

Quick User Manual

Device Control Desktop App

Major version - V3.0.0

2023/02/08

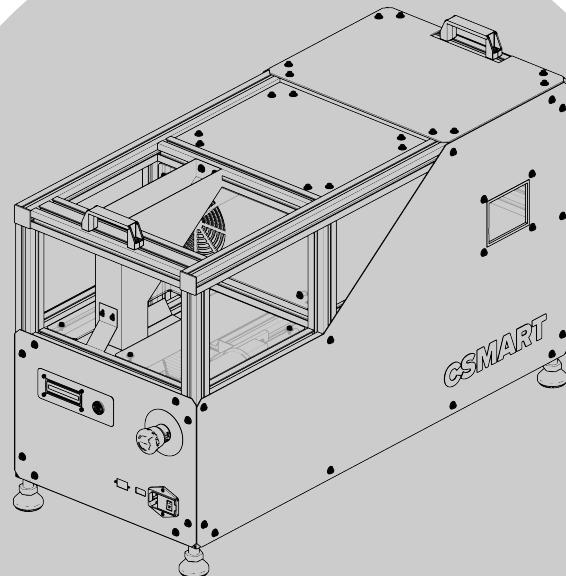
Csmart Digit

v3.0.0

We are excited to announce the release of version 3.0.0, a significant milestone in the evolution of Csmart Digit. This major update marks a pivotal transformation in software architecture, enabling a more versatile and seamless user experience across multiple operating systems. Version 3.0.0 not only represents a leap forward in terms of technology but also introduces a suite of enhancements and new features designed to improve performance, usability, and integration capabilities.

A key feature of this release is the integration of the desktop application with a proprietary web app that centralizes all analysis in a single repository. By consolidating data in one place, our solution now offers an unprecedented level of convenience and accessibility, allowing users to collaborate more effectively and streamline their workflows.

Local



Web

← → C csmart.ai/downloads

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CSMART

CSMART

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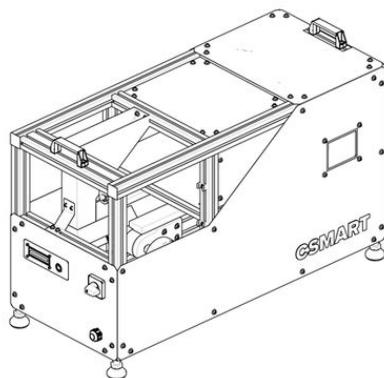
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Csmart Digit

Device Control Desktop App | v3.0.0

Click on the following button to download the installer

[Download Installer](#)



CSMART

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Download Installer

Go to
csmart.ai/downloads

The password to
download the app is:
digit_users

Find the file named
"csmart-digit Setup
3.0.0.exe" and
double-click to install.

Ignore any Windows or
antivirus messages
and proceed with the
installation.

Important: Choose a
location for installation
that doesn't require
admin privileges.

A desktop window will
appear once the
installation is finished.



Sample Name
No sample

File Location
C:\Users\user\Desktop\Analysis

Last Analysis Model
No previous analysis

Francisco Massucci Silveira
Open Web Server



Quality Control

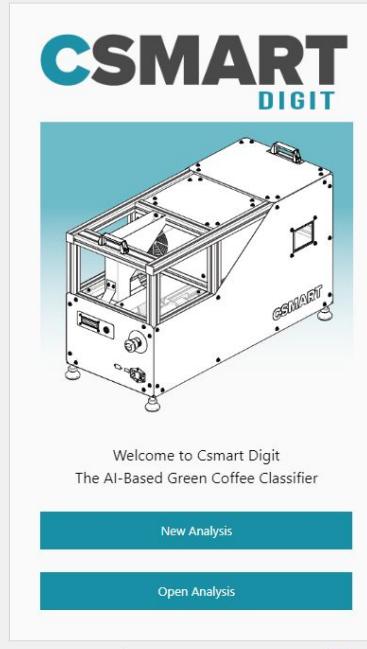
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Home

Upon first opening the app, you will be directed to the home screen.

In this page you have the option to create a new analysis or open an existing one.

The sidebar menu contains all the existing routes of the software, which will be discussed in detail in the subsequent slides.

The top bar consists of information about the opened analysis on the left and information about the user on the right

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1. Select the folder to create your analysis

Select Folder

C:\Users\user\Desktop\Analysis

2. Type the ID of your sample

Enter sample ID

Create New Analysis

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New Analysis

By clicking on "New Analysis," you can now choose the folder where the .hdf5 file will be saved.

Each analysis will be saved within a single .hdf5 file. This file is a self-contained data structure capable of holding all images and data related to the sample.

Enter the sample ID or simply click "Create New Analysis" to start recording the images with a random sample name.

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New Analysis

Flow Control

Light

Belt

Feeder

Feeder Speed

129

Detected Kernels: 0 Seed Area: 0 mm²

Record

Stop

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New Analysis

Click on "Record" to start the camera.

The connection logo in the upper right corner will change from red to blue, indicating that a connection has been successfully established.

If the connection fails to establish, please verify the USB cable connection to the Wi-Fi device.

Once the camera is on, you can proceed to turn on the light, belt, and feeder, adjusting the feeder speed as needed.

