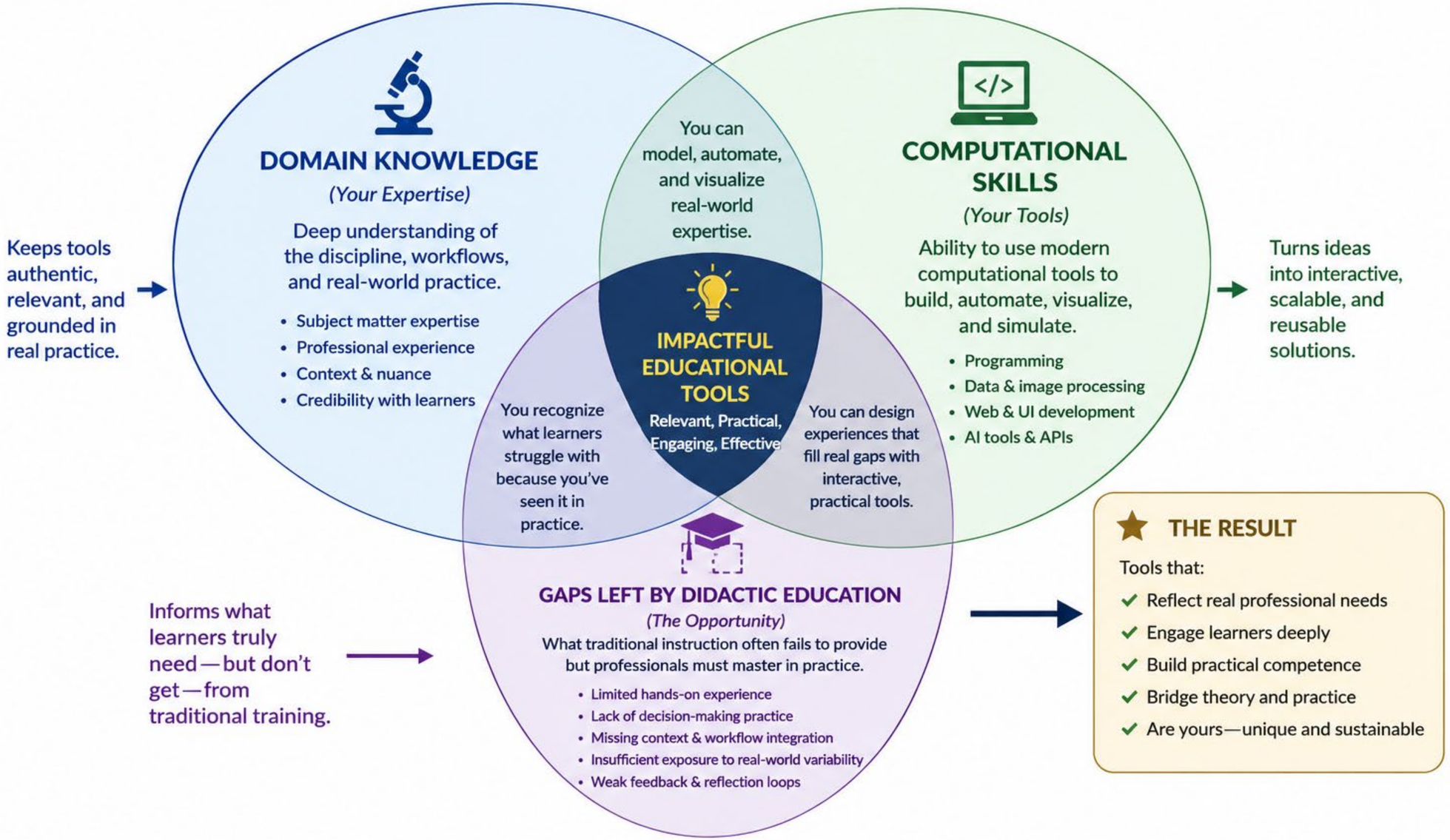
# Teaching the toughest things.

## Where impactful teaching tools are born.

Daniel Haun, MLS(ASCP)H June 17 2026

# Where Impactful Educational Tools Are Born




***Expertise defines the problem. Computational skills build the solution. Gaps define the opportunity.***

**The intersection creates impact.**

# Two Decades and More to Come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# Learning Resources

### Hematology
Hematology simulators.

Open →

### Body Fluids
Body fluid analysis simulator.

Open →

### Urinalysis
Urinalysis simulators.

Open →

### Parasitology
Parasitology resources.

Open →

### Clinical Chemistry
Clinical chemistry simulator.

Open →

### Quality Control
Quality control simulator.

Open →

### Thought Challenger
Interactive case-based learning activities.

Open →

### Bacteriology
Bacteriology simulators and resources.

Open →

### Photo Tools
Tools for image collection.

Open →

# Learning Resources

## Hematology

Hematology simulators.

Licensed

Open →

## Body Fluids

Body fluid analysis simulator.

Licensed

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## Urinalysis

Urinalysis simulators.

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Interactive case-based learning activities.

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Bacteriology simulators and resources.

Licensed

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## Photo Tools

Tools for image collection.

Open →



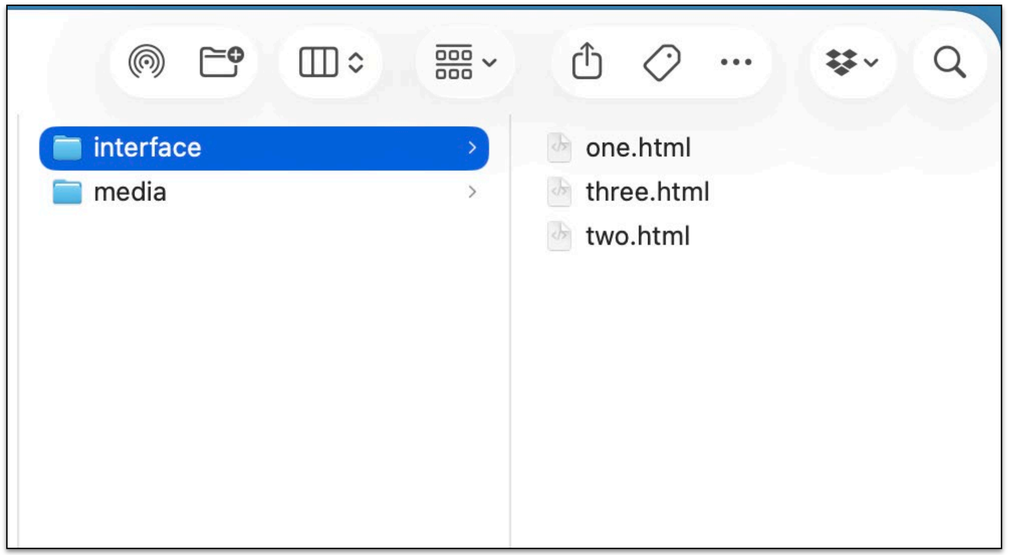
Needs?

