

# PETALS: Improving Learning of Expert Skill in Humanitarian Demining

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and Applied Sciences



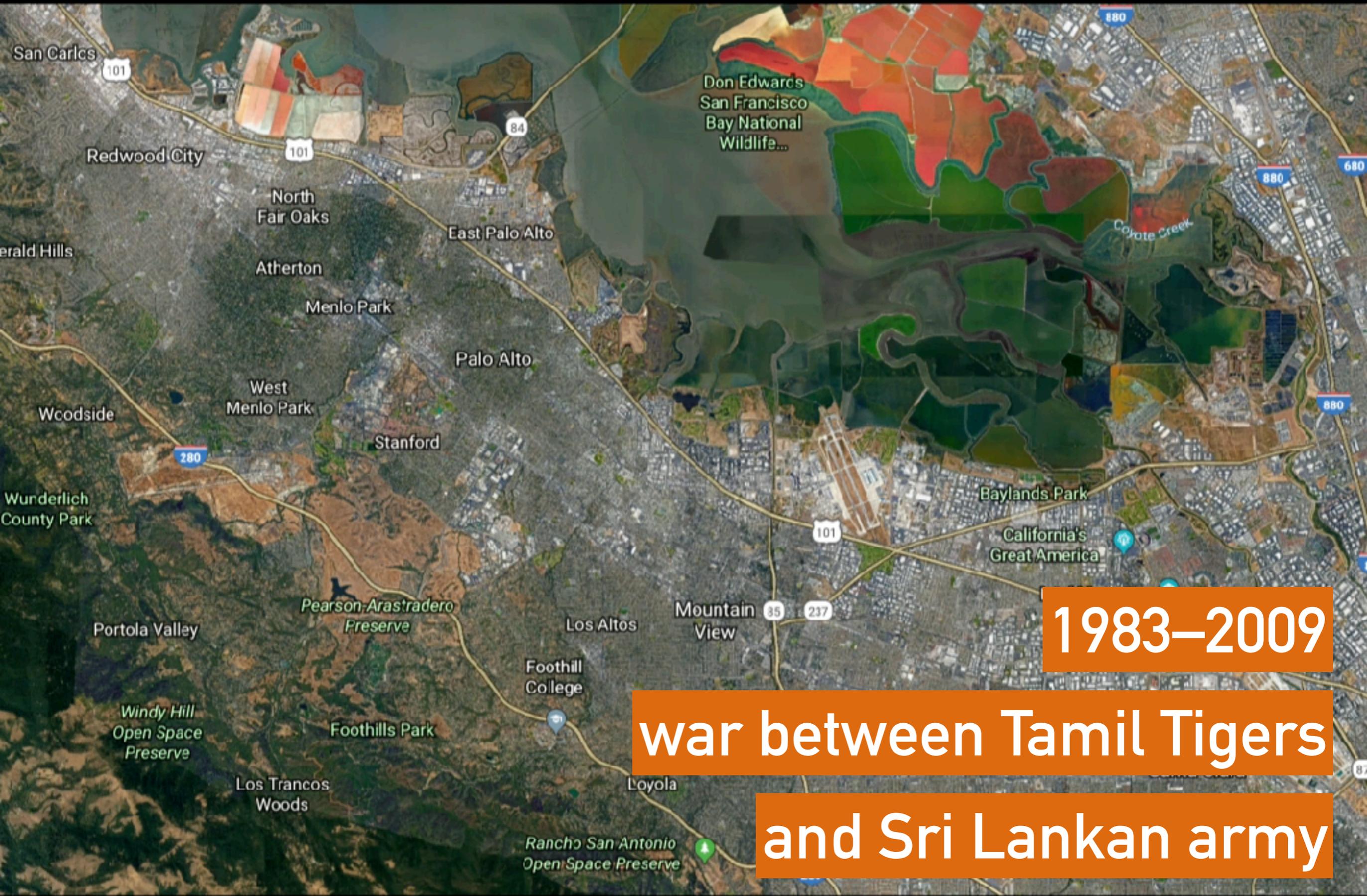
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Lahiru

Jayatilaka

Photo: Justin Ide/Harvard Staff Photographer



Don Edwards  
San Francisco  
Bay National  
Wildlife...

1983-2009

war between Tamil Tigers

and Sri Lankan army



1983–2009

war between Tamil Tigers

and Sri Lankan army





**6,461 casualties in 2015**

**in 61 countries**

**78% were civilians**

**38% were children**

Source: Landmine Monitor 2016



**DANGER MINES!**

**பாதிக்கப்பட்டிருக்கிற அபாயம்!**

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Photo: HALO Trust Archives

## **Lahiru's Mission:**

**Use the power of Computer  
Science to improve the safety  
and efficiency of humanitarian  
landmine clearance**

# Landmine Clearance Basics

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- For every landmine, 100 pieces of metallic debris are found



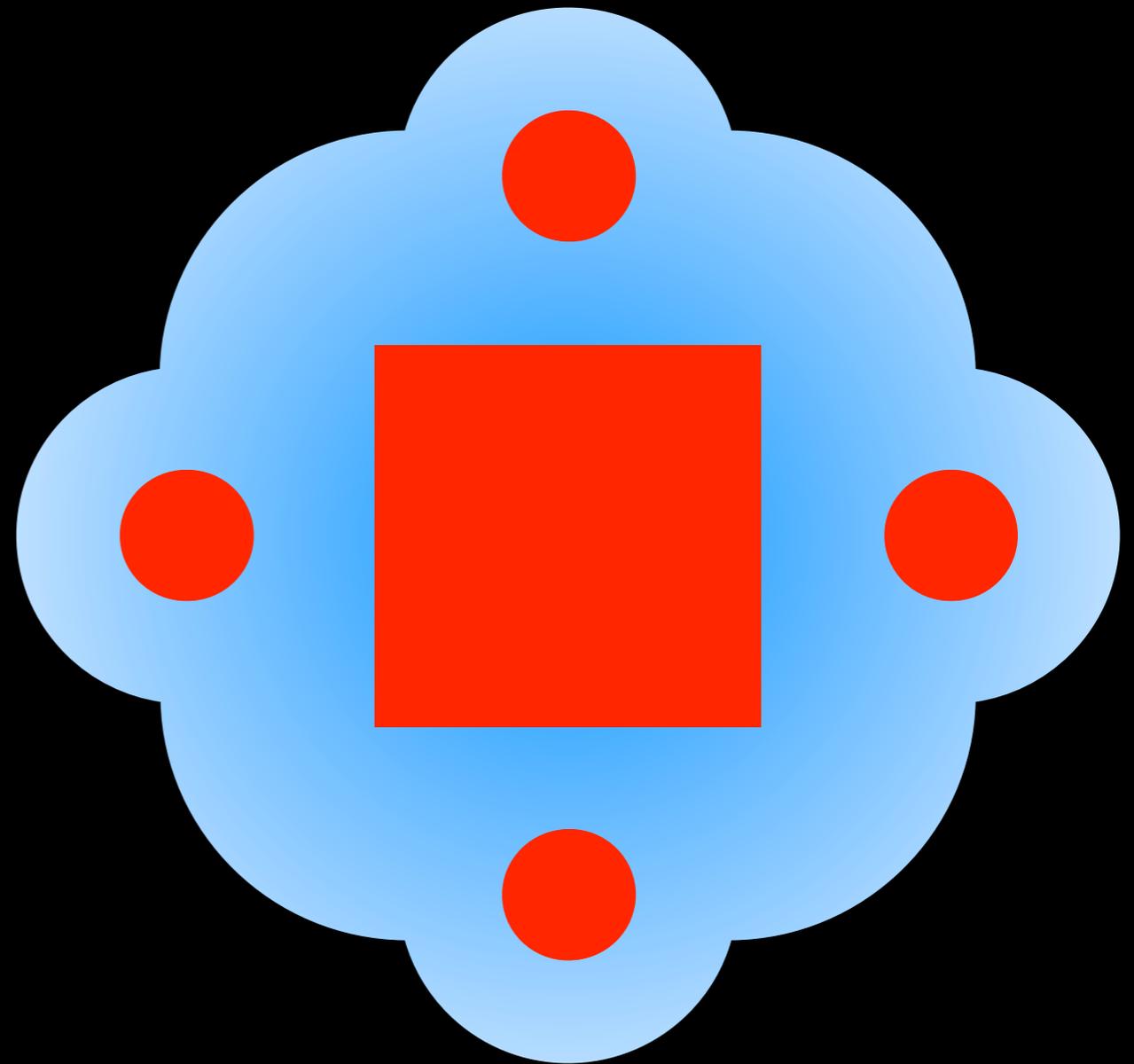
# Landmine Clearance Basics

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- For every landmine, 100 pieces of metallic debris are found
- When mines are placed in a cluster configuration, it is hard to tell how many mines there are and where they are located