To finish, simply click "Stop" once all sample have been processed.

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Artificial Intelligence

1. Select the AI model to run the analysis

Select Model

Selected Model: 224_MCL_RNXT_ARA_BRA_MIXEDV4_U97C

Base model:	Pytorch \ Resnext50_32x4d
Output Layer:	Softmax
Classification Methods:	COB, NY
Confidence Threshold:	85%
Saturation:	1.4
Classification Type:	Multiclass
Classes:	Black, Broken, Floater, Fox Bean, Husk, Immature, Insect Dam, Ok, Parchment, Pod, Rocks, Shell, Sour
Species:	Arabica
Variety:	Mixed
Origin:	Brazil
Region:	Sul de Minas/MG
Processing Method:	Mixed
Accuracy:	0.97
Created by:	Sucafina - Brazil
Database creation:	October/2023
Version:	21

2. Click 'Run Analysis' to start classification

Run Analysis**Artificial Intelligence**

After clicking the "Stop" button, the software will redirect you to the Artificial Intelligence page.

Click on "Select Model" to choose the appropriate classification model that matches the newly recorded sample.

Double-check the model information, then click "Run Analysis" to perform the classification analysis.

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Dashboard

Total Defects

7.38%

Count: 53

Primary Defects

0.28%

Count: 2

Secondary Defects

7.1%

Count: 51

Foreign Matter

0%

Count: 0

Inspected Seeds

718

Weight: 95g

COB protocol

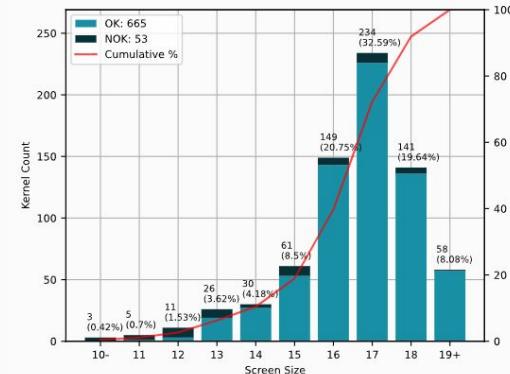
Tipo 4/5

Eq. Defects: 39

Dominant Color

RGB(151, 151, 123)

Screen Size Distribution

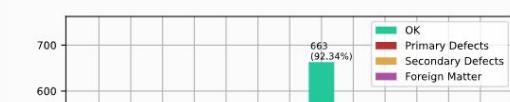


Screen Size	Count	Percentage	Cumulative %
Screen 10-	3	0.42%	100.00%
Screen 11	5	0.7%	99.58%
Screen 12	11	1.53%	98.88%
Screen 13	26	3.62%	97.35%
Screen 14	30	4.18%	93.73%
Screen 15	61	8.5%	89.55%
Screen 16	149	20.75%	81.05%
Screen 17	234	32.59%	60.30%
Screen 18	141	19.64%	27.71%
Screen 19+	58	8.08%	8.07%
MTGB	117	16.3%	N/A
MTGB Specialty	266	37.05%	N/A

Both OK NOK

[Save Image](#)

Classes Distribution



Class	Count	Percentage	Subset
Black	0	0.00%	Primary Defect
Broken	19	2.65%	Secondary Defect
Floater	0	0.00%	Secondary Defect

Dashboard

Upon completion of the analysis, the dashboard will automatically update to display all the information related to the sample.

The upper section of the page features:

- Total Defects
- Primary Defects
- Secondary Defects
- Foreign Matter
- Number of Seeds
- Grading Method
- Dominant Color

Following this, you will find the graph showing screen size distribution, accompanied by information in a table format

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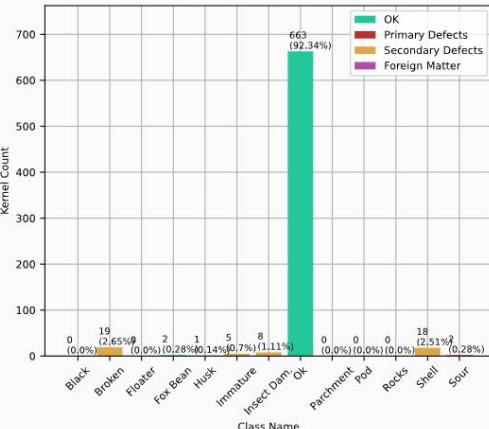
Sample Name
ID_240208_224946File Location
C:\Users\user\Desktop\AnalysisLast Analysis Model
224_MCL_RNXT_ARA_BRA_MIXEDV4_U97CFrancisco Massucci Silveira
Open Web Server

MTGB Specialty 266 37.05% N/A

 Both OK NOK

Save Image

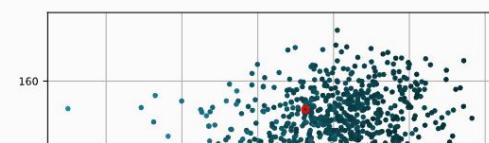
Classes Distribution



Class	Count	Percentage	Subset
Black	0	0.00%	Primary Defect
Broken	19	2.65%	Secondary Defect
Floater	0	0.00%	Secondary Defect
Fox Bean	2	0.28%	OK
Husk	1	0.14%	Secondary Defect
Immature	5	0.70%	Secondary Defect
Insect Dam.	8	1.11%	Secondary Defect
Ok	663	92.34%	OK
Parchment	0	0.00%	Secondary Defect
Pod	0	0.00%	Secondary Defect
Rocks	0	0.00%	Foreign Matter
Shell	18	2.51%	Secondary Defect
Sour	2	0.28%	Primary Defect

Save Image

Feature Analysis



Plot Parameters

 Scatter Hexbin Log

Scrolling down the page, one will find the Classes Distribution graphic along with a table detailing the defect classes, defects count, and their percentages relative to the total number of seeds.