1. Interactive Interface

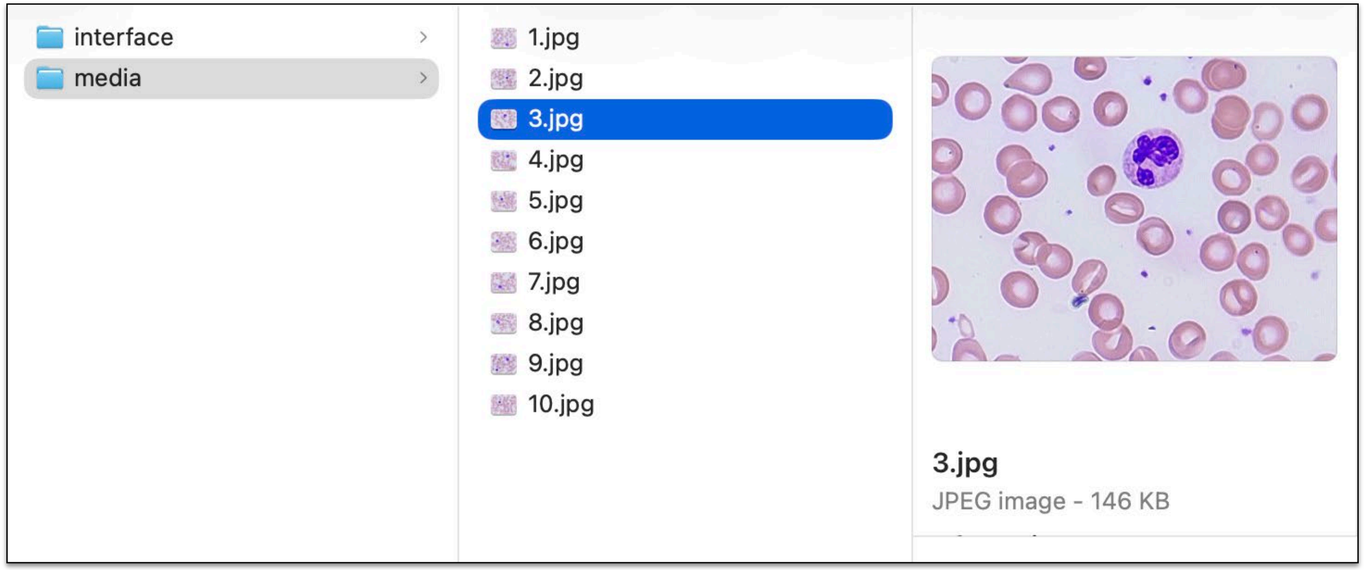
2. Some media

# Needs?

1. Interactive Interface




2. Some media



# Hypertext Markup Language (HTML)

```
<html>

<head>

</head>

<body>

<img id=“viewer” src=“../media/1.jpg”></img>

</body>

</html>
```

# HTML plus Javascript

```
<button onclick="advanceImage()">Next</button>

</body>

<script>

let imageNumber=1;

function advanceImage(){

imageNumber =imageNumber+1;

document.getElementById(“viewer").src="../media/"+imageNumber+".jpg";

}

</script>
```

# Add two more buttons and a results div

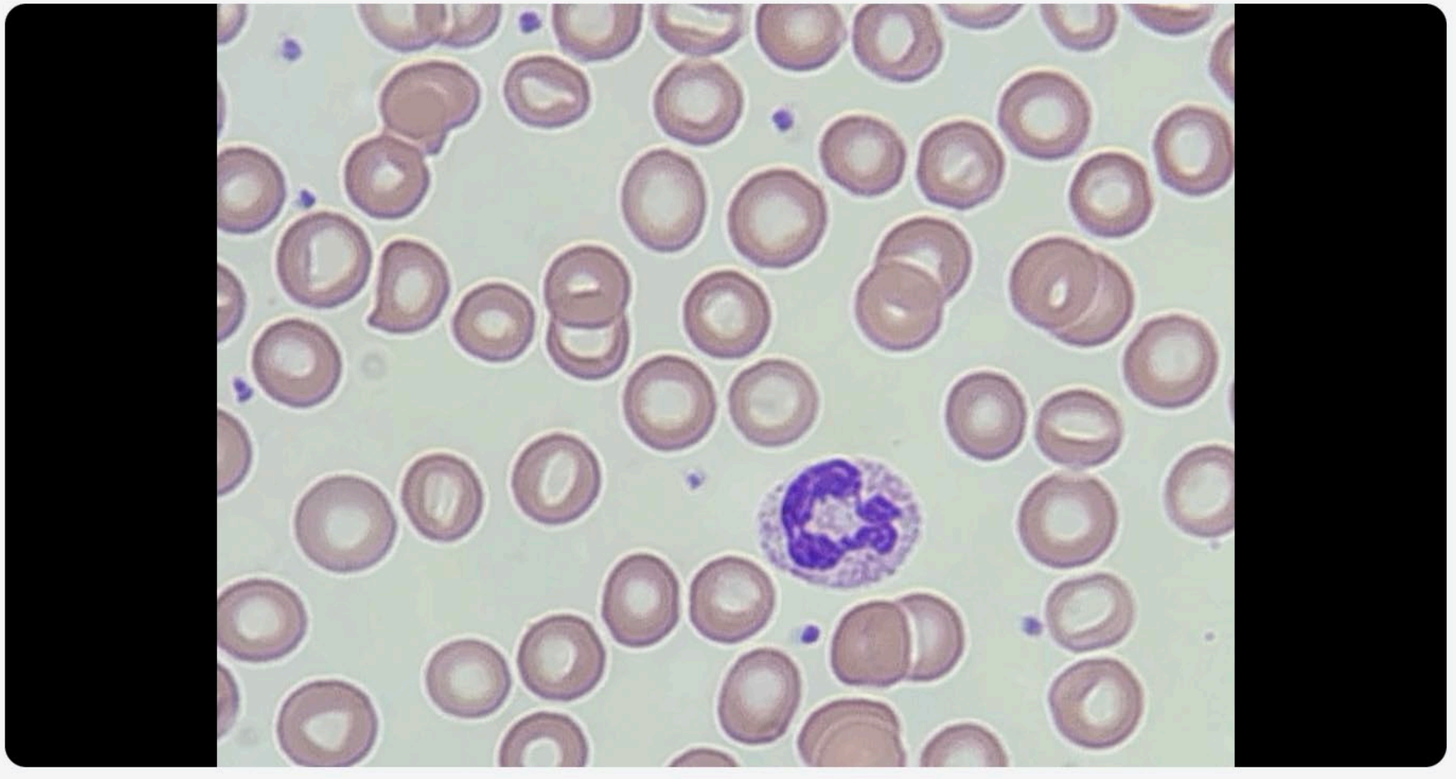
```
<button onclick="advanceImage('seg')">Seg</button>

<button onclick="advanceImage('lymph')">Lymph</button>

<button onclick="advanceImage('mono')">Mono</button>

<br><br>

<div id='results'>Results:</div>

</body>
```

# Modify the Javascript

```
<script>

let imageNumber=1;

function advanceImage(whatIsIt){

document.getElementById("results").innerHTML= document.getElementById("results").innerHTML

imageNumber =imageNumber+1;

document.getElementById(“viewer").src="../media/"+imageNumber+".jpg";

}

</script>
```

## WBC Differential Simulator

Scan ▶ | Undo | Start Over



| | | | | | |
|---|---|---|---|---|---|
| **seg** count 0 | **band** count 10 | **lymph** count 0 | **reactive lymph** count 0 | **mono** count 0 | **eos** count 0 |
| **baso** count 0 | **meta** count 0 | **myelo** count 0 | **pro** count 0 | **blast** count 0 | **unidentified** count 0 |
| **NRBC** count 0 | | | | | |

# Teaching the toughest things.

## Critical thinking

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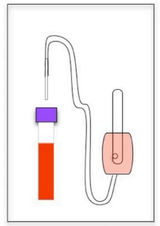
School of Allied Health Professions
Medical Laboratory Science

▶ ℹ Research use & implied consent

### Thought Challenger

You are working on the hematology bench verifying the complete blood count (CBC) shown below. The patient is a 20-year-old male who presented to an affiliated urgent care clinic; the provisional diagnoses are weakness, nausea, and cellulitis. Examine the results and address the statements to proceed with this case.

