



VIA Pixetto

USER MANUAL

The VIA Pixetto Vision Sensor

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Disclaimer

- Please read the information in this manual carefully. Improper use may cause the product to not work properly or even damage the product.
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Safety Precautions

- Minors or users under the age of 18 years old are required to be guided by teachers or adults.
- This kit includes different sizes of components that can be harmful to young children, so children under 3 years of age are prohibited to use or assemble this kit.
- Beware of power short-circuits in order to prevent causing harm to yourself and damaging property.
- Do not disassemble components and cables randomly, in order to prevent causing harm to yourself and damaging property.
- The battery power cable should be disconnected immediately when the main control board is not in use.
- The anti-static tasks should be performed properly before using it in order to prevent static from affecting the equipment.
- Avoid letting the hardware touch moist objects or being used in moist environments (except for soil moisture sensor).
- The main control board must be used after it is connected to the charger or battery.
- Please connect the hardware properly under teacher guidance or by following the installation instructions; connect the power last in order to prevent short-circuit.

Box Contents

- 1 x VIA Pixetto Vision Sensor
- 1 x Micro USB 2.0 Cable
- 1 x Quick Guide

Table of Contents

| | |
|--|-----------|
| 1. Product Overview | 1 |
| 1.1 Product Specifications | 2 |
| 1.2 Layout Diagram | 3 |
| 1.3 Product Dimensions | 4 |
| 2. How to setup VIA Pixetto Studio Software | 5 |
| 2.1 Installing VIA Pixetto Studio | 5 |
| 3. How setup the VIA Pixetto Vision Sensor | 11 |
| 3.1 Connecting VIA Pixetto to a PC | 11 |
| 4. VIA Pixetto Utility Description | 12 |
| 4.1 File Menu | 12 |
| 4.2 Device Menu | 12 |
| 4.3 Tool Menu | 13 |
| 4.4 Window Menu | 14 |
| 4.5 Language Menu | 14 |
| 4.6 Help Menu | 15 |
| 4.7 VIA Pixetto Utility Right Side Panel | 16 |
| 4.7.1 Configuration | 16 |
| 4.7.1.1 Ignore object smaller than | 16 |
| 4.7.1.2 Maximum display objects | 17 |
| 4.7.1.3 Color | 17 |
| 4.7.1.4 Shape | 18 |
| 4.7.1.5 Record Video | 19 |
| 4.7.1.6 Message | 19 |
| 5. How to configure VIA Pixetto Utility Functions | 21 |
| 5.1 How to configure Color Detection function | 21 |
| 5.2 How to configure Color Code Detection | 22 |
| 5.3 How to configure Shape Detection | 23 |
| 5.4 How to configure Sphere Detection | 24 |
| 5.5 How to configure Template Matching | 25 |
| 5.6 How to configure Keypoint | 26 |
| 5.7 How to configure Face Detection | 27 |
| 5.8 How to configure Apriltag | 28 |
| 5.9 How to configure Cloud Computing | 29 |
| 5.9.1 How to connect the VIA Pixetto vision sensor to a local server | 31 |
| 5.10 How to configure Lane Detection | 34 |
| 5.11 How to configure Digits Operation | 35 |
| 6. How to use the VIA Pixetto Machine Learning Accelerator | 36 |
| 6.1 How to use Pre-trained Models | 36 |
| 6.2 How to use Blocks | 42 |
| 6.3 How to use Machine Learning | 51 |
| 6.3.1 How to use VIA Pixetto Utility to create videos | 62 |
| 6.4 How to use Python | 65 |

| | |
|---|-----------|
| 7. Grove Connectors | 72 |
| 7.1 How to connect the Grove cable to an Arduino board..... | 72 |
| Appendix A.How to update Firmware | 73 |
| A.1. How to update Firmware manually..... | 73 |
| A.2. Automatic Firmware Updates | 74 |
| Appendix B.Tips on how to maintain the VIA Pixetto vision sensor | 76 |

List of Figures

| | |
|---|----|
| Figure 1: VIA Pixetto vision sensor..... | 1 |
| Figure 2: VIA Pixetto vision sensor layout diagram (front)..... | 3 |
| Figure 3: VIA Pixetto vision sensor layout diagram (back)..... | 3 |
| Figure 4: Dimensions of the VIA Pixetto vision sensor..... | 4 |
| Figure 5: VIA Pixetto Studio package diagram..... | 5 |
| Figure 6: Select Setup language pop-up diagram..... | 6 |
| Figure 7: English language diagram..... | 6 |
| Figure 8: Software notification diagram..... | 6 |
| Figure 9: License agreement diagram..... | 7 |
| Figure 10: Create desktop shortcuts diagram..... | 7 |
| Figure 11: Installation button diagram..... | 8 |
| Figure 12: Installation of VIA Pixetto Studio diagram..... | 8 |
| Figure 13: Completing the Pixetto Studio Setup diagram..... | 9 |
| Figure 14: VIA Pixetto Studio diagram..... | 9 |
| Figure 15: VIA Pixetto shortcut icons diagram..... | 10 |
| Figure 16: Connecting the Micro USB 2.0 cable to the VIA Pixetto vision sensor..... | 11 |
| Figure 17: Connecting the VIA Pixetto vision sensor to the computer..... | 11 |
| Figure 18: LED light diagram..... | 11 |
| Figure 19: File menu diagram..... | 12 |
| Figure 20: Device menu diagram..... | 12 |
| Figure 21: Tool menu diagram..... | 13 |
| Figure 22: Window menu diagram..... | 14 |
| Figure 23: Language menu diagram..... | 14 |
| Figure 24: Help menu diagram..... | 15 |
| Figure 25: Configuration setting diagram..... | 16 |
| Figure 26: Ignore object smaller than diagram..... | 16 |
| Figure 27: Maximum display objects diagram..... | 17 |
| Figure 28: Color diagram..... | 17 |
| Figure 29: Sphere detection diagram..... | 18 |
| Figure 30: Shape diagram..... | 18 |
| Figure 31: Record video diagram..... | 19 |
| Figure 32: Message diagram..... | 19 |
| Figure 33: Debug tab diagram..... | 20 |
| Figure 34: Tips tab diagram..... | 20 |
| Figure 35: Color Detection diagram..... | 21 |
| Figure 36: Color Code Detection diagram..... | 22 |
| Figure 37: Triangle and Circle Shape Detection diagram..... | 23 |
| Figure 38: Rectangle and Pentagon Shape Detection diagram..... | 23 |
| Figure 39: Sphere Detection diagram..... | 24 |
| Figure 40: Highlighting template diagram..... | 25 |
| Figure 41: Template Matching diagram..... | 25 |
| Figure 42: Keypoints diagram..... | 26 |
| Figure 43: Keypoints detected diagram..... | 26 |
| Figure 44: Face Detection diagram..... | 27 |
| Figure 45: Apriltag diagram..... | 28 |
| Figure 46: Wi-Fi connection diagram..... | 29 |
| Figure 47: Successfully connected Wi-Fi diagram..... | 29 |

| | |
|---|----|
| Figure 48: Cloud Computing diagram | 30 |
| Figure 49: Connect to Wi-Fi device diagram | 31 |
| Figure 50: Local Server pop-up window diagram | 31 |
| Figure 51: Uploading Local Server information to VIA Pixetto diagram..... | 32 |
| Figure 52: Red object diagram | 33 |
| Figure 53: Lane Detection diagram | 34 |
| Figure 54: Digits Operation diagram..... | 35 |
| Figure 55: Machine Learning Accelerator diagram | 36 |
| Figure 56: User Login diagram | 36 |
| Figure 57: Login pop-up message diagram..... | 37 |
| Figure 58: Model icon diagram | 37 |
| Figure 59: Pre-trained models diagram..... | 38 |
| Figure 60: Pixetto Link Notification diagram..... | 38 |
| Figure 61: Handwriting recognition for digits icon diagram | 39 |
| Figure 62: VIA Pixetto vision sensor notification diagram..... | 39 |
| Figure 63: Handwriting digits recognition model downloaded diagram | 40 |
| Figure 64: Serial port notification diagram..... | 40 |
| Figure 65: Handwriting digits recognition diagram | 41 |
| Figure 66: Handwriting letters recognition diagram | 41 |
| Figure 67: Traffic sign recognition diagram | 41 |
| Figure 68: Scratch color detection diagram | 42 |
| Figure 69: Login diagram..... | 43 |
| Figure 70: Add Extention icon diagram | 43 |
| Figure 71: VIA Pixetto extension diagram..... | 44 |
| Figure 72: Scratch platform diagram..... | 44 |
| Figure 73: Locating scratch file diagram | 45 |
| Figure 74: Chameleon example loaded diagram..... | 45 |
| Figure 75: Not Connected icon diagram | 46 |
| Figure 76: Pixetto Notification diagram..... | 46 |
| Figure 77: Connect button diagram | 47 |
| Figure 78: Go to Editor notification diagram..... | 47 |
| Figure 79: Yellow Chameleon diagram | 48 |
| Figure 80: Blue Chameleon diagram..... | 48 |
| Figure 81: Red Chameleon diagram | 49 |
| Figure 82: Disconnect from COM5-VTS8787 diagram..... | 49 |
| Figure 83: Disconnect pop-up icon diagram | 50 |
| Figure 84: Editor application diagram..... | 50 |
| Figure 85: Machine Learning Accelerator webpage diagram..... | 51 |
| Figure 86: Login button diagram..... | 51 |
| Figure 87: Login pop-up message diagram..... | 52 |
| Figure 88: Machine learning icon diagram | 52 |
| Figure 89: Upload Video platform diagram | 53 |
| Figure 90: Add Label and Video platform naming diagram | 53 |
| Figure 91: Add Label and Video uploading section diagram | 54 |
| Figure 92: Framing the object diagram | 54 |
| Figure 93: Video notification diagram | 55 |
| Figure 94: Play Tracking result diagram | 55 |
| Figure 95: Uploading another video diagram | 56 |
| Figure 96: Video icons diagram..... | 56 |

| | |
|---|----|
| Figure 97: Popular combinations diagram..... | 57 |
| Figure 98: Console Training screen diagram | 57 |
| Figure 99: Training Finished diagram | 58 |
| Figure 100:Console Chart diagram..... | 58 |
| Figure 101: VIA Pixetto Link icon diagram | 59 |
| Figure 102:Download to device button diagram..... | 59 |
| Figure 103:Download complete diagram | 60 |
| Figure 104:Yellow Brick diagram..... | 60 |
| Figure 105:Purple Brick diagram | 61 |
| Figure 106:Object detection algorithms diagram..... | 61 |
| Figure 107:Pixetto Utility Record button diagram | 62 |
| Figure 108:Record Timer diagram | 62 |
| Figure 109:Pop-up Window folder diagram | 63 |
| Figure 110: Video Name diagram..... | 63 |
| Figure 111: Video file diagram..... | 64 |
| Figure 112: Python Login diagram | 65 |
| Figure 113: Upload button diagram | 65 |
| Figure 114: Handwriting file located diagram | 66 |
| Figure 115: Upload file diagram | 66 |
| Figure 116: Handwriting file uploaded diagram | 67 |
| Figure 117: Handwriting file window diagram | 67 |
| Figure 118: Minst download button diagram | 68 |
| Figure 119: Mnist downloading diagram | 68 |
| Figure 120:Install Neural Network Model diagram | 69 |
| Figure 121: Model Path diagram | 69 |
| Figure 122:Uploading Mnist file diagram | 70 |
| Figure 123:Neural Network diagram | 70 |
| Figure 124:Handwritten digits recognition diagram | 71 |
| Figure 125:Grove connector connectivity diagram | 72 |
| Figure 126:Expansion board diagram | 72 |

List of Tables

| | |
|--|----|
| Table 1: VIA Pixetto Studio Applications | 5 |
| Table 2: Grove connector pinouts..... | 53 |

1. Product Overview

VIA Pixetto is a Full HD vision sensor that leverages object, shape, color, face, and handwriting recognition, as well as machine learning, to deliver a powerful and versatile AI learning platform for students, makers, and robotics enthusiasts.

Measuring just 38mm x 38mm, VIA Pixetto features an ARM Cortex-A7 processor (900MHz) combined with a 1920 x 1080 resolution camera. It uses a UART interface to connect to any Arduino, Raspberry Pi, or micro:bit based project, and also includes an integrated microphone, Micro USB 2.0 port, Micro SD card slot and WiFi antenna.



Figure 1: VIA Pixetto vision sensor

1.1 Product Specifications

Processor

- ARM Cortex-A7 (900MHz)

System Memory

- 64MB DDR SDRAM

Storage

- 128MB SPI Flash memory

Camera Sensor

- GalaxyCore GC2053 CMOS image sensor

Camera Lens

- 130° Field-of-View

Onboard I/O

- 1 x Camera lens
- 3 x LEDs (for power, OS booting and active status)
- 1 x Reset button
- 1 x Microphone
- 1 x Grove connector
- 1 x Micro USB 2.0 port
- 1 x Micro SD Card slot
- 1 x Wi-Fi antenna

Power Supply

- 5V/500mA Micro USB 2.0 port
- 5V/300mA 4-pin Grove connector

Operating System

- Linux

Operating Temperature

- 0°C ~ 45°C

Form Factor

- 38mm x 38mm (1.5" x 1.5")

1.2 Layout Diagram

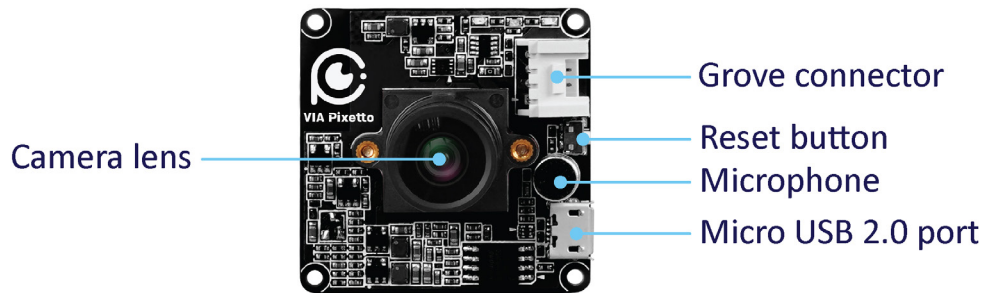


Figure 2: VIA Pixetto vision sensor layout diagram (front)

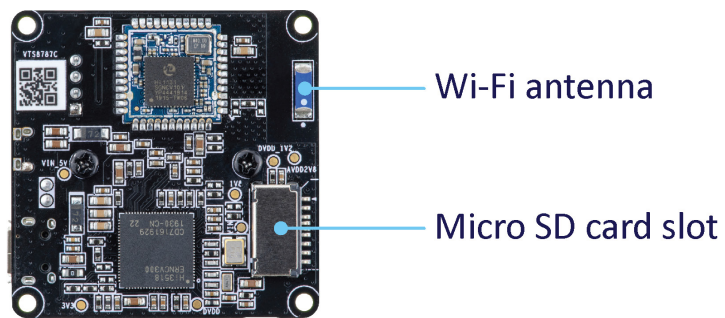


Figure 3: VIA Pixetto vision sensor layout diagram (back)

- Micro USB 2.0 port: Connects to a PC to setup functions, or to upgrade firmware.
- Grove connector: UART

1.3 Product Dimensions

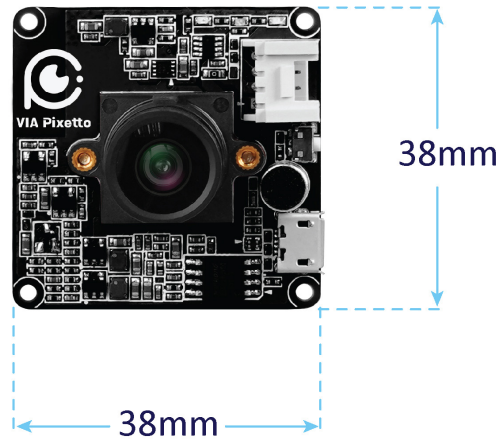


Figure 4: Dimensions of the VIA Pixetto vision sensor

2. How to setup VIA Pixetto Studio Software

This section provides information on how to install and setup the VIA Pixetto Studio software package on your computer. The VIA Pixetto Studio software package includes the Pixetto Utility, Pixetto Editor, Pixetto Junior, Pixetto Link, Pixetto Serial Tool, and Pixetto Launcher applications.

The VIA Pixetto Studio software package is compatible with Windows 10, Windows 8.1, Windows 8, and Windows 7 operating systems.

| Applications | Definition |
|---------------------|--|
| Pixetto Utility | This is used to configure the VIA Pixetto vision sensor when training it to perform the following functions: Color Detection, Color Label Detection, Shape Detection, Sphere Detection, Keypoint Template Matching, Apriltag (16H5), Cloud Computing and Lane Detection. It is an offline application. |
| Pixetto Editor | This is a programming application for Arduino IDE users, which is based on the Blockly framework. It is an offline application. |
| Pixetto Junior | This is a programming application for Arduino IDE users, which is based on the Scratch platform. It is an offline application. |
| Pixetto Link | This creates a bridge which connects the VIA Pixetto vision sensor and Machine Learning Accelerator web page. |
| Pixetto Serial Tool | This is used for debugging any issues which may occur on the Arduino board. |
| Pixetto Launcher | This provides easy-to-use rapid online training services for the VIA Pixetto vision sensor. |

Table 1: VIA Pixetto Studio Applications

2.1 Installing VIA Pixetto Studio

Step 1

Go to the <https://www.pixetto.ai> website to download the VIA Pixetto Studio software file from the Download tab.

Step 2

Double click on the **PixettoStudioSetup.1.2.0.exe** file to execute and begin the installation.

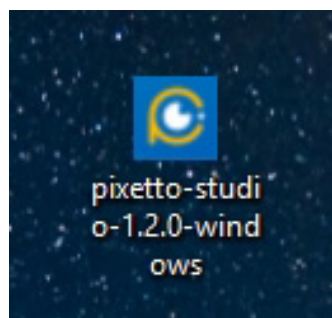


Figure 5: VIA Pixetto Studio package diagram

Step 3

Select the language of your choice to use during the installation process. Both English and Traditional Chinese are supported.

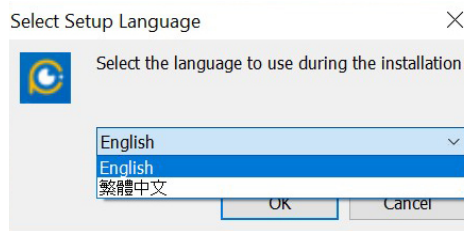


Figure 6: Select Setup language pop-up diagram

Step 4

Click 'OK' button to continue with the installation.

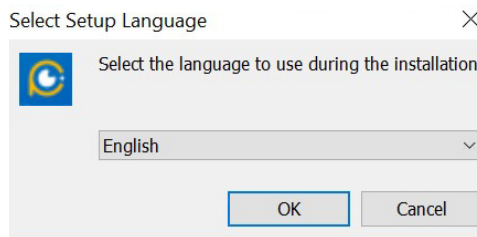


Figure 7: English language diagram

Note:
Please read the following note on the pop-up screen, then click the 'OK' button.

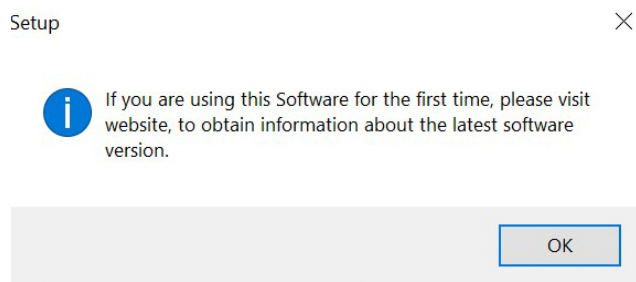


Figure 8: Software notification diagram

Step 5

Please review the License Agreement and select the 'I accept the agreement' section and click the 'Next' button.

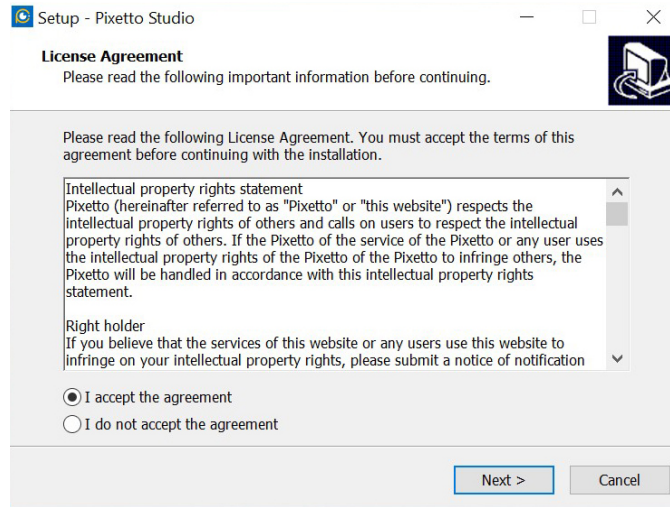


Figure 9: License agreement diagram

Step 6

To create the shortcuts of the icons on your desktop, select the 'Create a desktop shortcut' section. Then select the 'Next' icon.

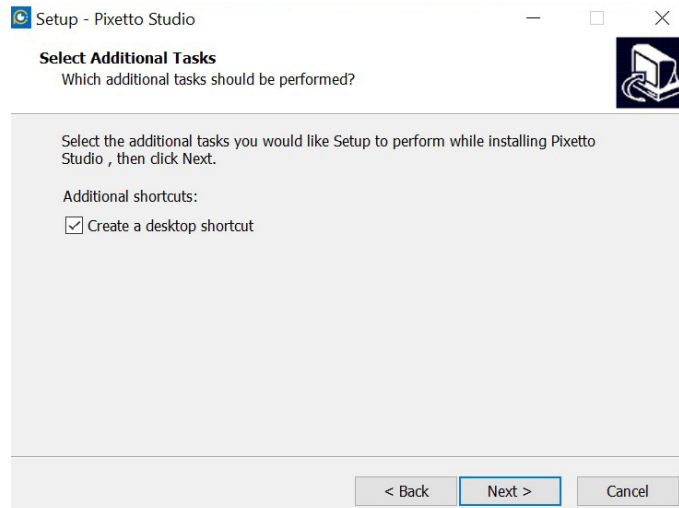


Figure 10: Create desktop shortcuts diagram

Step 7

Click the 'Install' button to continue with the installation process.

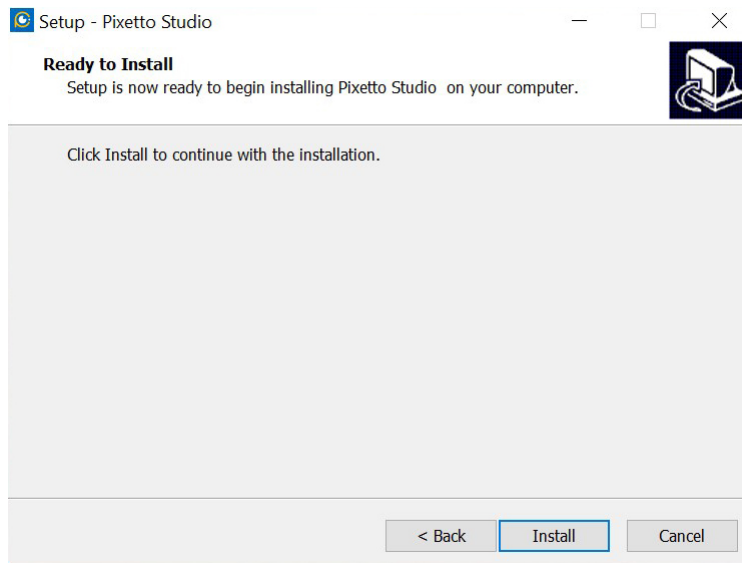


Figure 11: Installation button diagram

VIA Pixetto Studio will begin to install as shown below.

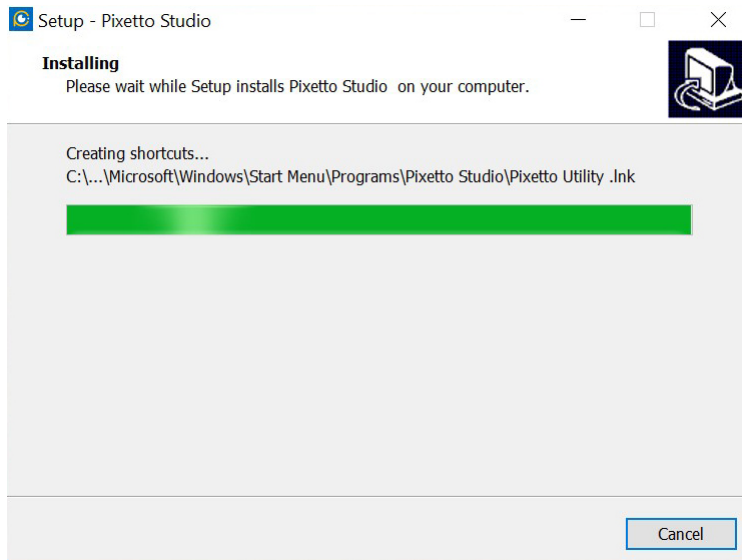


Figure 12: Installation of VIA Pixetto Studio diagram

Step 8

When VIA Pixetto Studio is installed, click the 'Finish' button to exit the setup.

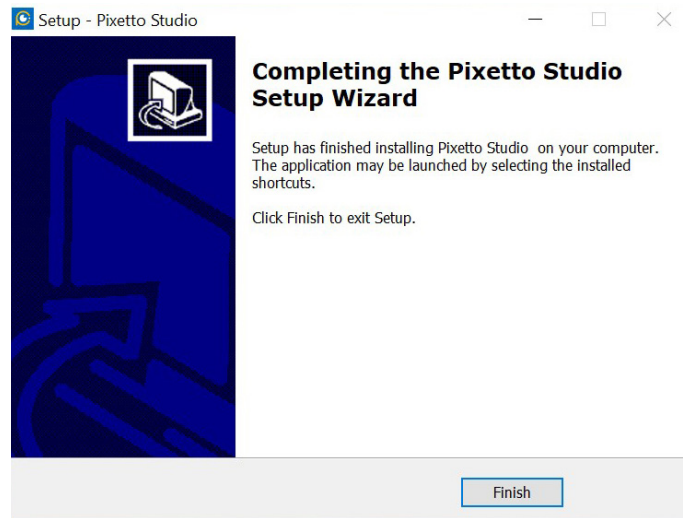


Figure 13: Completing the Pixetto Studio Setup diagram

Step 9

After the installation is completed, locate the icon named Pixetto Startup on the desktop. Double Click on it to open the icon

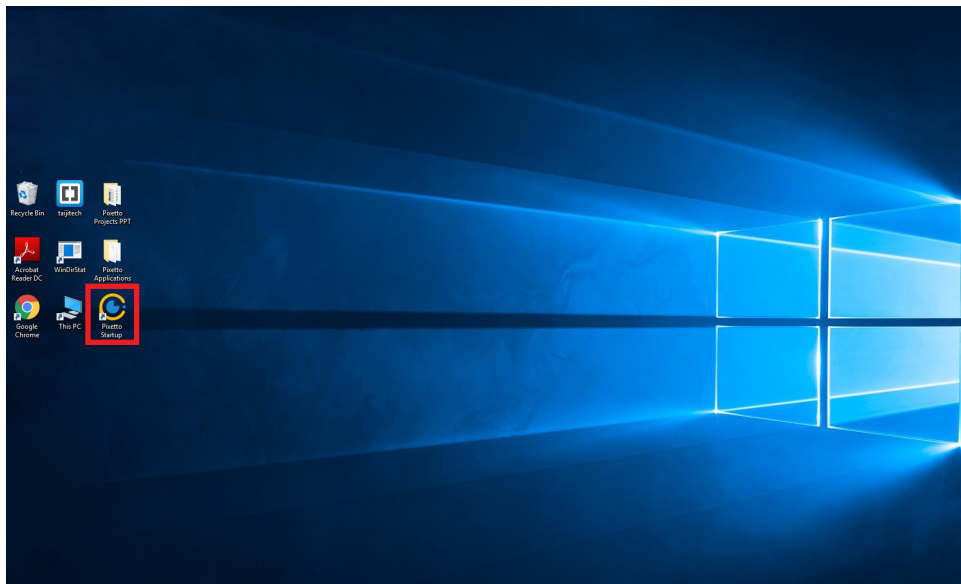


Figure 14: VIA Pixetto Studio diagram

Note:
The updated software will override the old version icons if you had installed the latest version.

Select any application you want to use. Click the 'x' to close the pop-up window or click on '-' to minimize it.

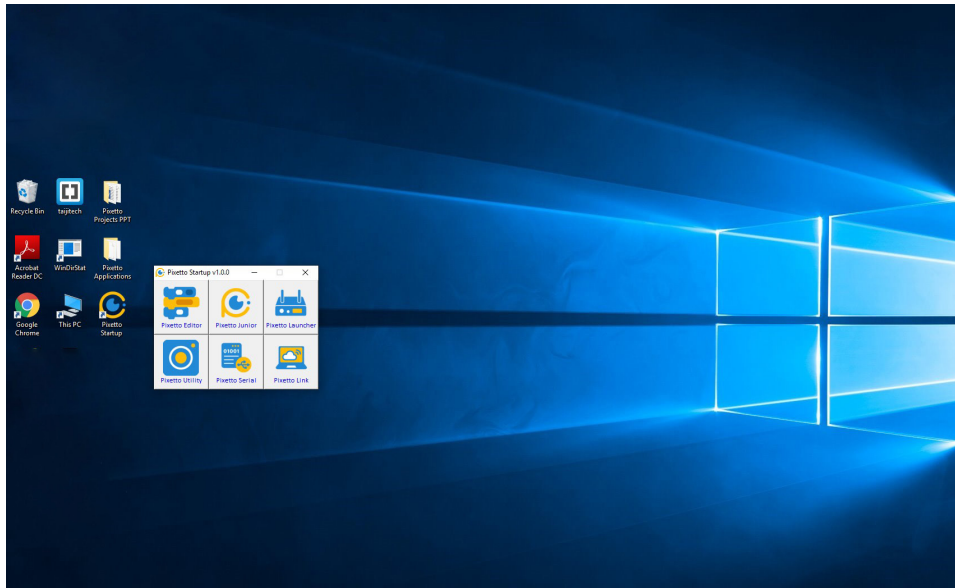


Figure 15: VIA Pixetto shortcut icons diagram

3. How setup the VIA Pixetto Vision Sensor

This section provides information on how to setup the VIA Pixetto vision sensor using a Microsoft Windows PC.

