

MATLAB EXPO

2021

Exploring Challenges with Artificial Intelligence and Augmented Reality

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Preparing to Participate in this Workshop

Use your:



Questions: communicate via chat window

Please complete the **prework** that was provided to you for this workshop

Set Up Workshop Environment – Part I



Products Solutions Academia Support Community Events

MATLAB & Simulink

Access MATLAB for your Hands on Workshop

MathWorks is pleased to provide a special license to you as a course participant to use for your Hands on Workshop. This is a limited license for the duration of your course and is intended to be used only for course work and not for government, research, commercial, or other organization use.

Course Name:	Exploring Challenges with Artificial Intelligence and Augmented Reality
Organization:	MathWorks
Ending:	05 May 2021

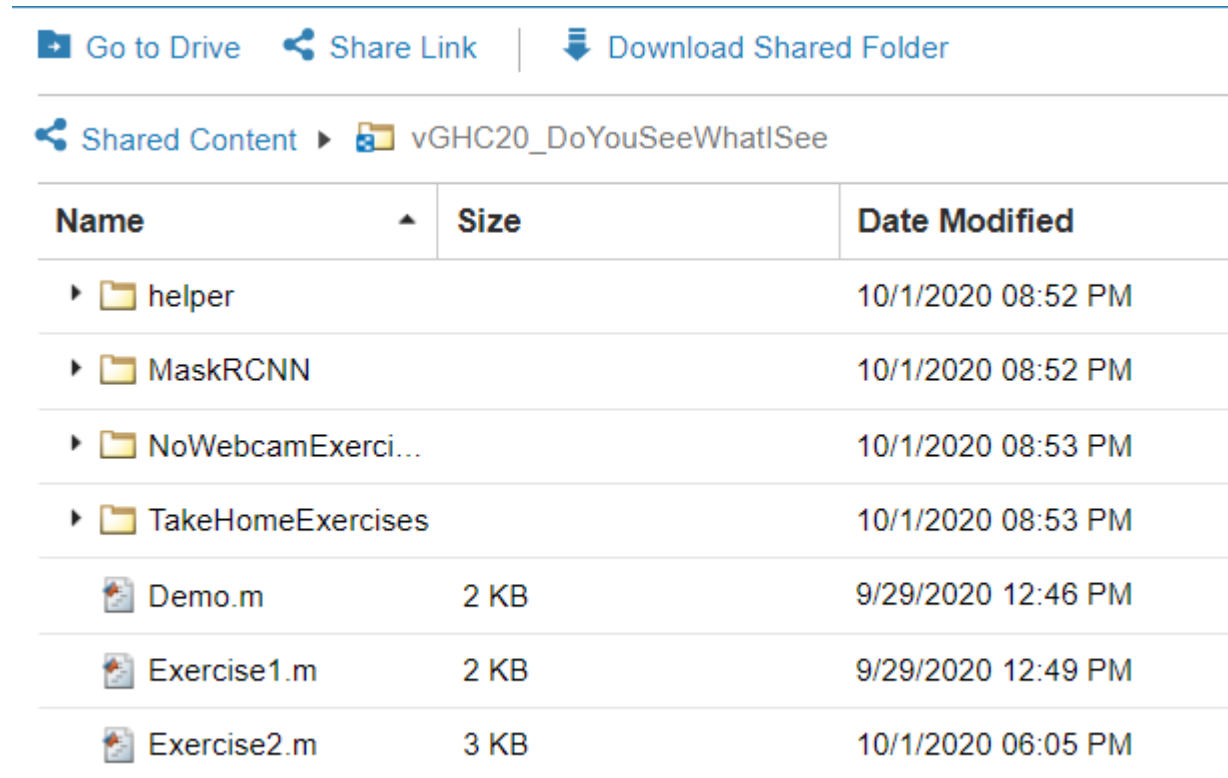
[Access MATLAB Online](#)

<https://tinyurl.com/MATLABOnlineARandAIWorkshop>

Set Up Workshop Environment – Part II

Access workshop files in MATLAB Drive

<https://tinyurl.com/GHC20ARAIExercises>



Go to Drive | Share Link | Download Shared Folder

Shared Content ▶ vGHC20_DoYouSeeWhatISee

Name	Size	Date Modified
▶ helper		10/1/2020 08:52 PM
▶ MaskRCNN		10/1/2020 08:52 PM
▶ NoWebcamExerci...		10/1/2020 08:53 PM
▶ TakeHomeExercises		10/1/2020 08:53 PM
▶ Demo.m	2 KB	9/29/2020 12:46 PM
▶ Exercise1.m	2 KB	9/29/2020 12:49 PM
▶ Exercise2.m	3 KB	10/1/2020 06:05 PM

Agenda



Augmented Reality (AR)



Artificial Intelligence (AI)



Challenges with AR and AI

Agenda



Augmented Reality (AR)



Artificial Intelligence (AI)



Challenges with AR and AI

What is Augmented Reality (AR)?