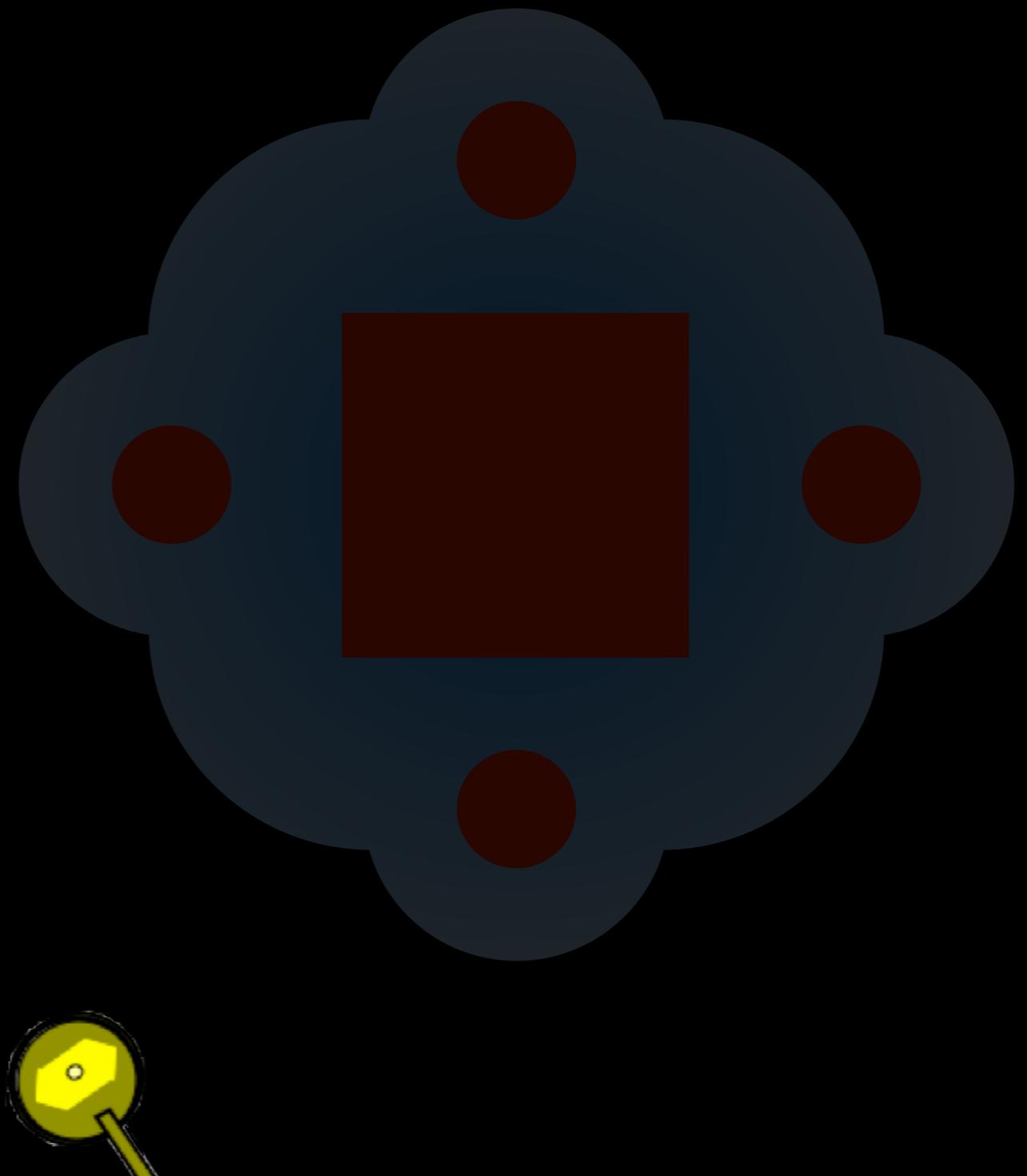
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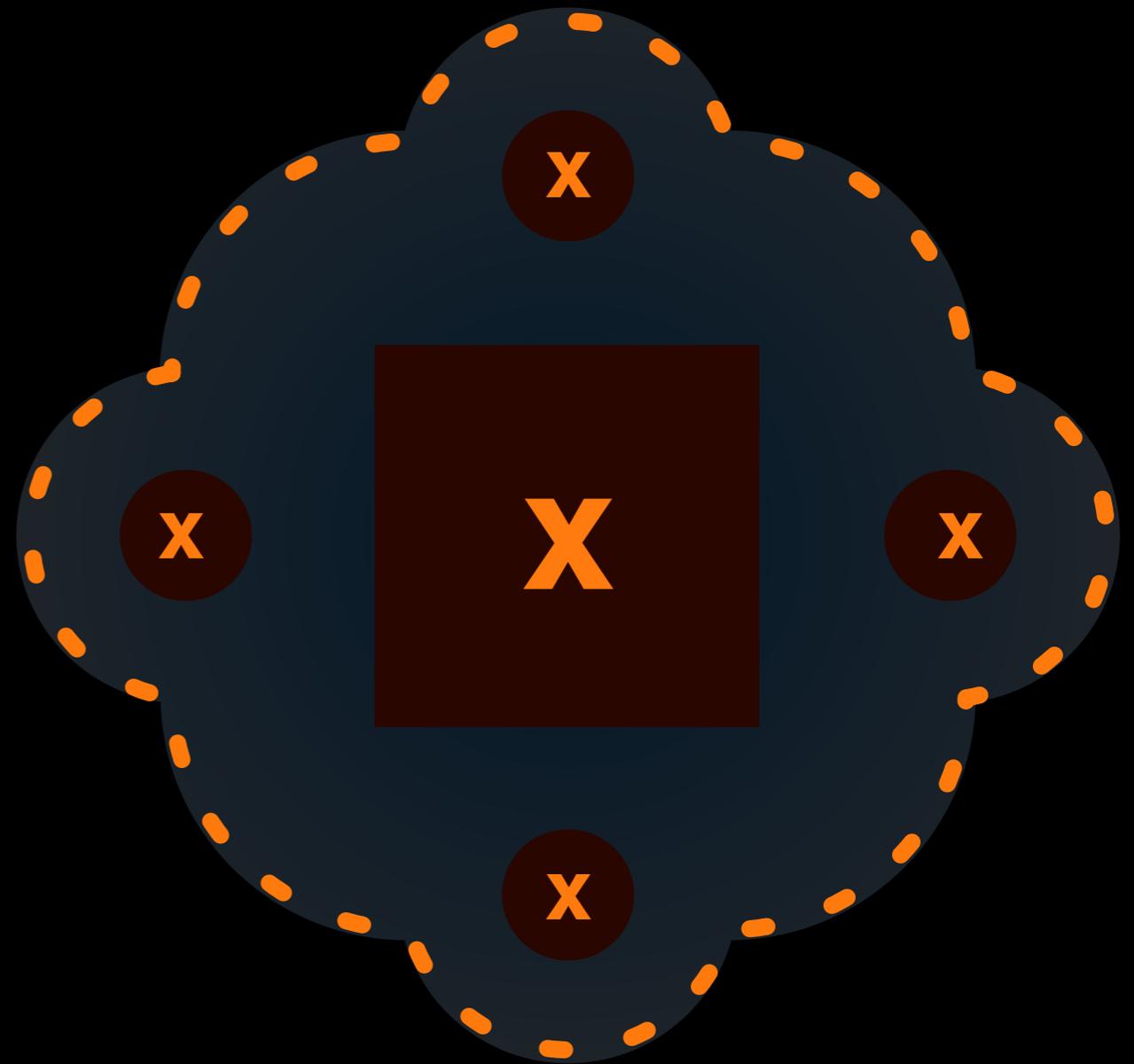
# Expert Approach: Metallic Signature Method

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- Experts have a way of dealing with clutter and cluster configurations, but their method is hard to teach