3.1 Connecting VIA Pixetto to a PC

Step 1

Connect the Micro USB 2.0 cable to the Micro USB 2.0 port on the VIA Pixetto vision sensor.

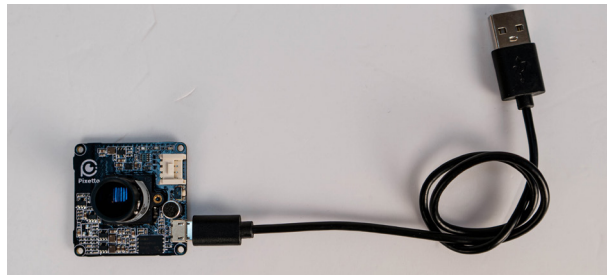


Figure 16: Connecting the Micro USB 2.0 cable to the VIA Pixetto vision sensor

Step 2

Connect the VIA Pixetto vision sensor to a USB 2.0/USB 3.0 port on the PC.



Figure 17: Connecting the VIA Pixetto vision sensor to the computer

Step 3

Wait until the green, blue and red LEDs are lit indicating that the vision sensor is ready to use. Remember to remove the lens cover.

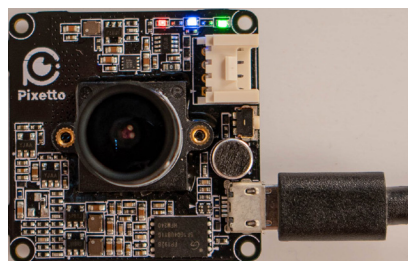


Figure 18: LED light diagram

4. VIA Pixetto Utility Description

The VIA Pixetto Utility gives access to all the setting through the VIA Pixetto Utility interface. By design, the interface gives access to the File, Device, Tools, Window, Languages, and Help menu to check for updates.

4.1 File Menu

File menu has 'Save Debug As' and 'Exit' options.

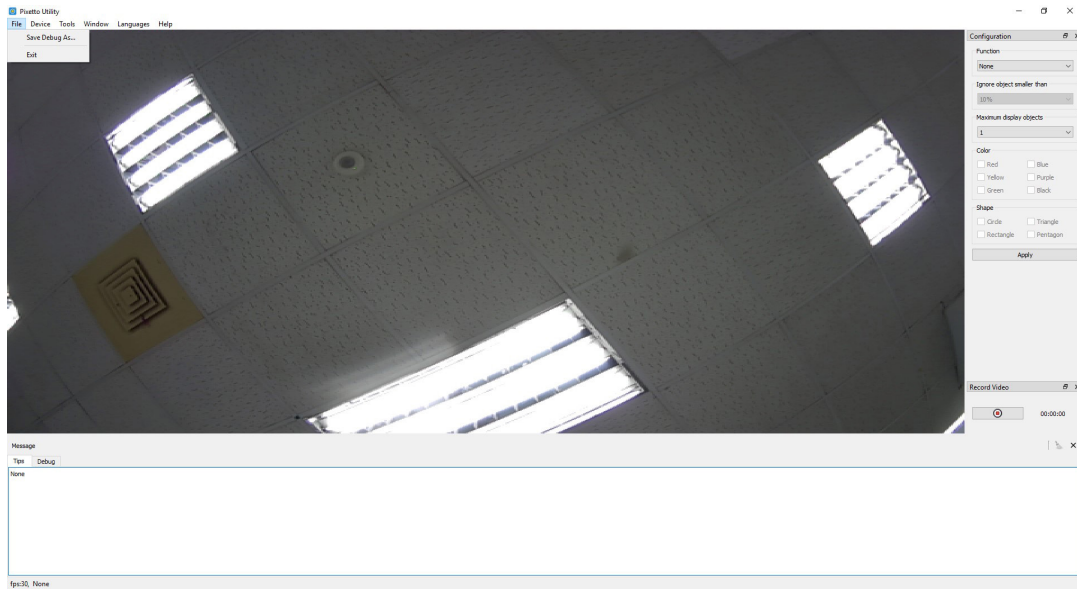


Figure 19: File menu diagram

4.2 Device Menu

Device menu has the 'UVC Camera' setting.

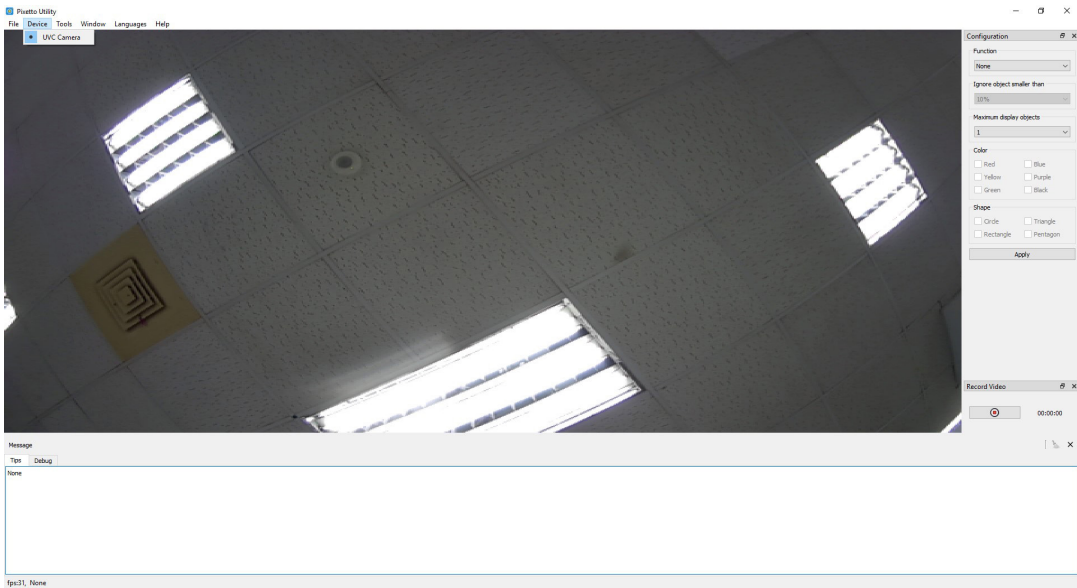


Figure 20: Device menu diagram

4.3 Tool Menu

Tool menu has the 'Frame Sync', 'Wi-Fi' and 'Index Label Editor' settings.

- Frame Sync - has two processes of matching the timing of an incoming video source to the timing of an existing video system, which are Sync and Async.
- Wi-Fi - use to connect the VIA Pixetto vision sensor to a Wi-Fi connection.
- Index Label Editor - use to rename the detected label.

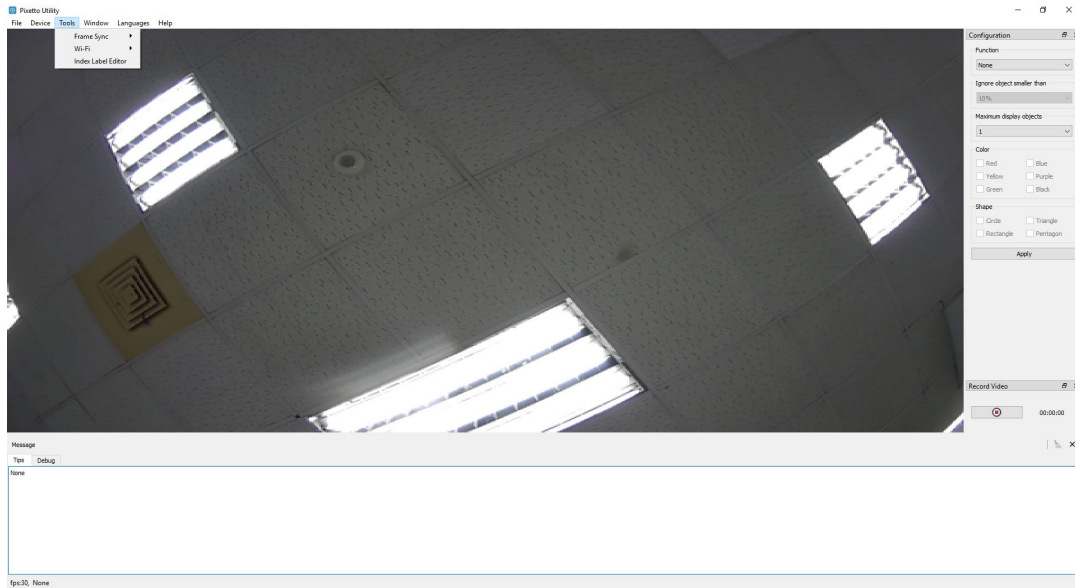


Figure 21: Tool menu diagram

4.4 Window Menu

Window menu has the 'Configuration', 'Messages', 'Install Neural Network model' and 'Record Video' setting.

- Configuration - has the functions to configure the VIA Pixetto vision sensor.
- Messages - has the information of the configuration functions (Tips) and debugging process (Debug).
- Install Neural Network model - use to upload the Neural Network Model file (*.tflite).
- Record Video - use to make recordings using the VIA Pixetto vision sensor.

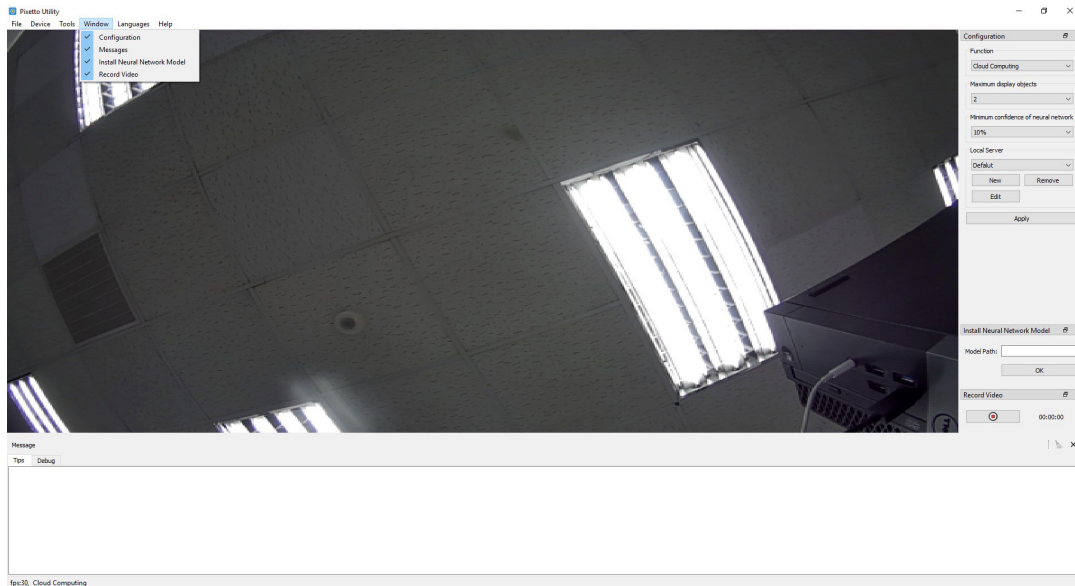


Figure 22: Window menu diagram

4.5 Language Menu

Language menu has three languages to select from: 'English', 'Traditional Chinese' and 'Simplified Chinese'.

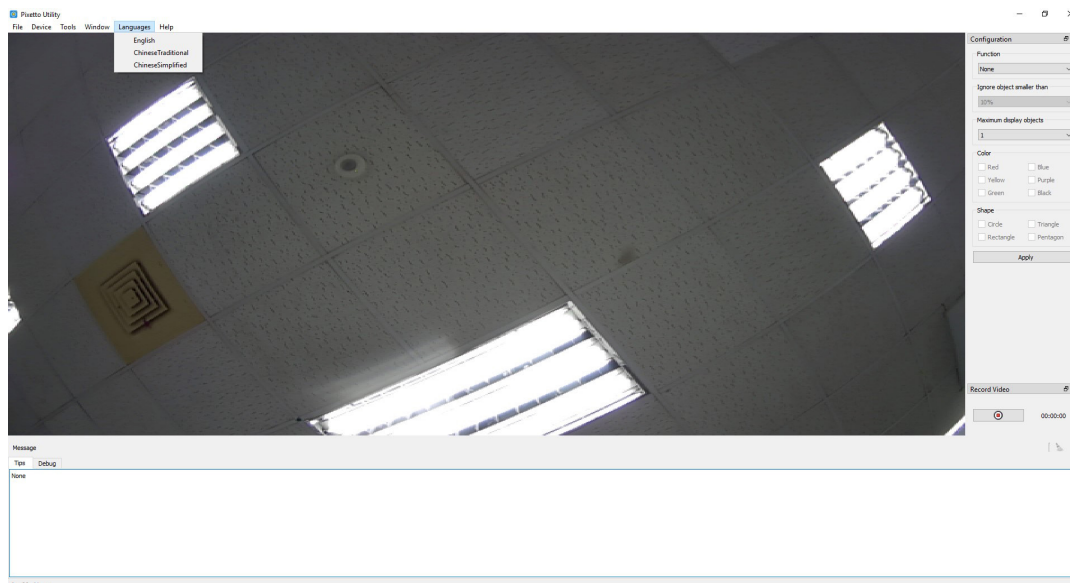


Figure 23: Language menu diagram

4.6 Help Menu

Help menu has the 'About' and 'Check for Update' setting.

- About - has information about the VIA Pixetto vision sensor firmware version and Utility version.
- Check for Update - has information of the latest firmware version and informs the user if they should update the firmware on their VIA Pixetto vision sensor.

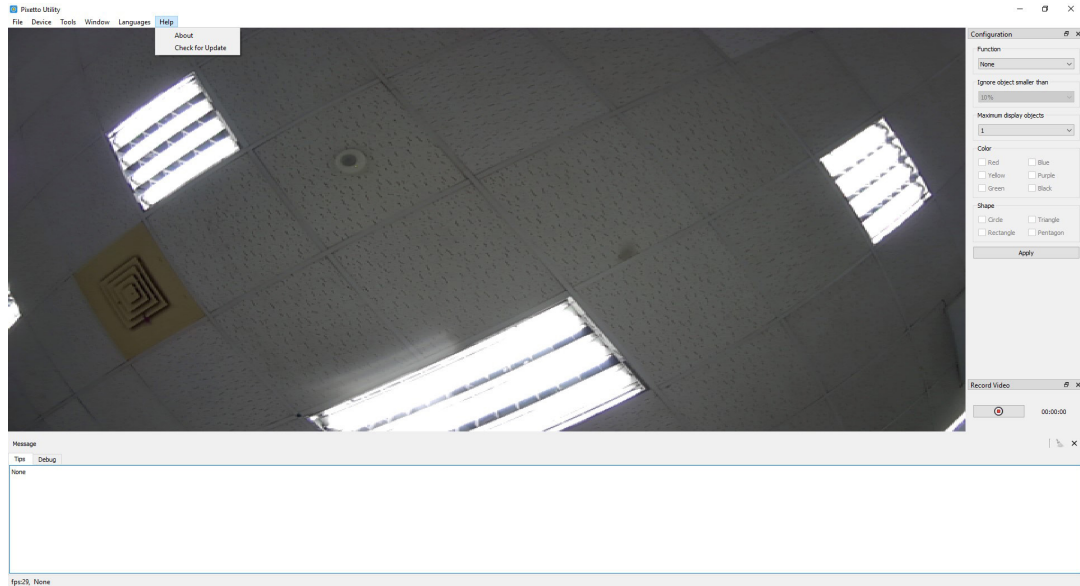


Figure 24: Help menu diagram

4.7 VIA Pixetto Utility Right Side Panel

The VIA Pixetto utility right side panel has the following: Configuration setting, Index Label Editor, Install Neural Network Model, Record Video and Message center at the bottom section of the Utility.

4.7.1 Configuration

Configuration setting has the list of functions that configures the VIA Pixetto vision sensor, colors and shapes options, adjusting the Maximum display objects and Ignore object smaller than functions.

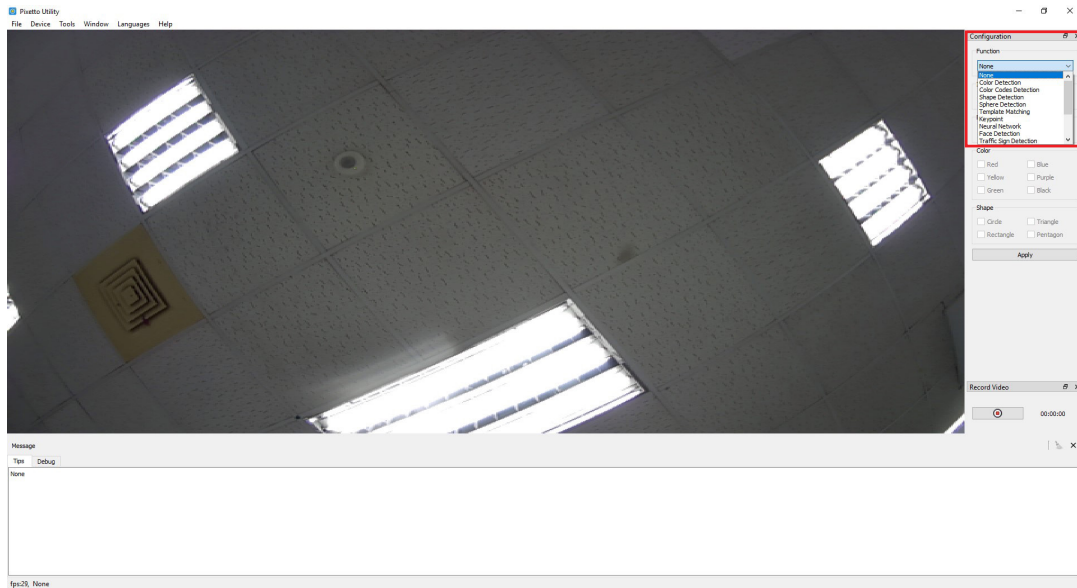


Figure 25: Configuration setting diagram

4.7.1.1 Ignore object smaller than

Ignore object smaller than function can be used to set the VIA Pixetto vision sensor to disregard objects that are smaller than a specific size, ranging from 10~50 percent of the view-point.

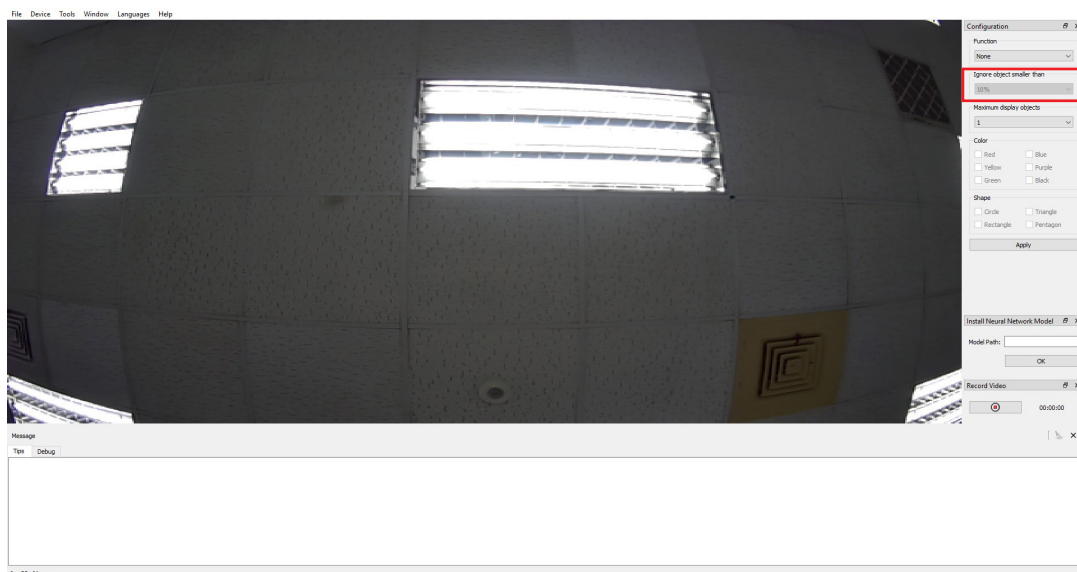


Figure 26: Ignore object smaller than diagram

4.7.1.2 Maximum display objects

Maximum display objects function can be used to set the number of objects the VIA Pixetto vision sensor can detect.

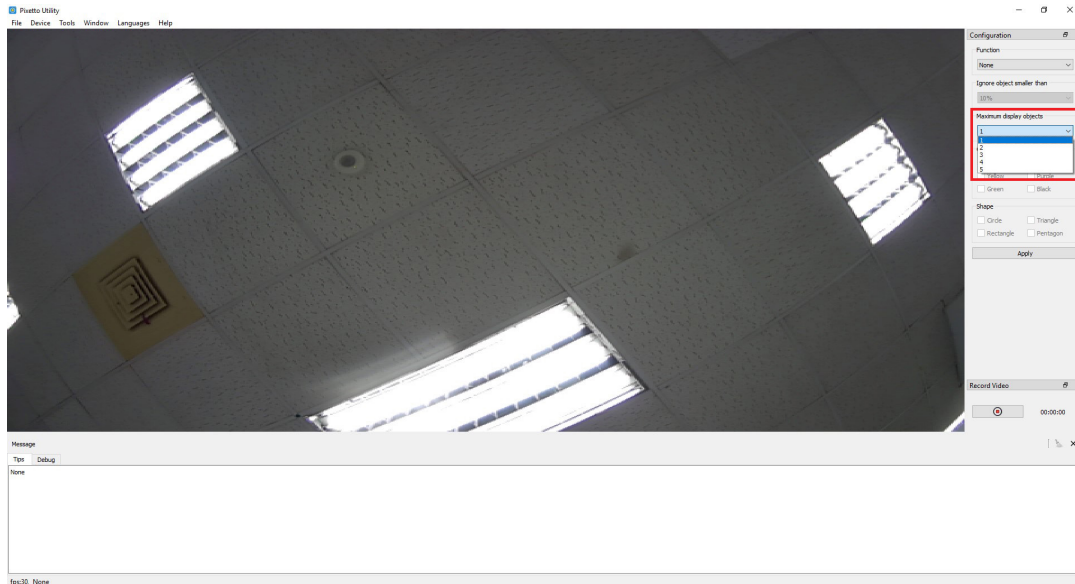


Figure 27: Maximum display objects diagram

4.7.1.3 Color

Color option setting has six different colors to choose from: Red, Yellow, Green, Blue, Purple and Black. The following functions that operates with the color settings are Color Detection, Color Code Detection and Sphere Detection.

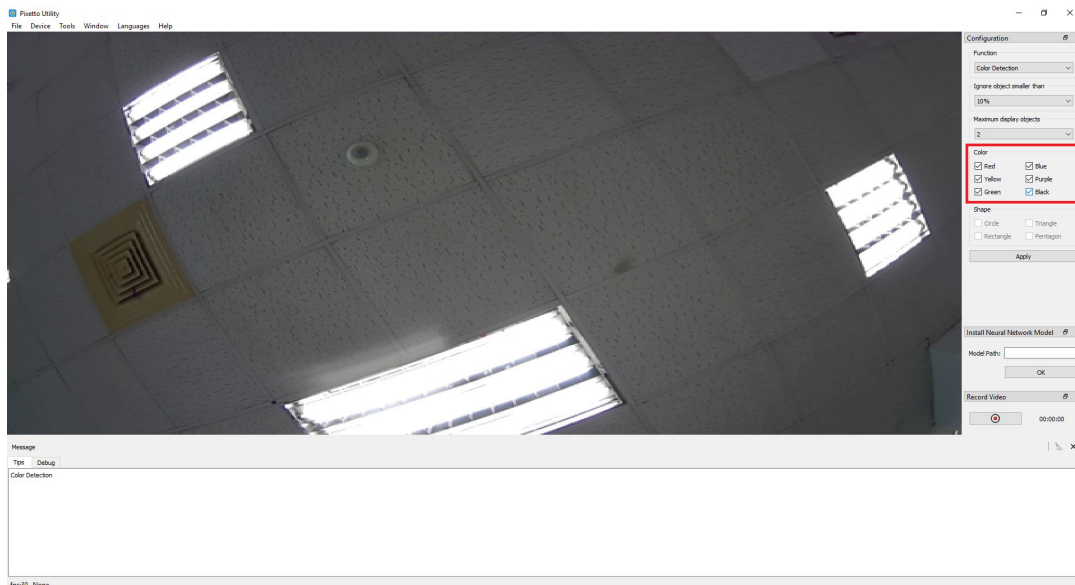


Figure 28: Color diagram

Sphere Detection only operates with the following three: Red, Green and Blue.

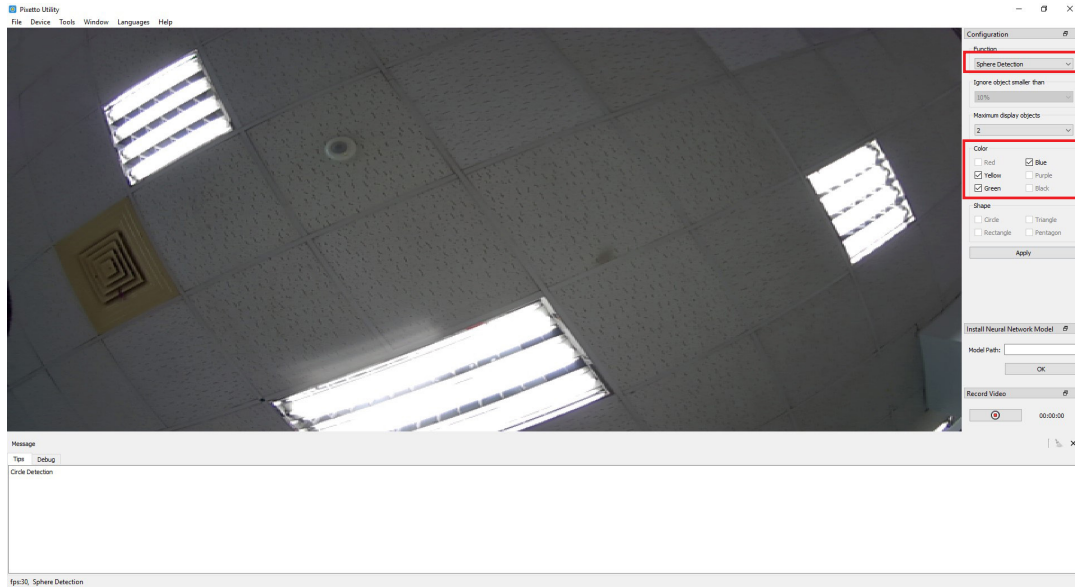


Figure 29: Sphere detection diagram

4.7.1.4 Shape

Shape option setting has four shapes to choose from, including Circle, Rectangle, Triangle and Pentagon for the Shape Detection function.

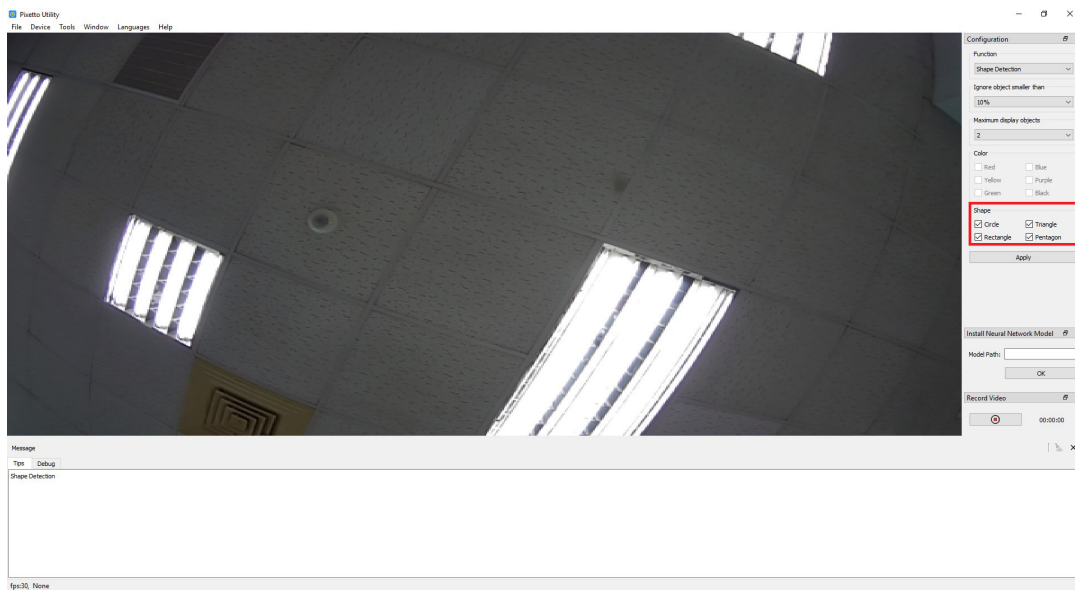


Figure 30: Shape diagram

4.7.1.5 Record Video

Record Video setting use to record videos using the VIA Pixetto vision sensor to be used for Machine Learning function.