Additionally, it categorizes each finding into subsets of classification, indicating Primary Defect, Secondary Defect, Foreign Matter, and Ok status.

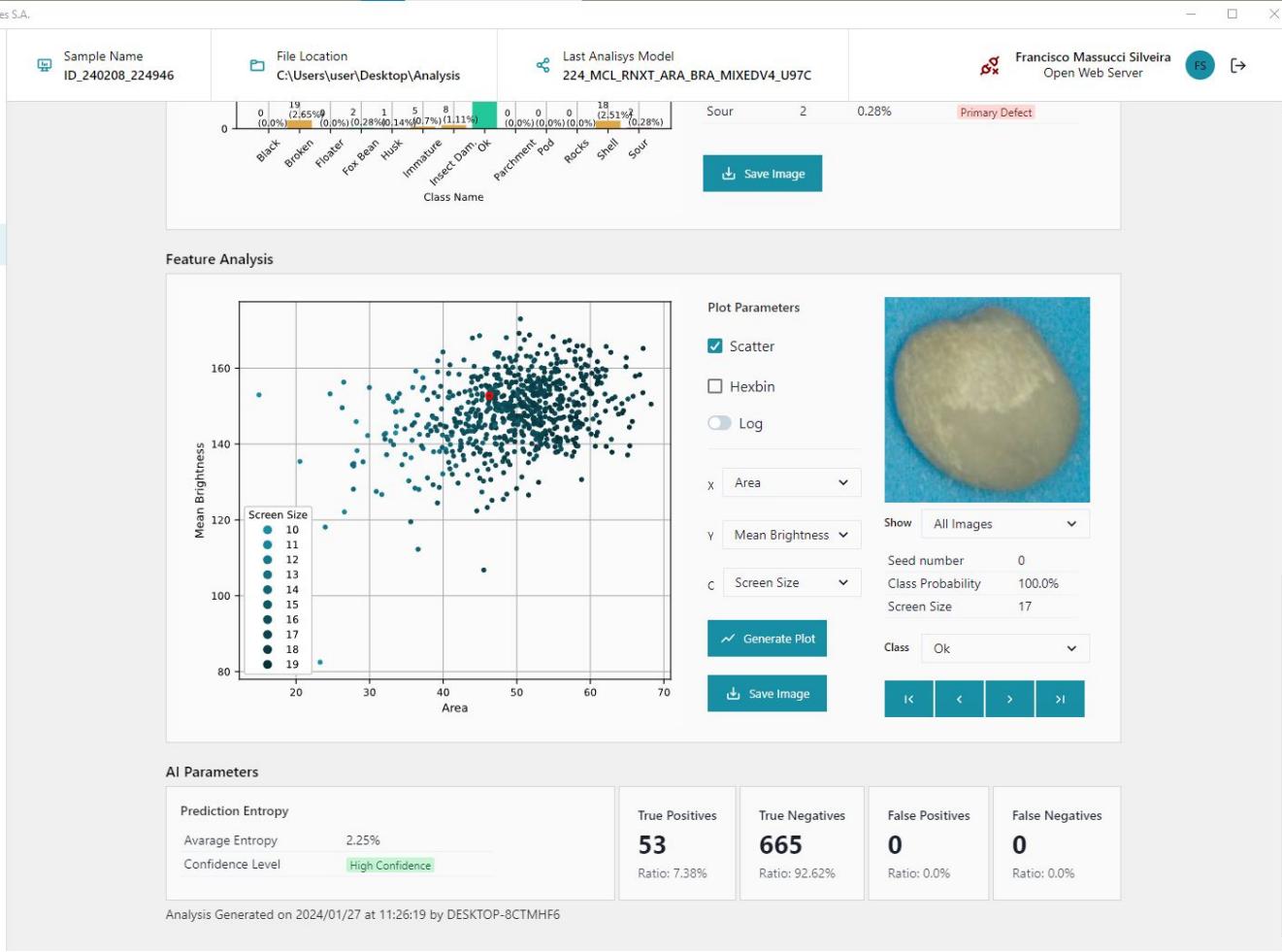
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Dashboard

At the bottom of the dashboard, the Feature Analysis chart is presented with variables that have been extracted from each seed.

Furthermore, the interface allows for the individual visualization of seeds, navigation through the entire collection, and modifying the classification through the "Class" selection menu.

In the footer, cards display information pertaining to Artificial Intelligence metrics, offering insights into the performance and outcomes of the classification process.