**Colta-conta Hematology Analyzers**



| | | | | |
|---|---|---|---|---|
| **20 y/o male** | **Instant care Today 9:34** | | Sample#: 496 | |
| **Analyte** | **Result** | **Previous** | Flag | Reference |
| **WBC** | **6.1 $10^3$/uL** | | | M:4.5-11.0 |
| **RBC** | **5.87 $10^6$/uL** | | | M:4.5-5.5 / F:4.0-5.0 |
| **Hemoglobin** | **16.9 gm/dL** | | | M:14.0-17.0 / F:13.0-16.0 |
| **Hematocrit** | **48.8 %** | | | M: 42.0-52.0 / F:36.0-46.0 |
| **MCV** | **86.1 fL** | | | 80-100 |
| **MCH** | **29.8 pg** | | | 28.0-34.0 |
| **MCHC** | **34.7 g/dL** | | | 32.0-36.0 |
| **RDW** | **13.7 %** | | | 12.0-14.6 |
| **Platelet count** | **29 $10^3$/uL** | **Immature Grans** | LL | 150-450 |
| **Automated Diff.** | | | | |
| **Neutrophils** | **85.0 %** | | | |
| **Lymphocytes** | **5.0 %** | | | |
| **Monocytes** | **6.4 %** | | | |
| **Eosinophils** | **1.7 %** | | | |

**Think!** Sort out the facts, data and steps that you know are correct for this scenario. Check ONLY the correct (true) statement(s). If none are correct, check none.

- ☐ This looks very normal except for the platelet count.
- ☐ To check for platelet clumping, examine the specimen grossly and microscopically
- ☐ Platelet counts can be falsely decreased if they are clumped or the specimen is clotted.
- ☐ One can simply verify this specimen but withhold the platelet count and do an estimate.

Submit

alliedhealth.lsuhsc.edu

Medical Labo...ce Resources | Apple | Business | ChatGPT | Weather | Dan Sites | LSUHSC | Ideas | News | iCloud | assholes

localhost:8080/~danielhaun/presentation/html/three.html | CE Instructor Portal | Thought Challenger • Instructor Portal

LSU Health NEW ORLEANS School of Allied Health Professions Medical Laboratory Science

## Challenger • Teacher Problem Browser

▶ ℹ Research use & implied consent (click to view)

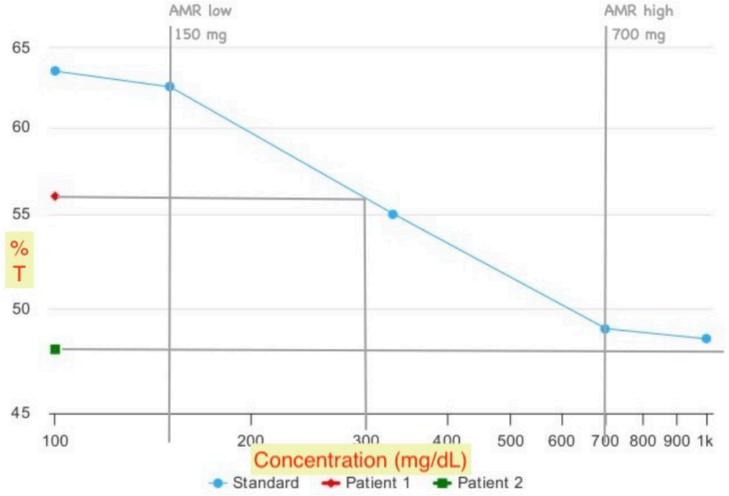
Step 1 • Instructor Code | Step 2 • Browse, Add & Finalize

### Case Preview

**Thought Challenger**

Using the graph below, depicting a colorometric assay, spend a few moments analyzing the image.

Think and address your observations for both patients. Then determine the final reportable result for patient 1.




### Instructor Setup

math and general | Bacteriology | Direct Gram Stains | Blood Bank | Hematology | Vintage Diffs | New Diffs | IntroLikert

Topic graph | Difficulty All | Context All

Search id/file/tag... | Clear

More filters ▸

Matches: **2**

Showing Question # 10241 | Add This One | Add all of these

Clear List

Found 2 | Previous | Next

Selected questions

Build the URL

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Medical Labo...ce Resources | Apple | Business | ChatGPT | Weather | Dan Sites | LSUHSC | Ideas | News | iCloud | assholes

localhost:8080/~danielhaun/presentation/html/three.html | CE Instructor Portal | Thought Challenger • Instructor Portal

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School of Allied Health Professions
Medical Laboratory Science

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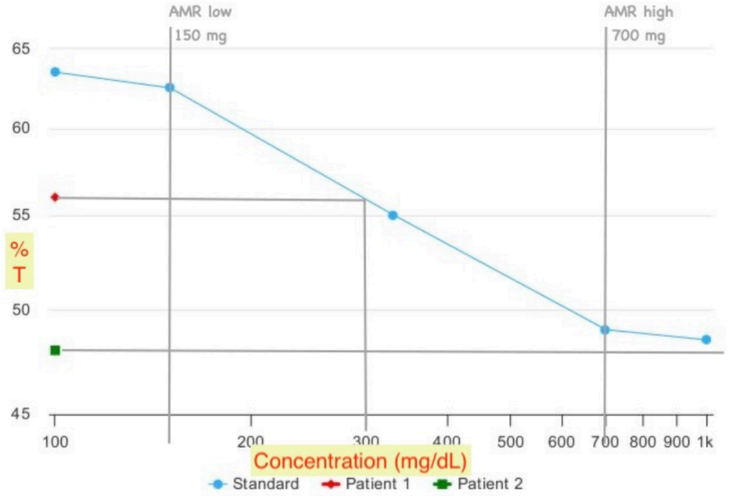



### Instructor Setup

math and general | Bacteriology | Direct Gram Stains | Blood Bank | Hematology | Vintage Diffs | New Diffs | IntroLikert

Topic: graph | Difficulty: All | Context: All

Search id/file/tag... | Clear

More filters ▸

Matches: **2**

Showing Question # 10241 | Add This One | Add all of these

Clear List

Found 2 | Previous | Next

Selected questions

## Assignment link created

**Assignment URL**

Right click and copy assignment

**Student PIN**

**4093**

Give students the assignment URL and the PIN.

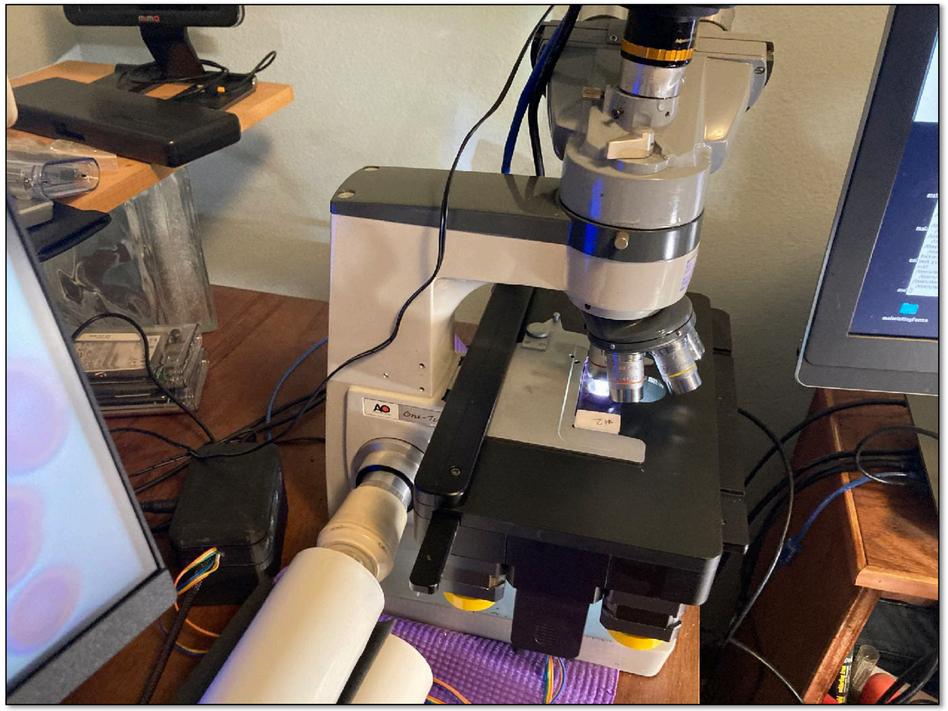
Needs?