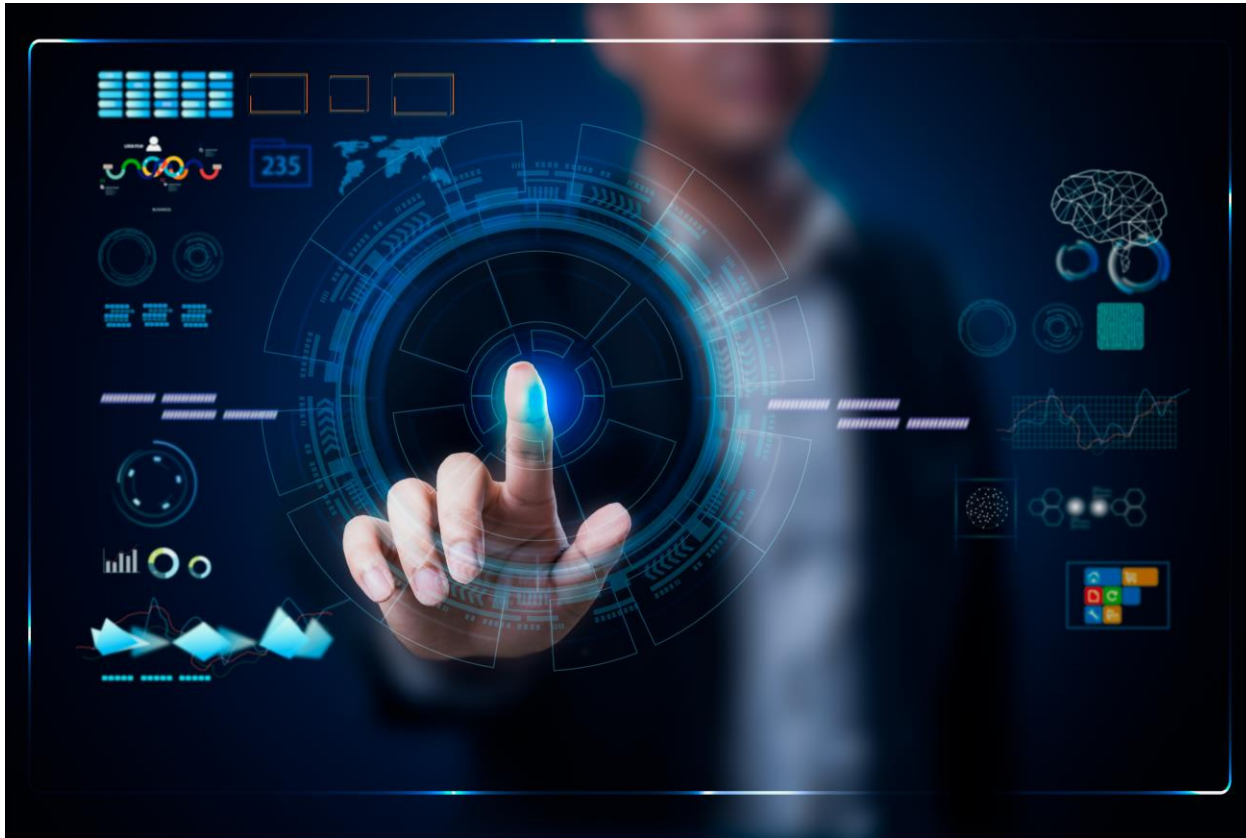
“The basic idea of augmented reality is to superimpose [graphics](#), audio and other sensory enhancements over a real-world environment in real time.”

<https://computer.howstuffworks.com/augmented-reality.htm>

What is Augmented Reality (AR)?

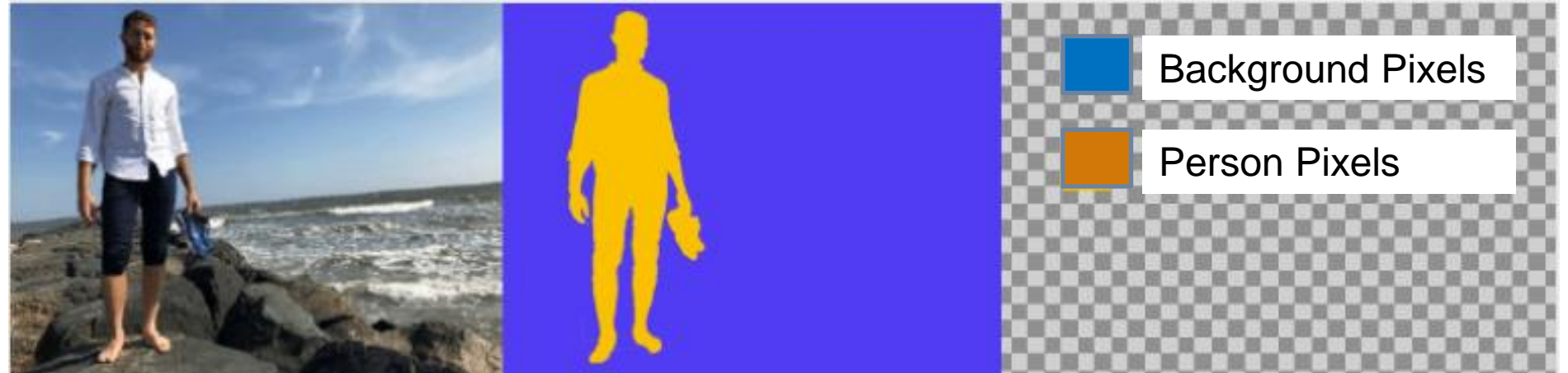
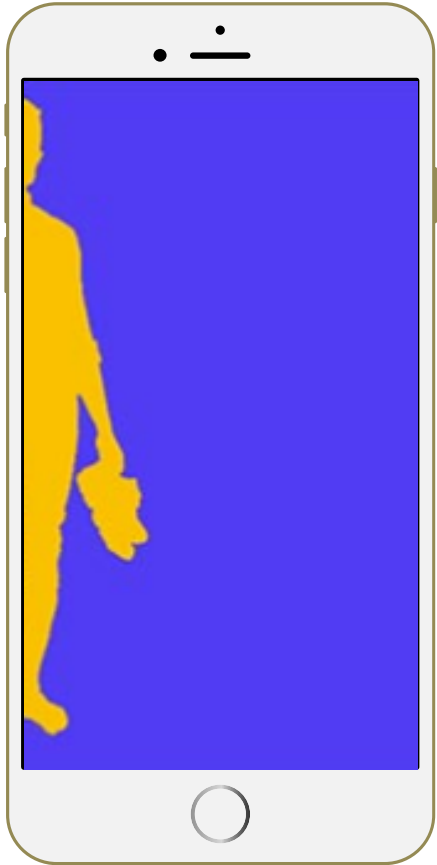