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Sample Name
ID_240208_224946

File Location
C:\Users\user\Desktop\Analysis

Last Analysys Model
224_MCL_RNXT_ARA_BRA_MIXEDV4_U97C

Francisco Massucci Silveira
Open Web Server

Francisco Massucci Silveira
Open Web Server

Non Defective Seeds

OK Classes

665 Seeds | 92.62%

Dominant Color

RGB(152, 152, 123)

Color by Class

Draw Perimeter

Draw Min Axis

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Defective Seeds

NOK Classes

53 Seeds | 7.38%

Dominant Color

RGB(145, 145, 118)

Color by Class

Draw Perimeter

Draw Min Axis

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Image Mosaic

Click on "Image Mosaic" to view a sample of both non-defective and defective seeds, along with the dominant color for each subgroup.

Use the drop-down menu to select and visualize a specific class within either the defective or non-defective seed groups.

The definitions of classes, as well as the categorization into defective and non-defective groups, are determined by the model file and can be modified upon request.

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Sample Name: ID_240208_224946

File Location: C:\Users\user\Desktop\Analysis

Last Analysys Model: 224_MCL_RNXT_ARA_BRA_MIXEDV4_U97C

Non Defective Seeds

OK Classes

665 Seeds | 92.62%

Dominant Color: RGB(152, 152, 123)

Color by Class

Draw Perimeter

Draw Min Axis

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Seed Features



Classification: Husk

Seed Info

Seed number	662
Class Probability	96.4%
Screen Size	10
Area	23.27 mm ²
Hull Area	26.02 mm ²
Minor Axis	105.0 mm
Major Axis	221.0 mm
Form Factor	2.1
Solidity	0.89
Surface Crack	13.05
Average Brightness	82.49
Black Ratio	1.03
Red Ratio	0.03
Green Ratio	0.0
Dissimilarity	0.79
Correlation	12.28
Homogeneity	0.51
Contrast	751.97
Metric	True Positive

Image Recorded on 2023/08/23 at 17:23:46.064 by iphone14

Image Mosaic

Click on any image to open a side drawer menu displaying comprehensive information about a specific seed.

Correct the classification by simply selecting a new class name from the classification drop-down menu.

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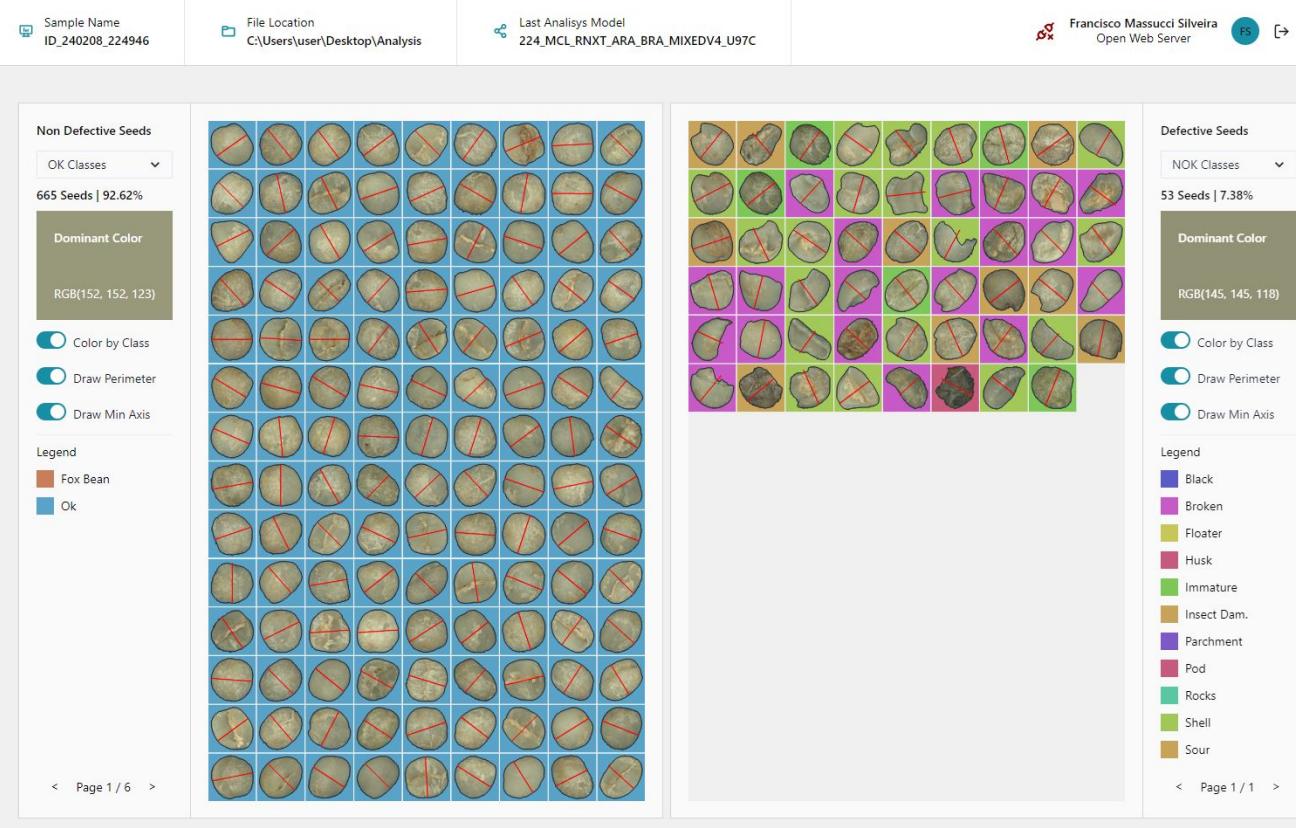


Image Mosaic

Incorporate visual artifacts, such as perimeter and minimum axis length, to improve the visualization.

