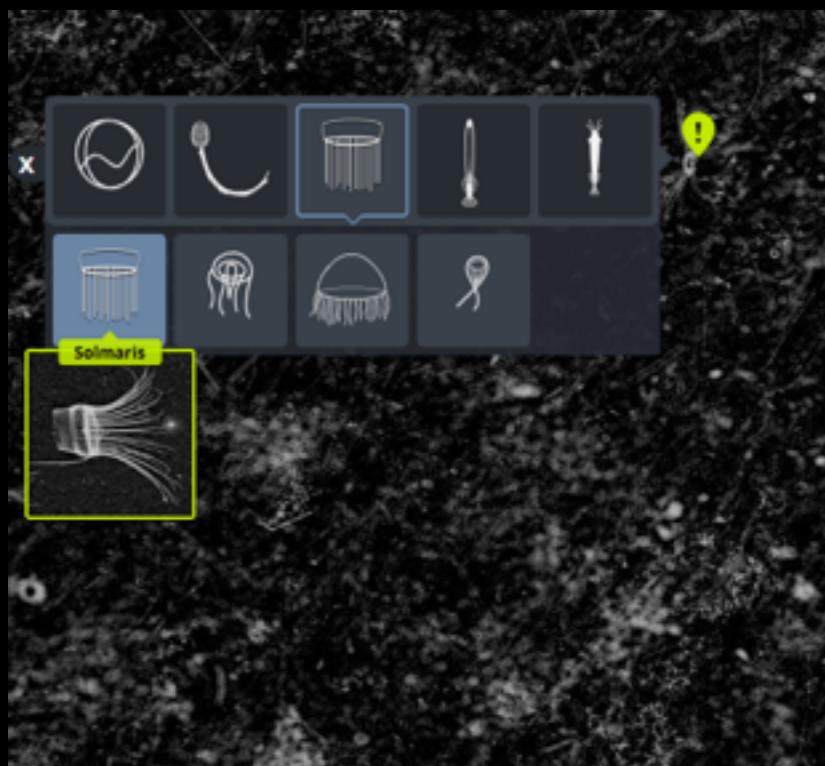


# CROWDCLASS: DESIGNING CLASSIFICATION-BASED CITIZEN SCIENCE LEARNING MODULES

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HCOMP, 10/31/2016





**Classify**

SDSS   Invert   Examples   Restart

Note: Please always classify the galaxy in the center of the image.

**SHAPE**  
Is the galaxy simply smooth and rounded, with no sign of a disk?

Smooth   Features or disk   Star or artifact

Toggle animations

What types of cell shapes (if any) do you see in this image?  
Select the types you can see and click done. If you don't  
see any click none.

Irregular   Tissue   Blood Cells

None

You're not signed in!

Antelope/deer -  q

Solid   Color   Curly   Tail   Build

Wildebeest

**Make a choice**

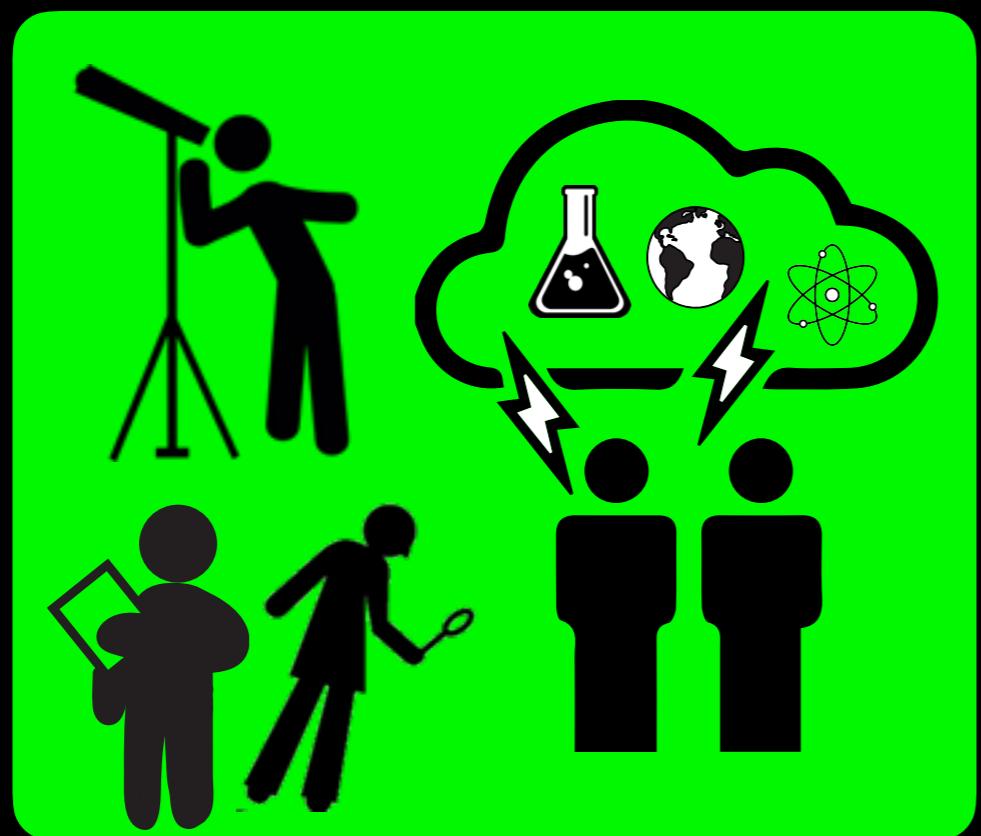
Great, that leaves us with just one option! Let's choose "Wildebeest" it and make sure it's a match.

