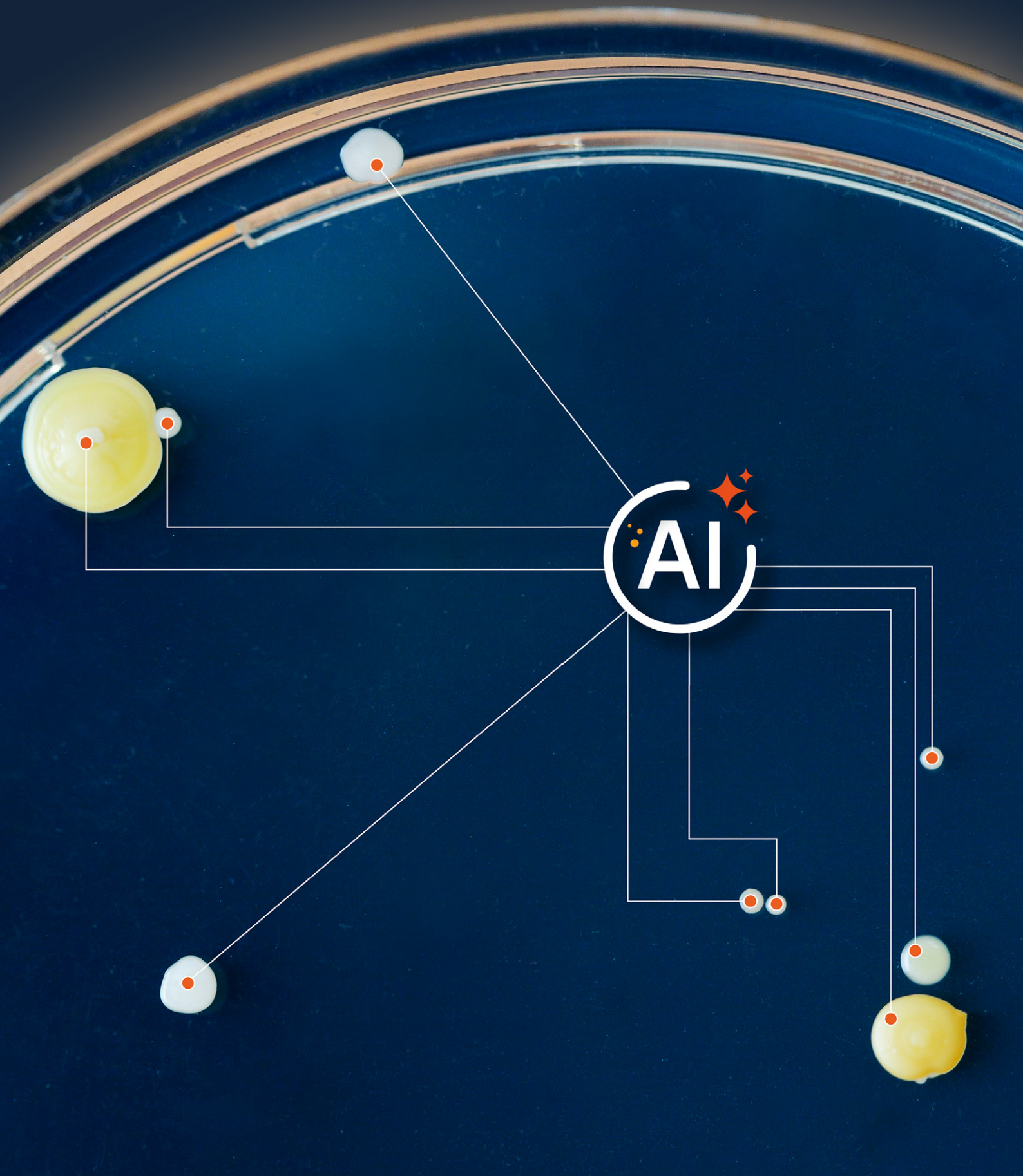
Julius reading skills

Real experience for real capabilities



Reading a petri dish seems to be simple enough, isn't it? You just need to count the little dots one by one and, Voila! You have your results!
If you are microbiologist, you know that this is (unfortunately) simply not true…

First, what is reading?

