

Past, Present and Future of Online Citizen Science

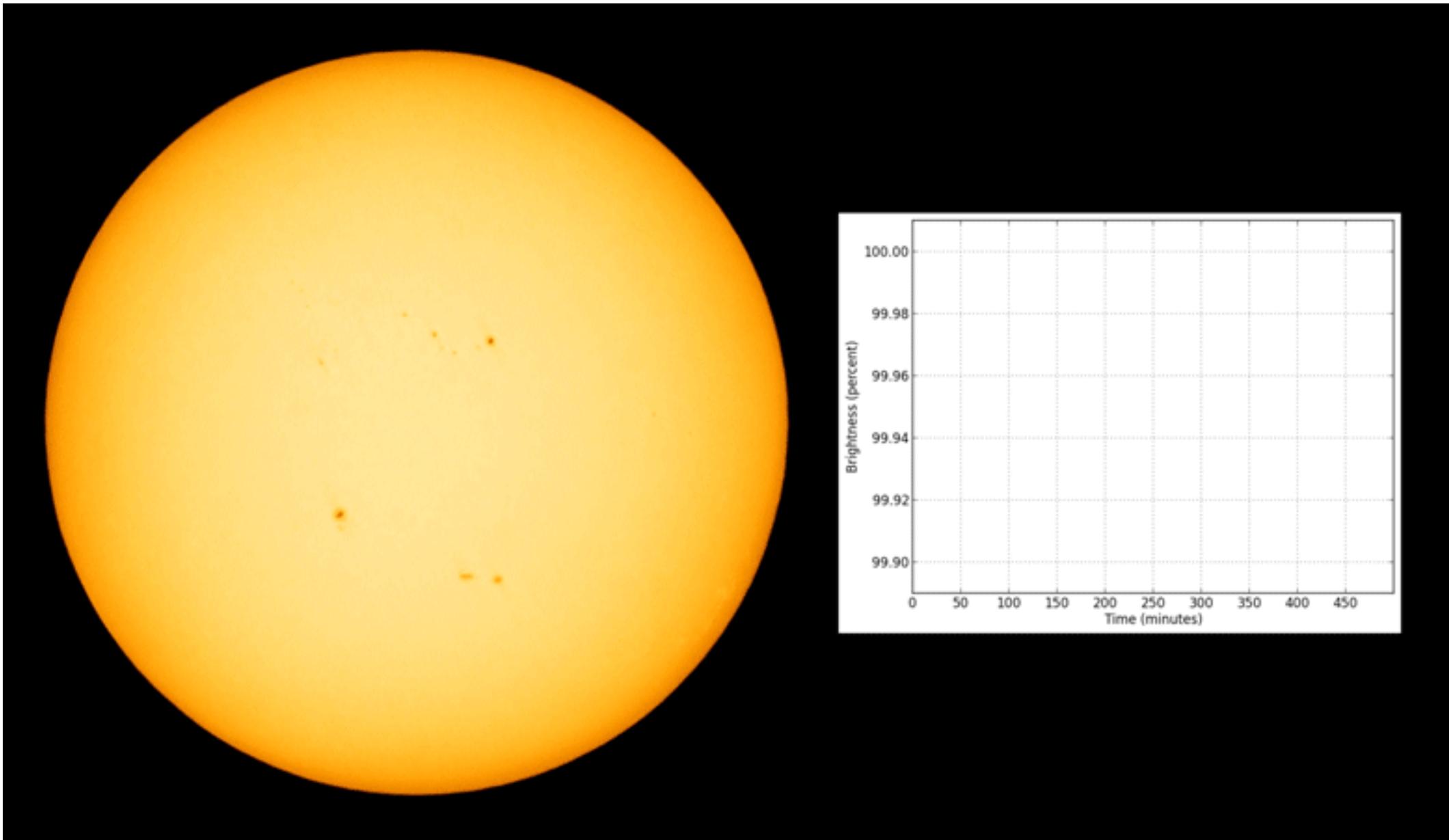
A View from the Zooniverse



Chris Lintott
University of Oxford



UNIVERSITY OF
OXFORD



Credit : James Gilbert

Planet Hunters TESS — Zooniverse

<https://www.zooniverse.org/projects/nora-dot-eisner/planet-hunter-tess>

PROJECTS ABOUT GET INVOLVED TALK BUILD A PROJECT NEWS NOTIFICATIONS MESSAGE

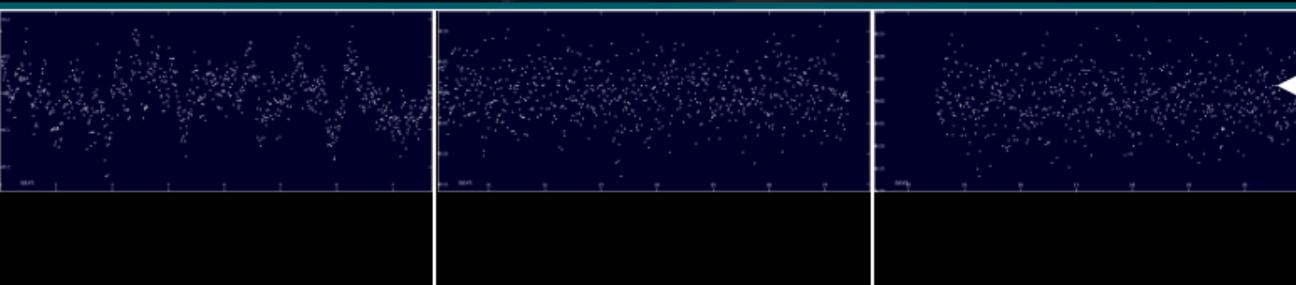


Planet Hunters TESS

ABOUT CLASSIFY TALK COLLECT RECENTS LAB

Join the Search for Undiscovered Worlds

Learn more Get started

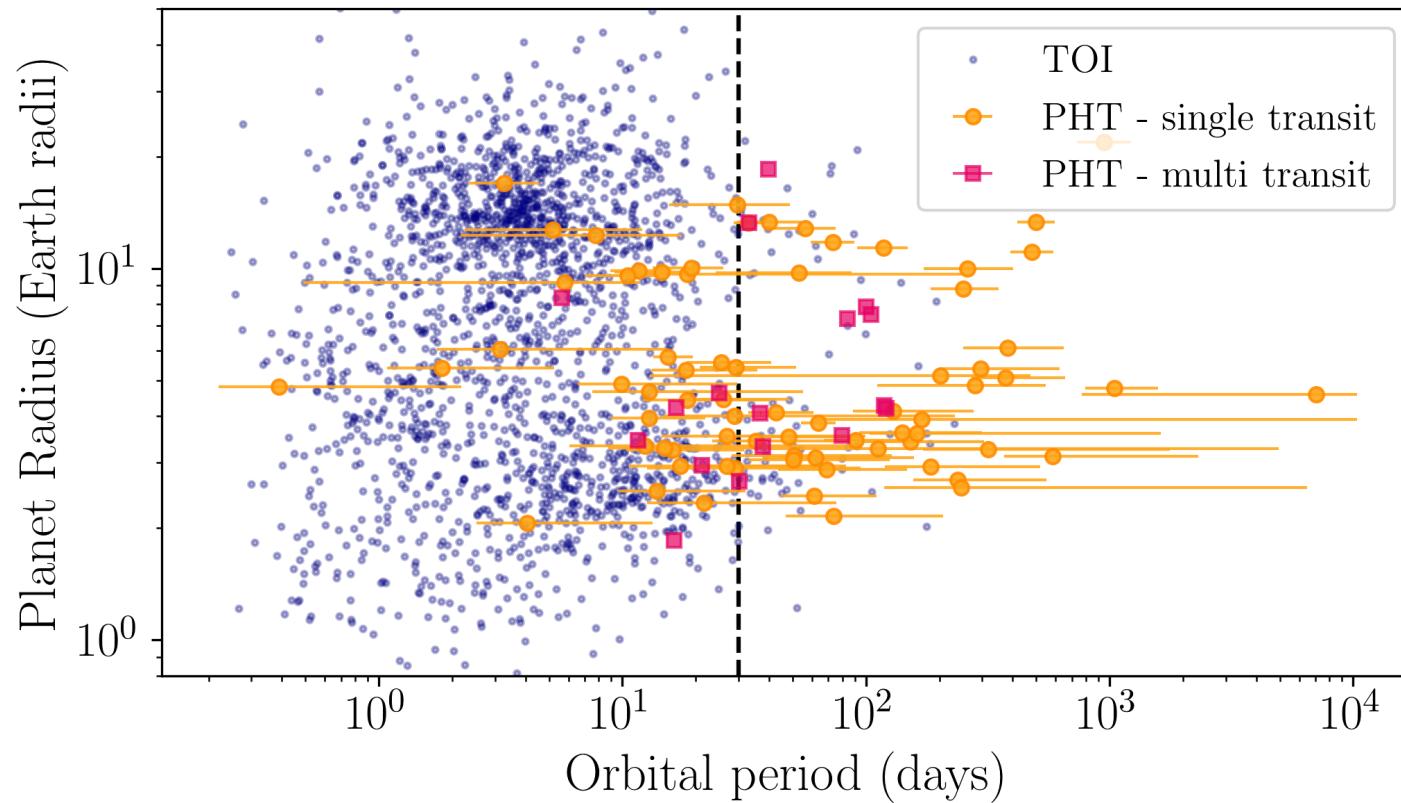


80 people are talking about Planet Hunters TESS right now.

