


New Release

Device Control Desktop App

Minor version - V3.1.4

2025/01/17


Quality Control

 Home Artificial Intelligence Dashboard Image Mosaic Lot Info Classification Report Export Data Export Images Compare


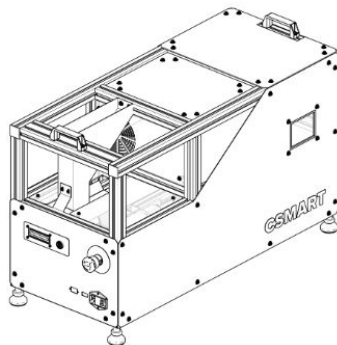
Cloud | Local Server

 Upload Analysis

AI Model | Dataset

 Edit Model Evaluate Model

System Configuration

 Acquisition Settings General Settings About**CSMART**
DIGITWelcome to Csmart Digit
The AI-Enabled Coffee Seed Classifier

Create New Analysis

Open Existing Analysis

Open User Manual


1

Knowledge Base

1. It is now possible to access the **User Manual or Knowledge Base** directly from within the application. This can be done by clicking on various locations within the software, which will open an external web browser.

The KB address is:

<https://csmart.gitbook.io/csmart-digit-kb>

Csmart Digit
v.3.1.4

Quality Control

Home

Artificial Intelligence

Dashboard

Image Mosaic

Lot Info

Classification Report

Export Data

Export Images

Compare

Cloud | Local Server

Upload Analysis

AI Model | Dataset

Edit Model

Evaluate Model

System Configuration

Acquisition Settings





General Settings

About

File Name
No file opened

File Location
D:\Csmart_Digit\Analysis

Last Analysis Model
No previous analysis



Quality Control

Artificial Intelligence

1. Select the AI model to classify the analysis file

Select Model

Selected Model: 224_ARA_BRA_MOGIANA_WIDENET100_93_V4

Classification Methods: COB

Classes: Ardido, Branco, Brocado, Cabeça, Concha, Fox Bean, Imaturo, Marinhoiro, Moka, Ok, Palha, Pau, Pedra, Pergaminho, Preto, Quebrado

Species: Arabica

Variety: Mixed

Origin: Brazil

Region: Mogiana de Minas

Processing Method: Mixed

Accuracy: 90.0%

Database Name: MOGIANA_V3_balanced

Model Issued: September/2024

Model Version: 4

Edit this model

2. Adjust the 'Pixel/cm' in the analysis file

-

260

+

Save

3. Select the AI model to remove duplicate seeds

Do Not Remove Duplicates

Coffee - Default AI

Generic - Light

Generic - Strict

Do Not Remove Duplicates

Run Analysis


Duplicate Seeds

2. New methods for removing duplicate seeds have been added. *Duplicate seeds* refer to pictures that contain more than one seed within a single frame.

An AI model, named **Coffee-Default AI**, has been introduced. The previous method, designed for use with other crops, is still available and can be found under two sensitivity levels: Generic - Light and Generic - Severe.

There is also an option to skip the removal of duplicate images, allowing users to review and clean the duplicates later.

It is highly recommended to use the **Coffee-Default AI** option as the standard protocol.

 **Csmart Digit**
v.3.1.4

Quality Control

- Home
- Artificial Intelligence
 - Dashboard
 - Image Mosaic
 - Lot Info
 - Classification Report
 - Export Data
 - Export Images
 - Compare

Cloud | Local Server

- Upload Analysis

AI Model | Dataset

- Edit Model**
- Evaluate Model





System Configuration

- Acquisition Settings
- General Settings
- About

File Name
No file opened

File Location
D:\Csmat_Digit\Analysis

Last Analysis Model
No previous analysis

AI Model | Dataset

Model Edit

1. Select the AI model to view/modify its properties


Select Model

Edit Model

3. A new side menu button, named **Edit Model**, has been added under the **AI Model | Dataset** group.

It is intended to support continuous efforts to enable users to better visualize and customize AI models, datasets, and all aspects related to the AI component of the software.