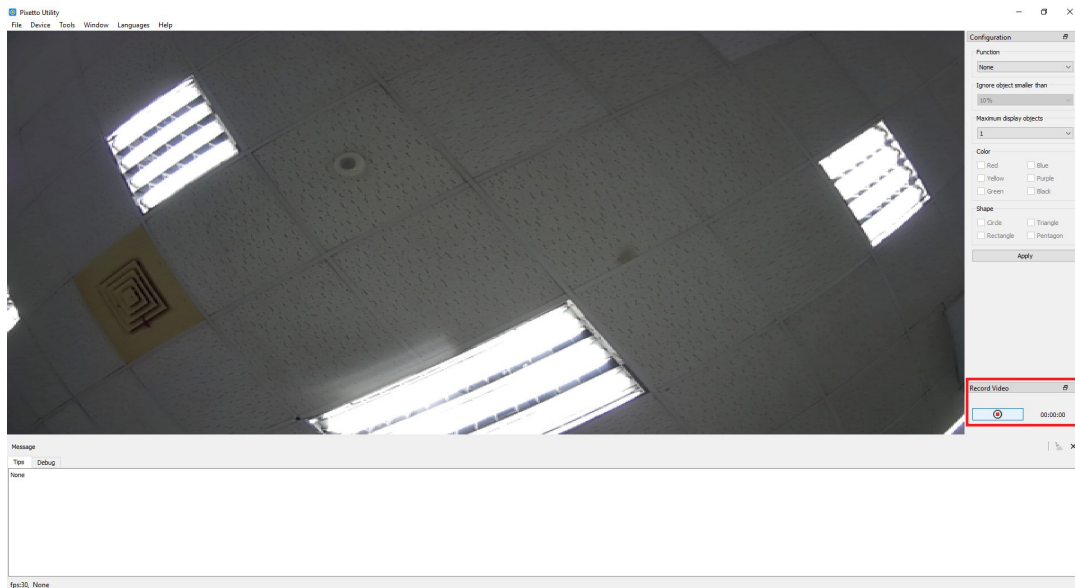


Figure 31: Record video diagram

4.7.1.6 Message

The bottom panel section of the VIA Pixetto Utility has the Message setting which has Tips and Debug tabs information.

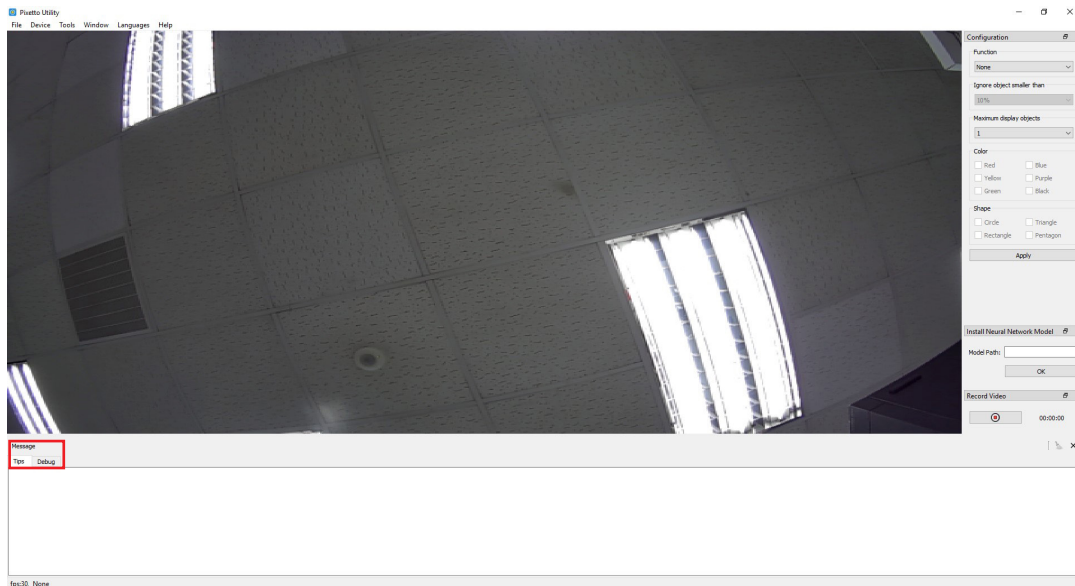


Figure 32: Message diagram

Debug tab gives information on the debugging issues.

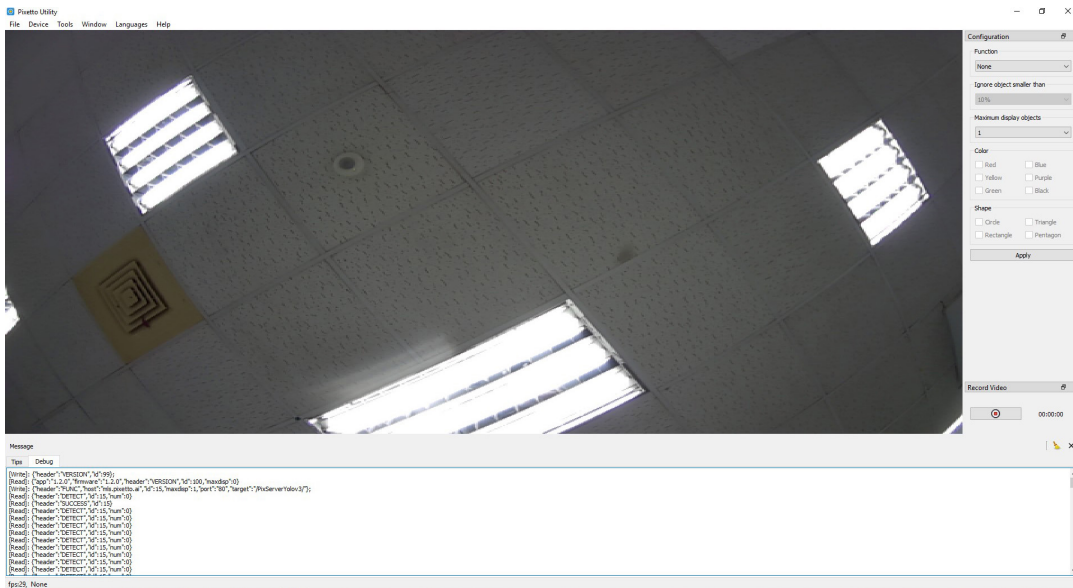


Figure 33: Debug tab diagram

Tips tab gives information on what functions have been selected to configure the VIA Pixetto vision sensor.

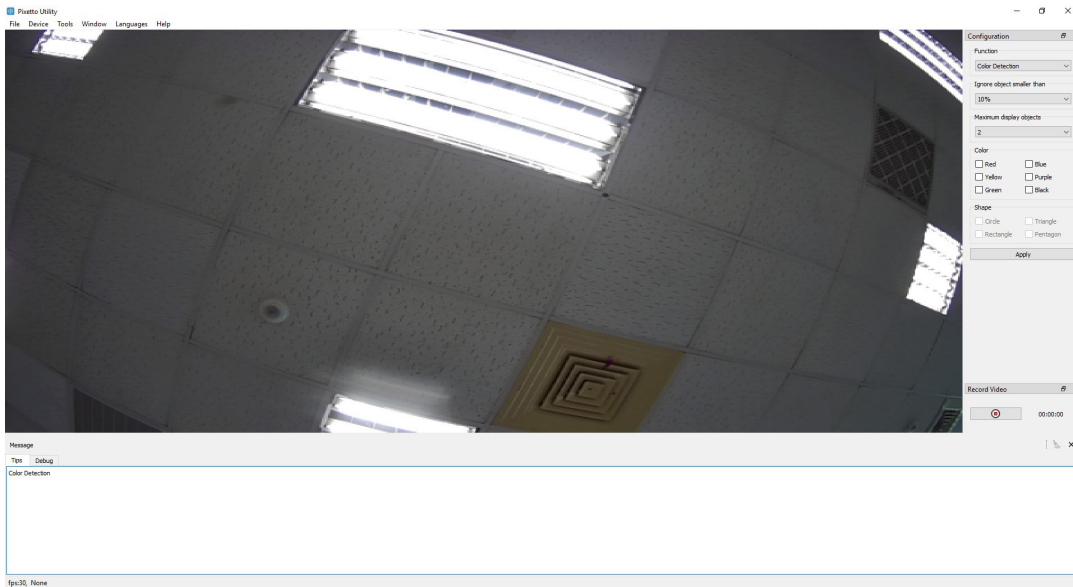


Figure 34: Tips tab diagram

5. How to configure VIA Pixetto Utility Functions

VIA Pixetto Utility is used to configure the VIA Pixetto vision sensor when performing the following functions: Color Detection, Color Code Detection, Shape Detection, Sphere Detection, Keypoint, and Template Matching.

5.1 How to configure Color Detection function

Select the Color Detection function in the VIA Pixetto Utility application to configure the VIA Pixetto vision sensor to detect the following six colors: red, blue, black, green, yellow and purple.

Step 1

To configure this function, open VIA Pixetto Utility. Select 'Color Detection' from the 'Function' menu on the upper right side of the application interface. Select any color by checking its designated box as shown in the diagram below. Click the 'Apply' button. You can now aim the VIA Pixetto vision sensor directly at the color you want to detect.

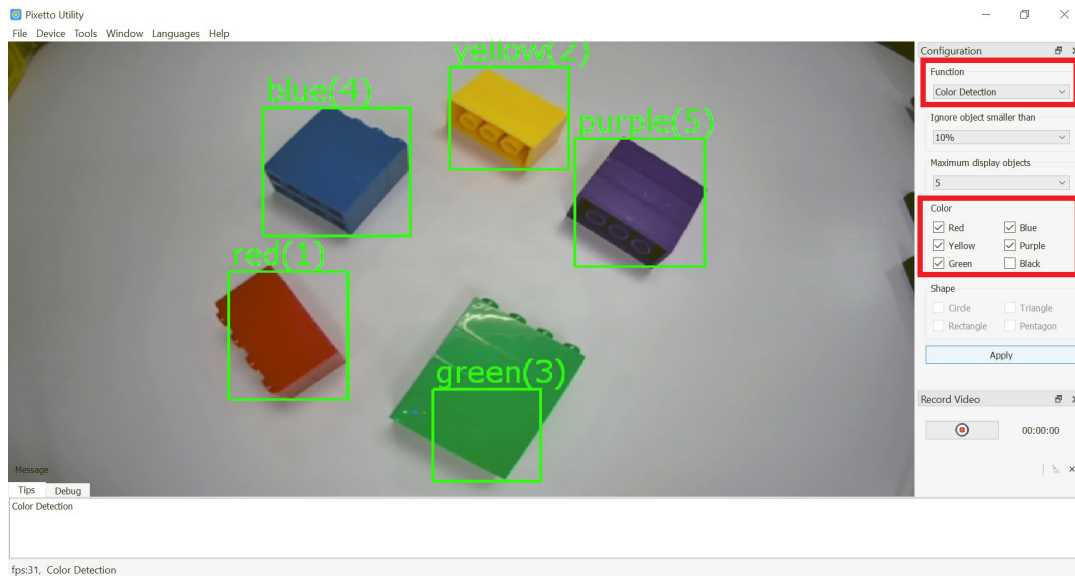


Figure 35: Color Detection diagram

Notes:

1. The 'Ignore object smaller than' function can be used to set the VIA Pixetto vision sensor to disregard objects that are smaller than a specific size, ranging from 10-50 percent of the view-point.
2. The 'Maximum display objects' function can be used to set the number of objects the VIA Pixetto vision sensor can detect.

5.2 How to configure Color Code Detection

Select the Color Code Detection function in the VIA Pixetto Utility application to configure the VIA Pixetto vision sensor to detect two or more color tags placed together and present as a single object.

Step 1

To configure this function, open VIA Pixetto Utility, and select 'Color Code Detection' from the 'Function' menu on the upper right side of the application interface. Select any color by checking its designated box as shown in the diagram below. Click the 'Apply' button. You can now aim the VIA Pixetto vision sensor directly at the colors you want to detect.

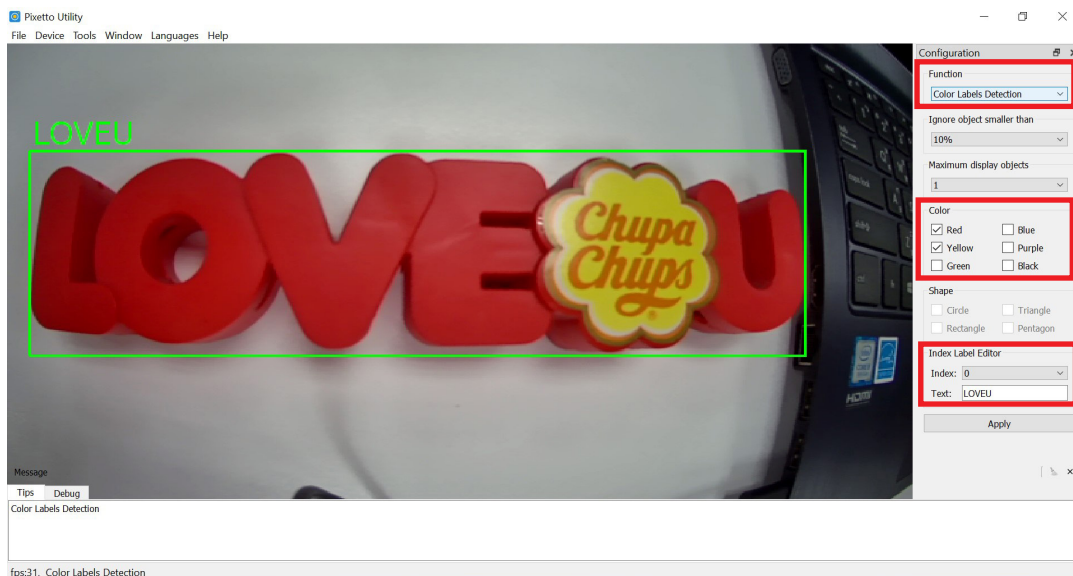


Figure 36: Color Code Detection diagram

Notes:

1. The 'Ignore object smaller than' function can be used to set the VIA Pixetto vision sensor to disregard objects that are smaller than a specific size, ranging from 10-50 percent of the view-point.
2. The 'Maximum display objects' function can be used to set the number of objects the VIA Pixetto vision sensor can detect.
3. The 'Index Label Editor' can be used to rename the detected label. For example, below you can see that the Index Label Editor has been used to rename the label detected as 'LOVEU'.

5.3 How to configure Shape Detection

Select Shape Detection in the VIA Pixetto Utility application to configure the VIA Pixetto vision sensor to detect shapes in the following forms: circle, triangle, rectangle, and pentagon.

Step 1

To configure this function, open VIA Pixetto Utility and select 'Shape Detection' from the 'Function' menu on the upper right side of the application interface. Select any shape by checking its designated box as shown in the diagram below. Click the 'Apply' button. You can now aim the VIA Pixetto vision sensor directly at the shape you want to detect.

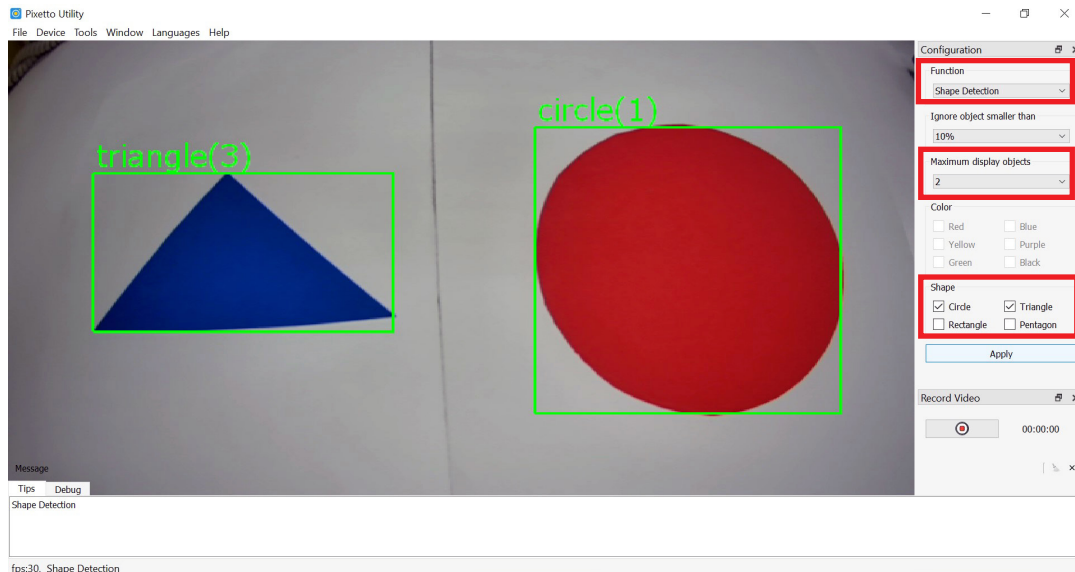


Figure 37: Triangle and Circle Shape Detection diagram

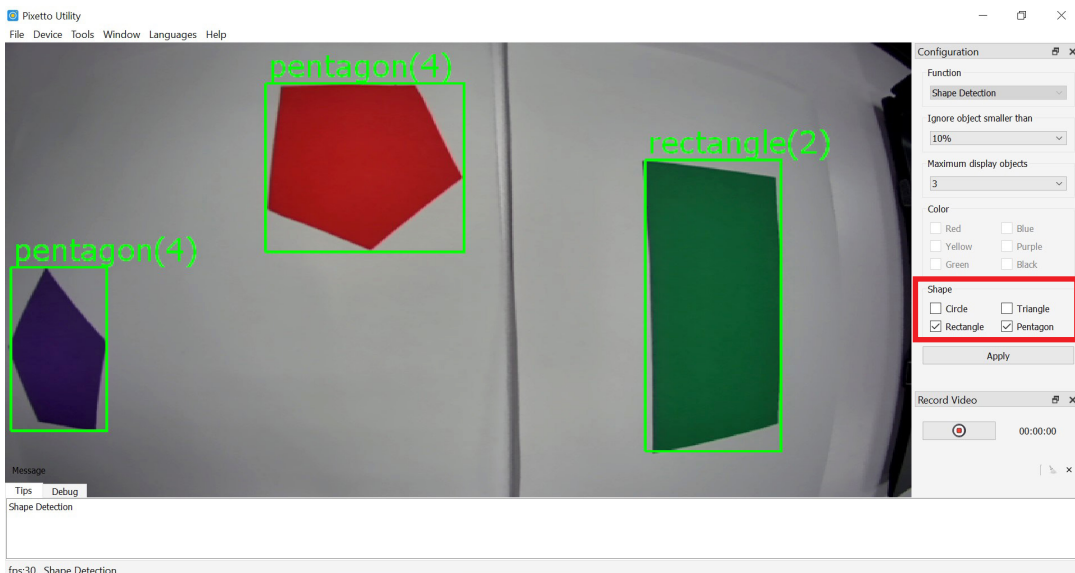


Figure 38: Rectangle and Pentagon Shape Detection diagram

Notes:

1. The 'Ignore object smaller than' function can be used to set the VIA Pixetto vision sensor to disregard objects that are smaller than a specific size, ranging from 10-50 percent of the view-point.
2. The 'Maximum display objects' function can be used to set the number of objects the VIA Pixetto vision sensor can detect.

5.4 How to configure Sphere Detection

Select Sphere Detection in the VIA Pixetto Utility application to configure the VIA Pixetto vision sensor to detect Spherical objects in the following colors: red, blue, yellow, purple, green and black.

Step 1

To configure this function, open VIA Pixetto Utility, then select 'Sphere Detection' from the 'Function' menu on the upper right side of the application interface. Select any color by checking its designated box as shown in the diagram below. Click the 'Apply' button. You can now aim the VIA Pixetto vision sensor directly at the Sphere object you want to detect.

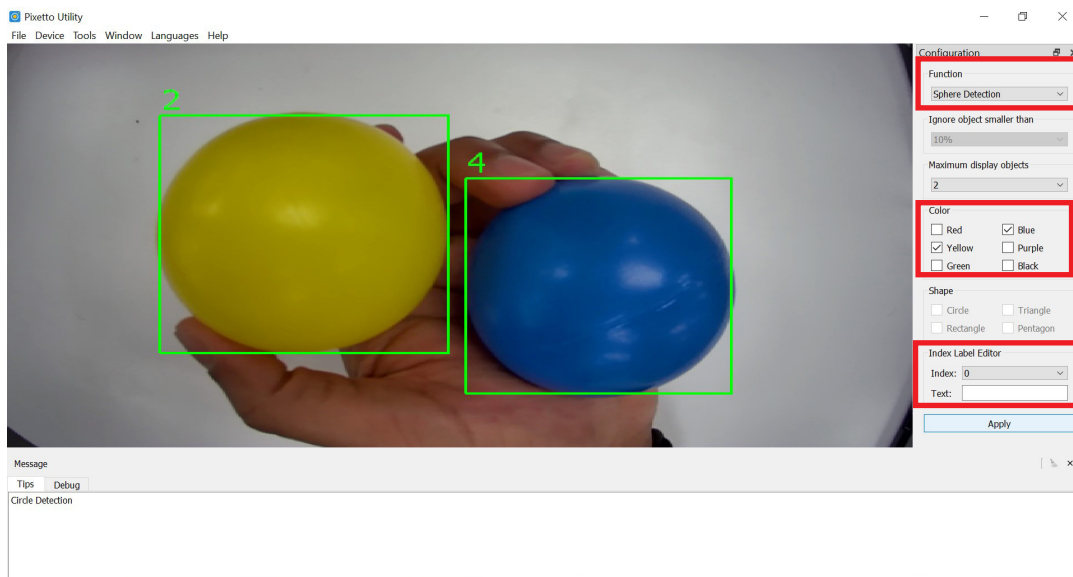


Figure 39: Sphere Detection diagram

Notes:

1. The 'Ignore object smaller than' function can be used to set the VIA Pixetto vision sensor to disregard objects that are smaller than a specific size, ranging from 10-50 percent of the view-point.
2. The 'Maximum display objects' function can be used to set the number of objects the VIA Pixetto vision sensor can detect.
3. The 'Index Label Editor' can be used to rename the detected Spheres.

5.5 How to configure Template Matching

Select the Template Matching function in the VIA Pixetto Utility application to configure the VIA Pixetto vision sensor to locate a specific area on an image.

Step 1

To configure this function, open VIA Pixetto Utility, and select 'Template Matching' from the 'Function' menu on the right side of the application interface.

Next, aim the VIA Pixetto vision sensor at the area of the image, then highlight the area on the image you want to template using the mouse, then select 'Apply'.

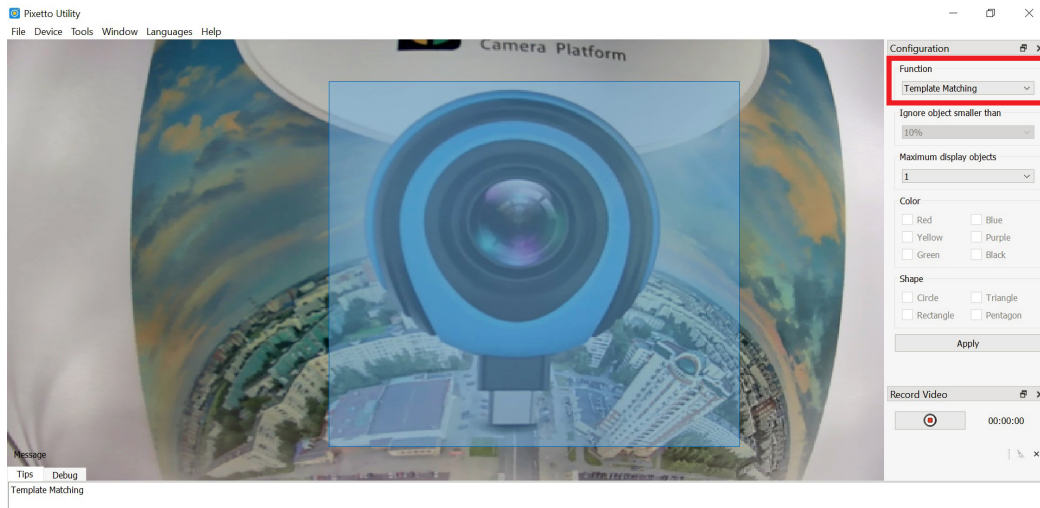


Figure 40: Highlighting template diagram

Step 2

To name the template area, use the Index Label Editor by entering the name in the 'Text' box as shown in the image below and select 'Apply'. Next, aim the VIA Pixetto vision sensor directly at the template area to detect it.

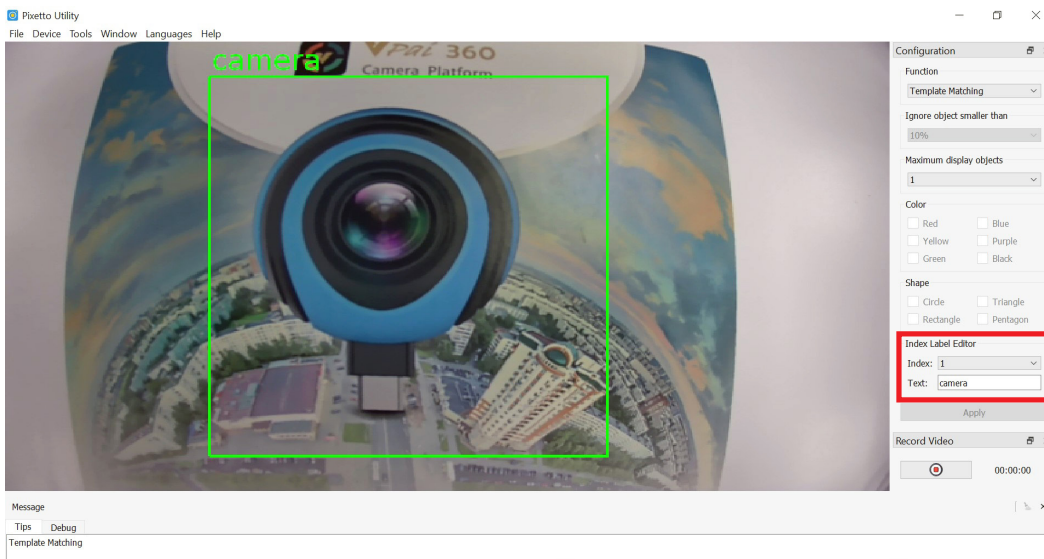


Figure 41: Template Matching diagram

Note:

The 'Maximum display objects' function can be used to set the number of objects the VIA Pixetto vision sensor can detect.

5.6 How to configure Keypoint

Select the Keypoint function in the VIA Pixetto Utility application to configure the VIA Pixetto vision sensor to located specific keypoints on an image or a body part.

Step 1

To configure this function, open VIA Pixetto Utility, then select 'Keypoint' under the 'Function' menu on the upper right side of the application interface. Next, aim the VIA Pixetto vision sensor directly at the area to locate the keypoints, as shown below in the image.

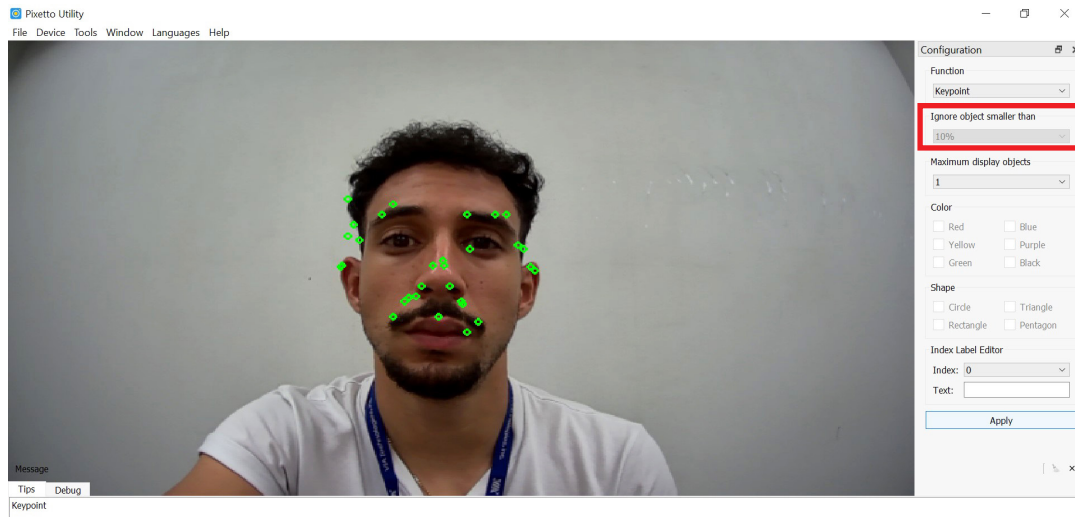


Figure 42: Keypoints diagram

Step 2

When the keypoints are located, a green box will highlight the keypoint area. To name the Keypoint area use the Index Label Editor by entering the name in the 'Text' box as shown in the image below. Next, aim the VIA Pixetto vision sensor at the Keypoint area to detect it.

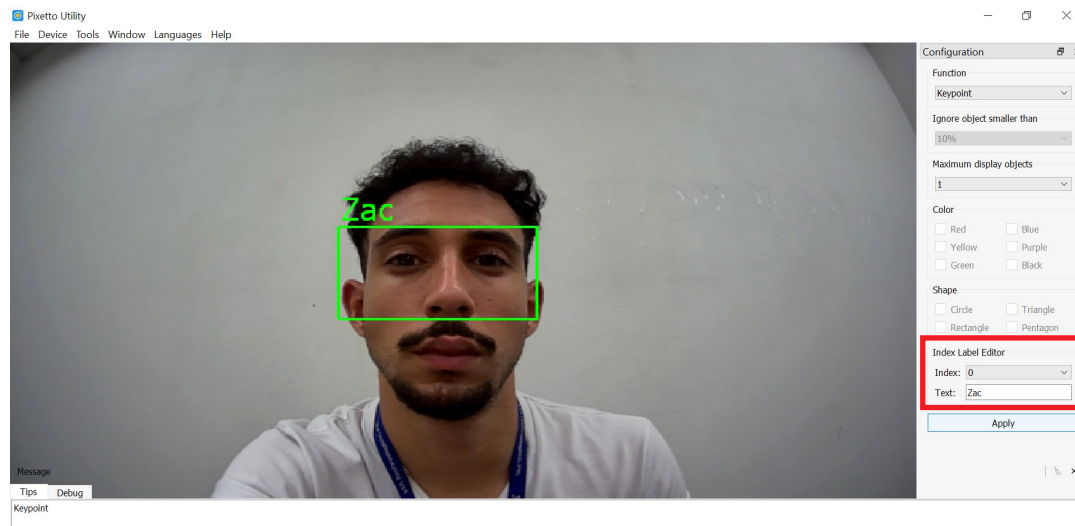


Figure 43: Keypoints detected diagram

Note:
The 'Maximum display objects' function can be used to set the number of objects the VIA Pixetto vision sensor can detect.

