Infrared AI

User Guide

Version 2.1.0 | Apr. 29, 2026

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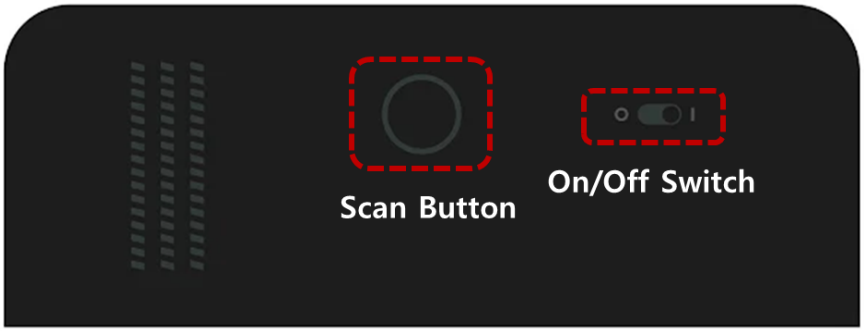
1 Product Overview

1.1 Top view

1.2 Side view



2. Installing Application

2.1 System Requirements

The following are the minimum system requirements to use the Infrared AI:

- **Windows**: Windows 10 (64bit) or higher
- **macOS**: macOS Ventura (version 13) or higher
- **Android**: Android 5.0 (API 21) or higher
- **iOS**: iOS 14.0 or higher

2.2. Installation

This section explains how to download and install the Infrared AI app.

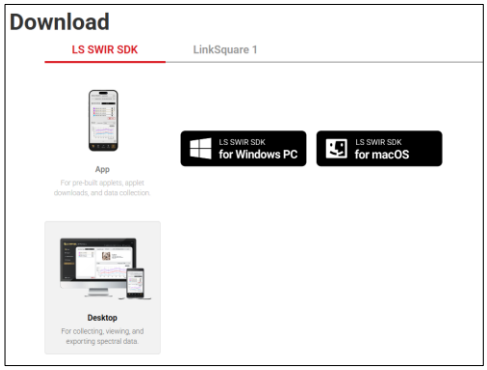
2.2.1 Download link

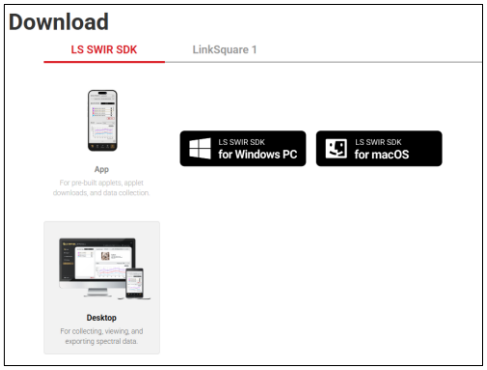
First, access the official download page through the link below.

- **Download Link**: https://linksquare.io/download/

Once you access the page, make sure the '**LS SWIR SDK**' tab is selected. LS SWIR SDK is available in two versions: 'App' for mobile/tablet and 'Desktop' for PC. Select either App or Desktop, then click the button for your operating system to proceed with the download.

- App: App Store (iOS), Google Play Store (Android)
- Desktop: Windows, macOS





2.2.2. Installation

iOS (App Store)

1. In the 'App' section, click 

button.
2. In the App Store, tap 'Get' to proceed with the installation.
3. Once the installation is complete, you can find the app icon on your home screen.

Android (Google Play Store)

1. In the 'App' section, click 

button.
2. In the Play Store, tap "Install" to proceed.
3. Once the installation is complete, you can find the app icon in your app drawer.

Windows

1. In the 'Desktop' section, click 

button to download the installer file (`.exe`).
2. Run the downloaded file.
3. Follow the on-screen instructions to proceed with the installation. If a "User Account Control" pop-up appears, click 'Yes'.
4. Once installed, you can run the LS SWIR SDK from your desktop or Start Menu.

macOS

1. In the 'Desktop' section, click 

button to download the disk image file (`.dmg`).
2. Open the downloaded file to show a Finder window.
3. Drag the LS SWIR SDK app icon to the 'Applications' folder to copy it.
4. Once installed, you can run the program from Launchpad or the Applications folder.

2.2.3. App Permission Requests

When you first launch the app, it may request permissions required to use LS SWIR SDK. For smooth device connectivity and app usage, please allow the permissions below.

Android

- Bluetooth: Required to search for and connect to LS SWIR SDK devices. On Android 12 and higher, a "Nearby devices" permission may be displayed.
- Location (some devices/OS): On Android 11 and below, location permission may be required for BLE scanning.
- Camera: May be required for scanning QR codes when importing a project.

iOS

- Bluetooth: Required to search for and connect to LS SWIR SDK devices.
- Camera Access: May be required for scanning QR codes when importing a project.
- Photo Library Access (Optional): Access to photos/files may be needed when adding sample images.

Windows / macOS (Desktop)

- Bluetooth: On macOS, you may need to consent to Bluetooth access when using BLE.

Note: **If you deny permissions, some app features may not function correctly.** You can change permission settings later in the app's settings menu or your OS's settings app. In particular, denying Bluetooth permission will prevent the LS SWIR SDK device connection feature from working, so please be sure to allow it.

3. Getting Started

3.1 Power On

Turn on the power by sliding the power switch from Off to On (O → I).

The green Power LED will blink, and the device initialization process will proceed. Once initialization is complete, the Power LED will remain on.

3.2 Charging Battery

Connect the USB cable to the LS SWIR SDK.

When the battery is charging, the charging LED turns on. When charging is complete, the charging LED turns off.

3.3 Connecting with the App

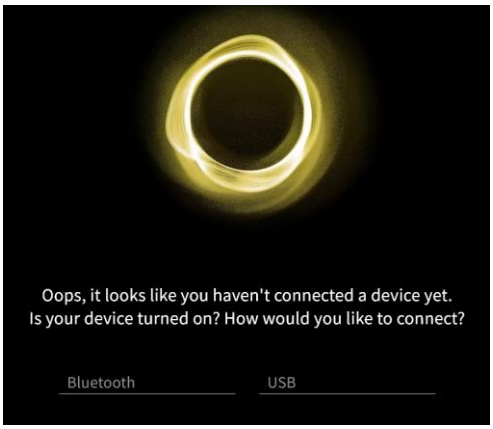
3.3.1 Device Connection

The LS SWIR SDK device can be connected via Bluetooth Low Energy (BLE) or USB.

- **Bluetooth Connection**: The PC must have built-in Bluetooth functionality, or an external Bluetooth adapter is required if not.
- **USB Connection**: One or more USB ports and a USB-C type data cable are required.

3.3.2 Infrared AI App

Once the app launches and the guide message appears, tap the 'SCAN' button or the 'No Device Connected' section in the left panel to view the device connection guide.



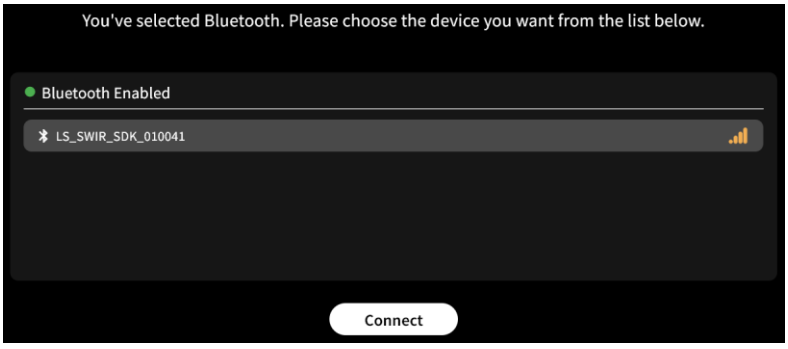
Select your preferred connection method (**Bluetooth** or **USB**) to see a list of available LS SWIR SDK devices. (Note: USB connection is only available on desktop.)

3.3.3 Bluetooth Connection (Desktop/Mobile)

Prerequisites

The following conditions must be met to connect to the device via Bluetooth.

- The device must be powered on and the initialization process must be complete.
- The Bluetooth function on the desktop or smartphone must be turned on.
- For smartphones, the app's Bluetooth permission request must be approved.



Connection Procedure

If the Bluetooth function is turned on, connect to the device in the following order:

- When the device is powered on, it becomes discoverable via Bluetooth.
- The discovered device is displayed in the list.
- Select the device to connect to and click the "**Connect**" button.

3.3.4 USB Connection

Prerequisites

For desktop (Windows, macOS), connection with the device is possible using a USB cable. Connect the desktop and the device with a USB-C type cable.

Connection Procedure

- Connect the device using a USB cable.
- The connected device is displayed in the list.
- Select the device to connect to and click the "**Connect**" button.

*Note: Can only be used on desktop (Windows/MacOS).