4. To visualize and customize an AI model, click on the **Select Model** button and locate the desired model to open it.

Csmat Digit
v3.1.4

Quality Control

Home

Artificial Intelligence

Dashboard

Image Mosaic

Lot Info

Classification Report

Export Data

Export Images

Compare

Cloud | Local Server

Upload Analysis

AI Model | Dataset

Edit Model

Evaluate Model

System Configuration

Acquisition Settings





General Settings

About

File Name
No file opened

File Location
D:\Csmat_Digit\Analysis

Last Analysis Model
No previous analysis



AI Model | Dataset

Model Edit

Selected Model:
224_ARA_BRA_SULDEMINAS_SEGFORM5_94_V6
C:\Users\user\Desktop\models

Change model

Model Description

Item	Description
Training Database	<input type="text" value="SULDEMINAS_V3_unbalanced"/>
Database Classes	<div><div>Ardido</div><div>Bom</div><div>Brocado</div><div>Casca</div><div>Coco</div><div>Concha</div><div>Marinheiro</div><div>Pau</div><div>Pedra</div><div>Pergaminho</div><div>Preto</div><div>Quebrado</div><div>Verde</div></div>
Species	<input type="text" value="Arabica"/>
Variety	<input type="text" value="Nao Informado"/>
Origin	<input type="text" value="Brasil"/>
Region	<input type="text" value="Sul de Minas"/>
Processing	<input type="text" value="Nao Informado"/>
Issued	<input type="text" value="Dez-2024"/>
Comments	<div><div>Comments</div></div>

7

Save










Edit Model

5. The first panel indicates the **model name and its location**.

6. The **Model Description** panel contains information that describes the characteristics of the coffee intended to be classified.

7. It is possible to modify these fields by typing in the selected field and then clicking the **Save** button at the bottom of the panel.



Quality Control

-  Home
-  Artificial Intelligence
-  Dashboard
-  Image Mosaic
-  Lot Info
-  Classification Report
-  Export Data
-  Export Images
-  Compare




Cloud | Local Server

-  Upload Analysis

AI Model | Dataset

-  Edit Model
-  Evaluate Model

System Configuration

-  Acquisition Settings
-  General Settings
-  About

Issued

Dez-2024

Comments

Comments

Save

8

Group Labels

Group

Label

Ok Classes

OK

Primary Defects

Defeitos Primarios

Secondary Defects

Defeitos Secundarios

Foreign Matter

Materia Estranha

Disregarded Classes

Desconsiderado

Save

Model Classes

Id Class

Color

Group

0

Ardido

20

Defeitos Primarios

1

Bom

100










OK

Edit Model

8. Every model is divided into five groups of classes: **Ok Classes, Primary Defects, Secondary Defects, Foreign Matter, and Disregarded Classes.** Even though a grading method doesn't use this terminology, Csmat-Digit divides classes into these five groups, which can have customized names in this panel.

Disregarded Classes have a special characteristic: they are not accounted for in any percentage calculation and are therefore disregarded. This is intended to replicate a condition that might occur in the sample but will certainly not occur in the production lot.



Quality Control

-  Home
-  Artificial Intelligence
-  Dashboard
-  Image Mosaic
-  Lot Info
-  Classification Report
-  Export Data
-  Export Images
-  Compare




Cloud | Local Server

-  Upload Analysis

AI Model | Dataset











-  Edit Model
-  Evaluate Model

System Configuration

-  Acquisition Settings
-  General Settings
-  About

9

Model Classes

Id	Class	Color	Group
0	<input type="text" value="Ardido"/>	20 	Defeitos Primarios 
1	<input type="text" value="Bom"/>	100 	OK 
2	<input type="text" value="Brocado"/>	140 	Defeitos Secundarios 
3	<input type="text" value="Casca"/>	70 	Materia Estranha 
4	<input type="text" value="Coco"/>	160 	Materia Estranha 
5	<input type="text" value="Concha"/>	170 	Defeitos Secundarios 
6	<input type="text" value="Marinheiro"/>	130 	Defeitos Secundarios 
7	<input type="text" value="Pau"/>	80 	Materia Estranha 
8	<input type="text" value="Pedra"/>	90 	Materia Estranha 
9	<input type="text" value="Pergaminho"/>	40 	Materia Estranha 
10	<input type="text" value="Preto"/>	120 	Defeitos Primarios 
11	<input type="text" value="Quebrado"/>	150 	Defeitos Secundarios 
12	<input type="text" value="Verde"/>	50 	Defeitos Primarios 

Create Class

Remove Class

Save

10

Descriptive Rules

Edit Model

9. In the Model Classes panel, it is possible to edit the class name, the color linked to each class (to be displayed in reports and plots), and the group. After editing any information here, it is necessary to click the save button to save the changes to the AI model file.