5.7 How to configure Face Detection

Select the Face Detection function in the VIA Pixetto Utility application to configure the VIA Pixetto vision sensor to detect the facial features of a person.

Step 1

To configure this function, open VIA Pixetto Utility, then select 'Face Detection' from the 'Function' menu on the upper right side of the application interface.

When the facial features of the person are detected, a green box will highlight the facial area. To name it, use the Index Label Editor by entering the name of the person in the 'Text' box as shown in the image below. Next, aim the VIA Pixetto vision sensor directly at the face of the person that you want to detect as shown below in the image.

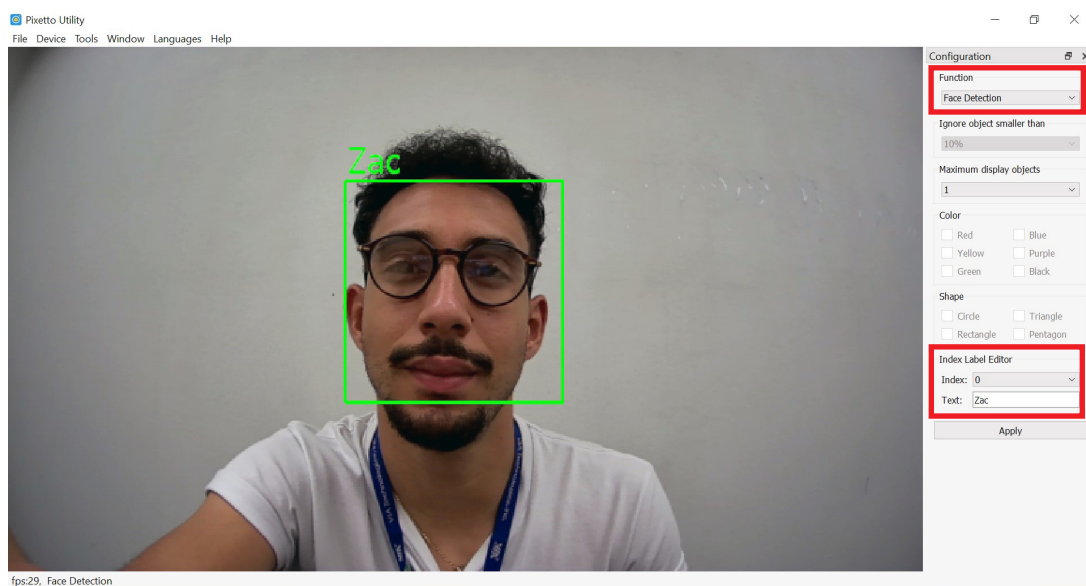


Figure 44: Face Detection diagram

Note:

The 'Maximum display objects' function can be used to set the number of objects the VIA Pixetto vision sensor can detect.

5.8 How to configure Apriltag

Select the Apriltag (16H5) function in the VIA Pixetto Utility application to configure the VIA Pixetto vision sensor to detect different tag commands.

Step 1

To configure this function, open VIA Pixetto Utility, then select 'Apriltag (16H5)' from the 'Function' menu on the upper right side of the application interface. When the Apriltag features of the tag is detected, a green box will highlight the tag area. Next, aim the VIA Pixetto vision sensor directly at tags that you want to detect as shown below in the image.

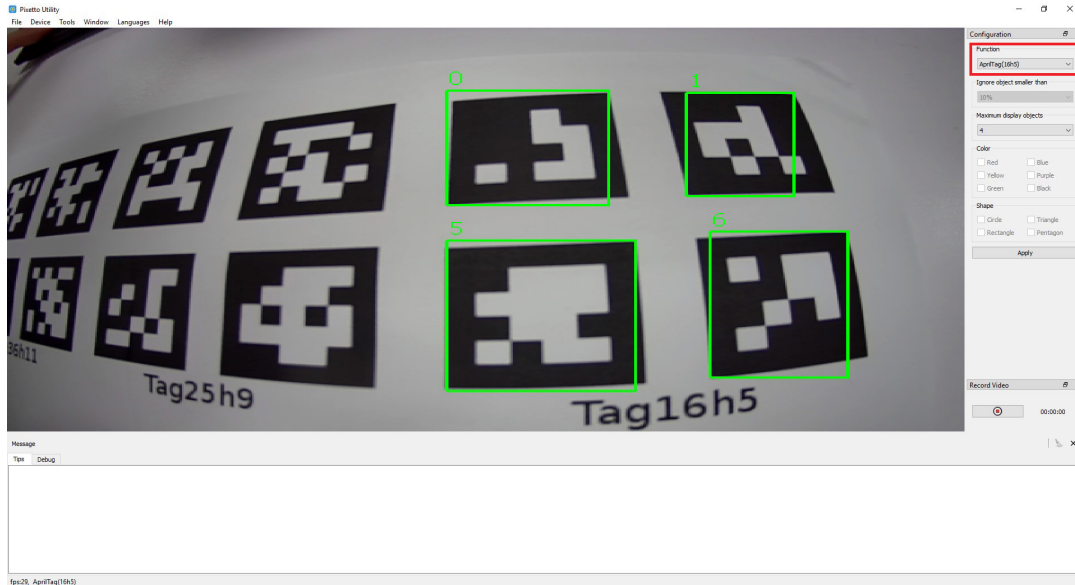


Figure 45: Apriltag diagram

Note:

1. The 'AprilTag' is a visual fiducial system, useful for a wide variety of tasks including augmented reality, robotics, and camera calibration. Targets can be created from an ordinary printer, and the AprilTag detection software computes the precise 3D position, orientation, and identity of the tags relative to the camera.
2. The 'Maximum display objects' function can be used to set the number of objects the VIA Pixetto vision sensor can detect.

5.9 How to configure Cloud Computing

Select the Cloud Computing function in the VIA Pixetto Utility application to configure the VIA Pixetto vision sensor to detect a person or different objects which are stored on a remote network server hosted on the internet.

Step 1

To connect the VIA Pixetto vision sensor to the Wi-Fi, go to the Tools menu setting on the VIA Pixetto Utility interface. Click on it, a dropdown menu will display, go to 'Wi-Fi' and connect to a 'Wi-Fi device'.

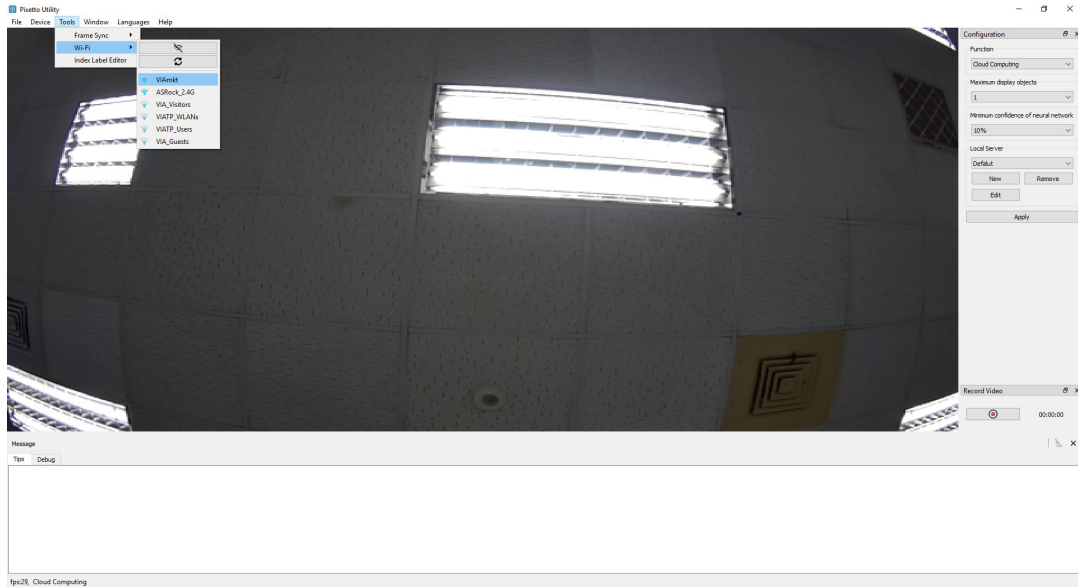


Figure 46: Wi-Fi connection diagram

When connected a pop-up screen will display 'Successfully connected' to the Wi-Fi device.

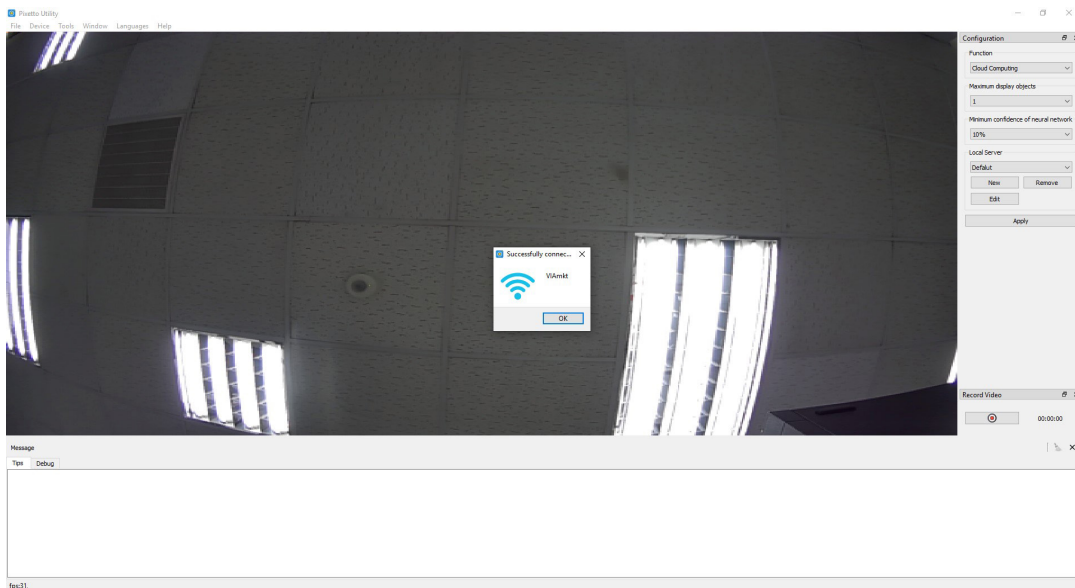


Figure 47: Successfully connected Wi-Fi diagram

Step 2

To configure this function, open VIA Pixetto Utility, then select 'Cloud Computing' from the 'Function' menu on the upper right side of the application interface. Click 'Apply' then aim the VIA Pixetto vision sensor directly at any object in an open space area.

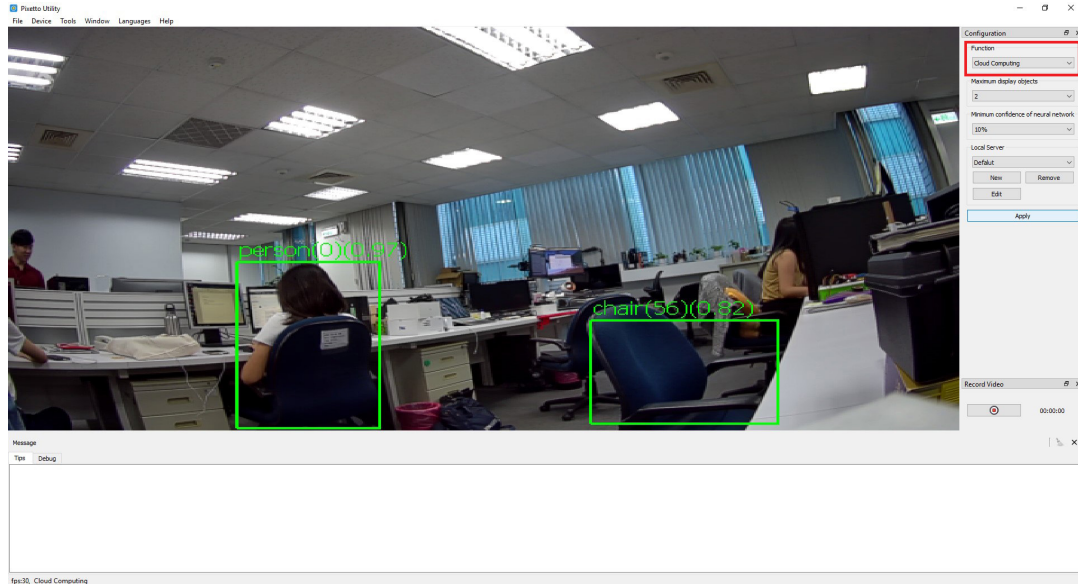


Figure 48: Cloud Computing diagram

Local Server Sections:

- Local Server: Default
- New: Create your own local Server
- Remove: Use to remove the local server you created
- Edit: Use to edit the server you created

Note:

1. Cloud computing is the practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer.
2. The 'Maximum confidence of neural network' function can be used to increase the VIA Pixetto vision sensor assurance to detect an object.
3. The 'Maximum display objects' function can be used to set the number of objects the VIA Pixetto vision sensor can detect.

5.9.1 How to connect the VIA Pixetto vision sensor to a local server.

To create a new local server the user must understand how to use Python and how to make a Python environment. To learn how to create a local server, click the following link for details [Pixetto Docs](#).

Step 1

Connect the VIA Pixetto to your PC and then open the VIA Pixetto Utility.

Step 2

Go to 'Tools' menu. Click on the 'Wi-Fi' to select a Wi-Fi device to connect.

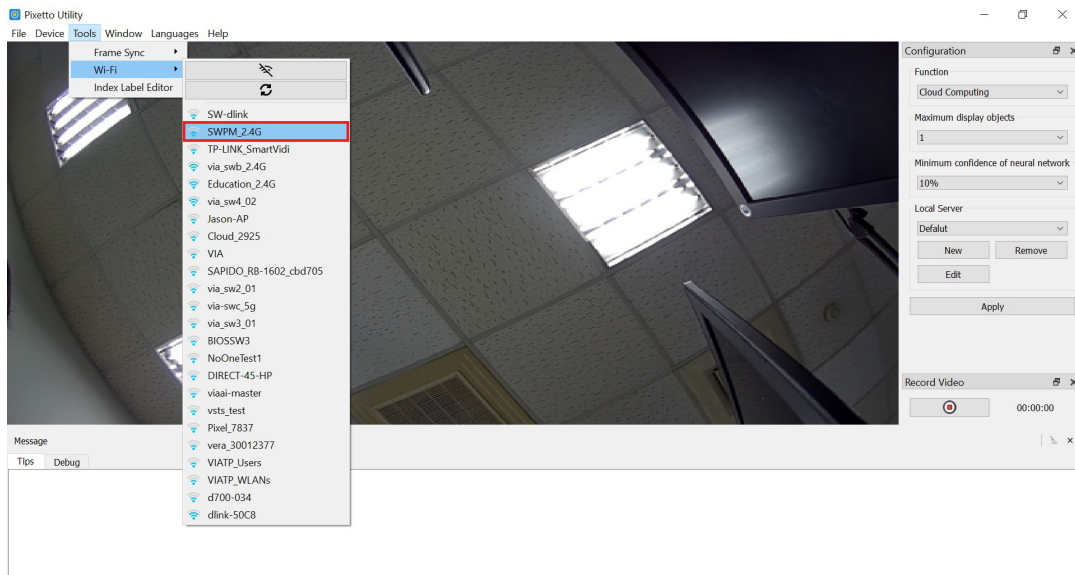


Figure 49: Connect to Wi-Fi device diagram

Step 3

Select the 'Cloud Computing' function from the right panel, and then click on the 'New' button under the Local Server menu to open the pop-up window.

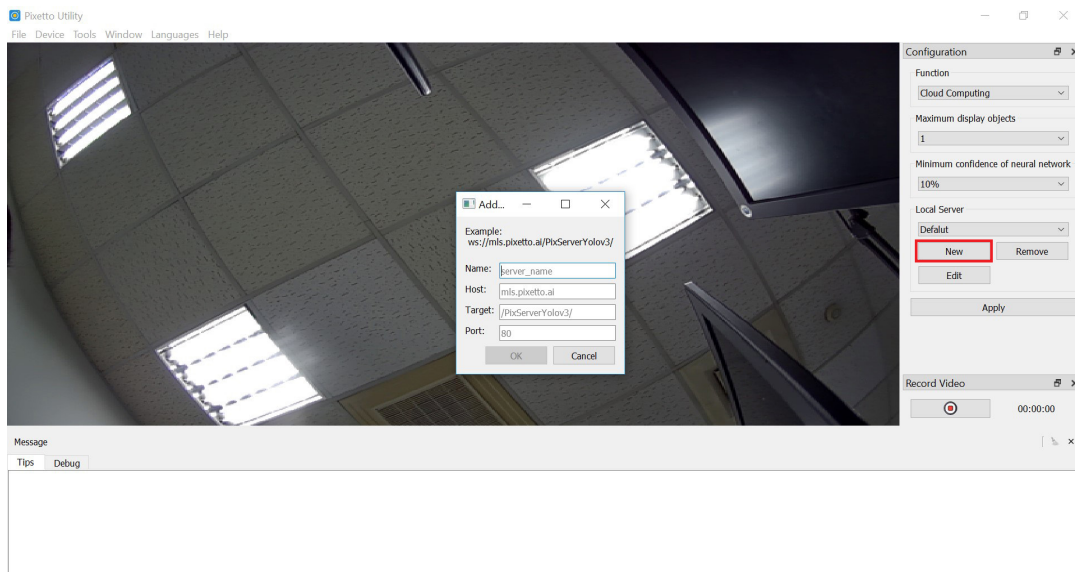


Figure 50: Local Server pop-up window diagram

Step 4

Enter the information that was created to create a connection between the VIA Pixetto vision sensor to and the local server. When you are finished, click the 'Ok' button to complete the link connection.

- Name: server name created by the user
- Host: local server IP address
- Target: Cloud base address of the local server
- Port: port number given by user

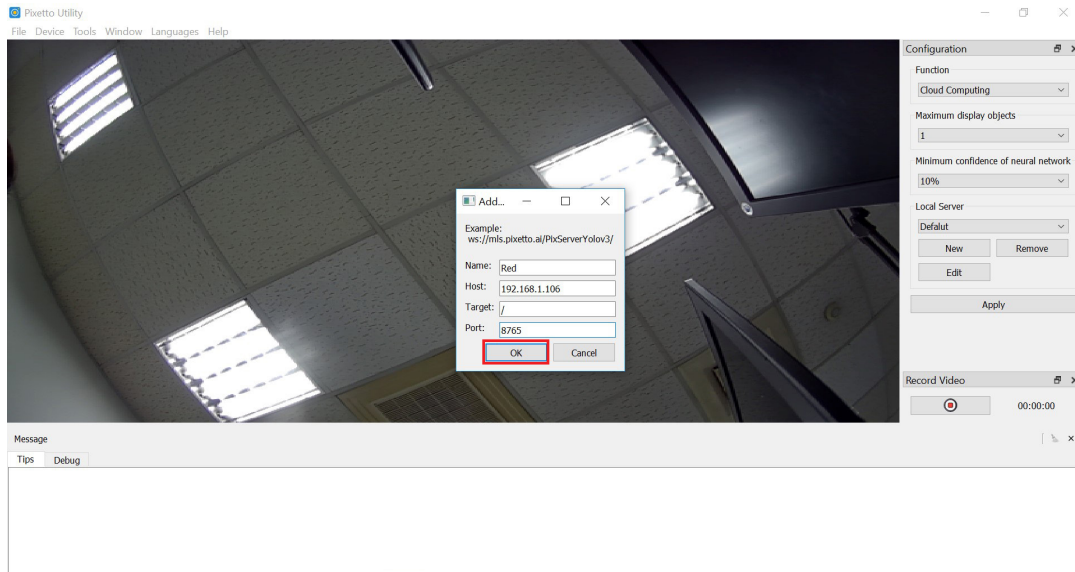


Figure 51: Uploading Local Server information to VIA Pixetto diagram

Note:

If you create a local server you only need to enter a '/' symbol on the Target section, but if you create a cloud server you need to get the link and enter it into the Target section.

Step 6

Click the 'Apply' button to connect the VIA Pixetto vision sensor to the new local server which is named 'Red'. Lastly, aim the VIA Pixetto vision sensor at any red object to detect it.

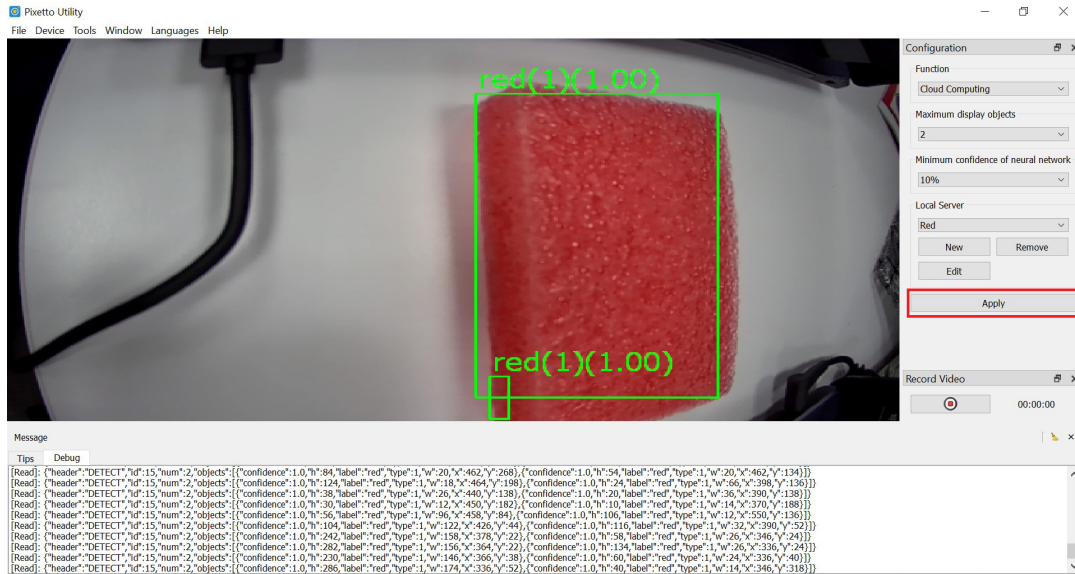


Figure 52: Red object diagram

Note:

1. The 'Minimum confidence of neural network' function can be used to increase the VIA Pixetto vision sensor assurance to detect an object.
2. The 'Maximum display objects' function can be used to set the number of objects the VIA Pixetto vision sensor can detect.

5.10 How to configure Lane Detection

Select the Lane Detection function in the VIA Pixetto Utility application to configure the VIA Pixetto vision sensor to detect lines on the side of a lane and use the detected lines to generate a goal point.

Step 1

To configure this function, open VIA Pixetto Utility, then select 'Lane Detection' from the 'Function' menu on the upper right side of the application interface. Click the 'Apply' button, then aim the VIA Pixetto vision sensor directly at the lanes.

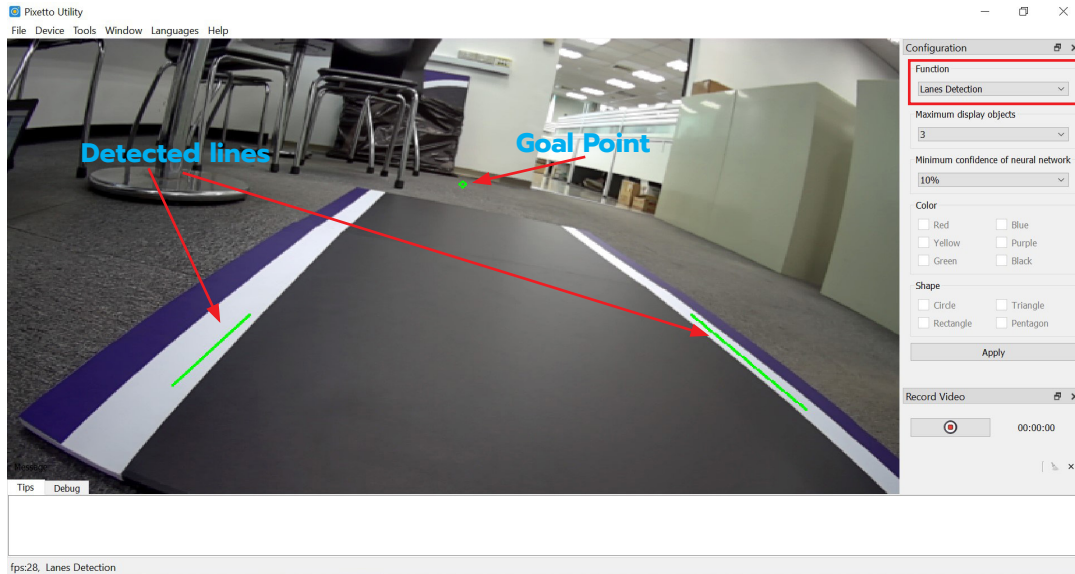


Figure 53: Lane Detection diagram

Note:

The 'Minimum confidence of neural network' function can be used to increase the VIA Pixetto vision sensor assurance to detect an object.

5.11 How to configure Digits Operation

Select the Digits Operation function in the VIA Pixetto Utility application to configure the VIA Pixetto vision sensor to compute the digits sum of the equation, then add the digits of the result until we obtain a single digit number which can be handwritten or printed for example, $4+6+8 = 18$.

Step 1

To configure this function, open VIA Pixetto Utility, then select 'Digits Operation' from the 'Function' menu on the upper right side of the application interface. You can write the digits or print them out as shown below.

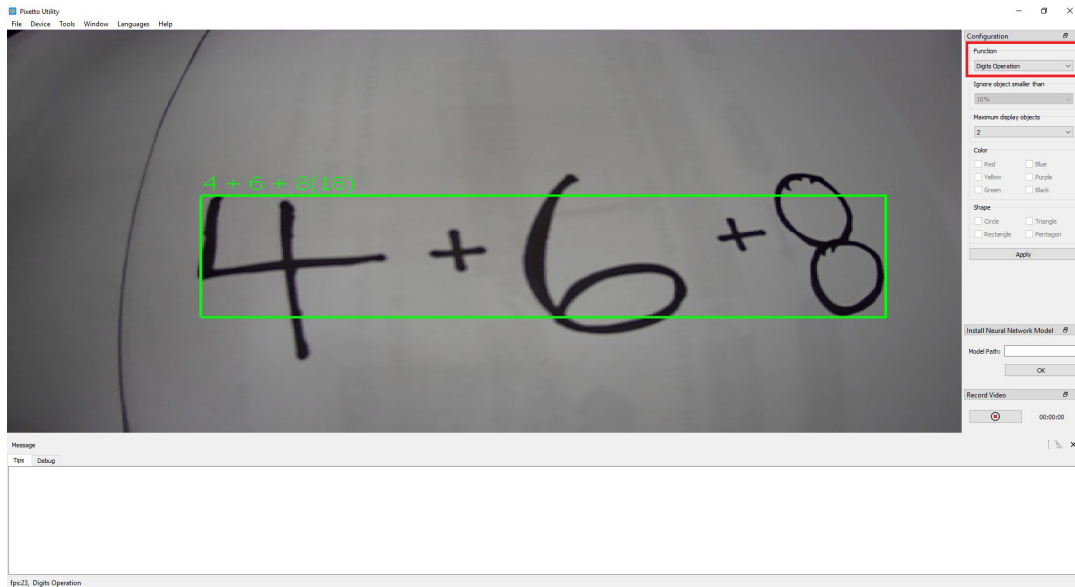


Figure 54: Digits Operation diagram

Note:

The 'Maximum display objects' function can be used to set the number of objects the VIA Pixetto vision sensor can detect.

6. How to use the VIA Pixetto Machine Learning Accelerator

This section provides information on how to use the VIA Pixetto Machine Learning Accelerator. The Machine Learning Accelerator is a cloud server used for training the VIA Pixetto vision sensor to perform different Computer Vision and Neural Network tasks.

6.1 How to use Pre-trained Models

The VIA Pixetto Machine Learning Accelerator comes with three easy-to-download pre-trained models: Handwriting recognition for digits, Handwriting recognition for letters, and Traffic sign recognition. The following steps below will show you how to download and train the VIA Pixetto vision sensor with these models.

Step 1

Open the VIA Pixetto Machine Learning Accelerator at <https://mls.pixetto.ai/>



Figure 55: Machine Learning Accelerator diagram

Step 2

Click the 'Login' button to open the login screen. Log in by entering a user name, and click the 'Login' button.



Figure 56: User Login diagram

Click the 'OK' button on the welcome pop-up message.

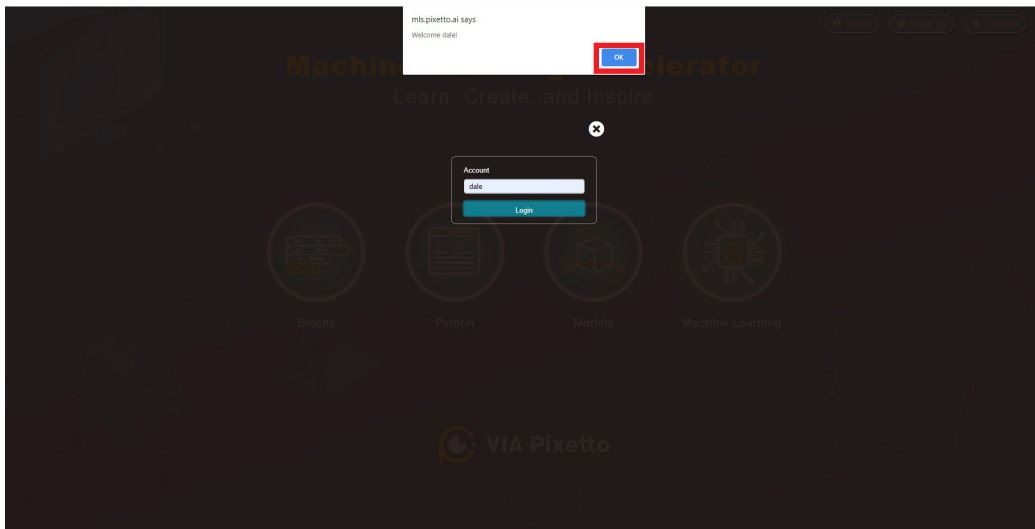


Figure 57: Login pop-up message diagram

Step 3

Click on the 'Models' icon.



