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# Improving Cloud Detection in Satellite Imagery using a Citizen Science Approach

EARSel Symposium  
July 2 | Salzburg

WeObserve EO4CO Workshop



@LandSense  
@WeObserveEU

# Motivation

- Clouds are an unavoidable and persistent issue in satellite-based optical imagery
- Need for accurate and automated cloud and cloud shadow detection algorithms in the preprocessing phase



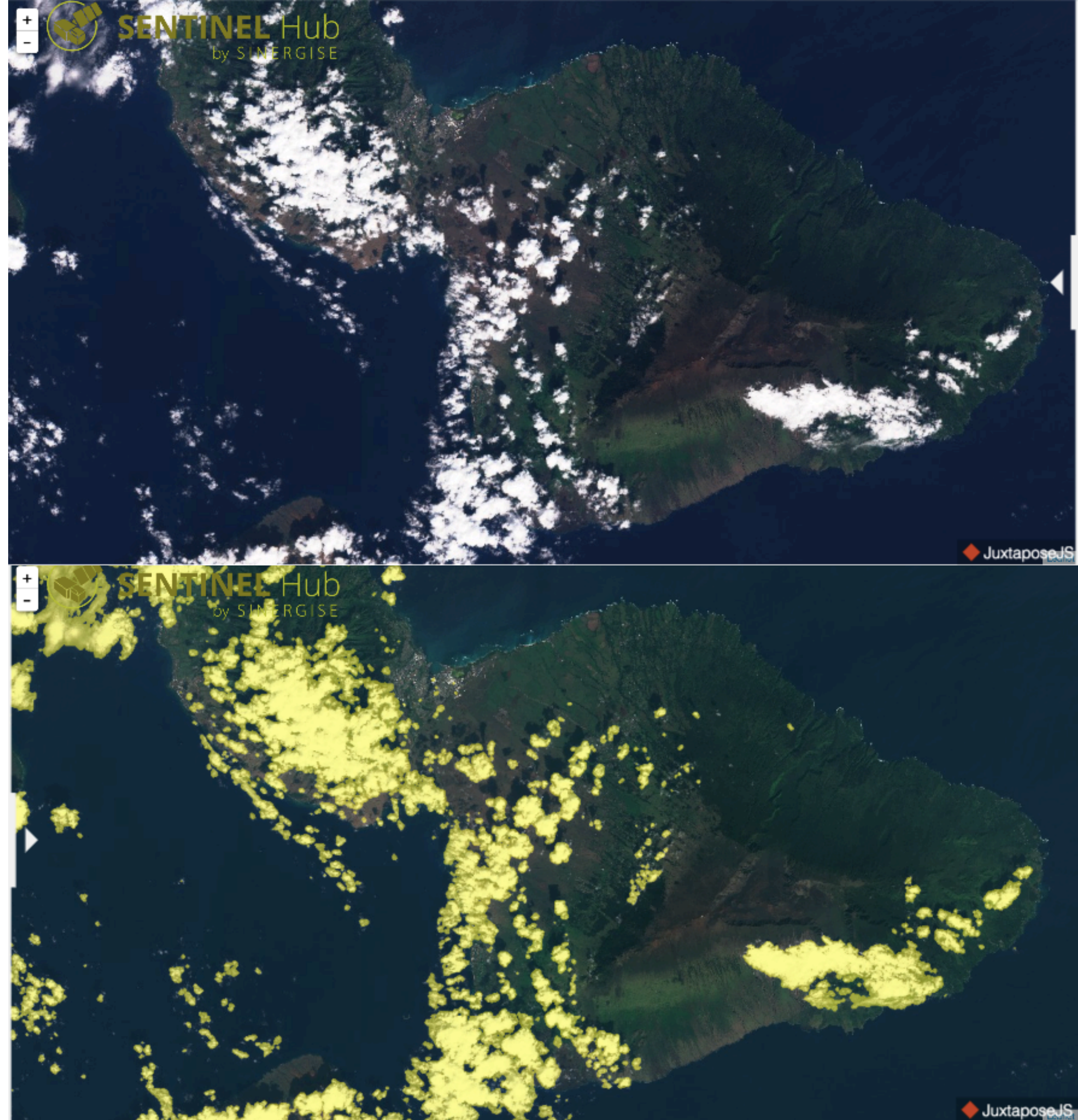
# s2cloudless

- Single scene cloud detection algorithm relying on machine learning techniques
- Pixel-based approach that requires training and validation datasets



