Knowledge Studio

User Manual V 1.0.4

The Knowledge Studio is a development tool that can help you to build your knowledge model quick and easy.

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Contents

1. How to build a knowledge model using the Knowledge Studio

The NeuroShield is an open source hardware compatible shield board.

It can be used by connecting to the Arduino or mbed platform.

1. Collect data from various sensors.

Various Sensors

Application Board

Classification (Recognition)

Detection (Object / Behavior)

Segmentation

Actuator / Controller

4. Apply learned models.

2. Extract features from the collected data.

3. Learn features and verify model

Knowledge Studio

5. Distribute or share learned models.

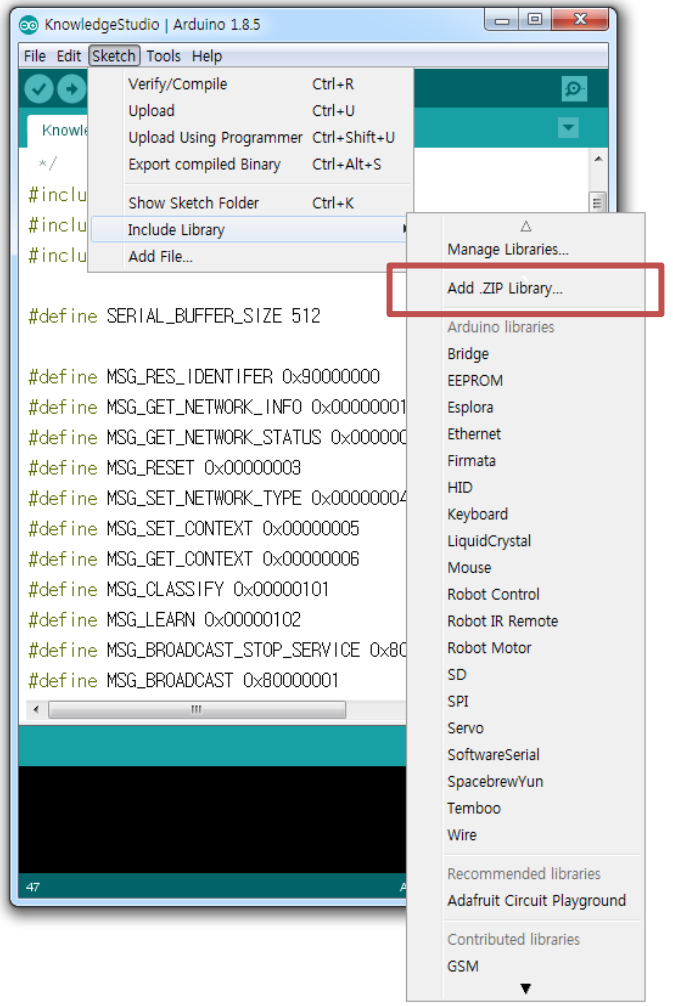
2. Application Board Setup

1. Connect NeuroShield to Arduino.

2. Connect the Arduino to your PC using a USB cable.

3. Download NSNeuralNetwork.zip and add it to the Arduino IDE as a library.

https://github.com/nepes-ai/knowledgestudio



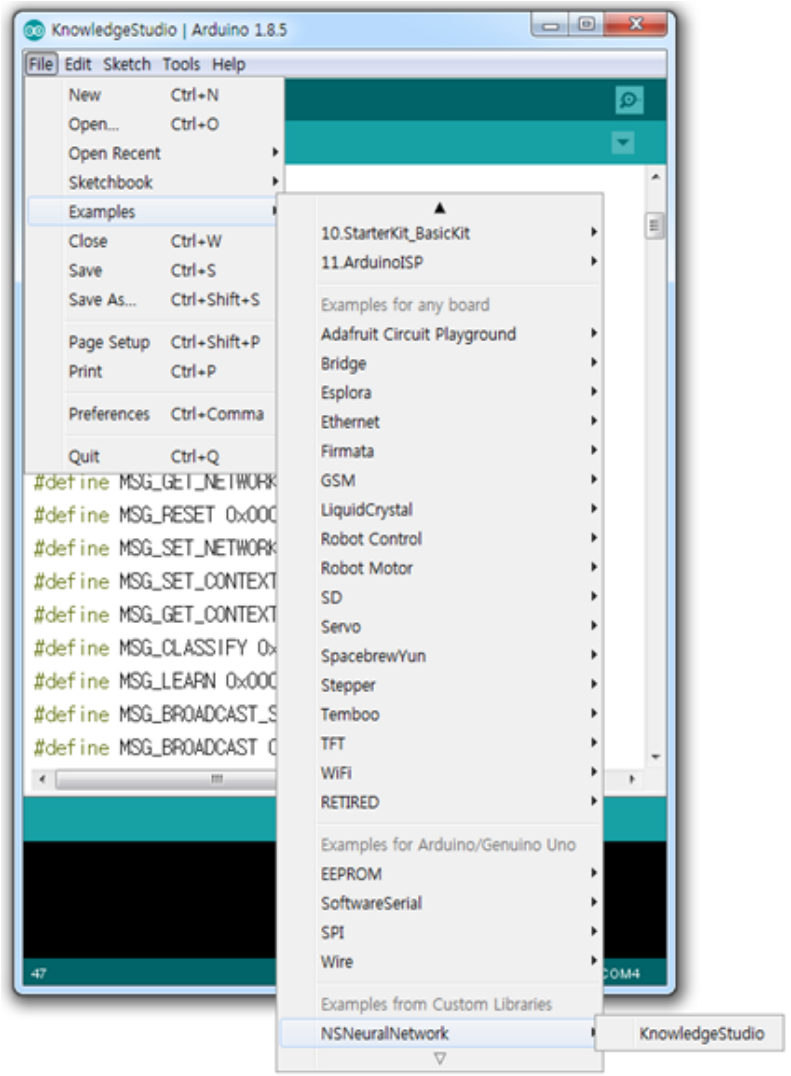
2. Application Board Setup

4. If the library has been successfully added,

move to File> Examples> NSNeuralNetwork

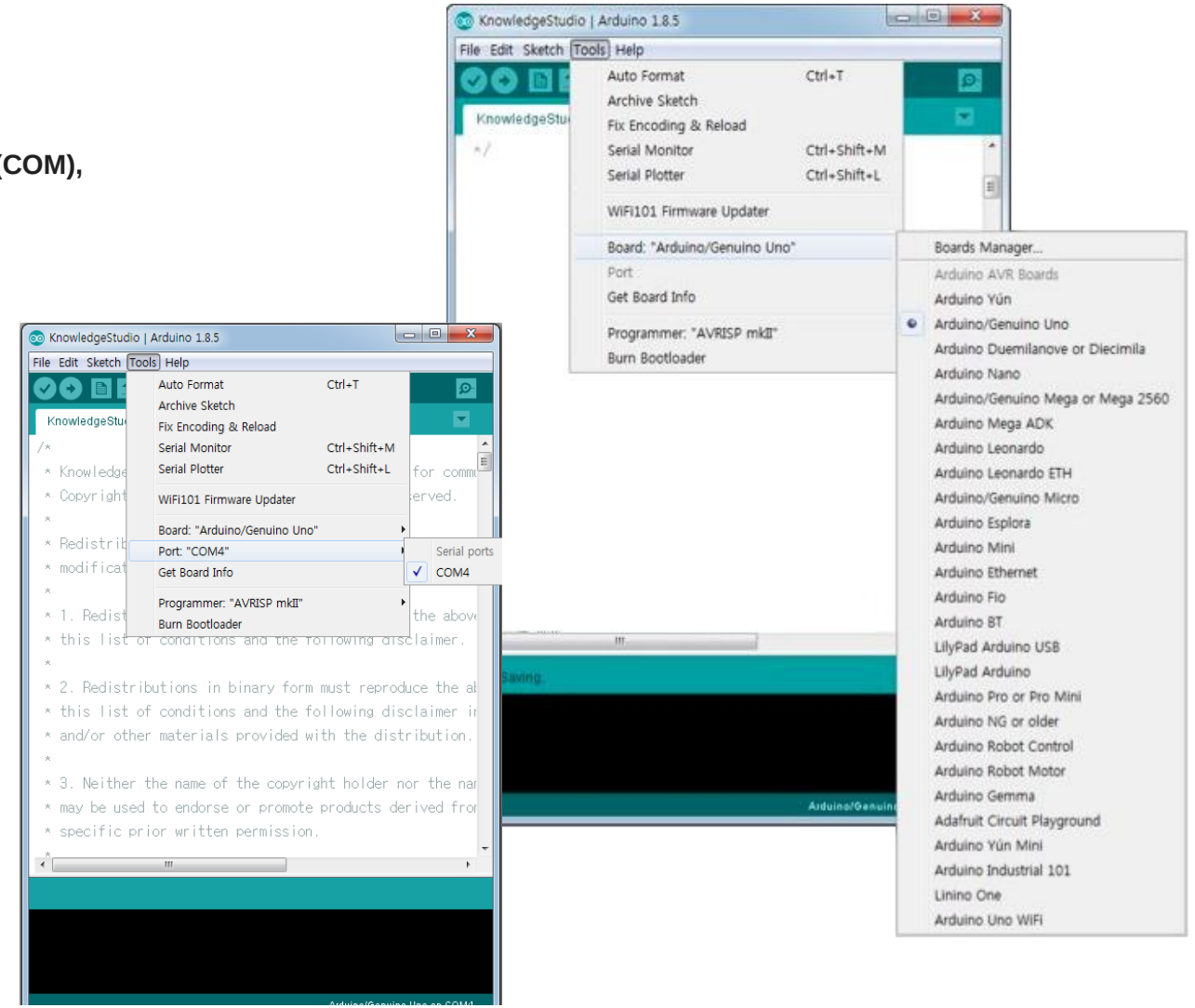
and select the KnowledgeStudio example.

The KnowledgeStudio sketch file is implemented communication protocol between the Knowledge Studio and Arduino through USB Serial.



