

# Microbiology and Machine Learning: Fungal Enumeration and Classification using ML Algorithms

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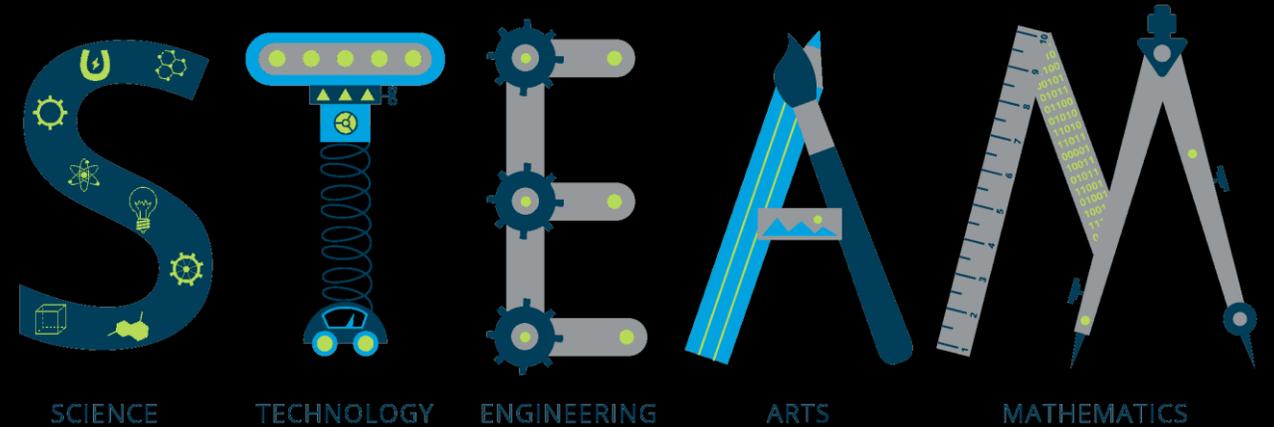
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Arizona State University SenSip Research Experience for Teachers

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# Project Description



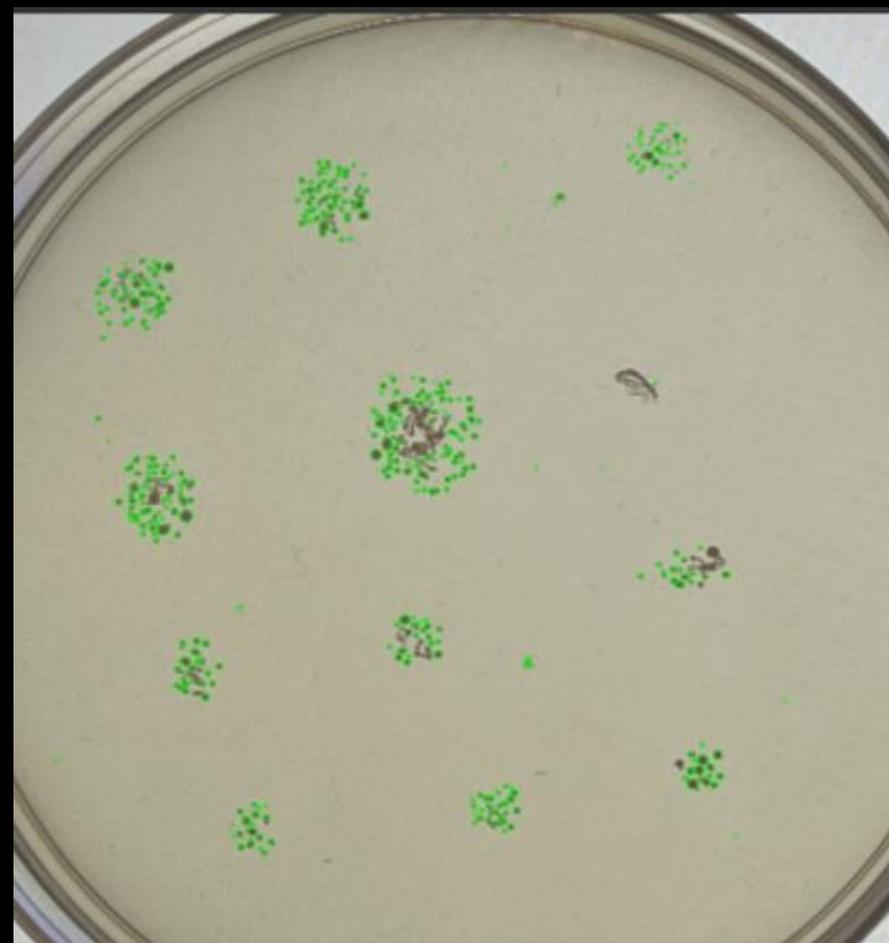
- Design a lesson to connect two or more STEAM disciplines with an introduction to machine learning that can be emulated in the high school classroom
- Use materials that are free/low cost or already available to most teachers within the stem disciplines.