**SENTINEL Hub**  
by SINERGISE

<https://github.com/sentinel-hub/sentinel2-cloud-detector>  
<https://medium.com/sentinel-hub>



A hand holding a smartphone in a snowy landscape at dusk. The phone's camera interface is visible, showing a battery icon, a lightning bolt icon, and a camera icon. The background is a blurred, snowy scene with trees and a building. The text "Could crowdsourcing help improve cloud detection algorithms?" is overlaid in white on the image.

Could crowdsourcing help improve  
cloud detection algorithms?



# LandSense

A Citizen Observatory and Innovation Marketplace for Land Use and Land Cover Monitoring

Connecting citizens with satellite imagery to transform environmental decision making

September 2016 → August 2020

LandSense.eu

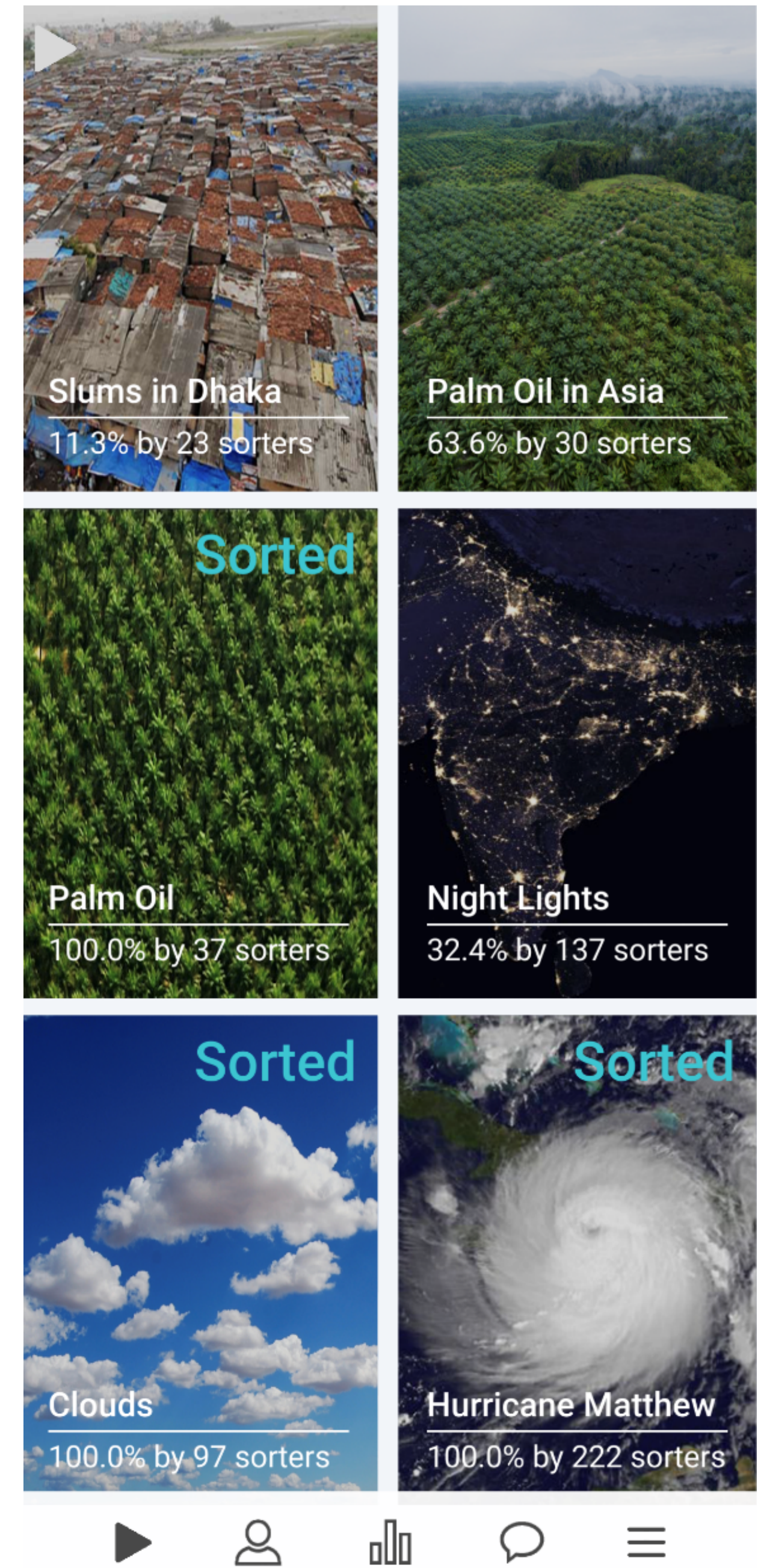
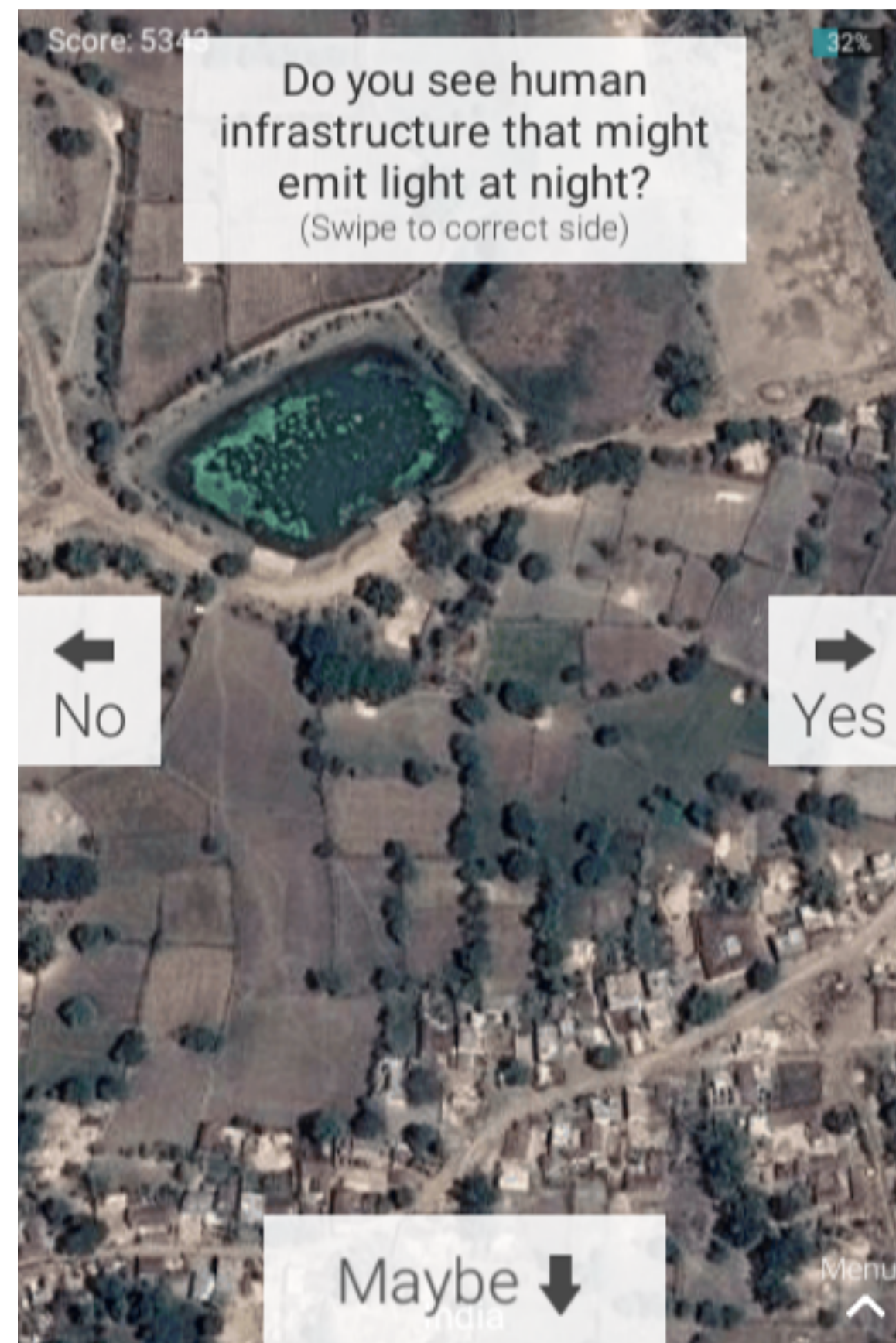
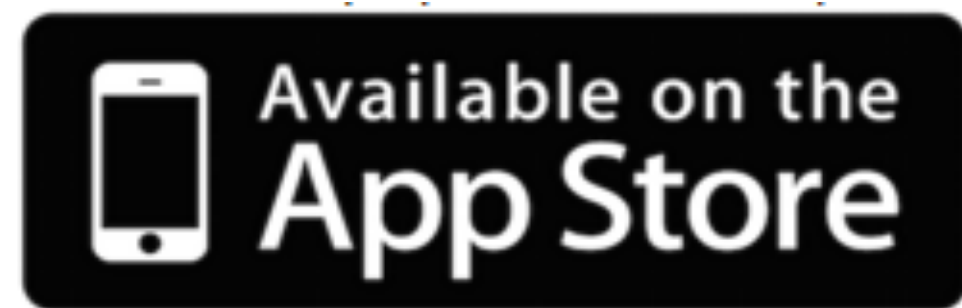