2. Application Board Setup

5. Select your Arduino board and port(COM),

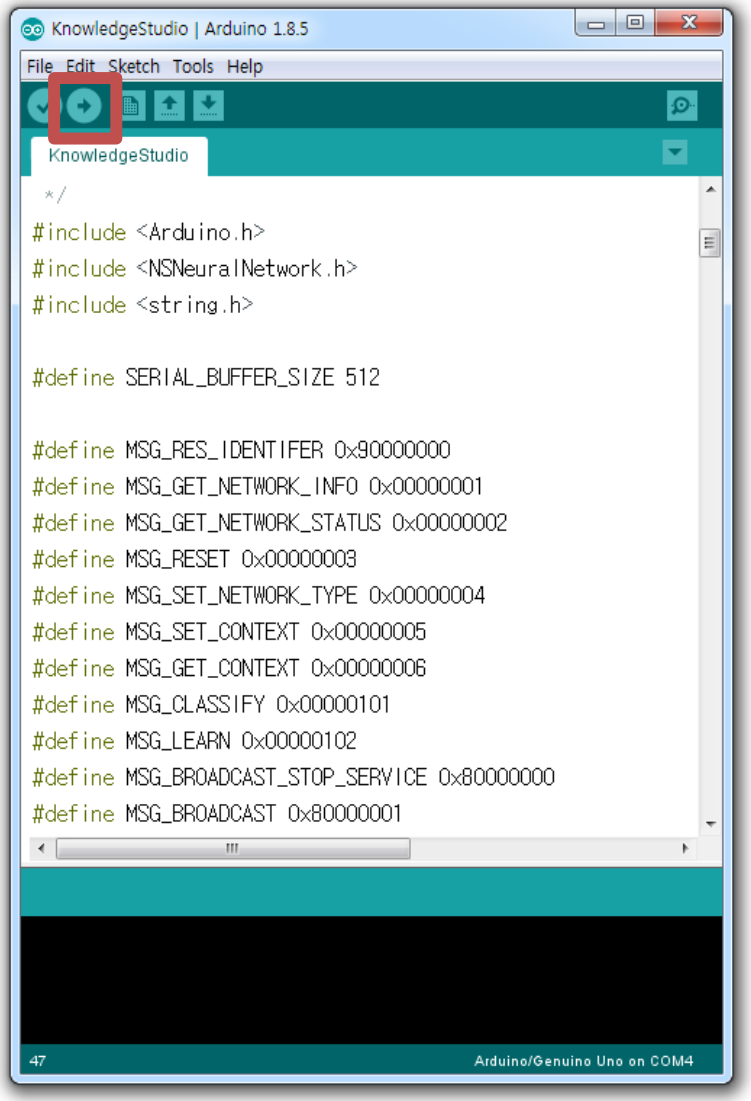


2. Application Board Setup

6. Upload the KnowledgeStudio.ino sketch.

7. If the sketch file has been uploaded successfully,

close the Arduino IDE.



3. Knowledge Studio

Function Navigation

- The icons may be changed depending on data type selected

Project Explorer

Training Data

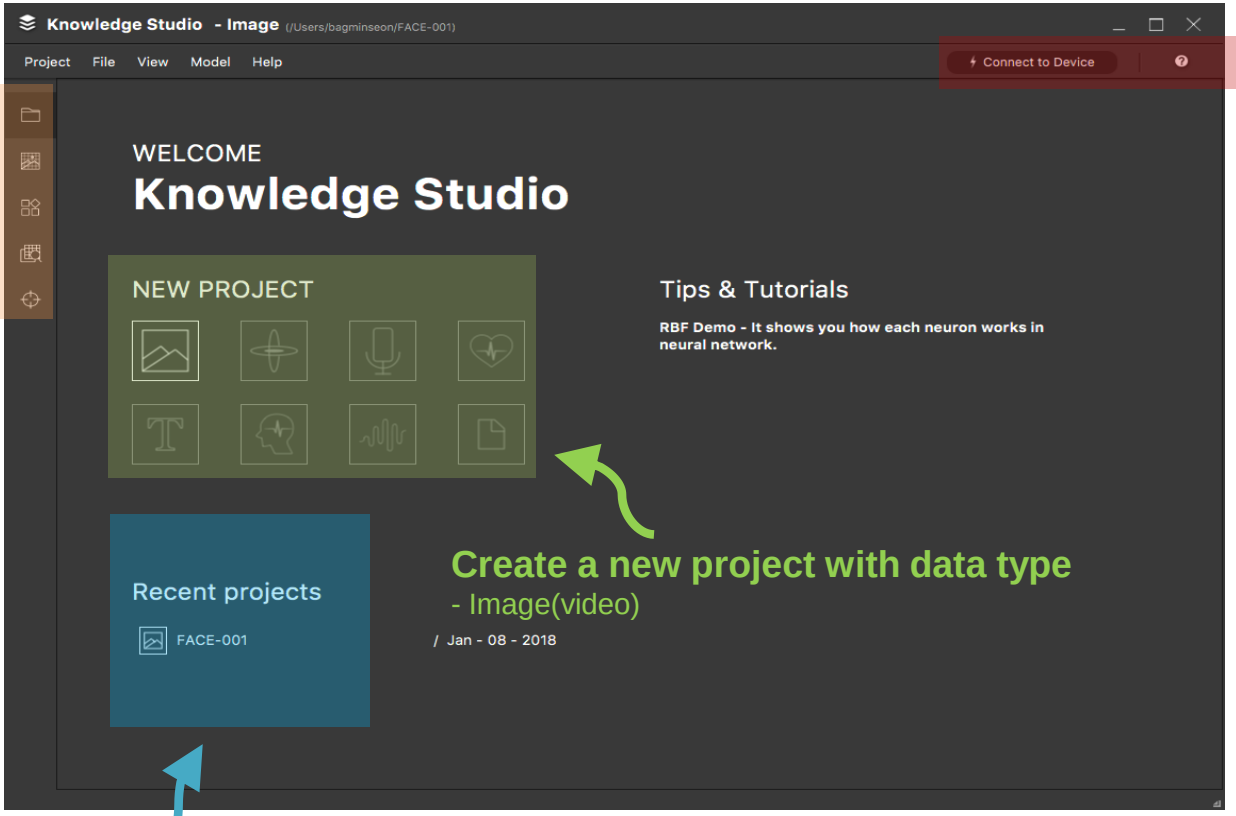
Image Segmentation

Recognition

Detection

Device Connection

- It manages to connect to the device like application boards



Recent Projects

- It provides quick access to recently opened project

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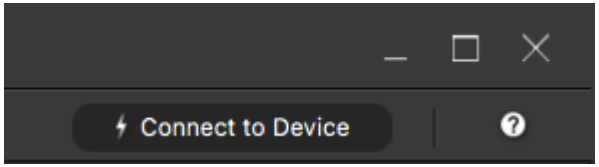
3. Knowledge Studio – Connect to Device

1. Click the “Connect to Device” button in the top right corner.



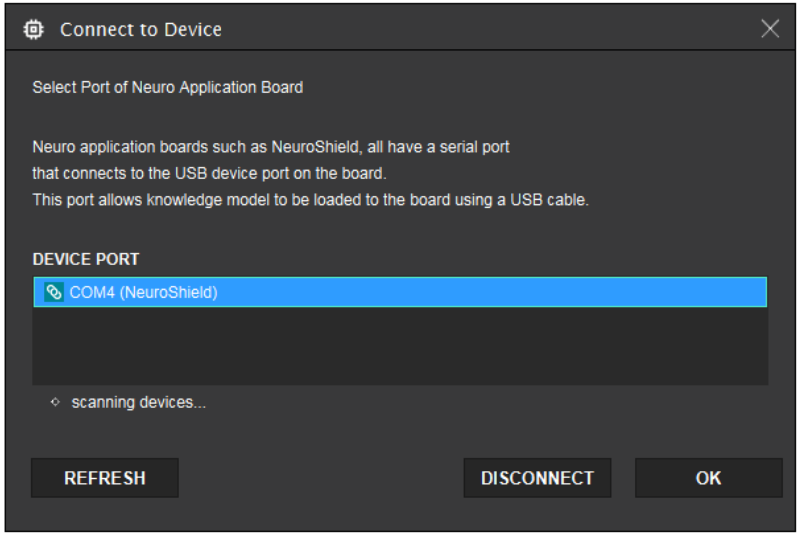
2. The Device Connection dialog shows list of devices,

3. Select the port to which the application board is connected.

4. Click “Connect” button,

The icon colors on device name represent the status of the connection.

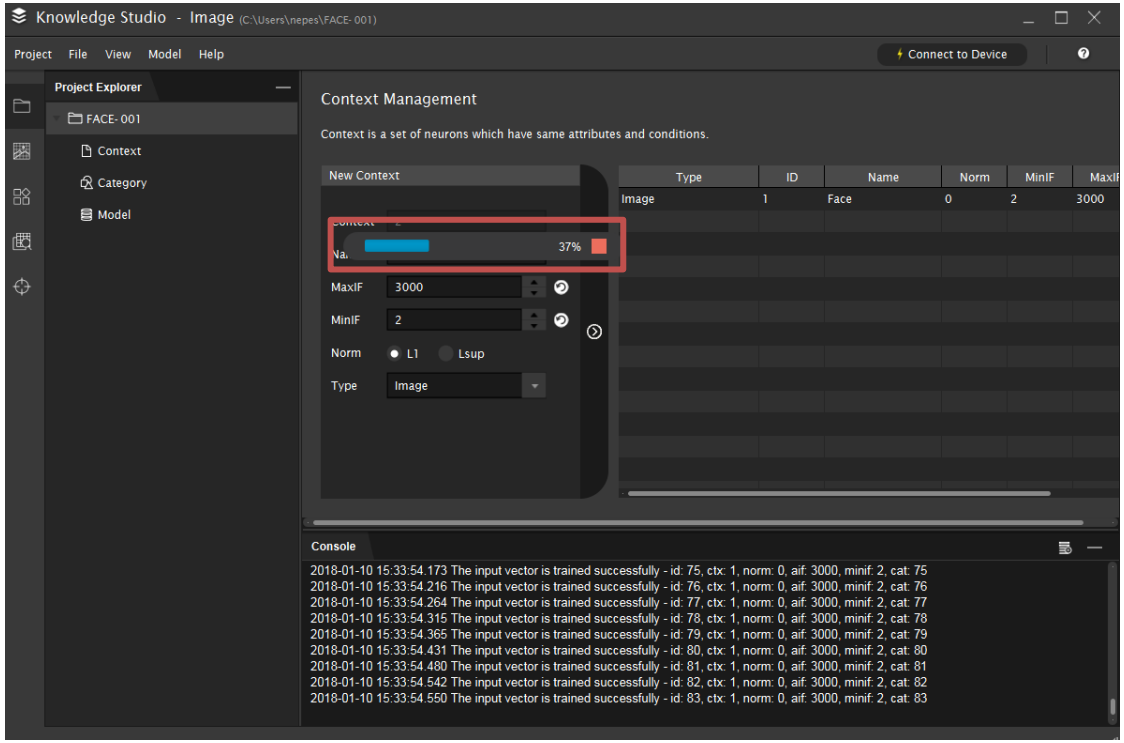
- Disconnected
- Connected. Not ready for use (identifying)
- Ready for use