When analyzing a culture media plate, you may want to detect microorganisms' presence, such as a pathogen, by simply checking whether there is any growth on the plate.

You may also want to quantify bacterial growth, for example the total aerobic flora. In this case, you count each of the colonies, taking into consideration standards but also real-life growth phenomena: overlapping colonies, pinpoint colonies, invasive colonies, matrix effects…

You may even go a step further and differentiate colonies types, for example counting only characteristic colonies on a chromogenic media.

As you can see, reading requires expertise. The habilitated operator must be able to analyze each plate according to the application needed and considering other lab variables that can make this step even more challenging.

They rotate the plate to make sure no colony is overlooked, identify colonies' morphology correctly, and stay focus all throughout the process to give accurate results from the first plates reviewed to the last.

Not that simple, right?

Automation for plate reading

To secure this essential step, laboratories can choose to automate. In that case reading is not done directly by the lab technician but a picture of the culture media plate is analyzed. With the right performances, automation can bring key benefits for the lab workflow.

But how to get the right performance? How to get the proficiency of a habilitated expert technician?

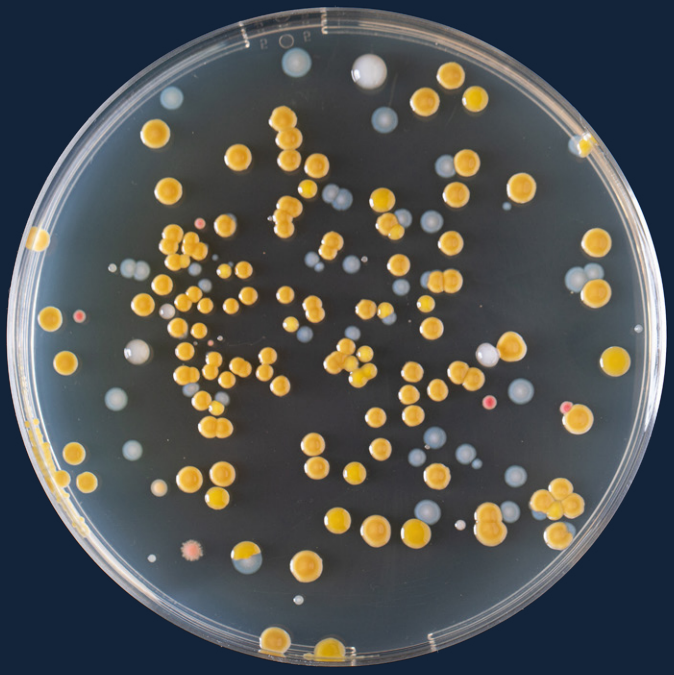
AI to improve automated reading

A technology to count bacterial colonies on a Petri dish seems simple at first glance. In practice, colonies can merge, vary in shape and size or be confused with bubbles and other artefacts.

Traditional automated colony counters rely on fixed parameters (color thresholding, size...) that work well under ideal conditions but fail as soon as laboratory conditions vary.

Thanks to artificial intelligence, Julius is able to overcome these challenges and robustly detects colonies.

The key advantage of the approach is the possibility to train the AI models to get to the desired performance level.



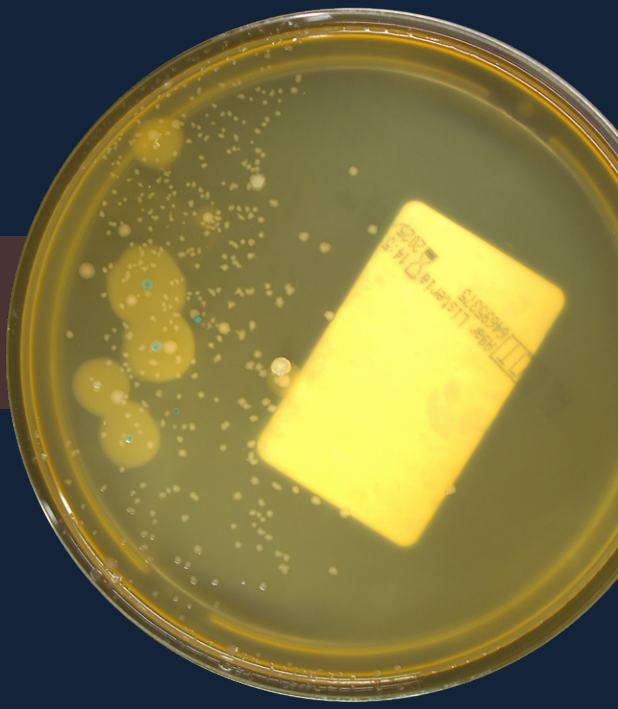
In other words, with AI in automated solutions, we can reproduce human strategy to become the best in any field: by gaining more experience, by learning from real-lab conditions.