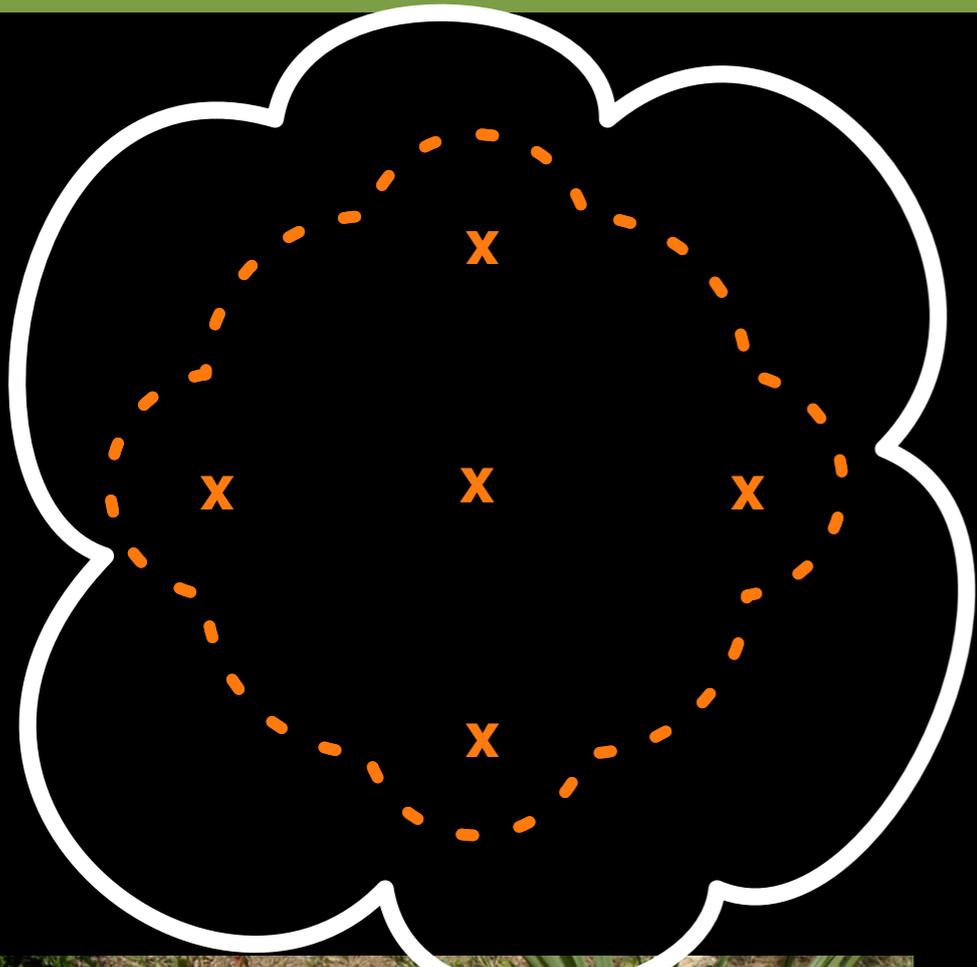


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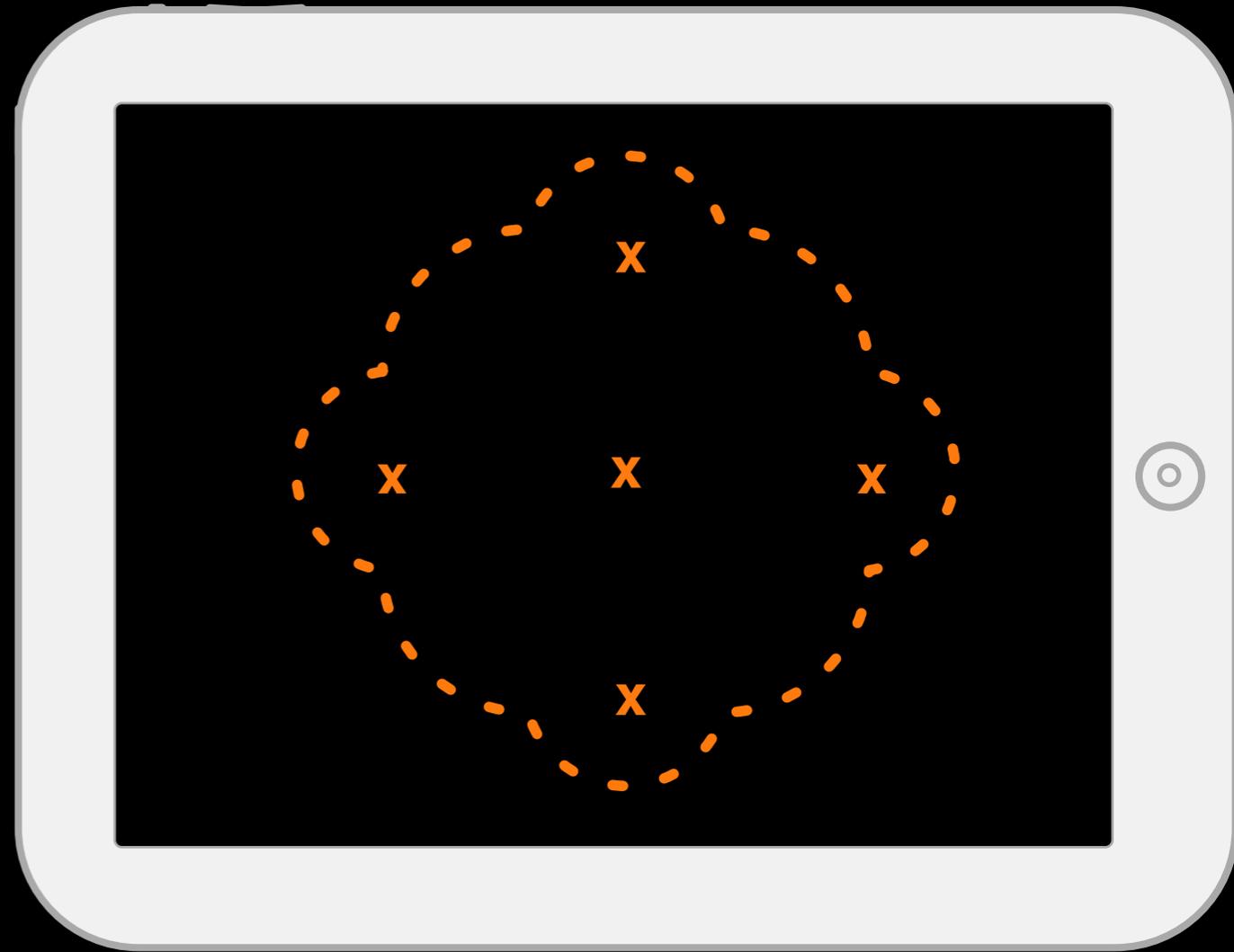
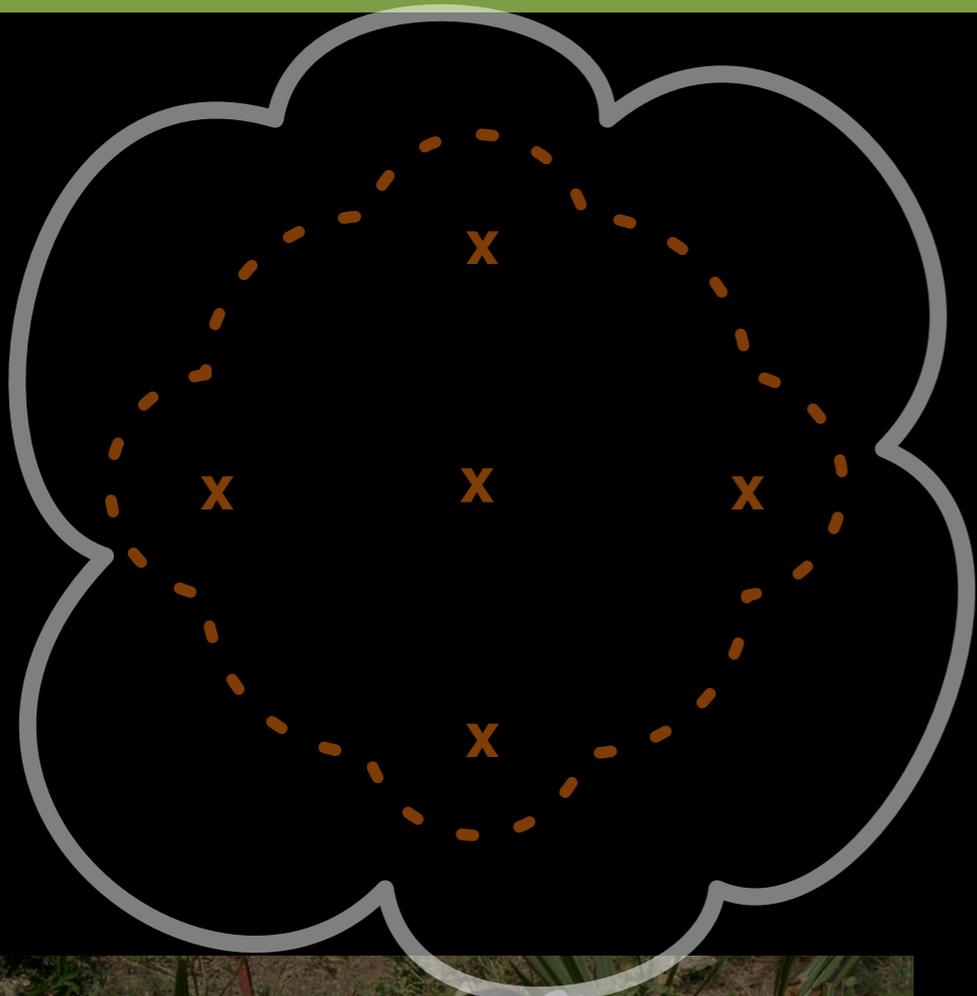
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# Key Idea: Visualize Metallic Signatures

