International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

Combining a Rapid Image Classification App with Artificial Intelligence through the Picture Pile Platform for Citizen Science

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Novel Data Ecosystems for Sustainability (NoDES) Research Group

Advancing Systems Analysis Program

ECSA Conference, 5-7 Oct 2022

Before Picture Pile

- Cropland Capture for rapid image classification

25 weeks

November 2014 — May 2014

3,314
Players

4,648,659
Classifications

187,673
Unique images

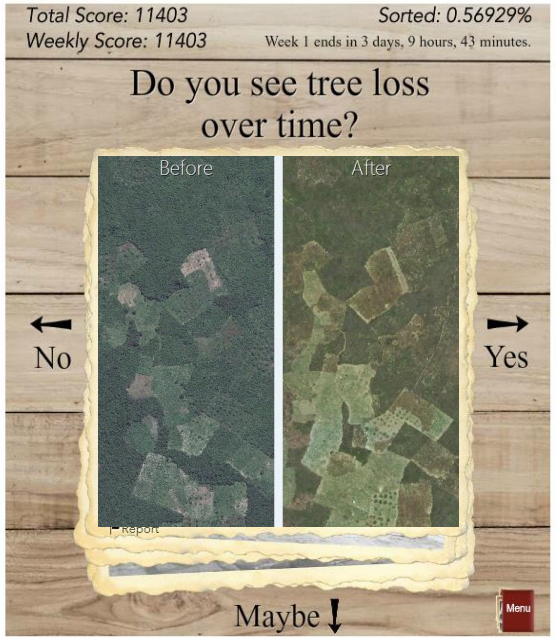
92%
< 2 seconds

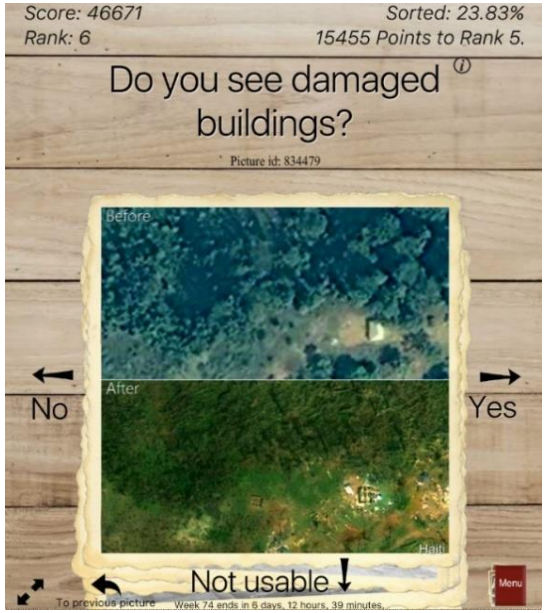
→ Leaderboard, weekly and final competition prizes

Follow us on twitter to get the latest news about Cropland Capture!

The Start of Picture Pile

- Generalization of Cropland Capture to any domain
- Pairs of images for change detection
- Wilderness, deforestation, building damage assessment
- Same yes/no/maybe mechanic





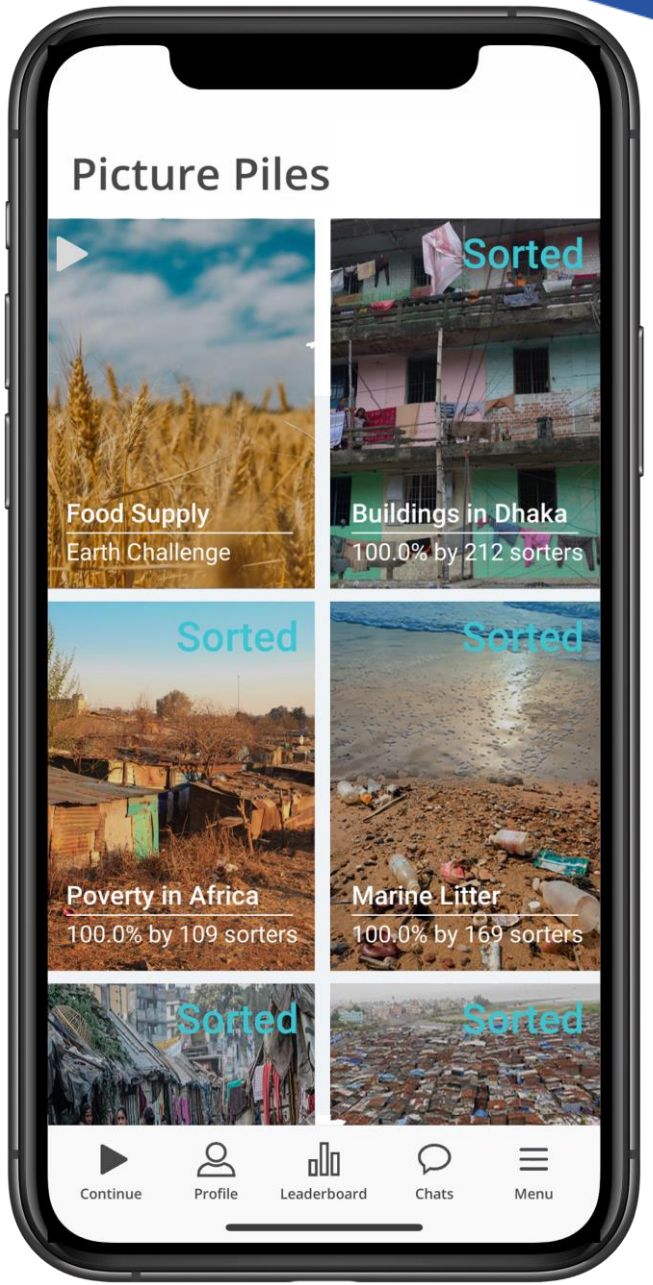
Picture Pile Campaigns

- Since 2014 we have run 16 different Picture Pile crowdsourcing campaigns
- More than 4000 volunteers participated
- More than 11.5 million pictures have been classified