TRAINING

Real lab training

Julius was trained by a large dataset collected from **several independent food and cosmetic service laboratories,** with diverse matrices and type of media (inhouse prepared media, ready to use, …).

It means that Julius was not trained on plates artificially contaminated. Only real-lab conditions, to develop the best performances.



It has learned to ignore anything that is not a colony:

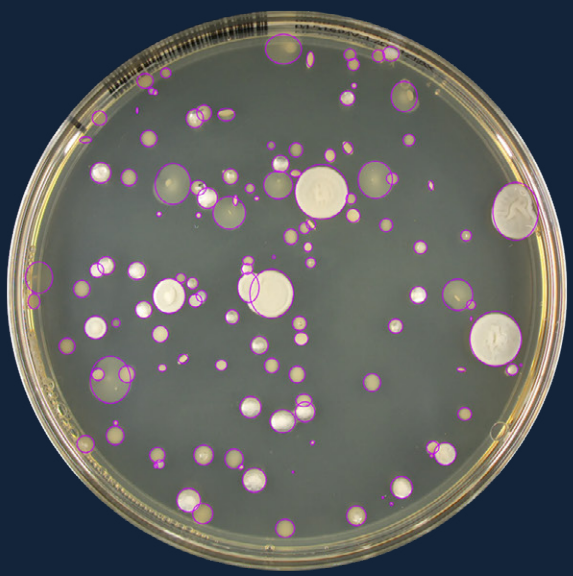
- **Labels and marker pen stroke**
- **Air bubbles**
- **Plastic injection point (or molding marks)**
- **Sample particles**

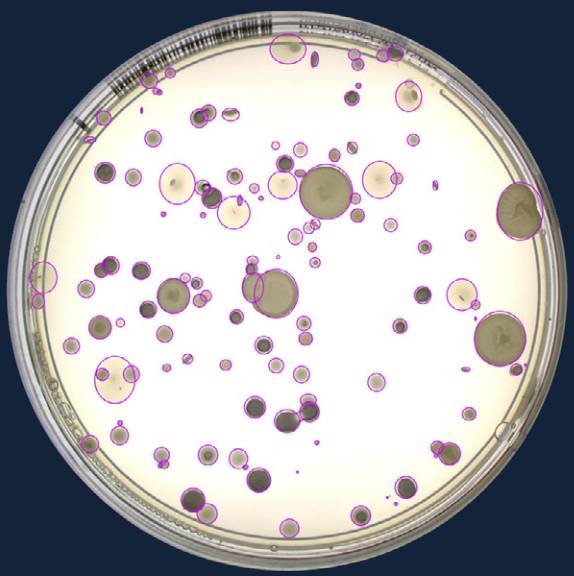
OPTICS

Achieving the scrutiny of a technician

Julius analyzes each plate **using simultaneously two pictures with different lighting sources** (side lighting and backlighting)—just like a technician rotating a plate under the light to ensure nothing is forgotten.

This dual-illumination technology allows Julius to detect colonies starting from 0.2 mm in diameter.





SORTING

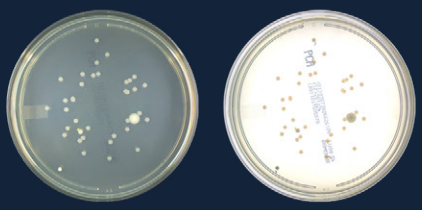
To fully improve the process from incubation to entering results in the LIMS, Julius analyzes and physically sorts the plates from the ones with growth and the ones without.