10. It is also possible to create extra classes that were not initially present in the training dataset classes. This is intended to create descriptive rules (covered in the next section) and modify the model classification. Although it is possible to create and remove extra classes, it is forbidden to exclude original classes, as this would create errors during classification.

Quality Control

- Home
- Artificial Intelligence
- Dashboard
- Image Mosaic
- Lot Info
- Classification Report
- Export Data
- Export Images
- Compare

Cloud | Local Server

- Upload Analysis

AI Model | Dataset

- Edit Model
- Evaluate Model

System Configuration

- Acquisition Settings
- General Settings
- About

Model Classes

Id	Class	Color	Group
0	Ardido	20	Defeitos Primarios
1	Bom	100	OK
2	Brocado	140	Defeitos Secundarios
3	Casca	70	Materia Estranha
4	Coco	160	Materia Estranha
5	Concha	170	Defeitos Secundarios
6	Marinheiro	130	Defeitos Secundarios
7	Pau	80	Materia Estranha
8	Pedra	90	Materia Estranha
9	Pergaminho	40	Materia Estranha
10	Preto	120	Defeitos Primarios
11	Quebrado	150	Defeitos Secundarios
12	Verde	50	Defeitos Primarios
13	Vazamento	0	OK

Create Class

Remove Class

OK

Defeitos Primarios

Defeitos Secundarios

Materia Estranha

Desconsiderado

11

Edit Model

11. In this example, a new class named **Vazamento** is created and set as part of the **Defeitos Secundários** group, with its color set to red (0).

Quality Control

- Home
- Artificial Intelligence
- Dashboard
- Image Mosaic
- Lot Info
- Classification Report
- Export Data
- Export Images
- Compare

Cloud | Local Server

- Upload Analysis

AI Model | Dataset

- Edit Model
- Evaluate Model

System Configuration

- Acquisition Settings
- General Settings
- About

File Name
No file opened

File Location
D:\Csmart_Digit\Analysis

Last Analysis Model
No previous analysis

9	Pergaminho	40	<div></div>	Materia Estranha	
10	Preto	120	<div></div>	Defeitos Primarios	
11	Quebrado	150	<div></div>	Defeitos Secundarios	
12	Verde	50	<div></div>	Defeitos Primarios	
13	Vazamento	0	<div></div>	OK	

Create Class

Remove Class

Save

12

Descriptive Rules

Id	Rule Name	Input Class	Variable	Rule	Value	Output Class	Delete
0	rock2broken	Pedra	Probability	Less/Equal	0.7	Quebrado	

Create Rule

Save

Grading Methods ?

Id	Method Name	Required Weight	Edit	Delete
0	cob	300 g		

Create Method

Save










Descriptive Rules

12. The Descriptive Rule panel is designed to create rules that override the AI classification, changing the class classification based on a linear descriptive rule.

The panel contains the following fields per rule:

Rule Name, the **Input Class** (the original class from classification), the **Variable** (where the user can select the variable to be checked), the **Rule** (which contains the condition to be checked), the **Value** (which is related to the Rule), and the **Output Class** (the class to be assigned if the condition created by the user is met).



Quality Control

-  Home
-  Artificial Intelligence
-  Dashboard
-  Image Mosaic
-  Lot Info
-  Classification Report
-  Export Data
-  Export Images
-  Compare

Cloud | Local Server

-  Upload Analysis

AI Model | Dataset

-  Edit Model
-  Evaluate Model





System Configuration

-  Acquisition Settings
-  General Settings
-  About

File Name
No file opened

File Location
D:\Csmat_Digit\Analysis

Last Analysis Model
No previous analysis



9	Pergaminho	40	<div></div>	Materia Estranha
10	Preto	120	<div></div>	Defeitos Primarios
11	Quebrado	150	<div></div>	Defeitos Secundarios
12	Verde	50	<div></div>	Defeitos Primarios
13	Vazamento	0	<div></div>	OK

Create Class

Remove Class

Save



Descriptive Rules

Id	Rule Name	Input Class	Variable	Rule	Value	Output Class	Delete
0	rock2broken	Pedra	Probability	Less/Equal	0.7	Quebrado	
1	ok2Vazamento	Bom	Screen Size	Less/Equal	12	Vazamento	

Create Rule

Save

Grading Methods ?

