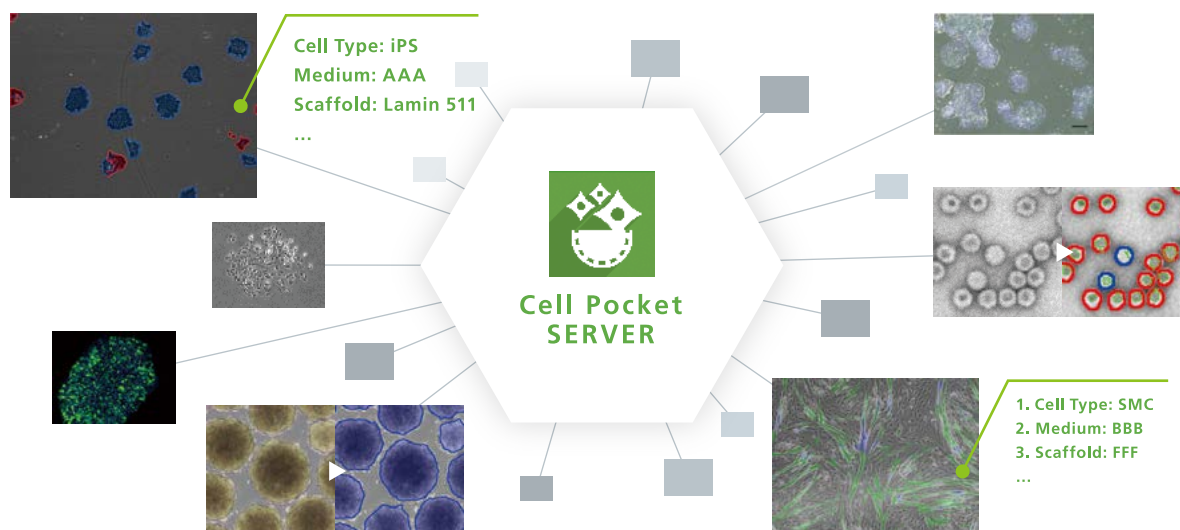


Web Application Supporting Cell Observation

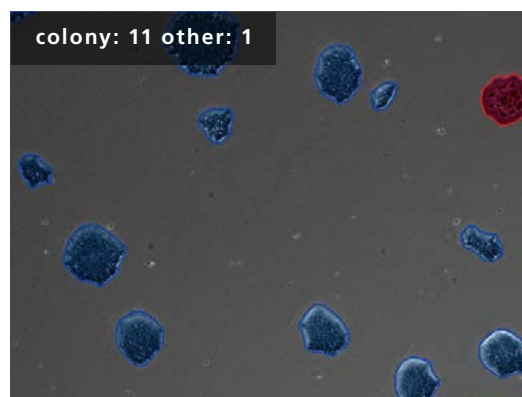
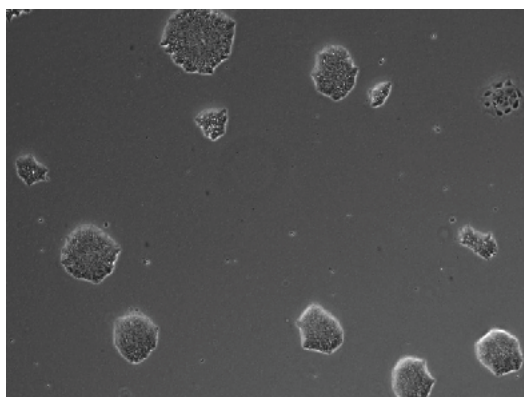
Cell Pocket



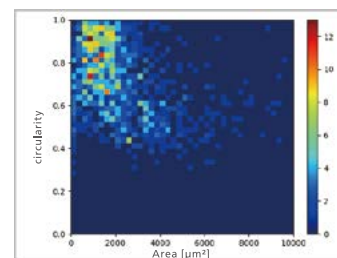
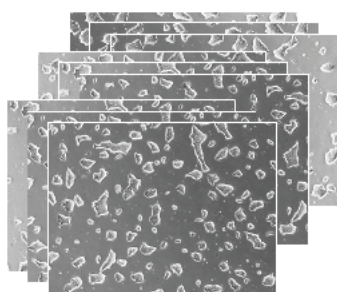
New Experience in Cell Image Analysis

— Using AI to display image information objectively and quantitatively —

Example Detection of abnormal colonies



Example Quantification and graphing of the morphological features of cell colonies



POINT 1

Quantify the visual state of cells from ——— P. 4 various aspects

- Deep learning technology can offer the quantification of cell status.
- Easy quantifying and graphing with customizable analysis recipes.