EASY PROCESS

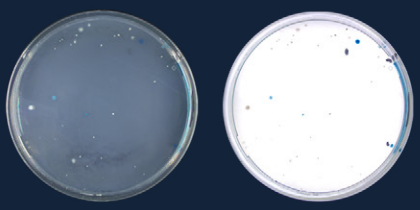
Each plate is analyzed for growth detection through the **Plate Sorting AI Model 1.0**, covering:

PCA · TBX · MRS · BP / BP RPF · TSA · DG18 · Mossel · RAPID'Salmonella · COMPASS® Listeria

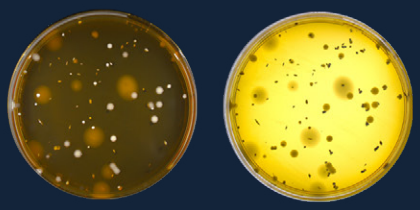
PCA



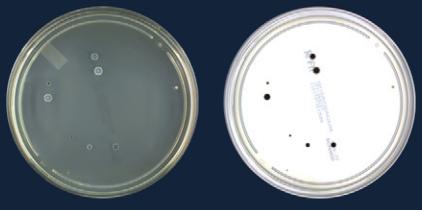
TBX



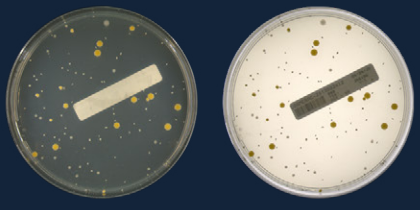
MRS



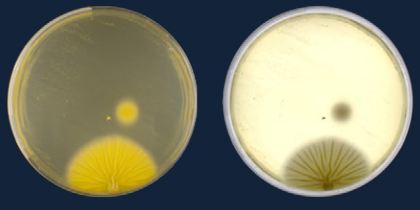
BP / RPF



TSA

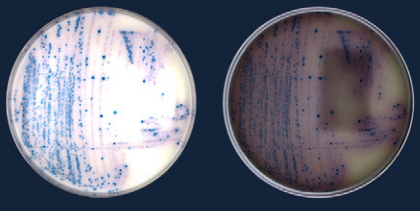


DG18

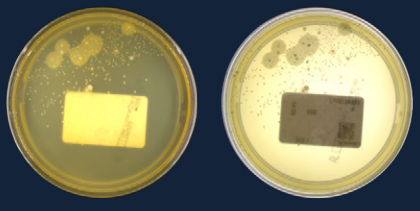


Mossel

RAPID'Salmonella



COMPASS® Listeria



New culture media models coming soon. Stay tuned!

PLATE SORTING METRICS

Plate Sorting Model 1.0 validation and Results, across several thousand plates tested in internal validation:

>98% **Recall minimizing false negatives**	**>98%** **Precision compared with the reference count**	**>98%** **Specificity, limiting false positives**

This performance level is consistent across all 9 media tested, on a total of 4470 plates.

Media	Precision
PCA	98,1 %
TBX	97,8 %
MRS	98,9 %
BP	97,1 %
TSA	98,1 %
DG18	98,9 %
MOSSEL	99,5 %
RAPID' Salmonella	98,1 %
COMPASS® Listeria	97,9 %
Global	**98,3 %**

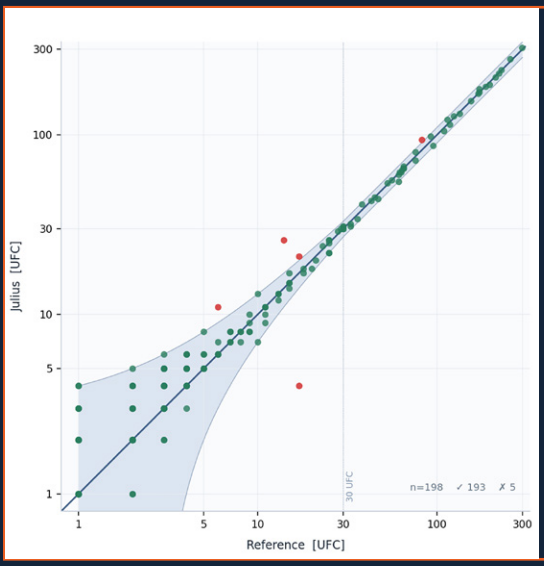
COLONY COUNTING METRICS

Evaluation of **A.B.Eye - Total Aerobic Count v1.0**, with **PCA (Plate Count Agar) media.**

97.5% **ISO Agreement** Like a technician undergoing qualification: results compared to a reference expert, within the margin set by the standard.	**R^2 = 0.97** **Correlation** Measures how closely Julius and the technician reach the same conclusions. Closer to 1 = perfect agreement.	**+0.45 CFU** **Average bias / plate** Slight tendency to count a bit more than the technician. This overestimation reduces the risk of missing a colony.