AR can be used in a variety of applications



Augmented Reality/Virtual Reality

Segmentation is a technique used to implement AR





You will use segmentation to change your background to a new scene

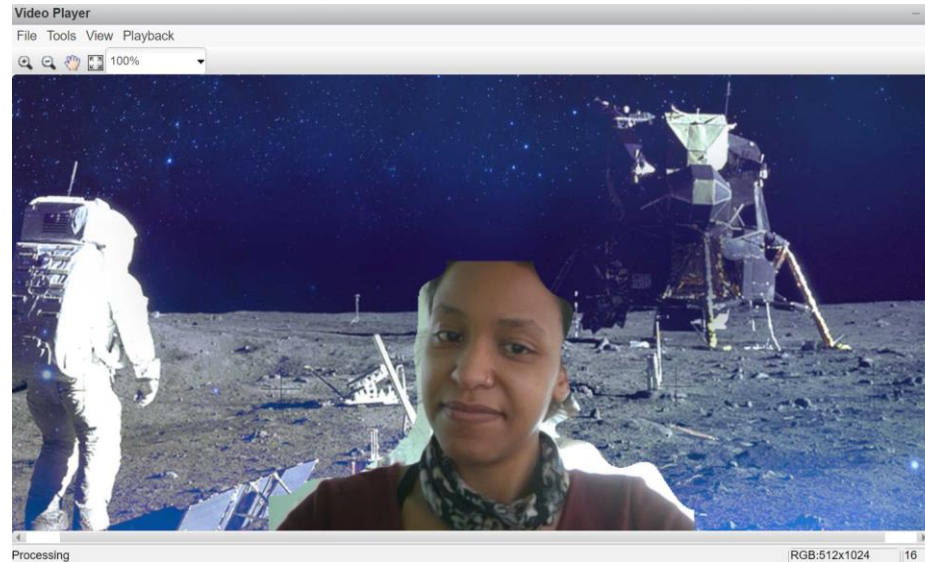


Demo .m

```
imageFileName = promptForBackground("all");  
  
while true  
    I = snapshot(cam);  
    [I, mask] = segmentUserFromBackground(I, model, cam);  
    superimposedImg = superimpose(I, mask, backgroundImg);  
    step(videoPlayer, superimposedImg);  
  
end
```

Demo: You will use a model called Mask-RCNN to change your scene!

1. Open Demo.m  and click Run 
2. Select a background to use.



If you have time, try again and review the code

Exploration of Demo Results

- How well does the algorithm segment you from your background?
- How does the lighting, resolution, etc. affect the results?

Agenda



Augmented Reality (AR)



Artificial Intelligence (AI)



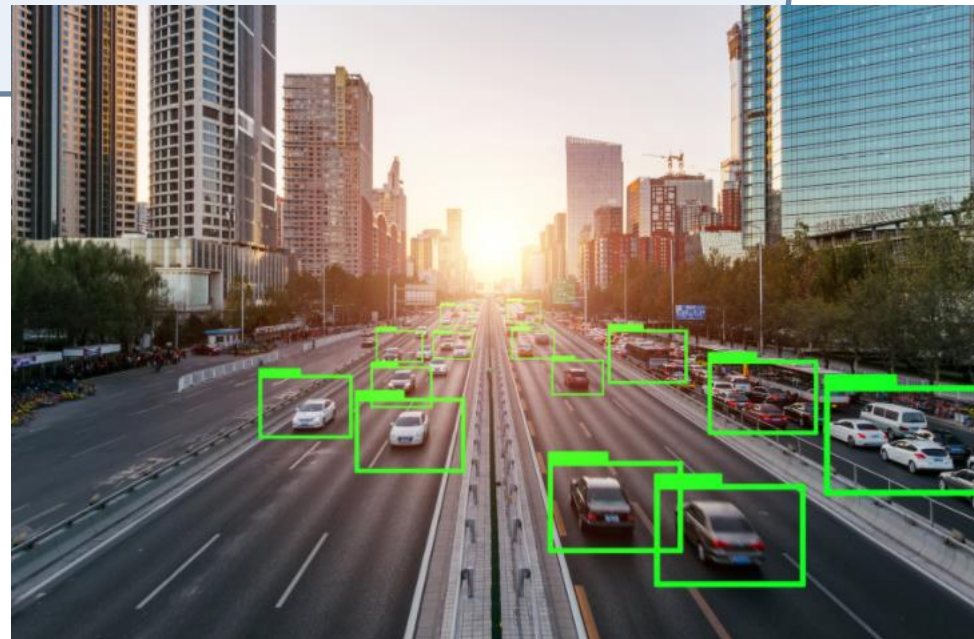
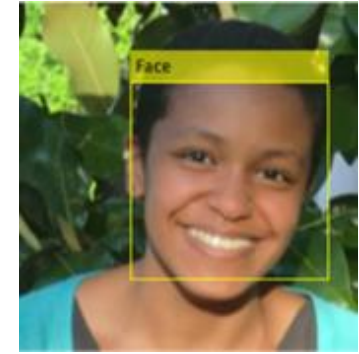
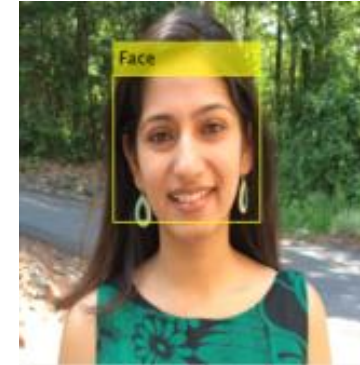
Challenges with AR and AI