Nothing here   **Finish**

Tutorial   Clear filters

# Worker Motivation

Citizen Scientist

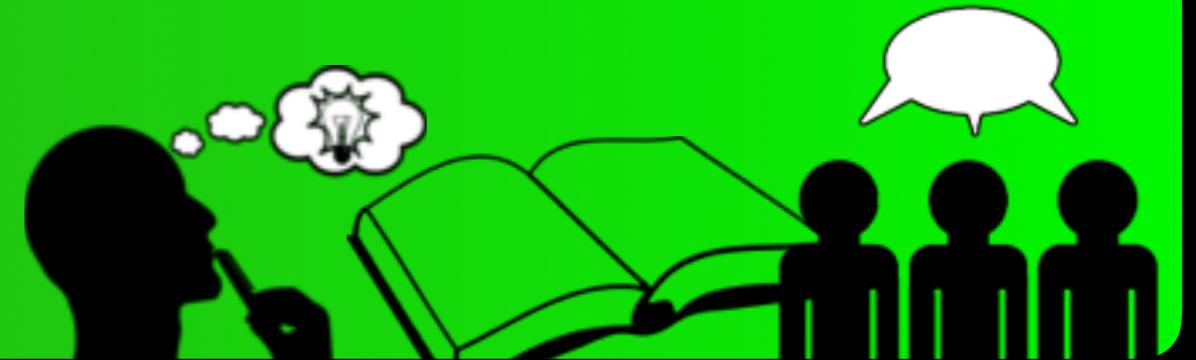


Crowdworker



# Engagement in Citizen Science

Macro-level  
community forum,  
external documentation

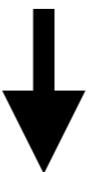


Micro-level  
pattern recognition,  
rule-based learning, workflow

# Classify the objects based on color



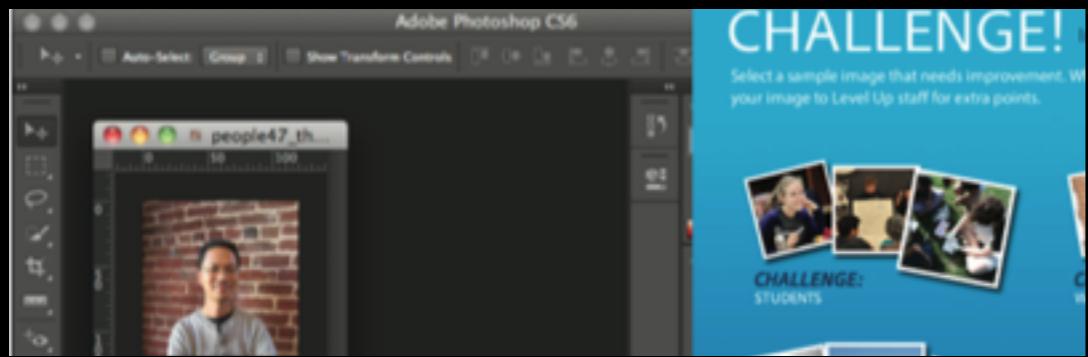
“Carrots contain keratin”



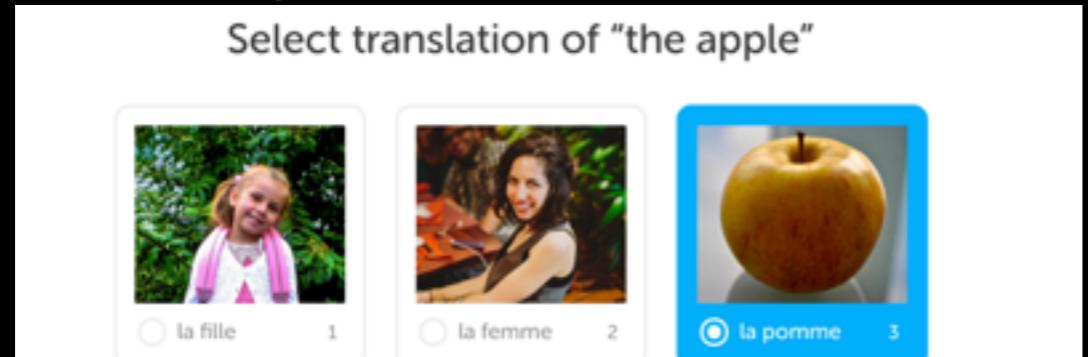
Does this object contain keratin?