POINT 2

Centralized management of all data from ——— P. 6 cell observation work

- Easy to gather various cell culture information such as culture conditions, image data, and analyzed data.
- This is a Web application for up to 20 users.
- Centralized management facilitates sharing data and knowledge among members.



POINT 3

User interface specialized for ——— P. 7 cell culture management

- Cell image data can be easily linked to culture conditions.
- The user interface for culture management is simple and easy to understand and supports a user's cell analysis work.

Product





Process flow for image analysis using AI

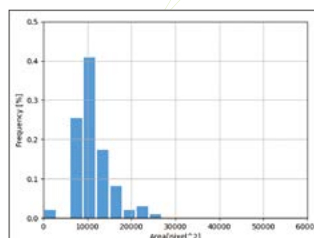
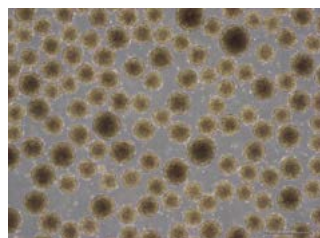


STEP
01

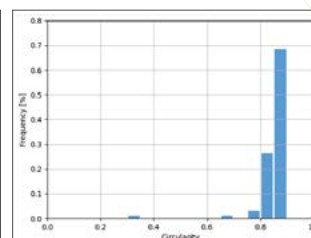
Set data analysis goals.

Clearly identify the desired analysis results.

Example: Evaluating the variability of spheroid area and circularity



Area



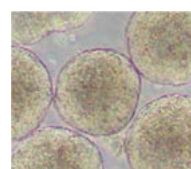
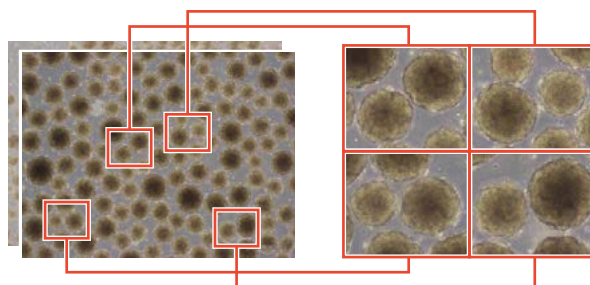
Circularity

STEP
02

Acquire AI training data.

Acquire images necessary for obtaining desired results.

Verification is possible from a minimum of about 10 image data sets.



Target image



Labeled image

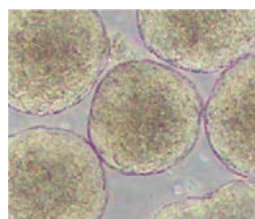
Note: Manually labeled or color-coded images are used as labeled images.

STEP
03

Train AI model and assess performance.

Train the AI model and assess its performance with test images. Cell Pocket™ automatically assigns a test image, numerically evaluates the entire test image, and indicates any regions of the test image where errors were predicted.

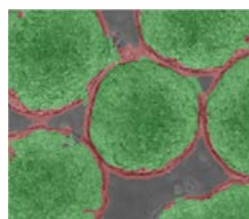
The figures below are used to assess whether spheroid regions were correctly predicted.



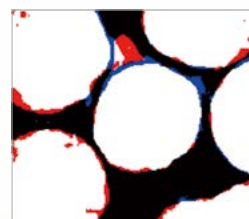
Test image



Predict errors



Prediction results



Consistency between spheroid predicted and labeled results



Note: Processes for calculating area and circularity values from predicted spheroid regions are specified in data analysis recipes indicated on the next page.

In this example, the results confirm whether spheroid regions can be correctly identified.



Quantify the visual state of cells from various aspects

Analysis recipes can be made in three steps

Constructed recipes can be used routinely for the same purpose

STEP 01

Preparation of trained model^{*1}

Cell Pocket equips the preparation function of trained models to deduce cell or colony regions by using a user's image data.