1. Interactive Interface ✅

2. Some media

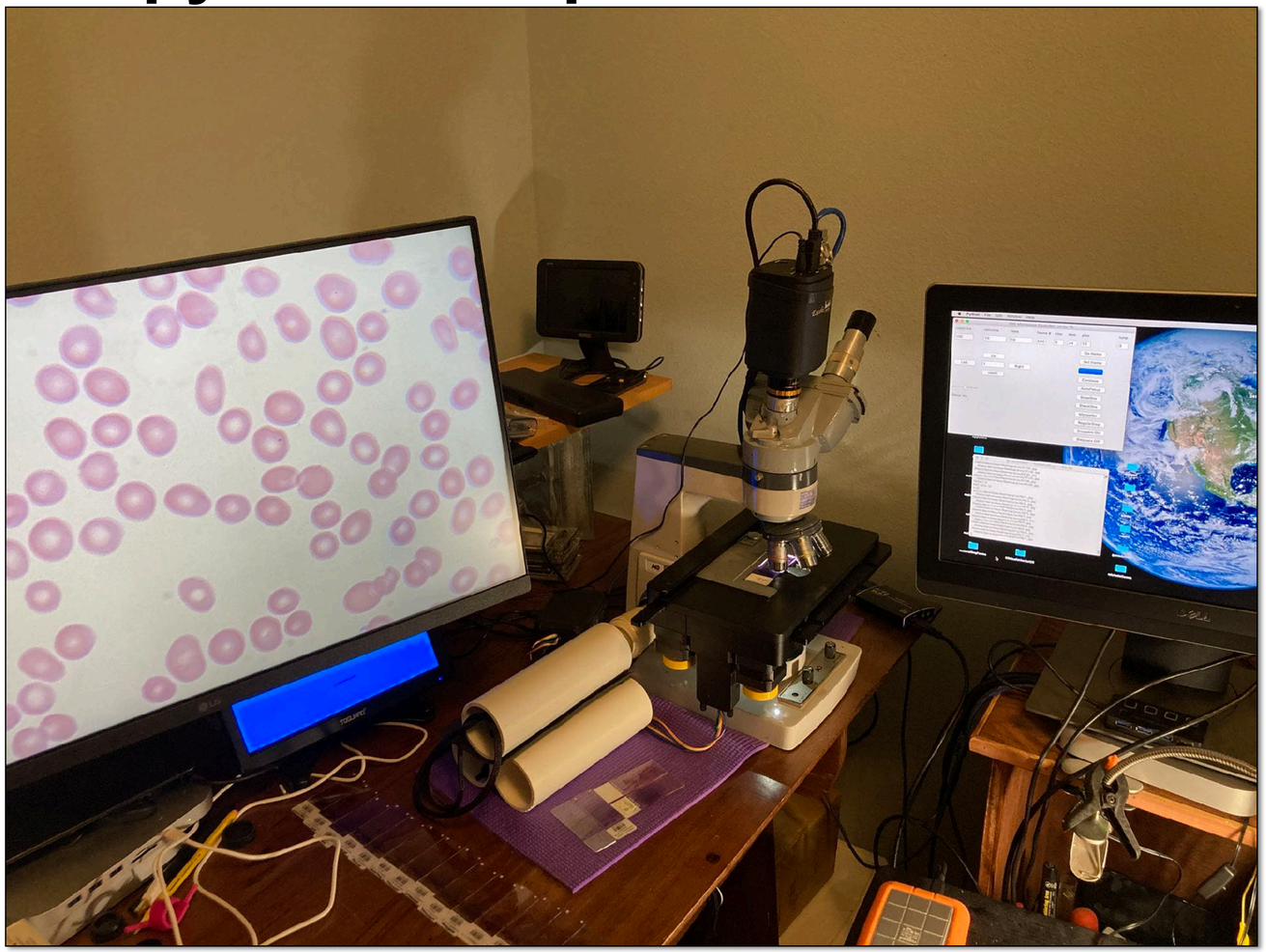
# Teaching the toughest things.

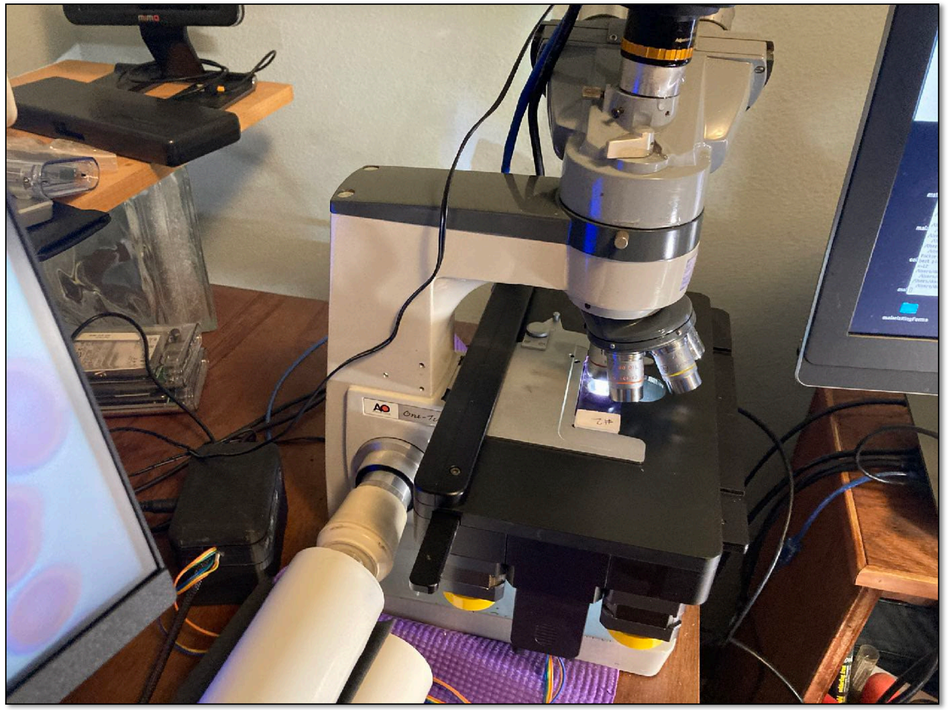
## Media Production



# Teaching the toughest things.

## Jalopy microscope *(Kevin Oufnac, Chief Counsel LSUHSC)*









1 WATCHED TODAY


1

# American Optical Spencer 1036 Binocular Microscope w/ 1051 Illuminator Kodak Cam

**Mother Lode Atlanta** (2189)
99.6% positive · Seller's other items · Message

**US $150.00** or Best Offer

as low as $26.03/mo with Klarna. Learn more

Condition: **Used**

Buy It Now

Add to cart

Make offer

♡ Add to Watchlist


12 WATCHED TODAY

14

# Apple Mac Mini Late 2012 - i5 2.5 GHz - 1 TB SSD - 16 GB Memory + AC Power Cord

**videotape_to_mp4** (379)
100% positive · Seller's other items · Message

## US $34.00

6 bids · Ends in 1d 13h · Saturday, 09:03 PM

Condition: **Used**
*"Used: Works Great - Good Condition - See Photos for Exact Condition"*