# Related Works

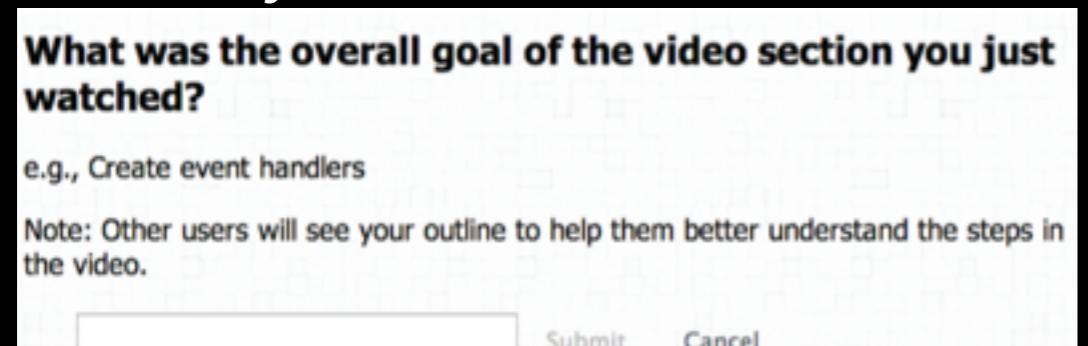
LevelUp [Dontcheva et al, CHI'14]



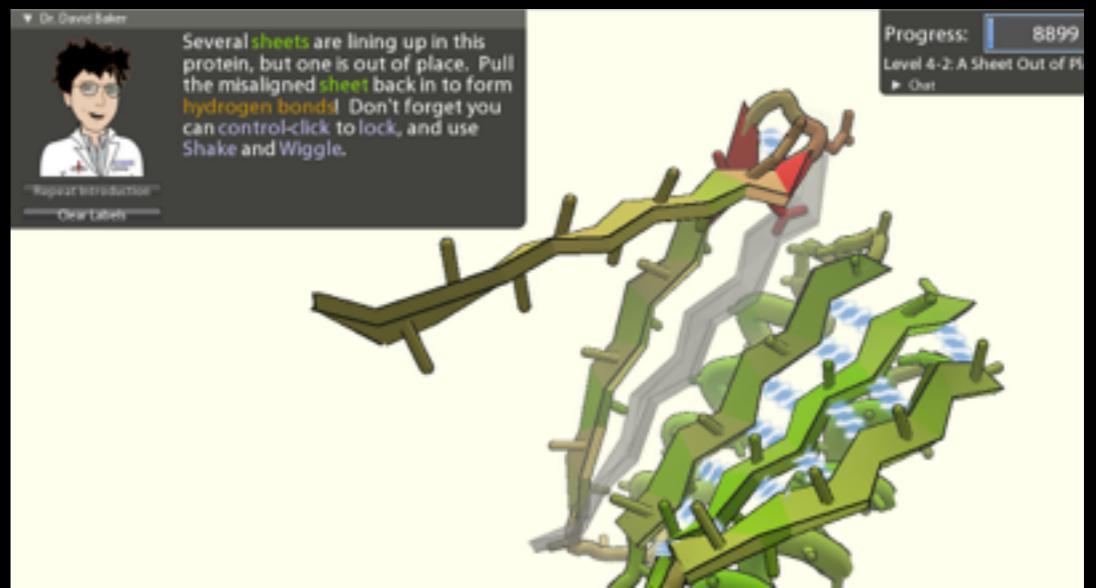
Duolingo [von Ahn, IUI'13]



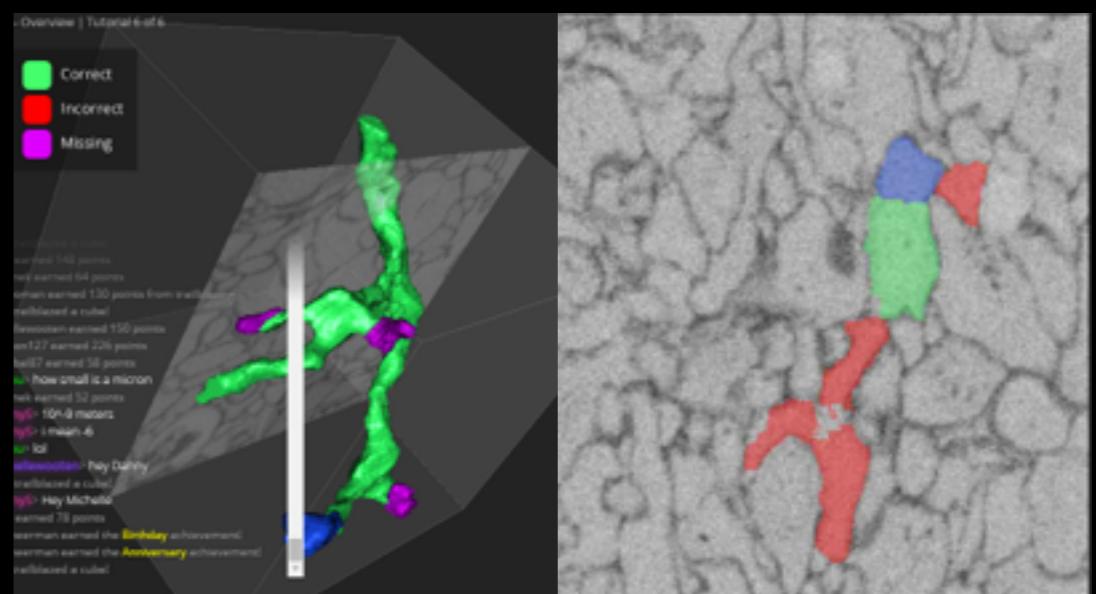
Crowdy [Weir et al, CSCW'15]