Additionally, visualize each defect class using the corresponding color indicated in the legend to facilitate easy identification.

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Lot Information

Commercial	Cupping	Producer Info	Botanic	Harvest & Processing	Physical Aspects
Sample Type +	Supplier	Received On	Crop Year		
Arrival	Supplier Name	mm/dd/yyyy	Crop Year		
Number of Bags	Bag Weight +				
Number of Bags	60				
Contracts	Shipment Month	Status			
Contracts Number	mm/dd/yyyy	Status			
Save					

Reset All Fields

Lot Information

The "Lot Information" menu consolidates all the details about the sample that cannot be directly discerned from its image, thereby enriching the sample information.

The first tab displays commercial information, which will be utilized in the PDF report. This includes:

- Sample Type
- Supplier
- Date Received
- Crop Year
- Number of Bags
- Bag Weight
- Contracts
- Shipment Month
- Status

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Lot Information

Commercial	Cupping	Producer Info	Botanic	Harvest & Processing	Physical Aspects
Physical Aspect	Cupping Results	Cupping Score			
Physical Aspect	Cupping Results	Cupping Score			
Save					

Reset All Fields

Lot Information

The "Cupping" tab displays detailed information concerning the grading attributes derived from cupping evaluations. This includes fields such as:

- Physical Aspects
- Cupping Results
- Cupping Scores



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Lot Information

Commercial Cupping **Producer Info** Botanic Harvest & Processing Physical Aspects

Country

Not Specified

Region

Region

Producer

Producer

Farm

Farm/Estate

City

City/State

Elevation

Elevation

Latitude

Latitude (-90 to 90)

Longitude

Longitude (-180 to 180)

Save

Reset All Fields

Lot Information

The "Producer Info" tab displays detailed information regarding the origin of the coffee and the farm where it was processed. Included fields are:

- Country
- Region
- Producer
- Farm
- City
- Elevation
- Latitude
- Longitude

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Lot Information

Commercial	Cupping	Producer Info	Botanic	Harvest & Processing	Physical Aspects
Species + Not Specified	Cultivar Cultivar / Variety	Phenotype + Not Specified			Save

[Reset All Fields](#)

Lot Information

The "Botanic" tab displays information regarding the Species, Cultivar and Phenotype.

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Lot Information

Commercial Cupping Producer Info Botanic **Harvest & Processing** Physical Aspects

Harvest Method + Processing Method + Drying Method + Drying Time Time Unit +

Not Specified Not Specified Not Specified Drying Time Days

Save

Reset All Fields

The “Harvest” tab displays detailed information regarding its production, including fields such as:

- Harvest Method
- Processing Method
- Drying Method
- Drying Time
- Time Unit

Sample Name ID_240208_224946	File Location C:\Users\user\Desktop\Analysis	Last Analysis Model 224_MCL_RNXT_ARA_BRA_MIXEDV4_U97C	Francisco Massucci Silveira Open Web Server
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Commercial
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Producer Info
Botanic
Harvest & Processing
Physical Aspects

Moisture Content (%)
Water Activity (%)
Bulk Density (g/ml)

Moisture Content

Water Activity

Bulk Density

Save

[Reset All Fields](#)

Classification Report

Finally, “Physical Aspects” present fields related to the sample’ physical state, including:

- Moisture Content
- Water Activity
- Bulk Density

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Classification Report

1. The opened analysis contains the following features:

- Defects Count per Class;
- Primary Defects;
- Secondary Defects;
- Foreign Matters;
- Dominant Colors;
- Screen Size Distribution;
- Classification Methods: COB, NY;

2. Select extra features to add the report

- Bar Plot
- Image Samples
- Scatter Plots
- AI Metrics
- Descriptive Statistics

3. Click 'Generate PDF' to save your report

Generate PDF

Open PDF after saving

Classification Report

The "Classification Report" Menu is designed to generate a comprehensive PDF file containing all the information presented on the dashboard.

Users can select the types of data to be included. By default, Bar Plot and Image Samples are selected.

The default logo for the report is the Csmart logo. However, if the user is connected to the web server and the company has uploaded a logo into the system, the report will automatically use the company's logo instead.

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Export Data

1. Select file formats to export

- CSV File
- Excel File

2. Click 'Export Data' to save files in the hard disk

 Export Data

 Open folder after saving

Export Data

The 'Export Data' menu is designed to export data from the .hdf5 file into standard data formats, such as .csv and Excel files.

The exported data includes the summary report of the sample and all the extracted features of each individual seed of the sample.

Exported files will be saved in the same folder where the .hdf5 file is saved.