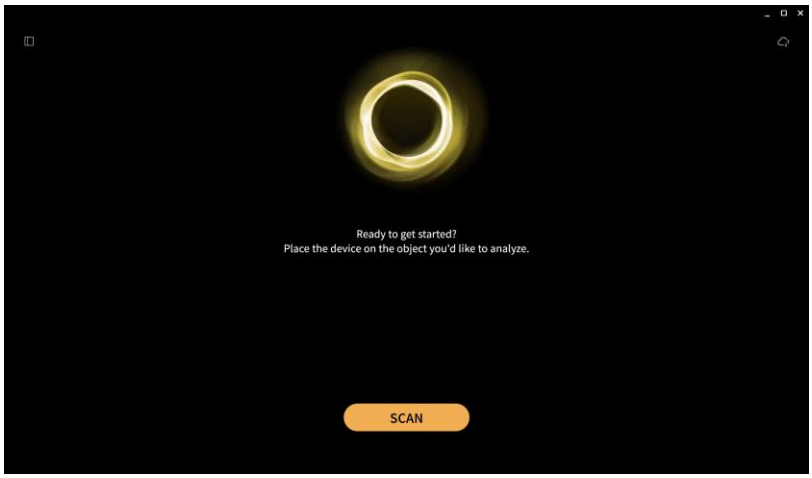
Successful Connection

Once the connection is successful, the device's status LED will light up, and a message to proceed with scanning will appear in the Infrared AI app. The connected device information is saved and will automatically reconnect if the device is detected the next time the app is launched. Detailed information about the connected device can be viewed on the Device Information screen.

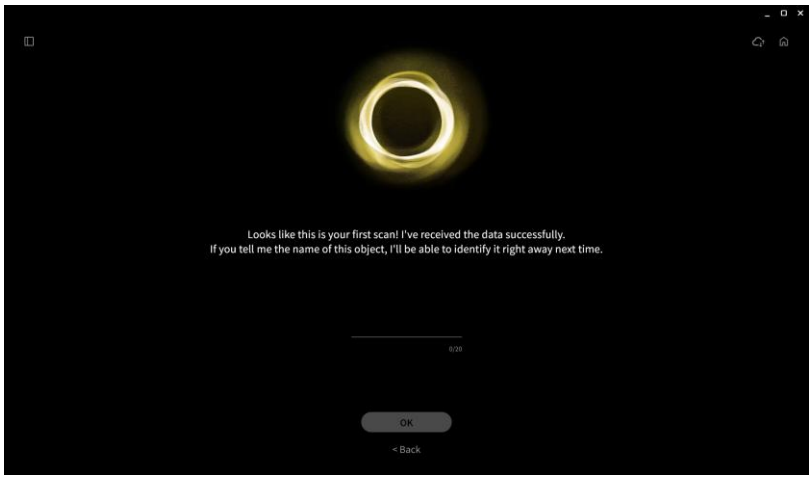
4. App Usage Instructions

The Infrared AI app provides interactive guidance to help users collect data using LS SWIR SDK devices. Users can manage the objects they wish to analyze as "Samples," collecting data that is then used to train infrared AI models.

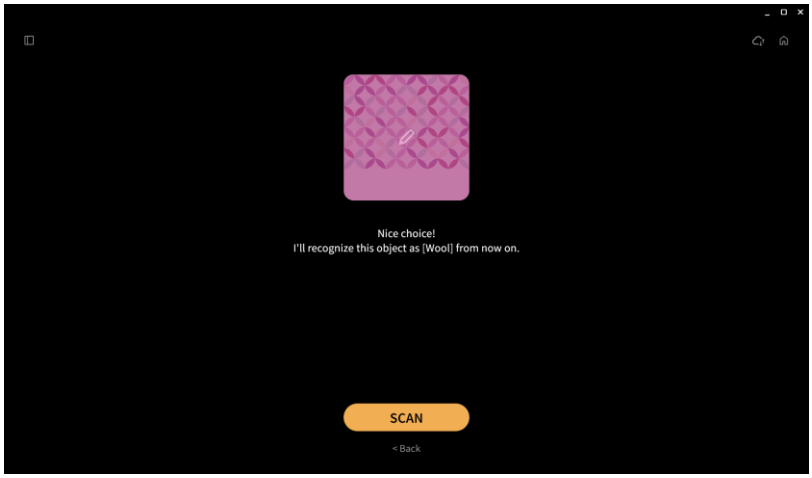
4.1 How to Use a Classification Model



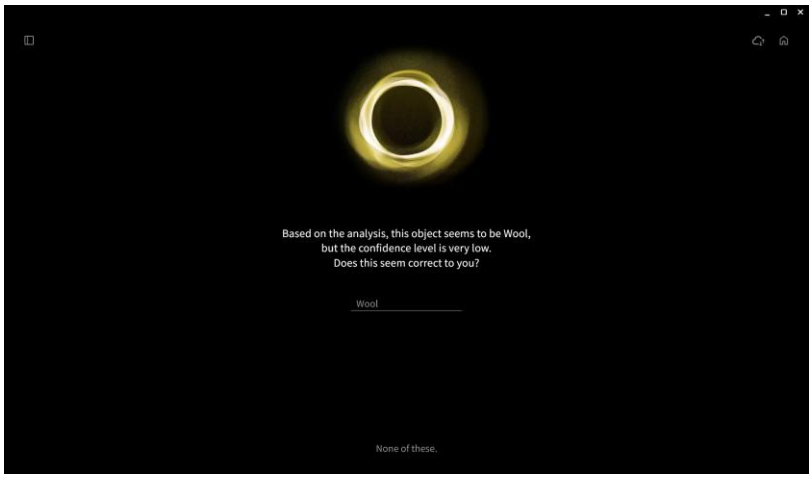
Following the on-screen instructions, place the device on the object you want to analyze and tap the "SCAN" button.



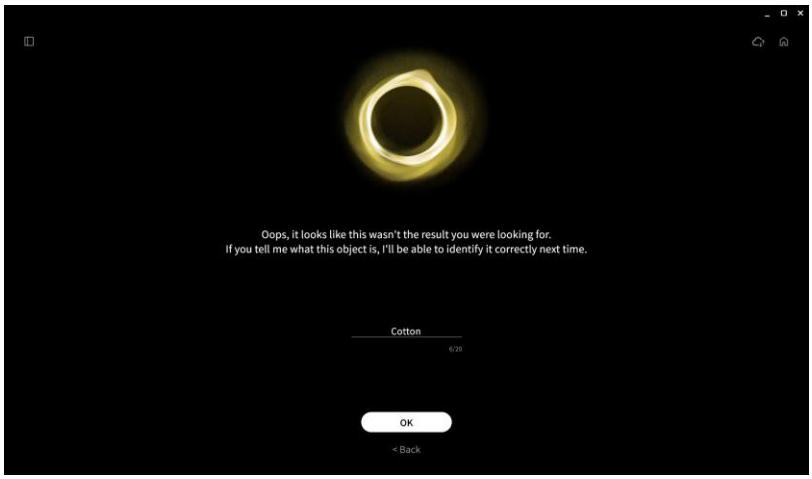
If it is your first scan, enter the name of the scanned substance and tap "OK" to register your first sample.



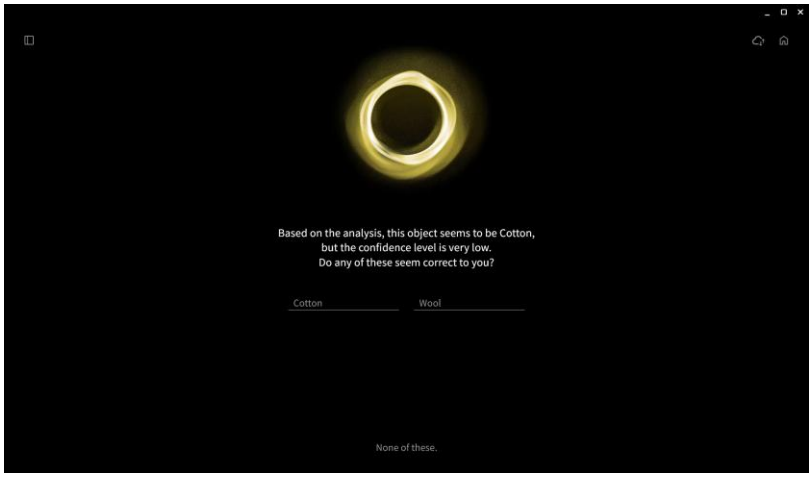
The scanned data has been saved as the entered sample. Collecting sufficient data by repeatedly scanning the same object will improve the performance of the infrared AI model in identifying that object. To collect data for a new object, place the device on the new object and tap the 'SCAN' button.