Results calculated according to ISO 7218:2024.

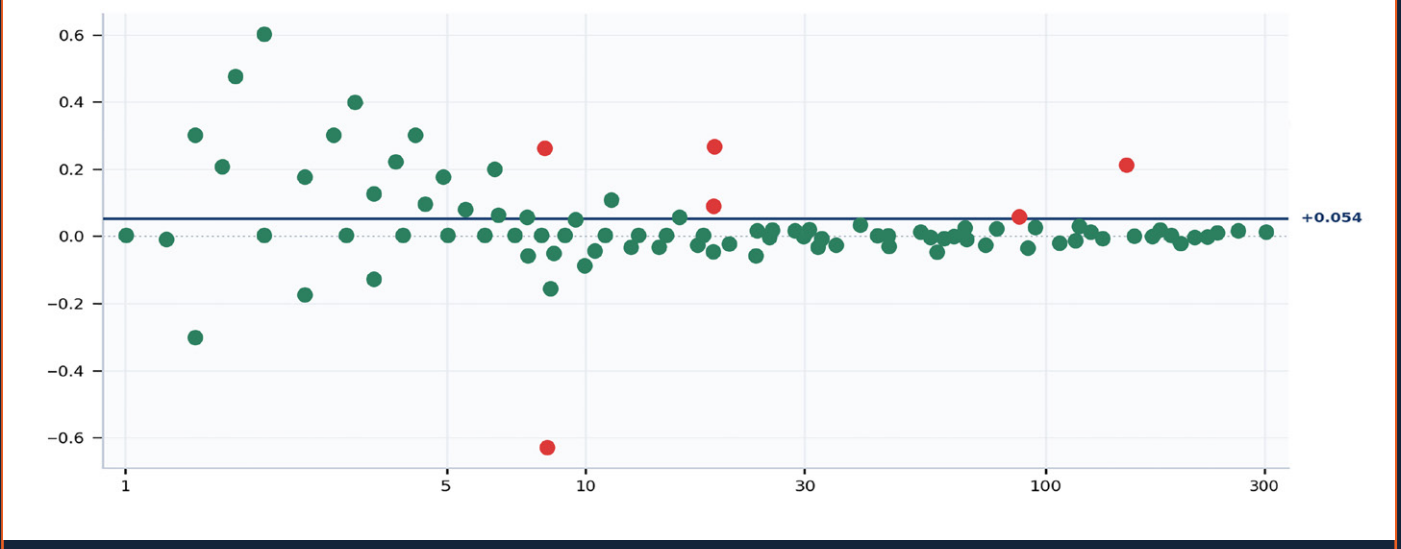
Julius vs reference correlation



- Plate in agreement with the reference
- Plate outside of ISO agreement criteria
- Acceptable agreement interval
- Perfect agreement

193/198 plates are in agreement with the reference ***(n=198 plates, log_{10} scale).***

Julius average bias



Bland-Altman analysis :

The central line (+0.054 in log_{10} or +0.45 CFU) represents the mean bias: Julius counts slightly more than the reference.

- Plates within the limits
- Plate outside the limits

The 95% limits of agreement [−0.229; +0.336] indicate that 95% of the plates fall within this interval (n=198).

JULIUS : YOU CAN COUNT ON HIM

Models to trust

Our tested and approved models are versioned and integrated within the Julius, a fully automated high throughput plate sorter and reader. The analysis and its performances always stay consistent over time. The models are not trained during the routine process to be able to validate a version and keep confidence in the results released.

Productivity at scale

With a throughput up to **700 plates per hour**, integrating Julius in your workflow releases the bottle neck of classical petri dish reading.

Traceability with confidence

All the plates reading results are directly integrated into your system, without any data entry error. Accelerate even more your traceability system with two pictures of each of the plates you analyzed.

Want to meet Julius ?

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