Export Images

Quality Control

Export Images

1. Click 'Export Images' to save individual images

Export Images

Export for training Open folder after saving

Similar to the previous feature, the 'Export Images' function allows for the export of all individual images stored in the .hdf5 file into JPG format.

Files can be organized into classes based on model classification (the default setting), or by selecting the 'Export for training' option, they will be exported into a single folder. This functionality is particularly useful for creating new datasets, especially when the classification has been previously done by hand and all images of the sample are, in fact, of a single class.

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Compare Lots

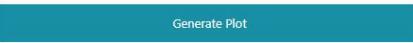
1. Add analysis files to the comparison list

 + Add Analysis

Comparison list not created

 Clear List

2. Click 'Generate Plot' to create PCA

 Generate Plot

Compare Lots

Unlike the functionalities focused on individual sample analysis, the 'Compare Lots' menu offers a suite of features designed for analyzing a sample in comparison to others, thereby generating insights from these comparisons.

By clicking on '+Add Analysis', users can select multiple files for comparison.

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Compare Lots

1. Add analysis files to the comparison list

+ Add Analysis

1	ID_240208_224946	Multiclass	
2	SPBR_77405_PRATA_PEREIRA	Multiclass	
3	Sour	Multiclass	
4	TribodaCafeina_Lote325_23	Multiclass	
5	consumo_x97	Multiclass	
6	Feijao	Multiclass	
7	MO00012980_GRANO_ESPECIAL	Multiclass	
8	TesteClassificacao	Multiclass	
9	Catuai	Multiclass	
10	CAFE_RESP_LOTE21045	Multiclass	
11	consumo	Multiclass	

Clear List

2. Click 'Generate Plot' to create PCA

Generate Plot

Compare Lots

After selecting the files, a list is generated, indicating whether each file's classification is multiclass or binary.

To proceed with the comparison, all files must have been analyzed using the same classification type—either all binary or all multiclass, though not necessarily with the same AI model.

After meeting these requirements, simply click on 'Generate Plot' to proceed with the comparison analysis.

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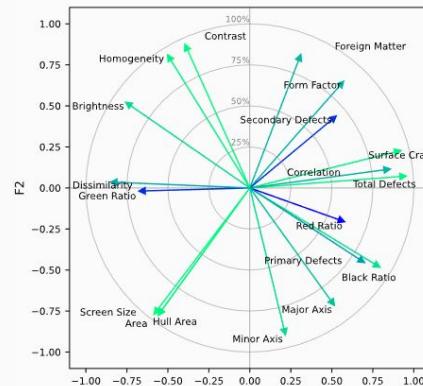
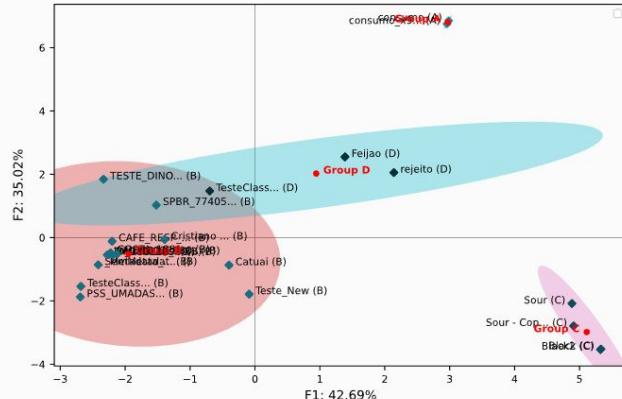
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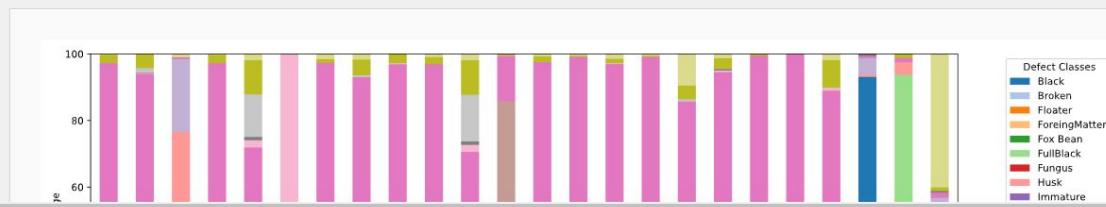
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Compare Lots

Dimensionality Reduction



Defects Comparison



Compare Lots

The initial analyses include dimensionality reduction, featuring a Principal Component Analysis Plot on the left and Pearson's Correlation Plot on the right.

Samples exhibiting similarity will be plotted in close proximity to each other, whereas dissimilar samples will be positioned further apart.

The right chart displays the spatial arrangement of features, clarifying the patterns observed in the left chart and emphasizing contributions through the color and size of arrows.