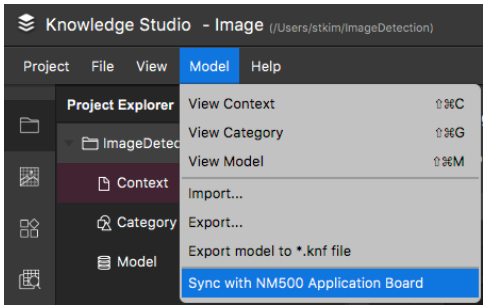


3. Knowledge Studio – Model Synchronization

5. If the project already has a learned model, it will perform the sync automatically.

The sync also can be done manually from the Top Menu > Model > “Sync with NM500 Application Board”



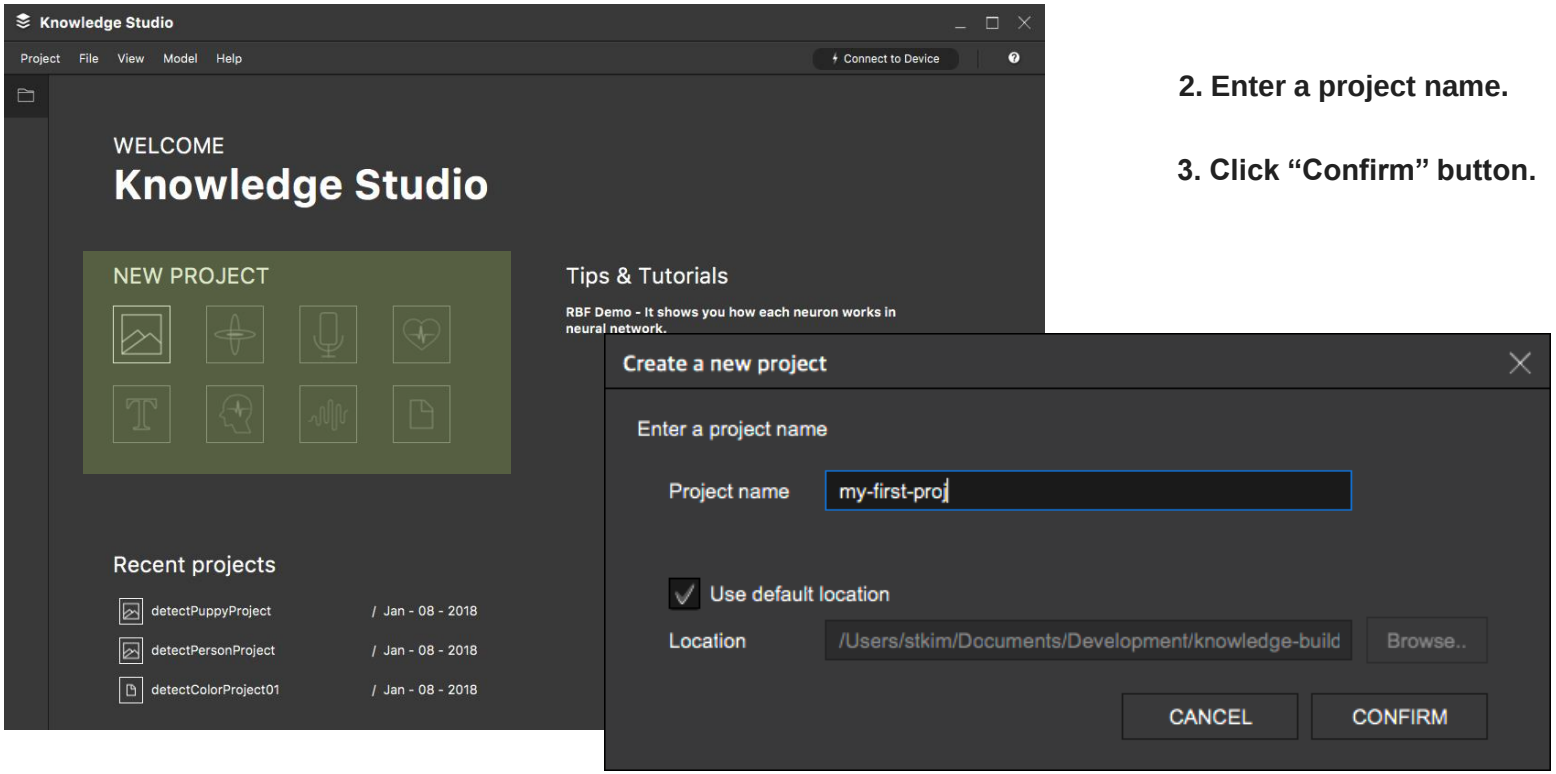


3. Knowledge Studio – Create a project

1. Click one of icons. It represents the data type. The current beta version only supports for image data type.

Selecting the data type is just a way for ease of use. There is no limitation even if wrong data type was selected.

It can be changed anytime.



2. Enter a project name.

3. Click “Confirm” button.

3. Knowledge Studio – Project Explorer

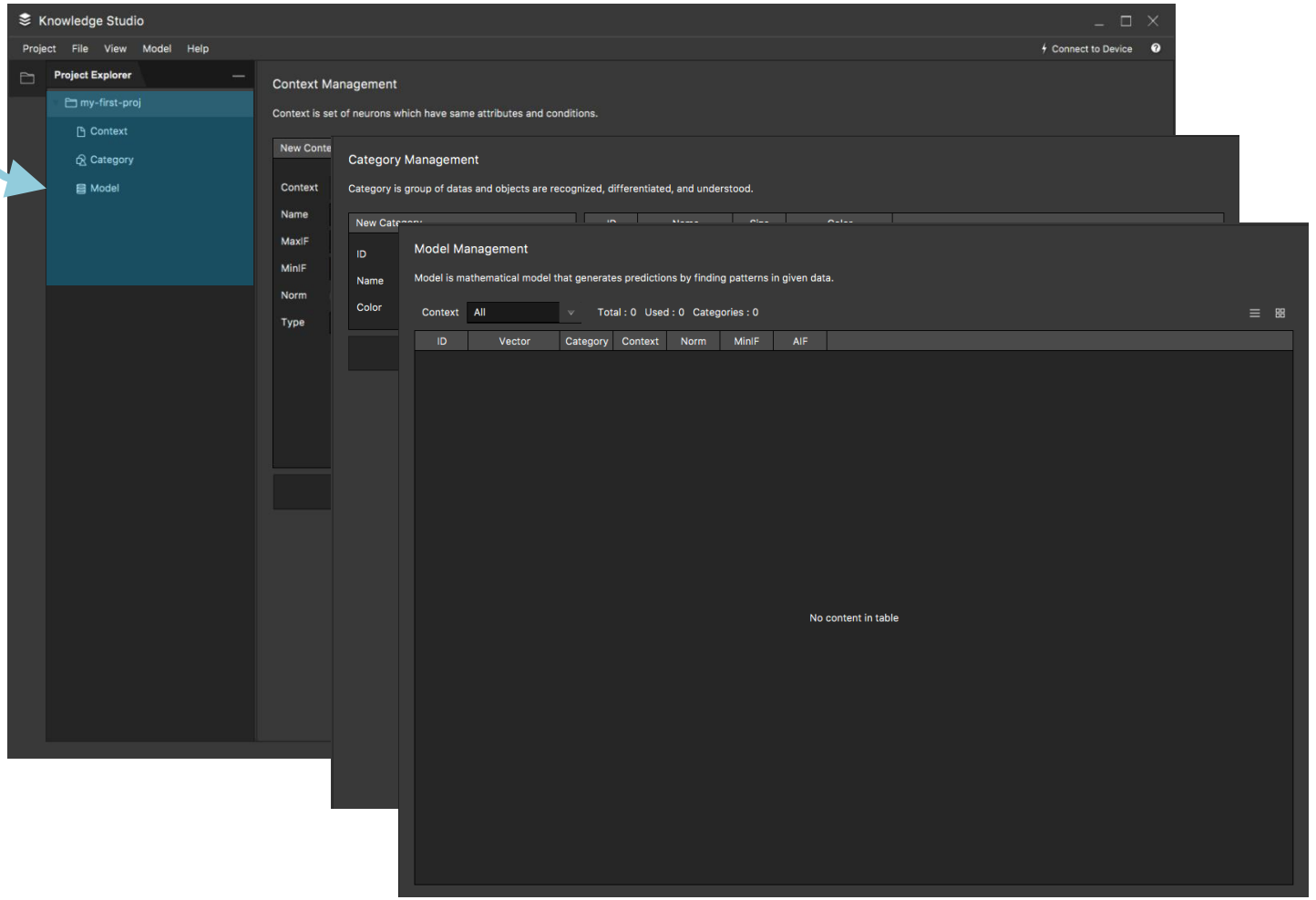
Project Explorer

- It shows basic structure of the project, It consists of context, category and model

Context

Category

Model



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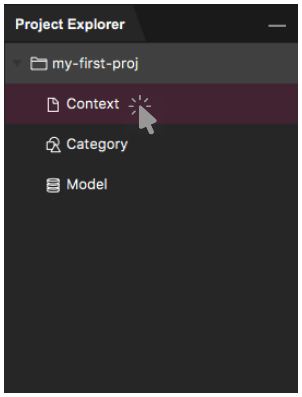
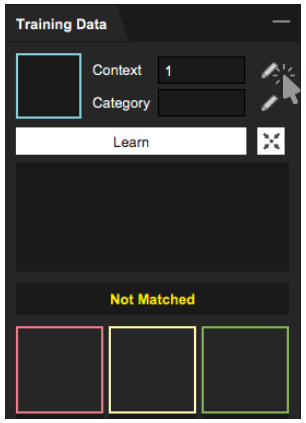
3. Knowledge Studio – Add a Context

