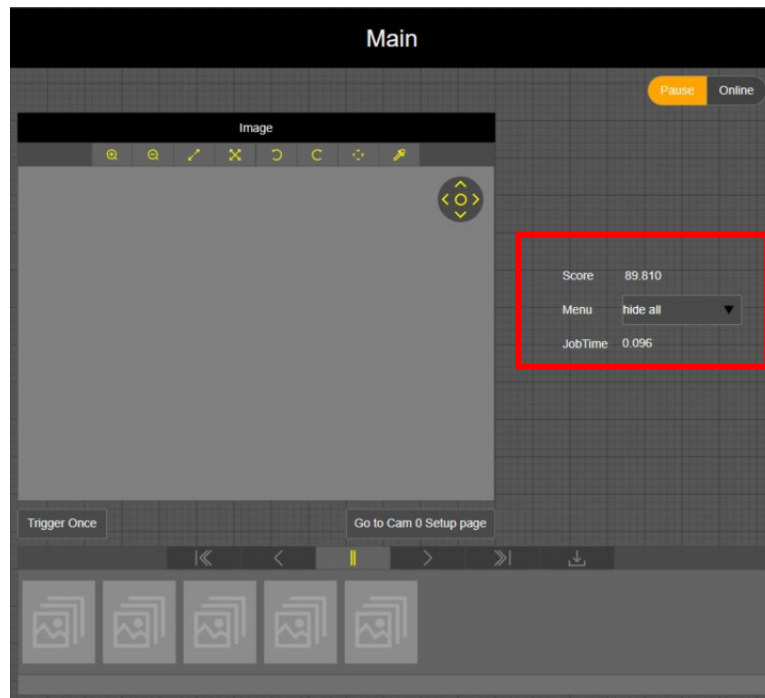


8. Drag the three new tags onto the Main WebPage.

NOTE: The new tags are found under the **Tasks** → **Spreadsheet** section of the Tags menu.



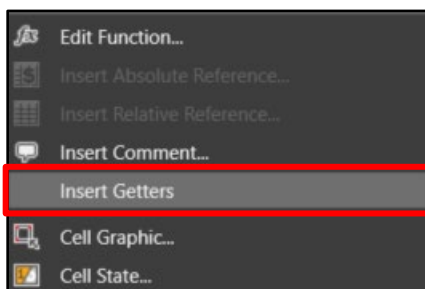
NOTE: Use the grid lines to line up the new tags on the web page.



9. Navigate to the **Spreadsheet** tab.



- Right-click on the ViDiCheck tool and select **Insert Getters** from the fly-out list.



The Getters for the ViDiCheck tool display.

NOTE: You may need to click the Trigger Once button for all getters to display.

	Check	View	Index	Match Index	Match	Check Regi	Check Region	Check Region Name	Expected	Actual	Passed	Chocolate_1	
9	ViDiCheck	ViDiCheck	ViDiCheck	0.000	0.000	ViDiMatch	0.000	ViDiCheckRegion	Chocolate_2	1.000	0.000	0.000	0.000
10							1.000	ViDiCheckRegion	Chocolate_1	1.000	0.000	0.000	0.000
11							2.000	ViDiCheckRegion	Chocolate_3	1.000	0.000	0.000	0.000
12							3.000	ViDiCheckRegion	Chocolate_0	1.000	0.000	0.000	0.000
13	Show												
14	hide all												
15	0.000												

NOTE: The information in the cells to the right of the Passed parameter is not going to be used and can be deleted.

- Right-click on cell **M9** (the ViDiCheck Passed parameter) and select **Publish** from the fly-out menu.

	Check	View	Index	Match Index	Match	Check Regi	Check Region	Check Region Name	Expected	Actual	Passed	Chocolate_1
9	ViDiCheck	ViDiCheck	ViDiCheck	0.000	0.000	ViDiMatch	0.000	ViDiCheckRegion	Chocolate_2	1.000	0.000	0.000
10							1.000	ViDiCheckRegion	Chocolate_1	1.000	0.000	0.000
11							2.000	ViDiCheckRegion	Chocolate_3	1.000	0.000	0.000
12							3.000	ViDiCheckRegion	Chocolate_0	1.000	0.000	0.000
13	Show											
14	hide all											
15	0.000											

A new Tag named **Passed** displays in the *Properties* panel.

- Rename the tag to *Result_Chocolate_X*.

NOTE: Review the Check Region Name parameter to select the correct chocolate #.

Cell Name	Cell
Image	A0
Score	H6
Menu	B14
JobTime	B1
Results_Chocolate_2	M9

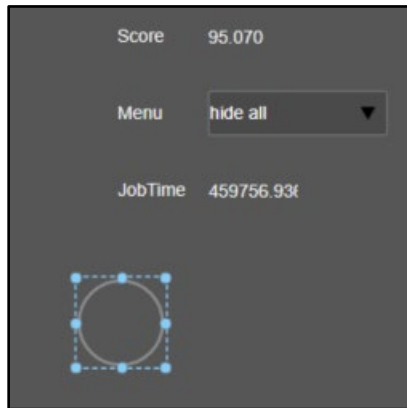
- Repeat this step for the 3 remaining chocolates, again consult the Check Region Name parameter to select the correct chocolate #:
 - Cell **M10**
 - Cell **M11**
 - Cell **M12**

14. Enter 'Total in cell L13 and an **And** statement in cell M13 (And(M9:M12)).

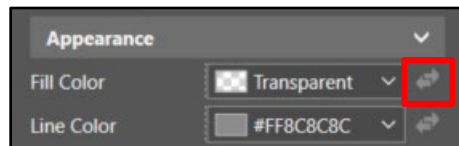
7													
8		Check	View	Index	Match Index	Match	Check Regi	Check Region	Check Region Name	Expected	Actual	Passed	
9		VIDICheck	VIDICheck	VIDICheck	0.000	0.000	VIDIMatch	0.000	VIDICheckRegion	Chocolate_2	1.000	0.000	0.000
10							1.000	VIDICheckRegion	Chocolate_1	1.000	0.000	0.000	
11							2.000	VIDICheckRegion	Chocolate_3	1.000	0.000	0.000	
12							3.000	VIDICheckRegion	Chocolate_0	1.000	0.000	0.000	
13		Show									Total	0.000	

- 15. Navigate to the **Main** tab.
- 16. Enter a **Ellipse** on the Main page.

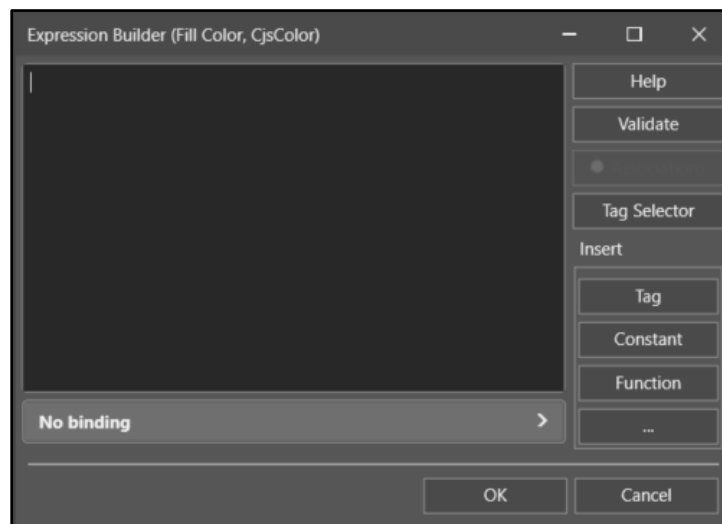
NOTE: The Ellipse is found in the Toolbox under Graphics → Ellipse.



17. Click the **Source** arrows on the **Fill Color** property.

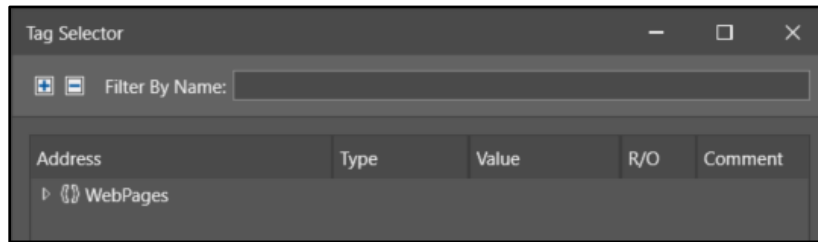


The **Expression Builder** displays.



18. Click the **Tag Selector**  button.

The **Tag Selector** dialog displays. Only *WebPages* displays.