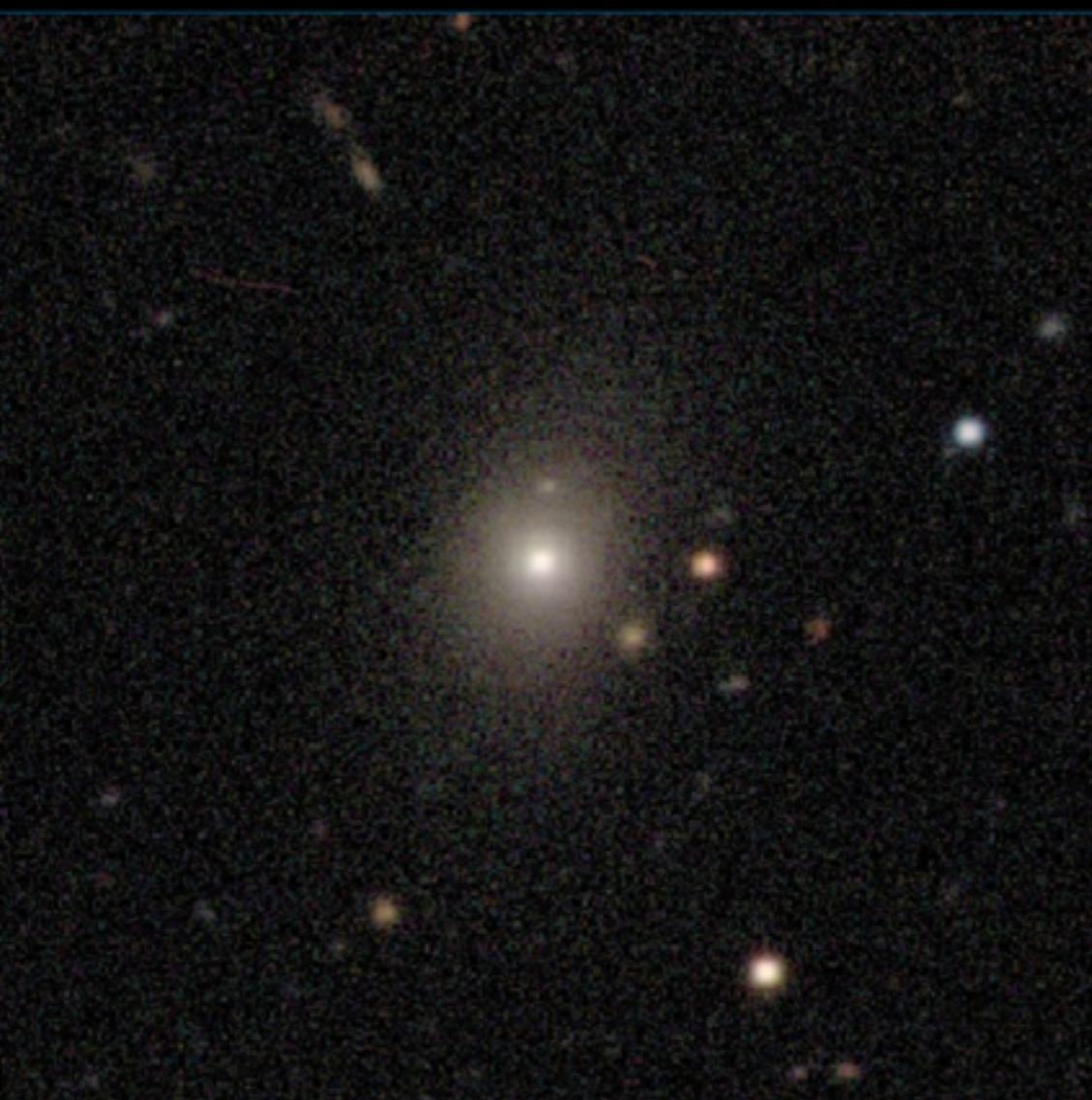


Foldit



Eyewire



[CLASSIFY](#)[STORY](#)[SCIENCE](#)[DISCUSS](#)[PROFILE](#)[LANGUAGE](#)

## Classify



DECALS



Invert

[Examples](#)[Restart](#)

*Note: Please always classify the galaxy in the centre of the image.*

### SHAPE

Is the galaxy simply smooth and rounded, with no sign of a disk?