# How many colonies can you see?



Correct Answer

# 462



# Open CFU (colony forming unit)

**Result:** 456 /462  Set as NA

Show objects Line width 0.8

**Files:**  
Image3/3 (IMG\_0642.JPG)  
Add files

**Threshold:**  
Regular | 1 |  Auto

**Radius:**  
1 | Min 9999 | Max  Auto-Max

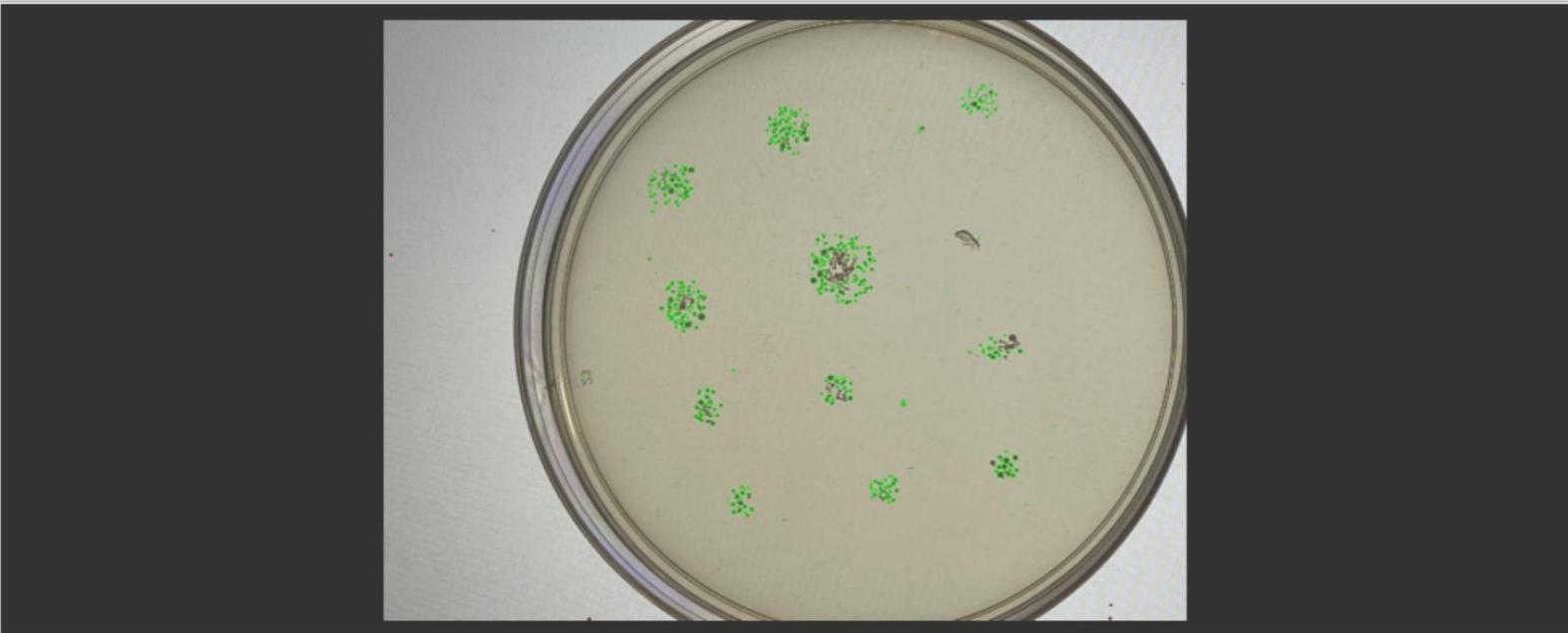
**ROIs and Mask:**  
None  Show Refresh

**Colour filter:**  
 Use colour filter

**Auto outlier filter:**  
 Use outlier filter

**Group similar colours:**  
 Recognise similar colours  
Coarseness: 3.9

About OpenCFU



**Per image**

ID	File name	#Objects	#Excluded	Comment	Full Path
0	IMG_0725.JPEG	250	0	2022-06-30 [10:41:26 PM]: no comment	C:\Users\Steven.Clemens\Desktop