Join in

PLANET HUNTERS TESS STATISTICS

First two years of PHT

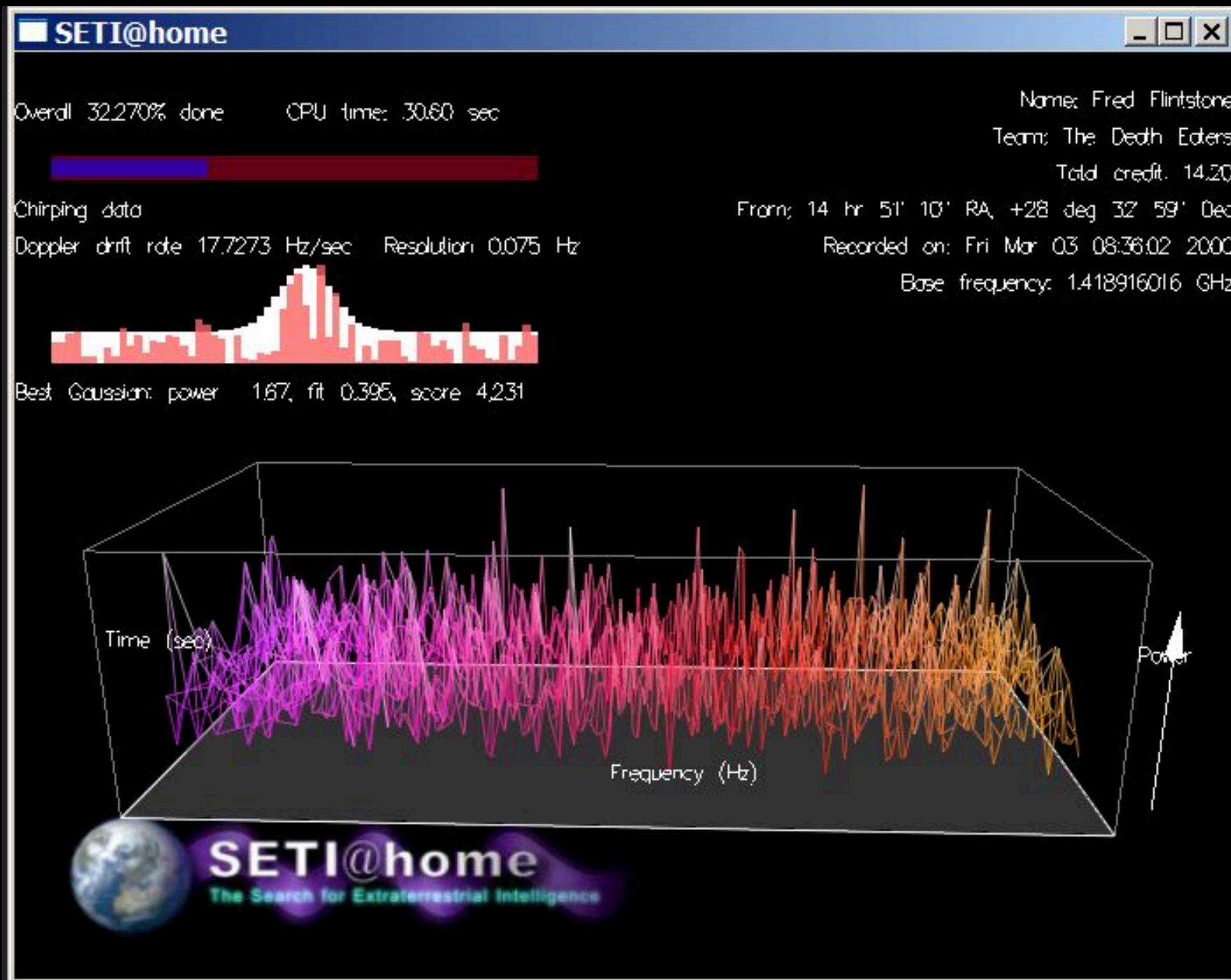




Schwamb et al arXiv:1210.3612



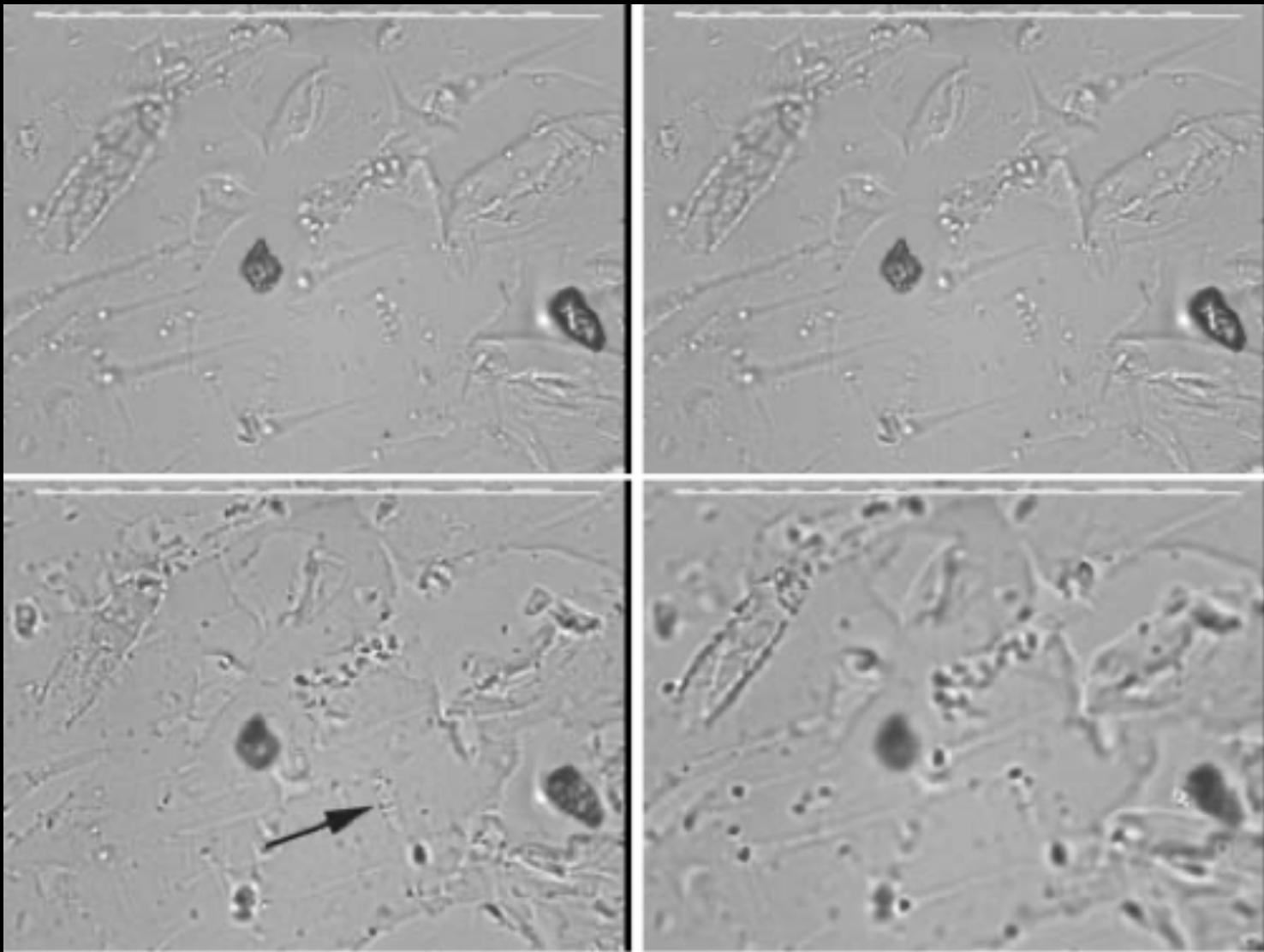
UNIVERSITY OF
OXFORD





UNIVERSITY OF
OXFORD

Stardust@home



Westphal et al, LPI 2005



GALAXY ZOO.org

[Welcome](#)[Home](#)[The Science](#)[How to Take Part](#)[Galaxy Analysis](#)[Forum](#)[Press & News](#)[FAQ](#)[Links](#)[Contact Us](#)[Login](#)[Register](#)[Galaxy Tutorial](#)[Galaxy Analysis](#)

Galaxy Analysis

Welcome to Galaxy Zoo's view of the Universe. If you're here you should already have seen the [Tutorial](#), but feel free to go and remind yourself. There's no need to agonise for too long over any one image, just make your best guess in each case.