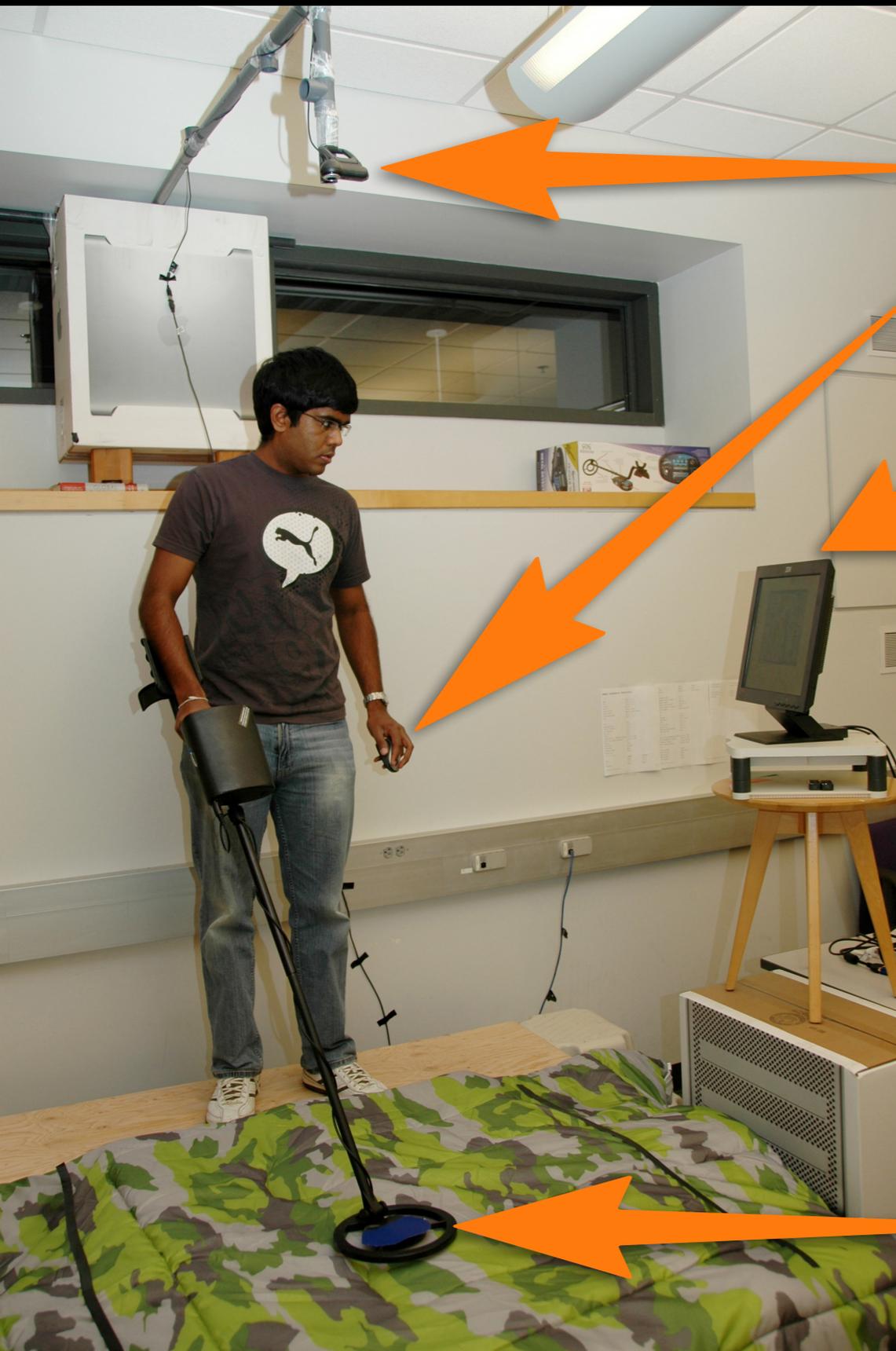


# Key Idea: Visualize Metallic Signatures



# Approach 0: Support Deminer in the Field

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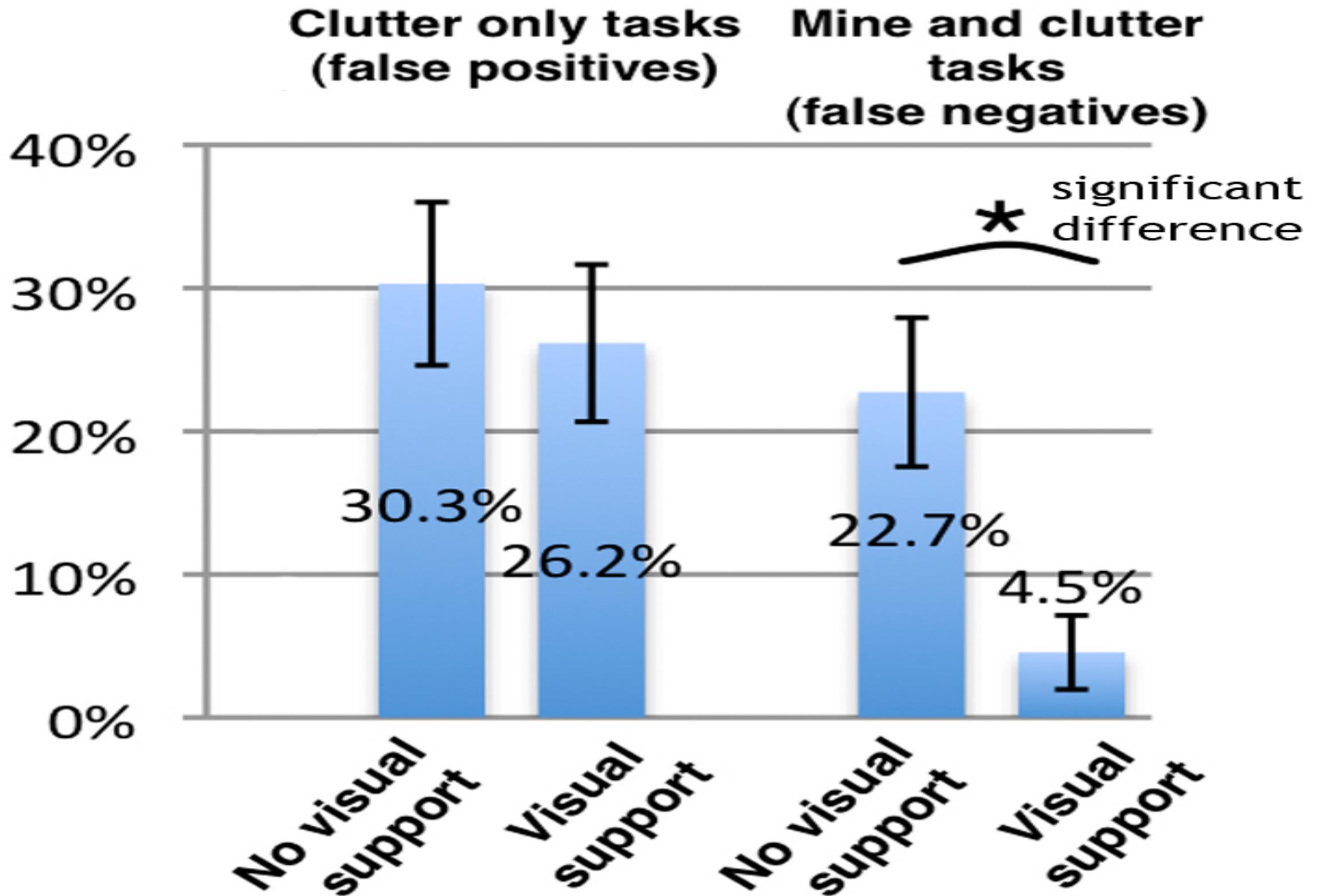


Camera  
Trigger  
Display



Color patch

# Approach 0: It Works! But...



# Approach 1: Scaffold Trainees' Learning

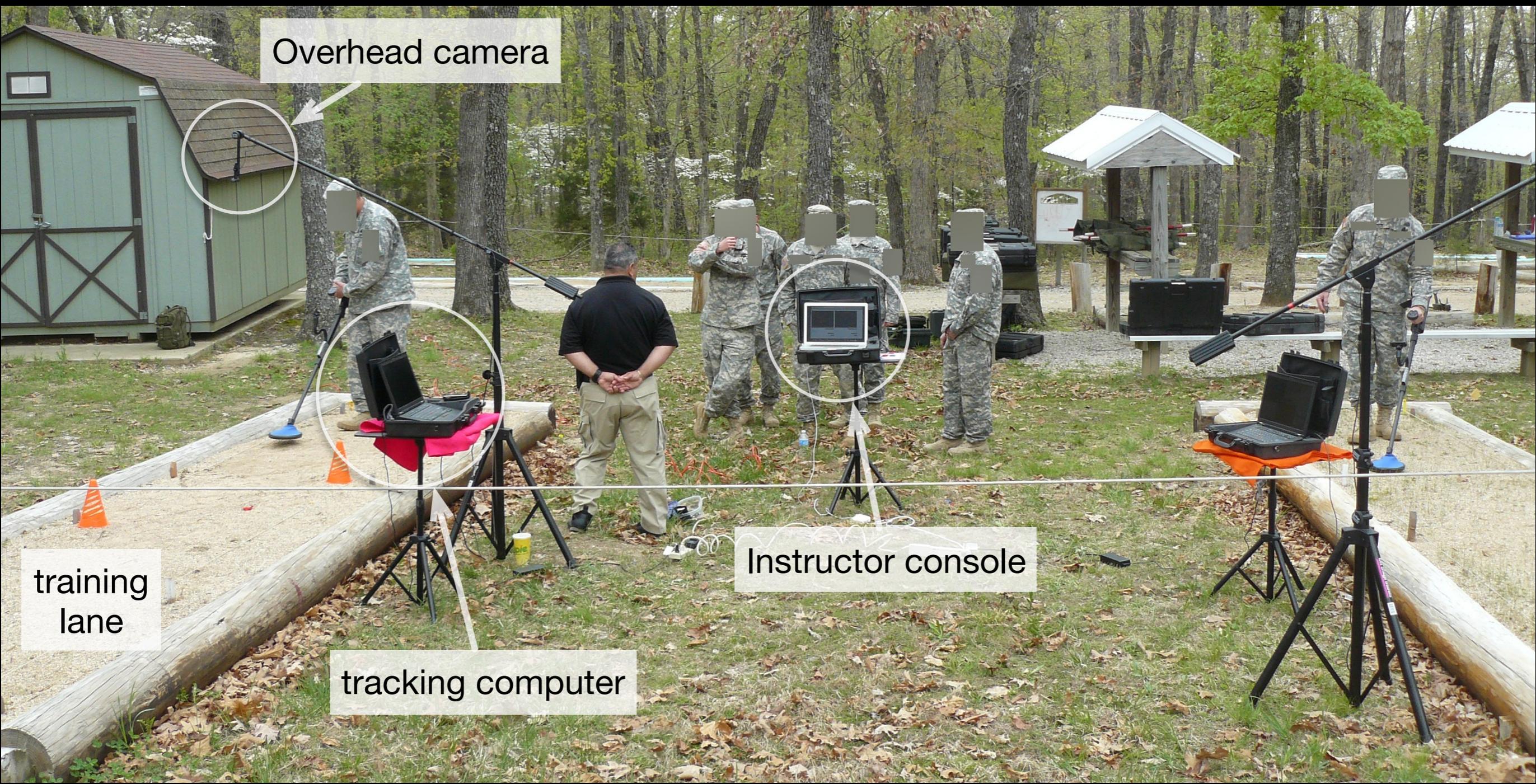
# Approach 1: Scaffold Trainees' Learning



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# Approach 1: Scaffold Trainees' Learning