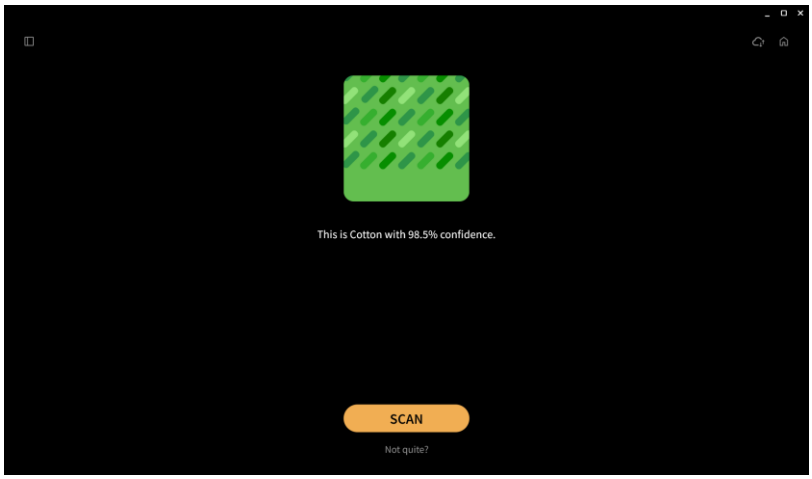
Since the new object has not yet been trained by the infrared AI model, it will not appear in the results. Tap the section that says 'None of these'



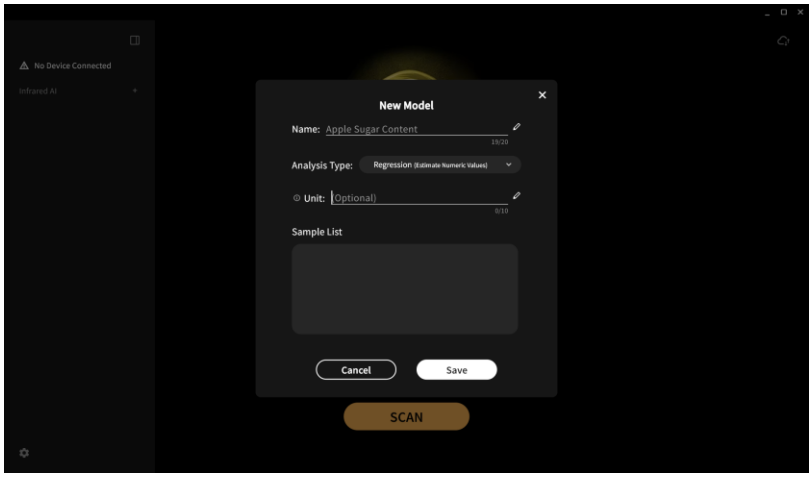
Once you enter a name for the new object, the scan data will be saved as a new sample. Continue to repeatedly collect scan data for your samples, then check the infrared AI model's results and select the correct sample.



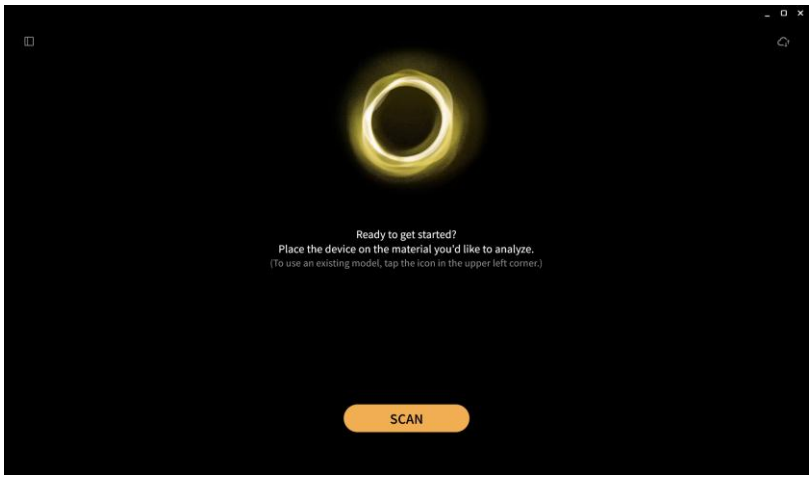
Once sufficient scan data has been collected and the infrared AI model is trained, its performance in distinguishing between samples will improve.



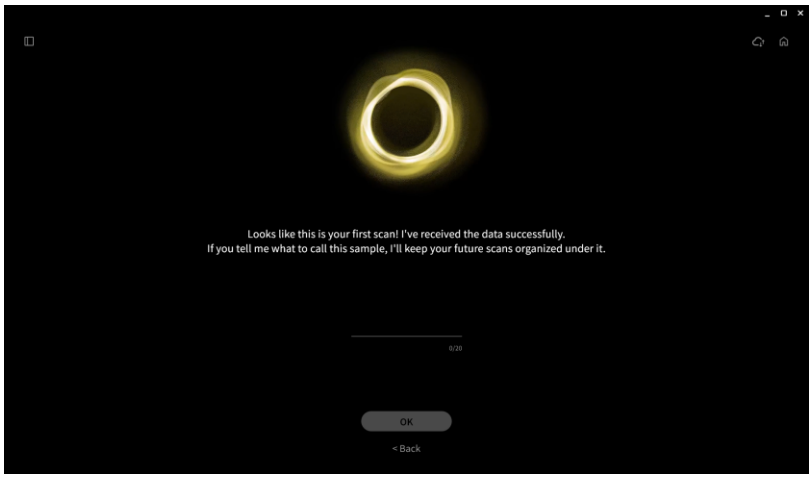
4.2 How to Use a Regression Model



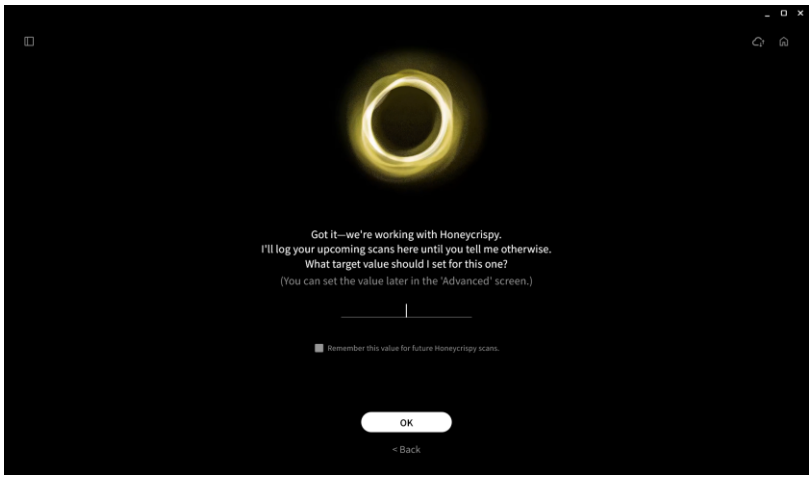
First, create a new model for regression analysis.



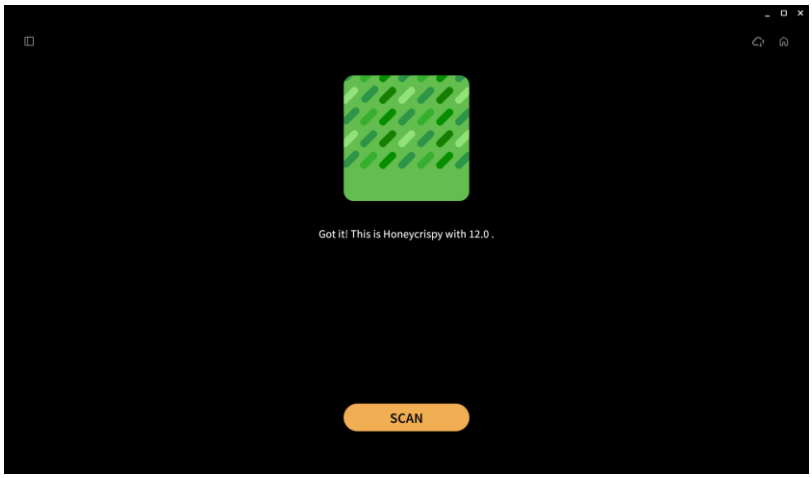
Follow the on-screen instructions, place the device on the object you want to measure, and tap the "Scan" button.



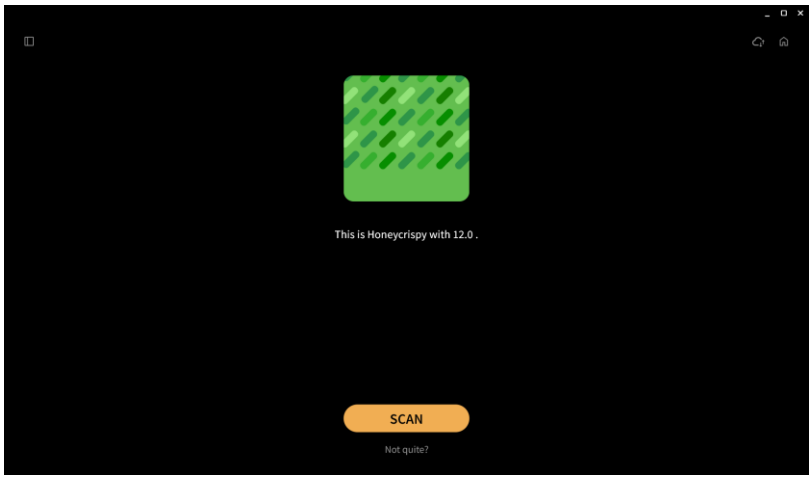
For the first scan, enter the sample name of the scanned object and tap "Create" to create a sample.