Available on the App Store

Available on Google Play

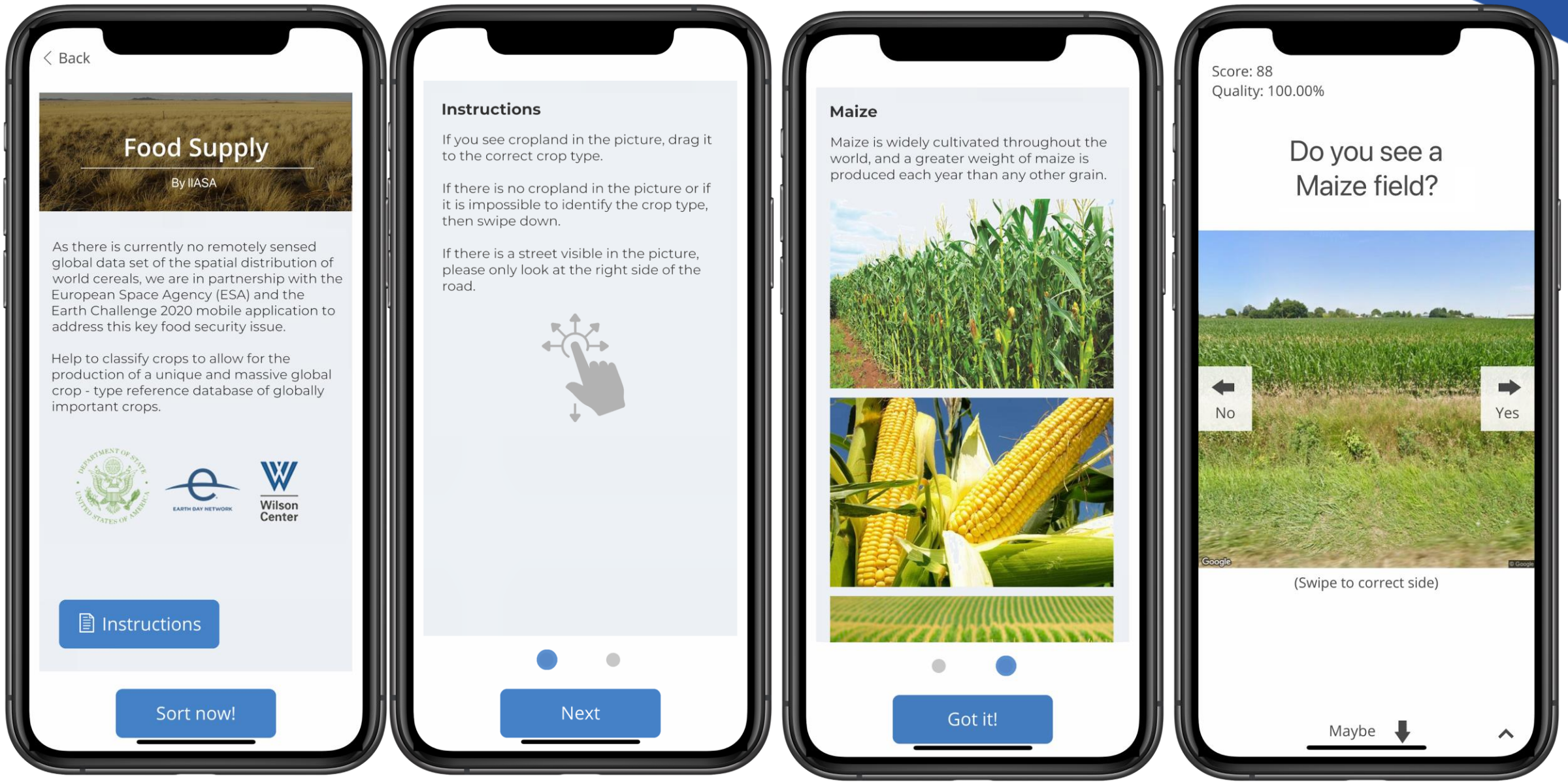
www.picturepile.org

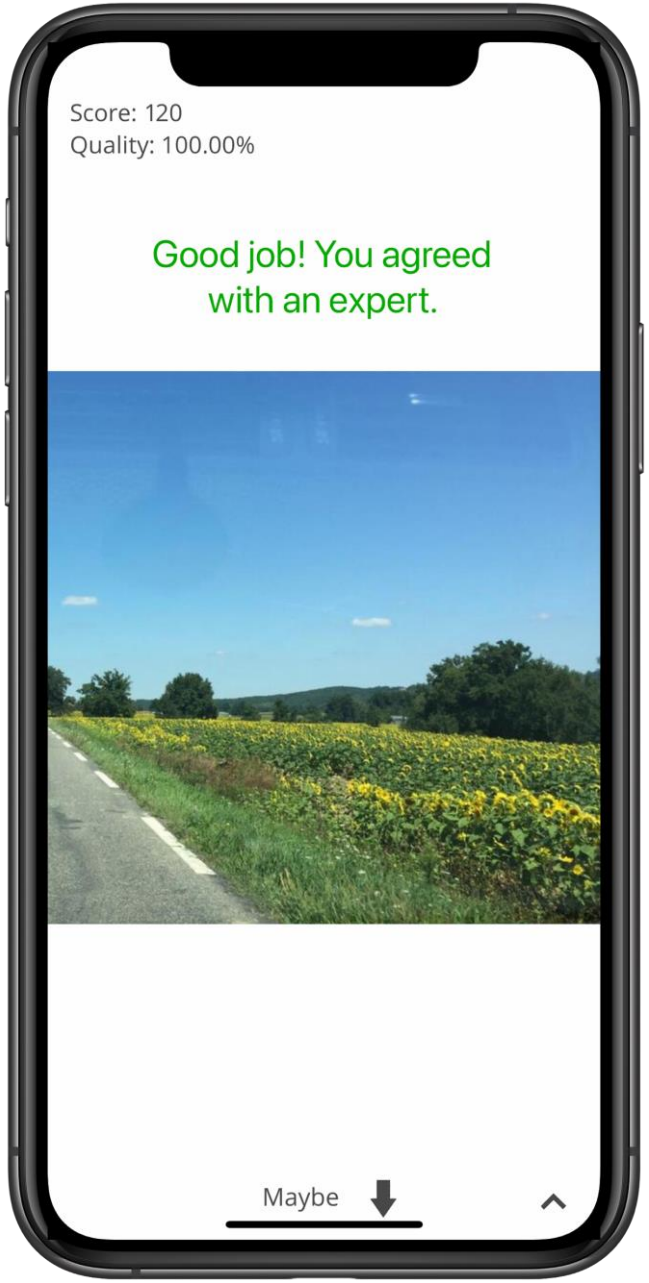


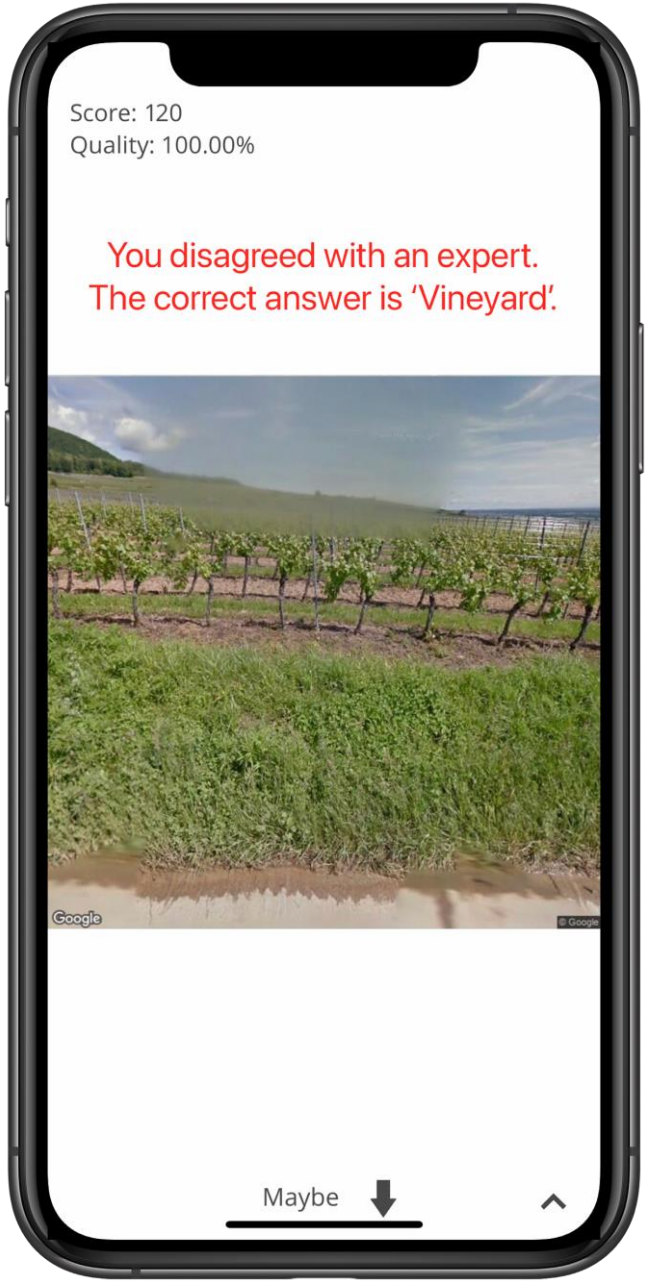
Picture Pile Campaigns

Campaign	Location	# of participants	# of validations	# of images	Campaign start date	Campaign available for
Wild landscapes	Global	32	11,937	86,176	2014-12-15	6 months
Deforestation	Tanzania, Indonesia	1360	5,127,697	362,544	2015-07-25	Left open until 2018-09-04
Hurricane Matthew campaign 1	Haiti	344	224,214	37,582	2017-04-28	6 days
Hurricane Matthew campaign 2	Haiti	421	298,323	37,582	2017-05-03	12 days
Cloud detection	Global	149	276,068	27,021	2019-02-28	2 months
Nighttime lights	Global	217	160,338	13,966	2019-03-04	6 months
Urundata land cover campaigns	Indonesia	395	1,373,840	14,221	2019-04-01	4 months
Oil palm plantations	Global	78	56,212	1,649	2019-07-31	1 month