Artificial Intelligence (AI) In Our World

Artificial Intelligence

The ability of a digital computer or robot to perform tasks commonly associated with intelligent beings

Face Verification



How can AI be implemented?

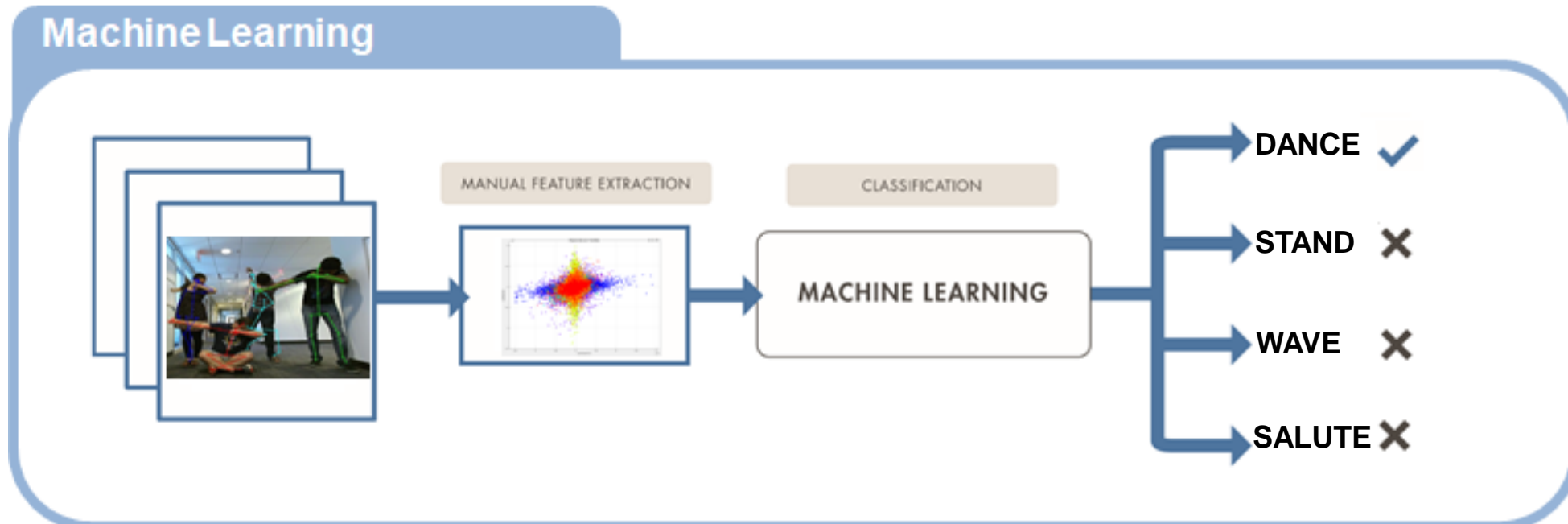
Machine Learning

The practice of **learning a task from data**
without relying on a predetermined equation or model