Place bid

Add to Watchlist

**People want this.** 14 people are watching this.

Autopano Pro 64bits 4.4.2

kolor autopano pro

Detect

Group 5 - 1 panorama found

100 images

No exif information

5.jpg 50.jpg 51.jpg 52.jpg 53.jpg

54.jpg 55.jpg 56.jpg 57.jpg 58.jpg

Edit

[Group 5]-1_99-100 images.pano *

100 images

12638 x 7699

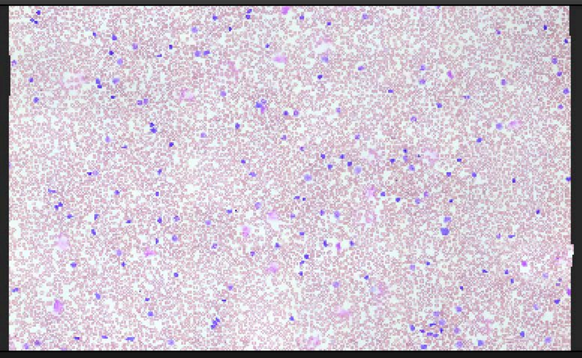
FOV 9.21 x 5.60

RMS 2.36

Standard

Planar

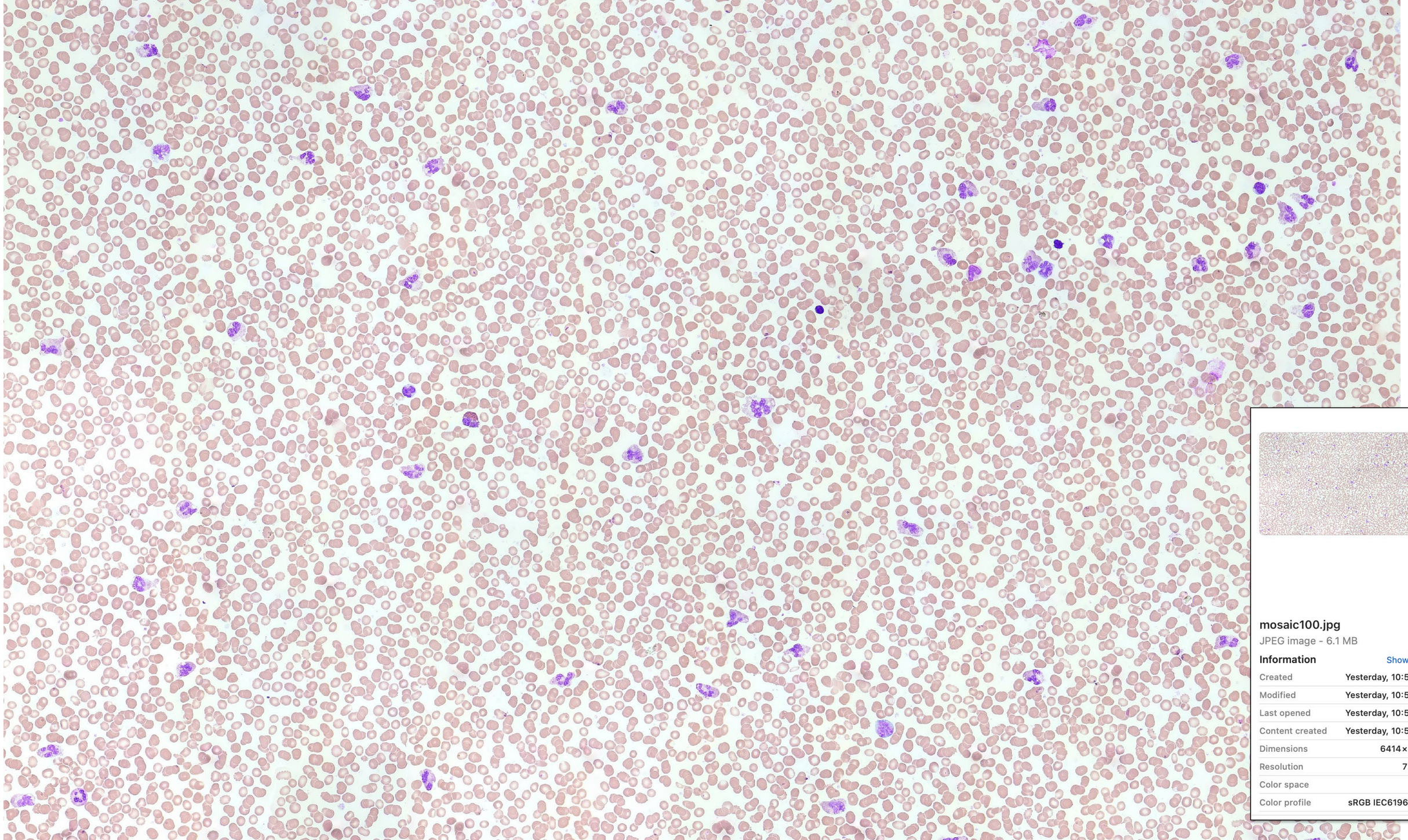
LDR

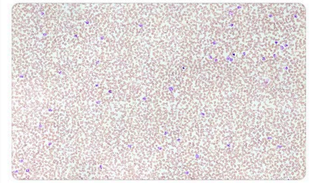


All groups

All panos

Start/Stop detection



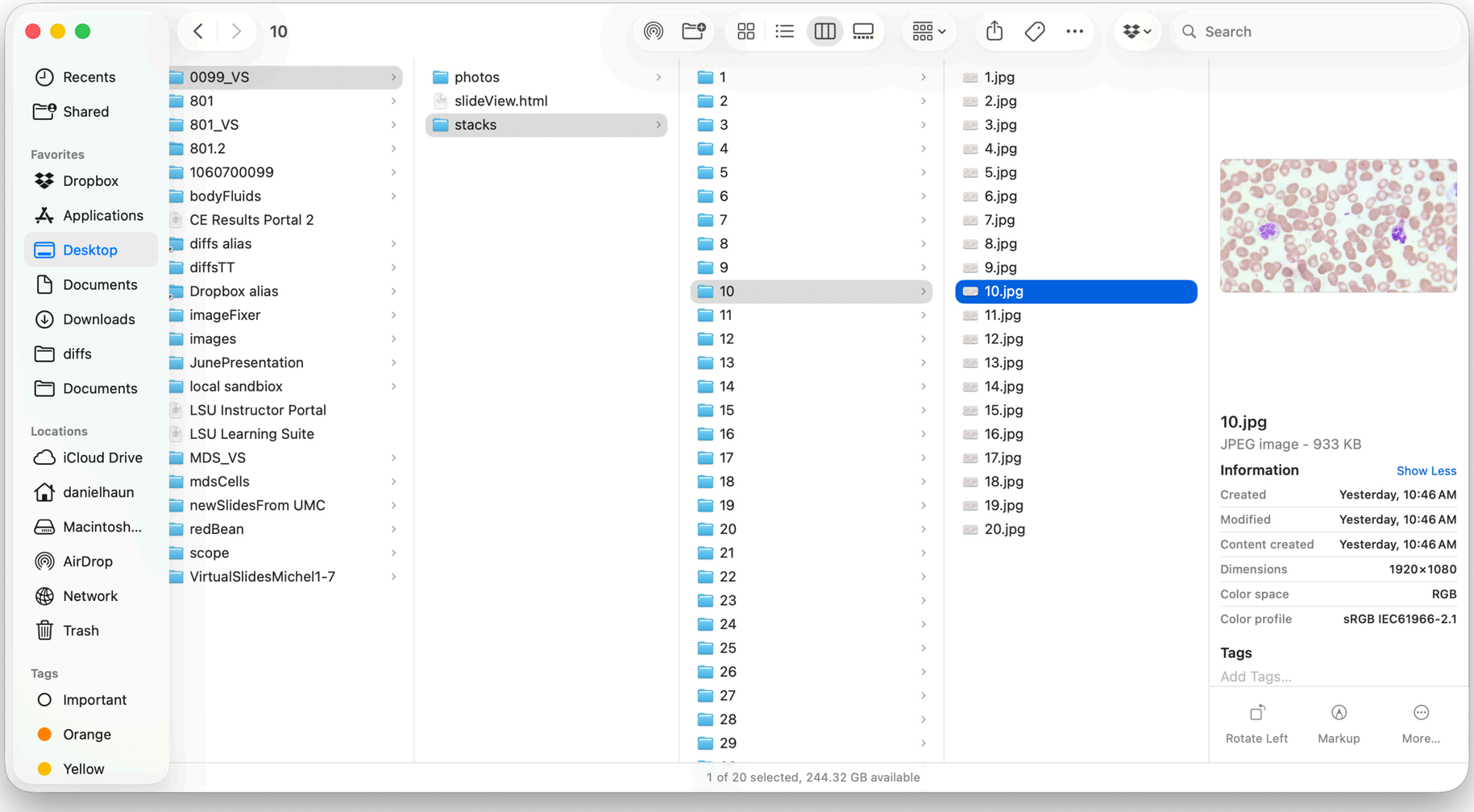


mosaic100.jpg

JPEG image - 6.1 MB

**Information** Show Less

| | |
|---|---|
| Created | Yesterday, 10:58 AM |
| Modified | Yesterday, 10:59 AM |
| Last opened | Yesterday, 10:59 AM |
| Content created | Yesterday, 10:58 AM |
| Dimensions | 6414×3857 |
| Resolution | 72×72 |
| Color space | RGB |
| Color profile | sRGB IEC61966-2.1 |