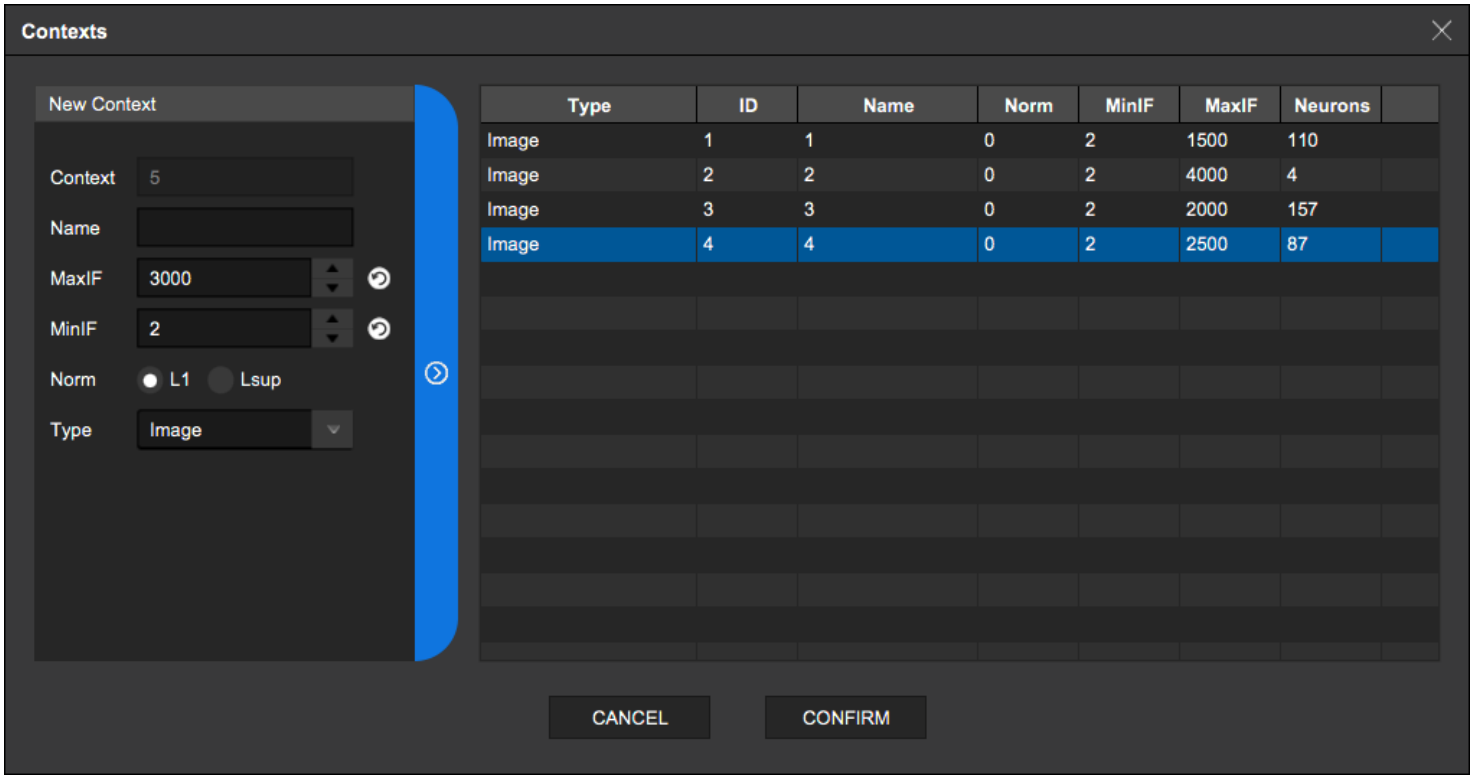
1. Enter the value for each property and click add button.



Project Explorer



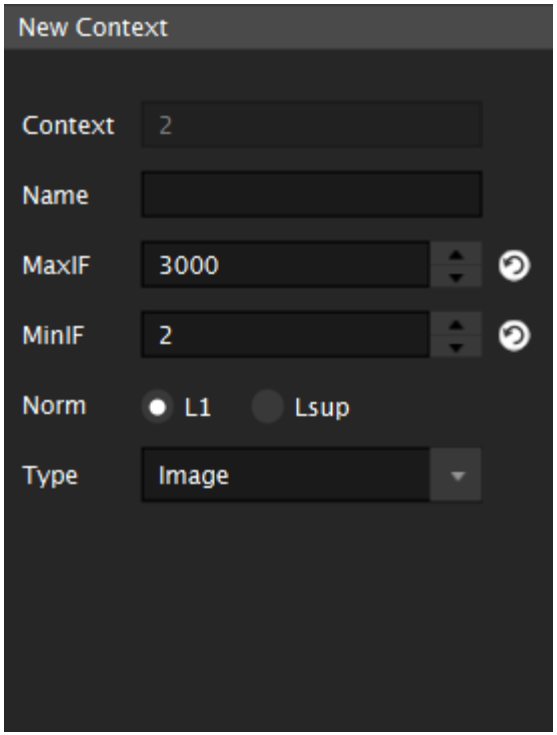
Training View



2. Select added context and double click to apply selected context to network.

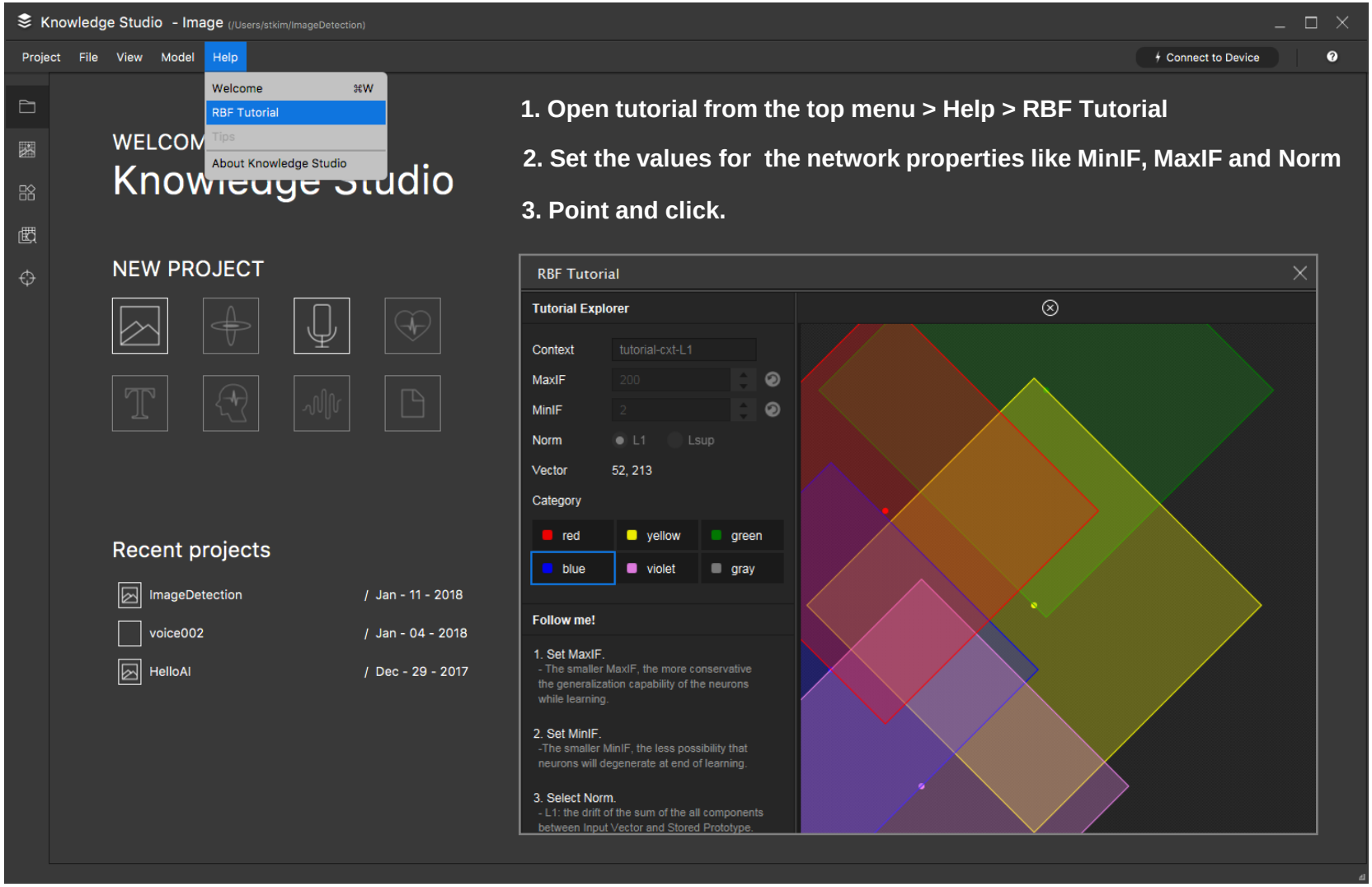
3. Knowledge Studio – Add a Context

- **The neurons can be associated to different contexts and their use can be enabled or disabled y selecting a context value.**
- **The all of neurons assigned with the same context, will be run with the same condition(properties), such as MinIF, MaxIF, Norm and the method for feature extraction.**
- **If any of neuron has been learned with certain context id, the Knowledge Studio doesn't allow to change the condition with that context id.**