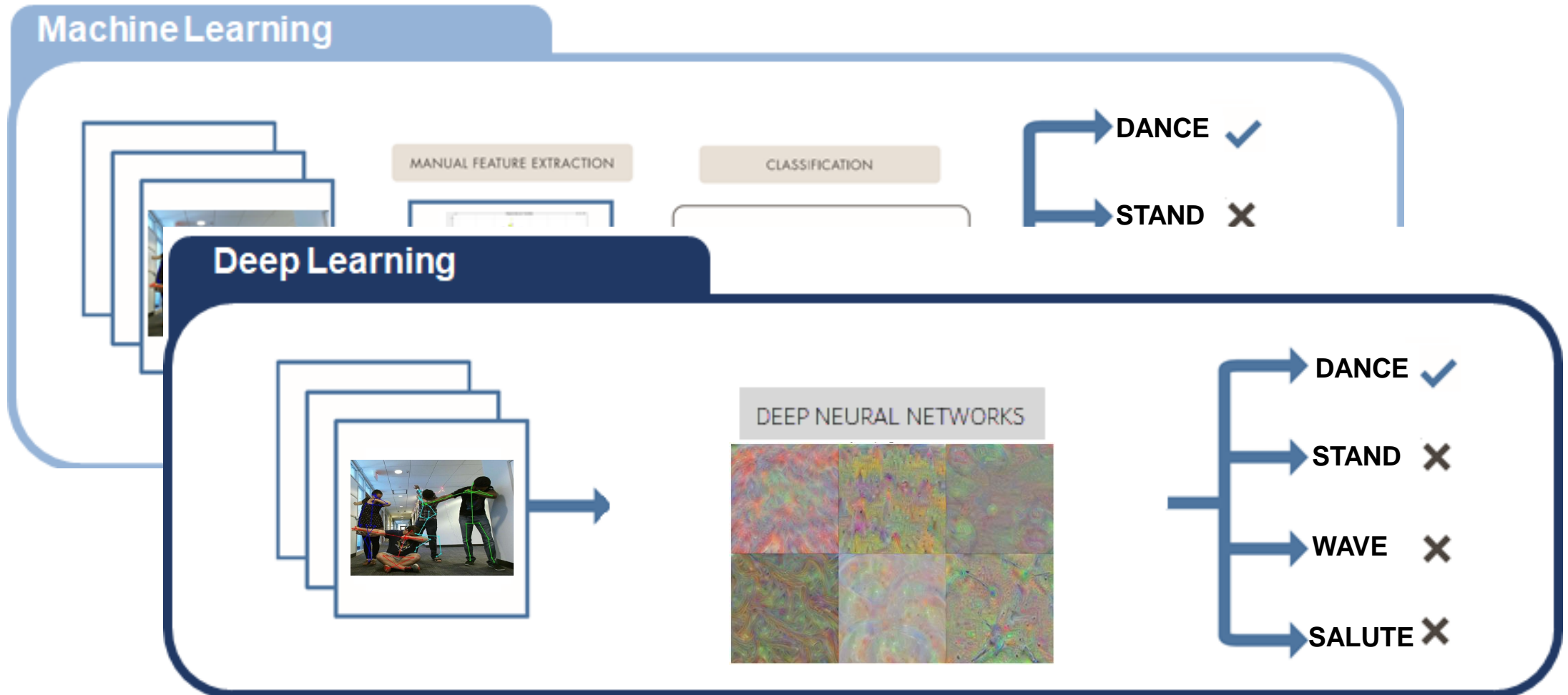
Deep Learning

A **type** of machine learning
in which a model learns to perform tasks
directly from images, text, or sound

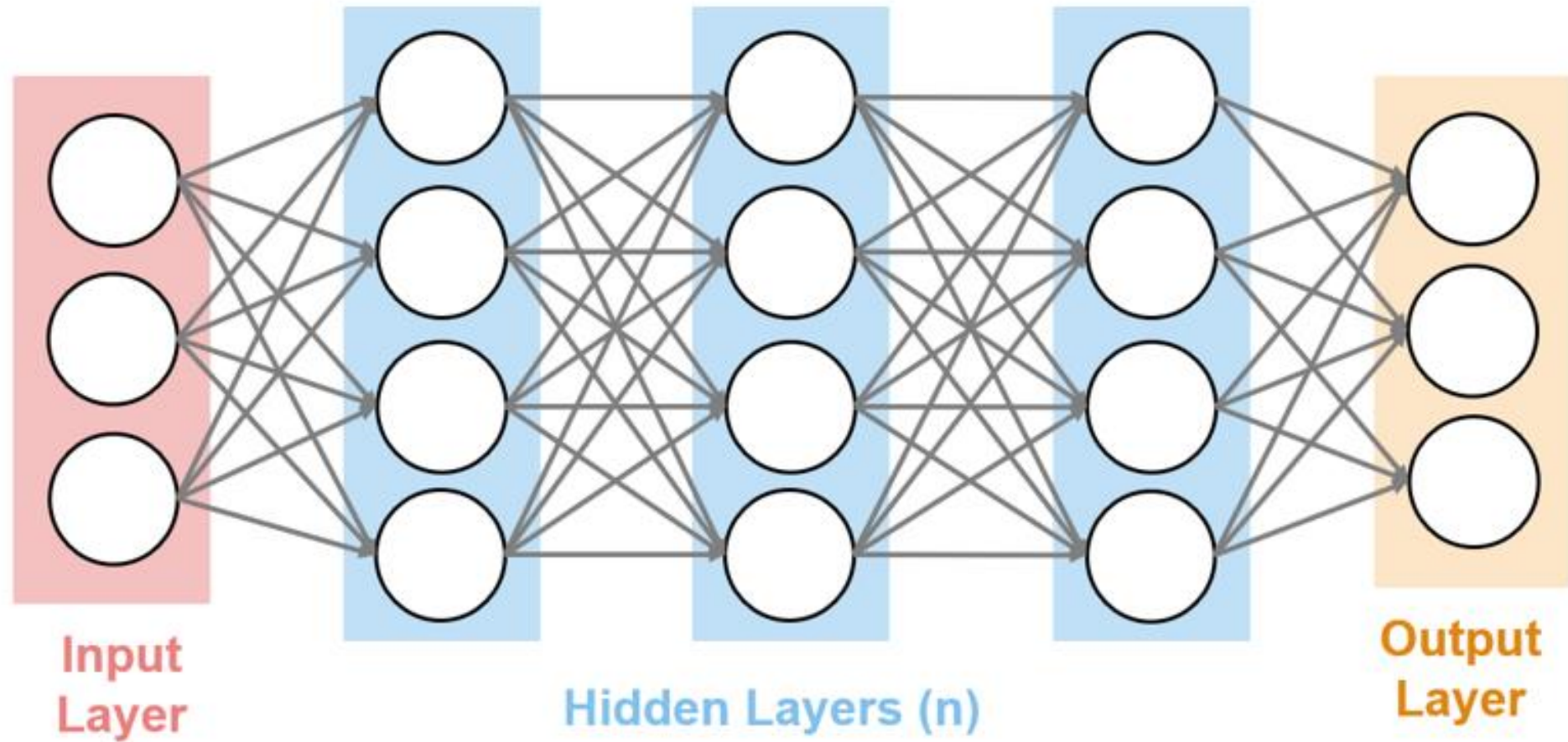
Machine learning involves extracting features from data