Figure 58: Model icon diagram

Step 4

You will see the three available models; Handwriting recognition for digits, letters, and Traffic sign recognition.



Figure 59: Pre-trained models diagram

Note:
 If this notification pops-up, make sure to open the Pixetto Link so the download can proceed. You can also use the cancel icon to stop the download process.

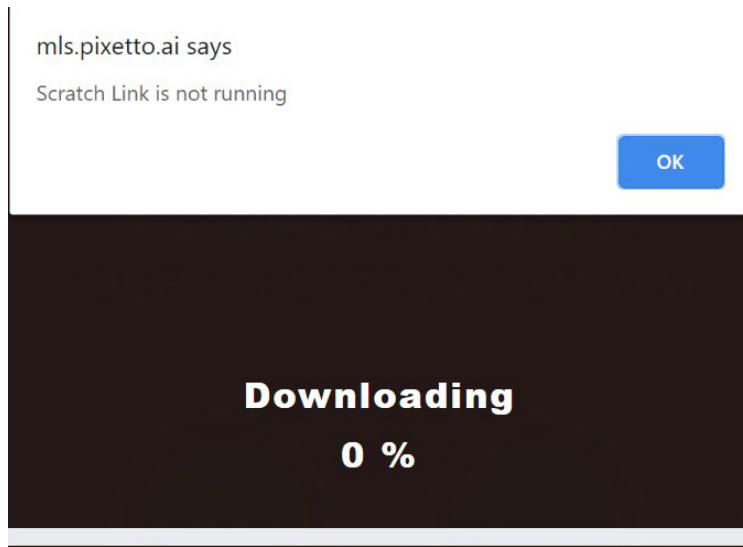


Figure 60: Pixetto Link Notification diagram

Step 5

Click on the 'Handwriting recognition for digits' icon to download the pre-trained model. You can also click on the other model icons to download them.

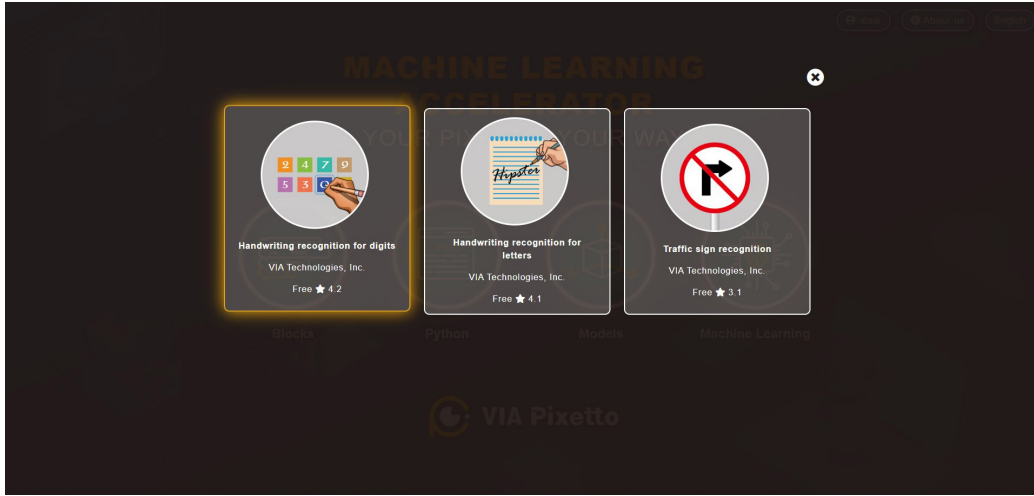


Figure 61: Handwriting recognition for digits icon diagram

Note: Make sure that your VIA Pixetto vision sensor is connected to the device you are using. If it's not connected a pop-up notification will appear on your PC.

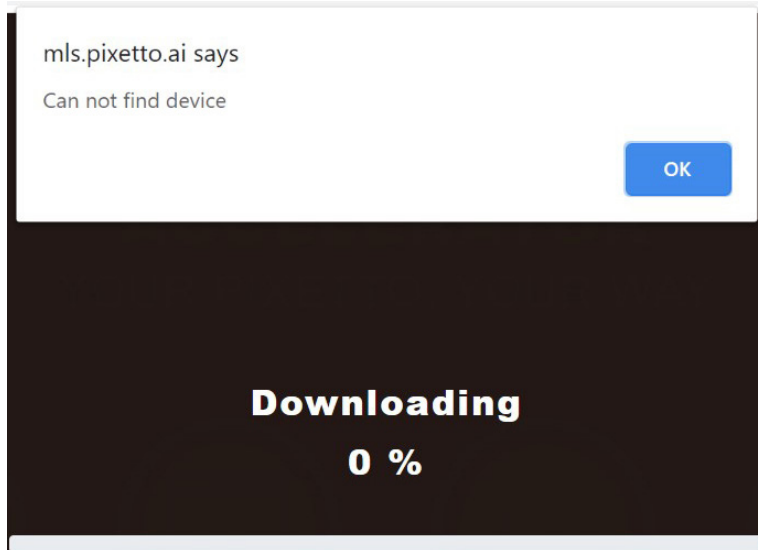


Figure 62: VIA Pixetto vision sensor notification diagram

Step 6

Open the VIA Pixetto Utility application and start identifying the model. When the model is downloaded, click on the cancel button to return to the model platform. The recognition results of the three models are shown below.

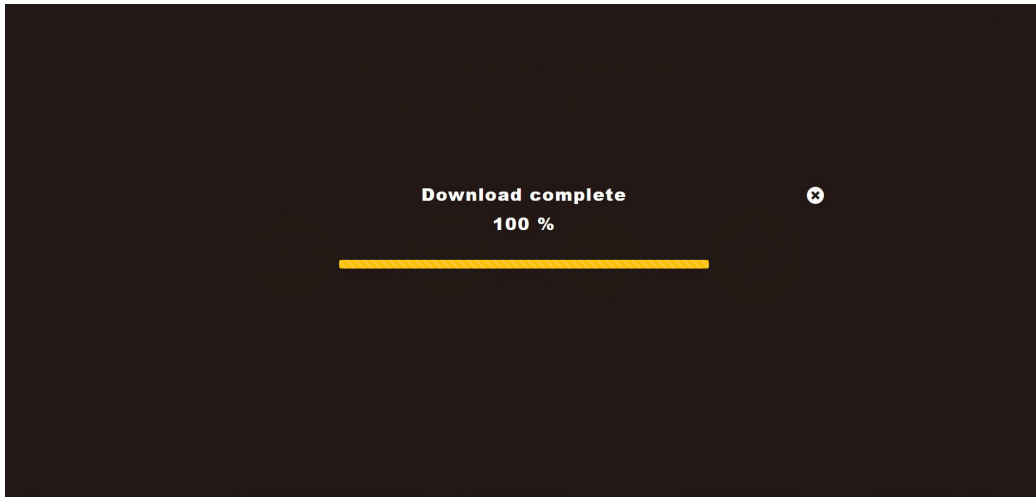


Figure 63: Handwriting digits recognition model downloaded diagram

Note:

If you can't download the other model and the notification below pops-up, it means that your VIA Pixetto Utility application is open. Simply close it to download the other models to the VIA Pixetto vision sensor.

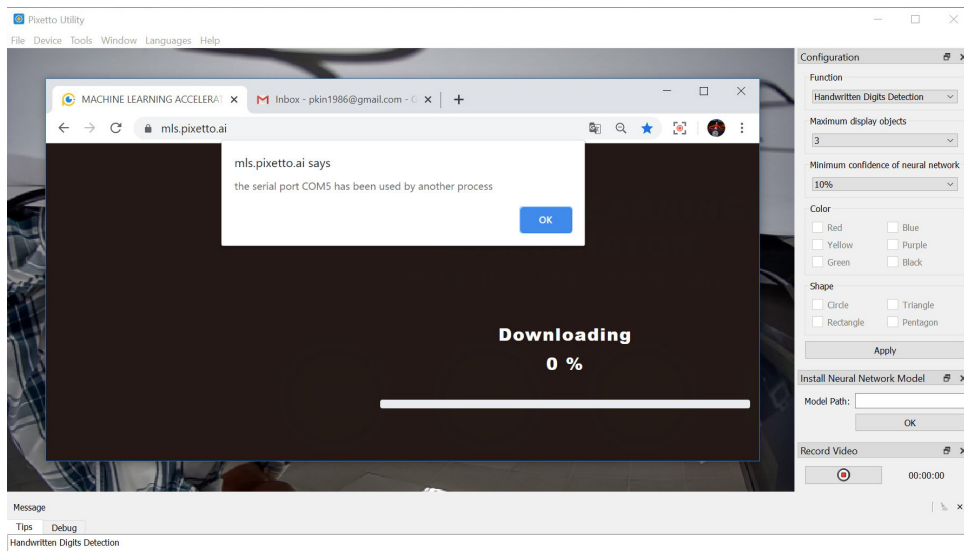


Figure 64: Serial port notification diagram

Notes:

1. The 'Maximum display of neural network' function can be used to set the VIA Pixetto vision sensor to disregard objects that are smaller than a specific size, ranging from 10-50 percent of the view-point.
2. Repeat step 4 and 5 to download the other two models.

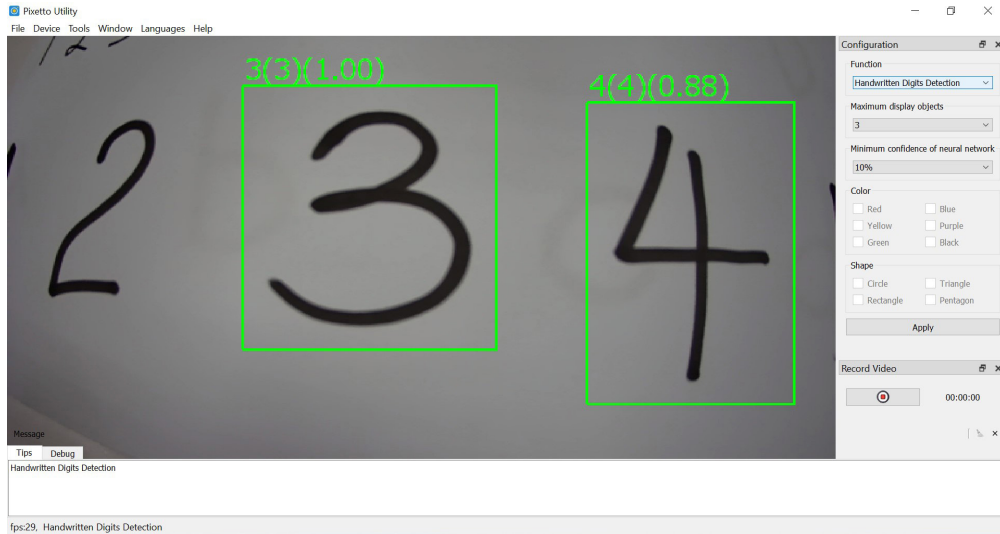


Figure 65: Handwriting digits recognition diagram

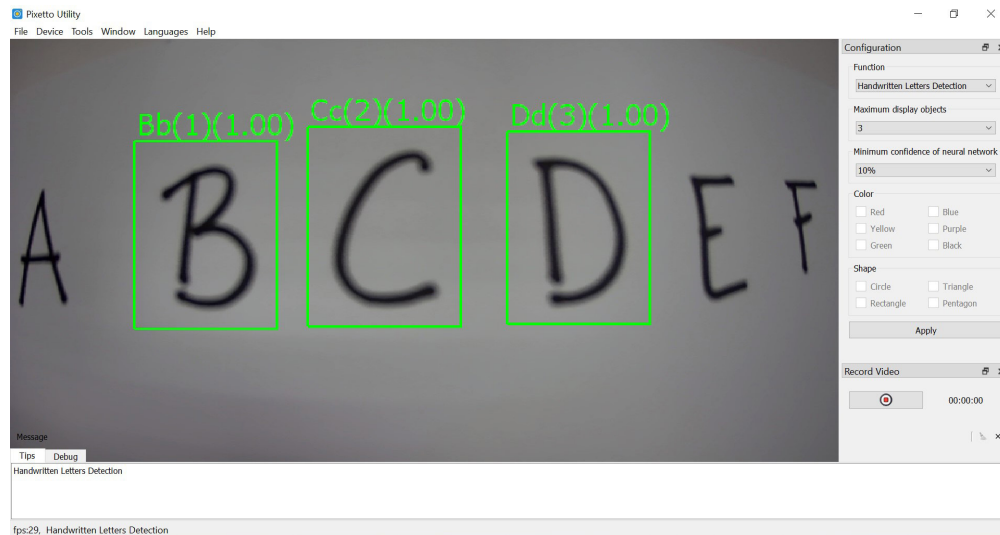


Figure 66: Handwriting letters recognition diagram



Figure 67: Traffic sign recognition diagram

6.2 How to use Blocks

The Blocks application is used to train your VIA Pixetto vision sensor to work with the Scratch online application. The VIA Pixetto extension has been embedded into the Scratch online application with different categories of blocks that allow easy programming to be done to the VIA Pixetto vision sensor.

Note:

Scratch is a programming language and an online community where children can program and share interactive media such as stories, games, and animations with people from all over the world

Step 1

Connect the VIA Pixetto vision sensor to the PC and open the VIA Pixetto Utility application.

Step 2

In the Function Settings (upper right), select the Color Detection function to configure the colors to be used in Scratch, then click the 'Apply' button.

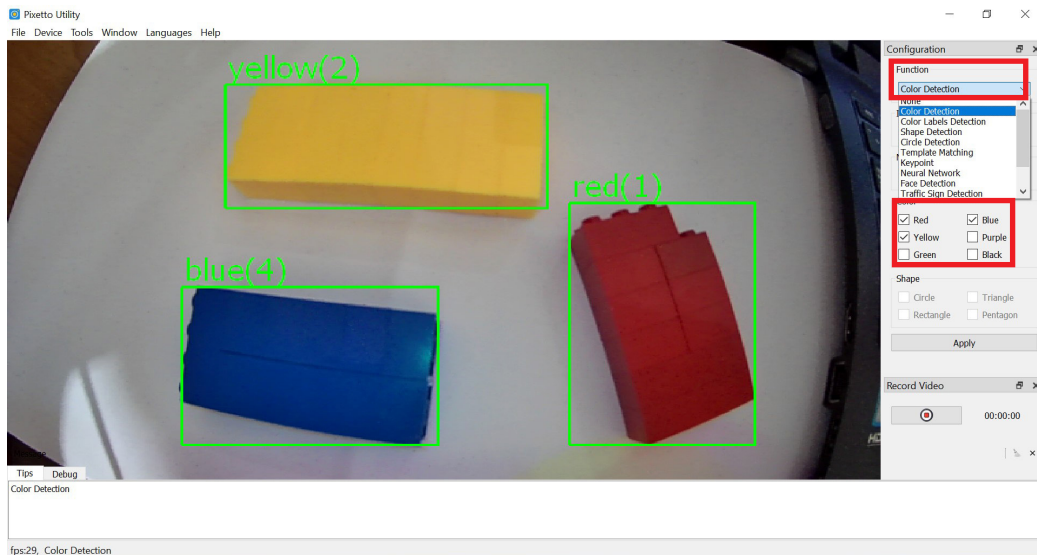


Figure 68: Scratch color detection diagram

Step 3

Close the VIA Pixetto Utility application.

Step 4

Go back to the VIA Pixetto Machine Learning Accelerator cloud home page. Click 'Blocks' to enter the Scratch application.



Figure 69: Login diagram

Step 5

You must click on the 'Add Extension' icon at the bottom left section of the Scratch application to open the extension application.

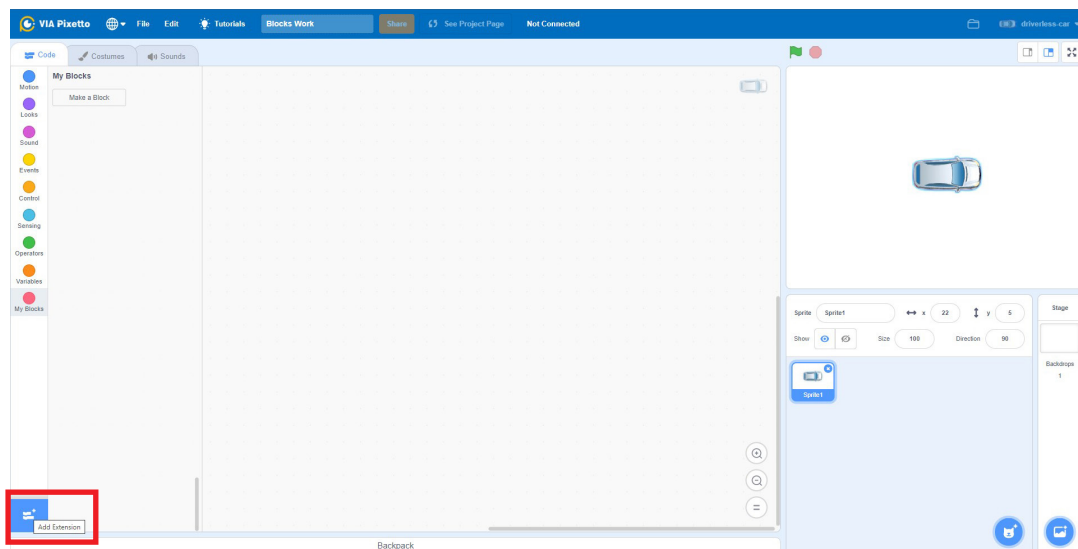


Figure 70: Add Extension icon diagram

The reason for opening the extension platform is to choose the VIA Pixetto extension which has been embedded into the Scratch application. Click on the 'VIA Pixetto extension' to open it. You will need these blocks to program the VIA Pixetto vision sensor to carry out different tasks.

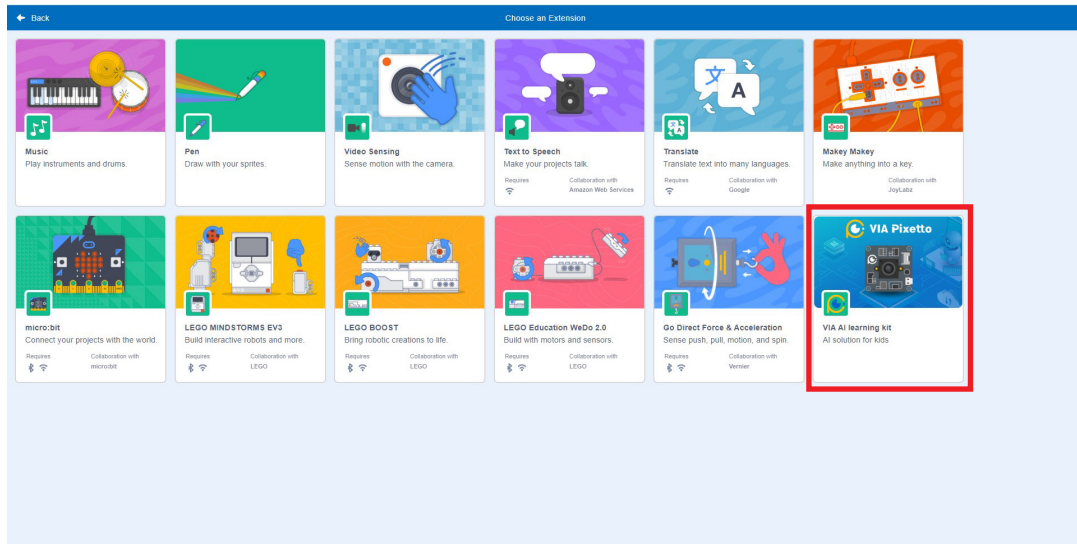


Figure 71: VIA Pixetto extension diagram

The VIA Pixetto extension will open on the Scratch application and you will be able to see the different categories of VIA Pixetto Blocks as shown below.

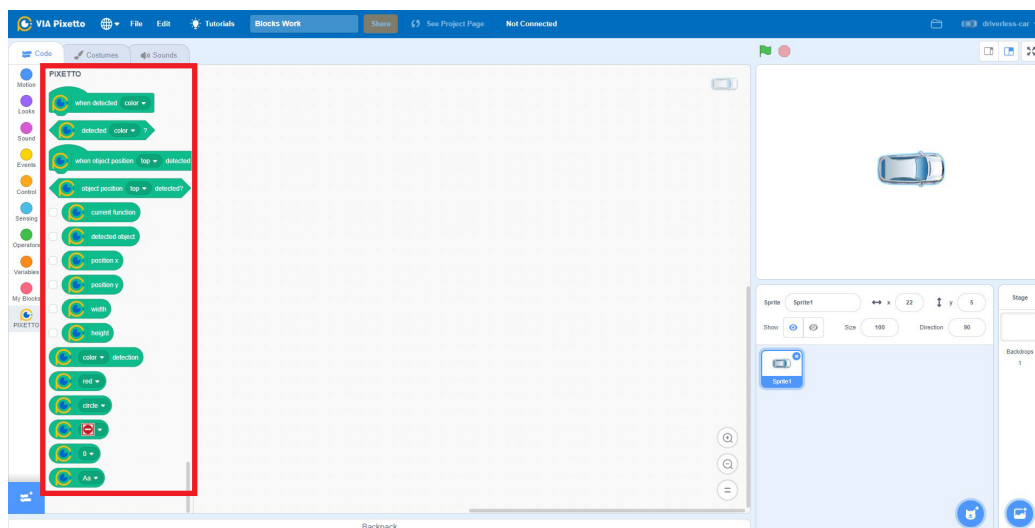


Figure 72: Scratch platform diagram

Step 6

We've created a sample that is named 'Chameleon' to be used as an example of how to upload your sample code to the VIA Pixetto vision sensor. The 'Chameleon' example has been created from VIA Pixetto Blocks and other categories of blocks from the Scratch application.

Click 'File', then select 'Load from your computer'. Locate the Scratch file on your PC, then select 'Open'.

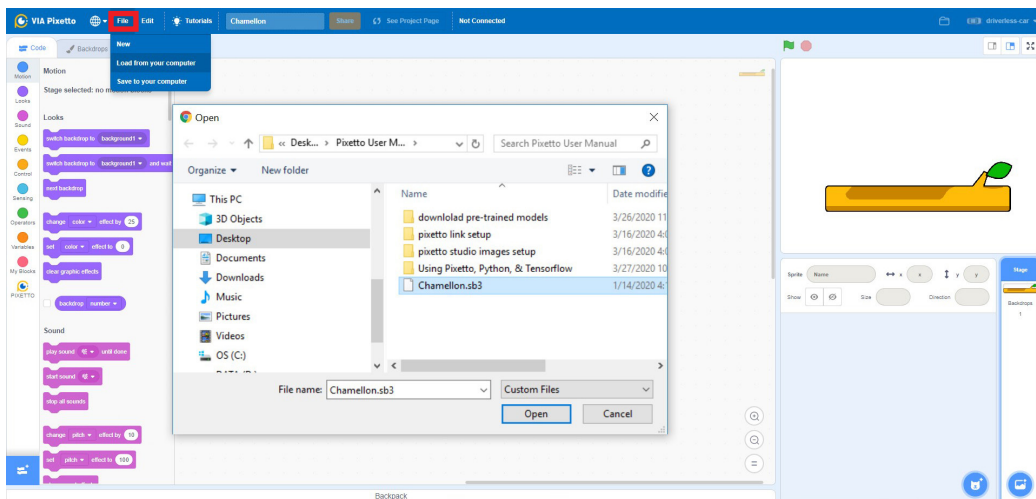


Figure 73: Locating scratch file diagram

The File will open as shown below.

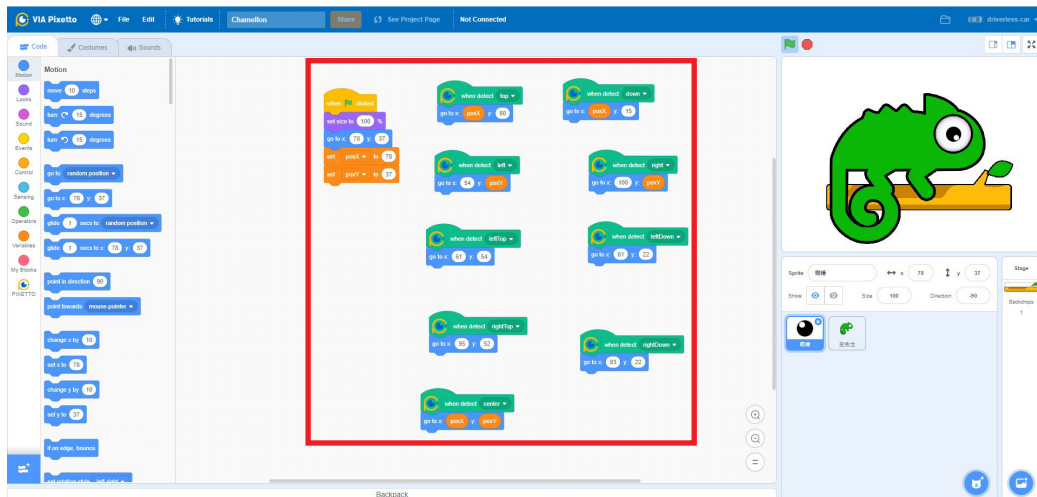


Figure 74: Chameleon example loaded diagram

Step 7

Check on the 'Not Connected' icon to open the connection.

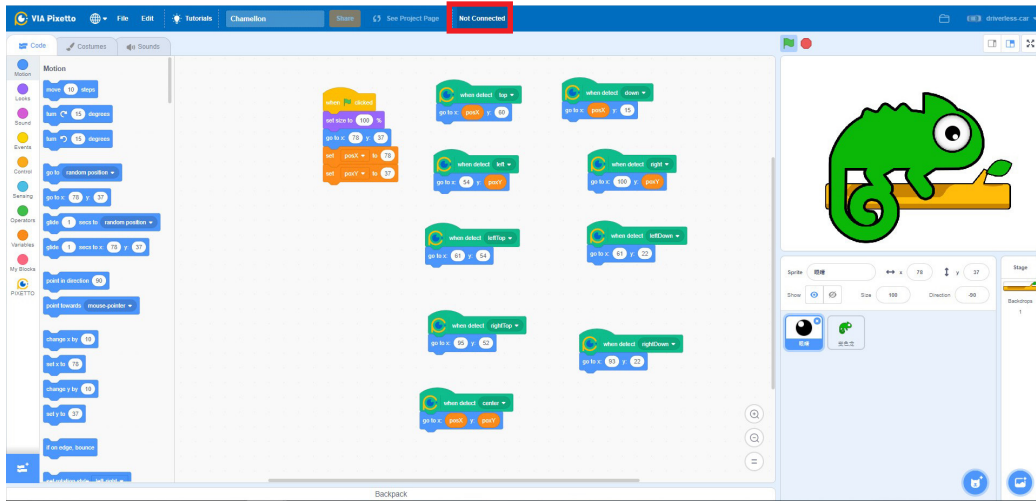


Figure 75: Not Connected icon diagram

Step 8

A pop-up notification will open, then a connection made between the VIA Pixetto vision sensor and the PC.

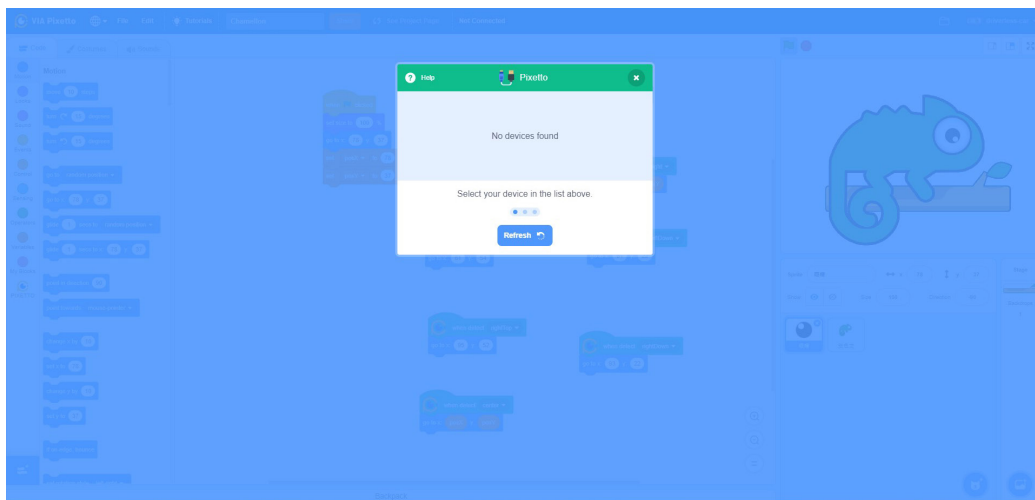


Figure 76: Pixetto Notification diagram

Step 9

Select the 'Connect' button to connect the VIA Pixetto vision sensor.

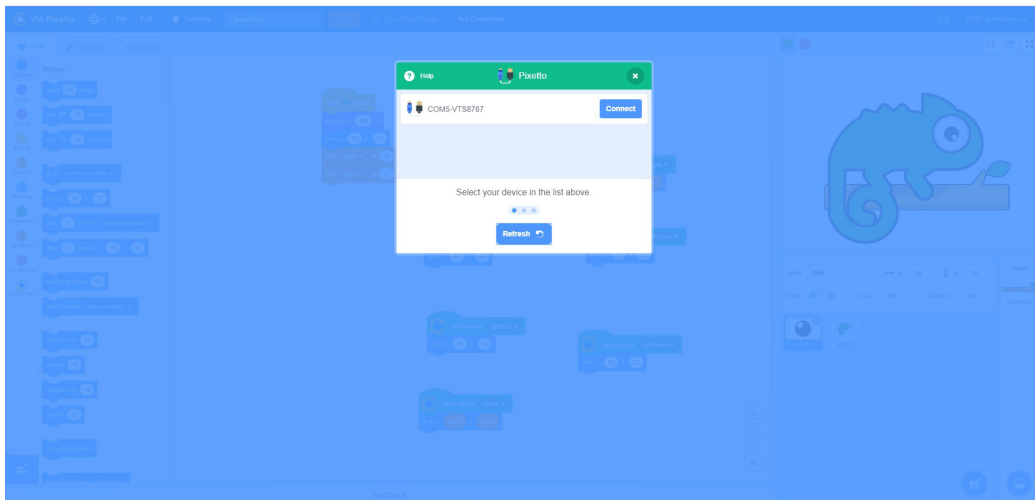


Figure 77: Connect button diagram

Once the VIA Pixetto vision sensor is connected, select 'Go to Editor' to return to the Scratch application.