Show Grid Overlay on the next Image

Galaxy Ref:
588010880371851294

Choose the Galaxy Profile by clicking the buttons below

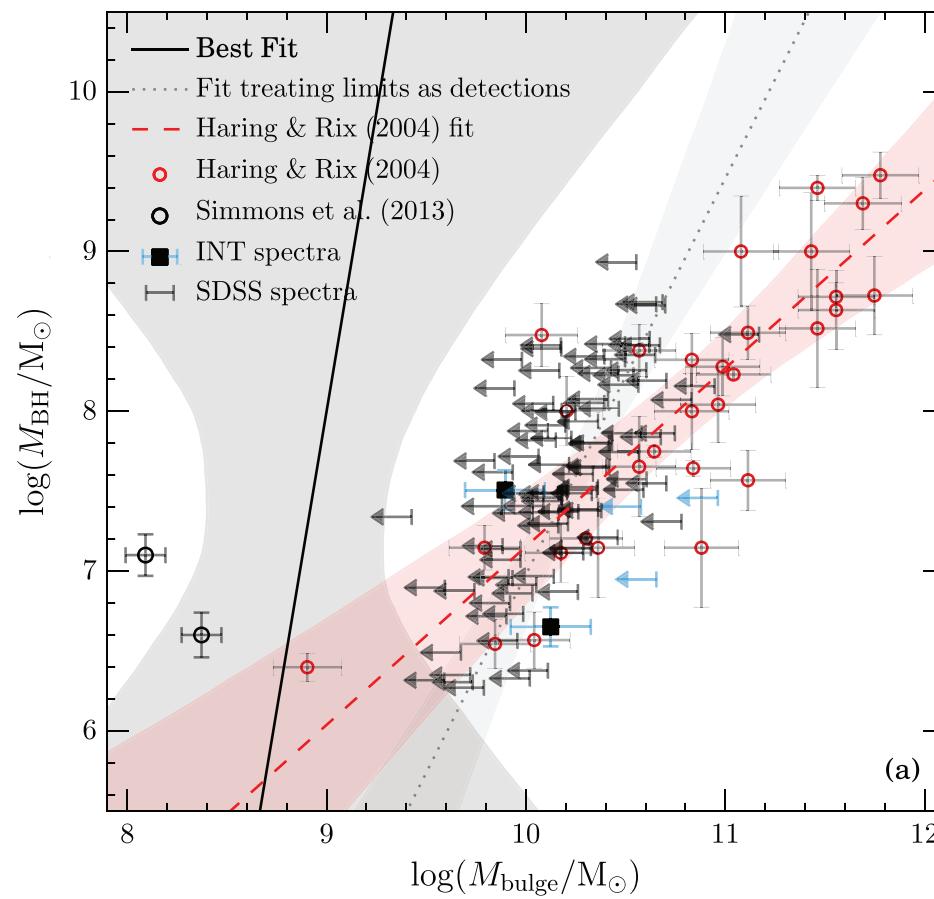




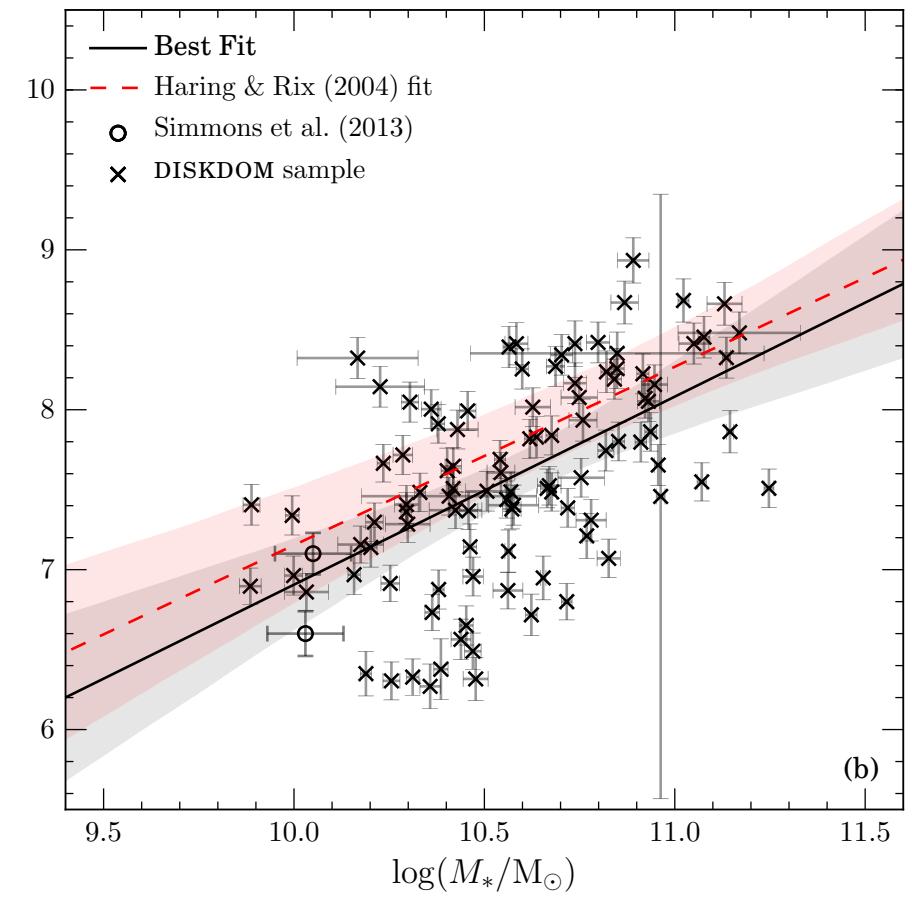
UNIVERSITY OF
OXFORD



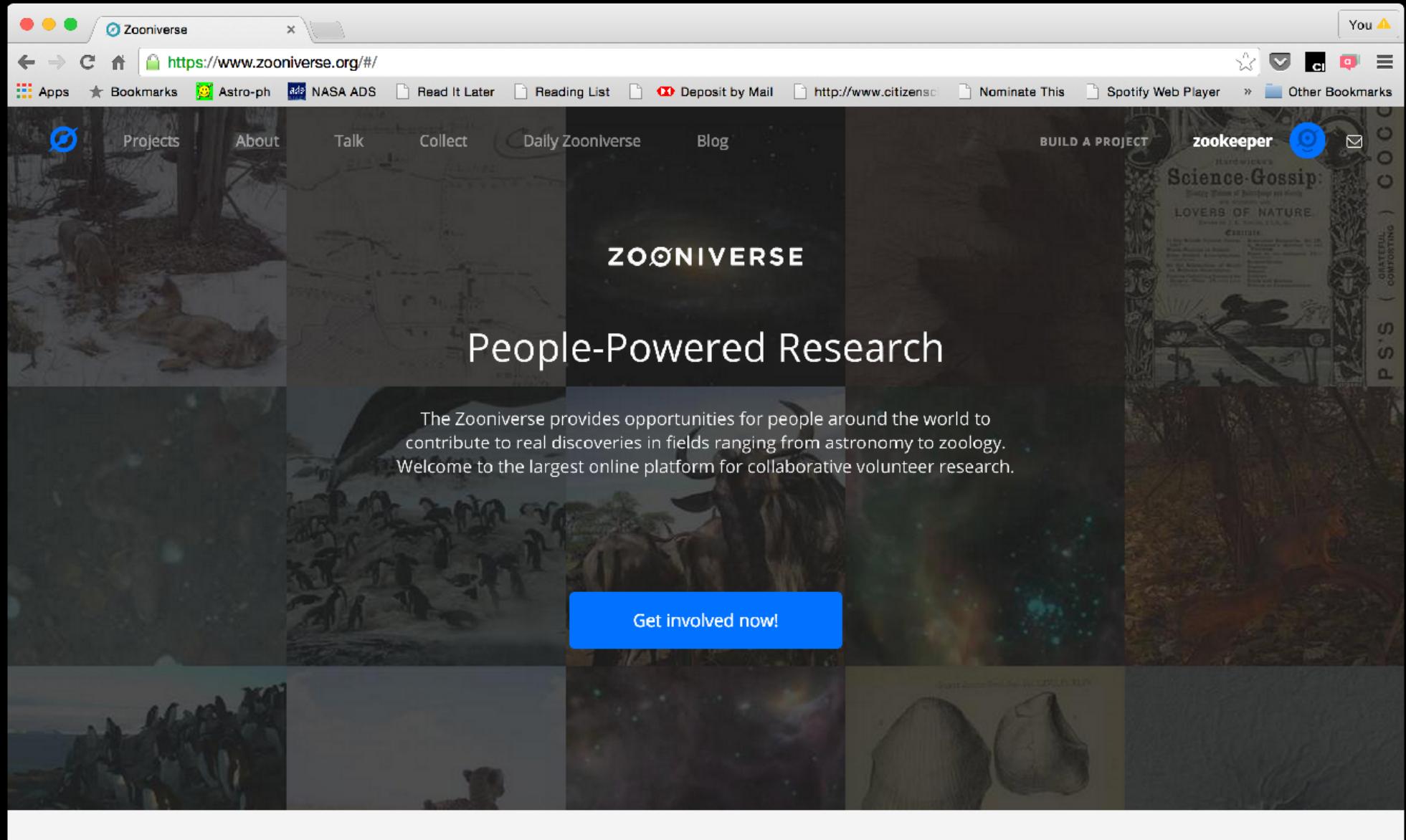
Simmons, Smethurst, Lintott
(arXiv: 1705.10793)



(a)



(b)



The screenshot shows the Zooniverse homepage as it would appear in a web browser. The URL in the address bar is <https://www.zooniverse.org/#/>. The browser's toolbar includes standard icons for back, forward, search, and refresh, along with links to various bookmarks and extensions.

The main content area features a collage of images from different Zooniverse projects, including a close-up of a cat, a map, a whale, a group of animals, a galaxy, and some shells. Overlaid on this collage is the Zooniverse logo ("ZOO(NIVERSE)") and the tagline "People-Powered Research". A blue button in the center of the collage says "Get involved now!". To the right of the main content, there's a sidebar with a "BUILD A PROJECT" section, a "zookeeper" profile icon, and a "Science-Gossip" section featuring a historical book cover.

ZOO(NIVERSE)

People-Powered Research

The Zooniverse provides opportunities for people around the world to contribute to real discoveries in fields ranging from astronomy to zoology. Welcome to the largest online platform for collaborative volunteer research.

Get involved now!

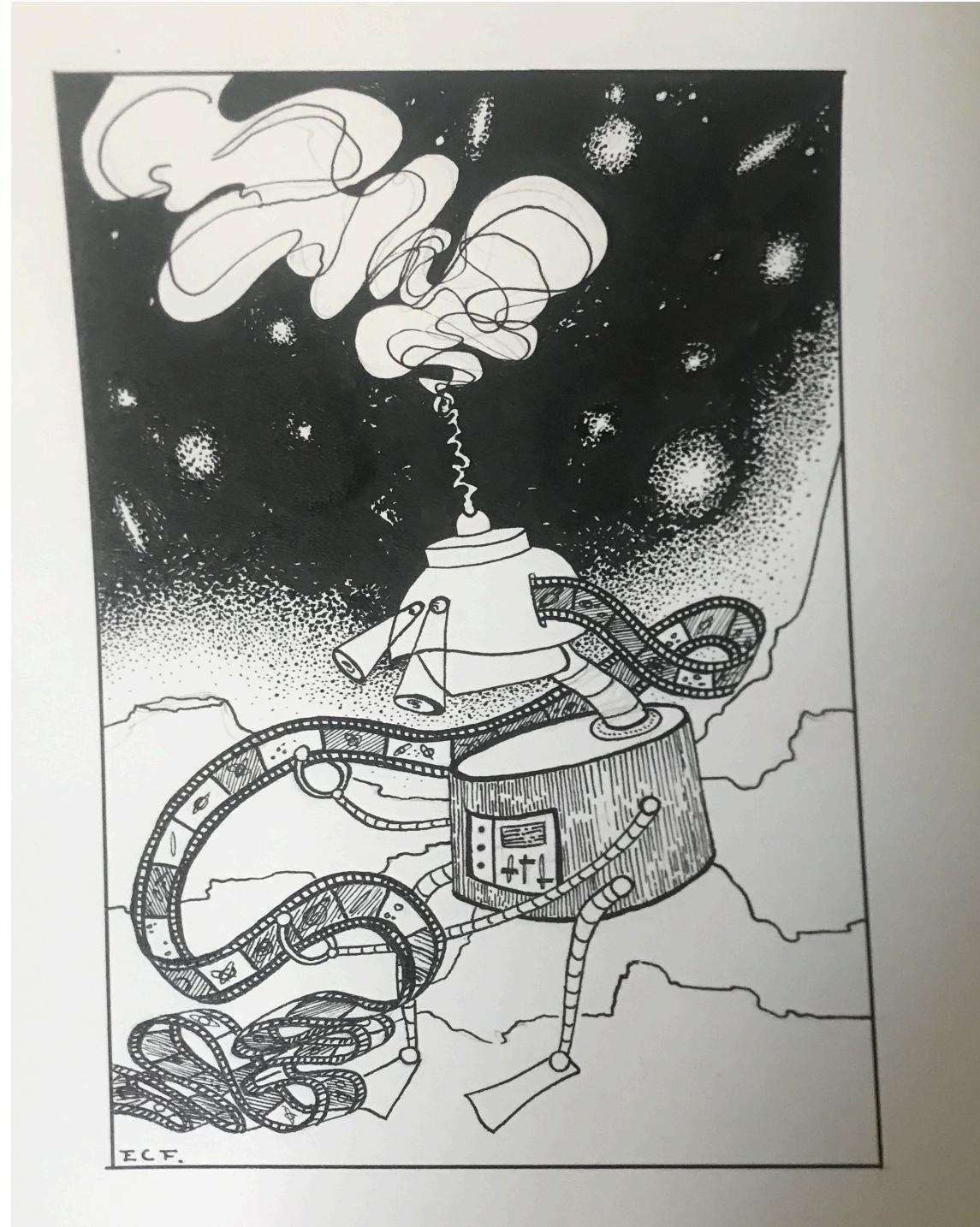
The screenshot shows the Zooniverse Lab interface for editing workflows. On the left, a sidebar lists project details, science case, results, FAQ, education, and collaborators. Under workflows, 'Start searching' is selected. Below it are 'Tell the time', 'New workflow', 'Untitled subject set', 'Just a few', 'New subject set', and 'Delete this project'. The main area has tabs for 'PROJECT #2', 'WORKFLOW TITLE', 'MAIN TEXT', 'HELP TEXT', 'TASKS', 'CHOICES', and 'ASSOCIATED SUBJECT SETS'. The 'WORKFLOW TITLE' tab shows 'Start searching' and 'Version 6687.6693'. The 'MAIN TEXT' tab contains the question 'What is wrong with the candidate?'. The 'TASKS' tab lists several questions, with the fifth one, 'What is wrong with the candidate?', highlighted in blue. The 'CHOICES' tab shows four options: 'Not circular - too small', 'Not circular - elongated', 'Not circular - distorted', and 'Not circular - diffuse', each associated with a 'Next task' entry '(End of classification!)'. The 'ASSOCIATED SUBJECT SETS' section notes that assigning subject sets doesn't work as expected right now.

github.com/zooniverse/panoptes

github.com/zooniverse/panoptes-front-end



UNIVERSITY OF
OXFORD



Zoobot by Emily Carrington Freeman
emilycarringtonfreeman.com



Planet Hunters TESS II: findings from... title:"Stardust@home" - NASA/ADS Galaxy Zoo: reproducing galaxy morph... https://watermark.silverchair.com/mn... SETI@home graphics Candidate Identification and Interfer...

Monthly Notices
of the
ROYAL ASTRONOMICAL SOCIETY

Mon. Not. R. Astron. Soc. **406**, 342–353 (2010) doi:10.1111/j.1365-2966.2010.16713.x

Galaxy Zoo: reproducing galaxy morphologies via machine learning*

Manda Banerji,^{1,2†} Ofer Lahav,¹ Chris J. Lintott,³ Filipe B. Abdalla,¹ Kevin Schawinski,^{4,5‡} Steven P. Bamford,⁶ Dan Andreescu,⁷ Phil Murray,⁸ M. Jordan Raddick,⁹ Anze Slosar,¹⁰ Alex Szalay,⁹ Daniel Thomas¹¹ and Jan Vandenberg⁹

We conclude that it is promising to use machine-learning algorithms to perform morphological classification for the next generation of wide-field imaging surveys and that the Galaxy Zoo catalogue provides an invaluable training set for such purposes.

Rotation-invariant convolutional neural networks for galaxy morphology prediction

Sander Dieleman¹*, Kyle W. Willett²* and Joni Dambre¹

¹*Electronics and Information Systems department, Ghent University, Sint-Pietersnieuwstraat 41, 9000 Ghent, Belgium*

²*School of Physics and Astronomy, University of Minnesota, 116 Church St SE, Minneapolis, MN 55455, USA*

For images with high agreement among the Galaxy Zoo participants, our model is able to reproduce their consensus with near-perfect accuracy (>99 per cent) for most questions. Confident model predictions are highly accurate, which makes the model suitable for filtering large collections of images and forwarding challenging images to experts for manual annotation. **This approach greatly reduces the experts' workload without affecting accuracy.**