Deep learning is end-to-end, based on raw images, text, or signals



Neural networks are architectures inspired by biology



Deep learning will be used to assist us with pose classification

Human poses can be classified for a variety of applications



You will use a deep neural network to classify your pose



Exercise1.m

```
labels = promptForLabelNames();

while true



    I = snapshot(cam);

    [label, score] = classifier.classify(I);

    ax.CData = I;
    title(join(["Label: ", string(label), "Score: ", sprintf("%.2f", max(score))], ' '),
        'HorizontalAlignment', 'left');

end
```

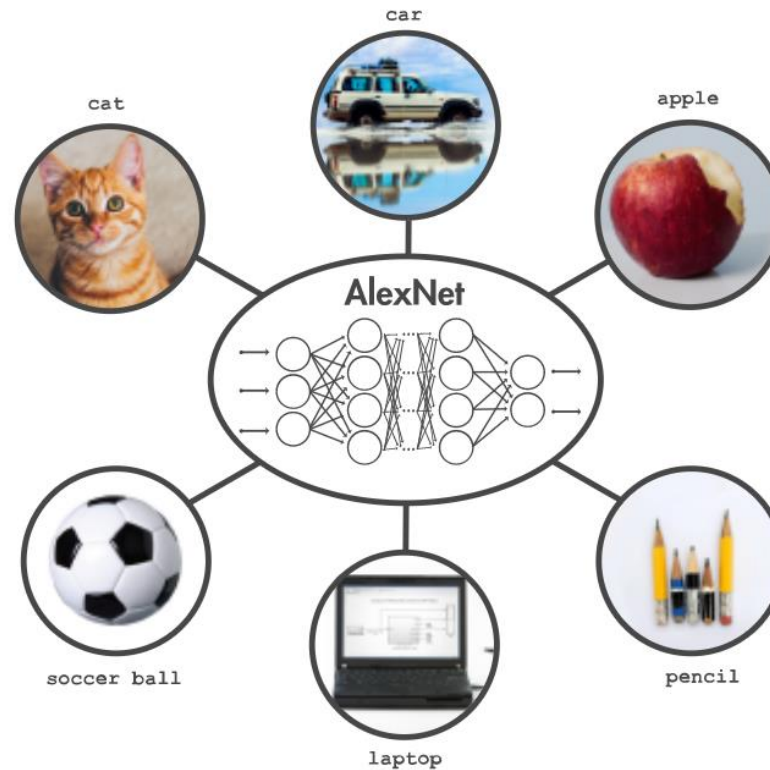
Exercise 1: You will use a deep neural network to classify poses!

1. Open Exercise1.m  and click Run 
2. When prompted, type a label for each pose that is shown and hit Return.
3. Try each of your poses and observe the classified label and score.

If you have time, try again and review the code

Exploration of Exercise Results

How well does the model recognize your pose?



Agenda



Augmented Reality (AR)

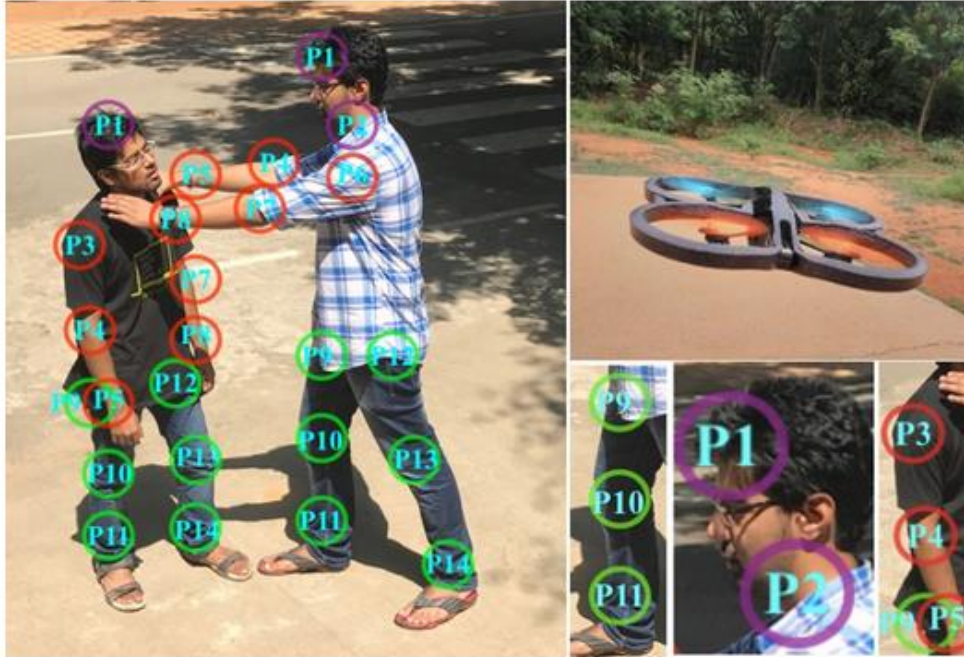


Artificial Intelligence (AI)



Challenges with AR and AI

Classifying poses in AR



Stabbing pose. Singh's deep learning network uses 14 key points on the human body to identify violent poses such as strangling, punching, kicking, shooting, and stabbing. Courtesy S.N. Omkar.