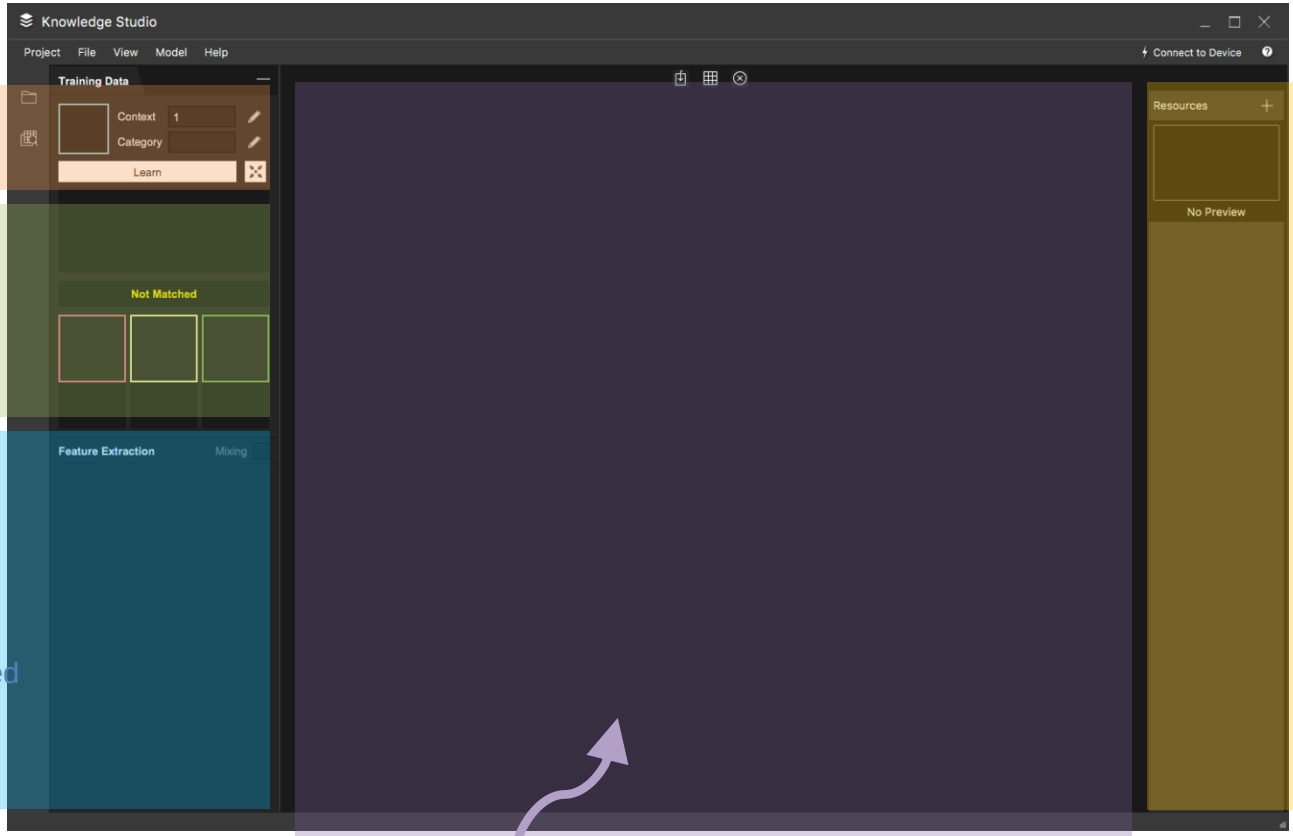
Property	Desc.
Context ID	The values range from 1 to 127.
MaxIF (Maximum Influence Field)	It represents maximum differences for similarity judgement and it is used to adjust conservatism. The values range from 1 to 65535. The default value is 3000 in Knowledge Studio.
MinIF (Minimum Influence Field)	It represents minimum differences for dissimilarity judgement and it is used to control uncertain domain. The default value is 2.
Norm	It is method to calculate the distance (similarity) between featured input vector and stored weight vector in neuron. The NM500 supports L1 (Manhattan) and Lsup (Supremum) as norm.

3. Knowledge Studio – Understanding How NM500 works



3. Knowledge Studio – Learning Workspace

Training Data
- It shows featured vector data and provide functions to learn



Recognition Results
- It shows recognition results from model.

Feature Selection
- It provides functions to select an algorithm required for feature extraction..

Resources List
- It shows all list of resources added.

Data Source
- It shows image that is selected from resources list.
- The ROI/ROS can be set in here.

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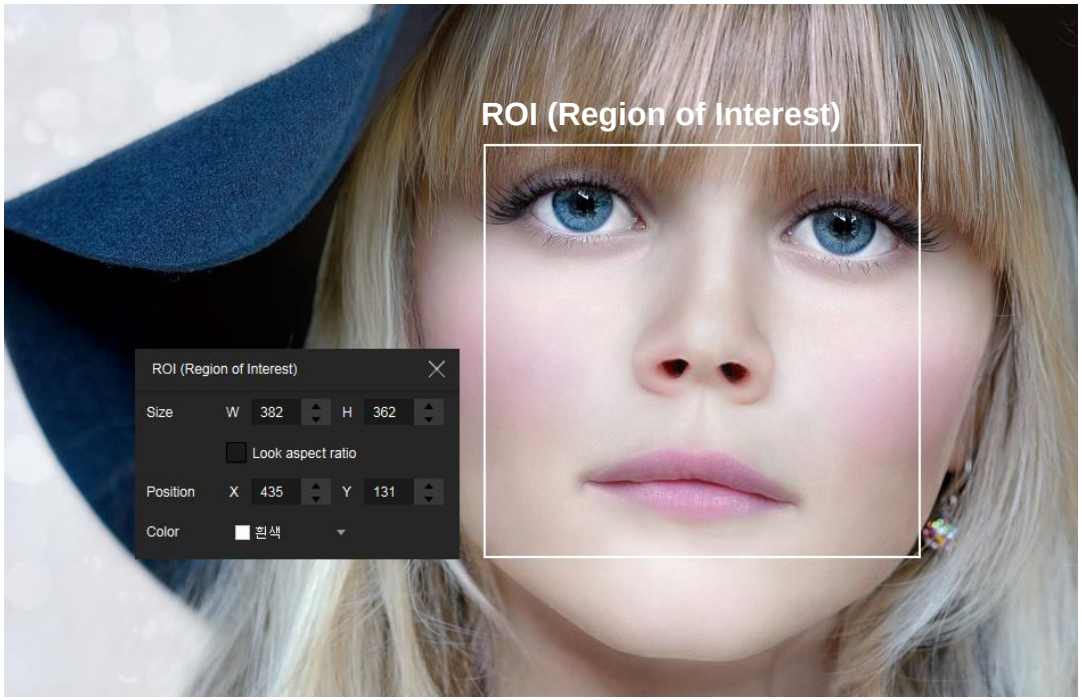
3. Knowledge Studio – Feature Extraction / Selection

- **It reduces the high-dimensional data to 256 dimensional data. (Each neuron of NM500 has 256 bytes weight memory)**
- **To obtain the expected result, the best-fitting algorithm should be selected for feature extraction.**
- **Knowledge Studio provides subsampling, histogram, and composition profile as the default features extraction algorithms.**



Average Subsampling

Max Subsampling

N^{th} Entry Subsampling

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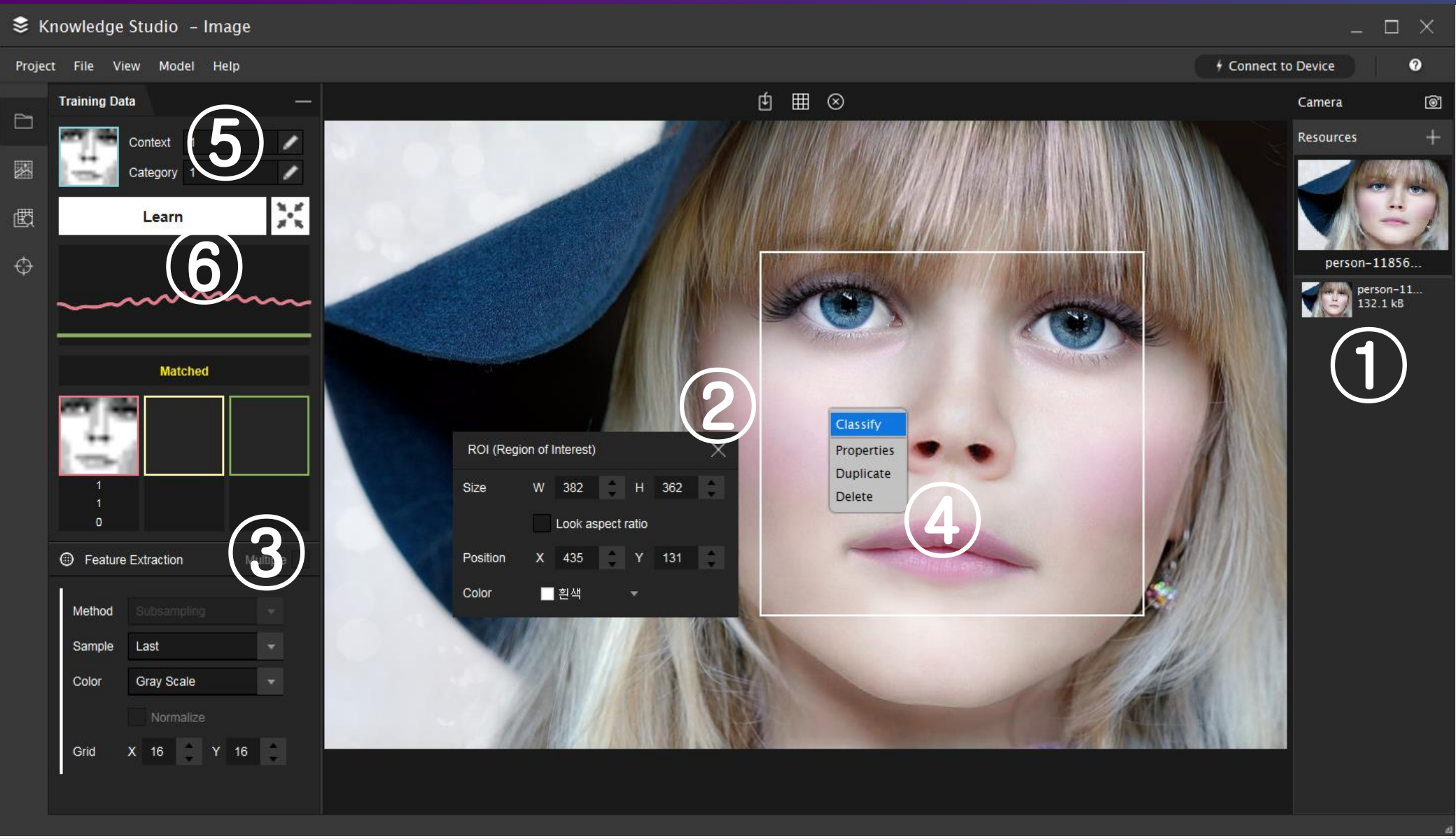
3. Knowledge Studio – Training Data (Learning)



3. Knowledge Studio – Training Data (Learning)

1) Add image file and double click the file. It will be presented at workspace.

2) Click right-button and select "*New ROI*" menu. You can scale the ROI as much as you want.

3) Select feature extraction method. (If any of neuron has been learned with certain context id, it cannot be changed)

4) Double click on the ROI area or Click right-button within the ROI and select "*Classify*" menu.

5) The result of classifying is shown. Assign a category for the result.

6) Press the "*Learn*" button.