Smooth

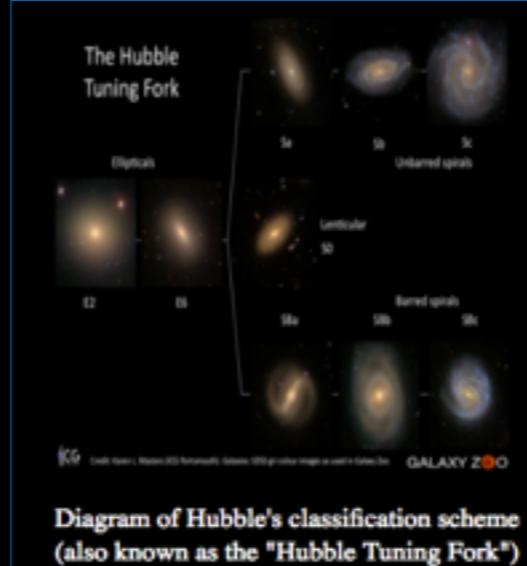


Features or disk



Star or artifact

# Crowdclass Workflow



## Ellipticals

Elliptical galaxies are the most abundant type of galaxy in the universe. But when we actually look up at the night sky, we actually see more spiral galaxies than ellipticals! That's because ellipticals galaxies appear dimmer because of their smooth light profile that exhibits almost no additional features. These elliptical galaxy also contain old, low-mass stellar populations that have very little star formation activity. On the other hand, spiral galaxies contain young bright stars that make them easier to see.