Could some of these **perceived violent poses** have a **different meaning** in other environments?

[A view to a brawl](#)

You will use deep learning to classify poses in different scenes using AR



Exercise2.m

```
labelsForBackground1 = ["CrossedArms", "HandsOnHips", "HeartPose", "Salute", "Wave"];
labelsForBackground2 = ["Shiver", "Spacewalk", "Ballet", "Squint", "Question"];

imageFileName = promptForBackground("default");

while true

    I = snapshot(cam);



    [I, mask] = segmentUserFromBackground(I, poseNet, cam, 'keypoints');

    superimposedImg = superimpose(I, mask, backgroundImg );

    [label, score] = classifier.classify(imcropCenter(superimposedImg, [256 192]));

end
```

Exercise 2: You will use deep learning to classify poses in different scenes using AR!

1. Open Exercise2.m  and click Run 
2. Select a background to use
3. Try each of your poses and observe the classified label and score.
4. If you have time, try again with a different background and review the code.

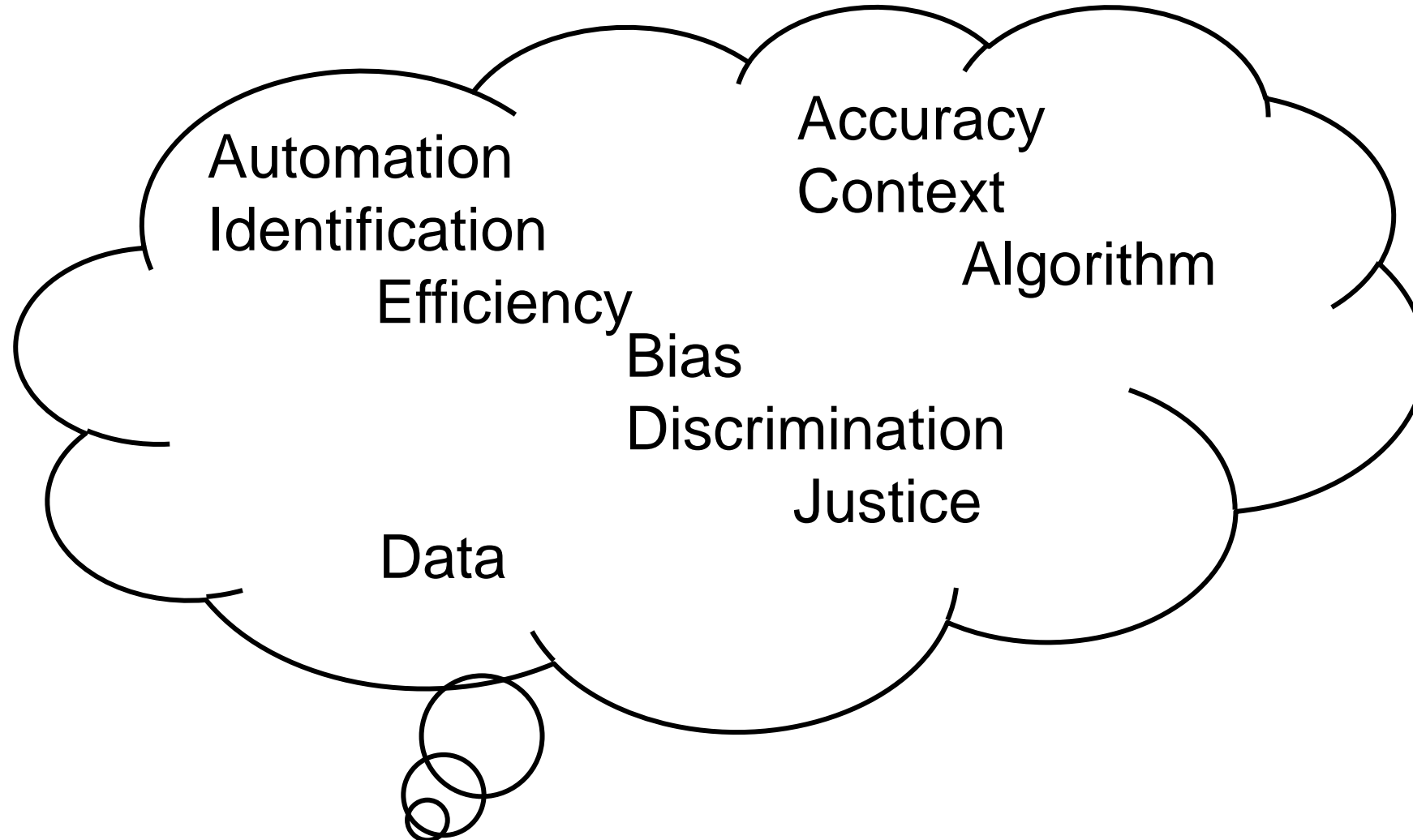
Exploration of Exercise Results

- How well is the algorithm able to segment the user from their background?
- How does the lighting, resolution, etc. affect the classification results?
- Did the classified results fit within the content of the scene where you were located?