Id	Method Name	Required Weight	Edit	Delete
0	cob	300 g		

Create Method

Save

13

Descriptive Rules

13. As an example, a new rule that includes the newly created class is demonstrated:

The rule is named **ok2Vazamento**. The input class is **Bom** (a class without defects), the variable is **Screen Size**, and the Rule, or condition, is **Less/Equal** with a value of **12**. Finally, the output class is **Vazamento**. This rule will classify any coffee that initially has no defects (class Bom) into the new class Vazamento if the screen size is equal to or less than 12.

This can be used as a way to consider as defective seeds that have very small sizes, even though there are no apparent defects in the seeds.

Quality Control

- Home
- Artificial Intelligence
- Dashboard
- Image Mosaic
- Lot Info
- Classification Report
- Export Data
- Export Images
- Compare

Cloud | Local Server

- Upload Analysis

AI Model | Dataset

- Edit Model
- Evaluate Model





System Configuration

- Acquisition Settings
- General Settings
- About

File Name
No file opened

File Location
D:\Csmat_Digit\Analysis




Last Analysis Model
No previous analysis

9	Pergaminho	40	<div></div>	Materia Estranha
10	Preto	120	<div></div>	Defeitos Primarios
11	Quebrado	150	<div></div>	Defeitos Secundarios
12	Verde	50	<div></div>	Defeitos Primarios
13	Vazamento	0	<div></div>	OK

Create ClassRemove ClassSave

Descriptive Rules

Id	Rule Name	Input Class	Variable	Rule	Value	Output Class	Delete
0	rock2broken	Pedra	Probability	Less/Equal	0.7	Quebrado	
1	ok2Vazamento	Bom	Screen Size	Less/Equal	12	Vazamento	
2	verde2ok	Verde	Probability	Less/Equal	.85	Bom	

Create RuleSave

14

Grading Methods ?

Id	Method Name	Required Weight	Edit	Delete
0	cob	300 g		










Create MethodSave

Descriptive Rules

14. Another useful example of how to use a descriptive rule is to change a class classification based on a probability threshold.

For instance, if a model is too sensitive when classifying immatures, it is possible to create a rule that changes the Immature class to Ok based on the probability of the classification. In this case, every seed initially classified as **Verde** (immature) that does not reach **85% probability**—indicating the model is not confident it is immature—will be reclassified as **Bom** (Ok).



Quality Control

-  Home
-  Artificial Intelligence
-  Dashboard
-  Image Mosaic
-  Lot Info
-  Classification Report
-  Export Data
-  Export Images
-  Compare


Cloud | Local Server

-  Upload Analysis

AI Model | Dataset





-  Edit Model
-  Evaluate Model

System Configuration

-  Acquisition Settings
-  General Settings
-  About

14

Grading Methods ?

Id	Method Name	Required Weight	Edit	Delete
0	<input type="text" value="cob"/>	<input type="text" value="300"/> g		
1	<input type="text" value="sca"/>	<input type="text" value="350"/> g		

Create Method

15

16

Save

Weight Estimation ?

Weight per Screen Size		<div><div></div><div>300</div><div></div></div>	g		Single Distribution		<div><div></div><div></div></div>	Class Distribution	
Class Name	Screen 10	Screen 11	Screen 12	Screen 13	Screen 14	Screen 15	Screen 16	Screen 17	Screen 18
All Classes	103738	113524	123309	132970	142910	152775	162535	172235	181920

Save










Grading Methods

14. The next panel is the **Grading Method** panel, which presents all the grading methods attached to the AI model. In this panel, users can only change the name of the method and adjust the required weight for each protocol within the method.

15. Users can create as many grading methods as necessary and later visualize the results in the dashboard. To create a new grading method, simply click the **Create Method** button.