Oil palm plantations Asia	Asia	78	99,618	13,653	2019-08-20	2 months
Poverty (degree of wealth)	Dhaka, Bangladesh	176	60,382	11,300	2019-08-26	6 months
Slums	Dhaka, Bangladesh	74	13,636	30,028	2019-08-27	6 months
Urundata Change Campaigns	Indonesia	195	3,553,315	153,115	2019-08-27	3 months
Marine litter	One beach	105	14,374	1,215	2019-12-13	3 months
Poverty (degree of wealth)	Africa	63	7,888	1,398	2019-12-18	6 months
Poverty (building height)	Dhaka, Bangladesh	181	36,430	12,300	2020-02-06	6 months
Earth Challenge Food Insecurity (crop types) from present	France, Latvia, USA	1292	289,553	45377 out of 70,520	2020-07-28	Ongoing

Source: Fraisl et al. (2022) https://www.sciencedirect.com/science/article/pii/S1462901121003208

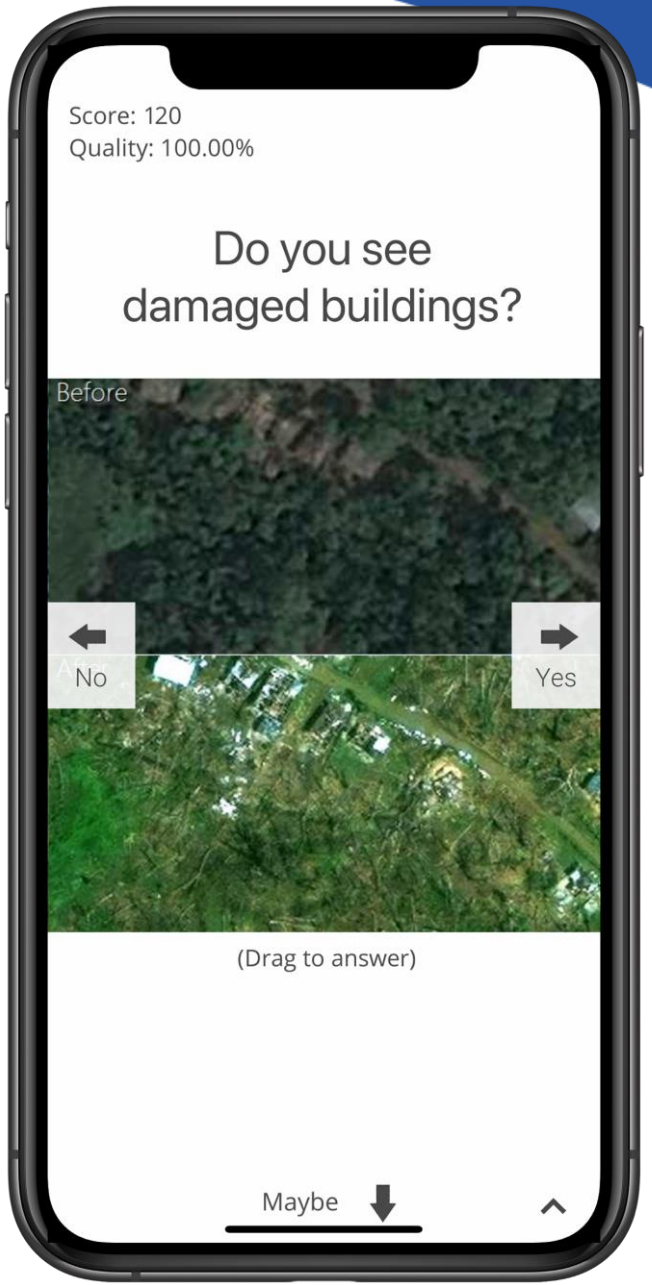

Back
Food Supply
By IIASA
As there is currently no remotely sensed global data set of the spatial distribution of world cereals, we are in partnership with the European Space Agency (ESA) and the Earth Challenge 2020 mobile application to address this key food security issue.
Help to classify crops to allow for the production of a unique and massive global crop - type reference database of globally important crops.
Wilson Center
Instructions
Sort now!
Instructions
If you see cropland in the picture, drag it to the correct crop type.
If there is no cropland in the picture or if it is impossible to identify the crop type, then swipe down.
If there is a street visible in the picture, please only look at the right side of the road.
Next
Maize
Maize is widely cultivated throughout the world, and a greater weight of maize is produced each year than any other grain.
Got it!
Score: 88
Quality: 100.00%
Do you see a Maize field?
No
Yes
(Swipe to correct side)
Maybe