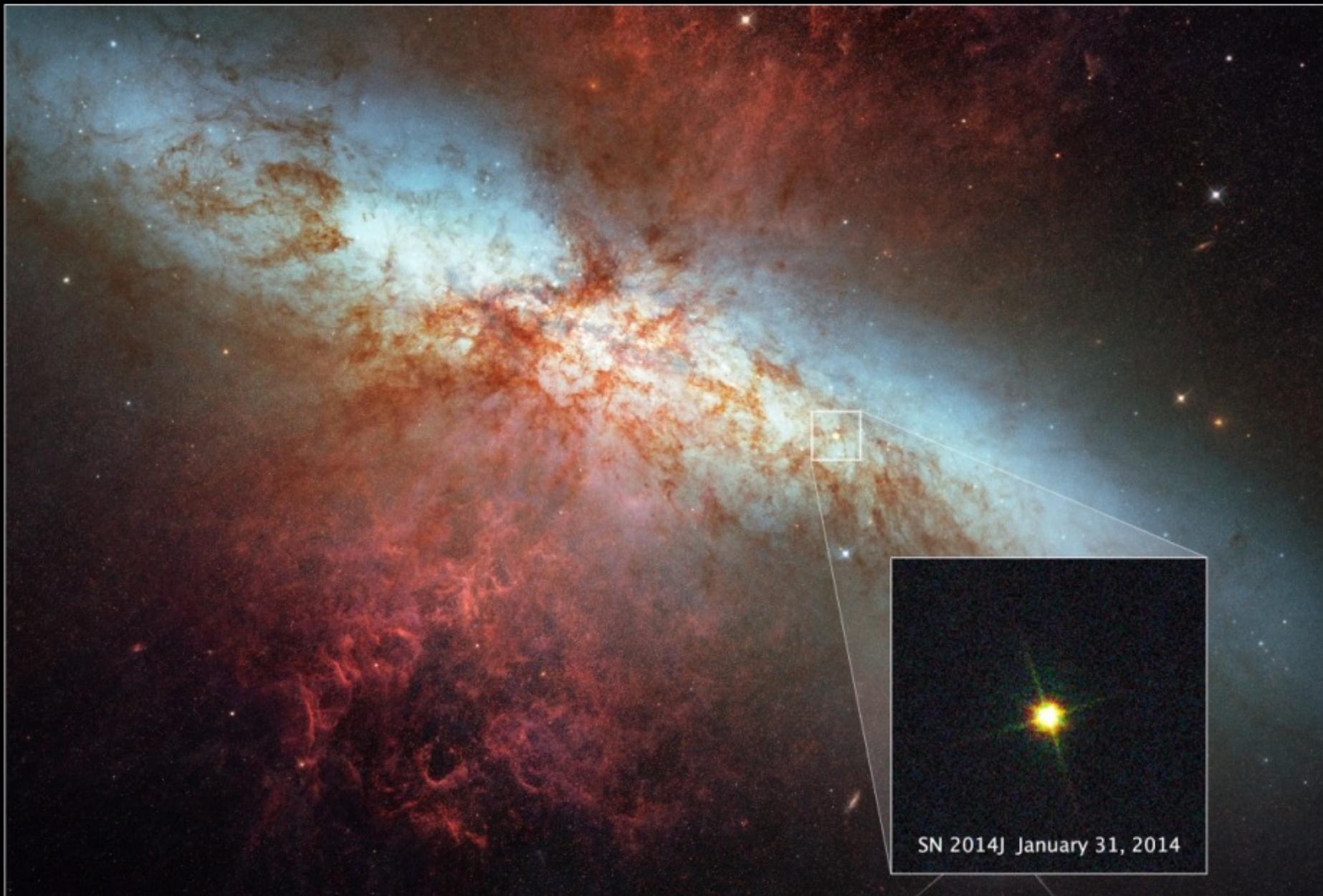


UNIVERSITY OF
OXFORD

CITIZEN SCIENCE ALLIANCE

Supernova 2014J in Galaxy M82

HST ■ WFC3/UVIS ■ ACS/WFC





TweetDeck Zooniverse | The Zooniverse Crowdsourced science: sociot Supernova Hunters — Zoonive Chris

Secure <https://www.zooniverse.org/projects/dwright04/supernova-hunters>

Apps Bookmarks Astro-ph NASA ADS Read It Later Coffee Rota Reading List <http://www.citizen...> Nominate This Timesify Other Bookmarks

SUPERNOVA HUNTERS ABOUT CLASSIFY TALK COLLECT PAN-STARRS1

zookeeper

Great work! Looks like this project is out of data at the moment!
[See the results](#) or [dismiss this message](#)

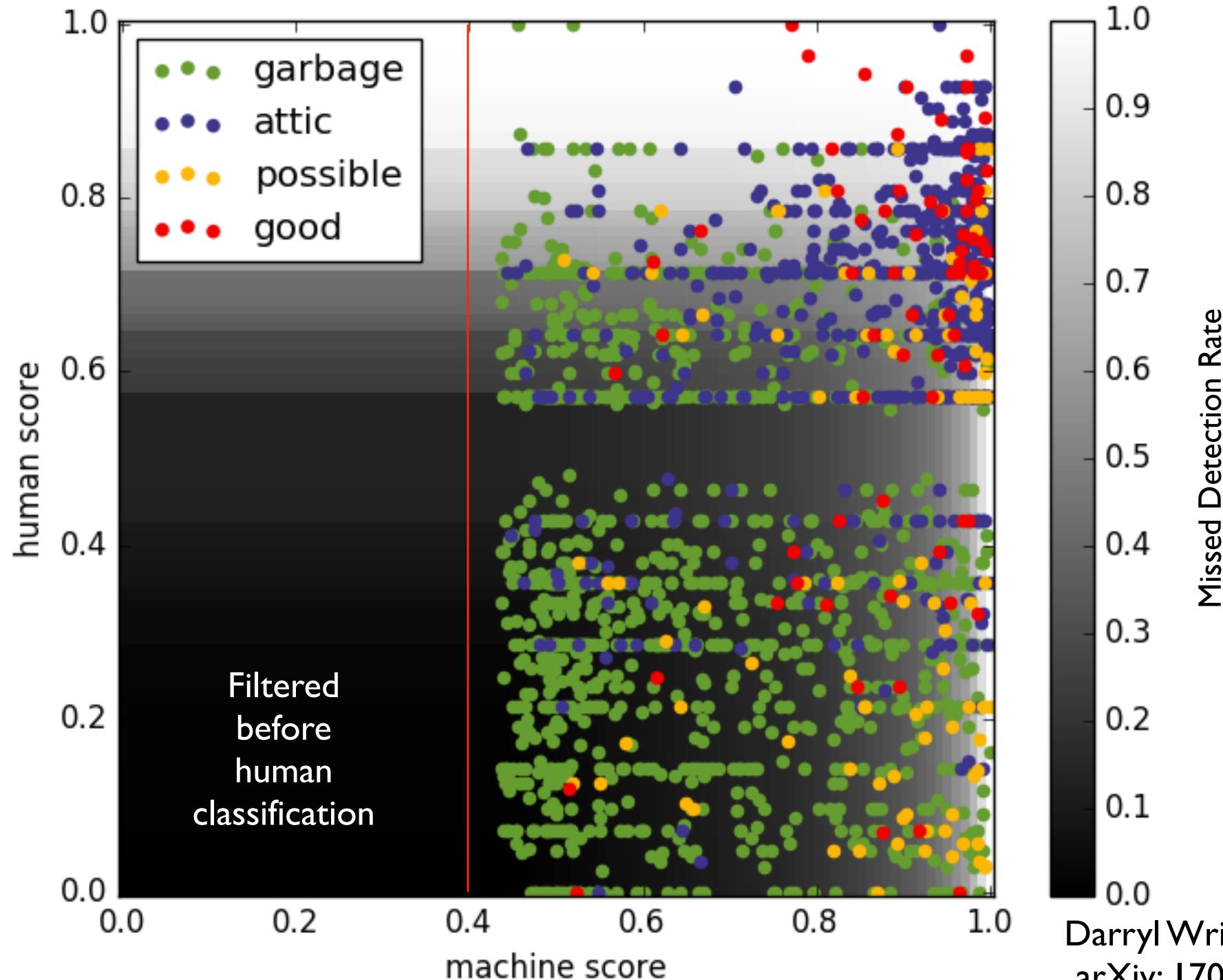
Help discover supernovae from Pan-STARRS1.

Learn more Get started

untitled (1).png

Show All

Pan-STARRS Supernovae



Darryl Wright et al.
arXiv: 1707.05223



Process Selected Images

You have selected 6 images to process. You have a choice to...

Export to CSV

Export

Move Subjects

Specify which subject set to move to:

97602

or, choose from:

97602 - Polar bears with 10 or more votes

Move

Retire Subjects

Specify which workflow to retire from:

19409

or, choose from:

19409 - measuring bears

Retire

Previous

Next



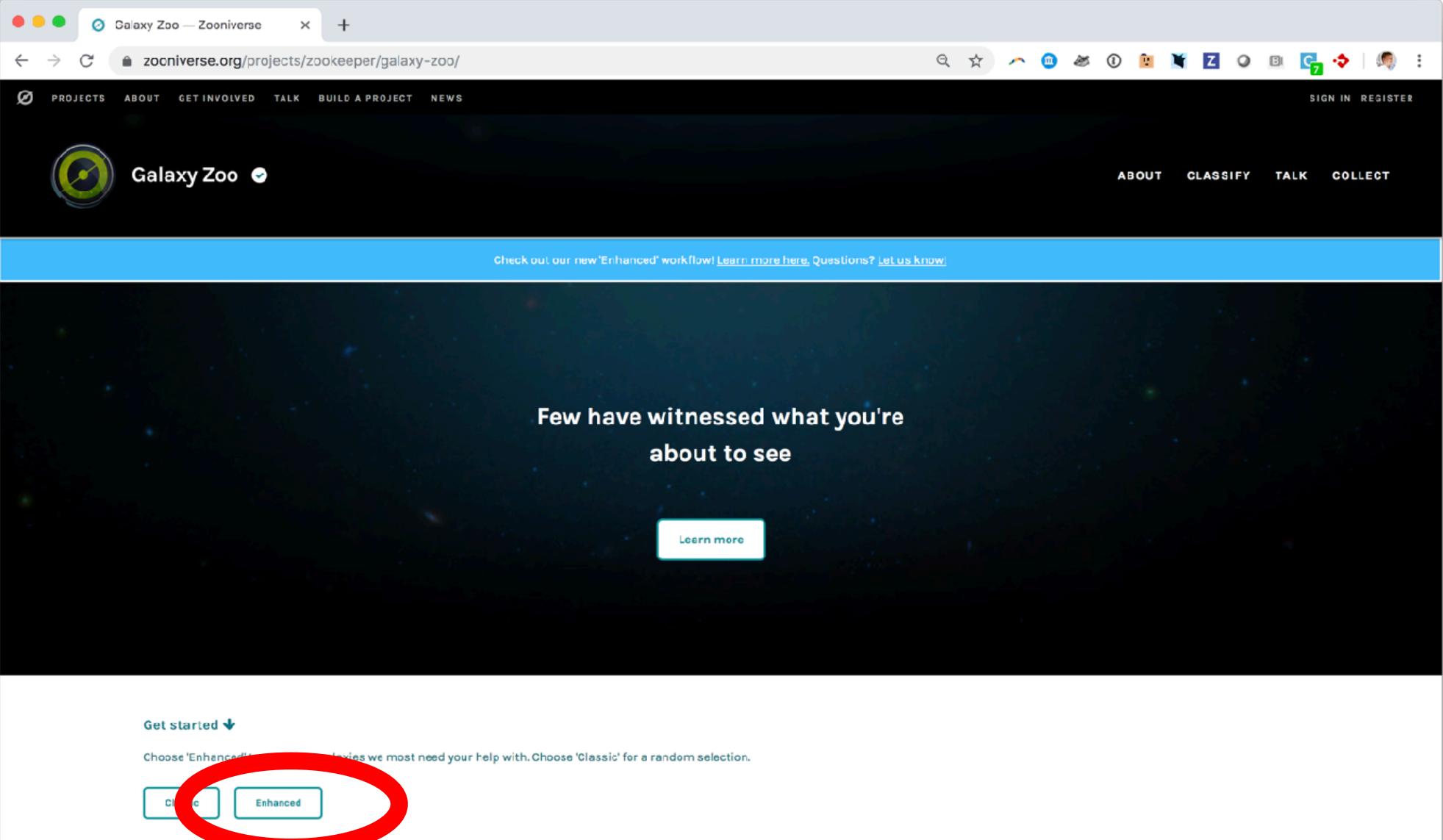
Transcribe the line of text that you've marked.

Hamilton & Harper now in my posession. in the

Hamilton & Harpir now in my pasession. in the

On the right side of the interface, there is a vertical toolbar with icons for search, refresh, and other functions. At the top right, there are tabs for "TASK" and "TUTORIAL". The "TASK" tab is active, showing the instruction: "Draw a line to start transcribing a line of text!" Below this, it says "T Single line of text 5 drawn". Underneath, it asks "Have all the volunteer-made underline marks turned grey?", with "Yes" and "No" options. At the bottom right, there are buttons for "Done & Talk" and "Done".