Next



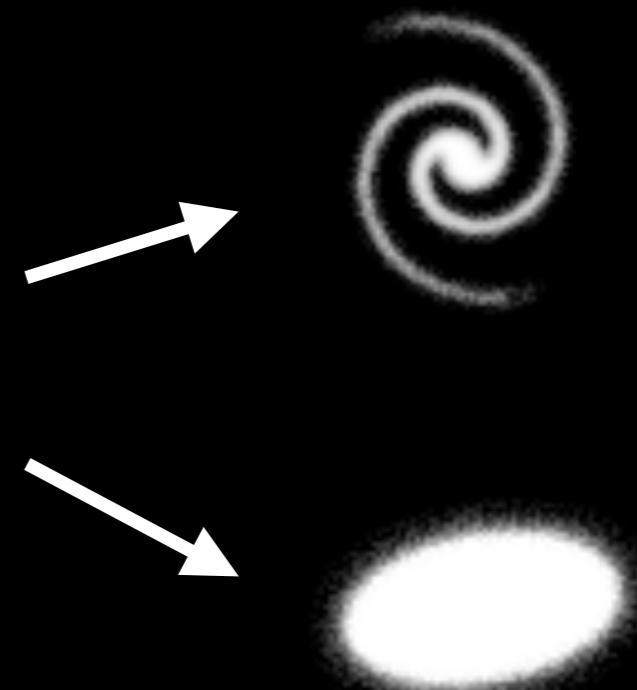
# Classify

Elliptical

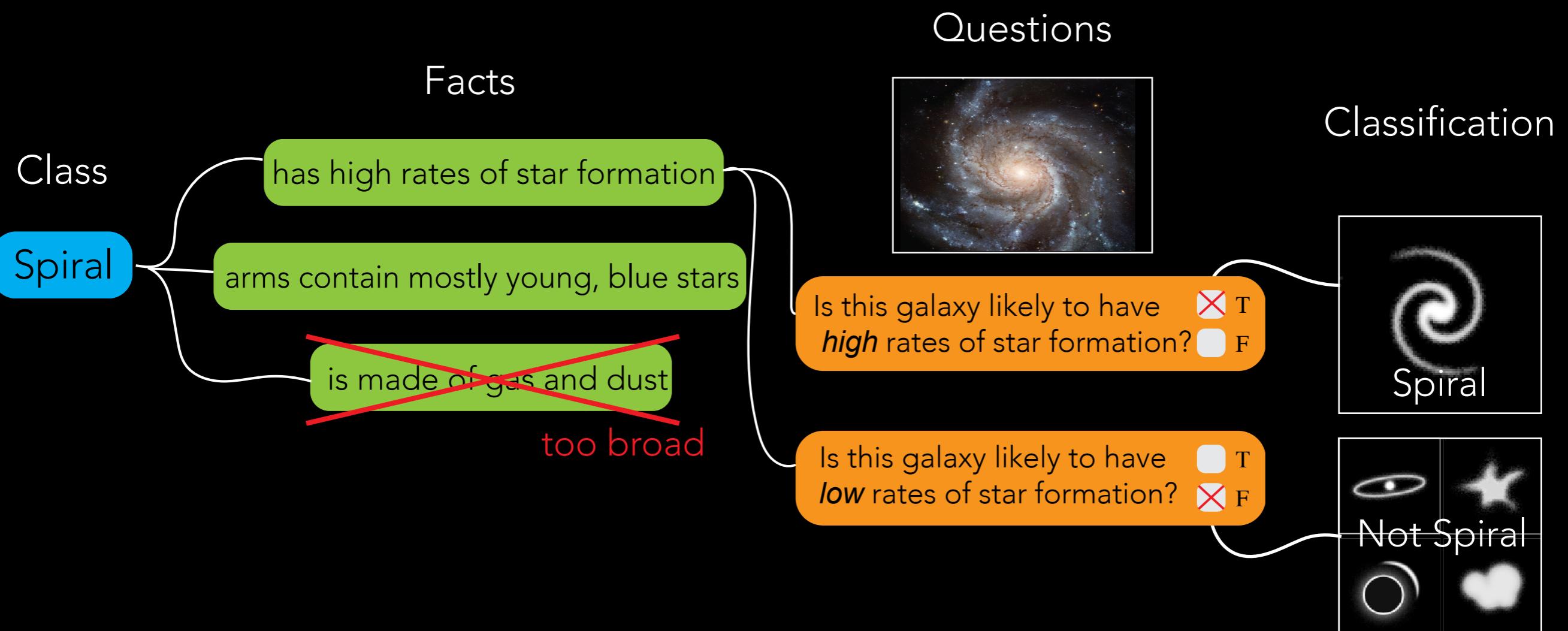
Is this object likely to contain old stellar populations that lack star formation?

Yes

No



# Workflow Generation

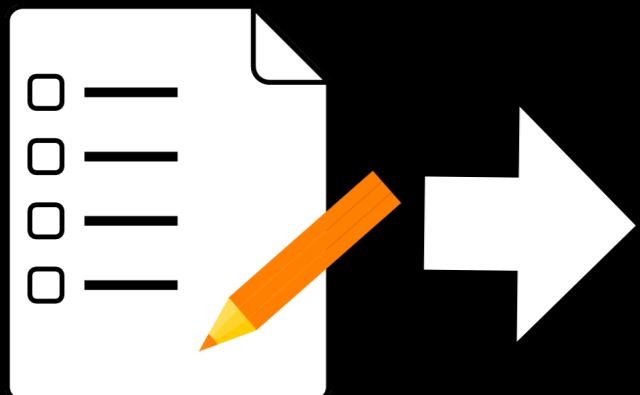


# Experiment

93 AMT participants



Pre-test



The Hubble Tuning Fork

**Hubble's Classification System**

**Spiral Galaxies**

Depending on from what angle you are looking at the spiral galaxy, their shape

**Edge-on v.s. Face-on observations**

In many cases, when galaxies are viewed edge-on, it is hard to visually distinguish whether it is an elliptical or spiral. Unfortunately, since these galaxies are so large and far away from us, it is impossible to re-orient our telescope to view them face-on. Fortunately, astronomers can often infer the properties of these galaxies by doing more detailed studies of these galaxies (from looking at its spectra or observing them at different wavelengths). By using some of relationships between galaxy morphology and their properties that we have learned in this module, we can often get a good sense of whether the galaxy is an elliptical or a spiral galaxy.

Image of NGC 4437, an edge-on spiral galaxy.

Classify

Note: Please always classify the galaxy in the center of the image.

Elliptical

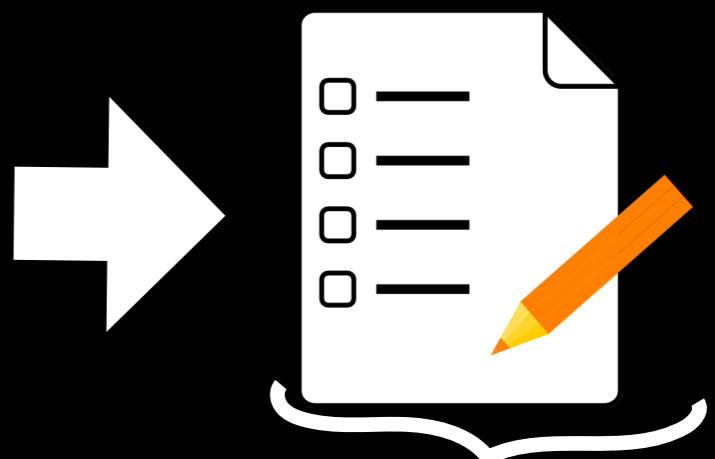
Could this galaxy have lost its structures through collisions with other galaxies?