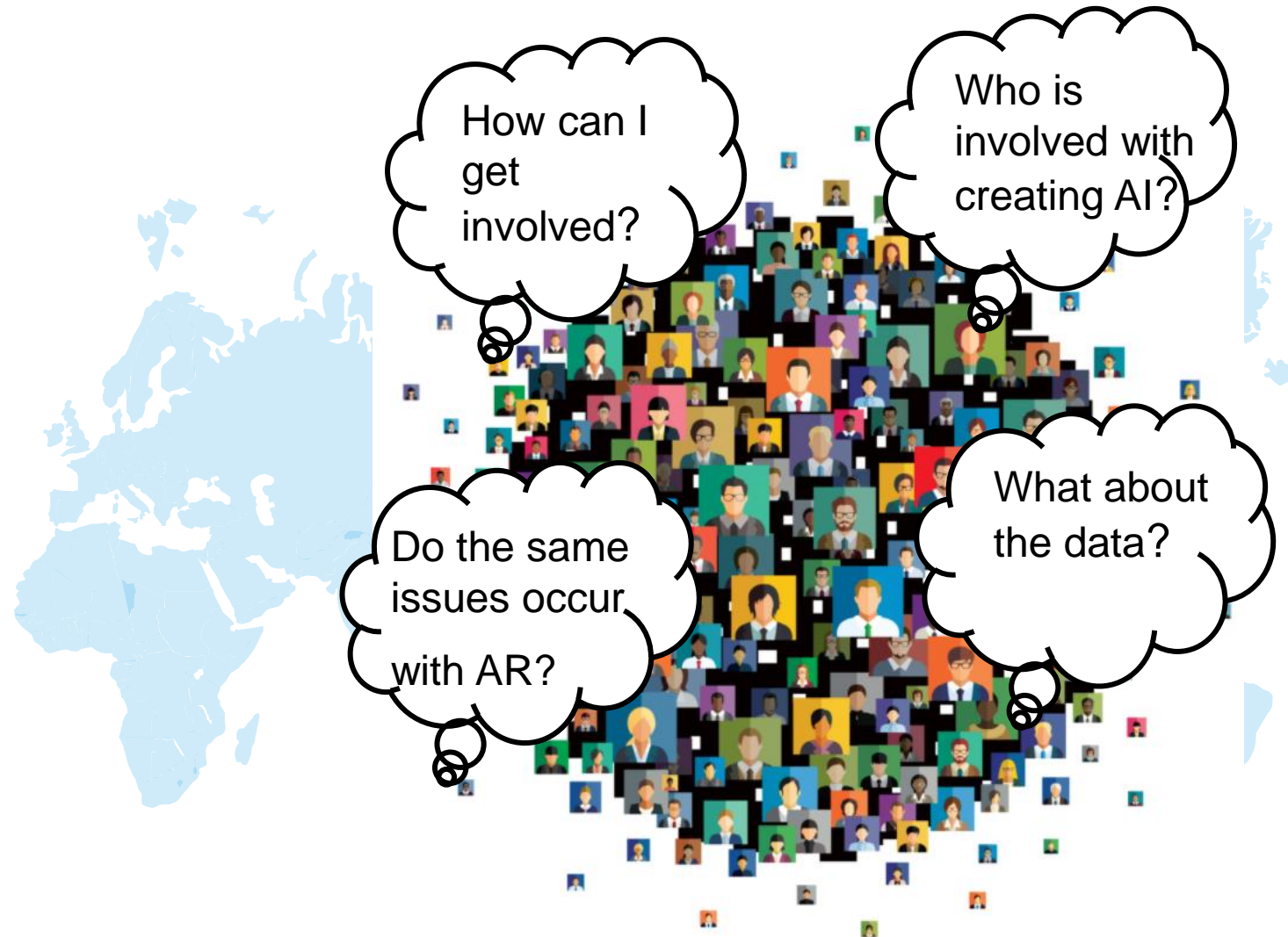
Let's reflect on the exercise results

- Some poses were not correctly classified
- Based on the scene, does the pose fit with the context of the scene?
- Who is determining how a pose should be classified?
- What is our responsibility as we not only **create** this technology, but as we **test** the technology, and **use** the technology which can have very severe **real-world consequences** for our fellow human beings?

Discussing Challenges with AI



All of us are impacted and Called to Action



Can We Address these Challenges with AI?



Augmented Reality/Virtual Reality

Resources to Continue Learning



MATLAB Onramp

Get started quickly with the basics of MATLAB®.

[Details and launch](#)



Simulink Onramp

Get started quickly with the basics of Simulink®.

[Details and launch](#)



Image Processing Onramp

Learn the basics of practical image processing techniques in MATLAB.

[Details and launch](#)



Signal Processing Onramp

An interactive introduction to practical signal processing methods for spectral analysis.

[Details and launch](#)



Machine Learning Onramp

An interactive introduction to practical machine learning methods for classification problems.

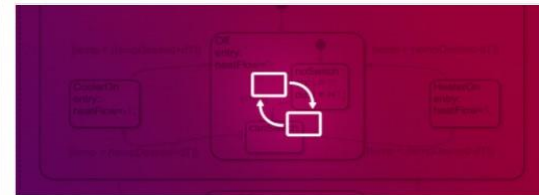
[Details and launch](#)



Deep Learning Onramp

Get started quickly using deep learning methods to perform image recognition.

[Details and launch](#)



Stateflow Onramp

Learn the basics of creating, editing, and simulating state machines in Stateflow®.

[Details and launch](#)



Control Design Onramp with Simulink

Get started quickly with the basics of feedback control design in Simulink.

[Details and launch](#)

[Bias in Deep Learning Systems » Deep Learning - MATLAB & Simulink \(mathworks.com\)](#)

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Thank you