Sample Name
ID_240208_22496

File Location
C:\Users\user\Desktop\Analysis

Last Analysis Model
224_MCL_RNXT_ARA_BRA_MIXEDV4_U97C

Francisco Massucci Silveira
Open Web Server

FS

Save Plot

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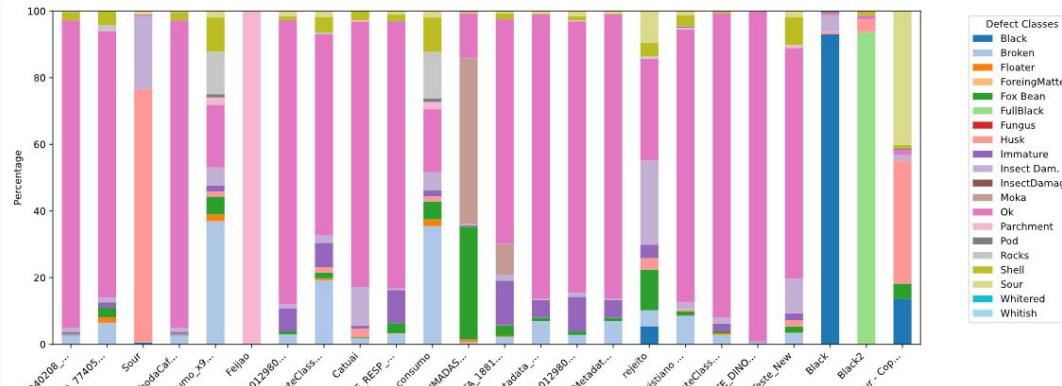
- Upload Analysis

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Defects Comparison



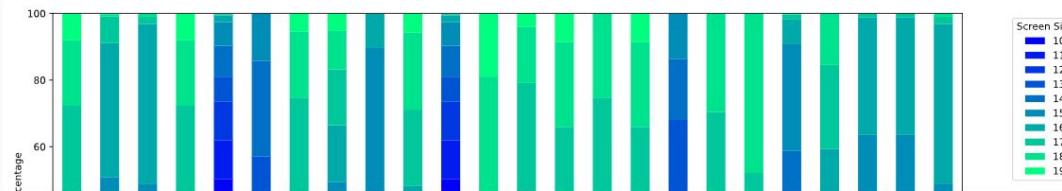
Save Plot

Compare Lots

The comparison of defects is shown immediately below, depicted as a bar plot that outlines each sample's class distribution.

This feature facilitates the easy visualization of differences in class occurrences among the selected samples.

Screen Size Comparison



Save Plot

Quality Control

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Classification Report

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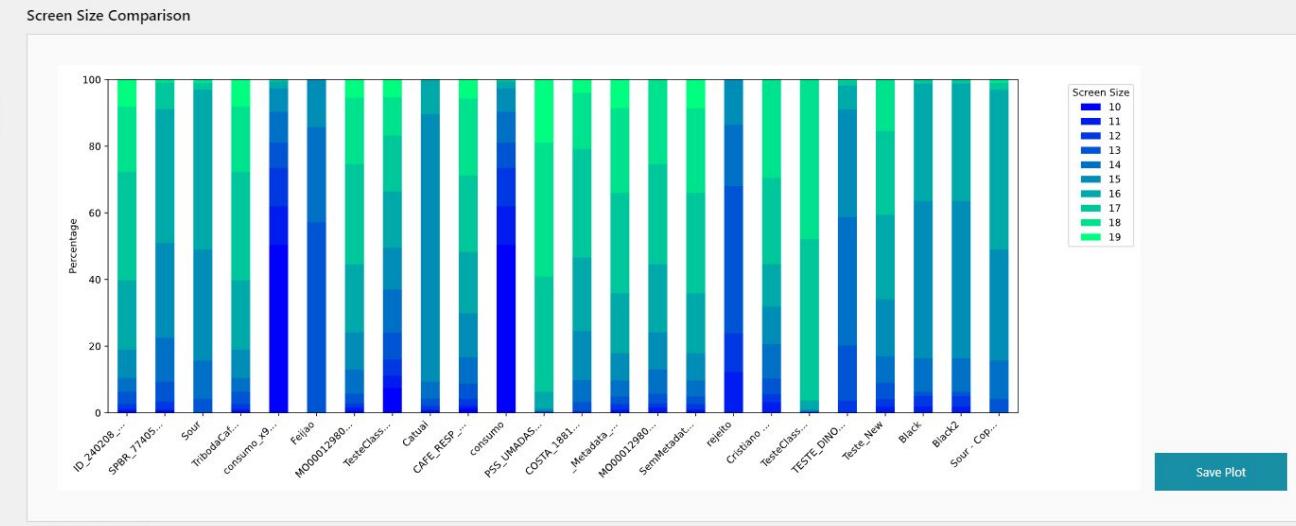
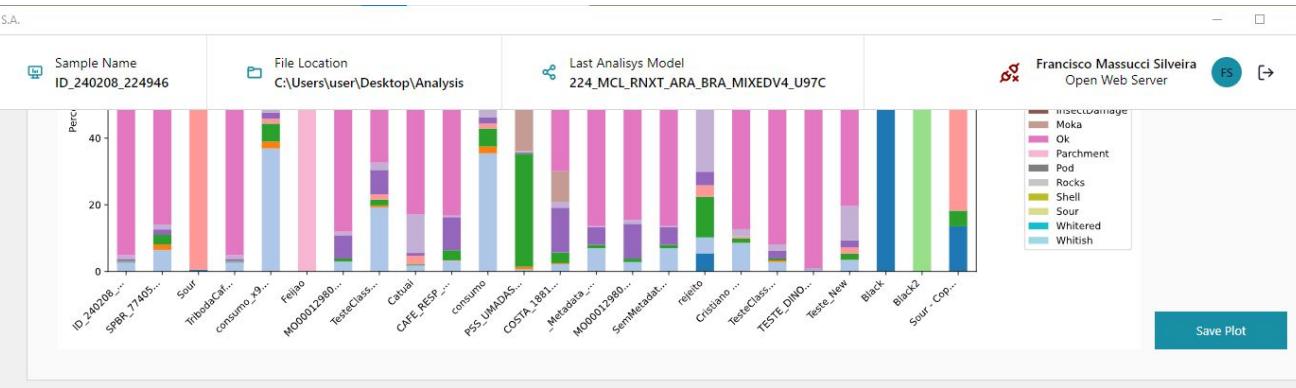
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Compare Lots