16. To modify an existing method, click the edit icon to access its properties. It is also possible to completely remove a method by clicking the delete icon.



Quality Control

-  Home
-  Artificial Intelligence
-  Dashboard
-  Image Mosaic
-  Lot Info
-  Classification Report
-  Export Data
-  Export Images
-  Compare




Cloud | Local Server

-  Upload Analysis

AI Model | Dataset

-  Edit Model
-  Evaluate Model

System Configuration

-  Acquisition Settings
-  General Settings
-  About

17

Equivalent Defects - COB ?

Id	Class Name	Seeds		Defect		Eq.Defect
0	Ardido	<input type="text" value="2"/>	to	<input type="text" value="1"/>	=	0.5
1	Bom	<input type="text" value="1"/>	to	<input type="text" value="0"/>	=	0
2	Brocado	<input type="text" value="5"/>	to	<input type="text" value="1"/>	=	0.2
3.1	Casca - Pequena	<input type="text" value="3"/>	to	<input type="text" value="1"/>	=	0.33
3.2	Casca - Media	<input type="text" value="3"/>	to	<input type="text" value="1"/>	=	0.33
3.3	Casca - Grande	<input type="text" value="1"/>	to	<input type="text" value="1"/>	=	1
4	Coco	<input type="text" value="1"/>	to	<input type="text" value="1"/>	=	1
5	Concha	<input type="text" value="3"/>	to	<input type="text" value="1"/>	=	0.33
6	Marinheiro	<input type="text" value="2"/>	to	<input type="text" value="1"/>	=	0.5
7.1	Pau - Pequeno	<input type="text" value="3"/>	to	<input type="text" value="1"/>	=	0.33
7.2	Pau - Medio	<input type="text" value="1"/>	to	<input type="text" value="2"/>	=	2
7.3	Pau - Grande	<input type="text" value="1"/>	to	<input type="text" value="5"/>	=	5
8.1	Pedra - Pequena	<input type="text" value="3"/>	to	<input type="text" value="1"/>	=	0.33
8.2	Pedra - Media	<input type="text" value="1"/>	to	<input type="text" value="2"/>	=	2
8.3	Pedra - Grande	<input type="text" value="1"/>	to	<input type="text" value="5"/>	=	5
9	Pergaminho	<input type="text" value="3"/>	to	<input type="text" value="1"/>	=	0.33
10	Preto	<input type="text" value="1"/>	to	<input type="text" value="1"/>	=	1
11	Quebrado	<input type="text" value="5"/>	to	<input type="text" value="1"/>	=	0.2
12	Verde	<input type="text" value="5"/>	to	<input type="text" value="1"/>	=	0.2
13	Vazamento	<input type="text" value="1"/>	to	<input type="text" value="0"/>	=	0

18

Grading Methods

17. The first panel indicates the equivalent defects present in the selected method.

The ? icon serves as a button that opens the user manual, specifically in the "Equivalent Defect" section.

18. Users can change every defect equivalence for each class. Keep in mind that all equivalences are calculated based on the number of seeds required to produce a specific number of defects. Both the seed and defect values must be equal to or greater than 0.

The equivalent defect result is automatically calculated and displayed in the last column.

Quality Control

- Home
- Artificial Intelligence
- Dashboard
- Image Mosaic
- Lot Info
- Classification Report
- Export Data
- Export Images
- Compare

Cloud | Local Server

- Upload Analysis

AI Model | Dataset

- Edit Model
- Evaluate Model

System Configuration

- Acquisition Settings
- General Settings
- About

19

Class Sizes Rules - COB

3 Casca			
Label Small	<input type="text" value="Pequena"/>	Small Area	<input type="text" value="30"/>
Label Medium	<input type="text" value="Media"/>	Large Area	<input type="text" value="60"/>
Label Large	<input type="text" value="Grande"/>	<button>Remove Rule</button>	

7 Pau			
Label Small	<input type="text" value="Pequeno"/>	Small Area	<input type="text" value="30"/>
Label Medium	<input type="text" value="Medio"/>	Large Area	<input type="text" value="60"/>
Label Large	<input type="text" value="Grande"/>	<button>Remove Rule</button>	

8 Pedra			
Label Small	<input type="text" value="Pequena"/>	Small Area	<input type="text" value="30"/>
Label Medium	<input type="text" value="Media"/>	Large Area	<input type="text" value="60"/>
Label Large	<input type="text" value="Grande"/>	<button>Remove Rule</button>	

Create Size RuleSave

20

Grading Methods

19. Some grading methods specify distinct defect equivalences within a single class based on size. The **Class Size Rules** panel is designed to indicate the classes that comply with this requirement.