Yes       No

Restart Examples Hint Invert DECaLS

A screenshot of a web-based application titled "Hubble's Classification System". It features a "Spiral Galaxies" section with text about distinguishing between edge-on and face-on observations. Below this is a "Classify" section for the galaxy NGC 4437, which is described as an edge-on spiral galaxy. The user is asked if the galaxy has lost structures through collisions. Two options are provided: "Yes" (marked with a checkmark) and "No". Navigation buttons like "Restart", "Examples", and "Hint" are visible at the bottom.

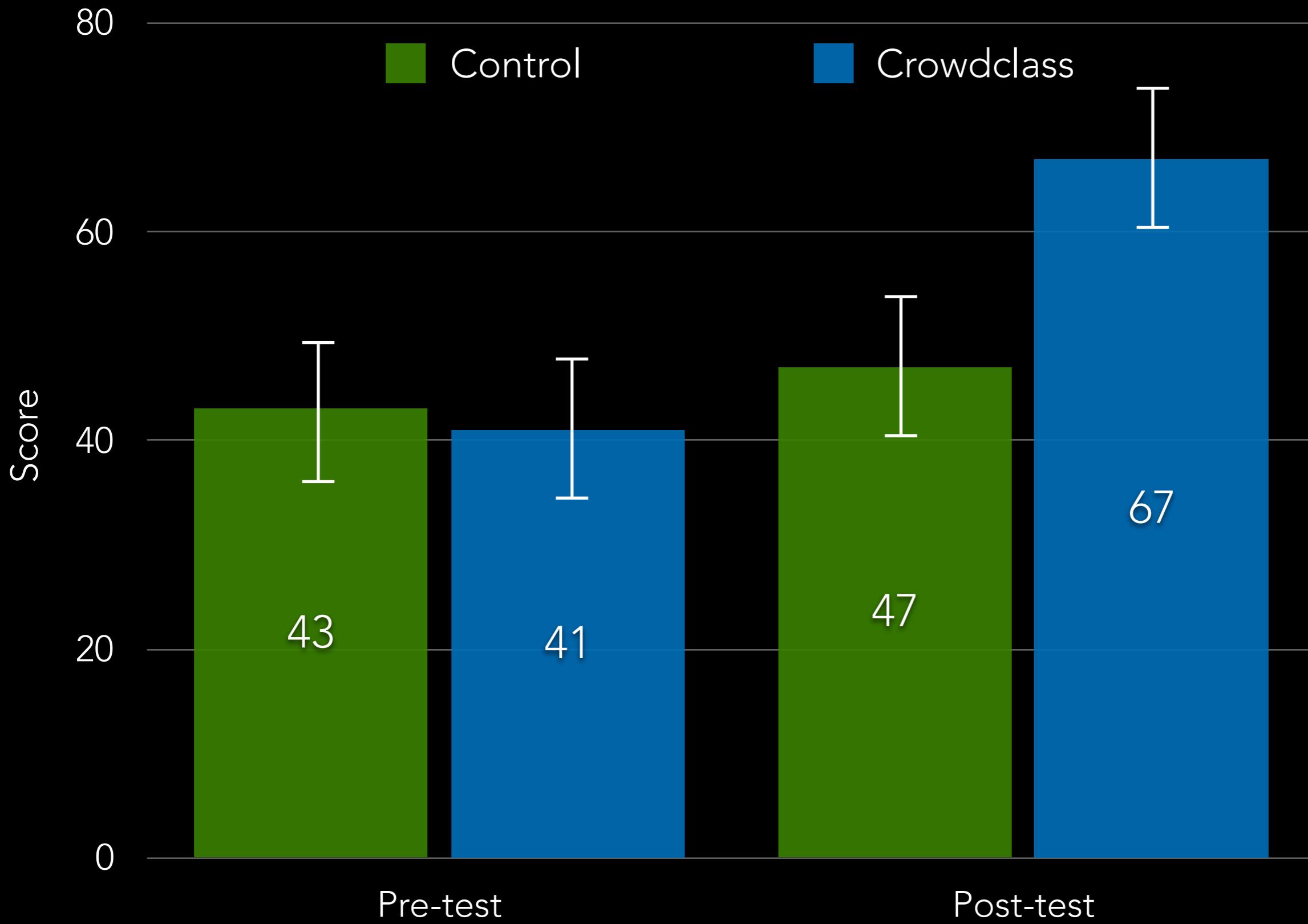
Post-test



Learning Scores

Classification Accuracy

# Learning is effective.



# Envisioned Applications



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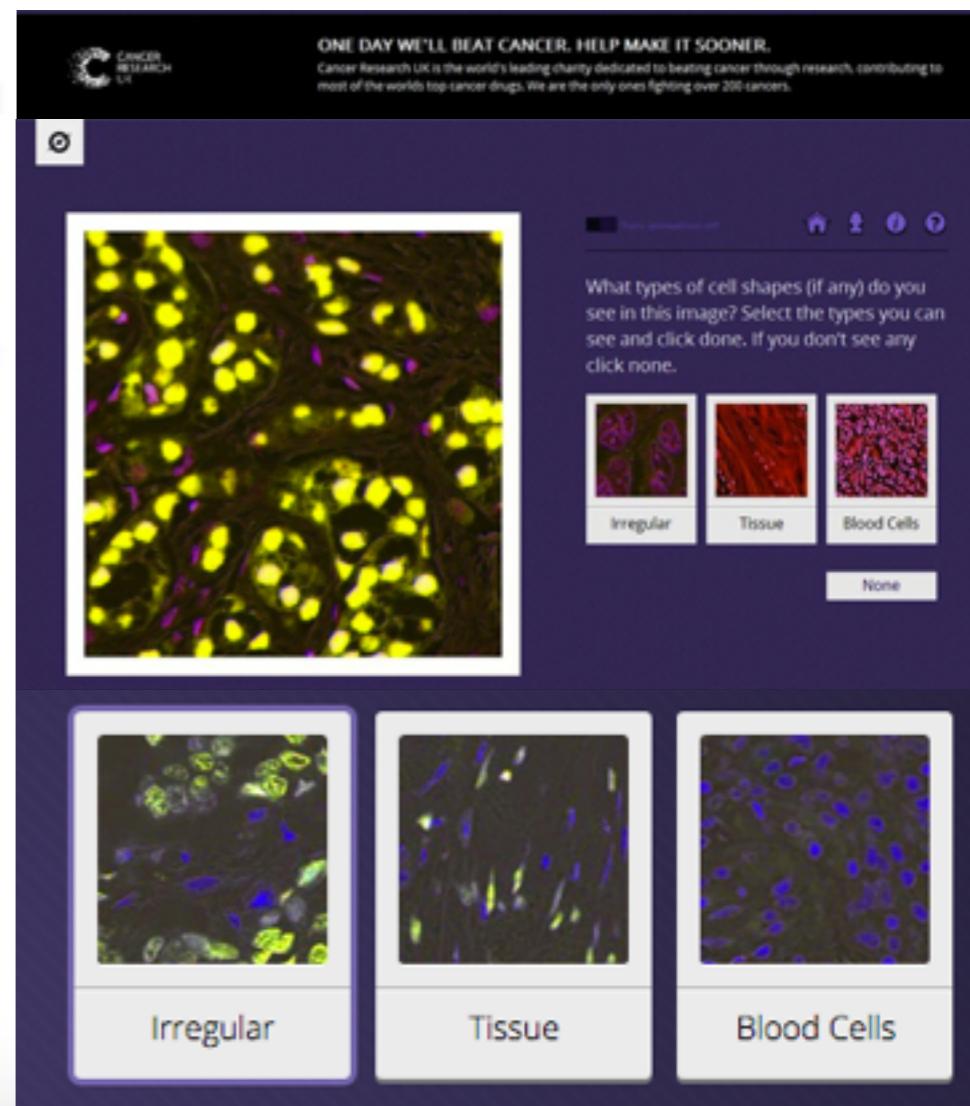
## Cancer

From Wikipedia, the free encyclopedia

*For other uses, see [Cancer \(disambiguation\)](#).*

**Cancer** is a group of diseases involving abnormal **cell growth** with the potential to invade or spread to other parts of the body.<sup>[1][2]</sup> Not all tumors are cancerous; **benign tumors** do not spread to other parts of the body.<sup>[2]</sup> Possible **signs and symptoms** include a lump, abnormal bleeding, prolonged cough, unexplained **weight loss** and a change in **bowel movements**.