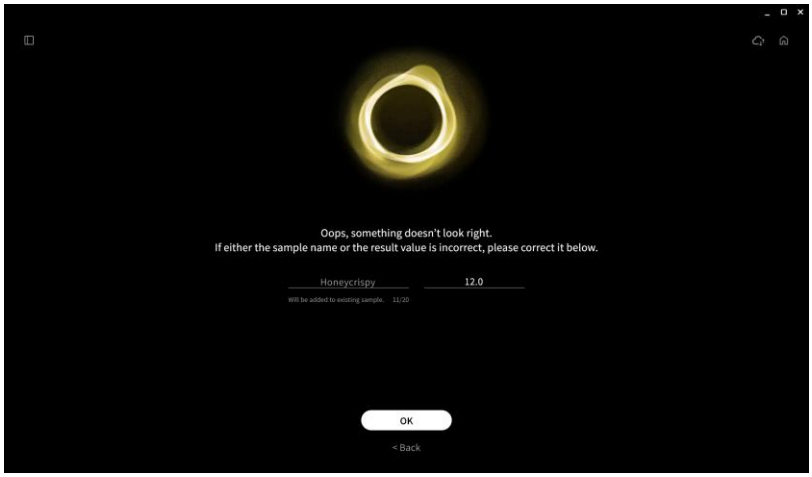
After creating the sample, enter the target value for the first scan. The entered target value is saved together with the scan data and is later used to train the regression model.



From the next scan onward, you can repeatedly collect data for the same sample. Place the device on the object again and tap the "Scan" button to perform an additional scan.



When the scan is complete, you can check the predicted result and the saved value. If the result is different from what you expected or needs to be corrected, tap "Not Quite?" to edit the sample and target value.



By repeating this process and collecting enough scan data and target values for each sample, you can improve the prediction performance of the regression model.

5. Infrared AI Features

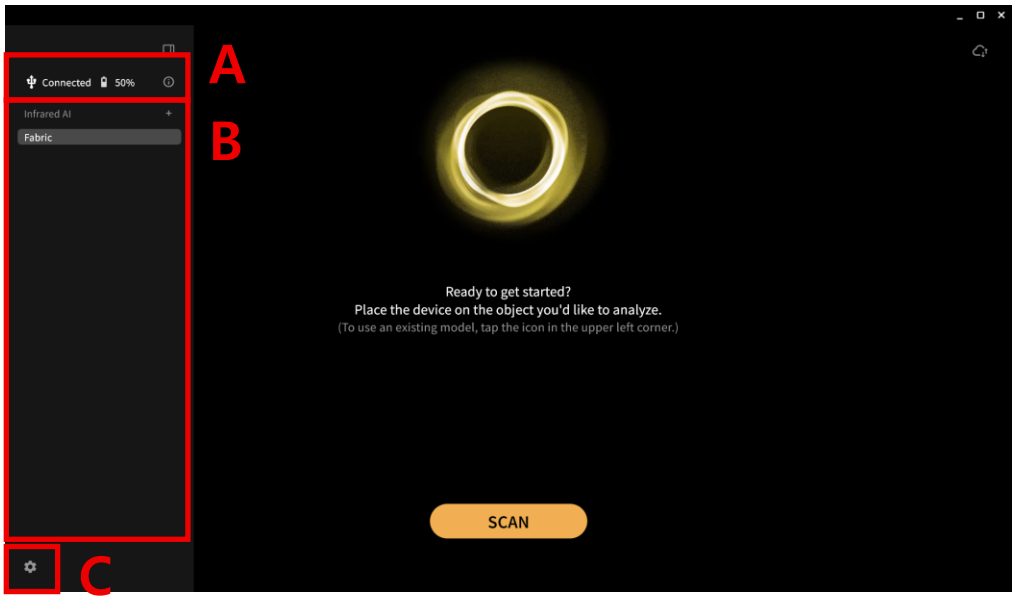
A: Opens the side panel. You can view detailed device information and Infrared AI model data.

B: Instructions displayed to the user.

C: Button to start a scan.

D: Button to share the currently collected data.

5.1 Side Panel

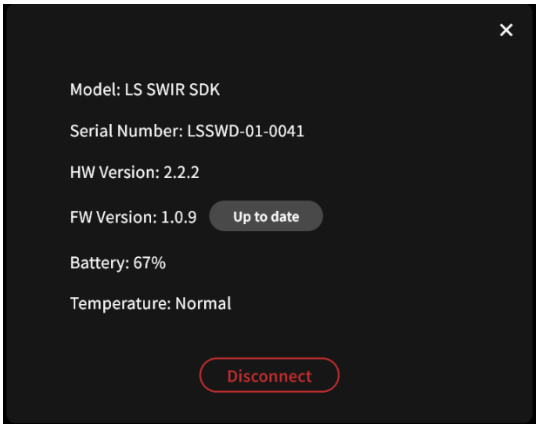


A: View information about the currently connected device. Clicking it will display the device's detailed information.

B: View the list of Infrared AI models, create new models, or modify models and access advanced features.

C: Displays the settings screen for the Infrared AI app

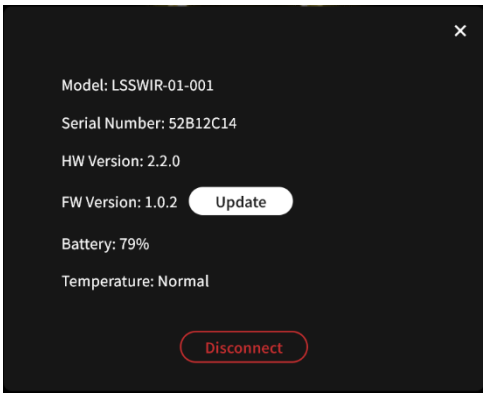
5.1.1 Device Information



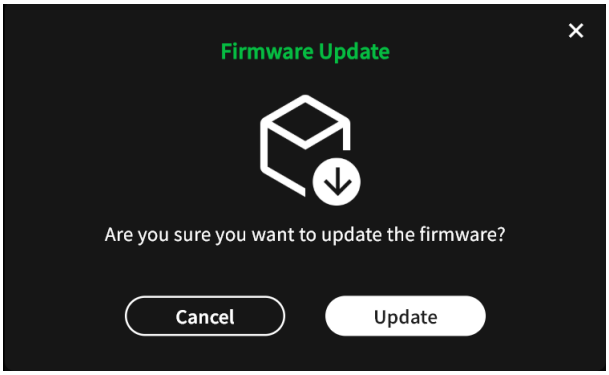
- **Model**: The model name of the device
- **Serial Number**: The serial number of the device
- **HW Version**: The hardware version of the device
- **FW Version**: The firmware version. If a newer firmware version exists than the device's current version, an **Update Available** button is displayed.
- **Battery**: The current battery charge level of the device is displayed.
- **Temperature**: The sensor temperature of the device is displayed.

5.1.1 Firmware Update

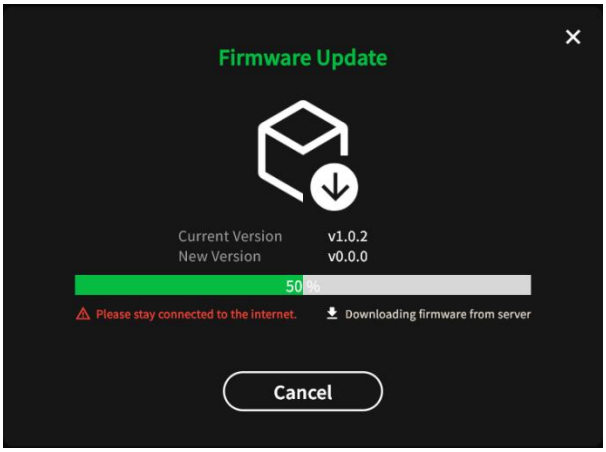
This function updates the device's firmware to the latest version. An **internet connection** is required to proceed with the firmware update. If you disconnect the internet or turn off the device power during the update process, it may cause problems with device operation.



If a newer firmware version exists than the firmware of the USB-connected device, an Update button is displayed next to FW Version.



Clicking the **Update** button displays a pop-up window to confirm if you want to proceed with the firmware update.



Clicking the **Update** button starts the firmware update, which may take some time to complete.