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 689812



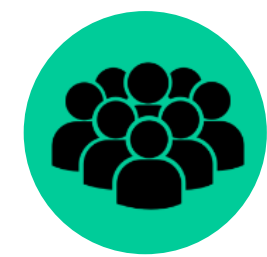
# Picture Pile

Mobile application for rapid image assessment and change detection. Designed to be generic and flexible tool customizable to different domains that requires EO data as an input resource.



# Picture Pile

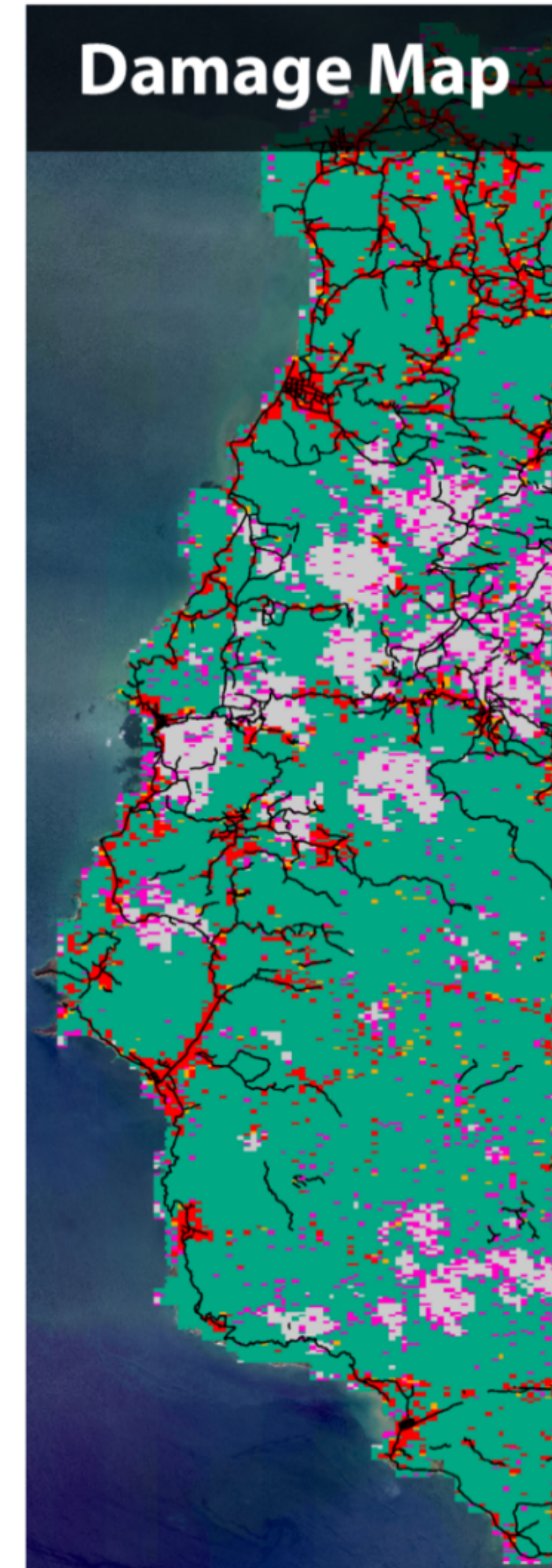