2020 Digital Extension Grant from the American Council of Learned Societies
 PI: Sam Blickhan, Adler Planetarium (samantha@zooniverse.org)
 Adler Planetarium, Chicago & University of Minnesota



Galaxy Zoo — Zooniverse

zooniverse.org/projects/zookeeper/galaxy-zoo/

PROJECTS ABOUT GET INVOLVED TALK BUILD A PROJECT NEWS SIGN IN REGISTER

Galaxy Zoo

ABOUT CLASSIFY TALK COLLECT

Check out our new 'Enhanced' workflow! [Learn more here.](#) Questions? [Let us know!](#)

Few have witnessed what you're about to see

Learn more

Get started ↓

Choose 'Enhanced' if you'd like to help with the most interesting galaxies we most need your help with. Choose 'Classic' for a random selection.

Classic Enhanced

Walmsley et al., arxiv: 1905.07424
Walmsley et al., arxiv: 2102.08414

Galaxy Zoo
Labels



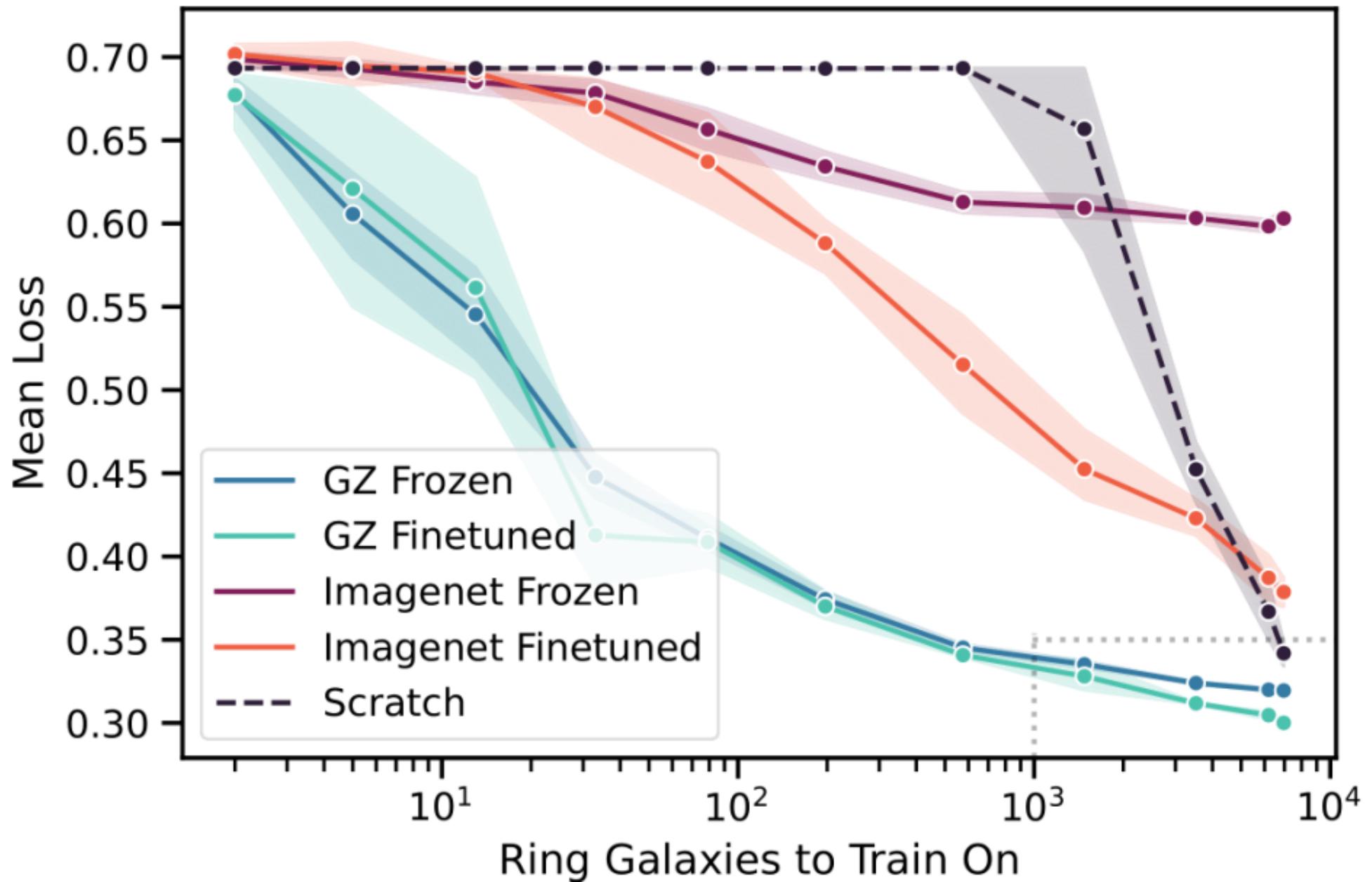
Featured: 7 of 10
Spiral: 5 of 7
Bar: 2 of 7
etc.

Supervised
Representation

[0.21, 0.32, 0.41...0.02]

Galaxy Zoo
Classifications

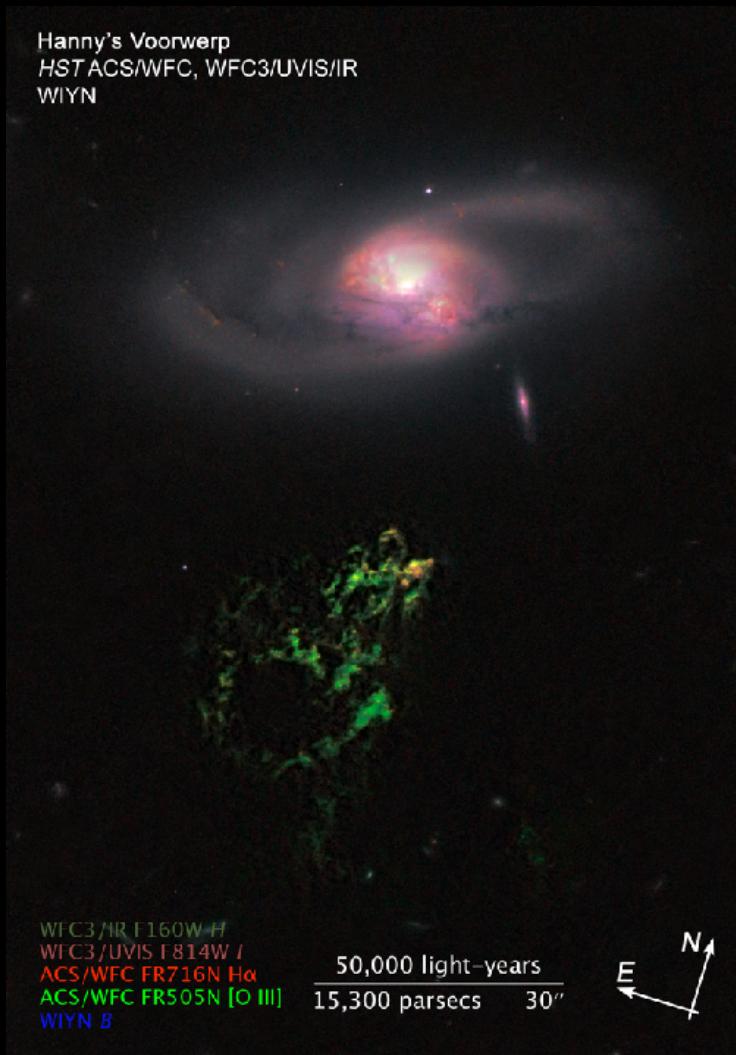
Fine-tuning
Similarity Search
Anomaly Detection





UNIVERSITY OF
OXFORD

Our surprising future



Lintott et al.
arXiv/0906.5304



UNIVERSITY OF
OXFORD

588017977278988558
J113946.93+382225.9



587739098597687419
J115135.32+375603.6



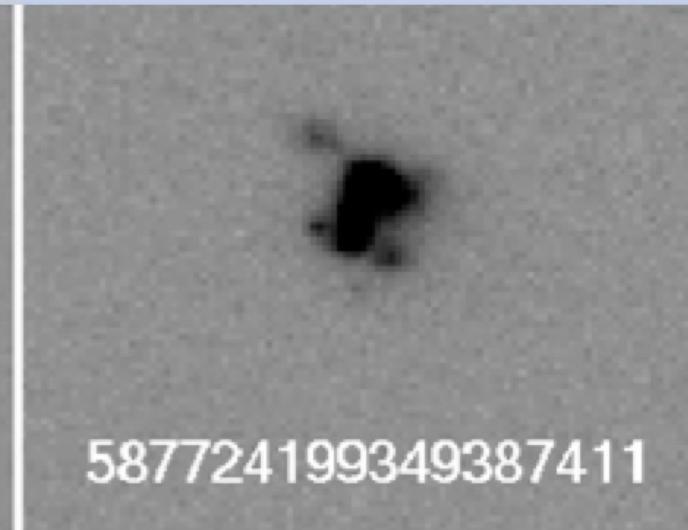
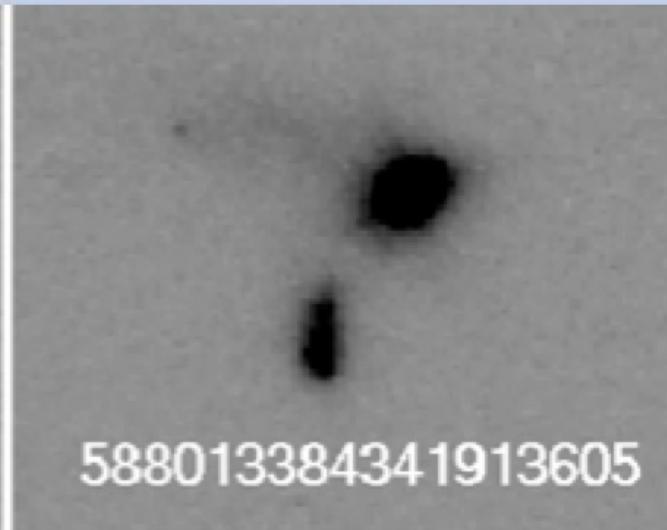
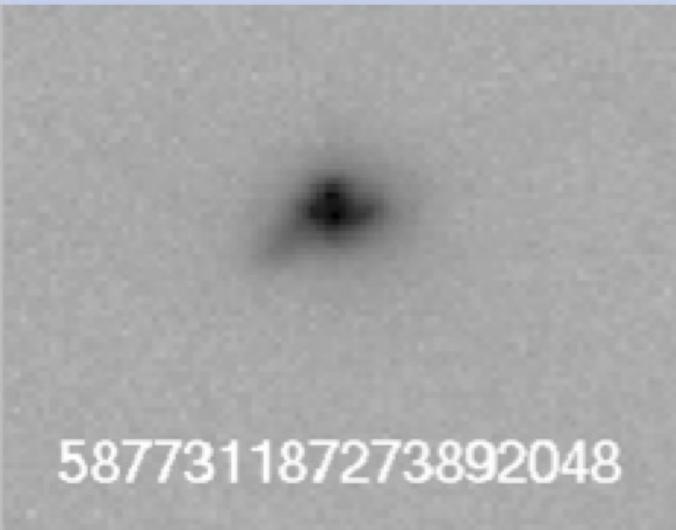
587739408393044155
J122245.71+360218.4