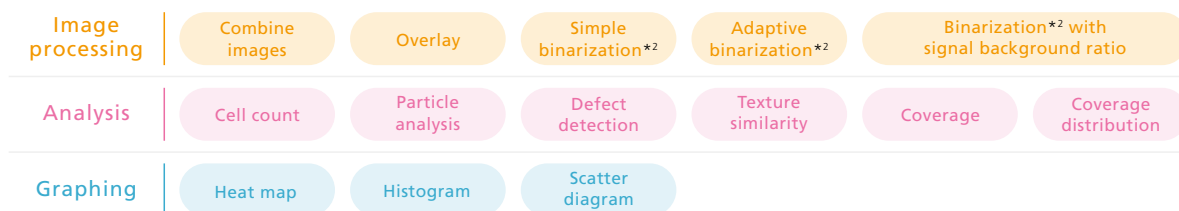
^{*1} For details on how to create a trained model, visit our web site.
(Since the performance of the trained model depends on the training data, we do not take any responsibility for its output.)

Feature

STEP 02

Selection of analysis processing scripts

Cell Pocket contains 14 kinds of commonly used analysis processing scripts. By assembling them, a variety of analysis recipes can be constructed. It is also possible to describe and add scripts on your own.

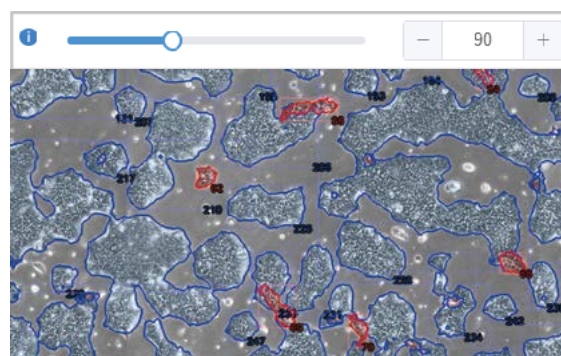
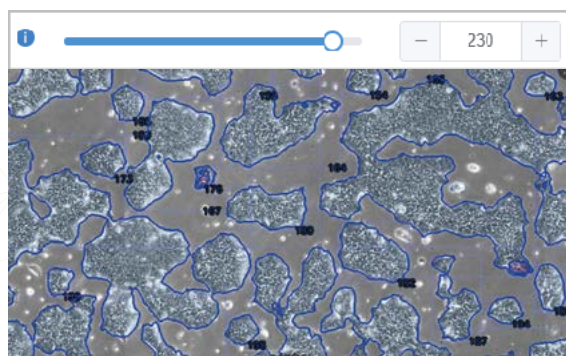


^{*2} "Binarization" means image processing for a discriminating area of interest or that of no interest. For example, this is used for discriminating nucleus and no cell region.

STEP 03

Optimization of parameters for analysis processing scripts

Parameters for analysis processing scripts can be adjusted with the user interface. Figures below show analysis examples before and after changing the parameters for the threshold of defect cells.



Analysis examples

Analysis of colony morphology distribution

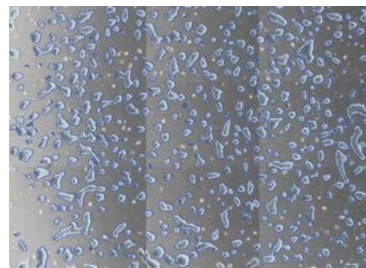
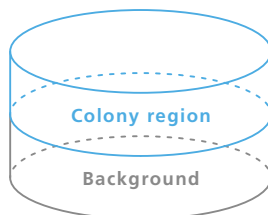
Trained model

Combine images

Coverage

Particle analysis

After combining nine images, colony regions are discriminated from the background, and then the diameter, area and circularity of each colony and coverage can be quantitated.



Coverage: 29 %

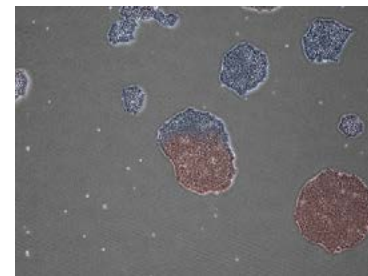
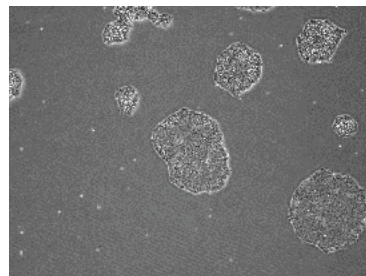
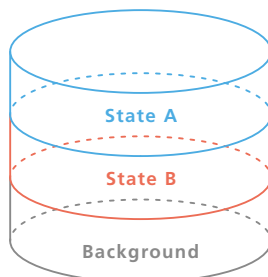
#	Diameter	Area	...	Aspect ratio
1	16.1	107.8		5.4
2	37.3	223.1		10.2
3	57.1	420.3		8.9
⋮				
242	32.7	180.2		6.8
243	44.2	267.9		6.2

Analysis of texture similarity

Trained model

Texture similarity

After training, a slight difference in pattern information on the cell texture can be detected and quantified.