<sup>[3]</sup> While these symptoms may indicate cancer, they may have other causes.<sup>[3]</sup> Over 100 cancers affect humans.<sup>[2]</sup>

**Tobacco** use is the cause of about 22% of cancer deaths.<sup>[1]</sup> Another 10% is due to **obesity**, poor **diet**, **lack of physical activity** and drinking **alcohol**.<sup>[1][4]</sup> Other factors include certain **infections**, exposure to **ionizing radiation** and environmental pollutants.<sup>[5]</sup> In the **developing world** nearly 90% of cancers are due to infections.



ONE DAY WE'LL BEAT CANCER. HELP MAKE IT SOONER.  
Cancer Research UK is the world's leading charity dedicated to beating cancer through research, contributing to most of the world's top cancer drugs. We are the only ones fighting over 200 cancers.

What types of cell shapes (if any) do you see in this image? Select the types you can see and click done. If you don't see any click none.

Irregular Tissue Blood Cells None

Irregular Tissue Blood Cells

# Summary

- Content learning within microtasks is important.
- Crowdclass: classification + learning quiz
- Future directions: longitudinal study, feedback

THANK YOU!

CROWDCLASS: DESIGNING  
CLASSIFICATION-BASED  
CITIZEN SCIENCE LEARNING MODULES

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HYBRID ECOLOGIES LAB