Users can modify the labels for small, medium, and large groups, as well as define the area of the bins to divide the class into three groups.

20. To remove a rule for a class, click the **Remove Rule** button. The equivalent defects form will automatically update to reflect this change, now providing a single defect equivalence.

Grading Methods

21. To create a new size rule, click the **Create Size Rule** button and select the desired class to create the size-specific division.

After saving the changes, the **Equivalent Defects** panel will display the division, allowing users to define three defect equivalences based on size.

21

Create Size Rule

×

Select class to create a size rule for:

Select a Class

▼

Select a Class

Ardido

Bom

Brocado

Coco

Concha

Marinheiro


Pergaminho

Preto

Quebrado

Verde

Vazamento

Csmart Digit
v.3.1.4

Quality Control

Home

Artificial Intelligence

Dashboard

Image Mosaic

Lot Info

Classification Report

Export Data

Export Images

Compare

Cloud | Local Server

Upload Analysis

AI Model | Dataset

Edit Model

Evaluate Model

System Configuration

Acquisition Settings




General Settings

About

File Name
melitta

File Location
D:\Csmat_Digit\Analysis

Last Analysis Model
224_MCL_CNVNXT_L_ARA_BRA_MIXEDV4_E97



8 Pedra

Create Size Rule

Save

22

Grade Types - COB

Id	Max. Allowed Defects	Type label
0	Defects 4	= Type Tipo 2
1	Defects 8	= Type Tipo 2/3
2	Defects 12	= Type Tipo 3
3	Defects 19	= Type Tipo 3/4
4	Defects 26	= Type Tipo 4
5	Defects 36	= Type Tipo 4/5
6	Defects 46	= Type Tipo 5
7	Defects 64	= Type Tipo 5/6
8	Defects 86	= Type Tipo 6
9	Defects 123	= Type Tipo 6/7
10	Defects 160	= Type Tipo 7
11	Defects 260	= Type Tipo 7/8
12	Defects 360	= Type Tipo 8

Create Type

Remove Type


Save

Grade Types

22. In the **Grade Types** panel, users can specify type labels based on the sum of equivalent defects in the sample.

This approach relies on defect occurrences, such as determined by methods like SCA, GCA, and COB (Brazil). However, the software currently does not account for methods based on the percentage of weight to specify a grade. Future updates will include this functionality.

23. A type is defined as the maximum allowed occurrence of equivalent defects, except for the last type, which has no upper limit. For example, a sample with 6 total equivalent defects is classified as **Tipo 2/3** in the COB methodology.

 **Csmart Digit**
v.3.1.4

Quality Control

Home

Artificial Intelligence

Dashboard

Image Mosaic

Lot Info

Classification Report

Export Data

Export Images

Compare

Cloud | Local Server

Upload Analysis

AI Model | Dataset

Edit Model

Evaluate Model

System Configuration

Acquisition Settings




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Last Analysis Model
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   ?

8 Pedra

Create Size Rule

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Grade Types - COB

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11	Defects 260	= Type Tipo 7/8
12	Defects 360	= Type Tipo 8

Create Type

Remove Type

24

Save

Grade Types










24. Users can create and remove grade types by clicking the **Create Type** and **Remove Type** buttons, respectively.

The final type descriptions must be arranged in ascending order, meaning a subsequent defect value cannot be smaller than the previous defect value.

For further reading on the topic of weight estimation, please open the following link of Csmart-Digit KB:

<https://csmart.gitbook.io/csmart-digit-kb/csmart-fundamentals/csmart-methodology-for-weight-estimation>



Quality Control

-  Home
-  Artificial Intelligence
-  Dashboard
-  Image Mosaic
-  Lot Info
-  Classification Report
-  Export Data
-  Export Images
-  Compare


Cloud | Local Server

-  Upload Analysis

AI Model | Dataset

-  Edit Model
-  Evaluate Model





System Configuration




-  Acquisition Settings
-  General Settings
-  About

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0	rock2broken	Pedra	Probability	Less/Equal	0.7	Quebrado	
1	ok2Vazamento	Bom	Screen Size	Less/Equal	12	Vazamento	
2	verde2ok	Verde	Probability	Less/Equal	0.85	Bom	

Create Rule

Save

Grading Methods ?