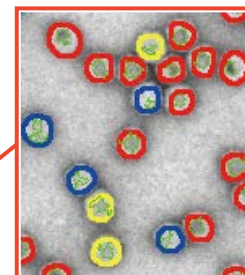
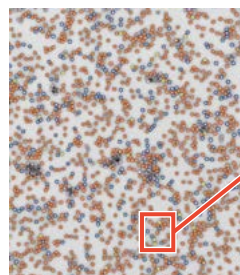
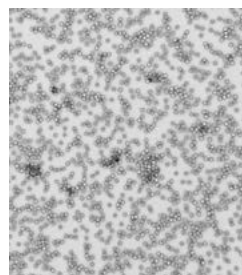
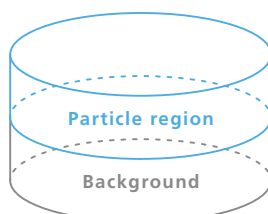
Similarity score with state A: 53 %

Particle classification by morphological analysis and characteristic quantities

Trained model

Particle analysis

By classifying particle types based on characteristic quantities, such as the shape, color, or brightness of particles, particles with particular characteristics can be counted.



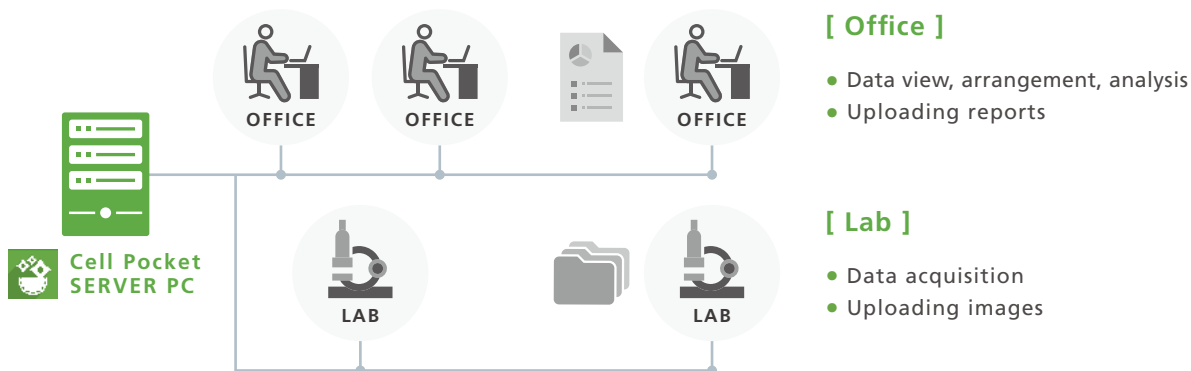


Centralized management of all cell culture data in your lab

Manage data via a Web application

After installing a server PC in your office, you can use this system via a web browser.

Note: Up to 20 users per one server PC



At-a-glance viewer for cell culture information

- Displays culture conditions, acquired data, and analyzed results at a glance
- Reduces labor time for comparing with past results, searching acquired data, and sharing the experimental progress

Project name

Project	Operator	Date
Project_5	Operator_2	2021-06
Operator_2	Operator_1	2021-06
Operator_1	Demo-Project	2021-06
Demo-Project	2021-06	2021-06
2021-06	sample_shimadzu5	2021-06
sample_shimadzu5	sample_shimadzu4	2021-06
sample_shimadzu4	sample_shimadzu3	2021-06
sample_shimadzu3	sample_shimadzu2	2021-06
sample_shimadzu2	sample_shimadzu	2021-06
sample_shimadzu	test02	2021-06
test02	test01	2021-06
test01	3rd_Project	2021-06

Main screen

Culture conditions

Plate	Cell Type	Medium	Lot	Date
Assessment-of-proliferative2	MSC	test-med2	119243	Jul 19, 2021
Assessment-of-proliferative1	MSC	test-med1	119243	Jul 12, 2021
Assessment of colony forming	MSC	D MEM	119243	Jul 5, 2021