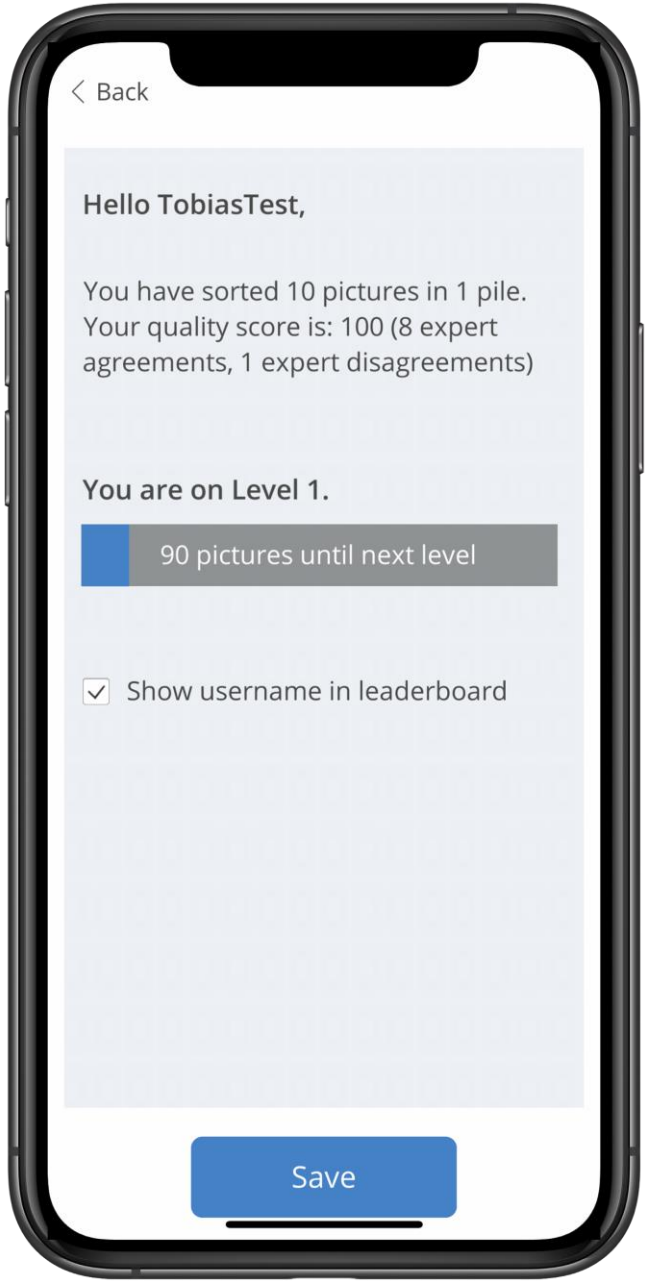

Score: 120
Quality: 100.00%
Good job! You agreed with an expert.
Maybe

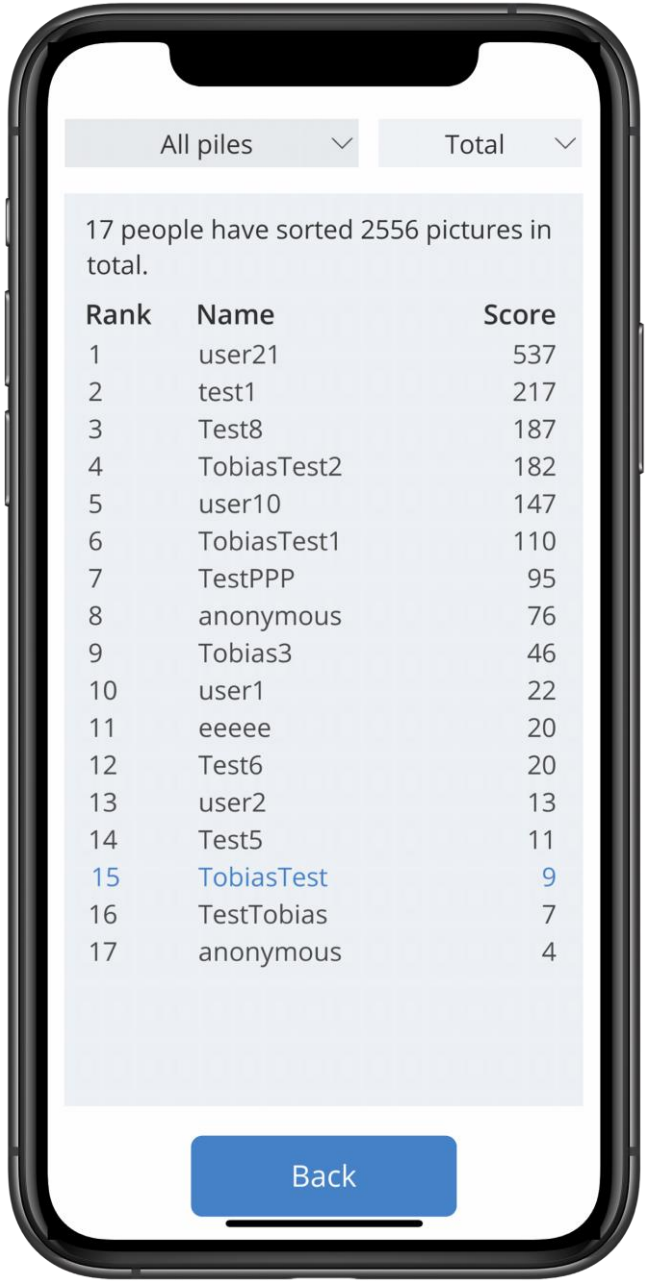

Score: 120
Quality: 100.00%
You disagreed with an expert.
The correct answer is 'Vineyard'.
Google
Maybe