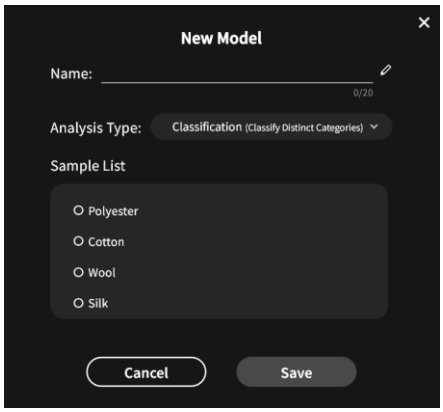
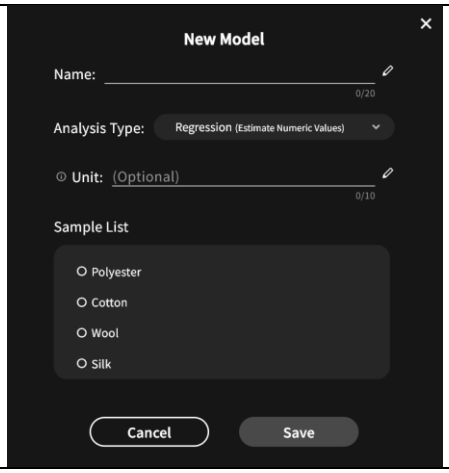
5.1.2 Infrared AI Model

You can create a new model in Infrared AI or select an existing model to use.

In Infrared AI, models manage sample information for classification or regression analysis.

5.1.3 Create an Infrared AI Model

A default model is automatically created when the app is launched and scanning begins. To create an additional model, tap the "+" button to display the screen for creating a new model.

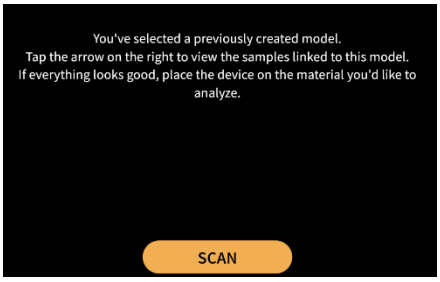
Analysis Type: **Classification**	Analysis Type: **Regression**
	

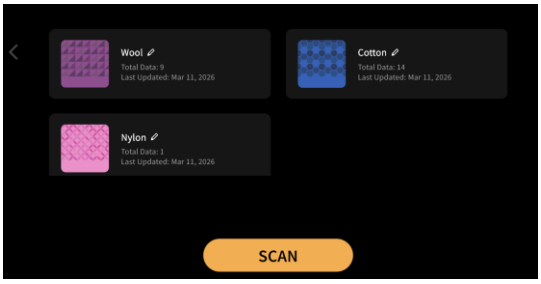
Enter the name of the new model, select the analysis type and the sample list to be used for the analysis, and then tap the "Save" button to create the model. New samples can be created by entering a name after scanning a object, or directly from the Advanced screen.

If Regression is selected as the analysis type, you can optionally enter a unit to be displayed after the value on the analysis result screen. (e.g., °Bx, %, ppm)

5.1.4 Infrared AI Model Information

Selecting a model from the list will display a screen where you can view the model's information. Tapping the right arrow on the screen will show the list of samples used by that model.

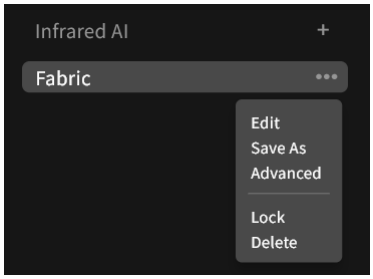




Sample Icon: Tap the sample icon to select a sample image.

Sample Name: Tap the sample name to view detailed information or to edit the name.

5.1.5 Infrared AI Model Menu

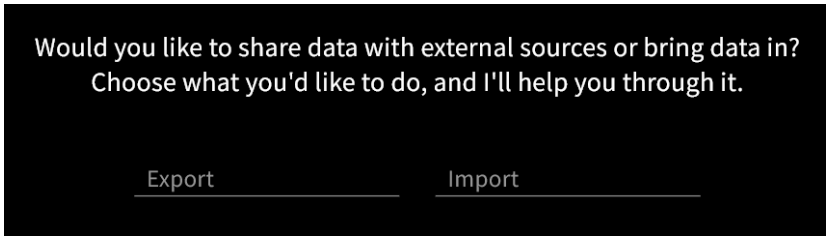


Clicking the right side of a model will display the model menu.

- **Edit**: Modify the model name and the list of samples.
- **Save As**: Create a copy of the model with a different name.
- **Advanced**: Access advanced features for sample management and training for the selected model
- **Lock**: You can lock the selected model to prevent further changes. When a model is locked, adding or removing samples and scan data is restricted, and additional training of the AI model triggered by newly added scan data can be temporarily paused.
- **Delete**: Delete the selected model.

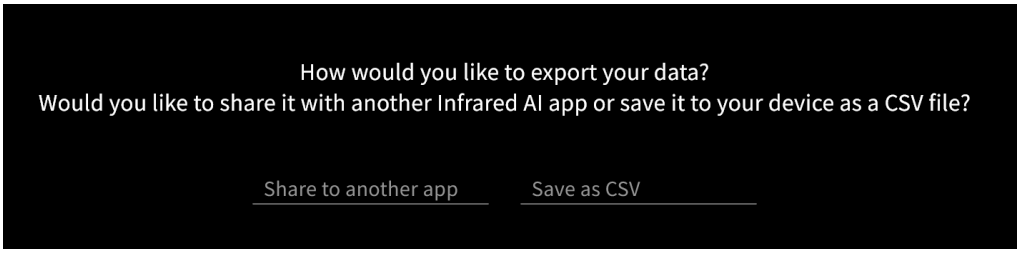
5.2 Data Sharing

Click the  icon in the top right corner of the screen to export model and sample data. You can share the exported data with other devices or save it as a CSV file.

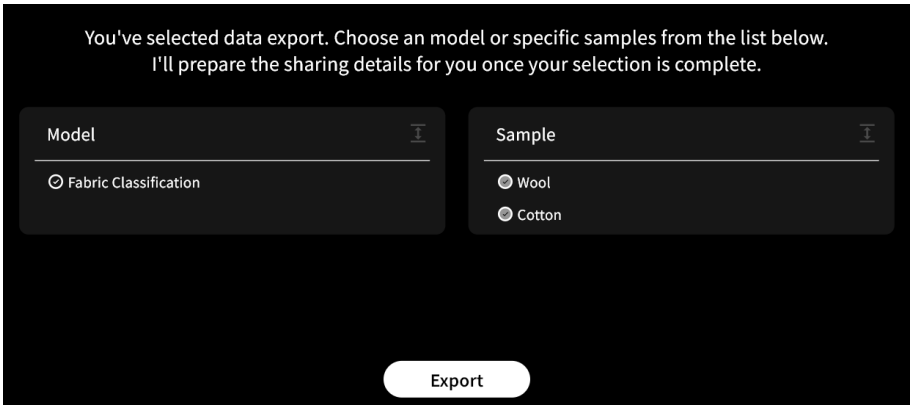


Export

Exports the current model and sample data for sharing or external use. Two export options are available:



- **Share to other Infrared AI**

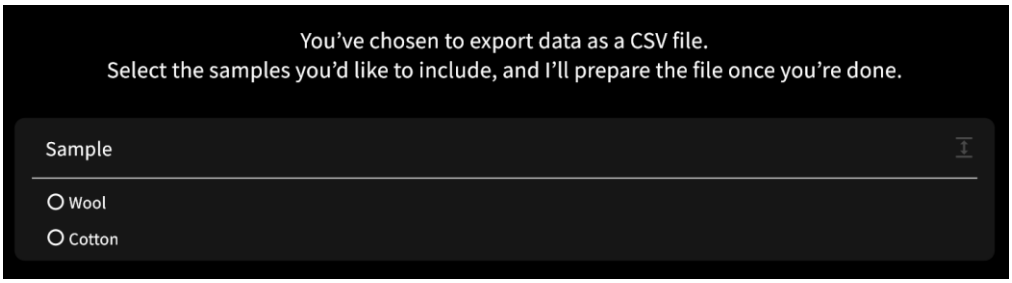


Select the models and samples you want to share, then tap the "Export" button to upload the data to the server. Once the upload is complete, a QR code and a 6-digit code will be generated.

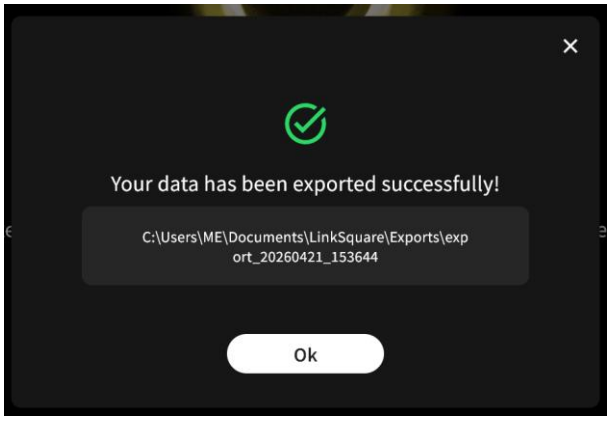
You can use either method in the Import menu on another device to retrieve the shared project.