Overhead camera

training lane

tracking computer

Instructor console

# Approach 1: Scaffold Trainees' Learning



Camera

Trigger

Color  
patch

# Approach 1: Scaffold Trainees' Learning



Display

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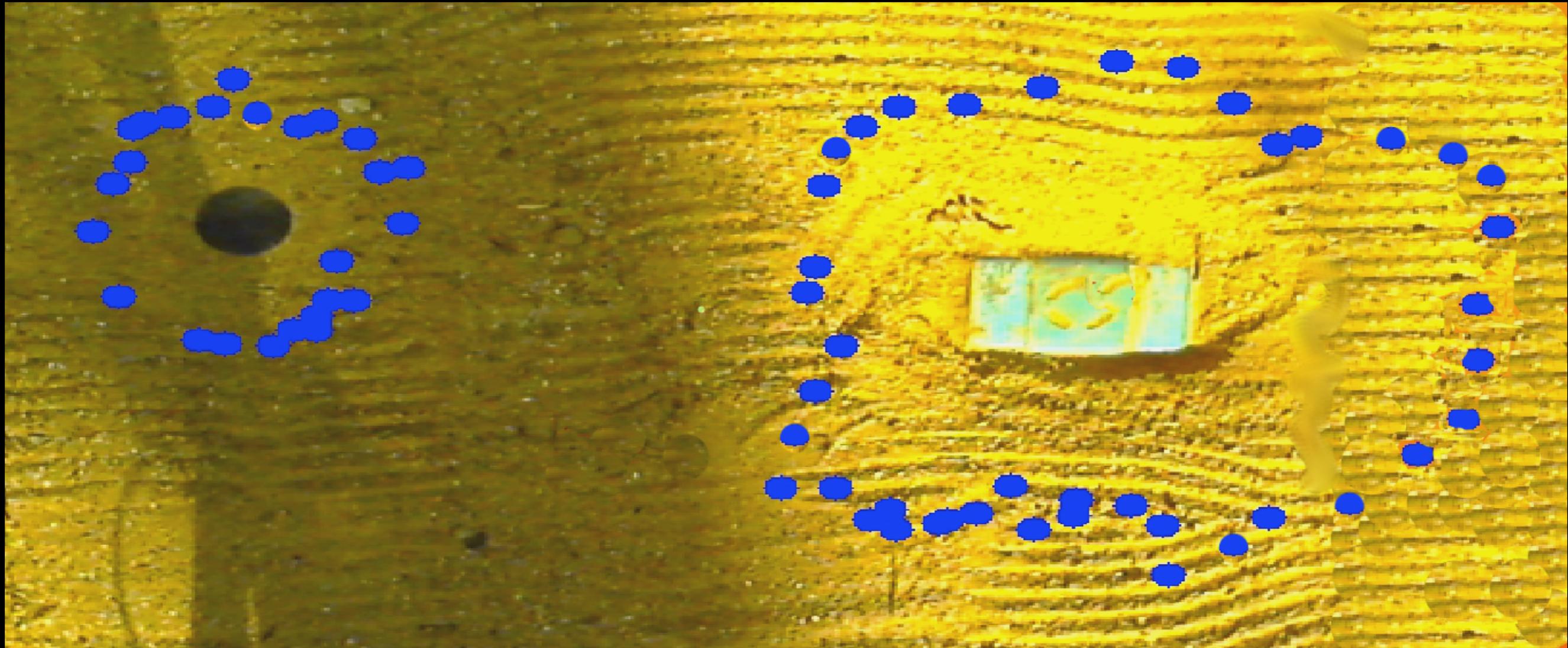
# Approach 1: Lessons Learned

- Real-time visualizations were not effective
- PETALS allowed instructors to monitor performance of multiple trainees simultaneously
- PETALS allowed instructors to communicate personalized process feedback after completion of each practice lane



# Approach 2: Support Instructors

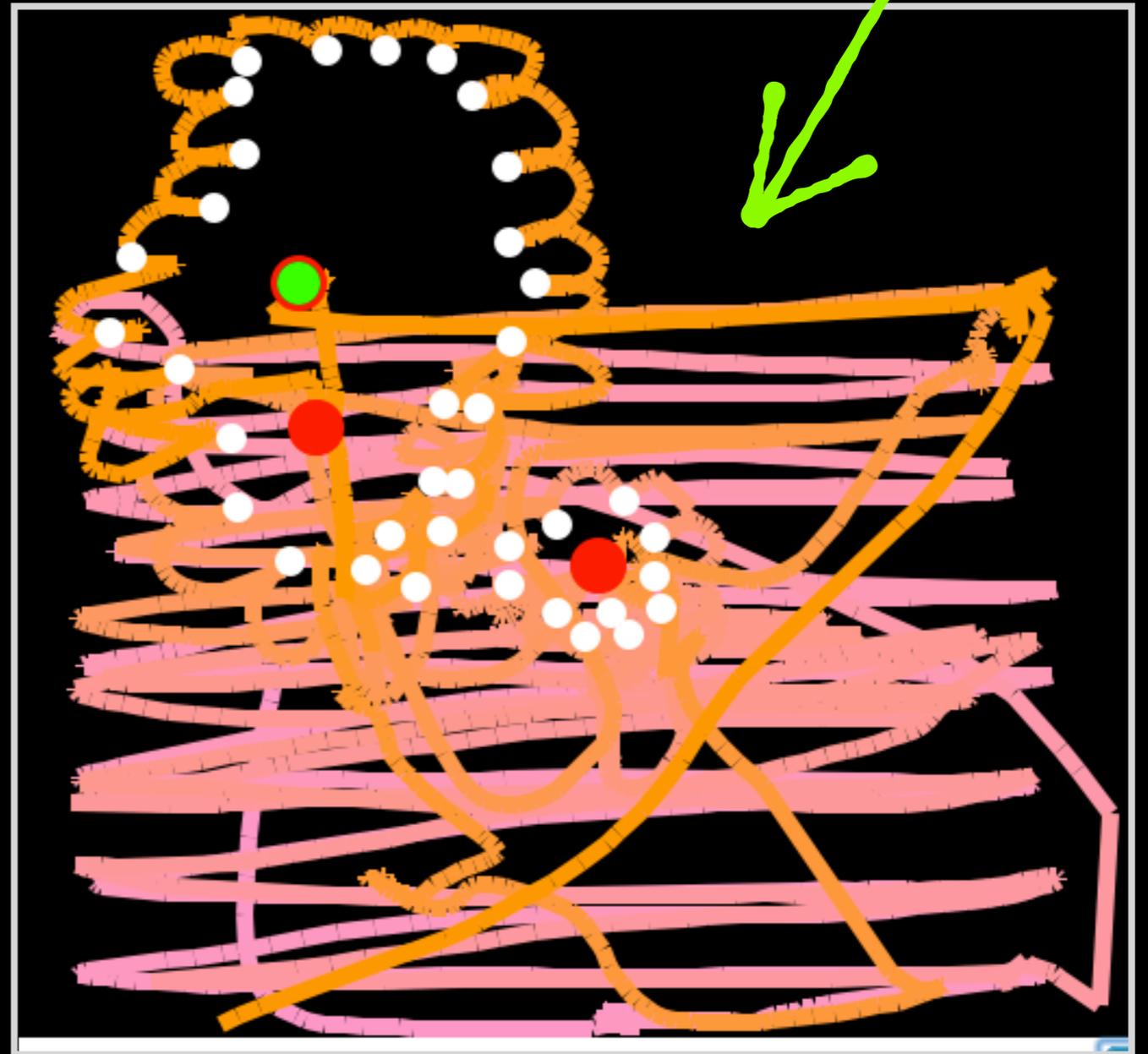
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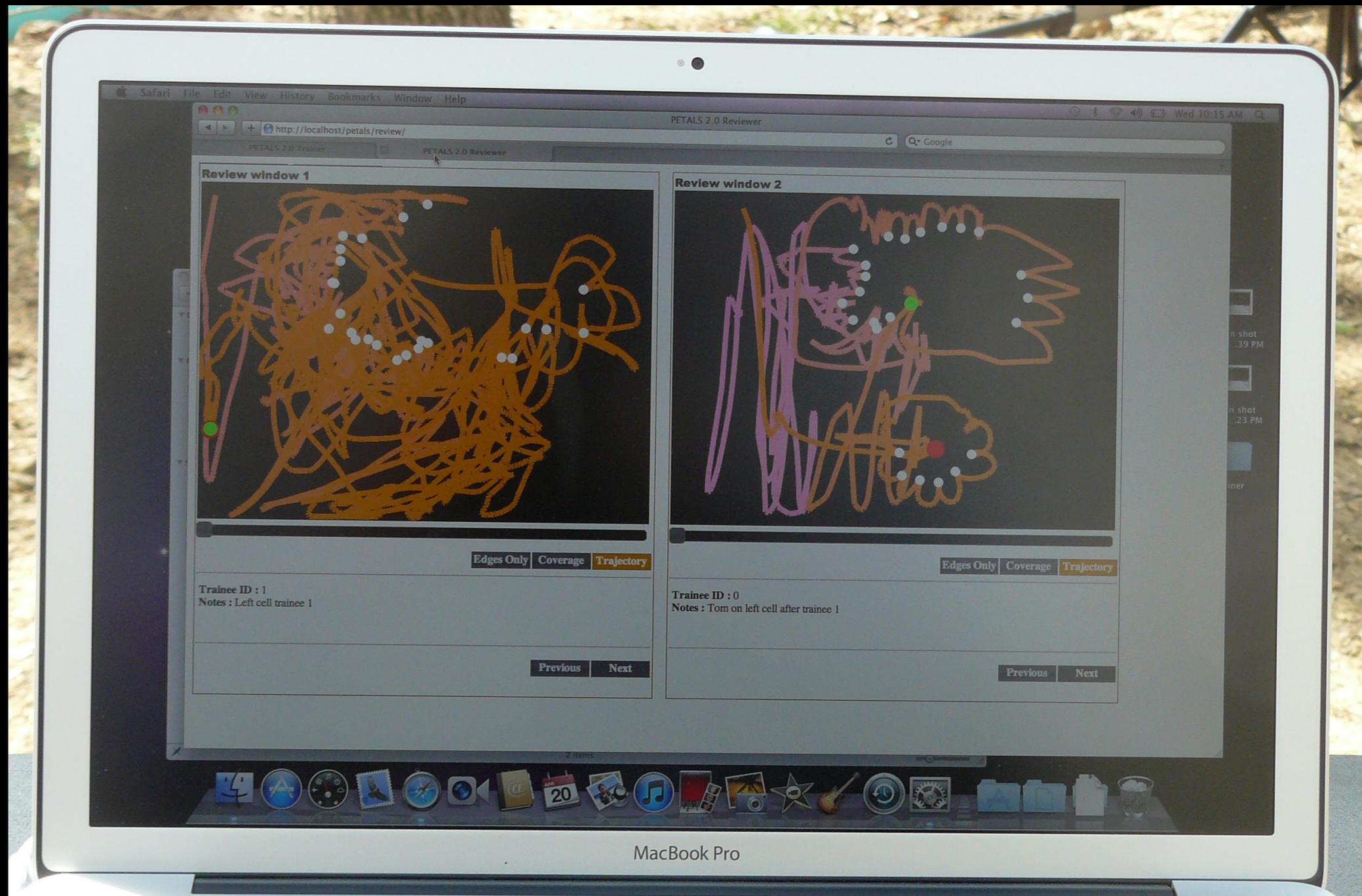