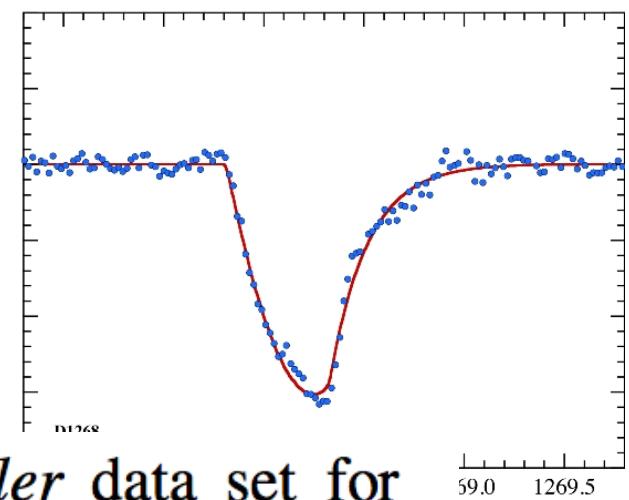
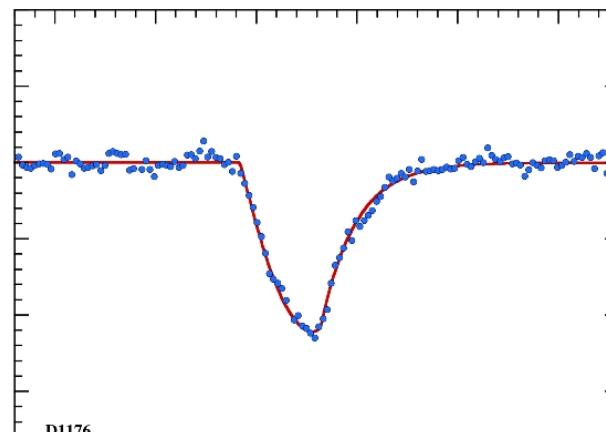
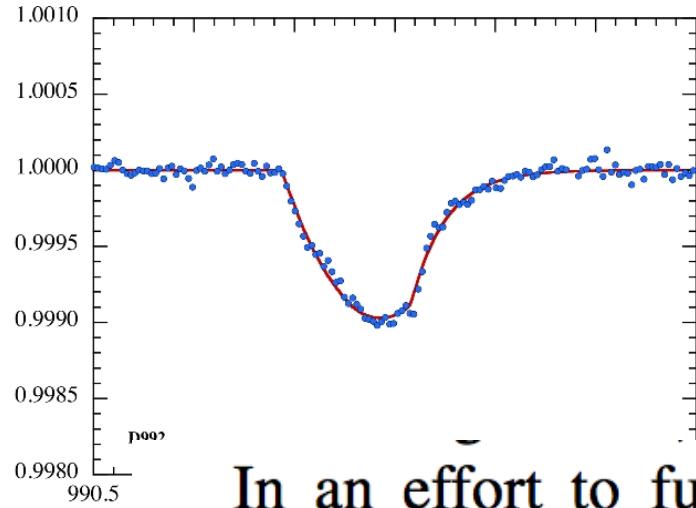
587731187273892048

588013384341913605

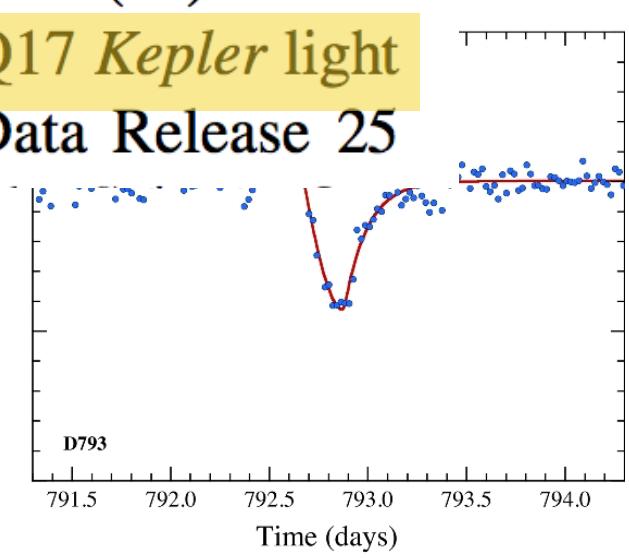
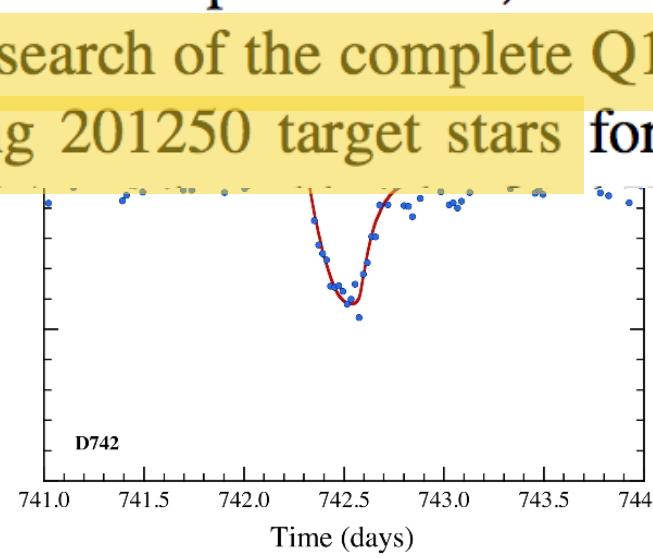
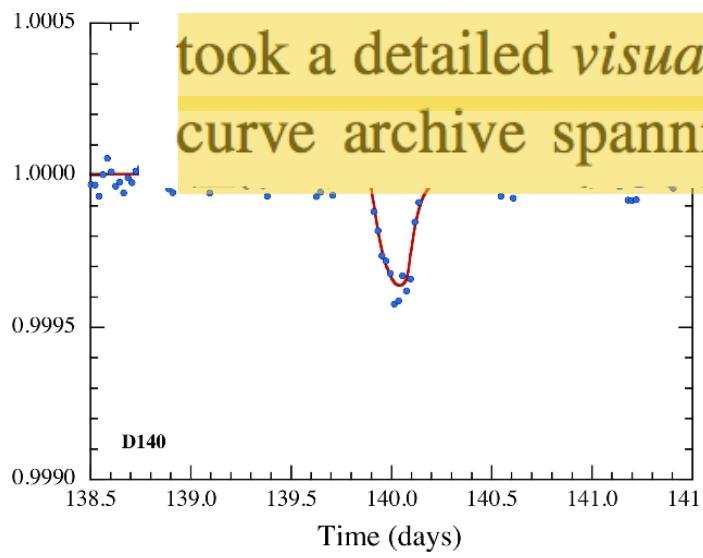
587724199349387411

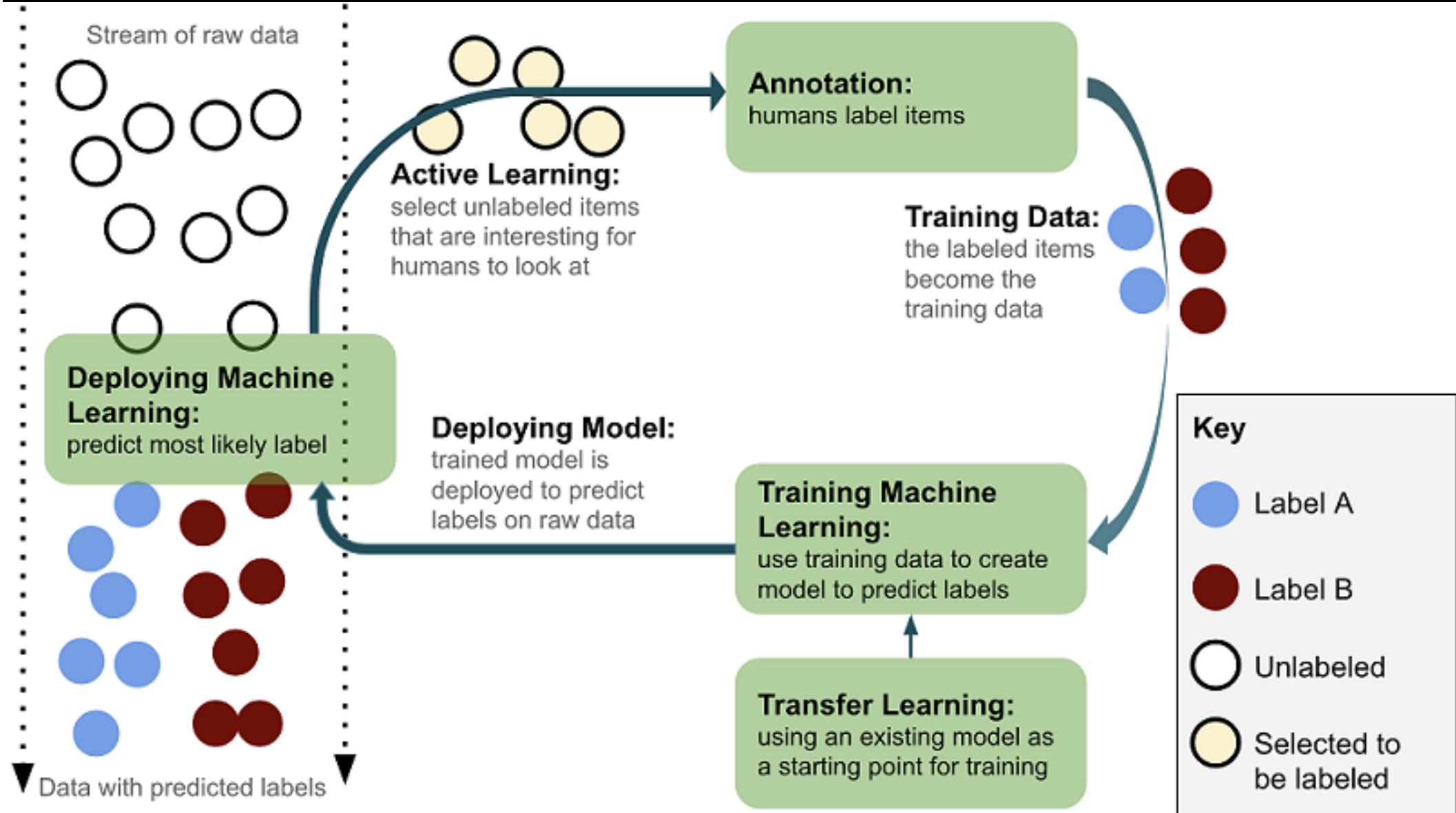


Exocomet transits?