3. Knowledge Studio – Image Data Format

- **Supported Image data format**

Format	Description
PNG	Portable Network Graphics
GIF	Graphics Interchange Format
BMP	Bitmap image file
JPEG (JPG)	Joint Photographic Experts Group

3. Knowledge Studio – Video Data Format

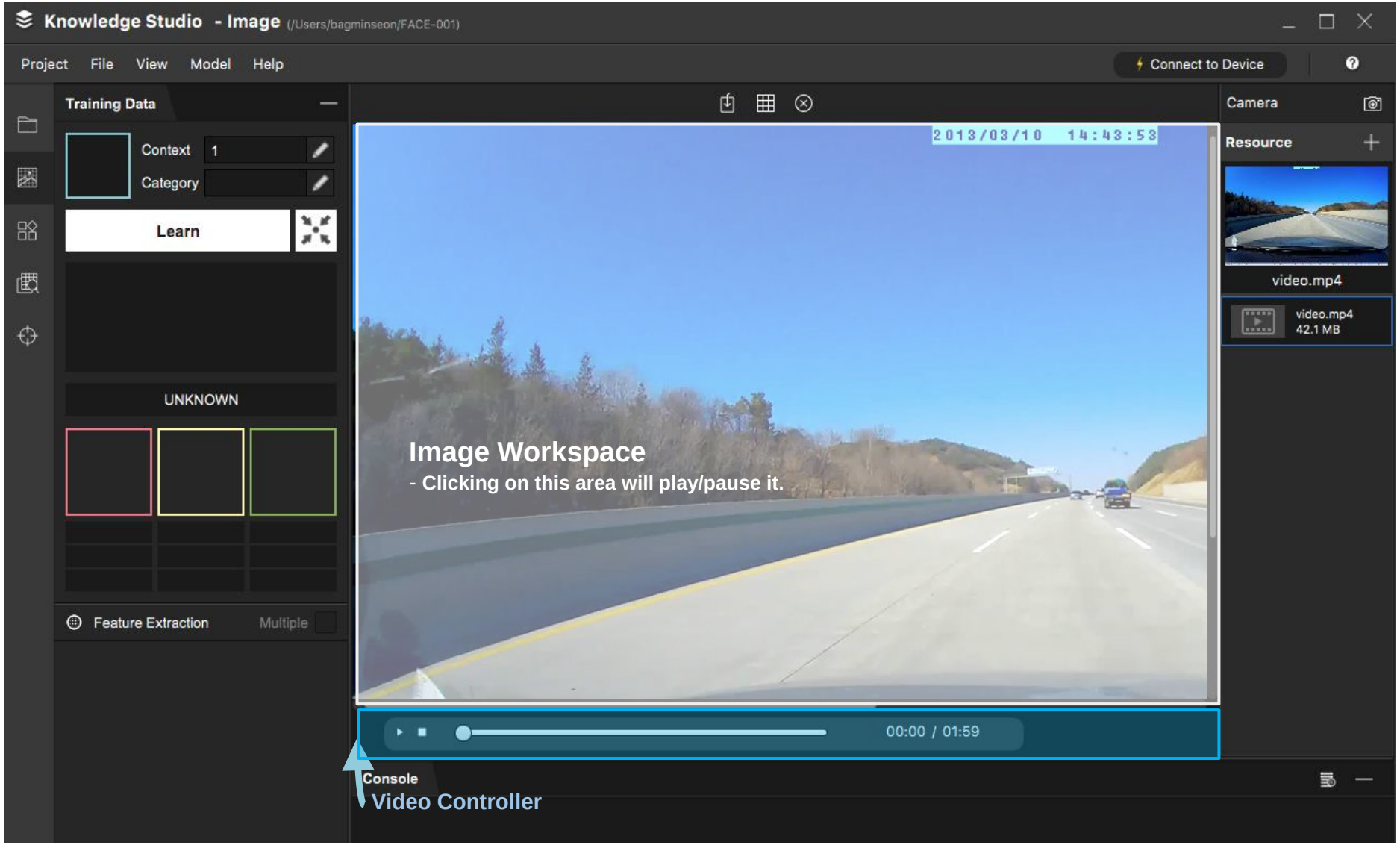
- **Supported Video Formats**

Container	Description	Video Encoding	Audio Encoding	MIME Type	File Extension
FXM, FLV	FX Media, Flash Video	**VP6**	**MP3**	video/x-javafx, video/x-flv	.fxm, .flv
HLS (*)	MP2T HTTP Live Streaming (audiovisual)	**H.264/AVC**	**AAC**	application/vnd.apple.mpegurl, audio/mpegurl	.m3u8
MP4	MPEG-4 Part 14	**H.264/AVC**	**AAC**	video/mp4, audio/x-m4a, video/x-m4v	.mp4, .m4a, .m4v

To convert video format supported, refer to the following URL,

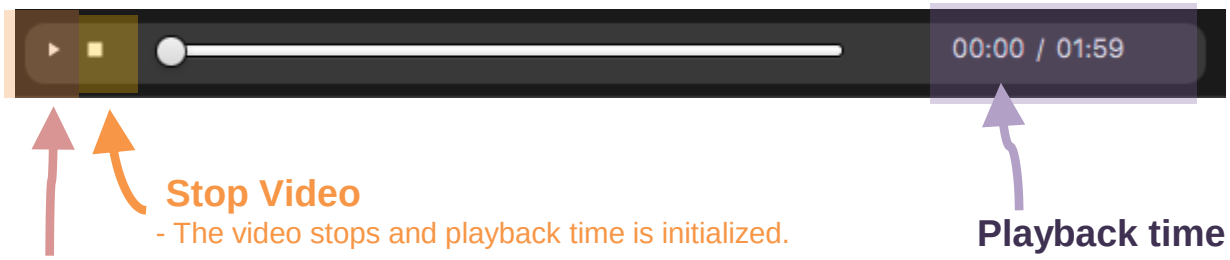
http://www.freemake.com/free_video_converter/

3. Knowledge Studio – Video Data Learning workspace



3. Knowledge Studio – Video Data Learning workspace

- **The features available on the media bar are described as follows,**



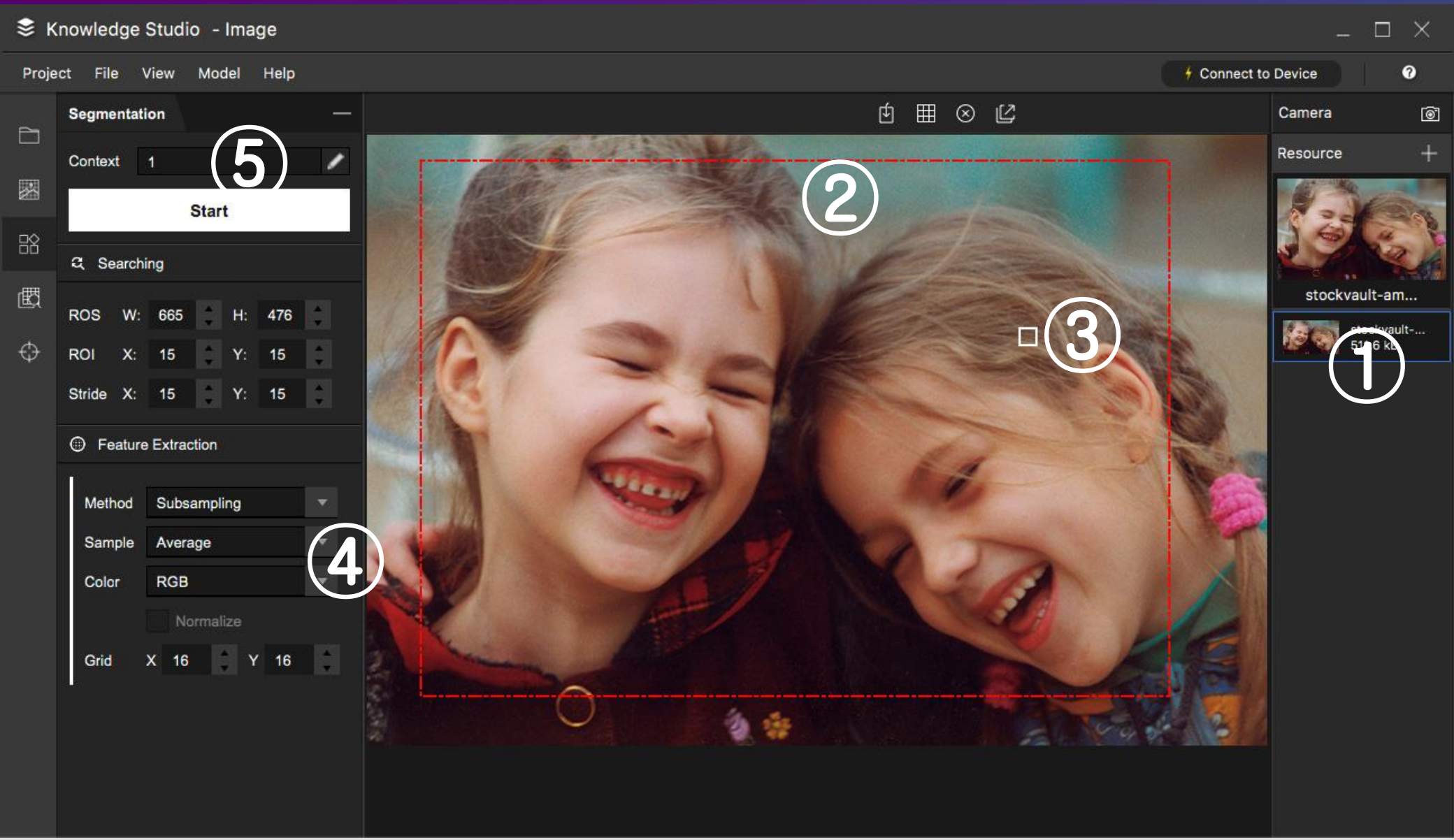
Stop Video
- The video stops and playback time is initialized.

Play video
- When video playback begins, this button is replaced by the pause button.

Playback time
- Indicates the time the video was played.
- Indicates the total playback time for the video.

Time Slider
- You can drag the button to any time point.