10
Search
Recents
Shared
Favorites
Dropbox
Applications
Desktop
Documents
Downloads
diffs
Documents
Locations
iCloud Drive
danielhaun
Macintosh...
AirDrop
Network
Trash
Tags
Important
Orange
Yellow
0099_VS
801
801_VS
801.2
1060700099
bodyFluids
CE Results Portal 2
diffs alias
diffsTT
Dropbox alias
imageFixer
images
JunePresentation
local sandbiox
LSU Instructor Portal
LSU Learning Suite
MDS_VS
mdsCells
newSlidesFrom UMC
redBean
scope
VirtualSlidesMichel1-7
photos
slideView.html
stacks
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10.jpg
JPEG image - 933 KB
Information
Show Less
Created
Yesterday, 10:46 AM
Modified
Yesterday, 10:46 AM
Content created
Yesterday, 10:46 AM
Dimensions
1920×1080
Color space
RGB
Color profile
sRGB IEC61966-2.1
Tags
Add Tags...
Rotate Left
Markup
More...
1 of 20 selected, 244.32 GB available

# Teaching the toughest things.

## Media Production

### What is Python?

Python is a high-level, interpreted, general-purpose programming language known for its simple, readable syntax that resembles the English language

It can leverage a large number of functions organized in libraries.

# What is Python?

| HTML | JS | PHP | Python |
| --- | --- | --- | --- |
| Client<br>Web Browser | Client<br>Web browser | Web<br>(Server side) | Desktop |
| Web page | Interactivity | Validate users<br>Receive data<br>Send emails | Media<br>production |

Microscope Flat Field Corrector v1

# Microscope Flat Field Corrector v1

Input / Output

Raw input folder: /Users/danielhaun/Desktop/4.7/pics Choose...

Blank / flat image: /Users/danielhaun/Desktop/blank24.jpg Choose...

Corrected output folder: /Users/danielhaun/Desktop/4.7/pics_flat_corrected Choose...

Correction Settings

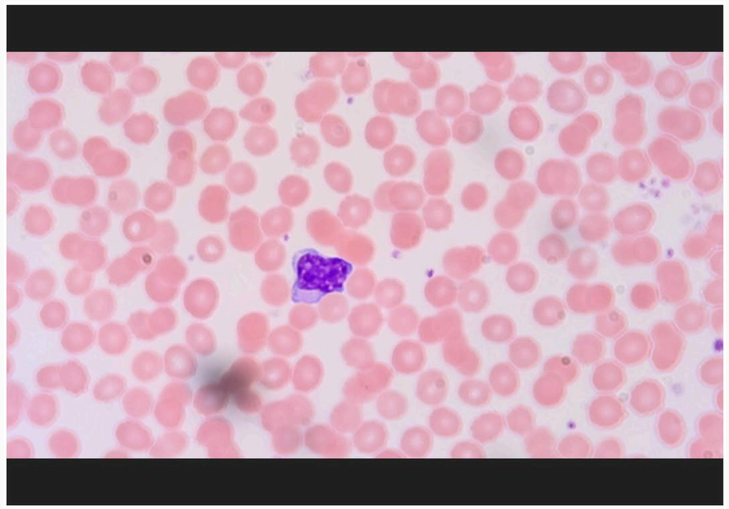
☑ Process nested folders ☑ Skip blank image if it is inside input folder ☑ Preserve average brightness

Blank blur radius: 31 Correction strength 0-1: 1.0 JPEG quality: 95

Start: blur 31, strength 1.0, preserve brightness checked.

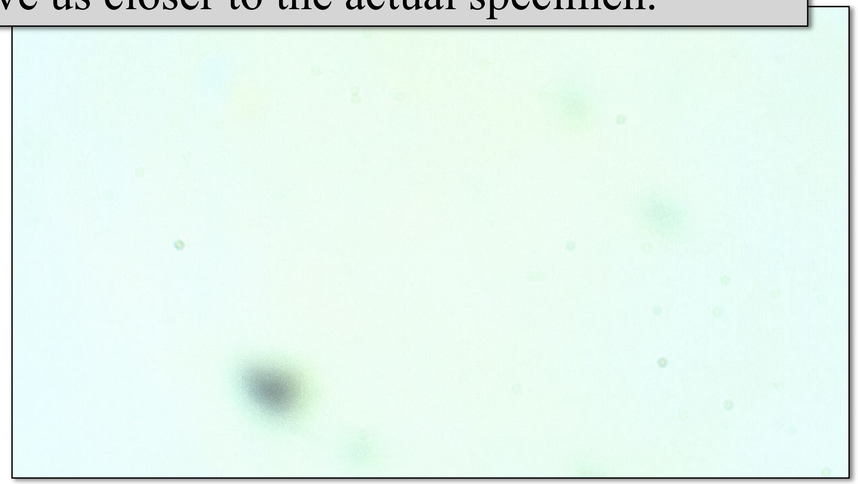
Preview One Image | Run Correction | Done: 4020 images corrected

Original Preview



Corrected Preview

“The flat field acts like a fingerprint of the microscope’s imperfections.
Once Python has that fingerprint, it can subtract the microscope flaw from the image
and leave us closer to the actual specimen.”



3 minutes, 10 seconds to do 4020 images.

Pick Best Stack Image

# Pick Best Image From Focus Stacks

Folders

Source stack folder: /Users/danielhaun/Desktop/4.7/pics_flat_corrected Choose...

Destination folder: /Users/danielhaun/Desktop/4.7/bestLow Choose...

Focus selection settings

Candidate set: top 5 Choose position in sorted candidates: lowest

Start considering image #: 3 Images per stack: 20

Center crop fraction: 0.85 Use light blur to reduce JPEG noise

Suggested WBC start: top 5, middle or second_highest, start image 3, crop 0.85, blur on.

Optional focus merge

Also save focus-merged image from top candidates

Merge neighborhood: 9 Final light cleanup blend

Recommended first test: merge ON, neighborhood 9, cleanup ON. Output name will be scene_merged.jpg.

Run Done

Log

```
194: chose 11.jpg score=27.218 [lowest of top 5; candidates [11, 12, 13, 14, 15]] (raw max 11.jpg=27.218) | merged=saved
195: chose 10.jpg score=27.957 [lowest of top 5; candidates [10, 11, 12, 13, 14]] (raw max 10.jpg=27.957) | merged=saved
196: chose 11.jpg score=28.196 [lowest of top 5; candidates [11, 12, 13, 14, 15]] (raw max 11.jpg=28.196) | merged=saved
197: chose 11.jpg score=25.192 [lowest of top 5; candidates [11, 12, 13, 14, 15]] (raw max 12.jpg=27.724) | merged=saved
198: chose 9.jpg score=25.055 [lowest of top 5; candidates [9, 10, 11, 12, 13]] (raw max 10.jpg=27.882) | merged=saved
199: chose 9.jpg score=26.305 [lowest of top 5; candidates [9, 10, 11, 12, 13]] (raw max 10.jpg=27.230) | merged=saved
200: chose 9.jpg score=24.978 [lowest of top 5; candidates [9, 10, 11, 12, 13]] (raw max 10.jpg=27.481) | merged=saved
5001: chose 10.jpg score=26.266 [lowest of top 5; candidates [10, 11, 12, 13, 14]] (raw max 11.jpg=27.582) | merged=saved

Done. Copied 201 best single images.
Single images saved in: best_single/
Also saved focus-merged images in: merged_focus/
Results CSV: /Users/danielhaun/Desktop/4.7/bestLow/laplacian_focus_results.csv
```

## Laplacian

$$\Delta f = \sum_{i=1}^{n} \frac{\partial^2 f}{\partial x_i^2}$$

```
lap = cv2.Laplacian(img, cv2.CV_64F)
```

64 seconds to sort 4020 images.