1	IMG_0641.JPG	523	0	2022-06-30 [10:41:42 PM]: no comment	C:\Users\Steven.Clemens\Desktop
2	IMG_0642.JPG	456	6	2022-06-30 [10:43:07 PM]: no comment	C:\Users\Steven.Clemens\Desktop
1	Clust #1	456			

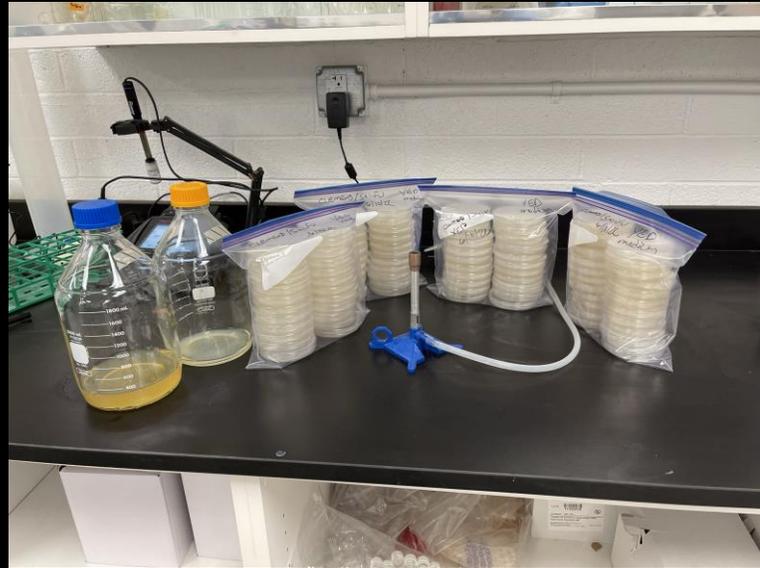
Save all Save selection Delete selection

**Per object**

ID	Valid	X	Y	ROI	Area	Radi
0	<input type="checkbox"/>	1031	3016	1	68	6
1	<input checked="" type="checkbox"/>	1826	2492	1	178	9
2	<input checked="" type="checkbox"/>	1814	2481	1	134	7
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4	<input checked="" type="checkbox"/>	1733	2438	1	25	3
5	<input checked="" type="checkbox"/>	2524	2402	1	89	6

Unselect

# Microbiology

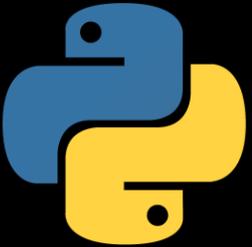


BE  
PRECISE!