Gapping

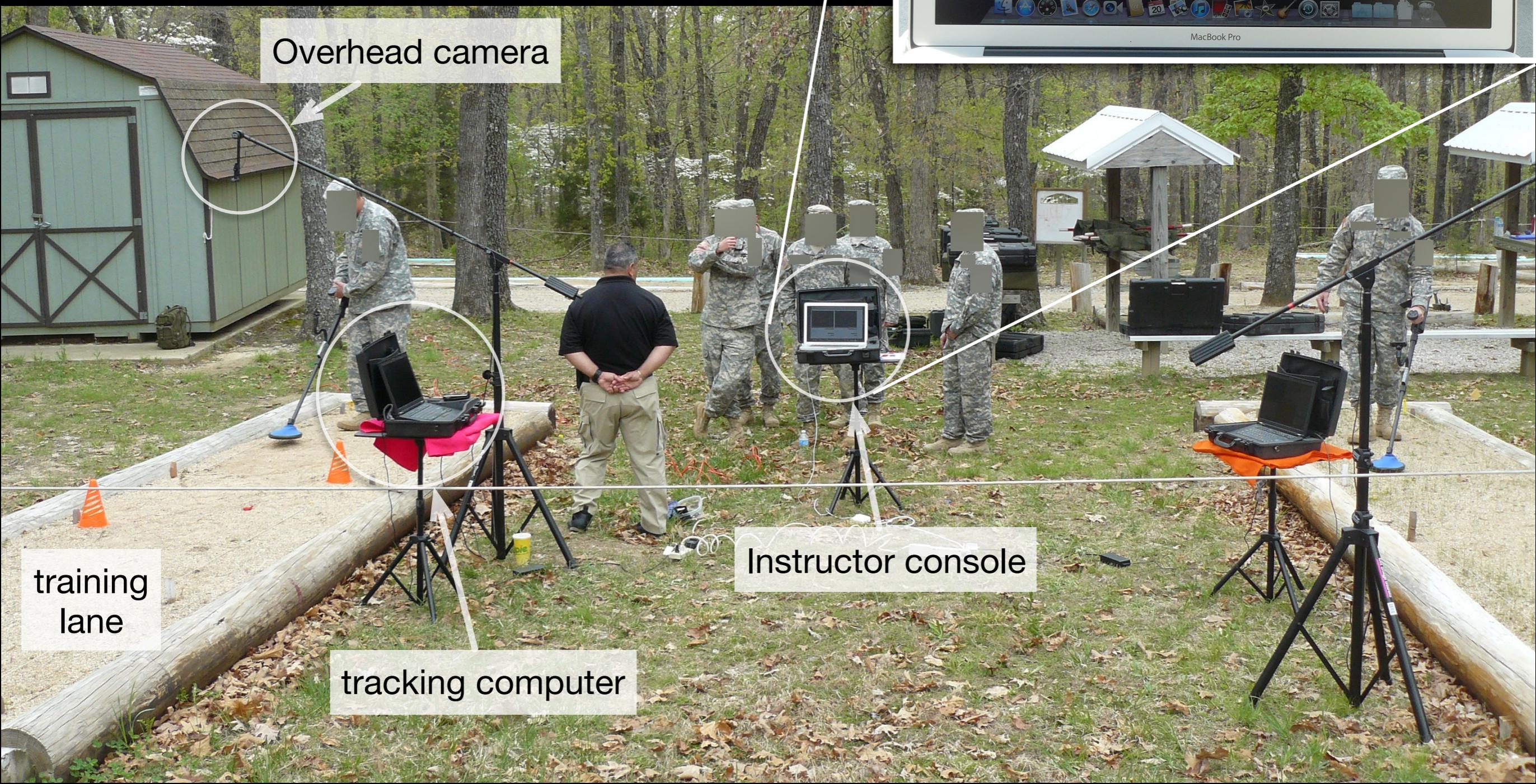


Target Lock

# Approach 2: Support Instructors



# Approach 2: Support Inst



Overhead camera

training lane

tracking computer

Instructor console

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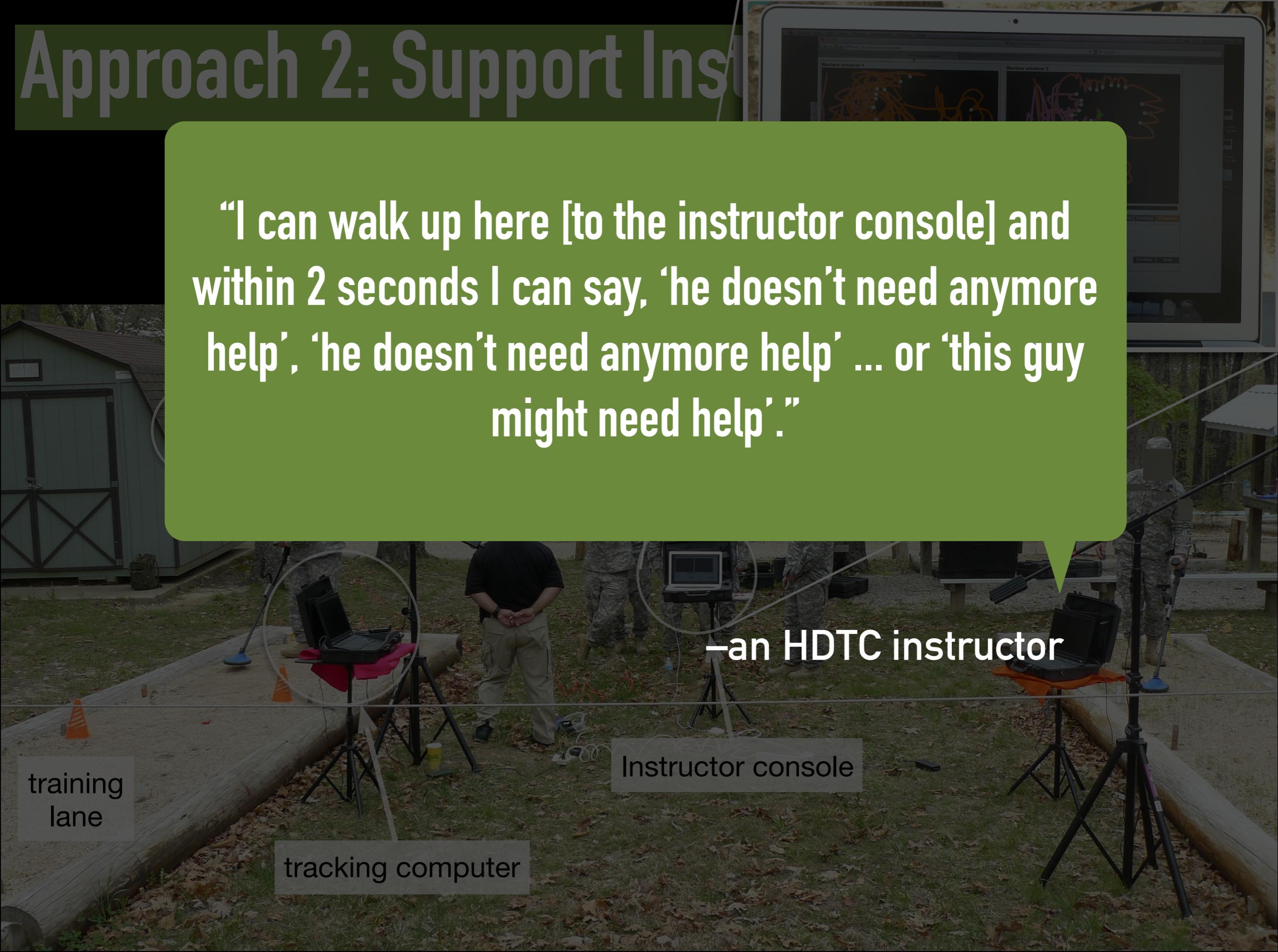
“I can walk up here [to the instructor console] and within 2 seconds I can say, ‘he doesn’t need anymore help’, ‘he doesn’t need anymore help’ ... or ‘this guy might need help’.”