# Javascript Web Viewers

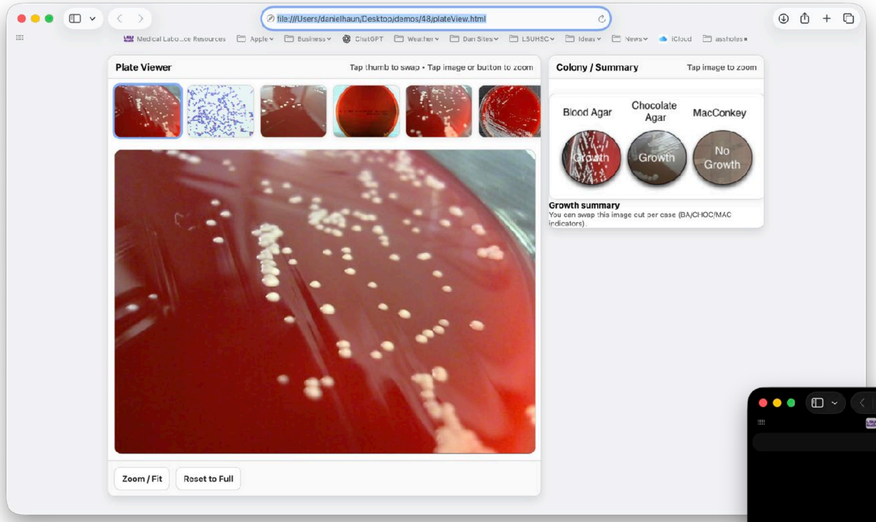
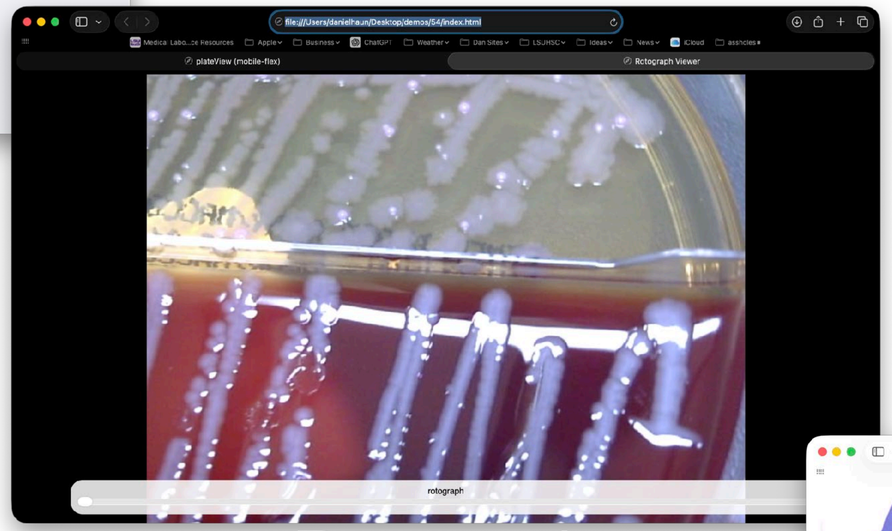
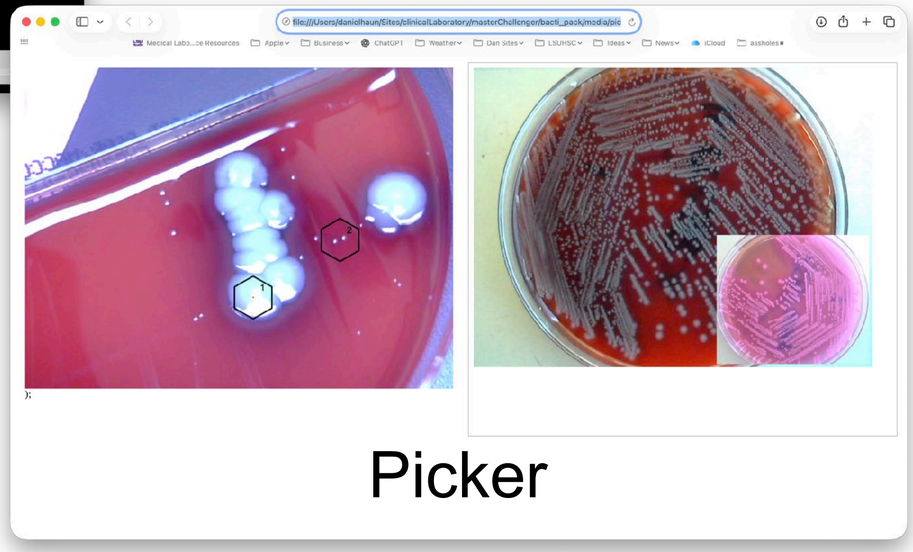