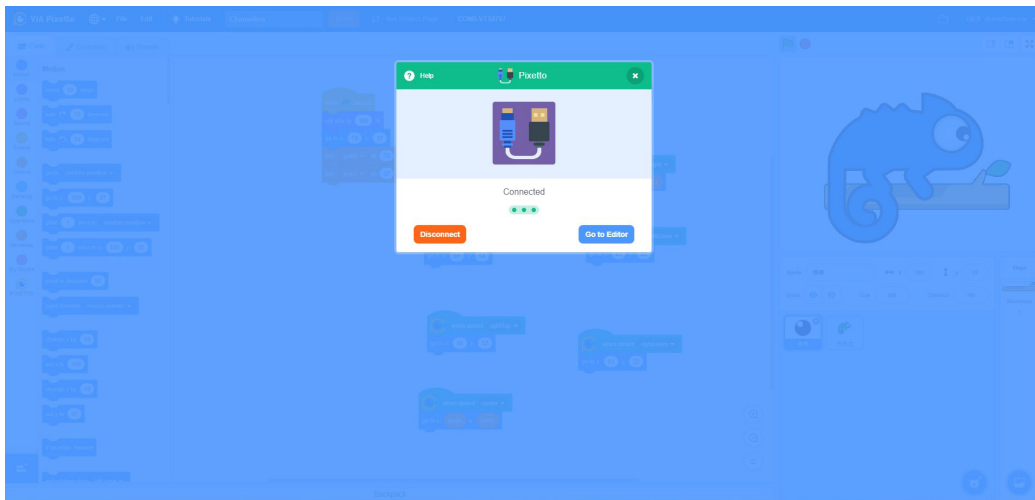


Figure 78: Go to Editor notification diagram

Step 10

Aim the VIA Pixetto vision sensor at the color, and the Chameleon will change color according to the color chosen, as shown below.

Yellow Chameleon

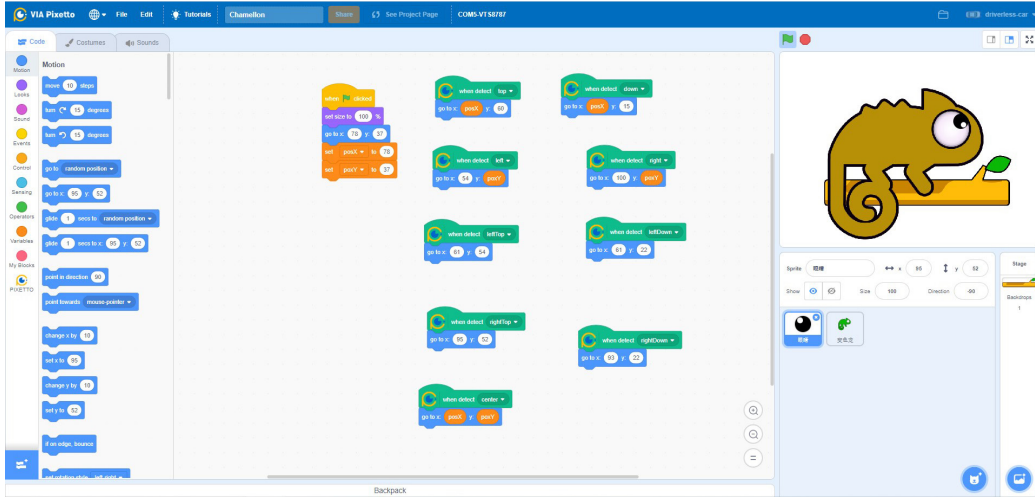


Figure 79: Yellow Chameleon diagram

Blue Chameleon

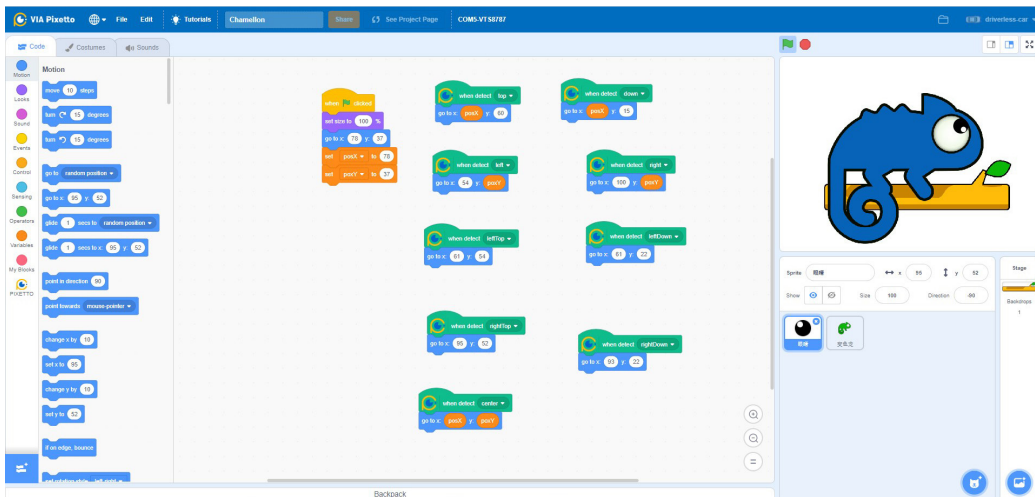


Figure 80: Blue Chameleon diagram

Red Chameleon

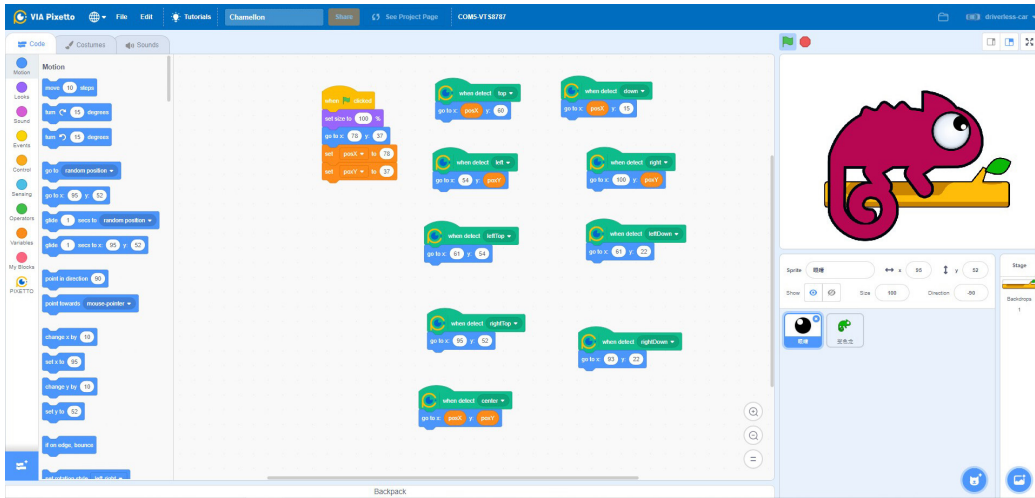


Figure 81: Red Chameleon diagram

Note:
Make sure to aim the VIA Pixetto vision sensor to one color at a time. You cannot aim it at multiple colors.

Step 11

When finished, click on the 'COM5-VTS8787' icon to disconnect the VIA Pixetto vision sensor.

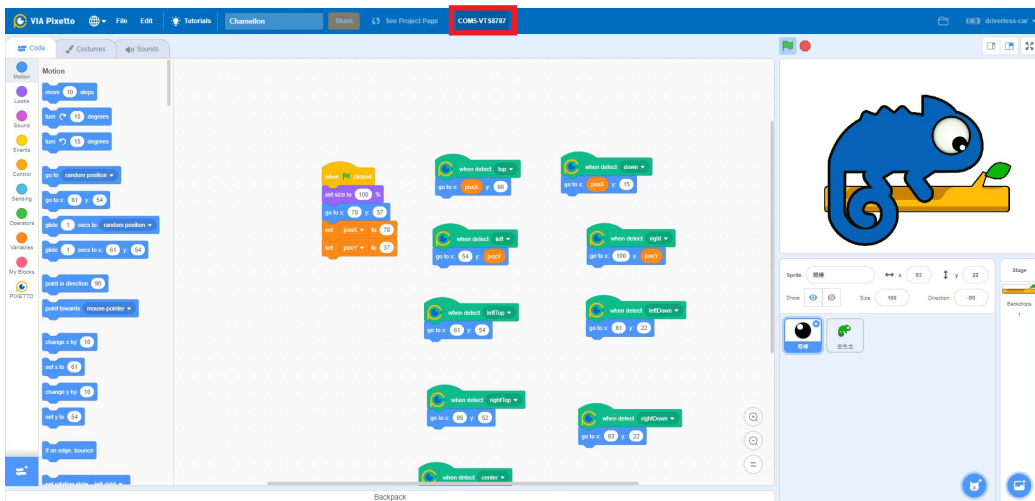


Figure 82: Disconnect from COM5-VTS8787 diagram

Select the 'Disconnect' icon to remove the VIA Pixetto vision sensor from the PC.

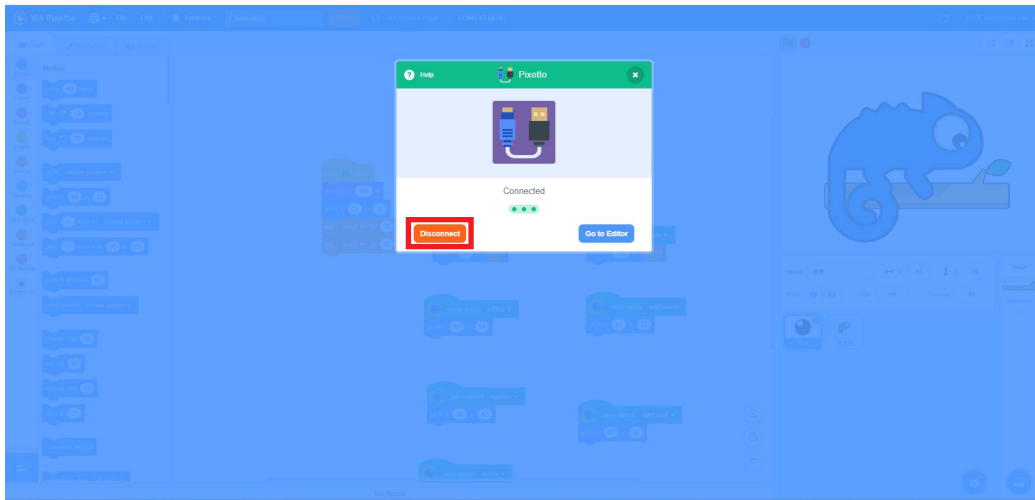


Figure 83: Disconnect pop-up icon diagram

When you click on the 'Disconnect' button, you will return back to the Editor application as shown below.

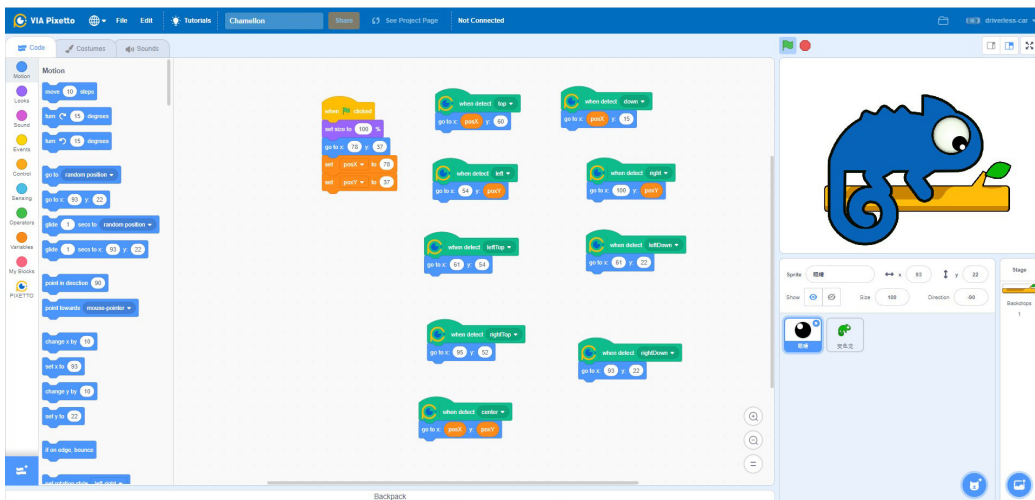


Figure 84: Editor application diagram

6.3 How to use Machine Learning

The Machine Learning application is used for building a Neural Network and training the VIA Pixetto vision sensor to recognize the newly created Neural Network.

Step 1

Open the VIA Pixetto Machine Learning Accelerator at <https://mls.pixetto.ai/>



Figure 85: Machine Learning Accelerator webpage diagram

Step 2

Click the 'Login' button to open the login screen. Log in by entering a user name, and click the 'Login' button.

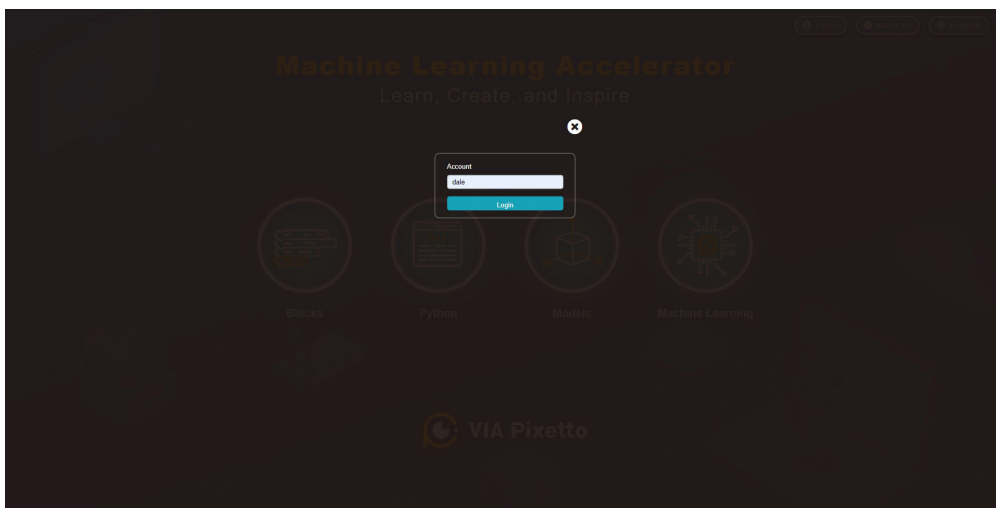


Figure 86: Login button diagram

Step 3

Click the 'OK' button on the welcome pop-up message.

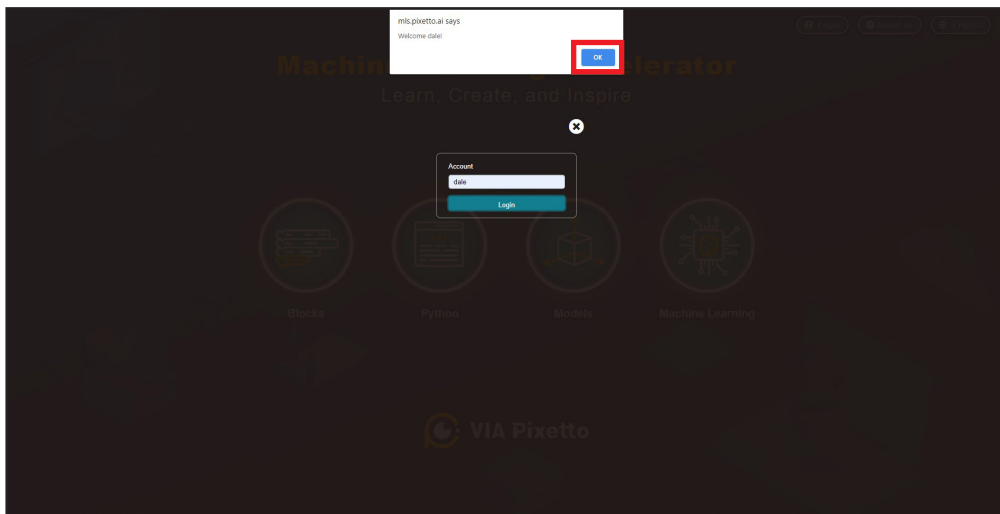


Figure 87: Login pop-up message diagram

Step 4

Enter the 'Machine Learning' section by clicking the 'Machine Learning' icon.



Figure 88: Machine learning icon diagram

Step 5

To record your video using VIA Pixetto Utility and the VIA Pixetto vision sensor, please refer to [section 5.3.1](#).

Step 6

Click on the 'Upload Video' button to open the 'Add Label and Video' section. At the same time, you can also name the model by entering the name in the 'Enter Model Name' section in the top-left corner.

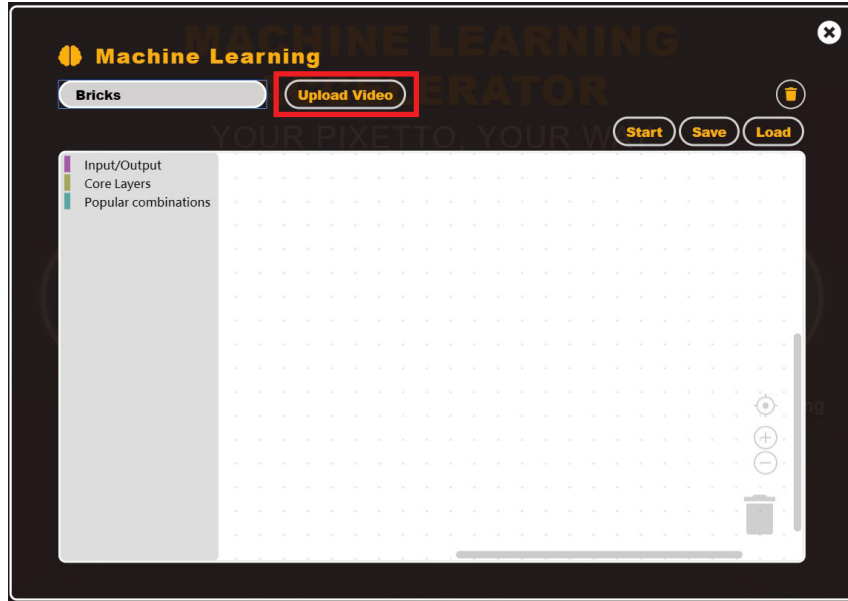


Figure 89: Upload Video platform diagram

Step 7

When the 'Add Label and Video' section is opened, you can label the video file with a name as shown below.

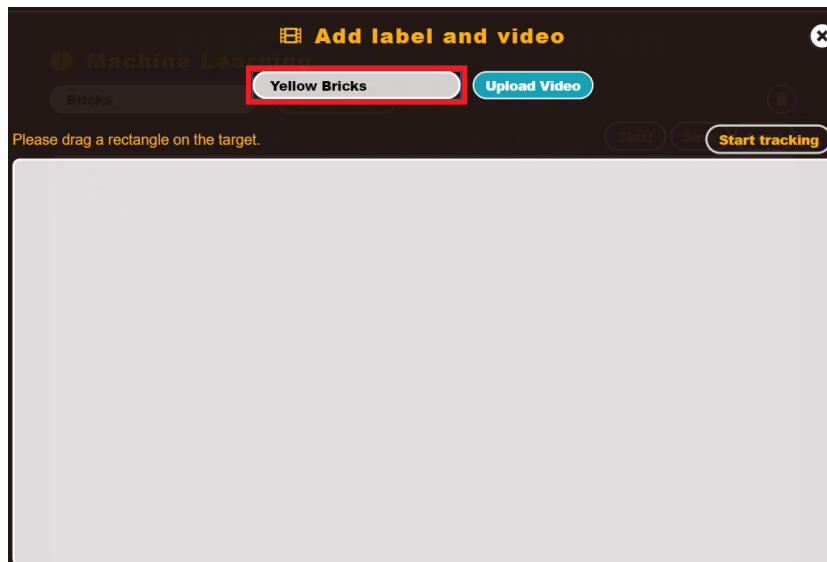


Figure 90: Add Label and Video platform naming diagram

Step 8

Click the upload video button and locate the video to be uploaded from your computer.

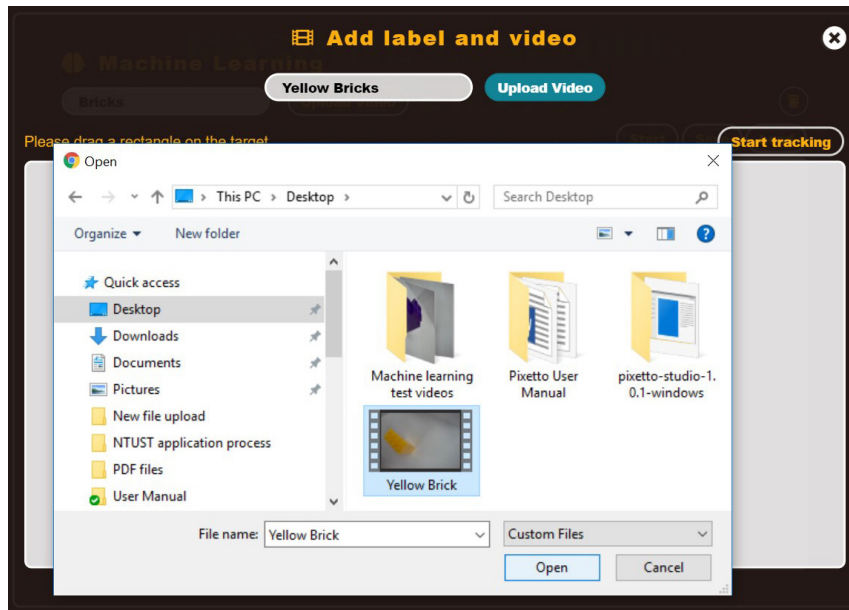


Figure 91: Add Label and Video uploading section diagram

Step 9

Use the mouse to frame the range of the object you want to train on the screen as shown in the green box below. Click 'Start tracking' to start uploading the file and tracking the object.

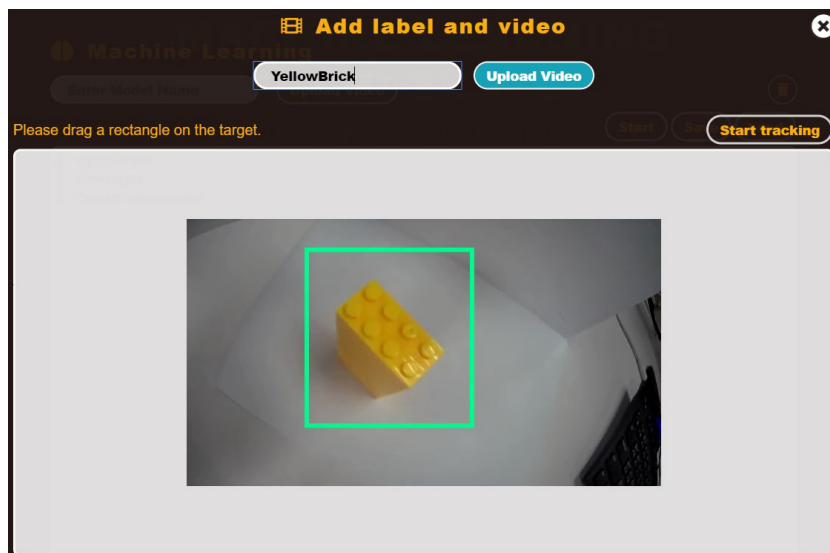


Figure 92: Framing the object diagram

Note:

Please review this notification and make the necessary changes to the naming of your video.

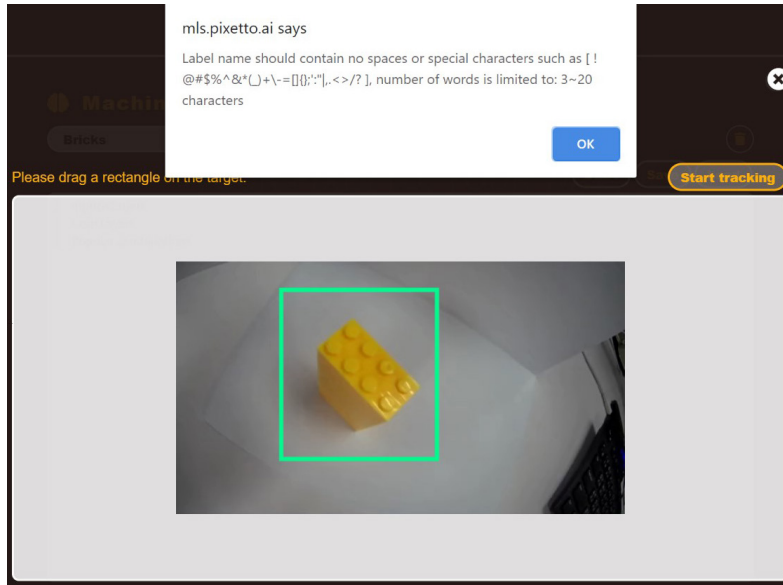


Figure 93: Video notification diagram

Step 10

Click the 'Yes' button to confirm storage of the object tracking results. You can also click the 'No' button to abandon the tracking results. To see the preview click on the 'Play' area.

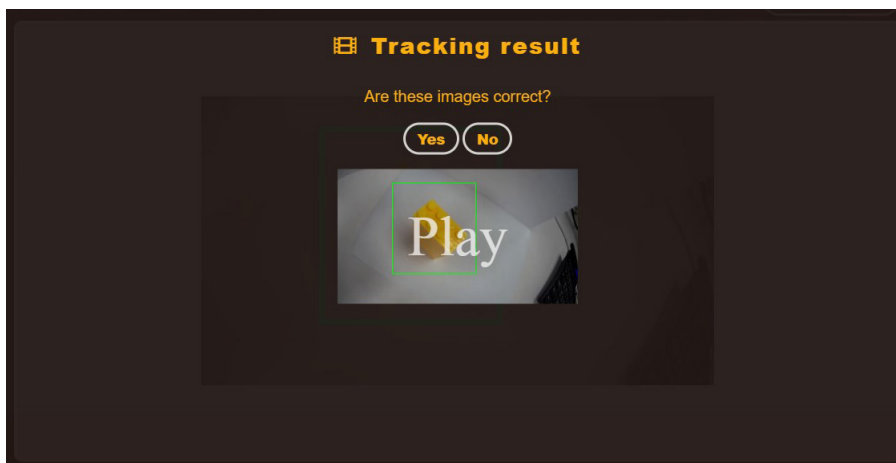


Figure 94: Play Tracking result diagram

Step 11

To upload the next video, repeat steps 6 - 10 to continue uploading the next file.

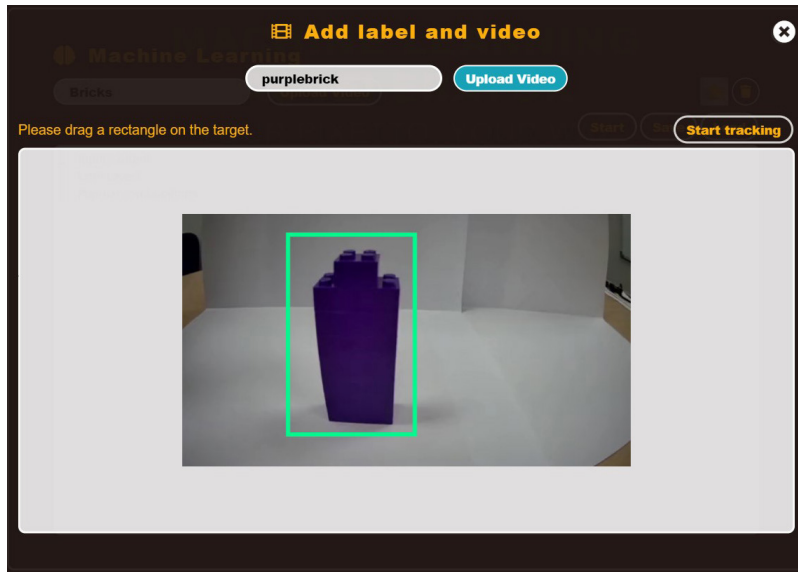


Figure 95: Uploading another video diagram

Step 12

The uploaded video file thumbnail images will be displayed in the upper right corner.

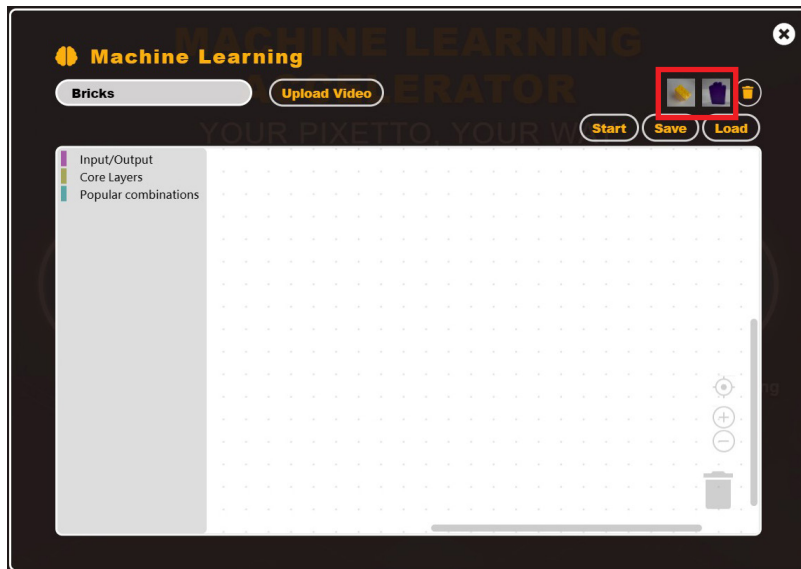


Figure 96: Video icons diagram

Step 13

Go to the platform and select 'Popular combinations' blocks to create a Neural Network as shown below. The number of objects to be trained (i.e. the number of uploaded files) is entered in the black box, as shown in the figure below. Click the 'Start' button to start training the network model.