—an HDTC instructor

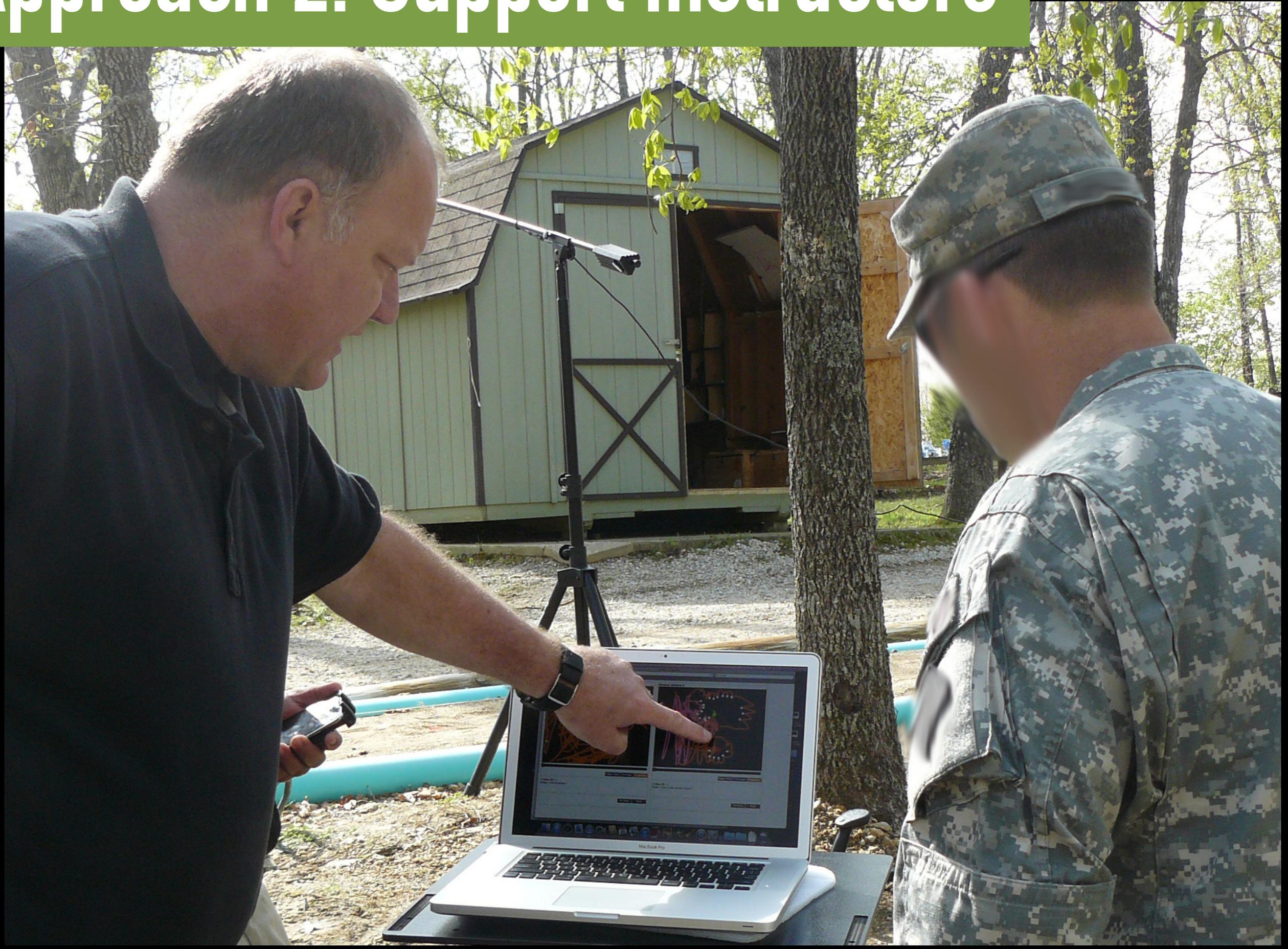
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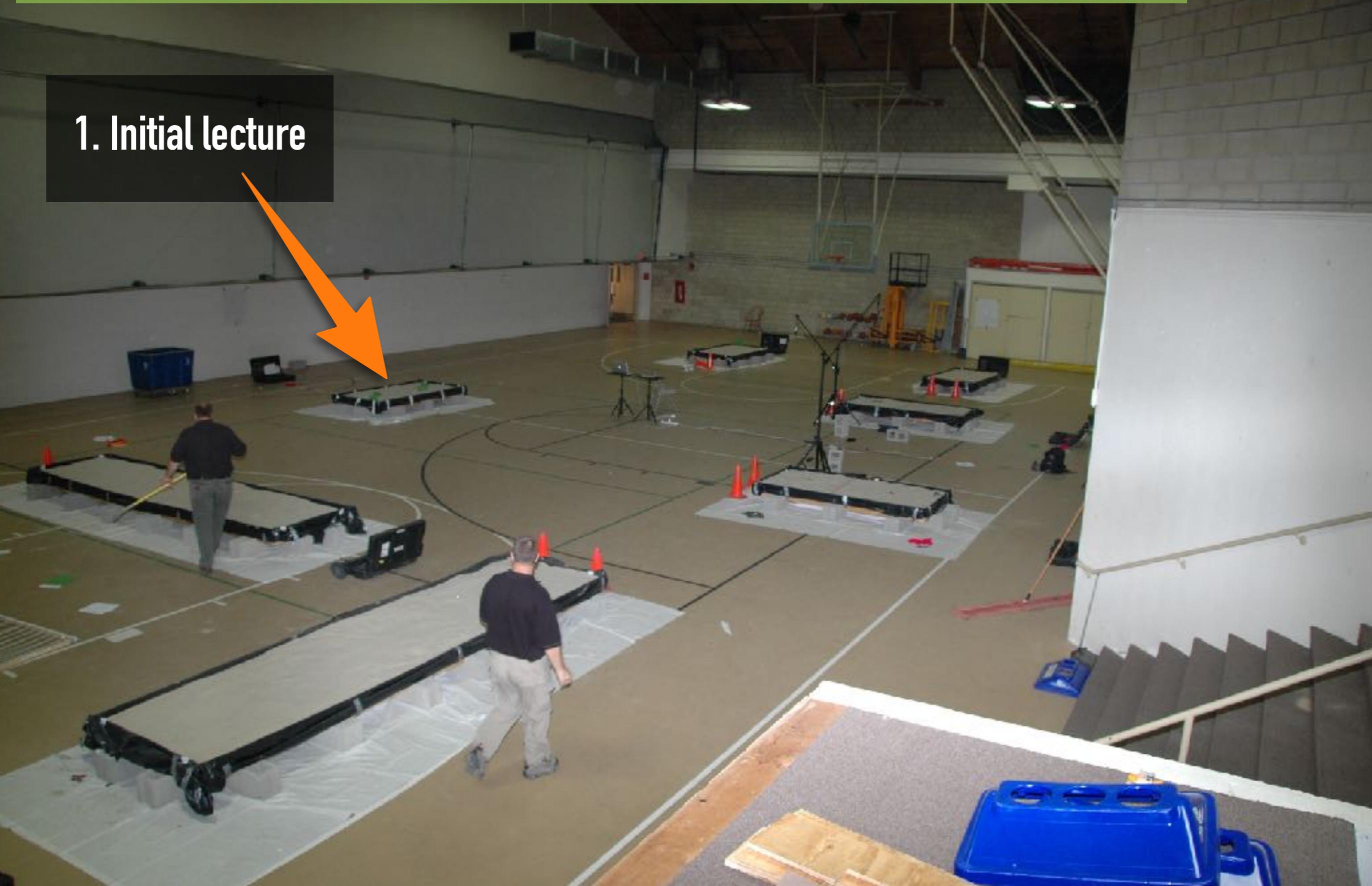
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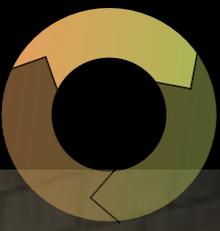