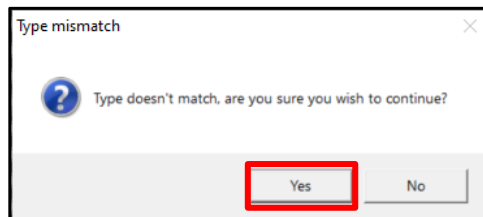
19. Check the **Show All Types** checkbox at the bottom of the dialog.



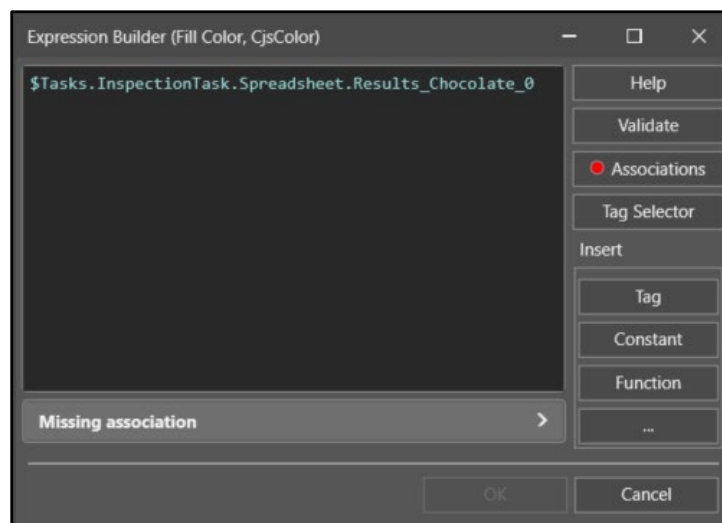
20. Navigate to **Tasks → Inspection Task → Spreadsheet → Results_Chocolate_0** and click the **Accept** button.

NOTE: You can also type `$Tasks.InspectionTask.Spreadsheet.Results_Chocolate_0` directly in the Expression Builder to build the expression.

21. The **Type mismatch** dialog displays. Click the **Yes** button to continue.

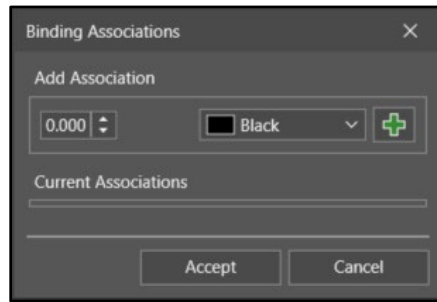



The **Expression** is built.

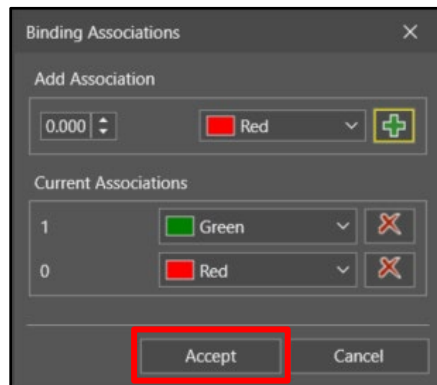


22. Click the **Associations** button.

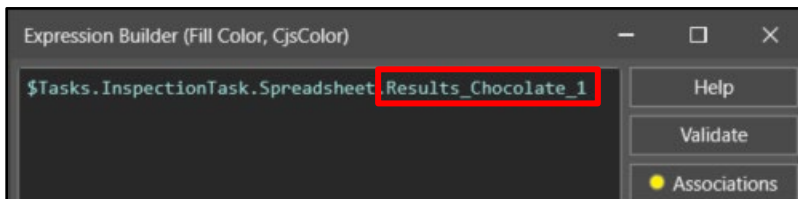
The **Binding Associations** dialog displays.



23. Build your Association and click the **Accept**  button.



24. The Association is built, click the **OK** button to close the Expression Builder.
25. Copy the ellipse and paste it next to the first.
- NOTE:** *This will copy your association and bring it into the new ellipse.*
26. Open the **Expression Builder** and change the expression to `Chocolate_1`. Click the **OK** button to close.



27. Repeat for the remaining chocolates.
- There are now 4 circles on your webpage.
28. Add a label to each ellipse to identify a chocolate region. Label the ellipses in the same order as the Layout Model that you created.

NOTE: The label is found in the Toolbox under Data Display. Toolbox → Data Display → Label.



NOTE: This is a suggestion. Arrange the ellipses on the webpage as you would like.

29. Return to the **Spreadsheet** tab. We will add some logic to let us know when the chocolate is in the correct spot in the assortment.
30. Enter the text in the following cells:
 - Cell **N8** = *Chocolate_0*
 - Cell **O8** = *Chocolate_1*
 - Cell **P8** = *Chocolate_2*
 - Cell **Q8** = *Chocolate_3*
 - Cell **R8** = *Which Chocolate?*

Press the **<Enter>** key after each entry

8	Check	View	Index	Match Index/Match	Check Regi	Check Region	Check Region Name	Expected	Actual	Passed	Chocolate_0	Chocolate_1	Chocolate_2	Chocolate_3	Which Chocolate?	
9	ViDiCheck	ViDiCheck	ViDiCheck	0.000	0.000	ViDiMatch	0.000 ViDiCheckRegion	Chocolate_2	1.000	0.000	0.000					
10							1.000 ViDiCheckRegion	Chocolate_1	1.000	0.000	0.000					
11							2.000 ViDiCheckRegion	Chocolate_3	1.000	0.000	0.000					
12							3.000 ViDiCheckRegion	Chocolate_0	1.000	0.000	0.000					
13	Show								Total	0.000						

31. Enter a **GetFeatureCount** function in cell **N9**, in this spreadsheet it will reference cells I12 and N8. *GetFeatureCount(I9,N8)*.

NOTE: The first cell referenced for *Chocolate_0* is the Cell for its **ViDiCheckRegion**, and the second cell referenced is the **Name of the Chocolate** (that you entered).

 - Cell **O9** = *GetFeatureCount(I10,O8)*
 - Cell **P9** = *GetFeatureCount(I11,P8)*
 - Cell **Q9** = *GetFeatureCount(I12,Q8)*
32. Repeat step 31 for the remaining chocolate rows.
33. Click the **Trigger Once** button to view the results.

	Check	View	Index	Match Index/Match	Check Region Index	Check Region	Check Region Name	Expected	Actual	Passed	Chocolate_0	Chocolate_1	Chocolate_2	Chocolate_3	Which Chocolate?	
	ViDiCheck	ViDiCheck	ViDiCheck	0.000	0.000	ViDiMatch	0.000 ViDiCheckRegion	Chocolate_2	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
							1.000 ViDiCheckRegion	Chocolate_1	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
							2.000 ViDiCheckRegion	Chocolate_0	1.000	1.000	1.000	1.000	0.000	0.000	0.000	
							3.000 ViDiCheckRegion	Chocolate_3	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
Show									Total	0.000						

34. Next, we will add the logic to determine which chocolate is in each spot. Enter the following formula in cell **R9**, *If(N9,N8,If(O9,O8,If(P9,P8,If(Q9,Q8,"NONE"))))*
35. Repeat step 34 for the remaining chocolate cells.

36. Click the **Trigger Once**  button to view the results.

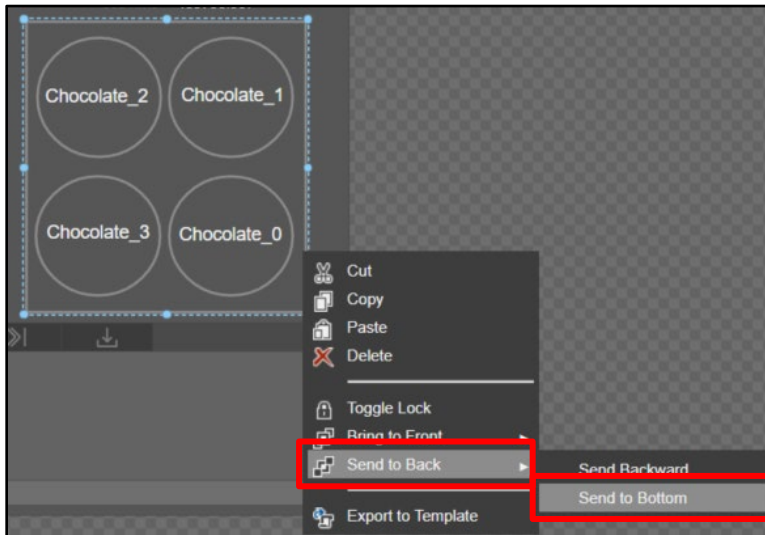
Check	View	Index	Match Index	Match	Check Region Index	Check Region	Check Region Name	Expected	Actual	Passed	Chocolate_0	Chocolate_1	Chocolate_2	Chocolate_3	Which Chocolate?
D\DiCheck	D\DiCheck	D\DiCheck	0.000	0.000	D\DiMatch	0.000	D\DiCheckRegion	Chocolate_2	1.000	0.000	0.000	0.000	0.000	0.000	NONE
						1.000	D\DiCheckRegion	Chocolate_1	1.000	1.000	1.000	0.000	1.000	0.000	Chocolate_1
						2.000	D\DiCheckRegion	Chocolate_0	1.000	1.000	1.000	1.000	0.000	0.000	Chocolate_0
						3.000	D\DiCheckRegion	Chocolate_3	1.000	1.000	1.000	0.000	0.000	1.000	Chocolate_3
Show								Total		0.000					