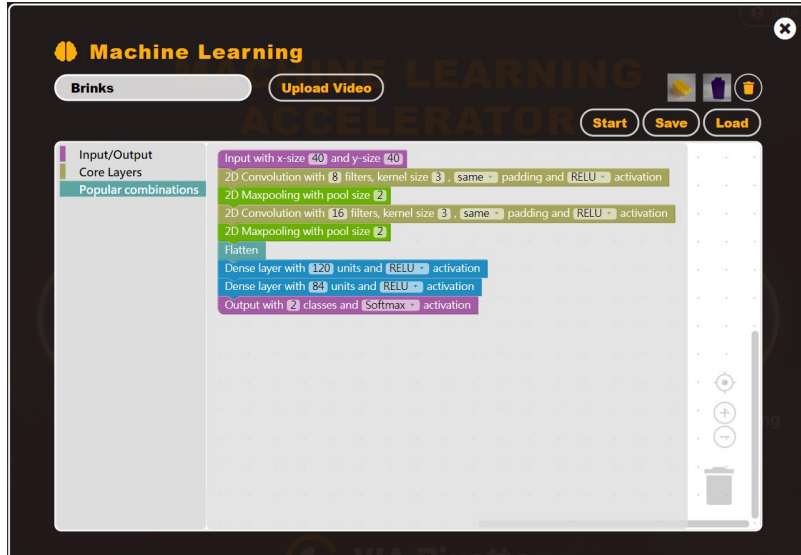


Figure 97: Popular combinations diagram

Step 14

Once started you will see the console page as shown below. The training process will be displayed here.

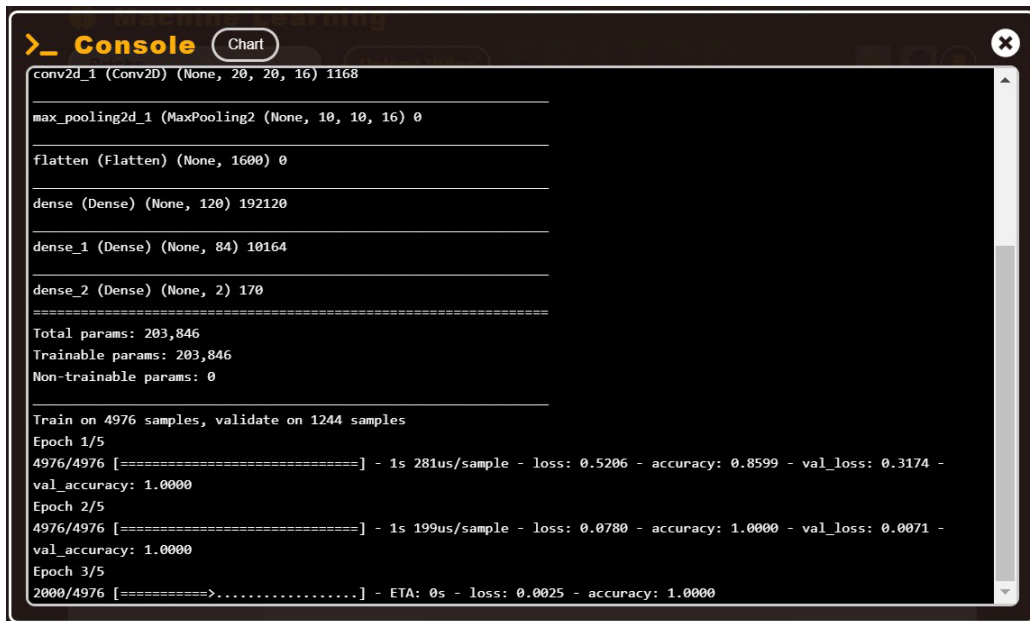


Figure 98: Console Training screen diagram

Step 15

When the word '===Finish===' appears, this means that training is completed.

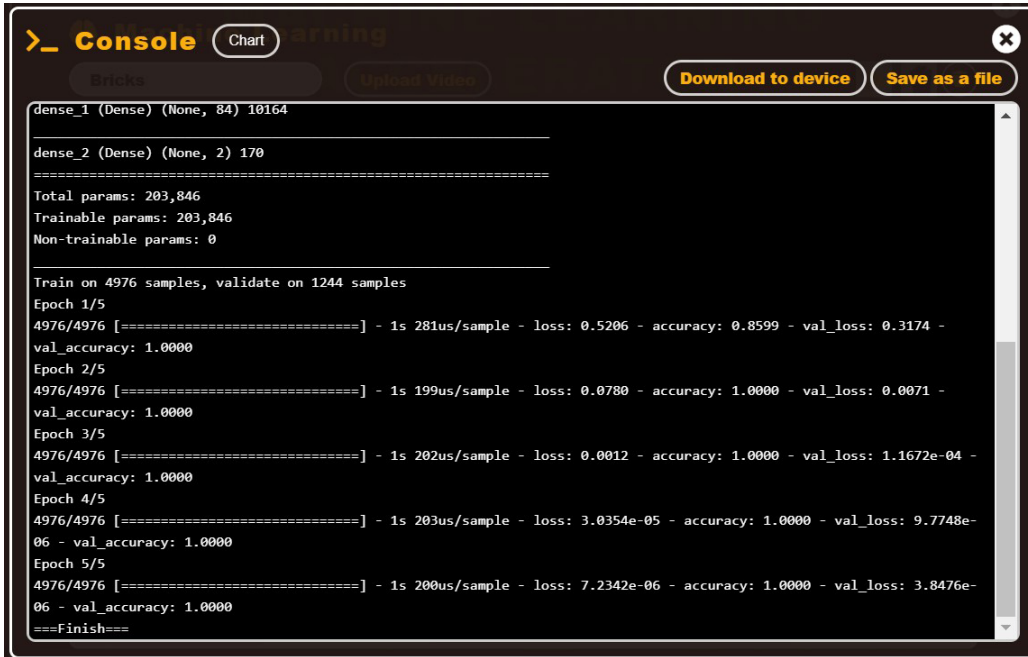


Figure 99: Training Finished diagram

Step 16

To see an accuracy record of the training, click on the 'Chart' button. Click 'Console' to switch back to the original screen.

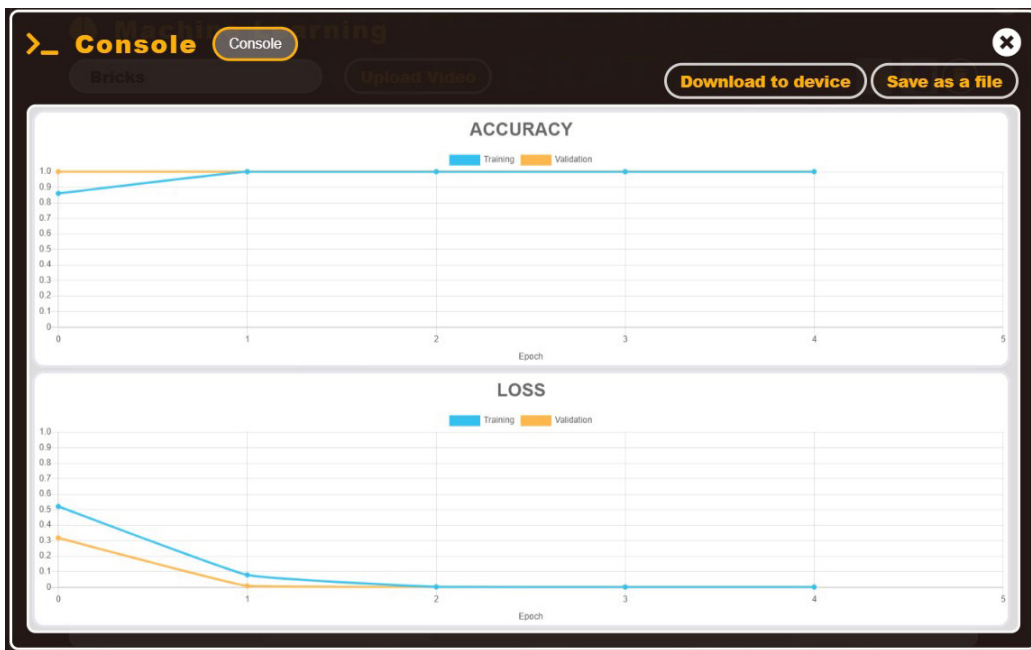


Figure 100: Console Chart diagram

Before downloading the trained model to the VIA Pixetto vision sensor, confirm that the VIA Pixetto Link has been executed, as shown on the bottom right corner of this image. Also make sure that the VIA Pixetto Utility application is closed.

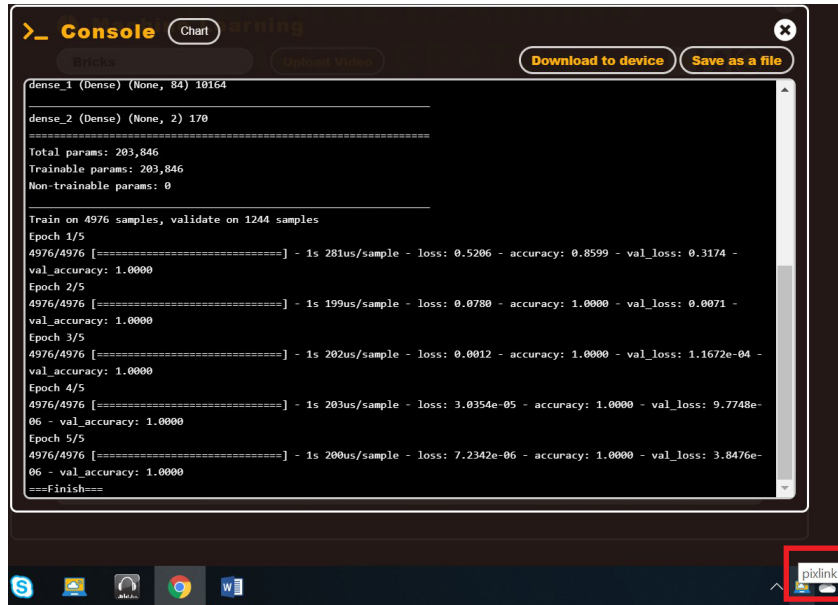


Figure 101: VIA Pixetto Link icon diagram

Step 17

Click 'Download to device' to start downloading the trained model to your VIA Pixetto vision sensor. Download progress will be displayed during the download. Close the progress box when the download is complete.

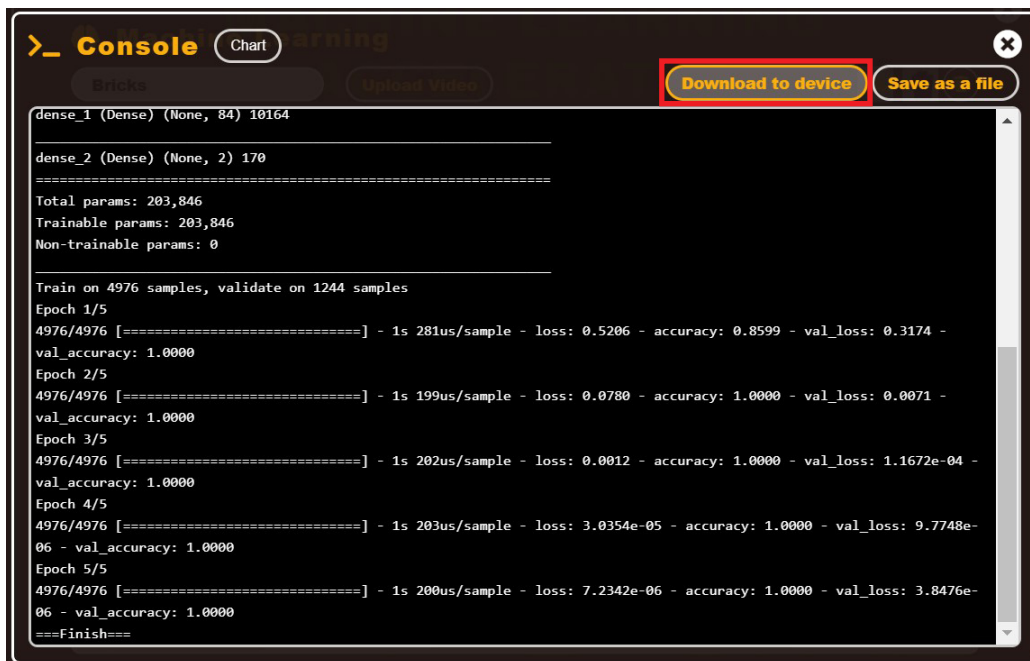


Figure 102: Download to device button diagram

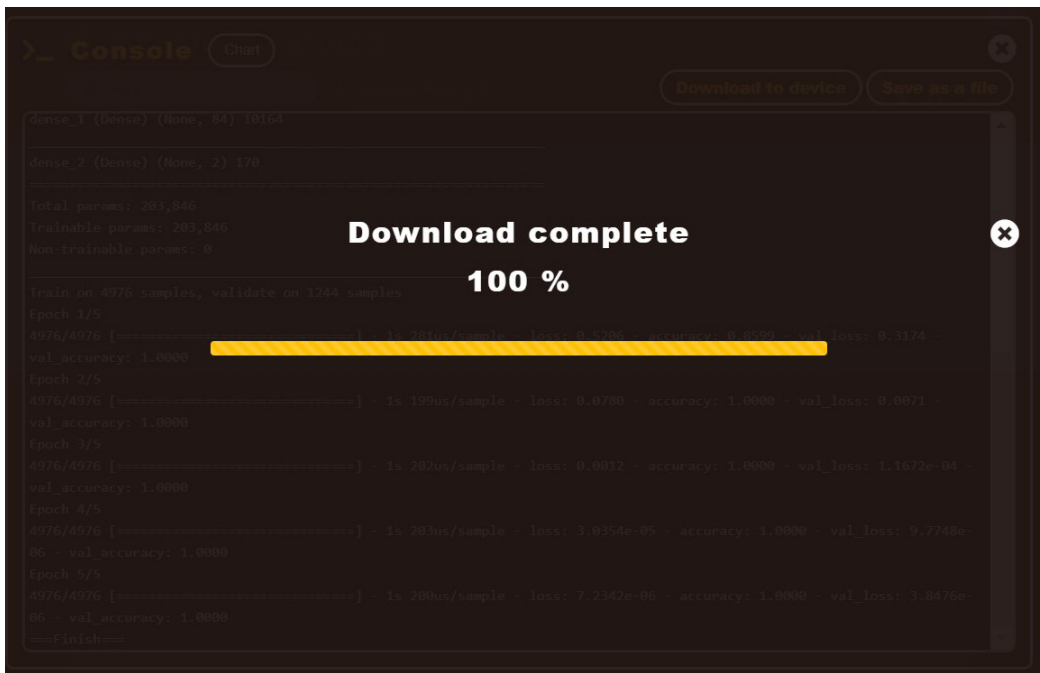


Figure 103: Download complete diagram

Step 18

Open the VIA Pixetto Utility application. The function setting will automatically be displayed as 'Neural Network Identification'. Aim the VIA Pixetto vision sensor at the object you recorded earlier. The identified objects on the screen will be marked with a green frame with an identification number, as shown below.

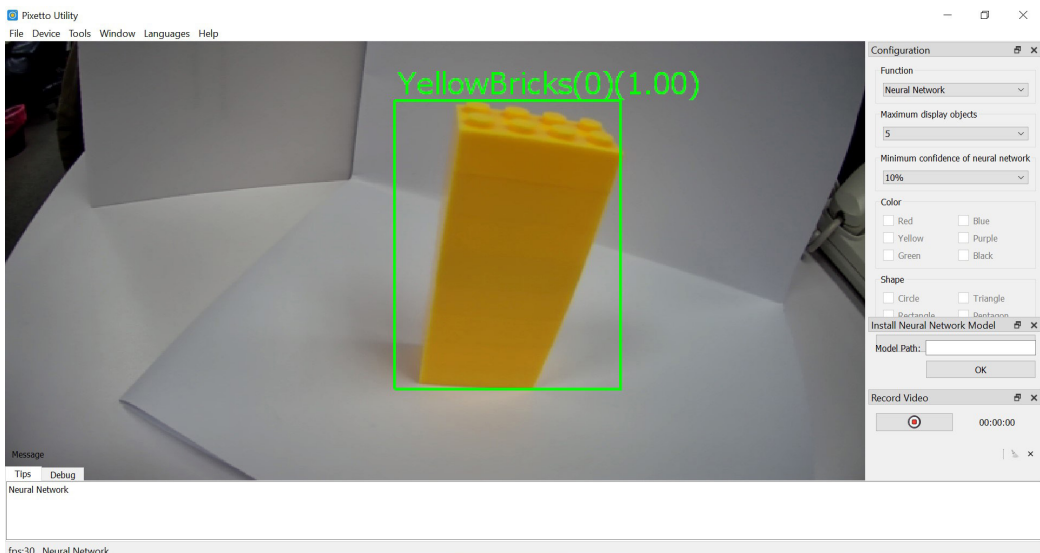


Figure 104: Yellow Brick diagram



Figure 105: Purple Brick diagram

Object detection algorithms are a method of recognizing objects in images or video. You can select these methods as shown in the diagram below to optimize your Neural Network.

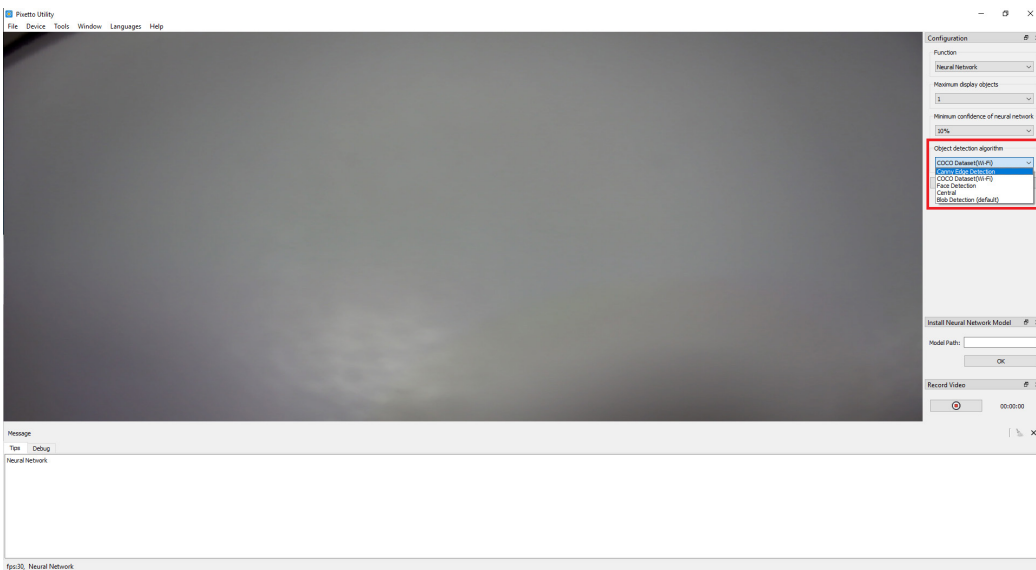


Figure 106: Object detection algorithms diagram

- Notes:
1. Coco Database is large scale images with Common Objects in Context (COCO) for object detection, segmentation, and captioning data set.
 2. Canny Edge Detection is an edge detection operator that uses a multi-stage algorithm to detect a wide range of edges in images
 3. Face Detection is a computer technology being used in a variety of applications that identifies human faces in digital images.
 4. Central refers only only to the object in the square window will be identified.
 5. Blob Detection (default) refers to modules that are aimed at detecting points and/or regions in the image that differ in properties like brightness or color compared to the surrounding.

6.3.1 How to use VIA Pixetto Utility to create videos

The VIA Pixetto Utility can be used to create videos by connecting it to the VIA Pixetto vision sensor. These videos can be used to create a Neural Network using the Machine Learning platform.

Step 1

Connect the VIA Pixetto vision sensor to a PC and open VIA Pixetto Utility.

Step 2

Click the 'Record Video' button located on the bottom right side of VIA Pixetto Utility.

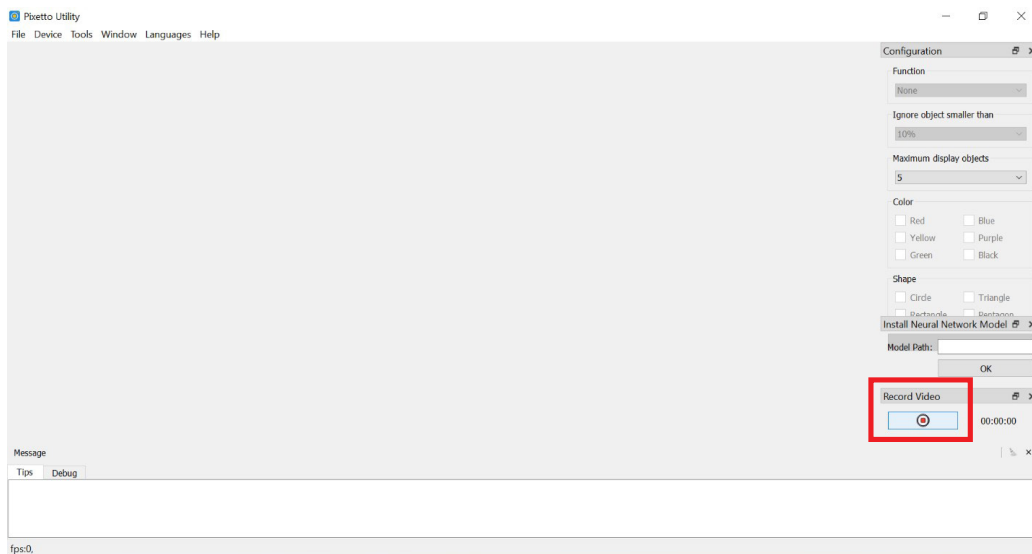


Figure 107: Pixetto Utility Record button diagram

Step 3

Aim the VIA Pixetto vision sensor directly at the object you want to record. When you click the 'Record Button', the time clock will start to run.



Figure 108: Record Timer diagram

Note:
When recording the video, make sure to move the VIA Pixetto camera 360° around the object.

Step 4

Click the 'Record Video' button again when you've finished recording your video.

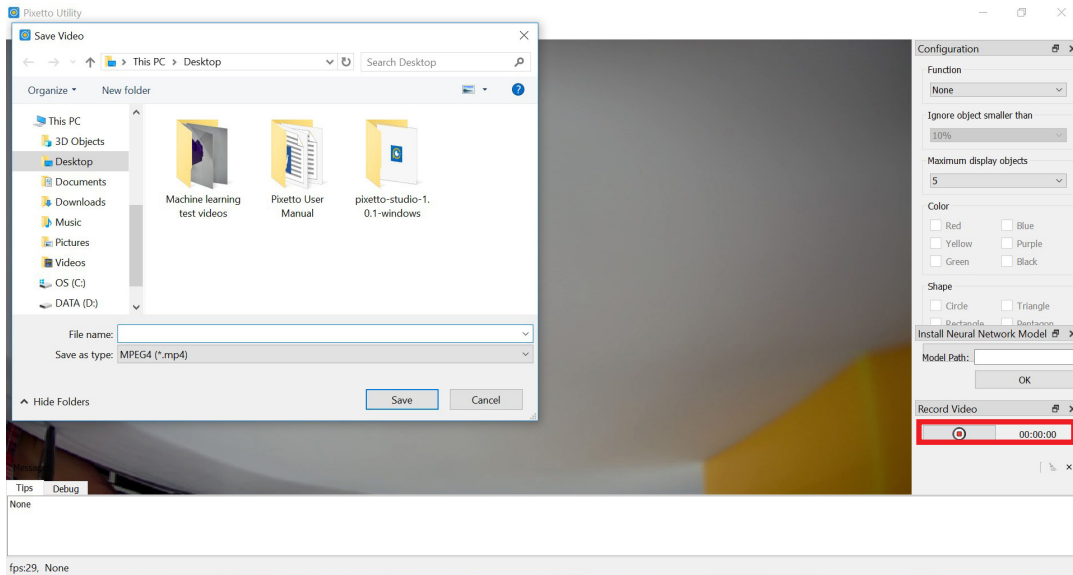


Figure 109: Pop-up Window folder diagram

Step 5

A pop-up window file will be displayed. You can name the video and find a suitable place to save it on your PC.

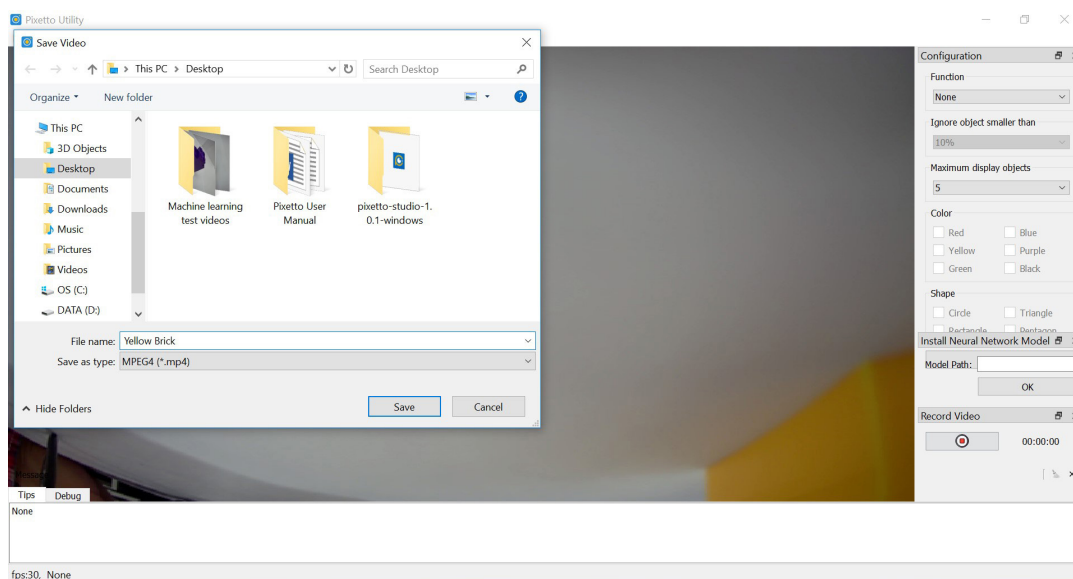


Figure 110: Video Name diagram

The video file below was saved on the desktop.

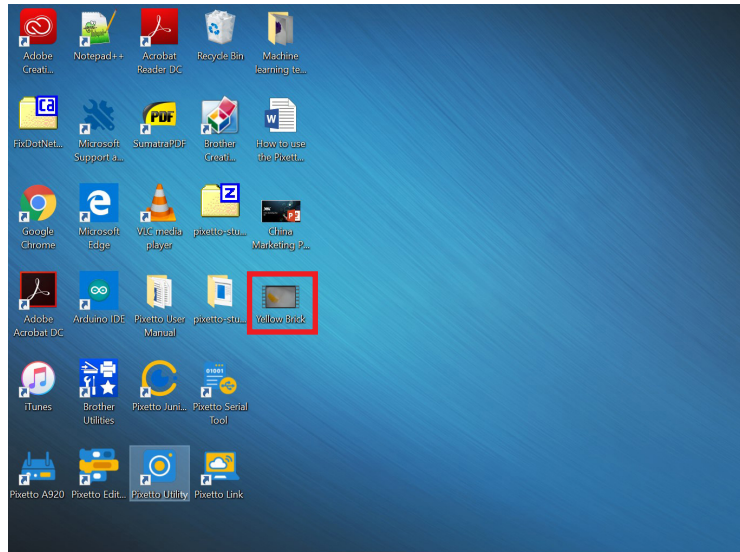


Figure 111: Video file diagram

6.4 How to use Python

The Python application can be used to write or upload codes created. The data created can be uploaded to train the VIA Pixetto vision sensor via the Pixetto Utility application.

Step 1

Login to the VIA Pixetto Machine Accelerator cloud home page. Click on the Python icon to enter the Jupyter Notebook page.



Figure 112: Python Login diagram

Step 2

In the upper right corner of the Jupyter Notebook home page, click the 'Upload' button to upload the Python file.

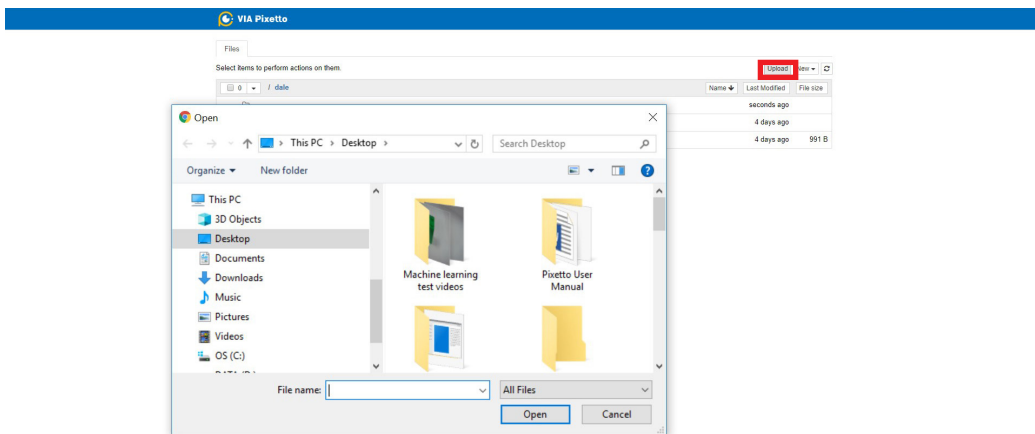


Figure 113: Upload button diagram

Step 3

We've created a sample that is named ' HandwritingDigitsInPython.ipynb' to be used as an example of how to upload your 'Python code' to the Python online application.

Locate the file on your PC and open it.