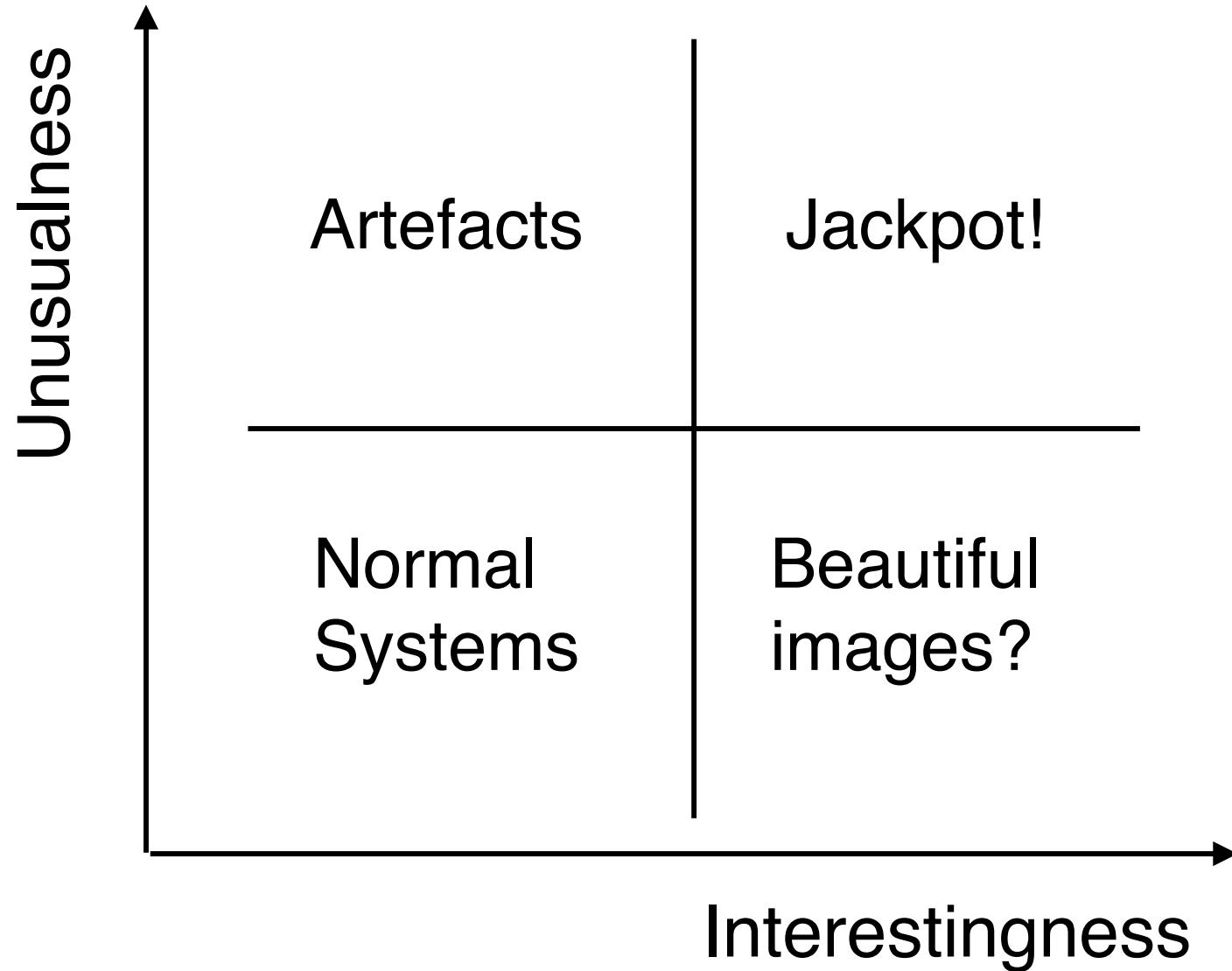


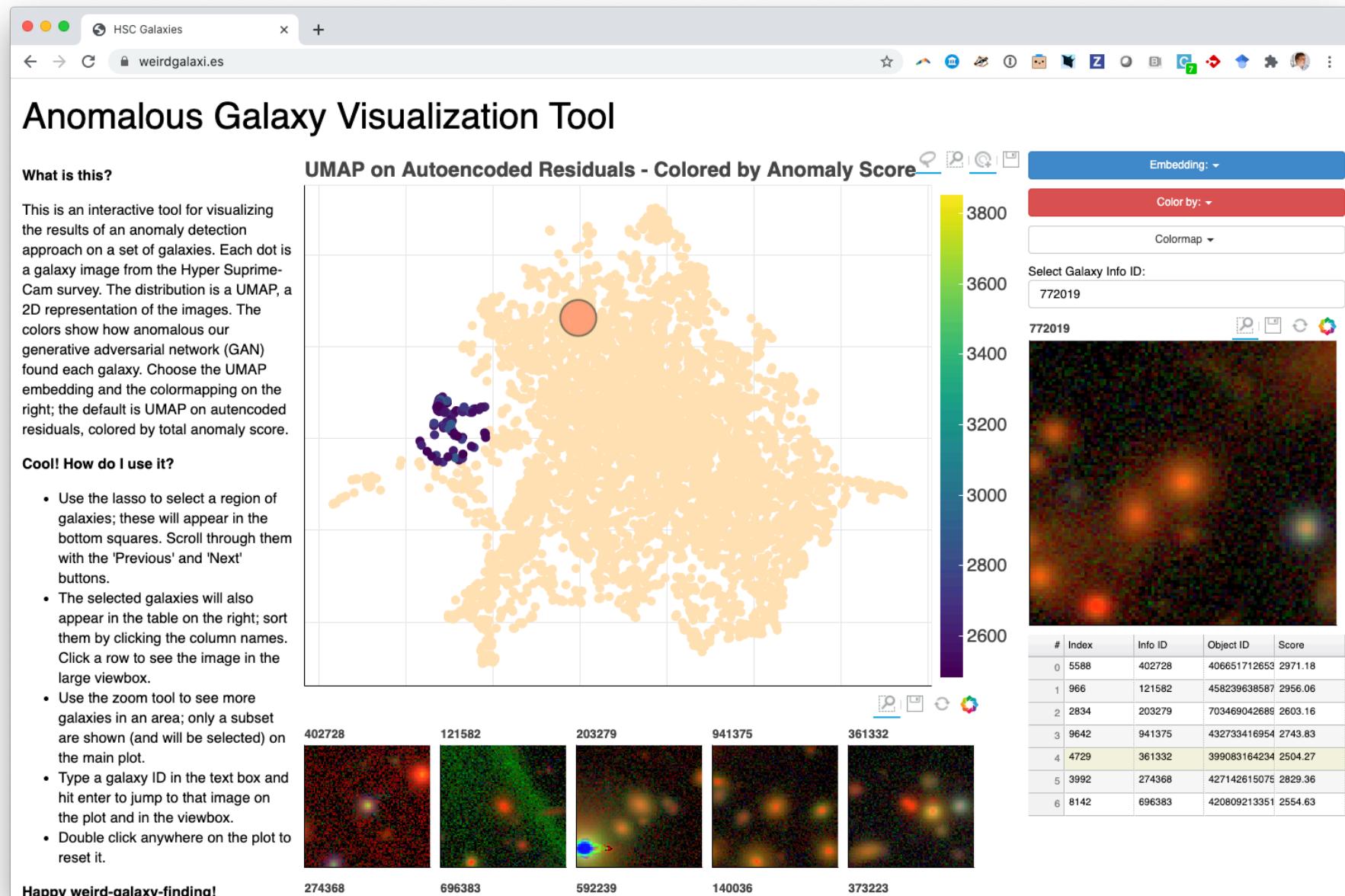
In an effort to further explore the larger *Kepler* data set for isolated transits or aperiodic phenomena, one of us (TJ) undertook a detailed *visual* search of the complete Q1-Q17 *Kepler* light curve archive spanning 201250 target stars for Data Release 25





Human in the Loop Machine Learning
Monarch, Manning Publications (2021)

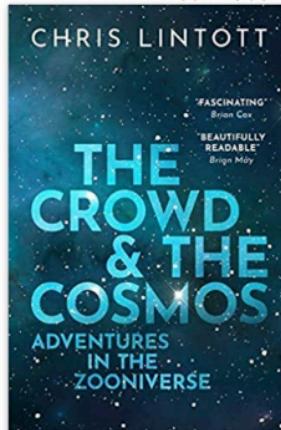




weirdgalaxi.es

Applied to HSC galaxies by Kate Storey-Fischer (NYU)

[Look inside](#) ↴



Listen



[See this image](#)

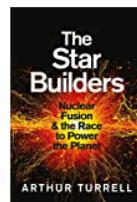
Follow the author



Lintott, Chris

[+ Follow](#)

Books you may like



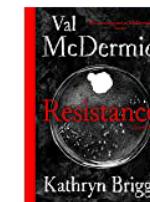
The Star Builders:
Nuclear Fusion and the
Race to Power the Planet
Arthur Turrell
 19
Hardcover
£13.99
[prime](#) FREE One-Day



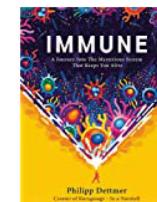
First Light: Switching on
Stars at the Dawn of
Time
Emma Chapman
 132
Hardcover
£12.22
[prime](#) FREE One-Day



The Ministry for the
Future
Kim Stanley Robinson
 2,056
Paperback
£8.19
[prime](#) FREE One-Day



Resistance: A Graphic
Novel
Val McDermid
 68
Hardcover
£12.90
[prime](#) FREE One-Day



Immune: The new book
from Kurzgesagt - a...
Philipp Dettmer
 142
Hardcover
#1 Best Seller in Family &
Lifestyle Immunology
£21.99
Delivery at no extra cost for
Prime members
In stock on November 26



Rutherford and Fry's
Complete Guide to...
Adam Rutherford
 47
Hardcover
#1 Best Seller in Biological Evolution
£10.59
[prime](#) FREE One-Day

Buy new:

£8.19

RRP: £9.99

Save: £1.80 (18%)

& FREE Returns

FREE delivery: Saturday, Nov 13

Order within 5 hrs 11 mins [Details](#)

Deliver to Chris - Oxford OX2 7

**Only 2 left in stock (more on
the way).**

As an alternative, the [Kindle eBook](#) is
available now and can be read on any
device with the free Kindle app. Want
to listen? [Try Audible](#).

Quantity:

[Add to Basket](#)

[Buy Now](#)

Secure transaction

Dispatches from Amazon

Sold by Amazon

Return policy: [Returnable until Jan 31, 2022](#)

Add gift options

[Add to List](#)

Share <Embed>



Night Sky Almanac 2022:
A stargazer's guide
 467
£8.19

Sponsored

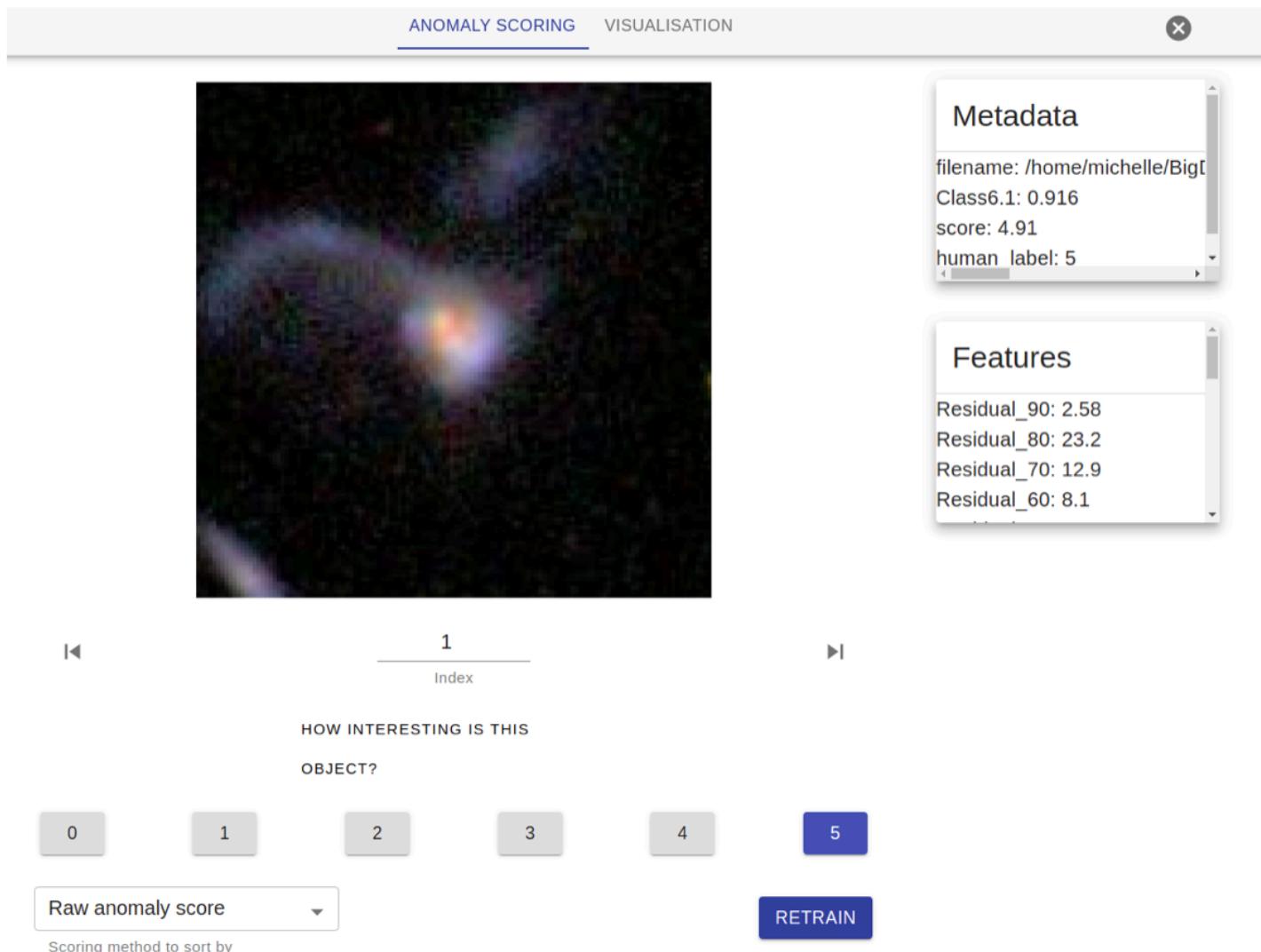


Figure 2: A screenshot of the ASTRONOMALY visual interface with a Galaxy Zoo example. This interface is used to quickly scroll through the most anomalous objects labelling them according to relevance.