Score: 21
Quality: 100.00%
What do you see?
Sunflower
Vineyard
Maize
Sorghum
Other Crop
Wheat
Google
(Drag to answer)
Maybe

Score: 88
Quality: 100.00%
How wealthy is the location?
Poor
Rich
Google
(Drag to answer)
Maybe


Score: 120
Quality: 100.00%
Do you see damaged buildings?
Before
No
Yes
(Drag to answer)
Maybe

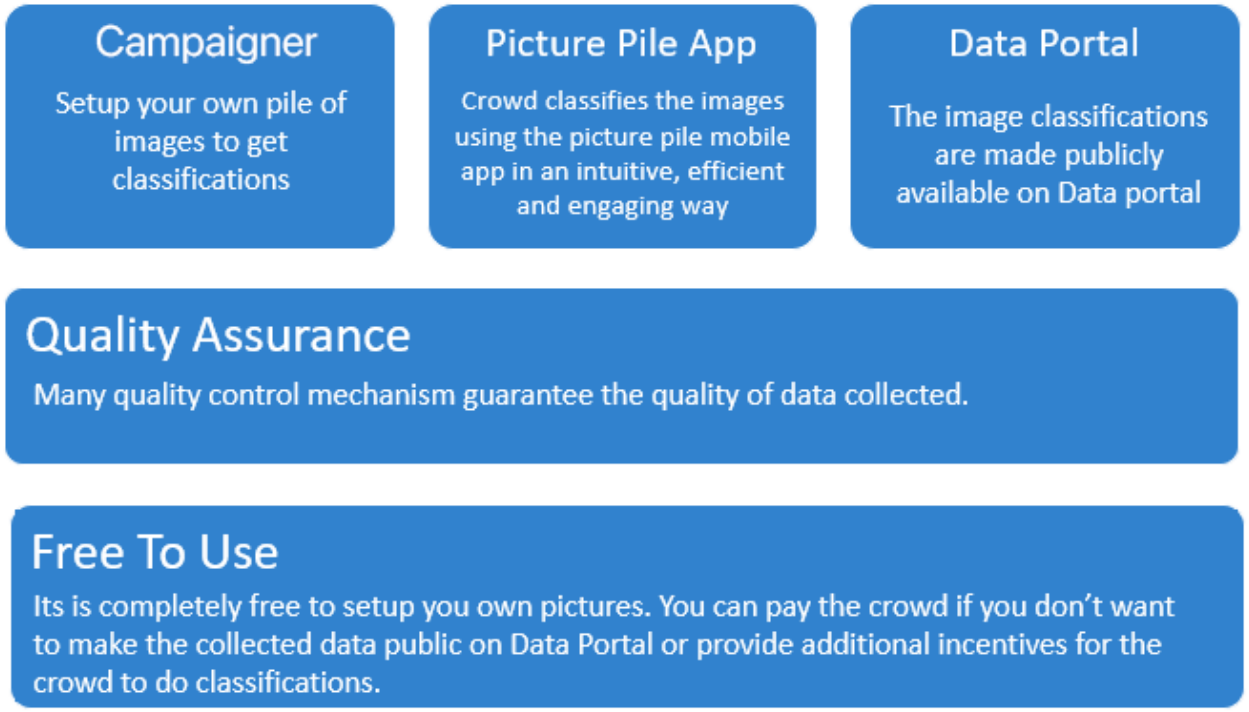

Back
Hello TobiasTest,
You have sorted 10 pictures in 1 pile. Your quality score is: 100 (8 expert agreements, 1 expert disagreements)
You are on Level 1.
90 pictures until next level
Show username in leaderboard
Save


All piles
Total
17 people have sorted 2556 pictures in total.
Rank Name Score
1 user21 537
2 test1 217
3 Test8 187
4 TobiasTest2 182
5 user10 147
6 TobiasTest1 110
7 TestPPP 95
8 anonymous 76
9 Tobias3 46
10 user1 22
11 eeeee 20
12 Test6 20
13 user2 13
14 Test5 11
15 TobiasTest 9
16 TestTobias 7
17 anonymous 4
Back

General Topic
Enter message...
Send
Tobias
If there is no plant swipe the image down.
anonymous1
Hi! I have a question regarding this pile. What should I do if there is no plant visible?
Back