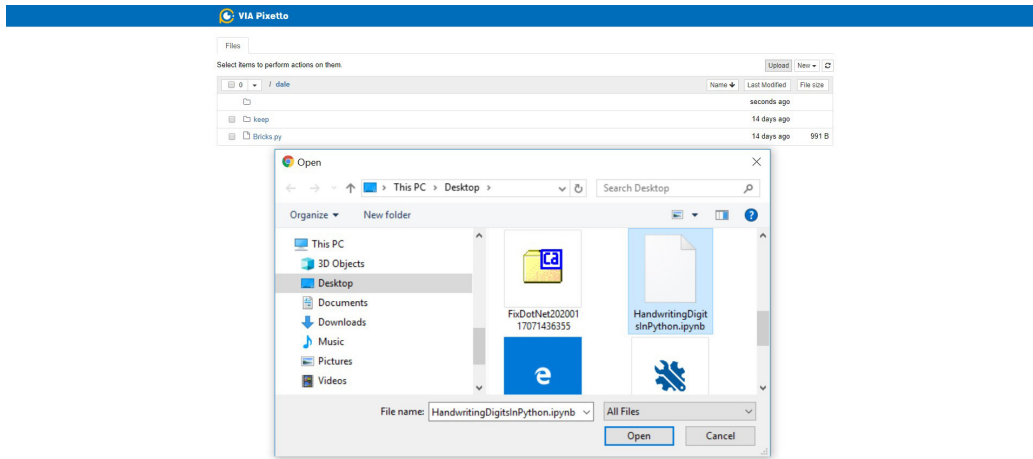


Figure 114: Handwriting file located diagram

The file can then be added to the Jupyter Notebook application. Click the 'Upload' button to continue the process.

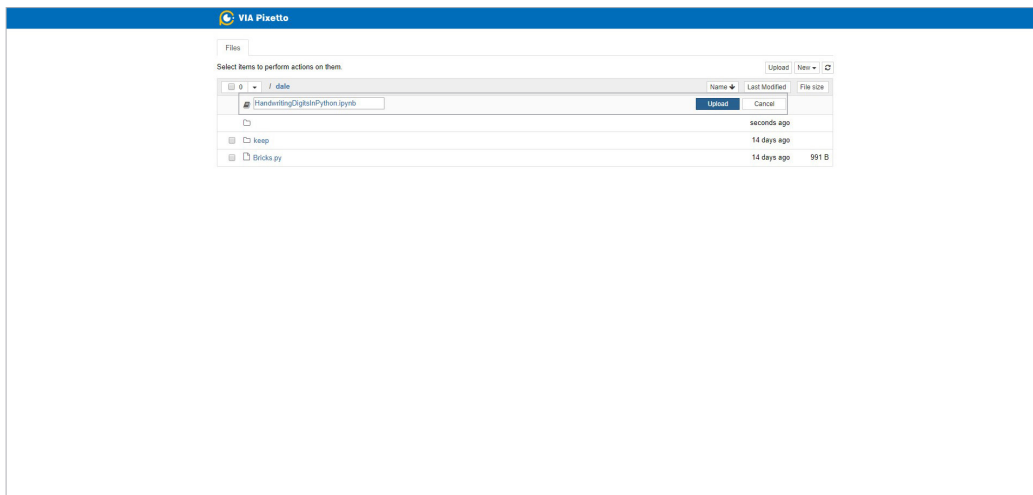


Figure 115: Upload file diagram

Note:
The cancel button can be used to cancel the file from uploading.

The file is uploaded.

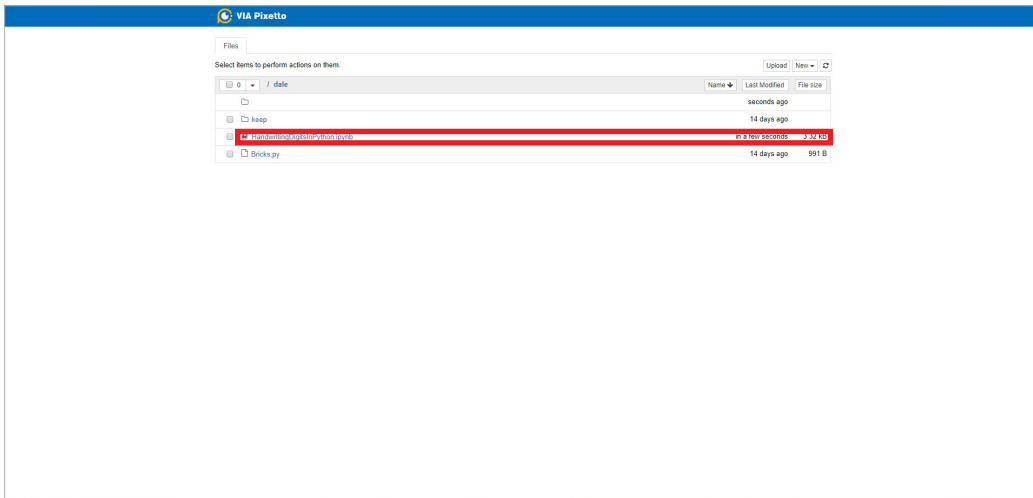


Figure 116: Handwriting file uploaded diagram

Step 5

Double click on the 'HandwritingDigitsInPython.ipynb' file and a new window will open. Click 'Run' to execute this Python program.

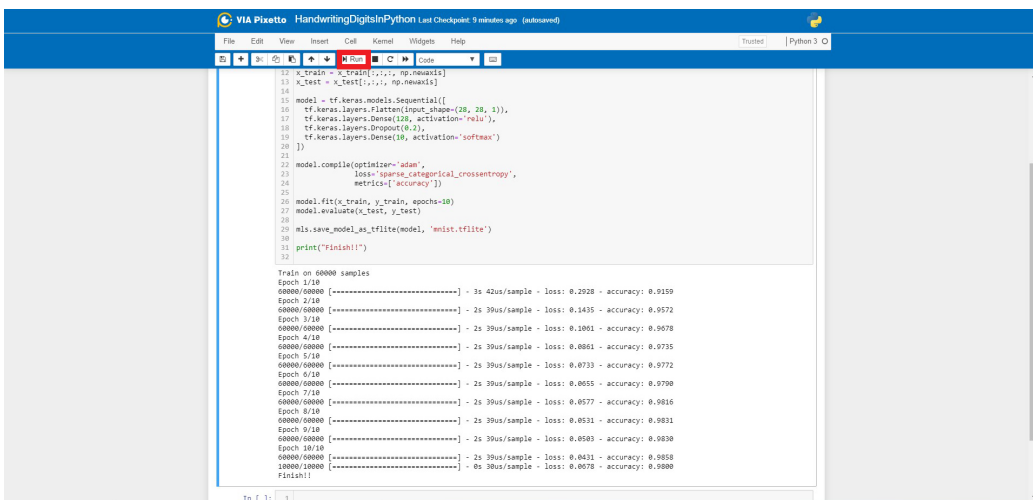


Figure 117: Handwriting file window diagram

Note: You can use the stop button to stop the process from continuing. You can also edit the code by clicking on the keyboard icon on the right side of the platform.

Step 6

Go back to the Jupyter Notebook navigation page where you will see the Python file. Click on the check box next to the 'mnist.tfite' file then select the download button.

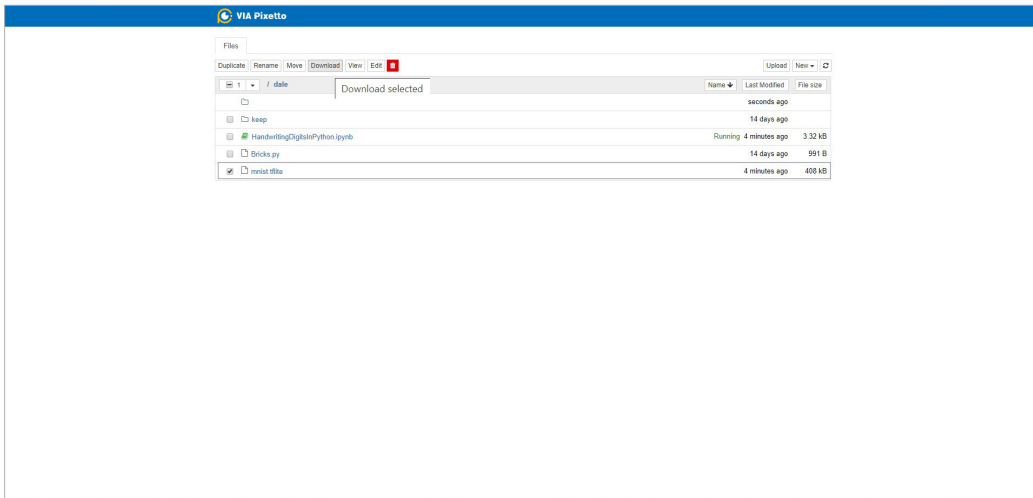


Figure 118: Mnist download button diagram

The file is downloading.

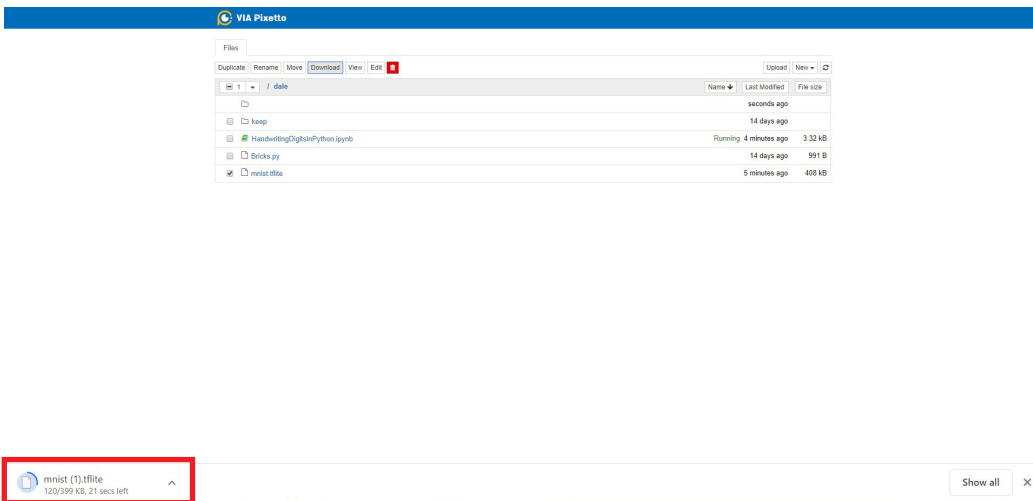


Figure 119: Mnist downloading diagram

Step 7

Connect the VIA Pixetto vision sensor to your PC, then open VIA Pixetto Utility to upload the file to your VIA Pixetto vision sensor. Select 'Install Neural Network Model'.

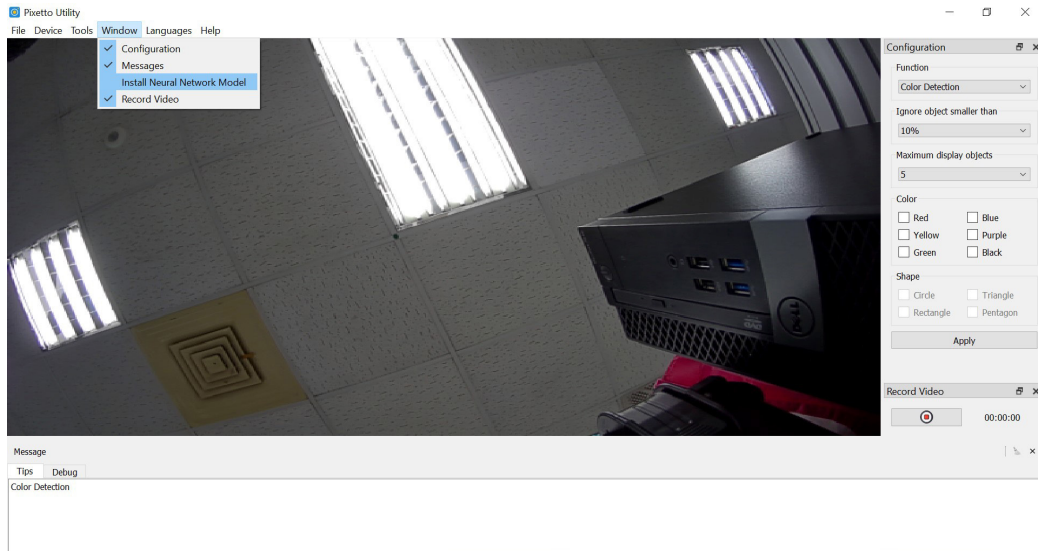


Figure 120: Install Neural Network Model diagram

Step 8

Click on the 'Model Path' to open a window and upload the file located on your PC, then click the 'Open' button.

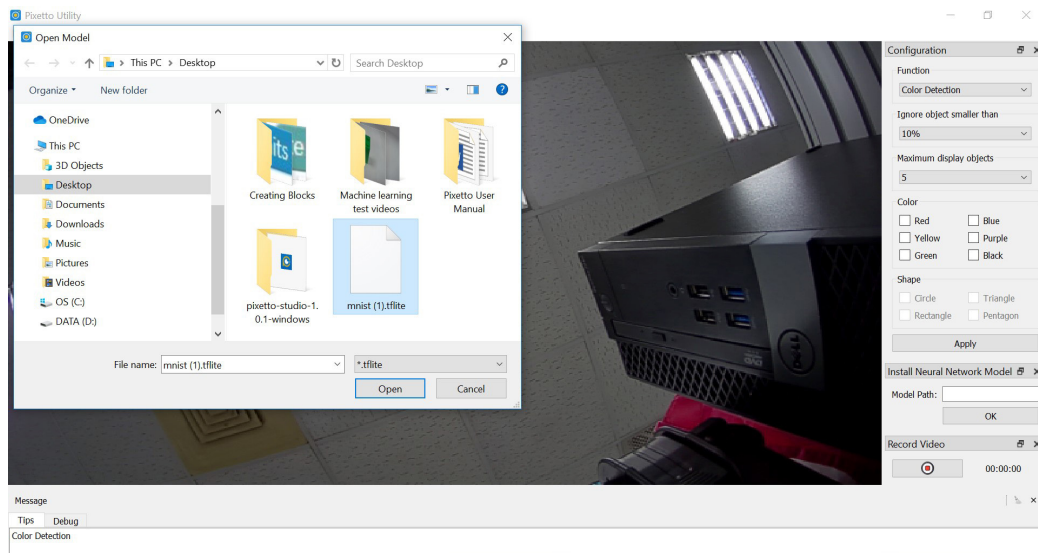


Figure 121: Model Path diagram

Click the 'Ok' button to finish the process.

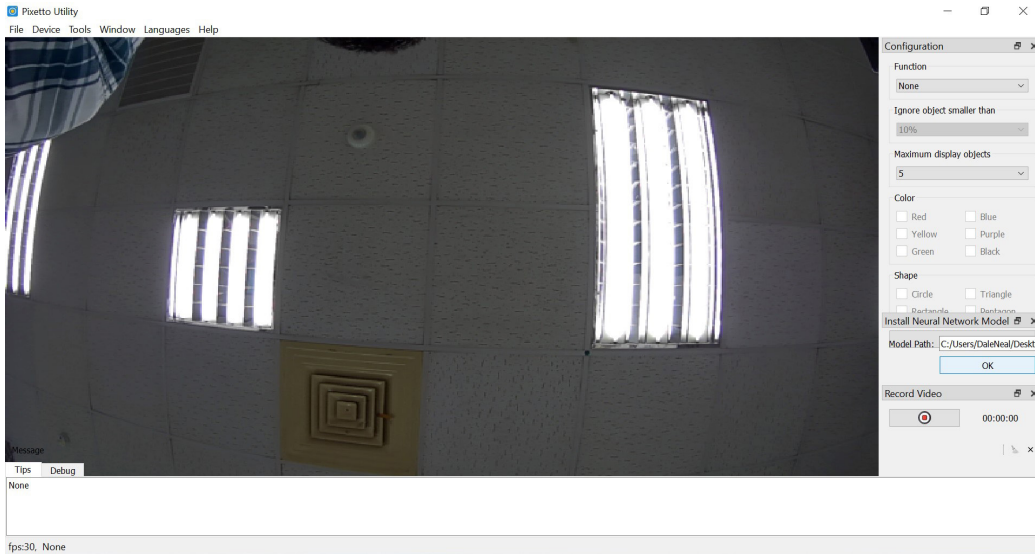


Figure 122: Uploading Mnist file diagram

When the file is uploaded, 'Neural Network' will be displayed in the function section.

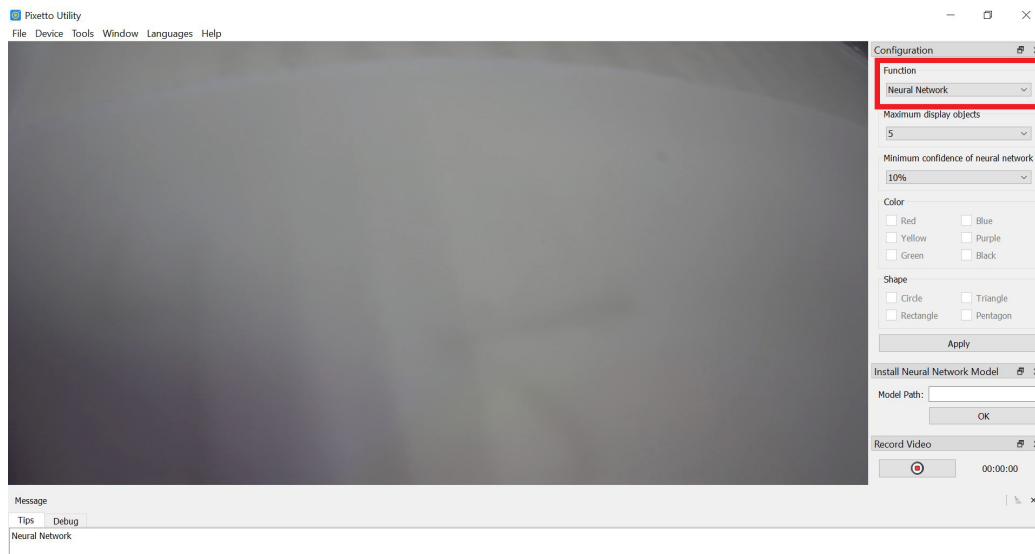


Figure 123: Neural Network diagram

Step 9

Aim the VIA Pixetto vision sensor at the Handwritten Digits.

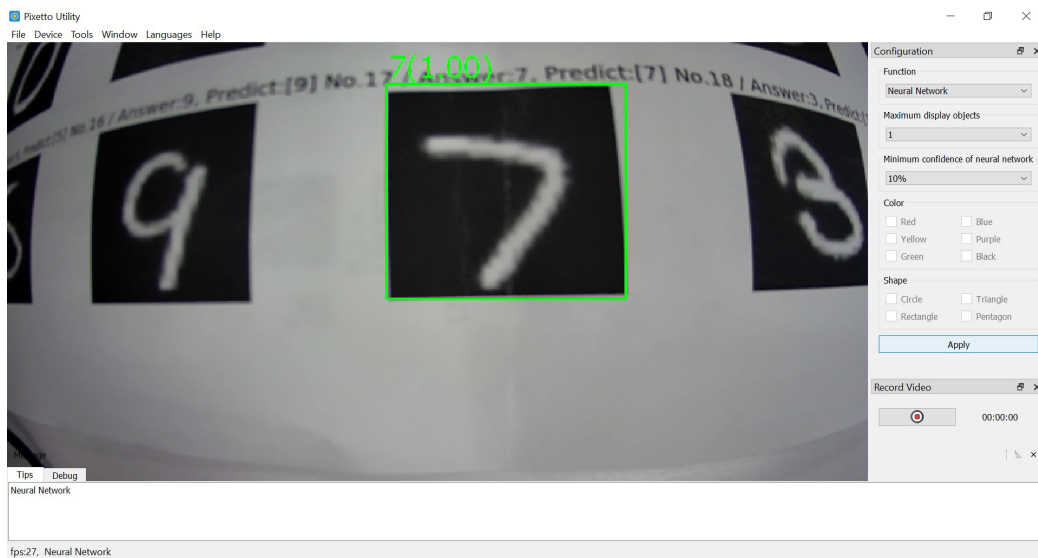


Figure 124: Handwritten digits recognition diagram

7. Grove Connectors

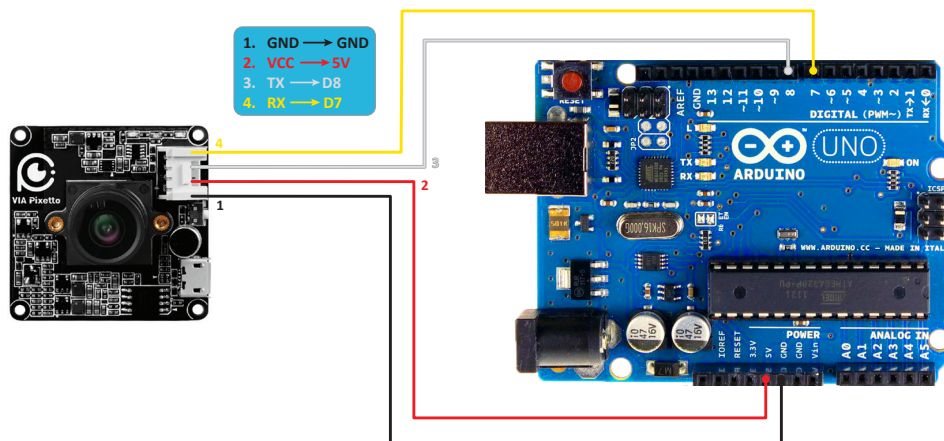
This section shows you how to connect an Arduino board using Grove connector pinouts to the VIA Pixetto vision sensor.

| Pin | UART mode |
|-----|-----------|
| 1 | GND |
| 2 | VCC |
| 3 | TX |
| 4 | RX |

Table 2: Grove connector pinouts

7.1 How to connect the Grove cable to an Arduino board

To enable UART communication, connect pin 3 and pin 4 to D0 and D1 for hardware serial, or any two pins in D2-D12 for software serial.



UART Mode (Software Serial)

Figure 125: Grove connector connectivity diagram

The [Seeeduino Lotus](#) is recommended to make a connection with a Grove 4 pin cable connector.

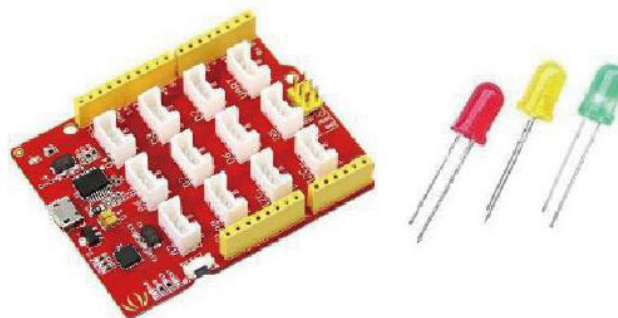


Figure 126: Expansion board diagram

Appendix A. How to update Firmware

This chapter provides information on how to download and update the firmware of the VIA Pixetto vision sensor.

A.1. How to update Firmware manually

Step 1

Connect the VIA Pixetto vision sensor to a PC and wait until all three LEDs are lit.

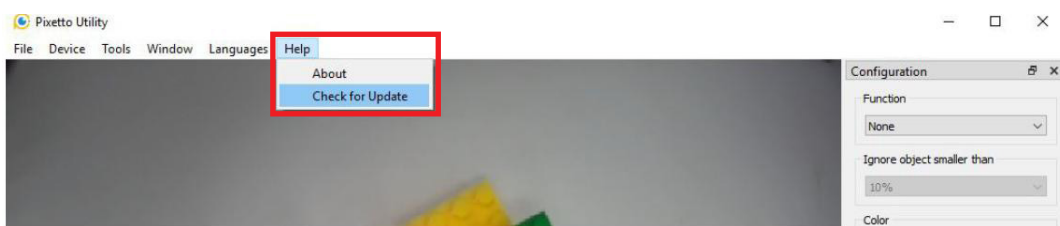
Step 2

Wait until all three LEDs on the VIA Pixetto vision sensor are lit. This means the VIA Pixetto vision sensor has finished booting up and is ready to use.



Step 3

Open the VIA Pixetto Utility application. Go to the 'Help' tab, and select 'Update Device' to update the firmware. Wait until updating is 100% completed.



Caution:

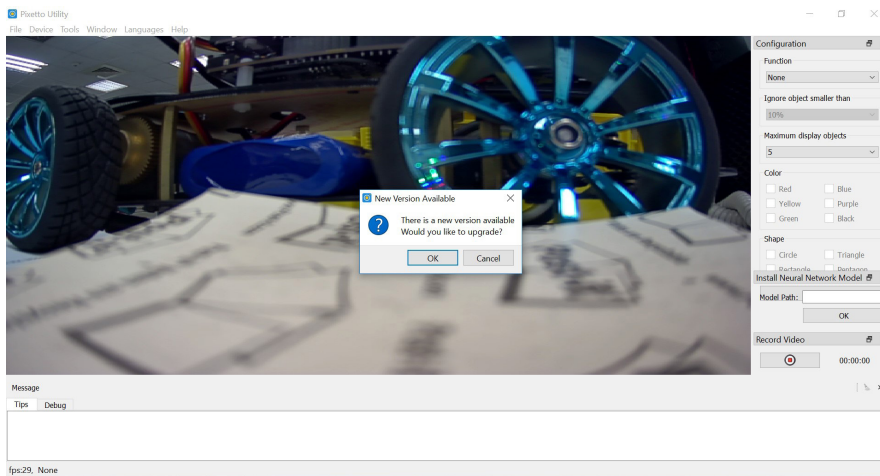
Do not close the VIA Pixetto Utility application or unplug the VIA Pixetto vision sensor during the update to avoid any damage to the device.

A.2. Automatic Firmware Updates

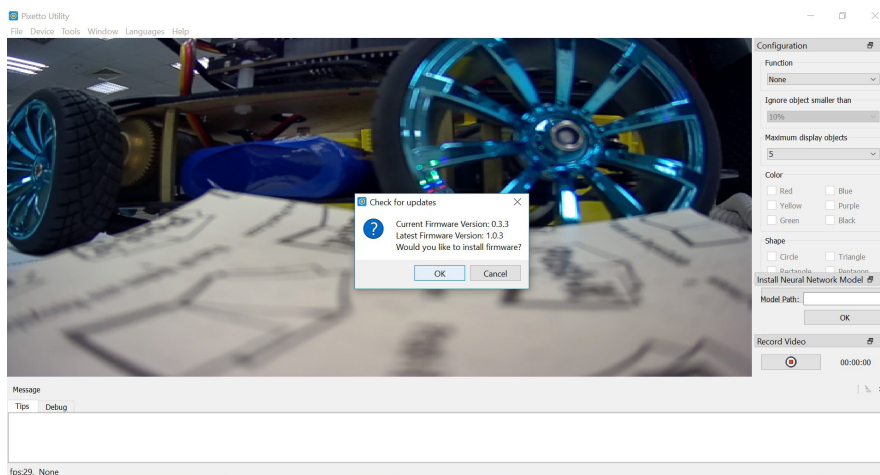
This chapter provides information on how to automatically update the firmware of the VIA Pixetto vision sensor.

Step 1

If you have just installed VIA Pixetto Studio on your computer, when you connect the VIA Pixetto vision sensor to the computer, and open the Pixetto Utility application, the following pop-up message will be shown on your screen. The pop-up will inform you that there's a new version of the firmware to be updated.



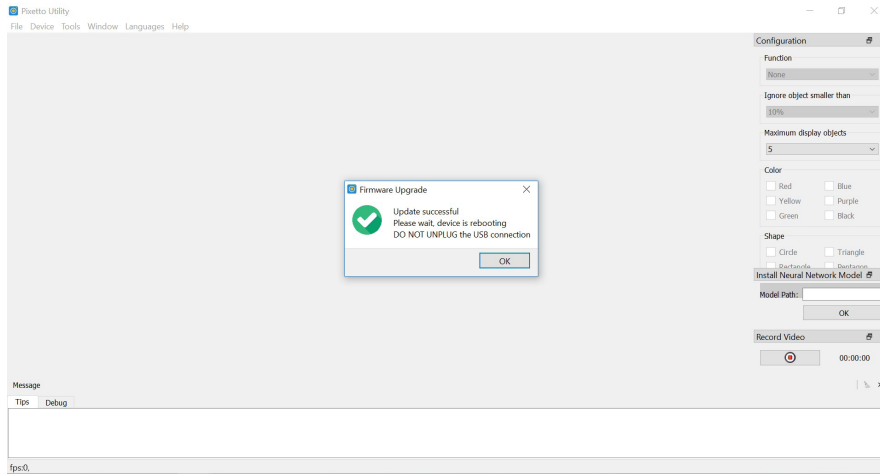
The pop-up will show the firmware version of your VIA Pixetto vision sensor and the newest version. Click on the 'OK' button to update the firmware.



Caution:
Do not close the VIA Pixetto Utility application or unplug the VIA Pixetto vision sensor during the update to avoid any damage to the device.

Step 2

When the firmware is successfully updated, click on the 'OK' pop-up screen to finish the process.



Appendix B. Tips on how to maintain the VIA Pixetto vision sensor

1. Check the electronic components, cables and charger regularly to determine if they are damaged. Cease use immediately if damage is detected and do not use again until the damaged component is repaired or replaced.
2. Update to the latest version of the software applications and firmware regularly. Visit the official VIA Pixetto website to download software and firmware update installation packages.
3. It's important to notice that all three LEDs light on the Pixetto Smart Sensor Camera are working properly. If they aren't working please visit us at www.viapixetto.com.
4. Definition of the three LEDs: Red light, Green Light and Blue light.
 - The green is the power LED.
 - The blue means the VIA Pixetto vision sensor OS boots correctly.
 - The red means that the object is detected by the VIA Pixetto vision sensor.
5. Avoid touching the PCB board of the camera. If possible, it is recommended to use a grounded wrist strap before handling the camera. Electrostatic discharge (ESD) can damage some components.



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