37. Publish cell **M13** and name the Tag *Results_All*.

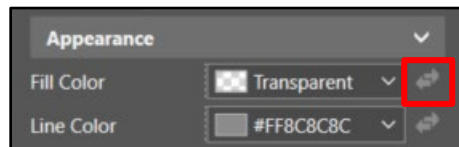
38. Navigate to the Main tab.

39. Add a **rectangle** around the four chocolate circles.

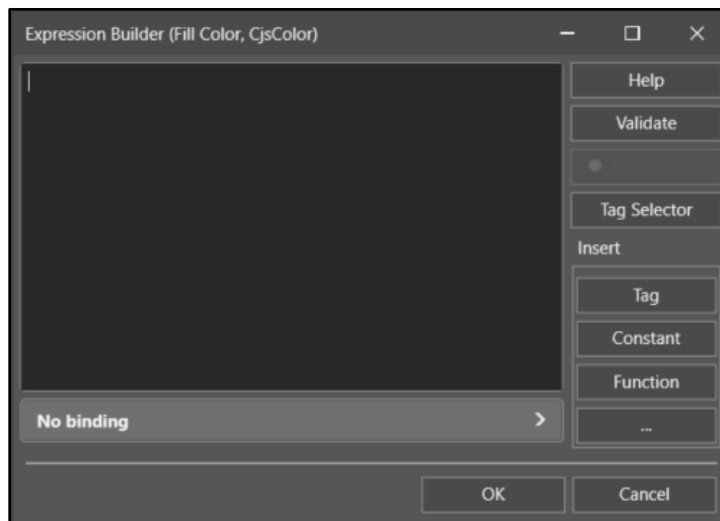
NOTE: *This rectangle has been placed on top of the current rectangles.*
Right-click → **Send to Back** → **Send to Bottom**.

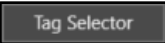


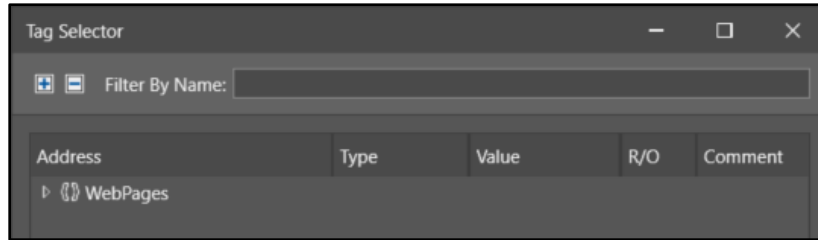
40. Click the **Source** arrows on the **Fill Color** property.



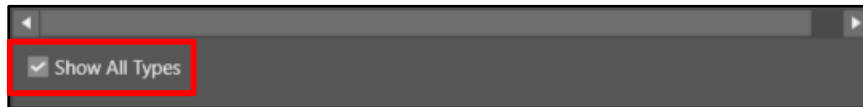
The **Expression Builder** displays.




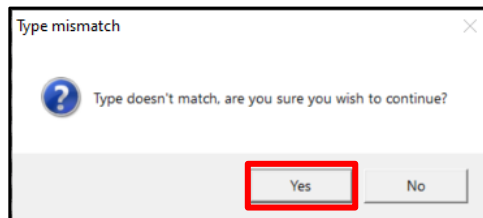
- Click the **Tag Selector**  button.
The **Tag Selector** dialog displays. Only WebPages displays.



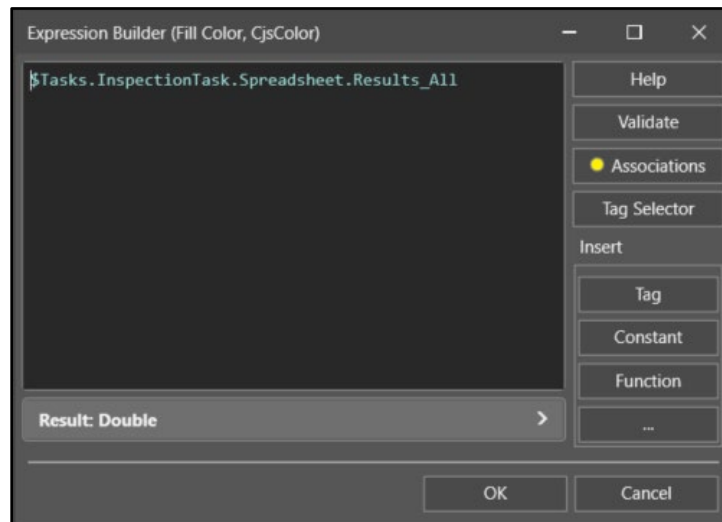
- Check the **Show All Types** checkbox at the bottom of the dialog.



- Navigate to **Tasks** → **Inspection Task** → **Spreadsheet** → **Results_All** and click the **Accept**  button.
NOTE: You can also type `$Tasks.InspectionTask.Spreadsheet.Results_All` directly in the *Expression Builder* to build the expression.
- The **Type mismatch** dialog displays. Click the **Yes** button to continue.

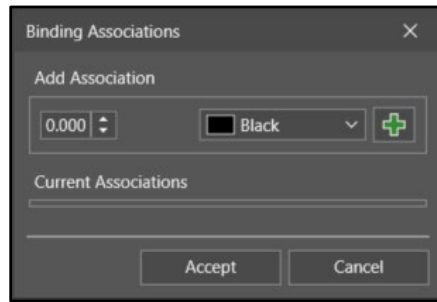



The **Expression** is built.

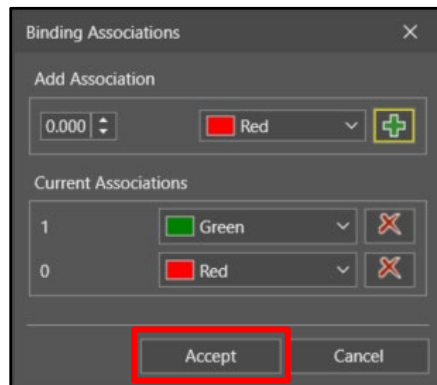


- Click the **Associations**  button.

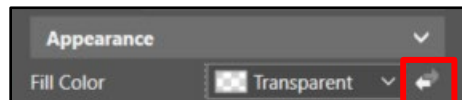
The **Binding Associations** dialog displays.



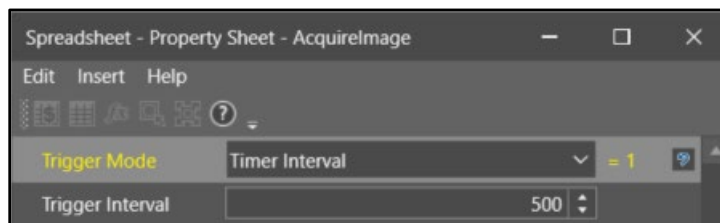
46. Build your Association and click the **Accept**  button.



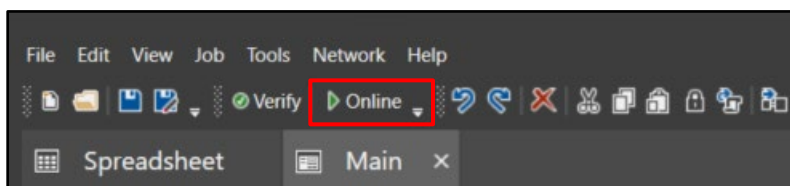
47. The Association is built, click the **OK** button to close the Expression Builder.