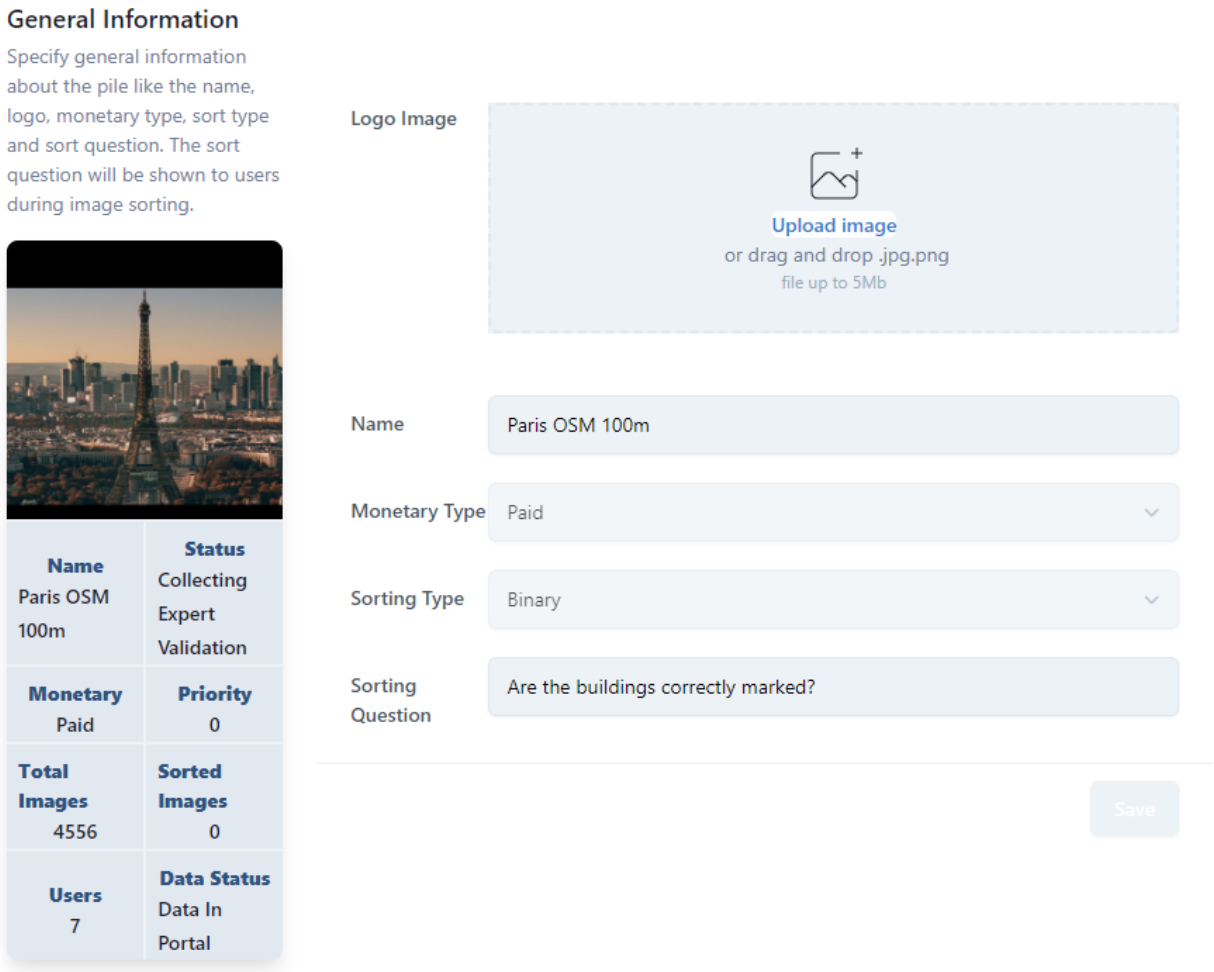
Picture Pile Platform

- Picture Pile Platform, new project funded by ERC Proof of Concept
- Commercially self-sustaining platform
- Anyone can setup a pile and run their own campaigns via the Picture Pile Campaigner for free
- Users can earn money
- Data freely available on the Picture Pile Data Portal
- AI/machine learning tools embedded



Example from the Platform

- Pile creation for free:
  - Data will be made publicly available on the Data Portal
- Payment of a fixed price based on pile size:
  - Users earn at least a minimum amount
  - Share paid to the platform to being able to operate it
  - Option to make data collected private



https://pppui.cloud.geo-wiki.org/

Pile Description

Specify the pile description and a logo.

This campaign is to validate the global human settlement layer. By contributing your time you will help to improve information where people live.

Logo Image

Upload image

or drag and drop .jpg.png

file up to 5Mb

Description

This campaign is to validate the global human settlement layer. By contribu

Save

Pile Instructions

Add Instructions to the pile to help user with sorting the images.
Higher order instructions will be shown first

Building Markings

Verify Building Markings Order: 0

Logo Image

Upload image(s)
or drag and drop .jpg.png
file up to 5Mb(Max 5 Files)

Title

Order 1

Description

Paid Pile Configuration

Specify the paid pile configuration.

Euros paid per score.

Euros paid per score can be minimum 0.01.

0.01

Minimum Quality score, below which a warning message will be shown.

Value can be between 0.5 and 0.9.

0.9

Maximum Quality score, below which a error message will be shown and no payout will be maid.

Value can be between 0.0 and 0.9 and should be less than Minimum quality score.

0.6

Save

Validation Settings

Specify the sort settings for Expert Validation and Crowd Validation. The Expert Validation settings are used to convert input image as control points. The Crowd Validation Settings are used to complete validations on input images.

Expert Validation

Number of Expert Agreements required to convert image to control point 1

Allowed Expert Disagreements per image 0

1 out of 1 swipes/submissions should match to make the image as control point.