Similar to the previous plot, the Screen Size comparison is depicted using a Cumulative Distribution Plot that includes all the chosen samples.

This type of visualization enables an efficient comparison of size distributions among the samples, highlighting both differences and similarities with clarity.



Sample Name No sample	File Location C:\Users\user\Desktop\Analysis	Last Analysis Model No previous analysis	
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Login

Welcome to Csmart Web Server

Login

Login to Cloud Services

The Cloud Service Menu features an "Upload Analysis" button designed to upload all collected data to a centralized repository.

This functionality facilitates the efficient storage and sharing of information. Upon initial selection, users are directed to a login screen, where they must enter their email address and password.

For information on obtaining these credentials, please contact:

grading@csmart.ai



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Cloud Services

Upload Analysis

1. Add analysis files to the upload list

[+ Add Analysis](#)

1	ID_240208_224946	Existing	Multiclass	
2	SPBR_77405_PRATA_PEREIRA	New	Multiclass	
3	Sour	Existing	Multiclass	
4	TribodaCafeina_Lote325_23	Existing	Multiclass	
5	consumo_x97	New	Multiclass	
6	Feijao	Existing	Multiclass	
7	MO00012980_GRANO_ESPECIAL	New	Multiclass	
8	TesteClassificacao	New	Multiclass	
9	Catuai	New	Multiclass	
10	CAFE_RESP_LOTE21045	New	Multiclass	
11	consumo	New	Multiclass	

[Clear List](#)

2. Click 'Upload Files'

[Upload Files](#)

Upload Files to Cloud Services

After logging in, users can choose files for upload by clicking "+Add Analysis."

The selected files will appear in the list component, which also indicates whether they already exist in the database and if they have been previously analyzed.

Only files that have undergone AI analysis are eligible for storage in the repository.

Existing files require confirmation for upload since they will overwrite any current data in the system.

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Sample Name
ID_240208_22496

File Location
C:\Users\user\Desktop\Analysis

Last Analysis Model
224_MCL_RNXT_ARA_BRA_MIXEDV4_U97C

Francisco Massucci Silveira
Open Web Server

App Configuration

Acquisition Settings

Camera Settings

Pixel/cm

294

Area Filter

Min and Max Area

15

70

Save as Default

Flow Control

Light

Belt

Belt Speed

127

Save as Default

Feeder

Feeder Speed

129

Save as Default

Detected Kernels: 0 Seed Area: 0 mm²

Camera On

Camera Off

Reset Acquisition Settings

Acquisition Settings

The "Acquisition Settings" are intended for setting up variables related to controlling the camera and physical devices, such as lights, belt conveyors, and vibratory feeders.

Once adjusted, users can save these settings as default by clicking the "Save as Default" button, utilizing the new values when creating a new analysis.

Click "Reset Acquisition Settings" to return to the factory default values.

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App Configuration

General Settings

Device Name	DESKTOP-8CTMHF6
Worked Hours	0.09 hours
Total Analysis	41
Image Scale	294 pixel/cm
Minimum Area Filter	15 mm ²
Maximum Area Filter	70 mm ²
Conveyor Belt Speed	127 (50%)
Electromagnetic Feeder Speed	129 (51%)

Edit Settings

General Settings

The "General Settings" display all of the acquisition settings values, as well as the worked hours of the machine, indicating the hours of operation, and the total number of analyses, indicating how many times the analyses have been run on this computer.

Click "Edit Settings" to adjust values as required.

Sample Name
ID_240208_224946File Location
C:\Users\user\Desktop\AnalysisLast Analysis Model
224_MCL_RNXT_ARA_BRA_MIXEDV4_U97CFrancisco Massucci Silveira
Open Web Server

About

The "About" section presents information about the company along with a hyperlink to the Csmart website.

CSMART

Csmart Coffee Technologies S.A.
Avenida Alan Turing, 776 - Sala 3. Cidade Universitária.
Campinas/SP - Brasil, CEP 13083-898
CNPJ 46.782.860/0001-25

csmart.ai

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CSMART COFFEE TECHNOLOGIES SA

Francisco Massucci Silveira
Founder | CTO

webpage: www.cmsart.ai

email to: grading@csmart.ai

whatsapp: +55 19 998267366

Address: Av. Alan Turing, 776 - Sala 3,
Cidade Universitária. Campinas/SP - Brasil - CEP 13083-898