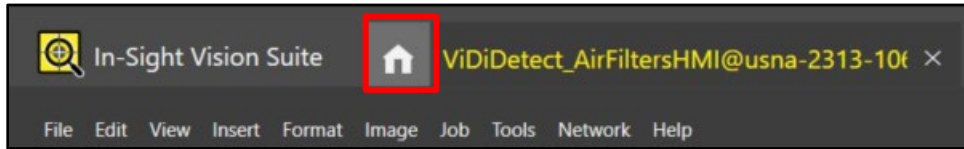
48. Return to the spreadsheet, open cell **A0** (Image) and set the **Trigger Mode** to *Timer Interval* and the **Timer Interval** parameter to *500ms* and click the **OK** button.



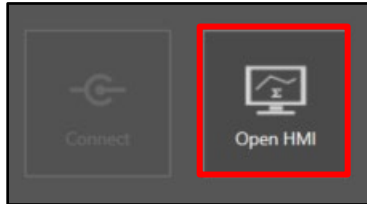
49. Save your job as **ViDiCheck_ChocolatesHMI** in the folder created in lab #1.
 50. Click the **Online** button to go Online.



- 51. Click the **Home** tab to return to the ISVS home page.

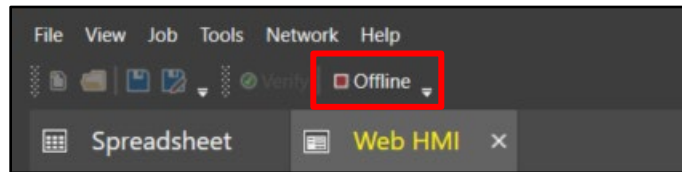


- 52. Click the **Open HMI** button.

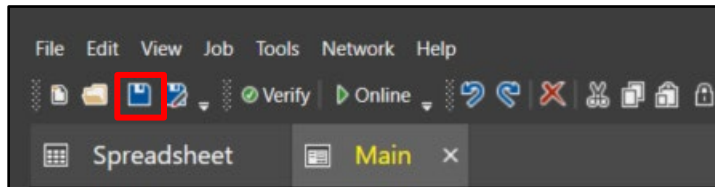


The HMI will open in a browser. Scroll through the images and review the results.

- 53. Click the **Offline** button to go Offline.



- 54. Click the **Save All** button to save your job.

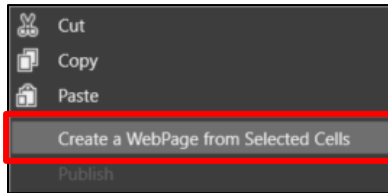


If time allows:

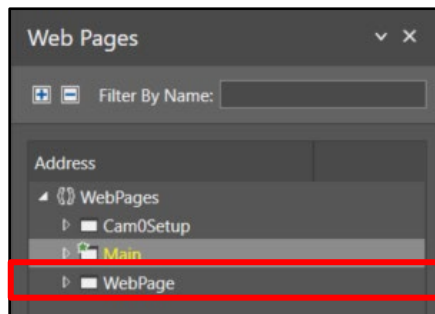
1. Navigate to the **Spreadsheet** tab.
2. Highlight cells **J8 through R13**.

Check Region Index	Check Region	Check Region Name	Expected	Actual	Passed	Chocolate_0	Chocolate_1	Chocolate_2	Chocolate_3	Which Chocolate?
0.000	0VIDICheckRegion	Chocolate_2	1.000	0.000	0.000	0.000	0.000	0.000	0.000	NONE
1.000	0VIDICheckRegion	Chocolate_1	1.000	0.000	0.000	0.000	0.000	0.000	0.000	NONE
2.000	0VIDICheckRegion	Chocolate_0	1.000	0.000	0.000	0.000	0.000	0.000	0.000	NONE
3.000	0VIDICheckRegion	Chocolate_3	1.000	0.000	0.000	0.000	0.000	0.000	0.000	NONE
				Total	0.000					

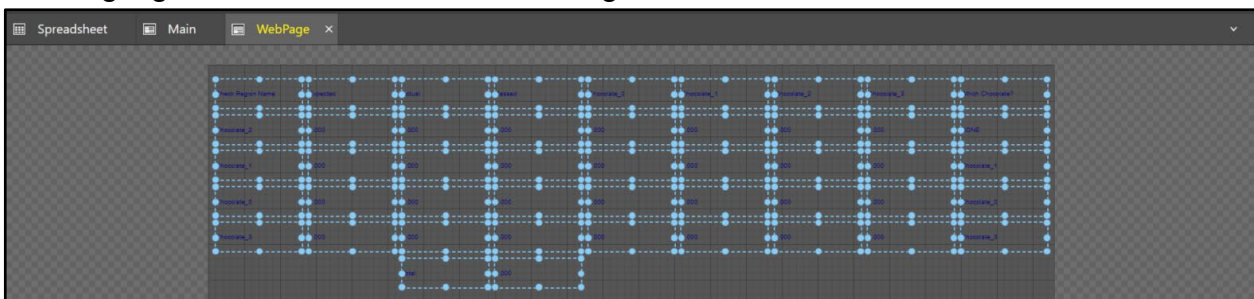
3. Right-click and select **Create a WebPage from Selected Cells** from the fly-out.



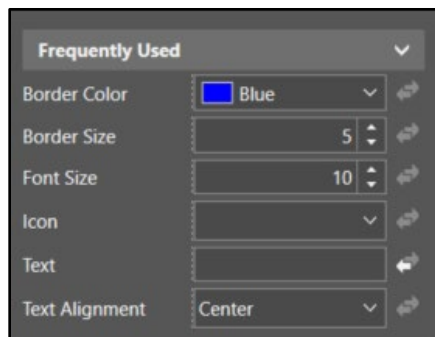
A new WebPage is created.



4. Highlight all items on the new WebPage.



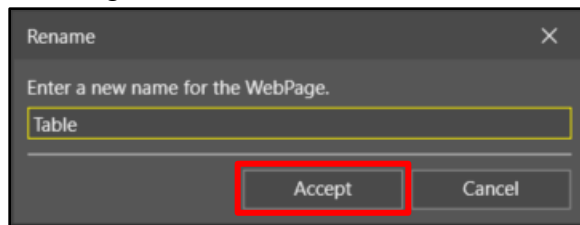
5. Change the **Border Color** to *Blue*, **Border Size** to **5**, **Font Size** to **12** and **Text Alignment** to *Center*.



6. Change the **Background Color** to White.

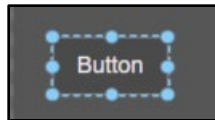
Check Region Name	Expected	Actual	Passed	Chocolate_0	Chocolate_1	Chocolate_2	Chocolate_3	Which Chocolate?
Chocolate_2	1.000	0.000	0.000	0.000	0.000	0.000	0.000	NONE
Chocolate_1	1.000	1.000	0.000	0.000	1.000	0.000	0.000	Chocolate_1
Chocolate_0	1.000	1.000	0.000	1.000	0.000	0.000	0.000	Chocolate_0
Chocolate_3	1.000	1.000	0.000	0.000	0.000	0.000	1.000	Chocolate_3
Total			0.000					

7. Right-click on the WebPage, rename to *Table* and click the **Accept** button.

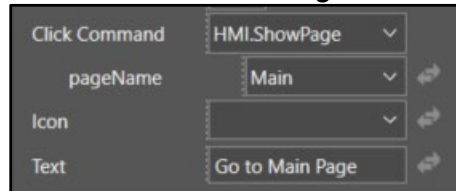


8. Add a **button** to the webpage.

NOTE: The button is found in the toolbox under User Inputs.



9. In the Properties, set the **Click Command** to *HMI.ShowPage*, set the **pageName** to *Main*, and change the **Text** to *Go to Main Page*.



10. Format the text color and background color as you choice.

Note: This button has a background color of black, text color of yellow, font size 18 and the text is centered on the button.