Crowd Validation

Number of Crowd Agreements to complete validation 5

Allowed Crowd Disagreements per image 3

5 out of 8 swipes/submissions should match to make the image as crowd control point, else image gets removed from pile validation

Save

Pile Messages

You can show popup messages to the users when they have reached a certain score during the pile sorting. These messages can be congratulation messages or interesting information to teach the users; like 'Did you know...' etc, to keep them entertained.

Title	Message	Score	
Title of Message	Congratulations on scoring 100	100	Add

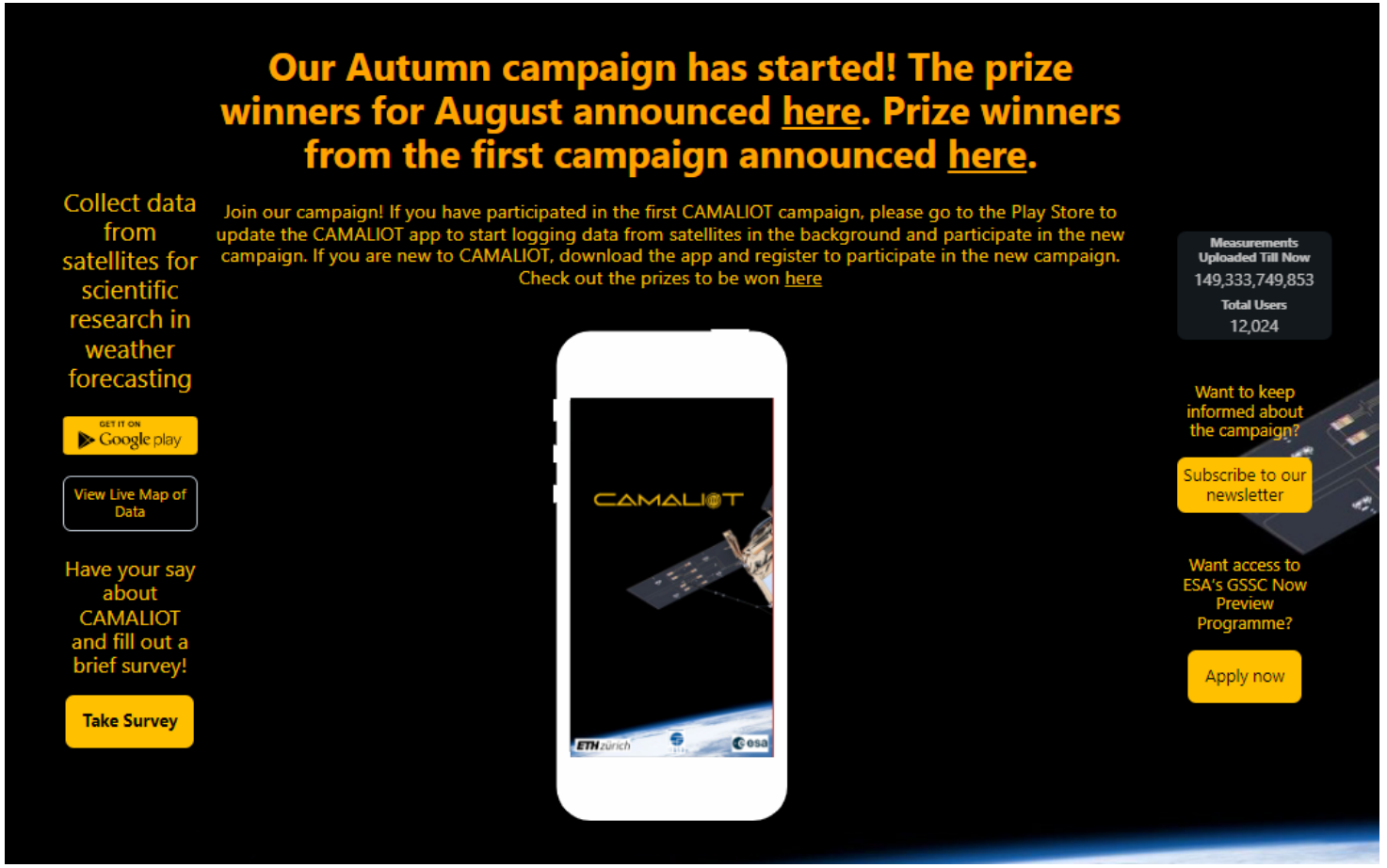
Great Poster on Friday

Title: Knowing by owning – How Web3 infrastructures support citizen science through NFTs and SBTs - Example using The Picture Pile App – presented by **Kai-Ti Wu**

- Demonstration of how Web3/block chain can be used to create a system for contributions from citizen scientists
- Data can be 'minted' by contributors as Non-Fungible Tokens (NFTs) and rewarded by Soul-Bound Tokens (SBTs), which are stored on the Interplanetary File System (IPFS)
- The prototype system is demonstrated using Picture Pile
- Potential for many other citizen science projects here to get involved

Plug for our latest project: CAMALIOT

- Collection of raw GNSS data from mobile phones to improve weather forecasting
- 12K participants; 150 billion measurements



https://www.camaliot.org

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Picture Pile Platform will launch early 2023

Do you have ideas for our first piles? If so, get in touch!

Linda See (see@iiasa.ac.at)

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