Post-disaster damage mapping






**179**  
volunteers



**249K**  
validations



-  Damaged
-  Likely damaged
-  Unknown
-  No damage
-  Not usable



# Picture Pile – Cloud Detection



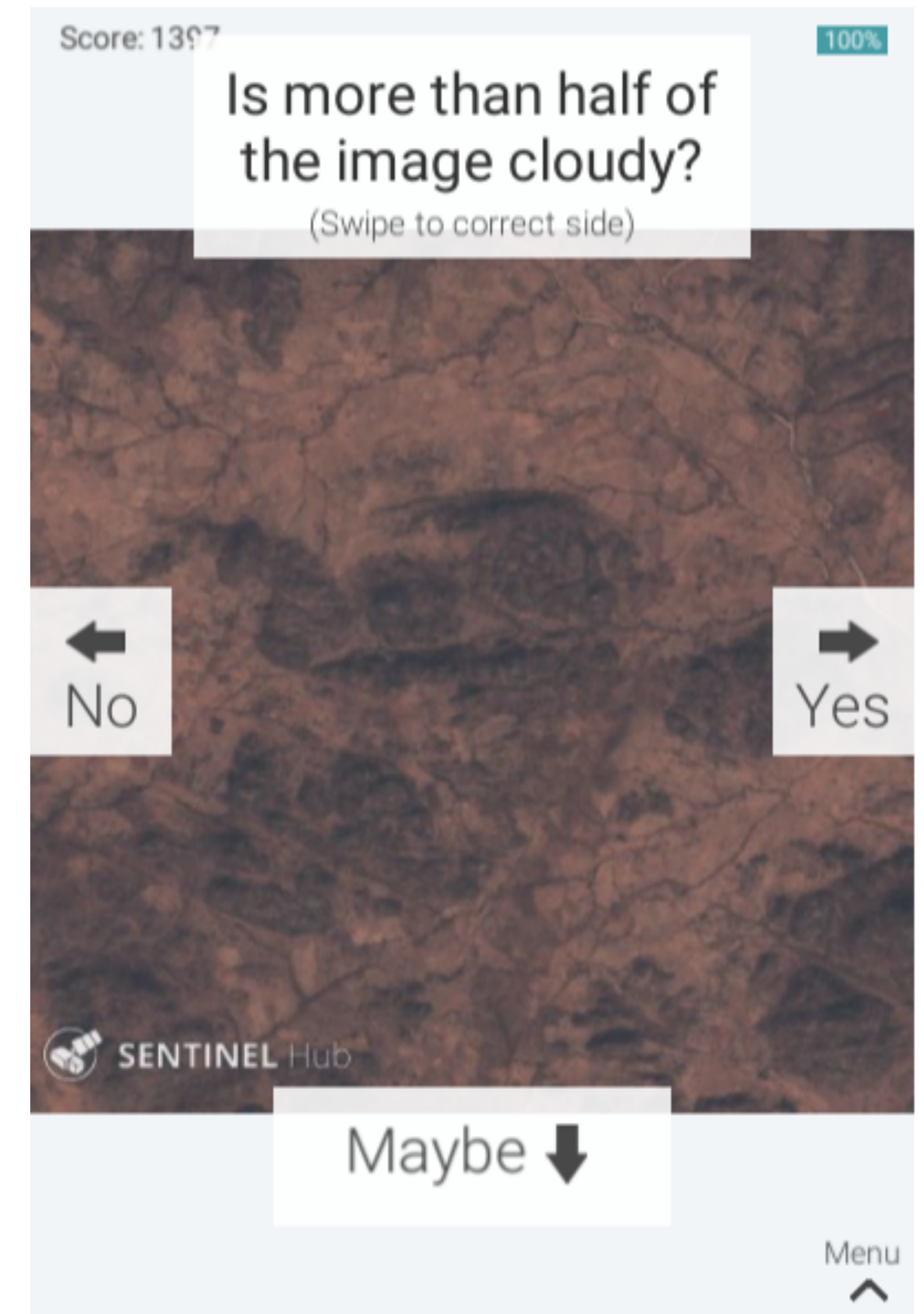
**97**  
volunteers



**27K**  
unique images

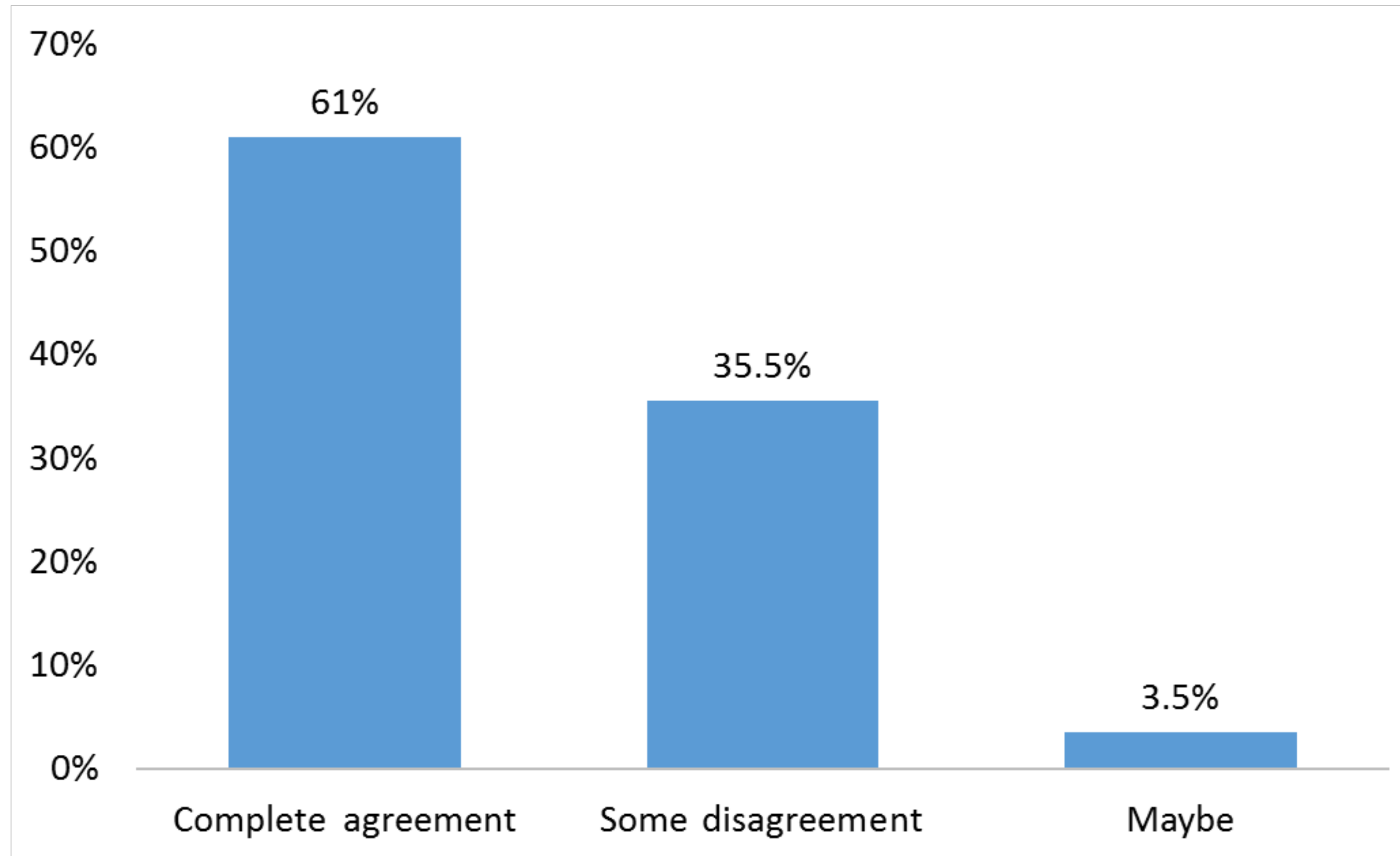


**272K**  
validations





# Picture Pile – Cloud Detection



## Quality Control

- Multiple volunteers per image
- Expert-classified control images are presented to volunteers at random

# Next exploratory steps

- Volunteers identify regions of clouds/no clouds/partial clouds
- Shadows created by clouds
- Training and validation samples for machine learning



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