# Summative Evaluation

1. Initial lecture



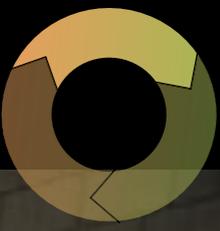
# Summative Evaluation



## 2. Training

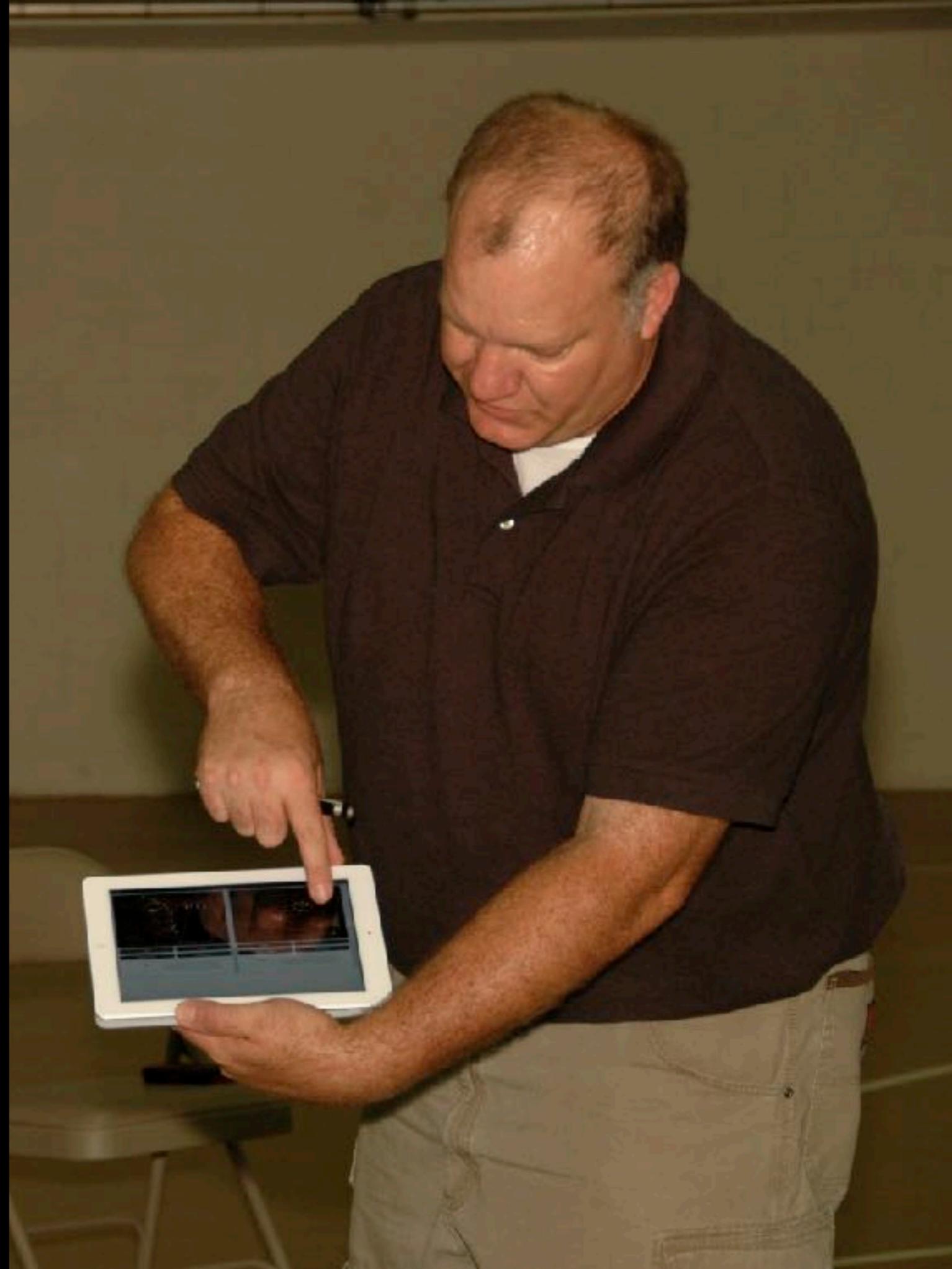


# Summative Evaluation



3. Exam

# 1. Initial lecture



# 2. Training



# 2. Training



# 2. Training



# 3. Exam



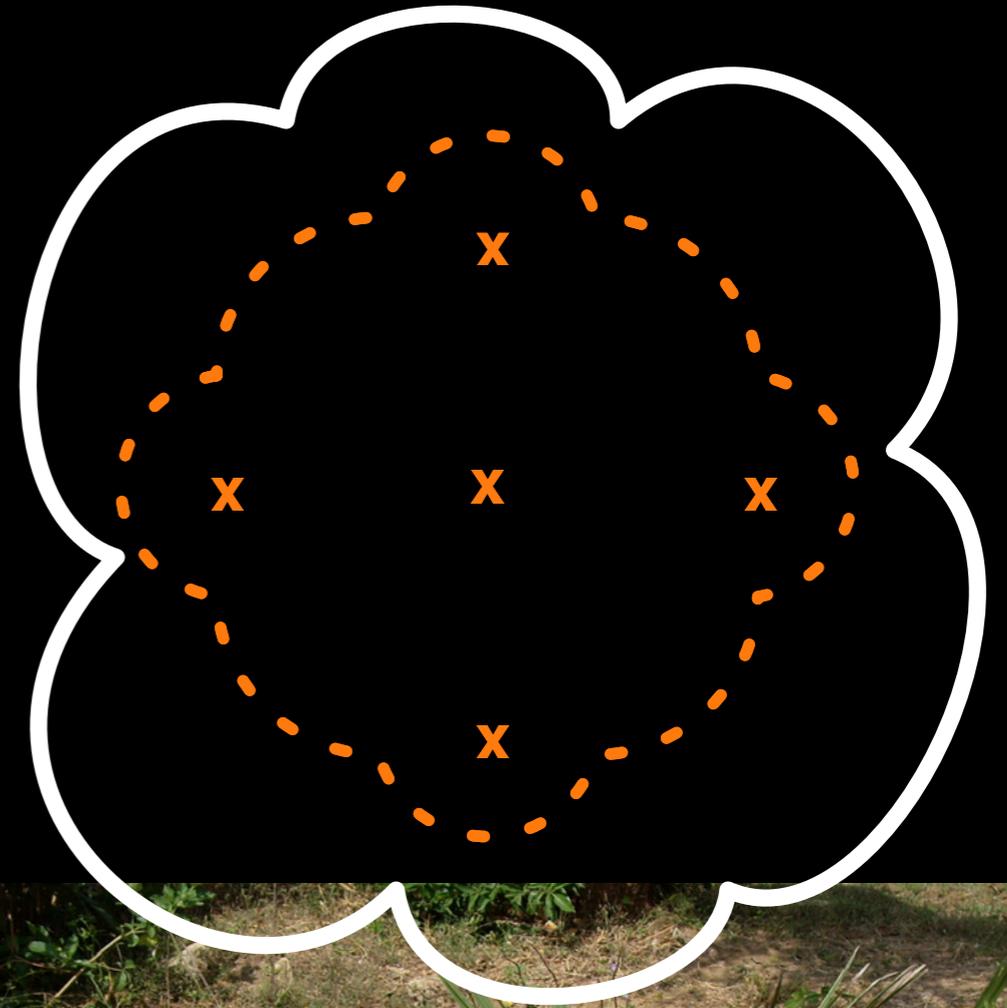
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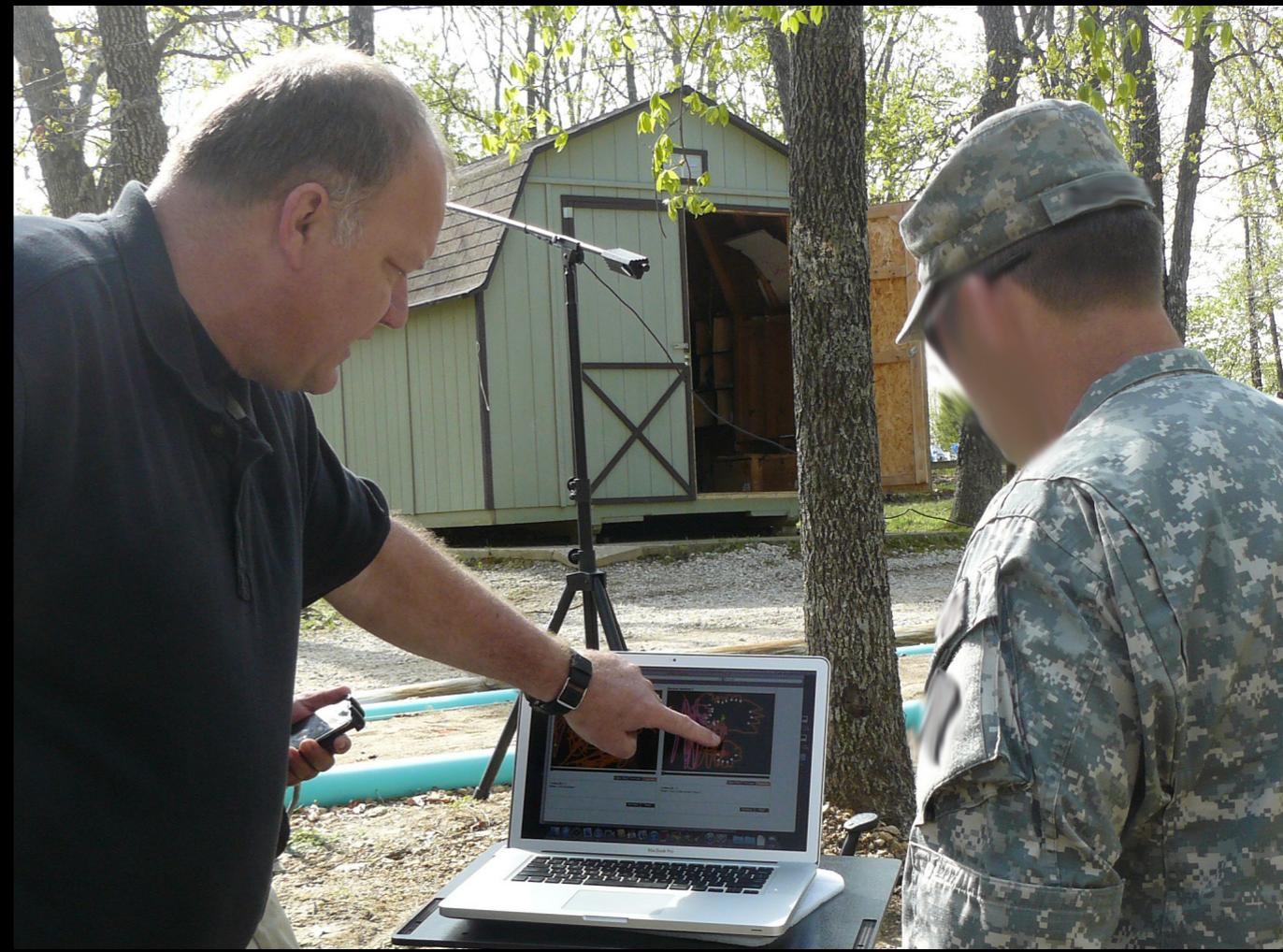
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