3. Knowledge Studio – Segmentation / Clustering



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3. Knowledge Studio – Segmentation / Clustering

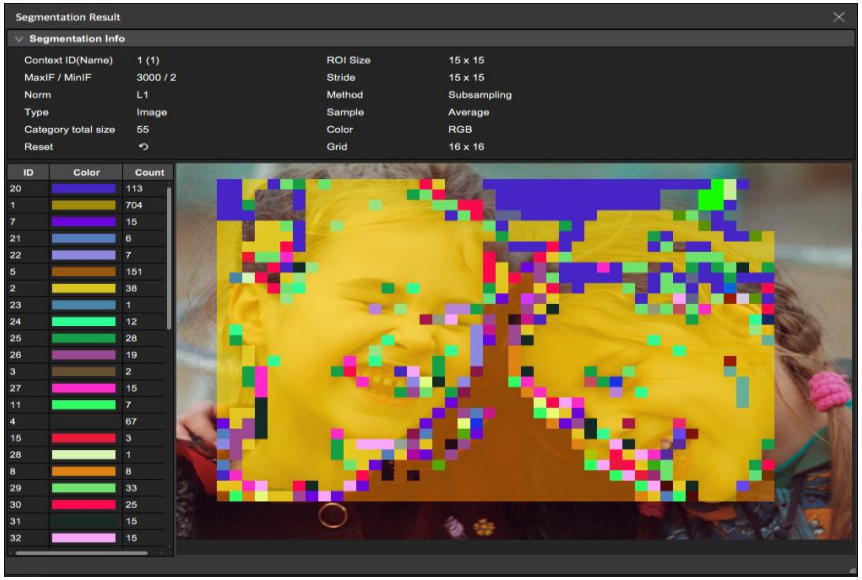
1) Add image file and Double click the file. It will be presented at workspace.

2) Click right-button and select "*Set ROS"* menu. ROS is an area that show a result of segmentation. By dragging or input values on the function view, You can scale the ROS as much as you want.

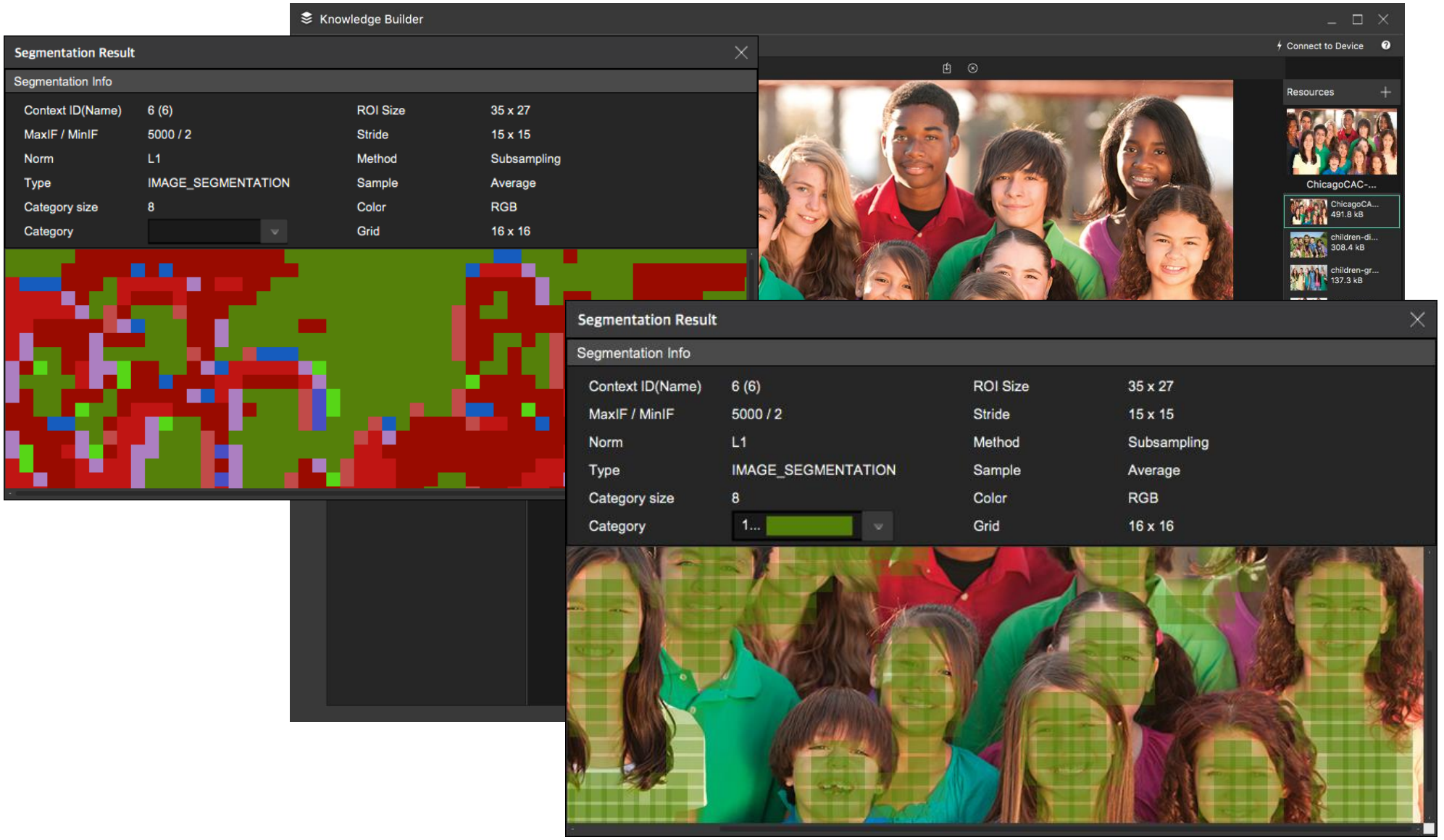
3) Click right-button and select "*New ROI* " menu. By dragging or input values on the function view, You can scale the ROS as much as you want.

4) Set the subsampling details. Once a segmentation begins with that value in a context, it cannot be changed.

5) Select a context and click "*Start"* button.



3. Knowledge Studio – Segmentation / Clustering



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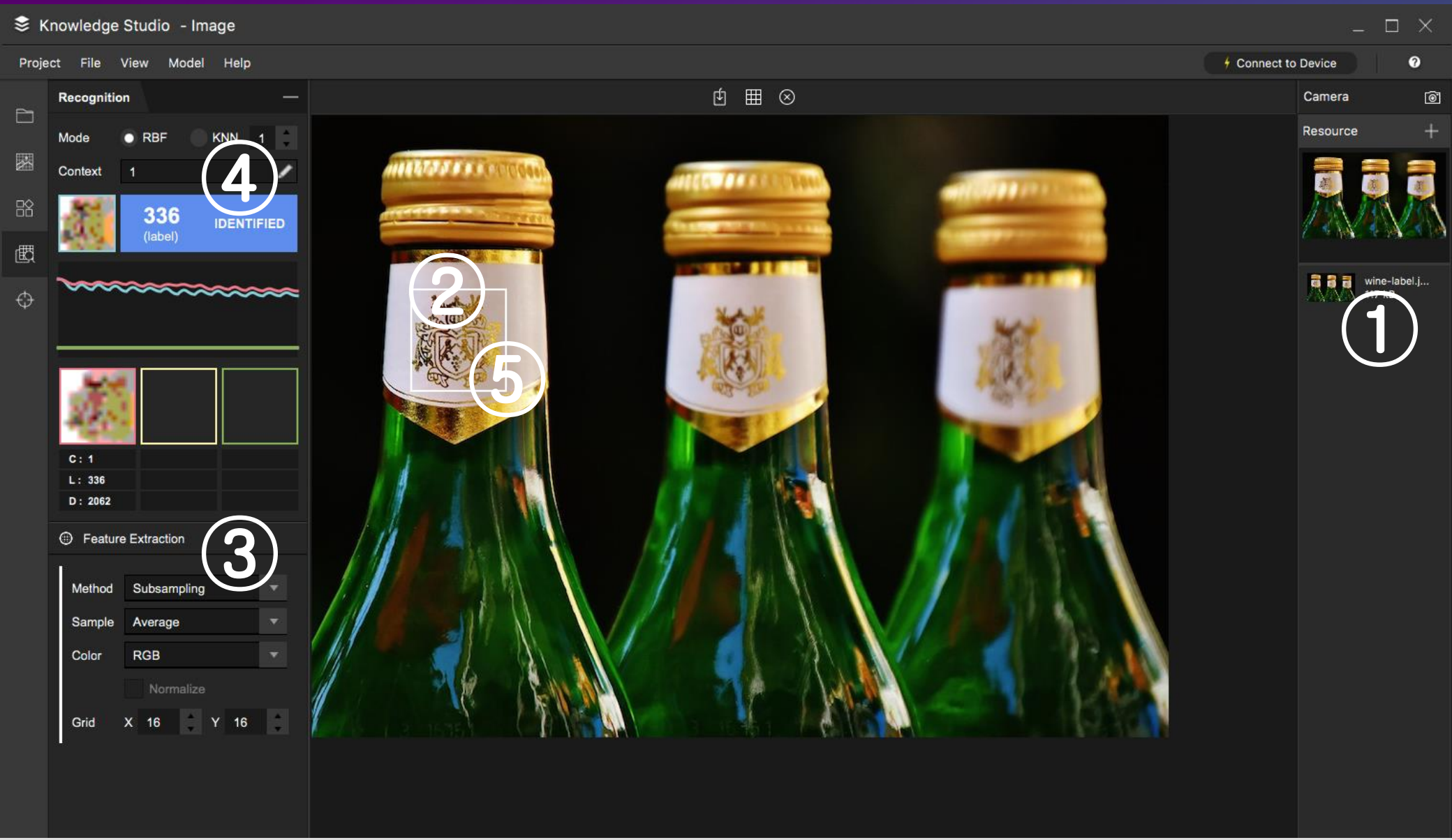
3. Knowledge Studio – Recognition



3. Knowledge Studio – Recognition

1) Add image file and double click the file. It will be presented at workspace.