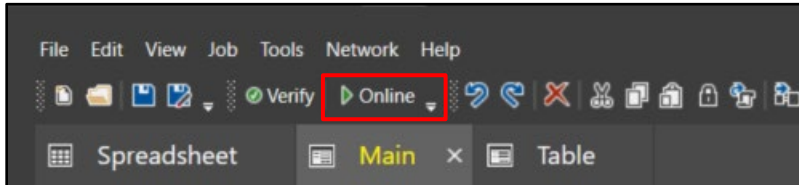
Check Region Name	Expected	Actual	Passed	Chocolate_0	Chocolate_1	Chocolate_2	Chocolate_3	Which Chocolate?
Chocolate_2	1.000	0.000	0.000	0.000	0.000	0.000	0.000	NONE
Chocolate_1	1.000	1.000	0.000	0.000	1.000	0.000	0.000	Chocolate_1
Chocolate_0	1.000	1.000	0.000	1.000	0.000	0.000	0.000	Chocolate_0
Chocolate_3	1.000	1.000	0.000	0.000	0.000	0.000	1.000	Chocolate_3
Total			0.000					

Go to Main Page

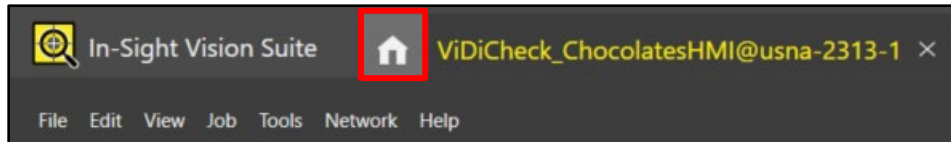
11. Repeat steps 8 – 10 to add a button to the Main webpage.
 - **Click Command** = *HMI.ShowPage*
 - **pageName** = *Table*
 - **Text** = *Go to Table Page*

NOTE: You can also copy and paste the button from the Table page and change the *pageName* and *Text*.

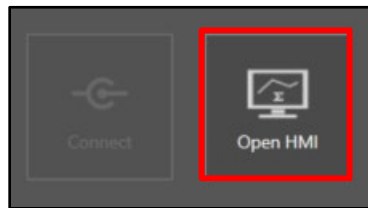
12. Click the **Online** button to go Online.



13. Click the **Home** tab to return to the ISVS home page.

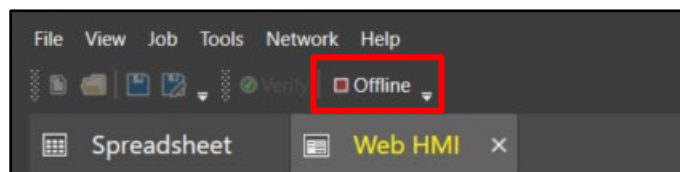


14. Click the **Open HMI** button.

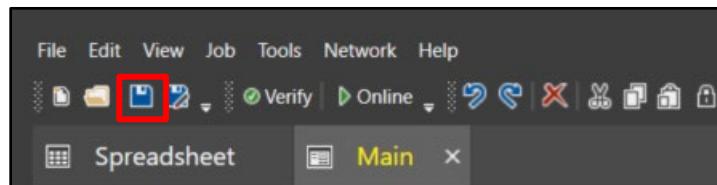


The HMI will open in a browser. Scroll through the images and review the results.

15. Click the **Offline** button to go Offline.



16. Click the **Save All** button to save your job.



Lab Exercise 9.1 – Deployment

At the end of this lab exercise, Participants will be able to:

- Utilize the utilities available in In-Sight Vision Suite to finish deploying the application

The Participant will utilize the following In-Sight Vision Suite Functions to successfully complete this exercise:

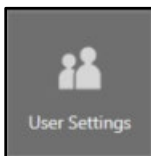
- User Settings
- Update Firmware
- Network Settings
- Backup
- Restore

NOTE: *In order to complete this lab exercise, you should not be connected to your camera or emulator. This will allow you to access the Utilities.*

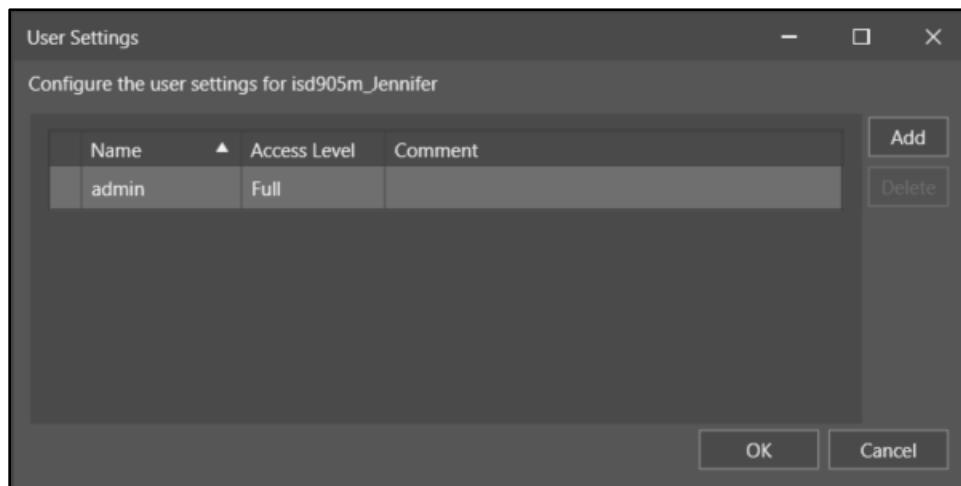
User Settings


Follow the steps below to complete the lab exercise:

1. Click on the **User Settings** link – this is found in the **Utilities** menu.

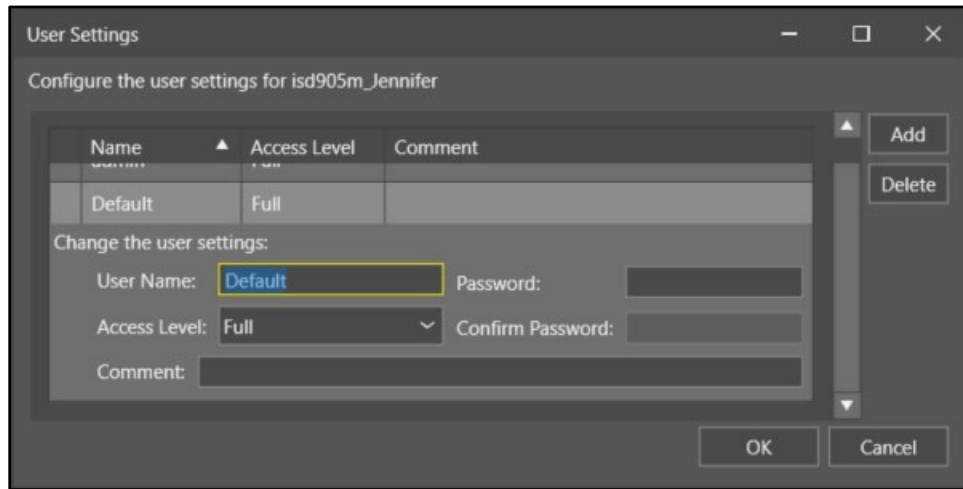


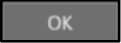
The **User Settings** dialog displays.

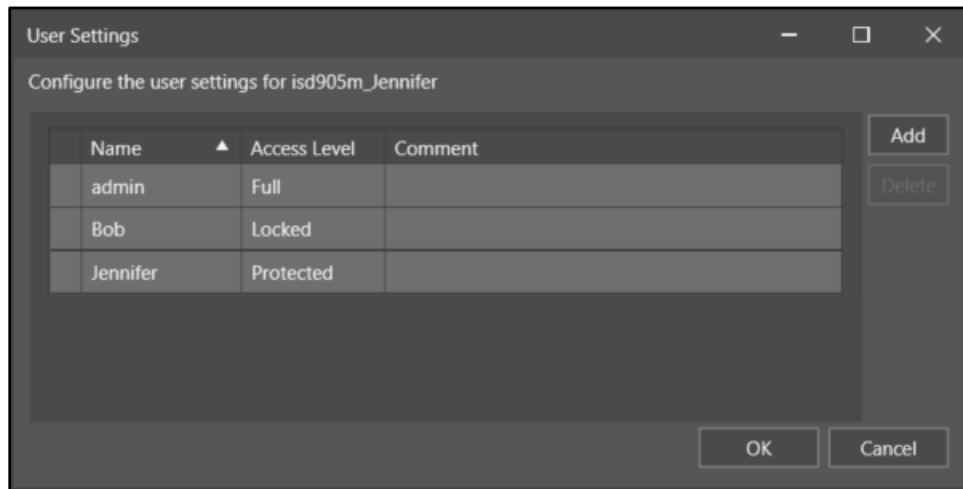


2. A user with the Name **admin** should already be there, with Full access. Click the **Add**  button to create a new user.

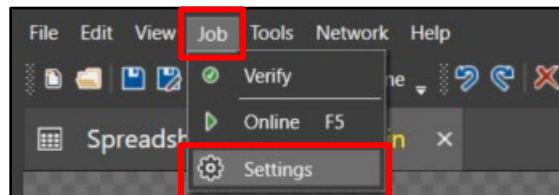
A new line displays.



3. Enter the new user’s information in the appropriate fields and click the **OK**  button.
NOTE: Create two new users, one with Protected access and one with Locked access. Choose the names you would like, use the password Cognex for both.