User interface specialized for cell culture management

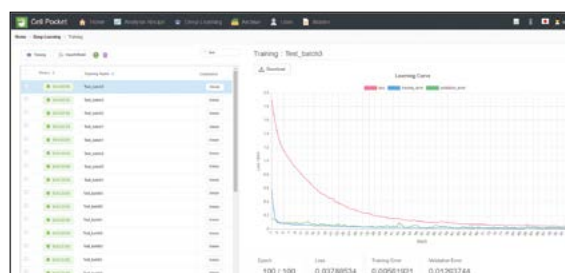
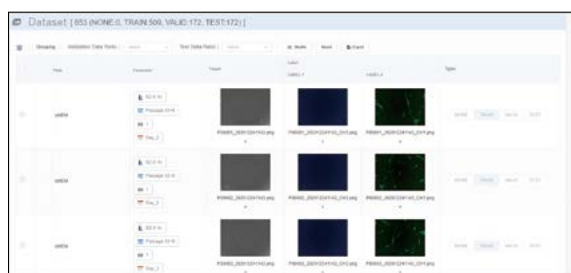
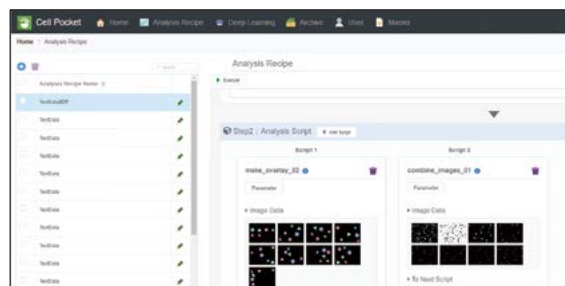
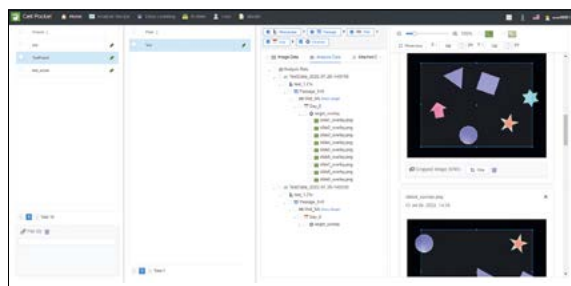
Input culture conditions with ease and without omission

- Input by selecting specific cell culture conditions, such as cell line and culture medium.
- Cell culture information input from lab members can be consistent using the "template Input" function.
- New templates can be created and administrative users can edit the template.

The screenshot shows a form for inputting culture conditions. At the top, there is a field for "Plate Name" with the value "Test" and a "4/100" indicator. Below this, there are two dropdown menus for "Related Plate" (set to "Project") and "Plate". A "Tag Template" dropdown is set to "sample". There are two main input sections: "Tag 1" and "Tag-2". "Tag 1" has a dropdown set to "Cell Type" and a "0/30" character count, with a "Text" button. Below it are five buttons: "MSC", "iPSC", "C110", "HeLa", and "HICX". "Tag-2" has a dropdown set to "Medium" and a "0/30" character count, with a "Text" button. Below it are five buttons: "D-MEM", "MEM", "StemFit", "test-med1", and "test-med2".

Support data management for utilizing AI

- Data traceability is ensured by keeping a record of data sets, training histories, data analysis recipes, and data analysis results.
- It effortlessly achieves data management, which is even more important due to the use of AI.



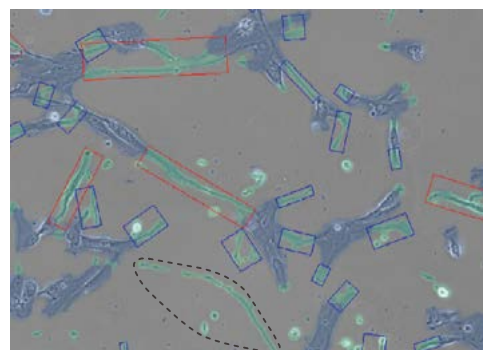
Related Software

Morphology Analysis Plug-in for Mesenchymal Stem Cells

This application extracts the filamentous pseudopodia from cellular regions, quantifies the long axis length and its ratio in comparison to the total, and outputs a histogram.

This product is an analysis script developed through collaborative research with Dr. Shin Kawamata at the Research & Development Center for Cell Therapy, Foundation for Biomedical Research and Innovation in Kobe, Japan.

Refer to the flyer C297-E140 for details.



- Counted as long pseudopodia
- Counted as short pseudopodia

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Shimadzu Corporation
www.shimadzu.com/an/

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