*** Note:** The file uploaded to the server is only valid for about **5 minutes**. After 5 minutes, it is automatically deleted from the server, and import is no longer available. Perform the export again if necessary.

- **Save as CSV**



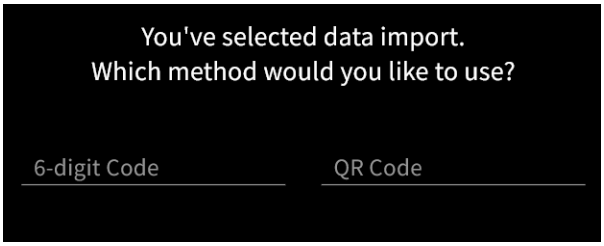
You can save the scan data of selected samples as a CSV file. Select the desired samples, then execute the CSV export to generate a file.



The generated CSV file can be used in external tools such as Excel or Python for further analysis.

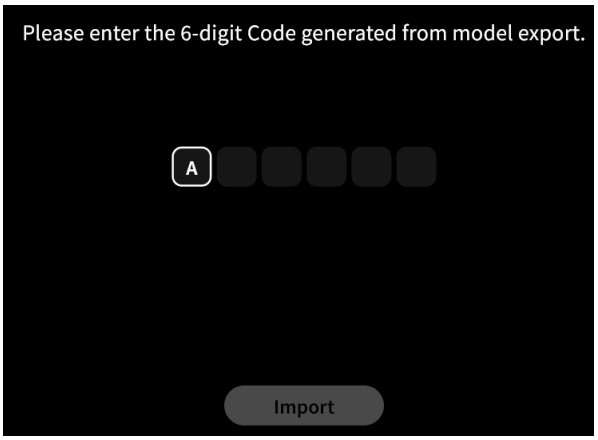
Import

Imports a project that was exported from another device to this device. To import a project, you need the **QR Code** or **6-digit Code** generated during the export process.



- **6-digit Code**

Enters the 6-digit Code displayed on the Export result screen to import the data.



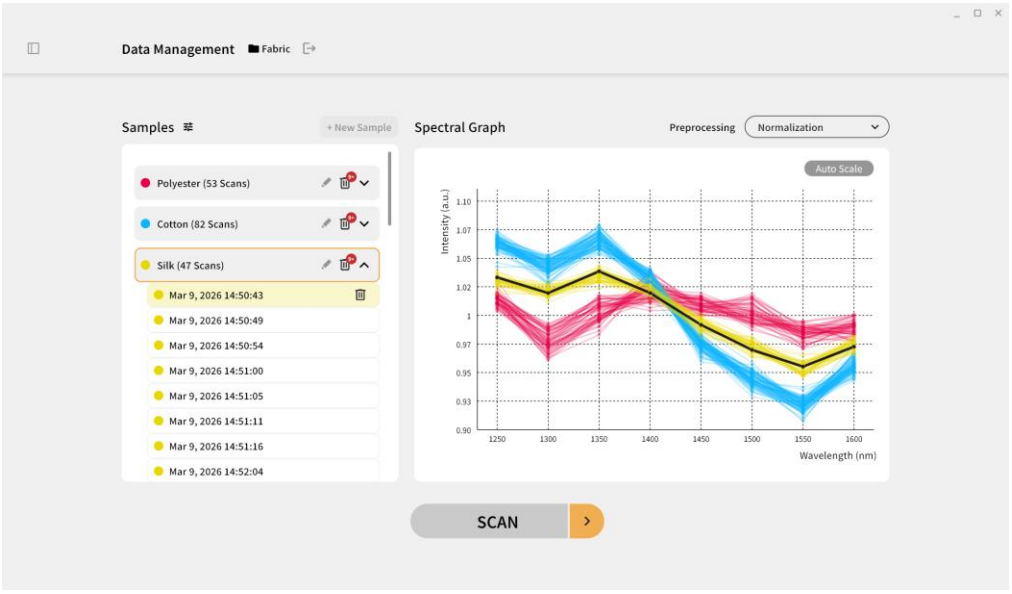
- **QR Code**

Scans the QR code displayed on the Export screen with the camera to import the data.

6. Advanced Feature

After selecting a model from the side panel, click the 'Advanced' item in the model menu. The Advanced screen will be displayed, allowing you to access data management and training features for the selected model.

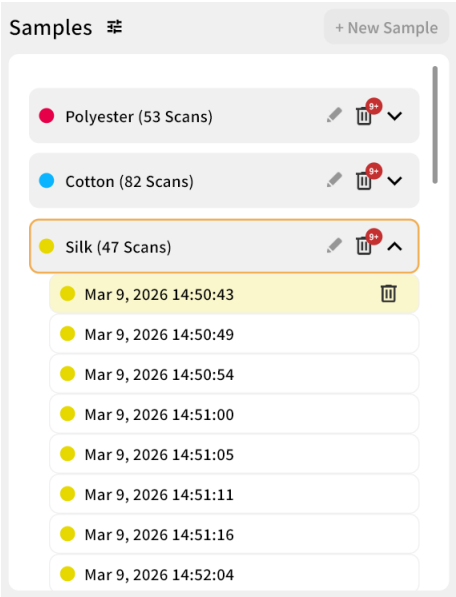
6.1 Data Management



You can view sample information for the selected model, collect scan data, and verify the results by displaying spectral graphs

6.1.1 Samples Menu

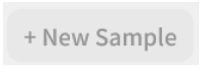
This menu manages the samples included in the Infrared AI Model. A list of samples included in the model is displayed.



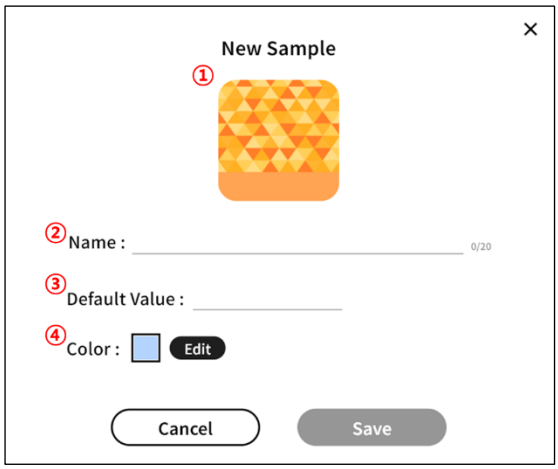
Editing the Sample List

Select the icon next to a sample (Samples) to choose the samples to be used in the model. You can include samples from other models in the current model or exclude them by deselecting them. Sample information remains stored in the app.

Add Sample



Tap the button to display the screen for creating a new sample in the model. You can then enter detailed information of the sample.



① **Sample Image**: Selects the image of the sample to be displayed on the Infrared AI result view. (Optional)

② **Name**: The Sample name (**Required**)

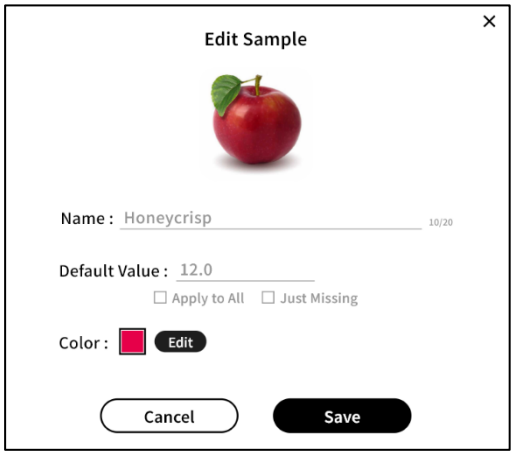
③ **Default Value**: Enter the value to be applied to the sample scan data. This field appears only when using a regression analysis model. (Optional)

④ **Color**: Selects the color to be displayed on the spectral graph (**Required**)

Edit Sample

Modifies the information of the selected sample. Press the **OK** button after modification to save the changes. Clicking the **Cancel** button cancels the changes and uses the existing information.

When a model uses regression analysis, a default value field and two checkboxes, "Apply to All" and "Just Missing" are displayed.



Apply to All: If selected, saving will change the values of all scan data in the current sample to the default value.

Just Missing: If selected, saving will change only the empty values in the current sample's scan data to the default value.

6.1.2 Spectral Data Scan

This is the **Scan** button to obtain spectral data from the currently connected device. It is only activated when **1) the app is connected to the device** and **2) a sample for data storage is selected**.

Normal Scan

Clicking the **Scan** button executes a single scan on the currently connected device, and the collected spectral data is saved to the selected sample. The collected data is displayed on the graph screen. Pressing the **Scan button on the device** can also execute the same scan.

Advanced Scan

Clicking the arrow to the right of the Scan button allows you to set **Advanced Scan Options**. The original Scan button is displayed as the Advanced Scan button, and clicking this button repeatedly executes scans according to the set options.