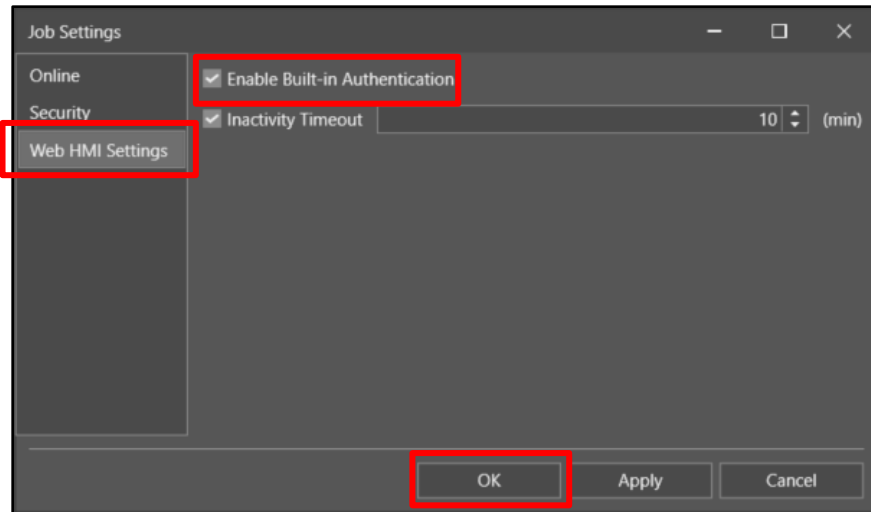


4. Connect to your camera. (if there is a job open on your camera, close it and open a new job).
5. Click the **Main** WebPage tab.
6. From the **Job** menu, select **Settings** from the drop-down list.

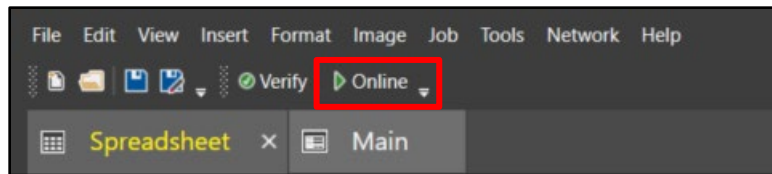


The **Job Settings** dialog displays.

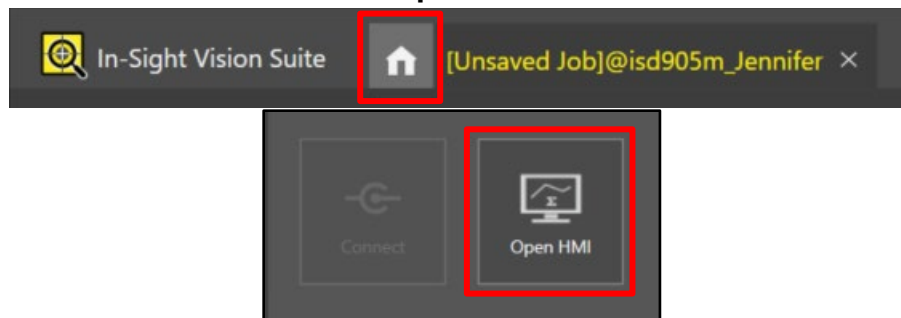
7. Click **Web HMI Settings** and check the **Enable Built-in Authentication** checkbox.



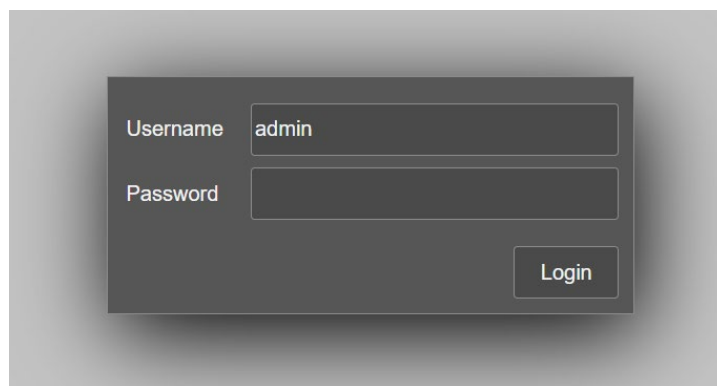
8. Click the **OK** button.
9. Click the **Online** button to go Online.



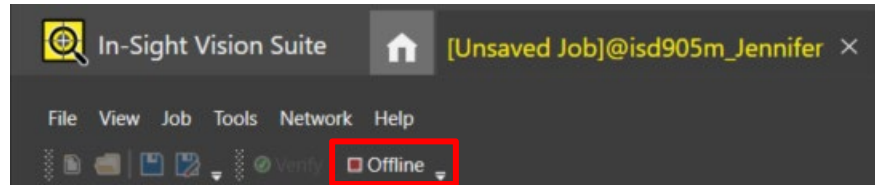
10. Click the **Home** tab and click the **Open HMI** button.



11. A new web browser opens – login as admin (with no password)



12. Log into the HMI with the other users that you created.
Notice the difference in the access that the different users have based on their access levels.
13. Return to your camera and click the **Offline** button to go offline. Do not save the job.



Firmware Update

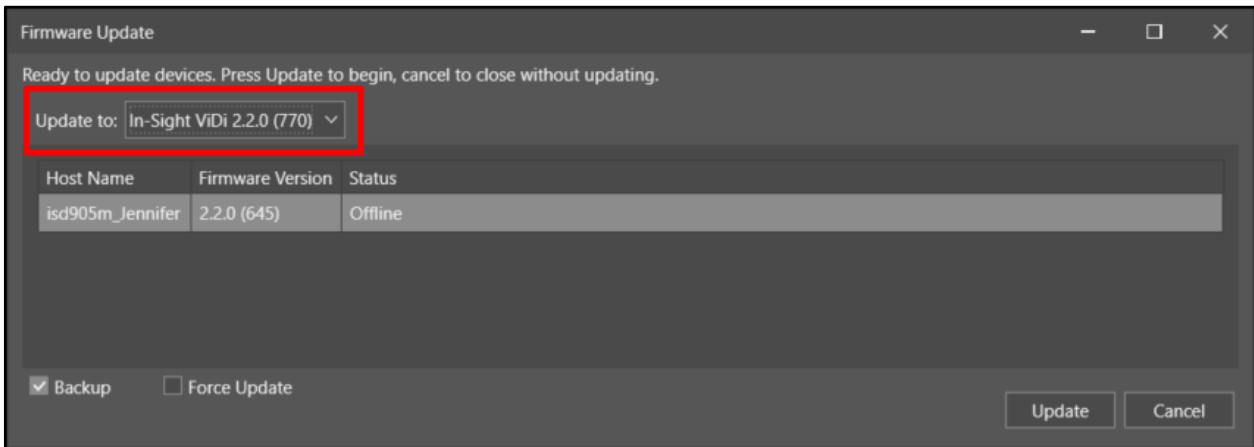
NOTE: *In this lab, you will look at the steps needed for a firmware update to the Controller and cameras, but you will **not** actually do an update.*


1. From the Utilities tab select **Firmware Update**.

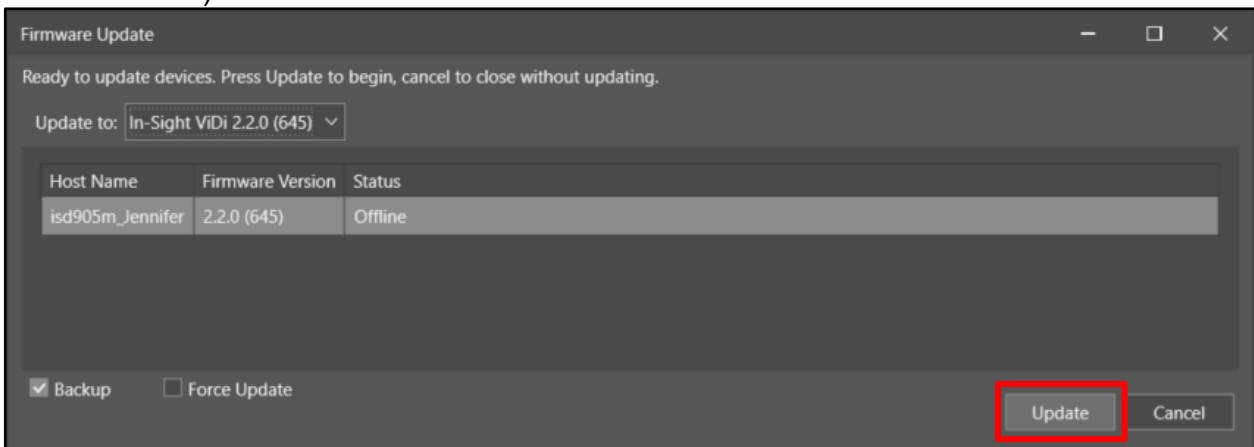


The **Firmware Update** dialog displays.