Similarity Search: tinyurl.com/ZooBotSimilarity

Mike Walmsley (Manchester)

RA (deg) ?
124.417040

Dec (deg) ?
4.497872

Important Notes +

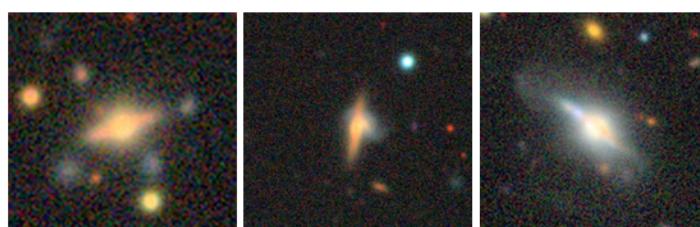
Closest Galaxy



RA: 124.41704. Dec: 4.49787. [Search Vizier](#)

Similar Galaxies

+

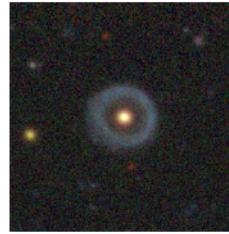


RA (deg) ?
180.431121

Dec (deg) ?
0.183135

Important Notes +

Closest Galaxy

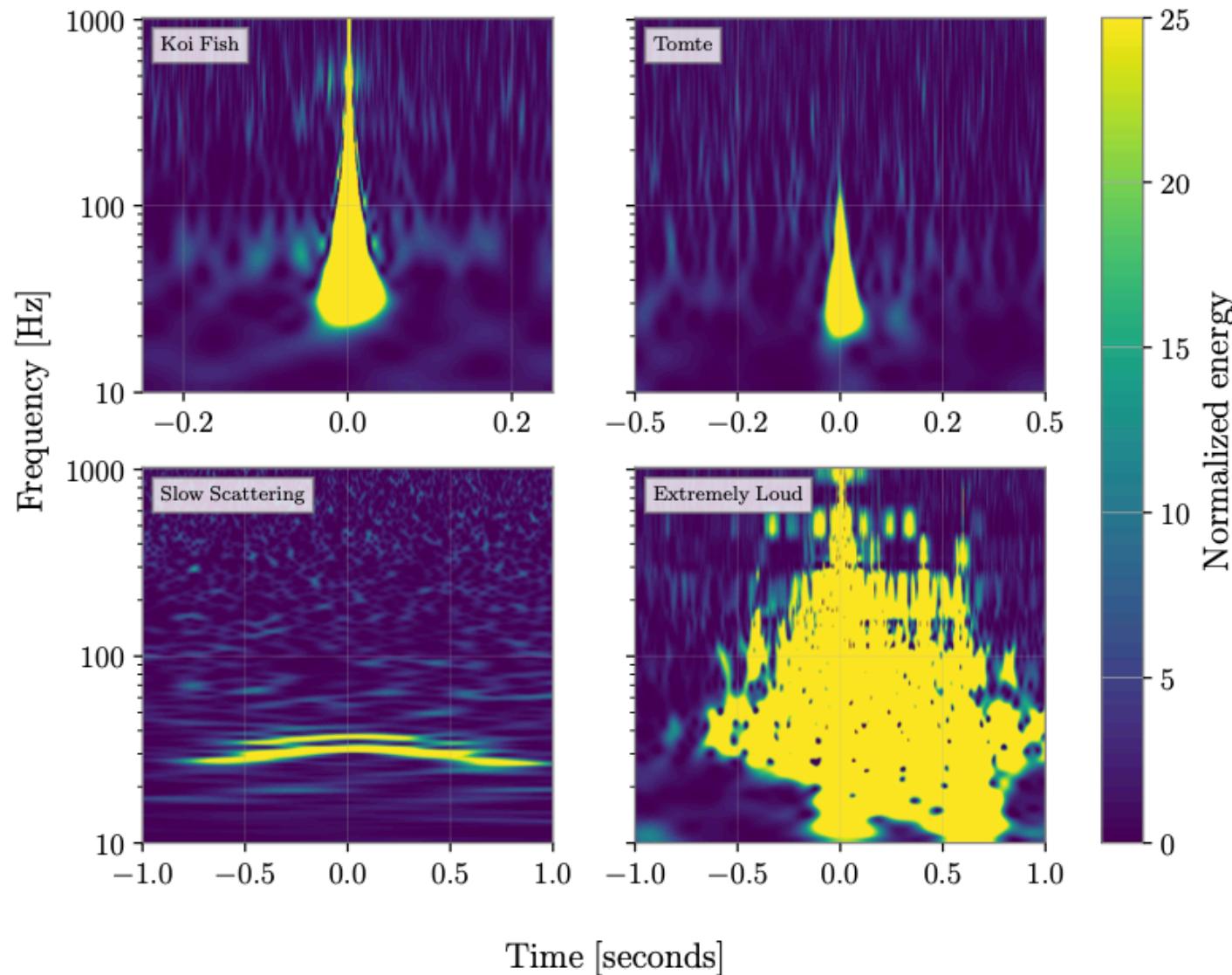


RA: 180.43112. Dec: 0.18313. [Search Vizier](#)

Similar Galaxies

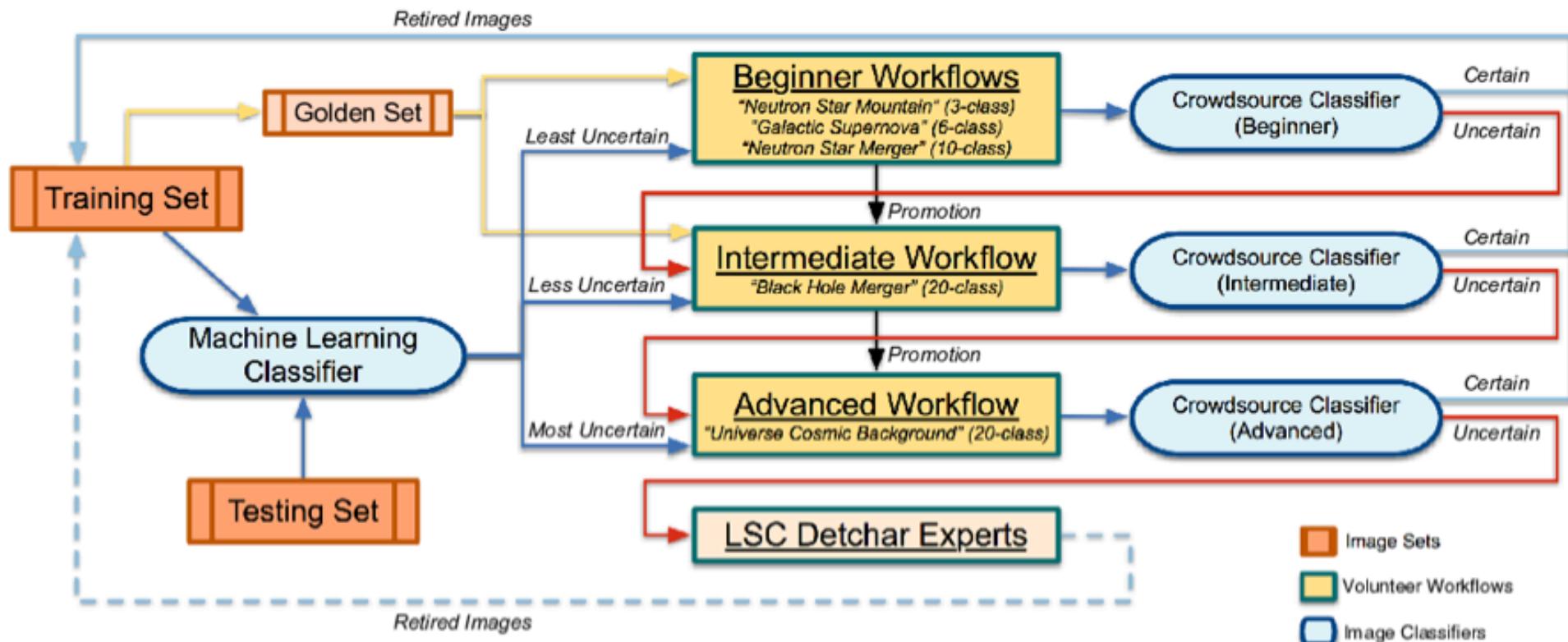
+



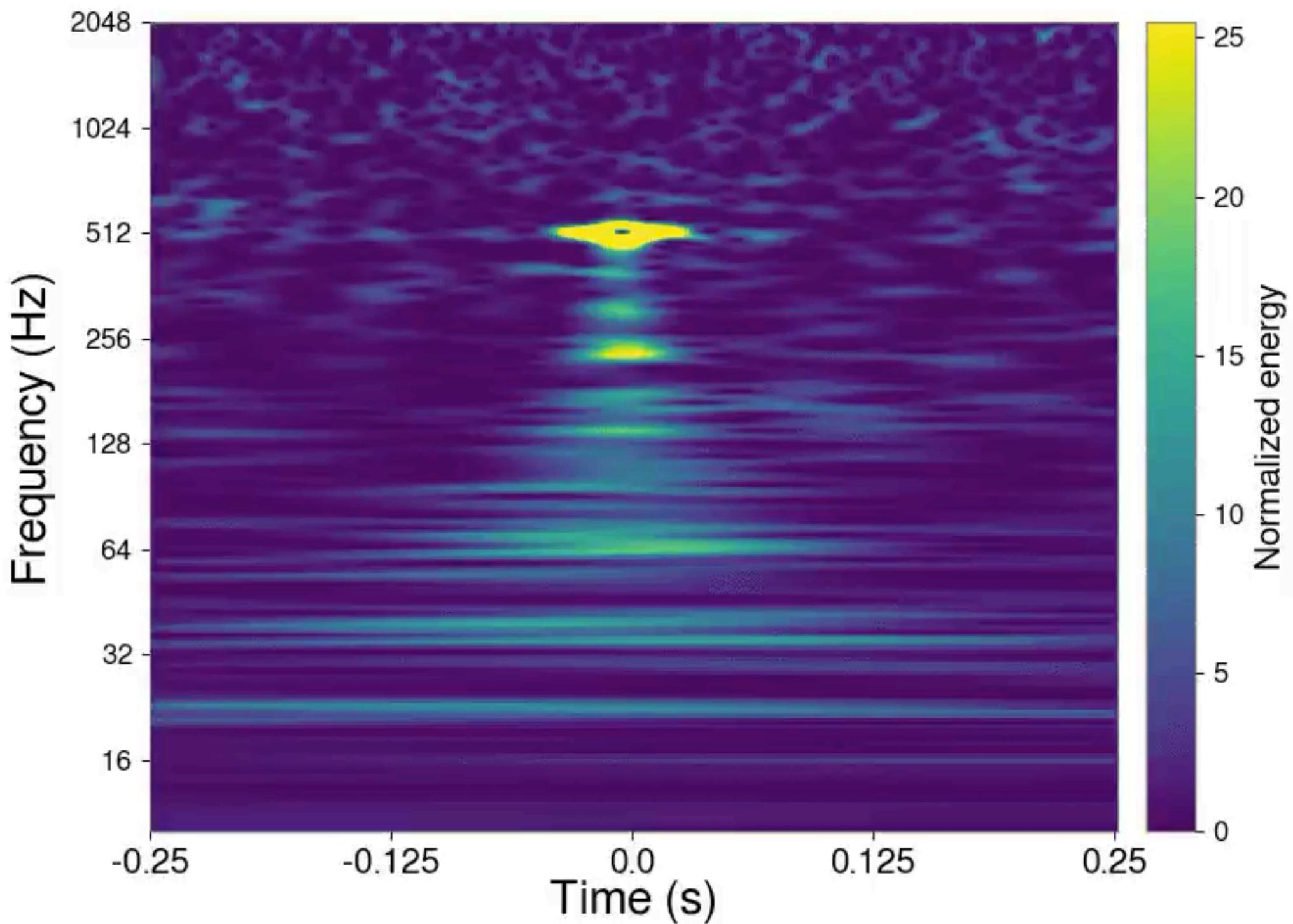


Coughlin et al. arXiv 1903.04058

Soni et al. arXiv 2103.12104



Livingston - O3



Thanks to the Zooniverse teams and all those who have participated.



Argelander

@chrislintott

chris.lintott@physics.ox.ac.uk