- **Interval**: The waiting time (in seconds) between consecutive scans. After receiving the spectral data of the current scan, the next scan starts after this interval.
- **Repeat**: The number of scans to repeat when the Scan button is pressed once.

Example: If **Interval** is set to 3 seconds and **Repeat** is set to 5 times, a single click of the Scan button executes a total of 5 scans with a 3-second wait between each scan.

- Reset ( ): Clicking the reset button **initializes all advanced scan options**.

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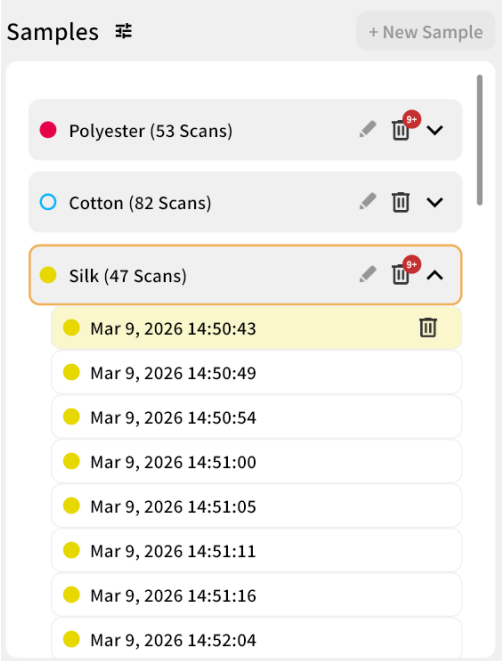
When the advanced scan is in progress, the total number of scans and the number of scans completed so far are displayed.

Cancel Scan

Clicking the **Cancel** button during a scan will complete the current scan and stop the repetitive scanning

6.1.3 Sample List

The sample list displays the samples included in the model and the spectral data list for each sample.



The list of samples included in the model and the spectral data for each sample are displayed.

The list displays the sample name along with the number of spectral data entries included. Clicking the checkbox in front of the sample name displays the graph of the spectral data included in that sample.

The delete icon next to the sample name allows you to delete the sample or any selected spectral data.

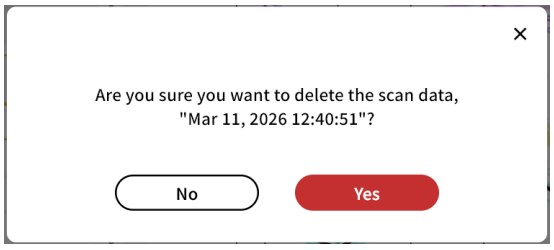
Clicking the arrow to the right of the sample name expands the list of spectral data included in the sample. The spectral data displays the time of the scan, and clicking the checkbox in front of the time can display it in the graph area.

Delete Sample

Click the delete icon in the sample list when no spectral data is selected (no number shown) to delete the sample.

The deleted sample cannot be recovered.

Delete Spectral Data

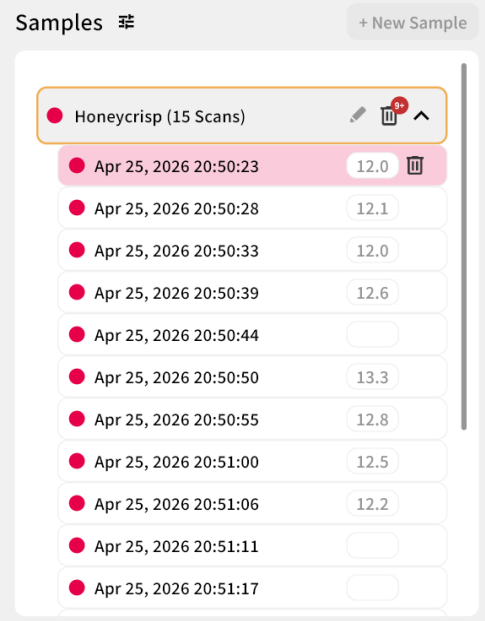


When you select the spectral data you wish to delete, the number of selected items will appear on the delete icon. Click the icon to remove the selected spectral data from the sample.

Deleted spectral data cannot be recovered.

Sample List for Regression Models

In the sample list for regression models, the target value for each scan is displayed.

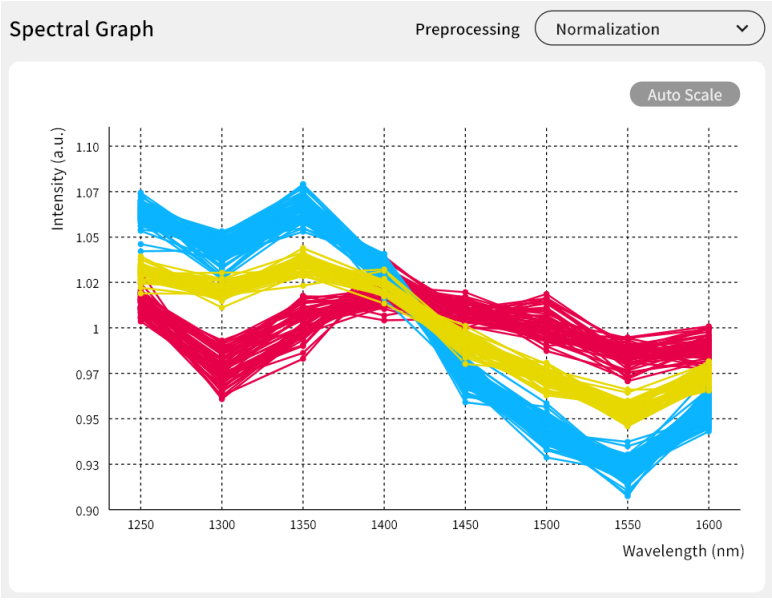


In Infrared AI, the target value for each scan in a regression model is set either to the value predicted by the model or to a value entered by the user.

If no target value is entered at the time of measurement, the scan is shown as blank, and the value can be entered directly in the sample list.

In the Edit Sample screen, after entering a default value, you can save with "Apply to All" or "Just Missing" selected to apply the default value to multiple scans at once.

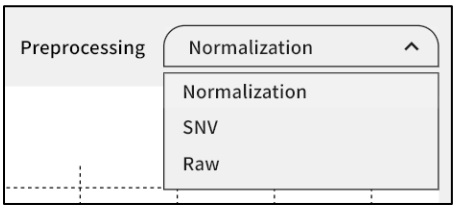
6.1.4 Spectral Graph



You can view the selected samples and spectral data as a graph. The spectral data is displayed according to the sample's color. The horizontal axis represents the **Wavelength**, and the vertical axis represents the **Intensity**.

Preprocessing

You can select the preprocessing method for the spectral data displayed on the spectral graph.

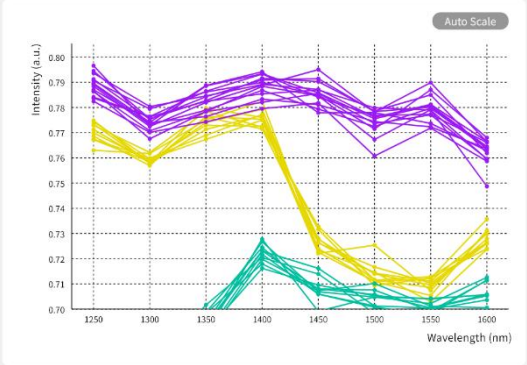


- **Normalization**: Preprocesses the spectral data using the **Normalization** method and displays it.
- **SNV**: Preprocesses the spectral data using the **Standard Normal Variate (SNV)** method and displays it.
- **Raw**: Displays the collected spectral data as is, **without preprocessing**.

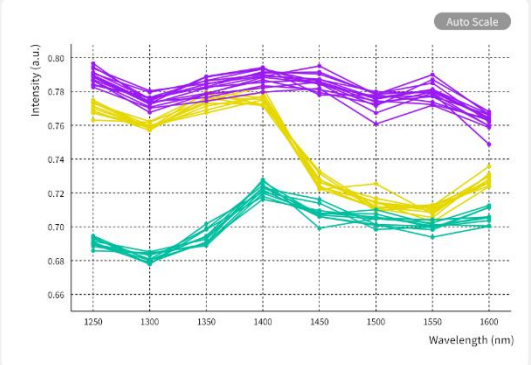
Auto Scale

If spectral data extends beyond the graph area, clicking the **Auto Scale** button automatically adjusts the graph's vertical axis to match the intensity range of the currently selected data.