2. Select the Firmware version from the **Update to:** drop down list.



3. **Do not actually do an update**, but if you were, highlight the camera to be updated and click the **Update**  button. (In this screenshot there is only one camera available).

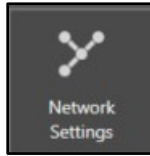


The **Update** will begin.

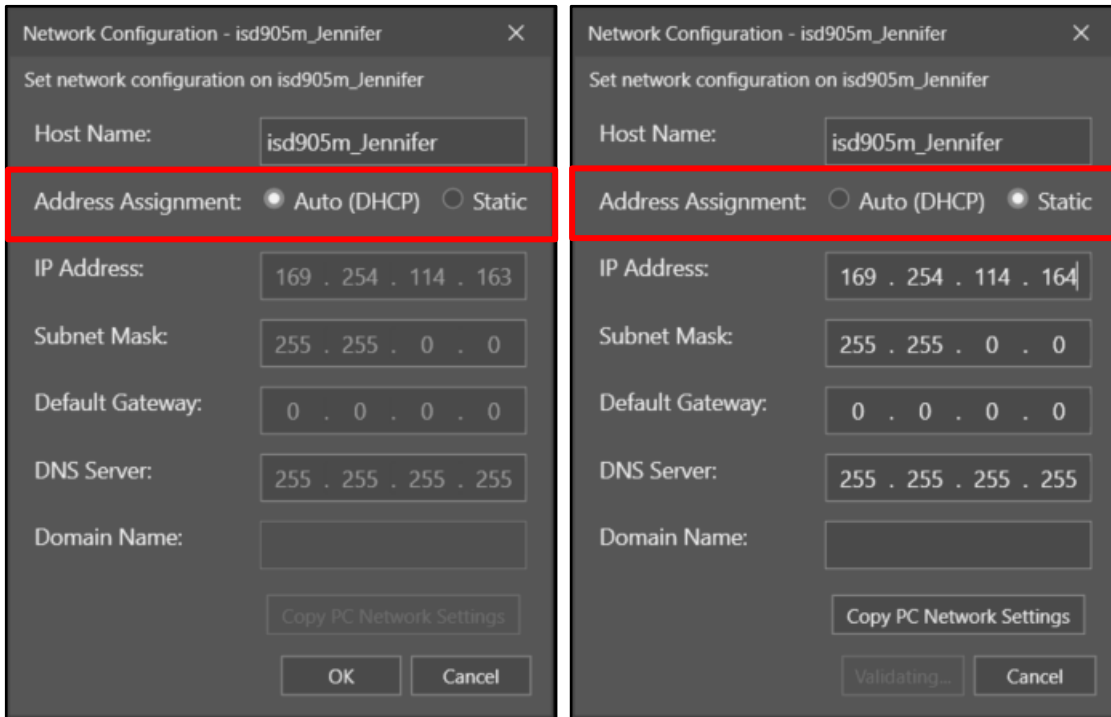
4. Click the **Cancel**  button to exit from this dialog.

Network Settings

1. From the Utilities tab select **Network Settings**.



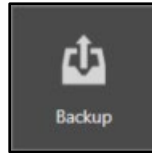
The **Network Configuration** dialog displays and might look like one of the following:



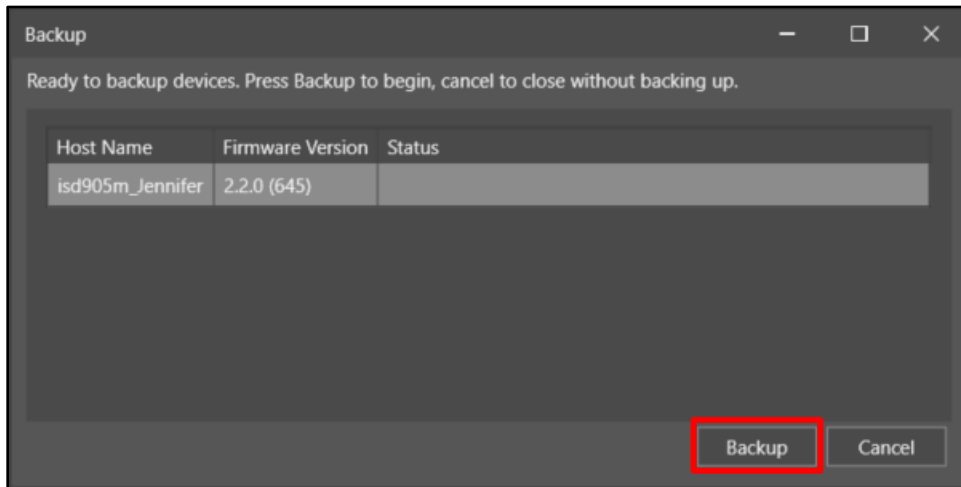
2. Review the settings.

Backup

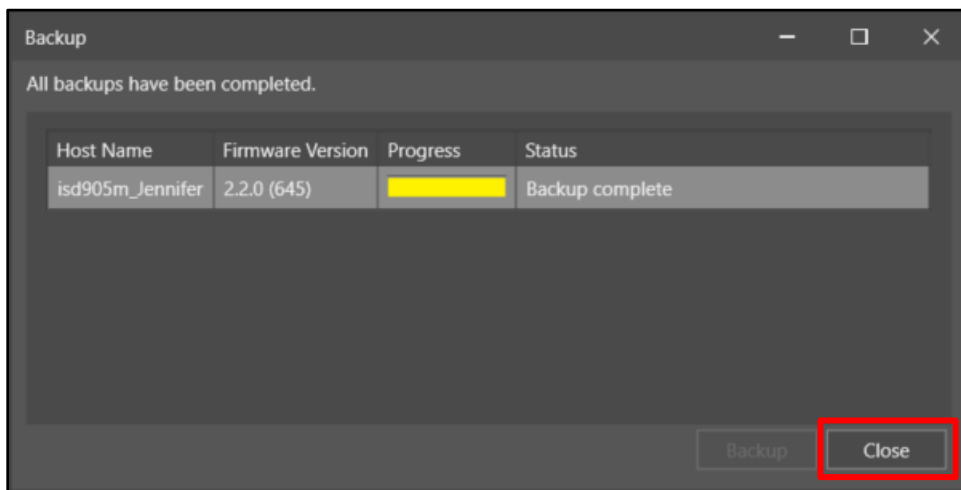
1. From the Utilities tab select **Backup**.



The **Backup** dialog displays.

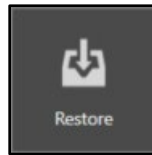


2. Select the camera to backup and click the **Backup** button.
3. Once the Backup is complete click the **Close** button.

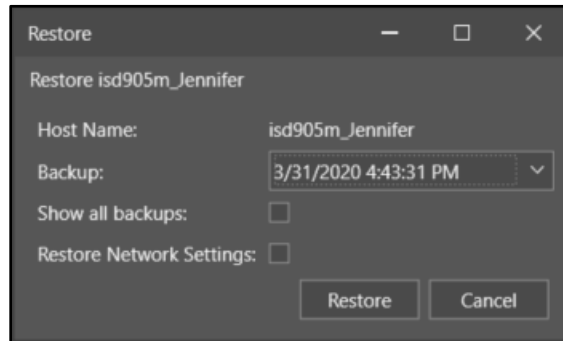


Restore



1. From the Utilities tab select **Restore**.

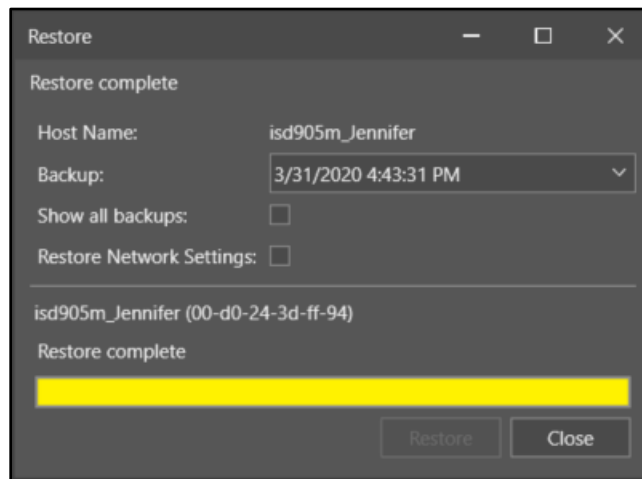


The **Restore** dialog displays.