Plate Viewer



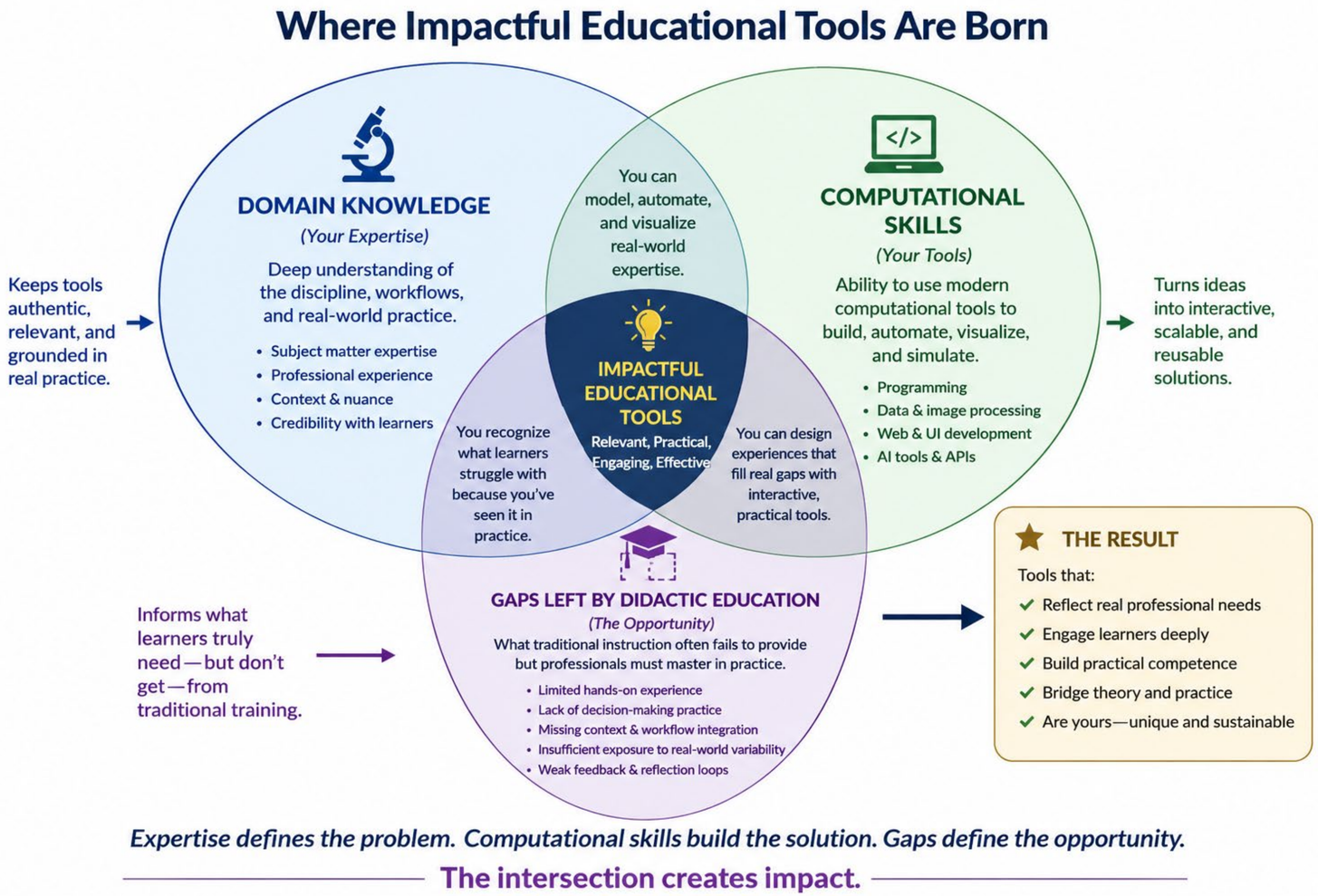

Rotograph




Picker

# Teaching the toughest things.

## How do you relate?



## “Voice Pattern Explorer”

A teaching tool where students upload or record a short voice sample, then the app visualizes measurable speech features.

Python could analyze:

- **Pitch / fundamental frequency** using `librosa` or `parselmouth`
- **Intensity / loudness patterns**
- **Pauses and speech rate**
- **Spectrograms**
- **Formants** for vowel production
- **Jitter and shimmer** for voice quality
- **Articulation timing**
- Possibly compare pre/post therapy samples

The educational angle:

Students learn to connect what they hear clinically with objective acoustic patterns.

Example case:

A patient with suspected voice disorder records:

“We were away a year ago.”

The app displays:

- waveform
- spectrogram
- pitch contour
- intensity contour
- estimated speaking rate
- abnormal pause pattern
- short interpretive prompts

Then students answer:

Which observation best supports vocal instability?
Which feature is most consistent with reduced respiratory support?
What clinical context would you want next?

Useful Python libraries:

librosa audio analysis
parselmouth Praat-style voice measures
pyAudioAnalysis
speech_recognition
whisper / faster-whisper for transcription
matplotlib graphs
streamlit quick GUI/web app

## “Ventilator Waveform Reasoning Lab”

A Python-backed teaching tool could simulate or analyze:

- pressure-time waveforms
- flow-time waveforms
- volume-time waveforms
- pressure-volume loops
- flow-volume loops
- auto-PEEP / air trapping
- patient–ventilator dyssynchrony
- bronchospasm patterns
- leaks
- poor triggering
- over-assistance / under-assistance

Python libraries could generate the waveforms mathematically, then JavaScript could present them int

# PT Simulator: Gait Analysis and Clinical Reasoning

## Title

**Why Is This Patient Limping?**

## Learning Objective

Students analyze a patient's gait pattern and determine the most likely underlying impairment and appropriate intervention.

## Clinical Scenario

**Patient:** Michael R.

**Age:** 67

**Referral:** Outpatient Physical Therapy

**Chief Complaint:**

"I've been walking funny since my hip surgery and I'm afraid I'm going to fall."

**History:**

- Right total hip replacement 8 weeks ago
- Cleared for weight bearing as tolerated
- Uses a cane occasionally
- Reports fatigue with walking
- No significant pain

### Student Resources

**Video 1**

Patient walking toward the camera

**Video 2**

Patient walking away from the camera

**Video 3**

Side view gait

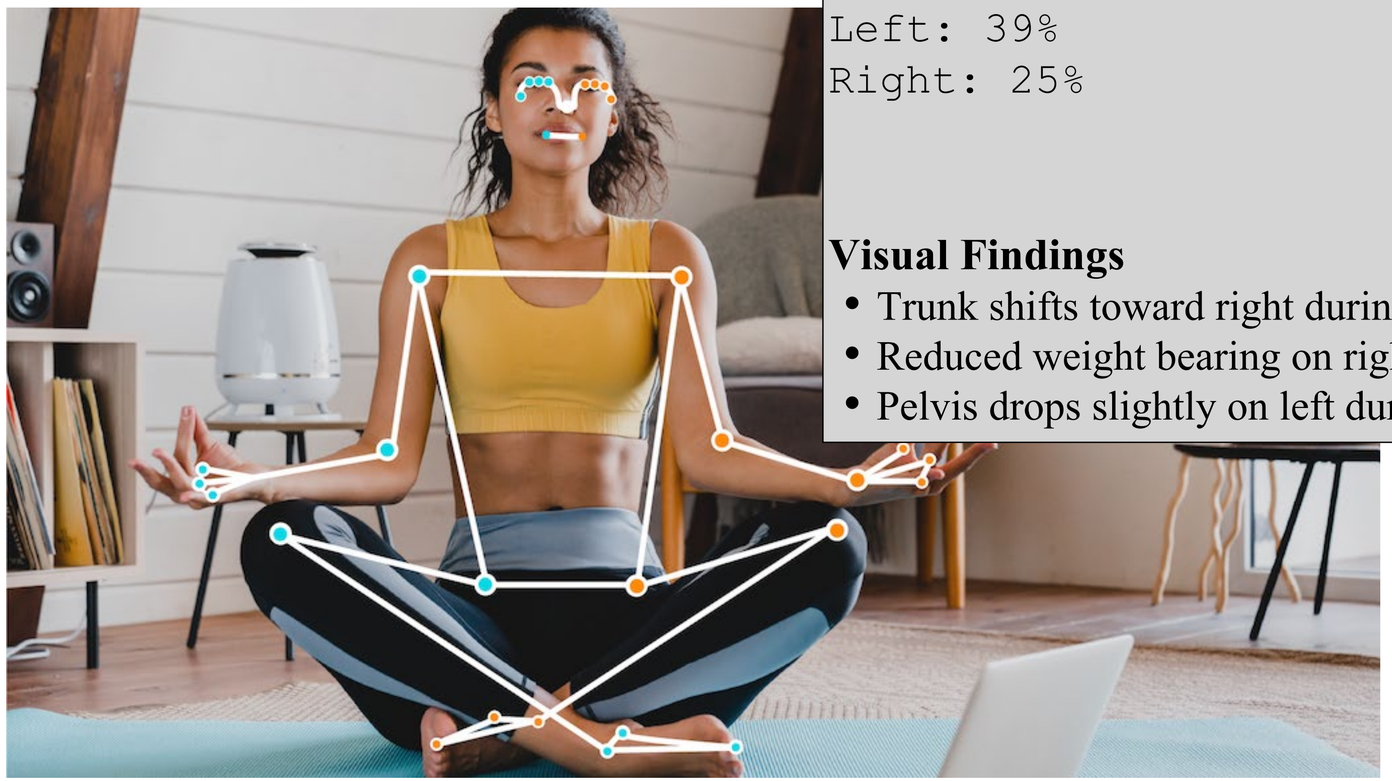
# Python Analysis Layer

Using:

- OpenCV
- MediaPipe Pose

The simulator extracts:

- Walking speed
- Step length
- Stride symmetry
- Pelvic tilt
- Trunk lean
- Time spent on each limb



**Student Observations**

Students review:

**Gait Metrics**

```
Walking Speed: 0.72 m/s

Left Step Length: 0.61 m
Right Step Length: 0.45 m

Single Limb Support:
Left: 39%
Right: 25%
```

**Visual Findings**

- Trunk shifts toward right during stance
- Reduced weight bearing on right side
- Pelvis drops slightly on left during gait cycle

*“The best time to plant a tree is 20 years ago. The second best time is today.”*

**Chinese proverb**