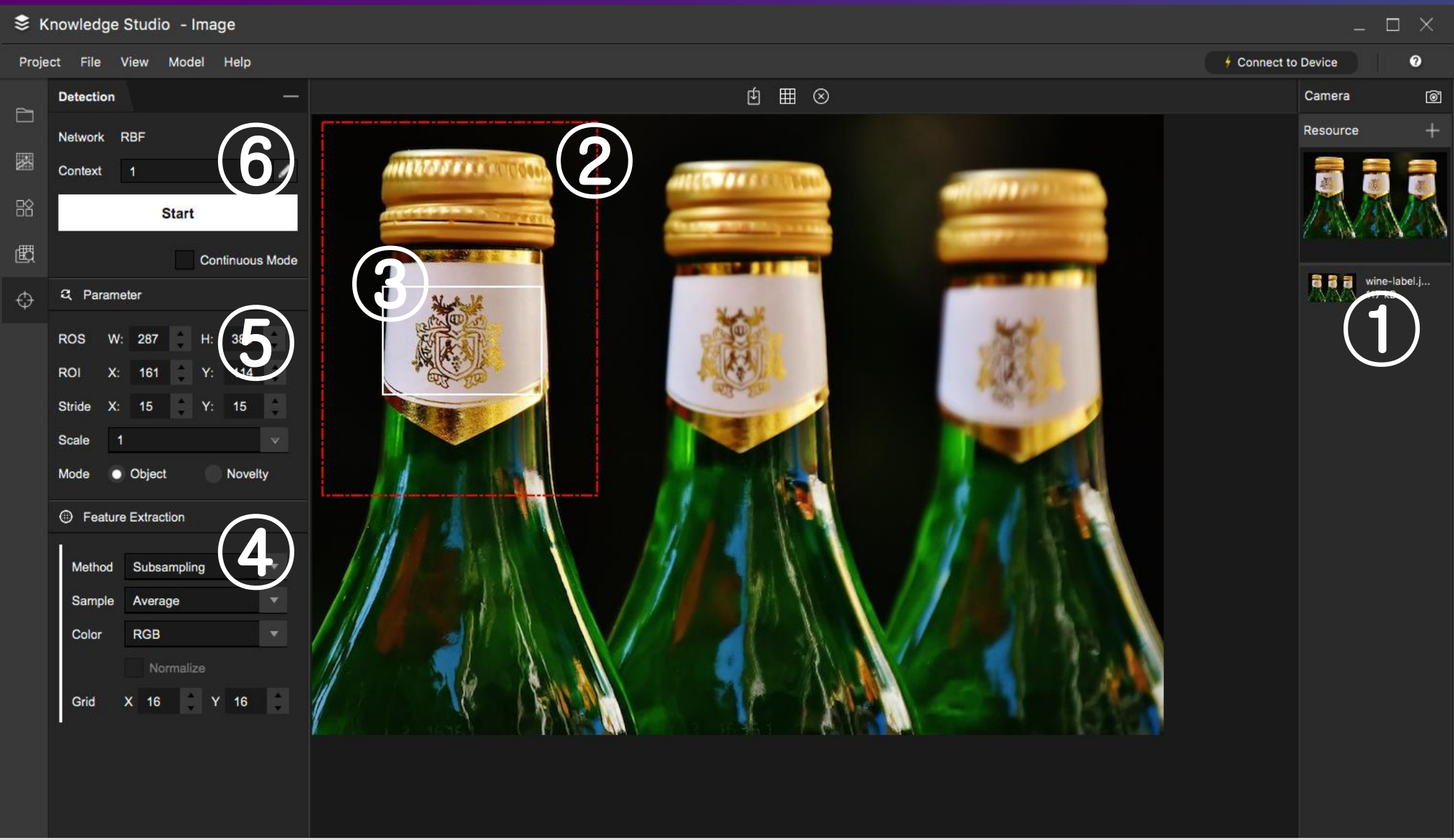
2) Click right-button and select "*New ROI*" menu. You can scale the ROI as much as you want.

3) Set the subsampling details. Once a learning begins with that value in a context, it cannot be changed.

4) Select a network mode(RBF | KNN) and a context.

5) Double click on the ROI area.

3. Knowledge Studio – Detection



3. Knowledge Studio – Detection

1) Add image file and double click the file. It will be presented at workspace.

2) Click right-button and Select "*Set ROS"* menu. The ROS is an area that show a result of segmentation. By dragging or input values on the function view, You can scale the ROS as much as you want.

3) Click right-button and select "*New ROI"* menu. By dragging or input values on the function view, You can scale the ROS as much as you want.

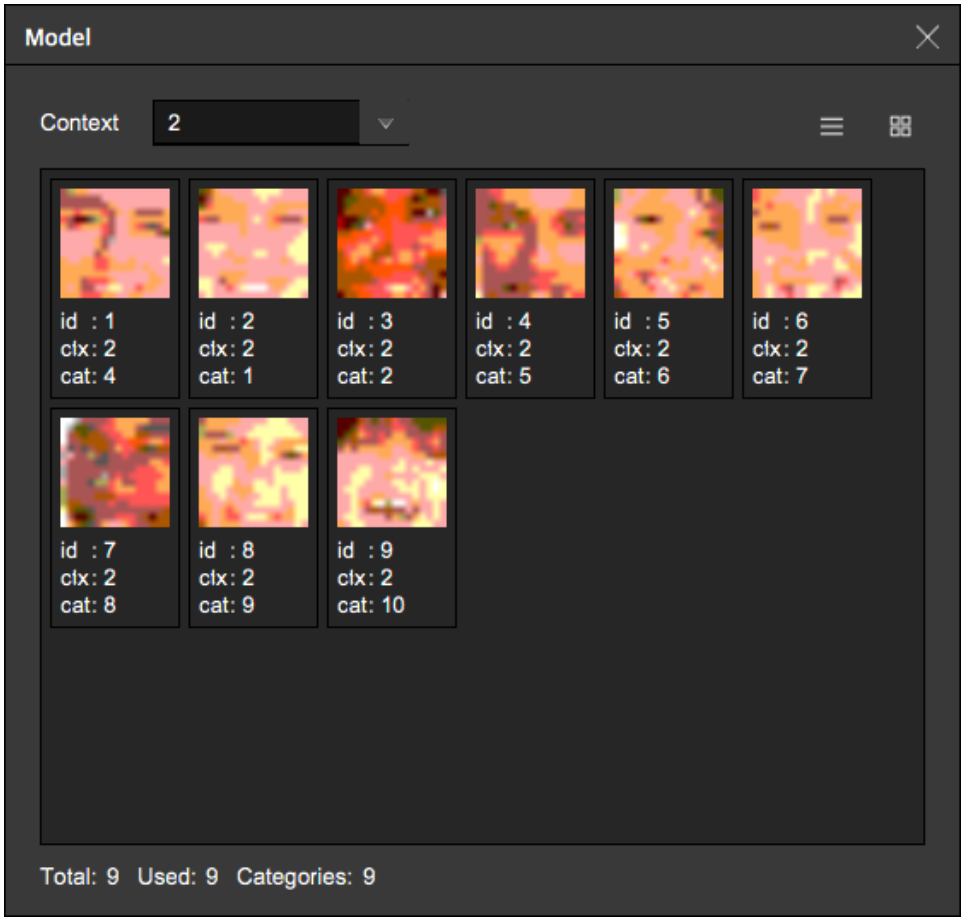
4) Set the subsampling details. Once a detection begins with that value in a context, it cannot be changed.

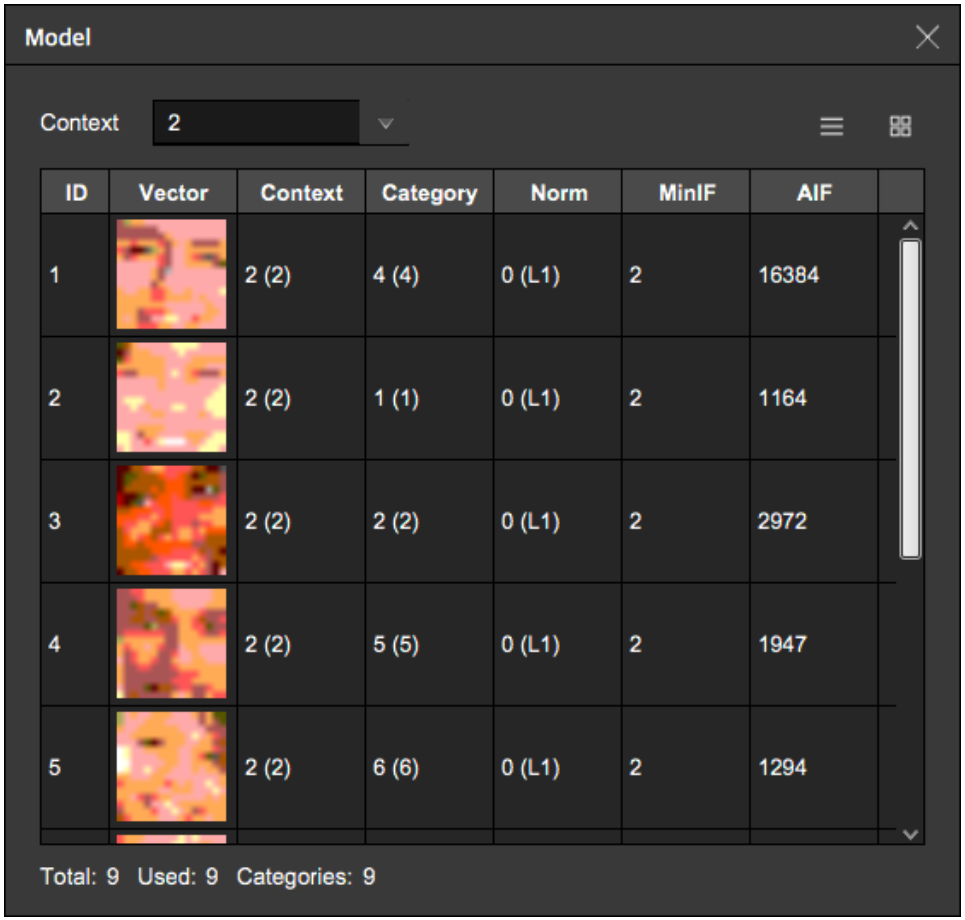
5) Select a detection mode. (object mode is to show what it is, and novelty mode is to find where is the unknown area.)

6) Select a context and click "*Start"* button.

3. Knowledge Studio – Model View

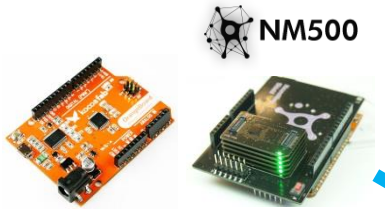
- **Using the model view, you can see what conditions the learned neurons are in.**





3. Knowledge Studio – Deployment

- **The learned models can be uploaded directly to the device or can be distributed using an SD card.**



Application Board

Save Knowledge Model to micro SD

Knowledge Studio

End of Document