NOTE: *If you want to see all the backups available on the network check the Show all backups checkbox.*

2. Select the Backup that you would like to restore the camera from and click the **Restore**  button.
3. Once the Restore is complete click the **Close**  button.



Final Lab Exercise

Objective:

In the Final Lab Exercise will allow the student to tie together all the training that was learned over the course of the two day In-Sight Vision Suite Standard class.

There is a lab for each of the In-Sight ViDi tools: *ViDiDetect*, *ViDiCheck* and *ViDiRead*. You will select a lab for one of the tools and complete it, inclusive of creating an HMI. If you have completed the lab and still have time available select a different tool and work on solving that lab also.

You will notice that the labs are not written step by step as they were during the class – this will allow you to come up with your own solution to the lab. There will be more than one solution for each lab exercise, so allow your creativity to shine through. Be prepared to discuss how you solved the lab with the class.

The images for each lab exercise can be found in the In-Sight Vision Suite folder in the Student Folder on the desktop of the computer or laptop.

Before You Start:

Create a folder named *In-Sight Vision Suite Final Lab* within the folder that you created in the first lab of the class.

Contents:

- ViDiDetect Lab
 - o Glass Vial Images
- ViDiCheck Lab
 - o Medical Kit Verification Images
- ViDiRead Lab
 - o Phone Back OCR Images

Goal:

The goal of each lab exercise is to utilize the In-Sight ViDi tool and show the good part and the bad part and why it either passes or fails.

Also, an HMI should be created including graphics showing why the part passes or fails.

Final Lab Exercise 1 – ViDiDetect Tool

Images Needed:

- Glass Vial Runtime Images
- Glass Vial Training Images

Emulator:

- In-Sight D905M

Part to Inspect:

- The challenge is the transparent part makes it difficult to distinguish breakage from debris along the front or back. The reflective surface also creates variability that would challenge tradition rules-based vision.

Goal:

- Use the ViDiDetect tool to accurately distinguish natural part variation from anomalies within the glass vials
- When complete save the job as *ViDiDetect_Final* in the folder created in lab #1



Good Part



Bad Part

Task Inspections:

1. Consistently find the part in the image.

2. What tools did you add to your spreadsheet to find the part in the image?

3. Did you change any parameters in the ViDi Editor? If so, what did you change and to what?

4. Create an HMI that shows the status of all the inspection tasks and the status of the overall inspection.

Final Lab Exercise 2 – ViDiCheck Tool

Images Needed:

- Medical Kit Verification Runtime Images
- Medical Kit Verification Training Images

Emulator:

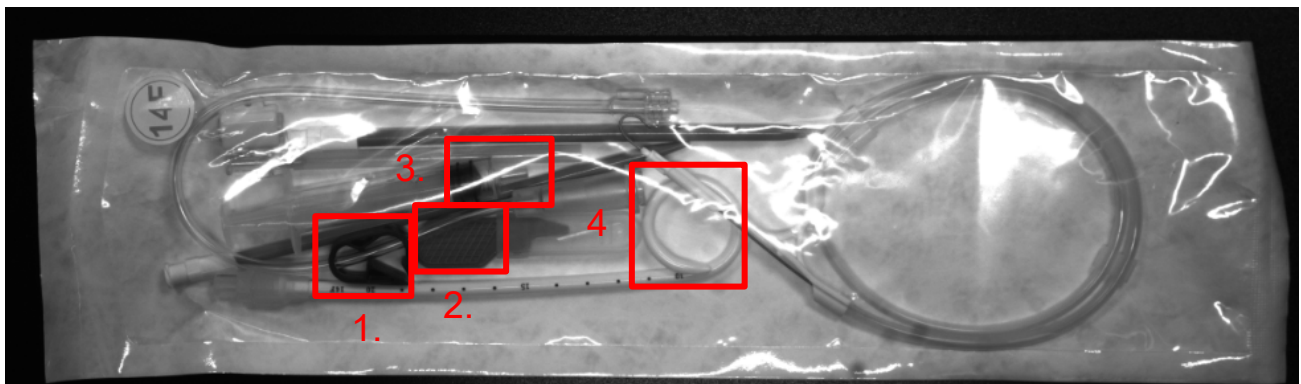
- In-Sight D905M

Part to Inspect:

- The challenge is that the elements must be identified through a transparent medical bag, which can be reflective and obscure the appearance of the elements.

Goal:

- Use the ViDiCheck tool to find the bag within the frame and determine if the four required features are present.
- When complete save the job as *ViDiCheck_Final* in the folder created in lab #1.



We are looking for 4 items in the Medical Kit:

1. Clip
2. Scalpel
3. Syringe
4. Pigtail

All 4 parts must be in the kit in order to be considered a good part. If 1 or more part(s) are missing, then that is to be considered a bad part.

Task Inspections:

1. Consistently find the part in the image.

2. What tools did you add to your spreadsheet to find the part in the image?

3. Did you change any parameters in the ViDi Editor? If so, what did you change and to what?

4. What did you use to find all four of the parts within the Medical Kit?

5. Create an HMI that shows the status of all the inspection tasks and the status of the overall inspection.

Final Lab Exercise 3 – ViDiRead Tool

Images Needed:

- Phone Back OCR Runtime Images
- Phone Back OCR Training Images

Emulator:

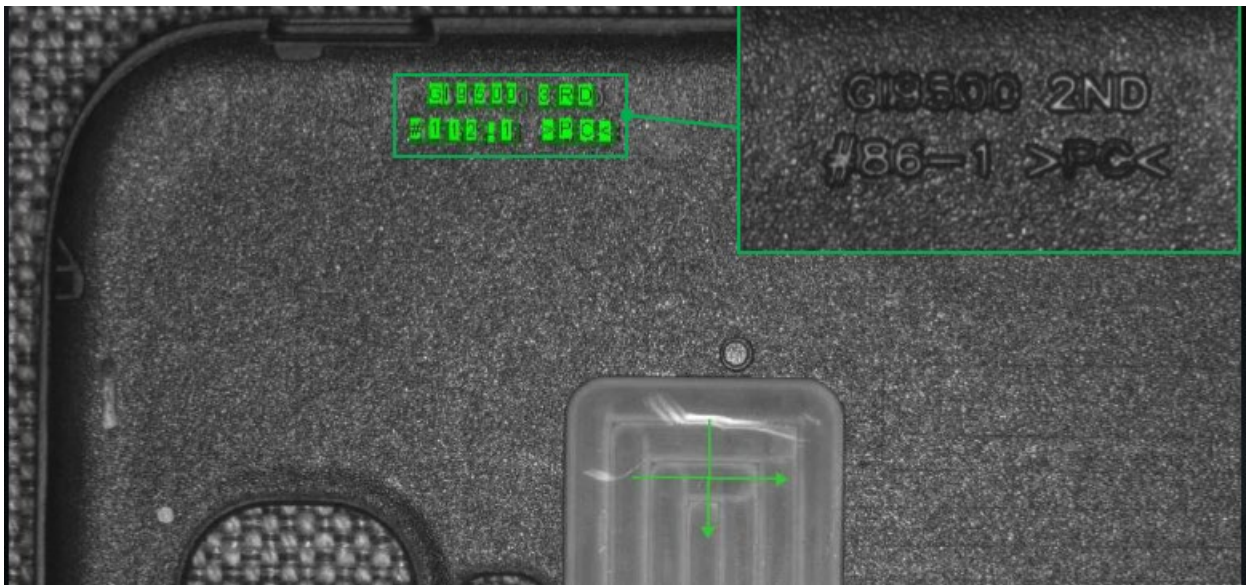
- In-Sight D905M

Part to Inspect:

- The challenge is that there are varying font and character sizes on a complex textured background creating a difficult application for traditional OCR.

Goal:

- Use the ViDiRead tool to accurately read the letters in a wide range of lighting and background conditions.
- When complete save the job as *ViDiRead_Final* in the folder created in lab #1.



Task Inspections:

1. Consistently find the part in the image.

2. What tools did you add to your spreadsheet to find the part in the image?

3. Did you change any parameters in the ViDi Editor? If so, what did you change and to what?

4. Create an HMI that shows the status of all the inspection tasks and the status of the overall inspection.