Id	Method Name	Required Weight	Edit	Delete
0	cob	300 g		
1	sca	350 g		

Create Method

Save

25 Weight Estimation ?

Weight per Screen Size

300 g

26

Single Distribution

Class Distribution

Class Name	Screen 10	Screen 11	Screen 12	Screen 13	Screen 14	Screen 15	Screen 16	Screen 17	Screen 18
All Classes	10 3738	11 3524	12 3309	13 2970	14 2910	15 2775	16 2535	17 2235	18 1920

27

Save

Weight Estimation

25. The **Weight Estimation** panel is designed to describe the occurrence of seeds per screen size required to obtain a specific weight value.

26. The **Weight per Screen Size** input represents the total weight to be used in the subsequent distribution.

27. Users must specify the seed occurrence for each screen size to achieve the previously specified weight. For example, to reach 300g of this coffee, it is necessary to have 3,738 seeds of screen size 14 or 3,524 seeds of screen size 11, and so on, **with each occurrence resulting in exactly 300g.**

Quality Control

- Home
- Artificial Intelligence
- Dashboard
- Image Mosaic
- Lot Info
- Classification Report
- Export Data
- Export Images
- Compare

Cloud | Local Server

- Upload Analysis

AI Model | Dataset

- Edit Model
- Evaluate Model

System Configuration

- Acquisition Settings
- General Settings
- About

Weight Estimation ?

Weight per Screen Size

300 g

Single Distribution ☒ Class Distribution

28

29

Class Name		Screen 10	Screen 11	Screen 12	Screen 13	Screen 14	Screen 15	Screen 16	Screen 17	Screen 18
Broken	10	5500	11 4575	12 3729	13 2794	14 2449	15 2654	16 2360	17 1885	18
Brown	10		11 6190	12 5070	13 3500	14 2663	15 2307	16 1981	17 1731	18 1345
Floater	10		11 6190	12 5070	13 3500	14 2663	15 2307	16 1981	17 1731	18 1345
Fragment	10	9533	11 7274	12 6283	13 4228	14	15	16	17	18
Full Black	10		11 6190	12 5070	13 3500	14 2663	15 2307	16 1981	17 1731	18 1345
Husk	10		11 1476	12 1476	13	14	15	16	17	18
Immature	10		11 6190	12 5070	13 3500	14 2663	15 2307	16 1981	17 1731	18 1345
Insect Dam.	10		11 6190	12 5070	13 3500	14 2663	15 2307	16 1981	17 1731	18 1345
Moldy	10		11 6190	12 5070	13 3500	14 2663	15 2307	16 1981	17 1731	18 1345
OK	10		11 6190	12 5070	13 3500	14 2663	15 2307	16 1981	17 1731	18 1345
Pod	10		11 856	12 856	13	14	15	16	17	18
Silver Skin	10		11 6190	12 5070	13 3500	14 2663	15 2307	16 1981	17 1731	18 1345
Stick	10		11 3326	12 3326	13	14	15	16	17	18
Stone	10	6533	11 3597	12 2989	13 2361	14 1809	15 1541	16 1321	17 1102	18 633

Save

Weight Estimation

28. It is also possible to switch from a single distribution to a class-specific distribution by clicking the designated switch button. Please note that switching between distribution methodologies will result in the loss of previously entered data.

29. In the class-specific distribution, users can include specific values for each class. All classes must have at least one entry, but if more than one entry is provided, the entries must be consecutive (e.g., 14, 15, 16). Non-filled values (e.g., empty, zero, or null) are ignored during validation and will receive min and max values of that row.



CSMART COFFEE TECHNOLOGIES SA

Francisco Massucci Silveira
Founder | CTO

webpage: www.cmsart.ai

email to: grading@cmsart.ai

whatsapp: +55 19 998267366

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