# Machine Learning



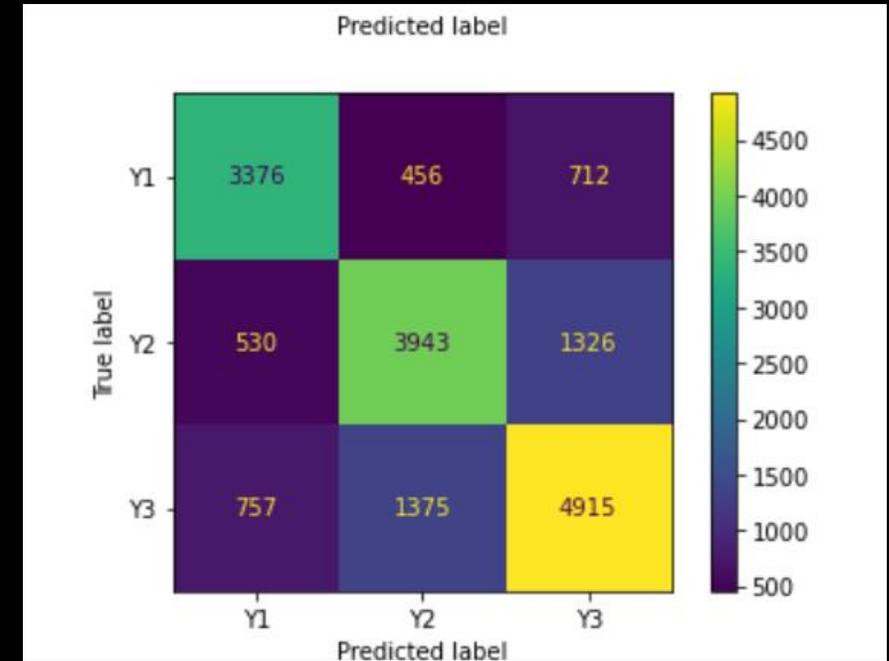
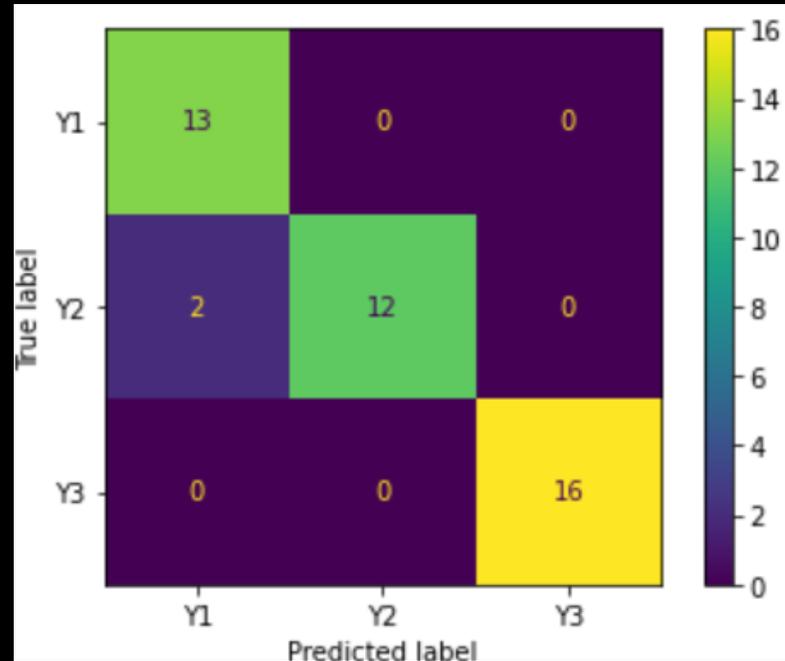
ANACONDA



python™

colab

## Classification – Decision Tree Classifier



# Classroom Implementation

- Teachers have two choices of implementing the lesson, with and without the microbiology portion. Also teachers can choose to use new data or the included data from my samples.
- Lesson can be completed in one class setting or can be divided over several class periods. Multiple classrooms can be involved with the lesson emulating the work of a research center
- Little to no cost to teacher
- Students will gain an understanding of what machine learning is by the hands on ML tools and how ML can help to solve problem.