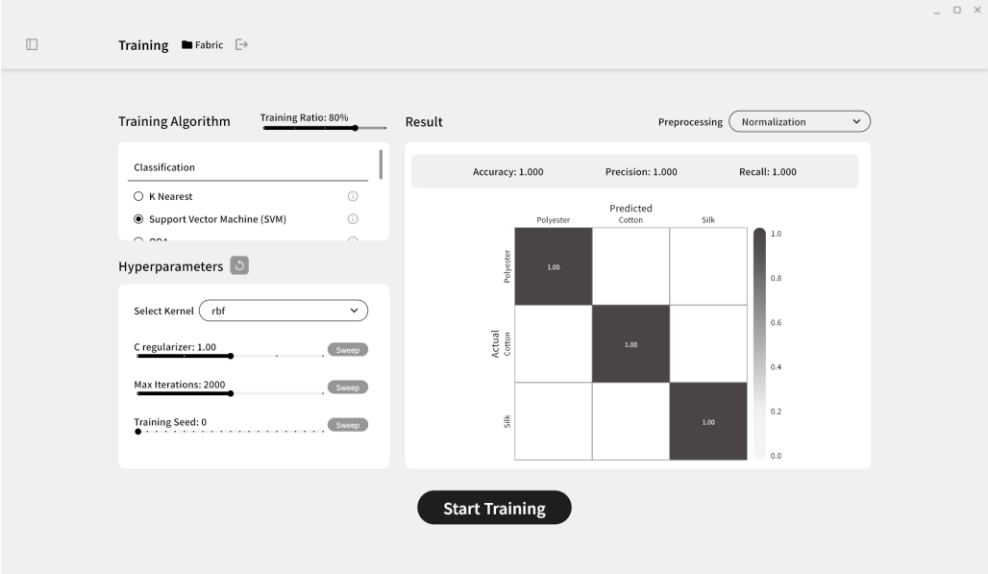
[Before Auto Scale]



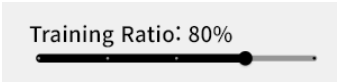
[After Auto Scale]



6.2 Training



You can train **Infrared AI models** using the spectral data collected from the LS SWIR SDK device.



- **Training Ratio**: Sets the ratio for splitting the selected data into training data and validation data. For example, if set to 80%, 80% of the selected data is used for training, and 20% is used for validation to evaluate the model's performance.

6.2.1 Training Algorithm

You can choose an algorithm according to the two analysis types: Classification and Regression.

For classification, which is used to distinguish between samples, the following algorithms are available:

- K Nearest
- Support Vector Machine (SVM)
- QDA

- Decision Tree
- Logistic

Regression is an analysis method that predicts continuous numerical values rather than classifying samples.

The following algorithms are available for regression analysis:

- Linear
- KNN

6.2.2 Hyperparameter

You can set hyperparameters for the selected training algorithm. You can try various hyperparameter combinations to improve performance.

Hyperparameter Sweep

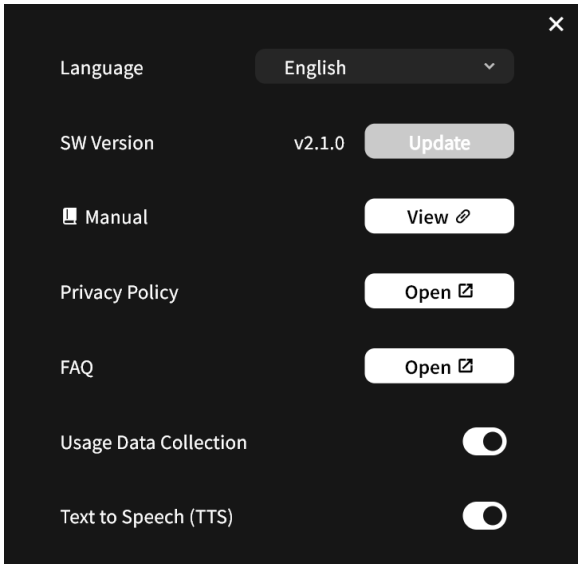
You can check the model's performance metrics for a selectable range of hyper-parameters. You can refer to the performance metric results to determine effective hyperparameter values

6.2.3 Start Training

After completing the settings for training algorithm, and hyperparameters, click the 'Start Training' button to begin training. Upon successful completion of training, the results screen for each classification can be viewed.

6.3 Settings

You can manage app settings, view information, or check frequently asked questions (FAQ).



- **Language**: Select the language to use in the app. Korean, English, and Japanese are supported, and the display language changes immediately when selected.
- **Software Version**: Displays the currently installed app version. When connected to the internet, the app checks whether a newer version is available, and the **Update** button is enabled if an update is available.
- **Manual**: Opens the Infrared AI user manual page.
- **Privacy Policy**: Directs you to the page where you can check the privacy policy (https://linksquare.io/legal.html)
- **FAQ**: Directs you to the page where you can check frequently asked questions and their answers.
- **Usage Data Collection**: Sets whether to collect usage data.
- **Text to Speech (TTS)**: Sets whether voice guidance is enabled. If the current device does not support voice data for the selected language, this feature may be disabled automatically.

7. Troubleshooting

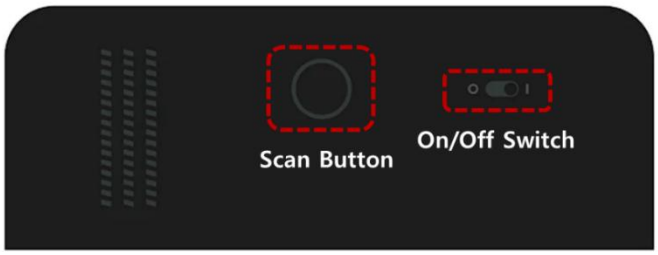
7.1 Safe Mode

If a notification window prompts you that Safe Mode operation is required during app operation, or if the device's status LED operation indicates a device error, you can restart the device in **Safe Mode** to proceed with a **device software update**.

If the problem persists even after the device software update, you can contact the customer support (linksquare@stratiotechnology.com) to inquire about resolving the device error.

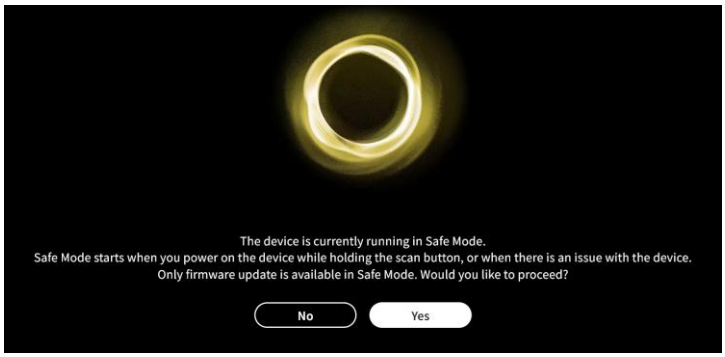
7.1.1 Operating the Device in Safe Mode

It operates when the **power switch is turned on while the SCAN button** of the LS SWIR SDK **is pressed**.

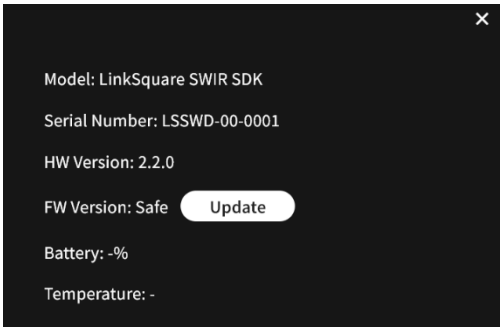


In Safe Mode:

① Bluetooth operation stops, so connection to the device is **only possible via a USB cable on a desktop**.
② Only **firmware download operation** is possible in the device tab of the app.



When a device operating in Safe Mode is connected to the Infrared AI app, a screen appears indicating that the device is currently in Safe Mode. If you proceed with the firmware update, the app moves to the Device Information screen, where the firmware can be updated.



When connected to a device operating in Safe Mode, the **FW Version** value is displayed as **"Safe"** in the Device Tab, as shown on the left.

7.2 Device Status via LED Operation

Before connecting with the app, the device's status and the type of error can be determined through the LED operation. If an unresolvable error persists, you can contact the customer support center (linksquare@stratiotechnology.com) to inquire about resolving the device error.

7.2.1 During Safe Mode Operation

Safe Mode booting has proceeded normally. Please proceed with the firmware update.

LED	LED Behavior
Scan LED	ON
Power LED	ON
Status LED	OFF

7.2.2 Device Startup Failure

The device has failed to start normally. Please contact customer support

LED	LED Behavior
Scan LED	ON
Power LED	OFF
Status LED	OFF

7.2.3 Abnormal Operation Occurred (Initialization)

The initialization process of the LS SWIR SDK device did not proceed normally. Please turn the power switch off and then on again to perform the initialization process. If the same symptom persists, please contact customer support.

LED	LED Behavior
Scan LED	OFF
Power LED	OFF
Status LED	Quickly Blinking (0.2 sec.)

7.2.4 Communication Error

A BLE or USB communication error has occurred. Please check if the problem is resolved by turning the power switch off and then on again. If the same symptom persists, please contact customer support. Providing the duration for which the Status LED is on can help with the response

LED	LED Behavior
Scan LED	OFF
Power LED	OFF
Status LED	Slowly Blinking (Repetition of "ON + 1 sec. OFF")