



Radiant Earth  
Foundation

## Radiant MLHub:

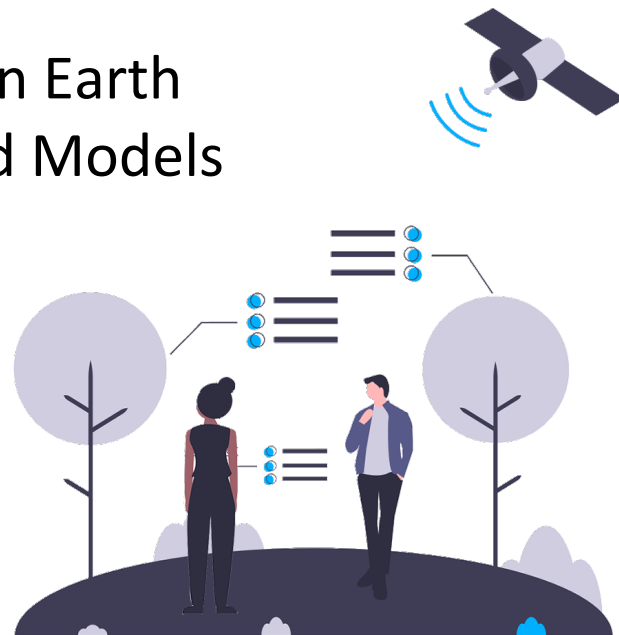
Advancing Machine Learning Applications in Earth  
Sciences with Benchmark Training Data and Models

**Hamed Alemohammad**

Chief Data Scientist and Executive Director

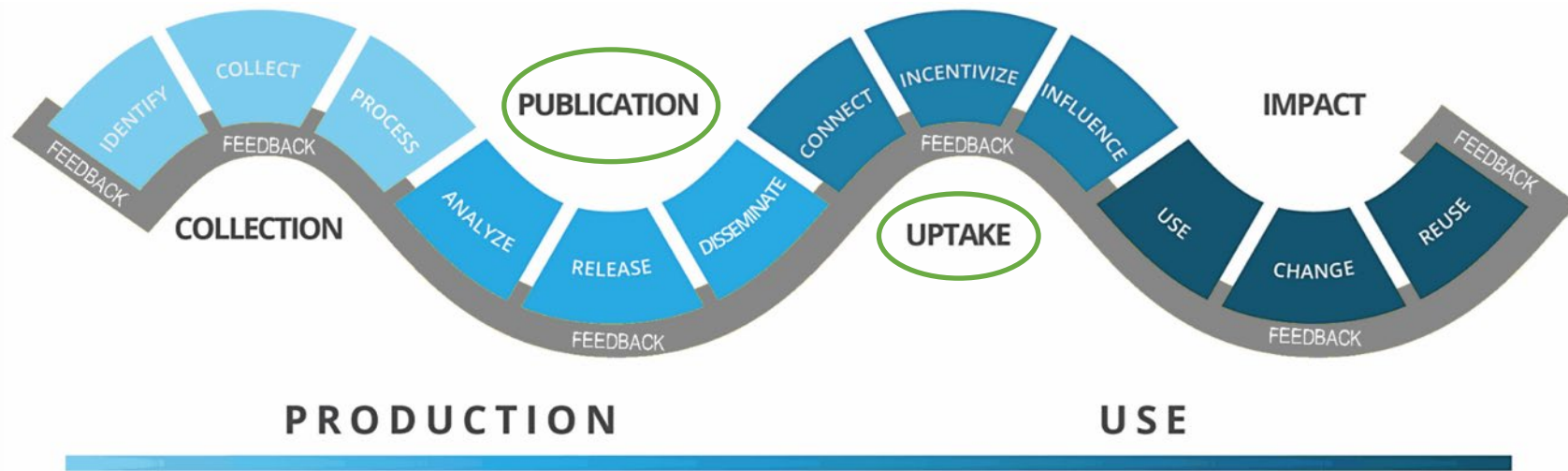
*ESA Living Planet Symposium*

*27 May 2022*





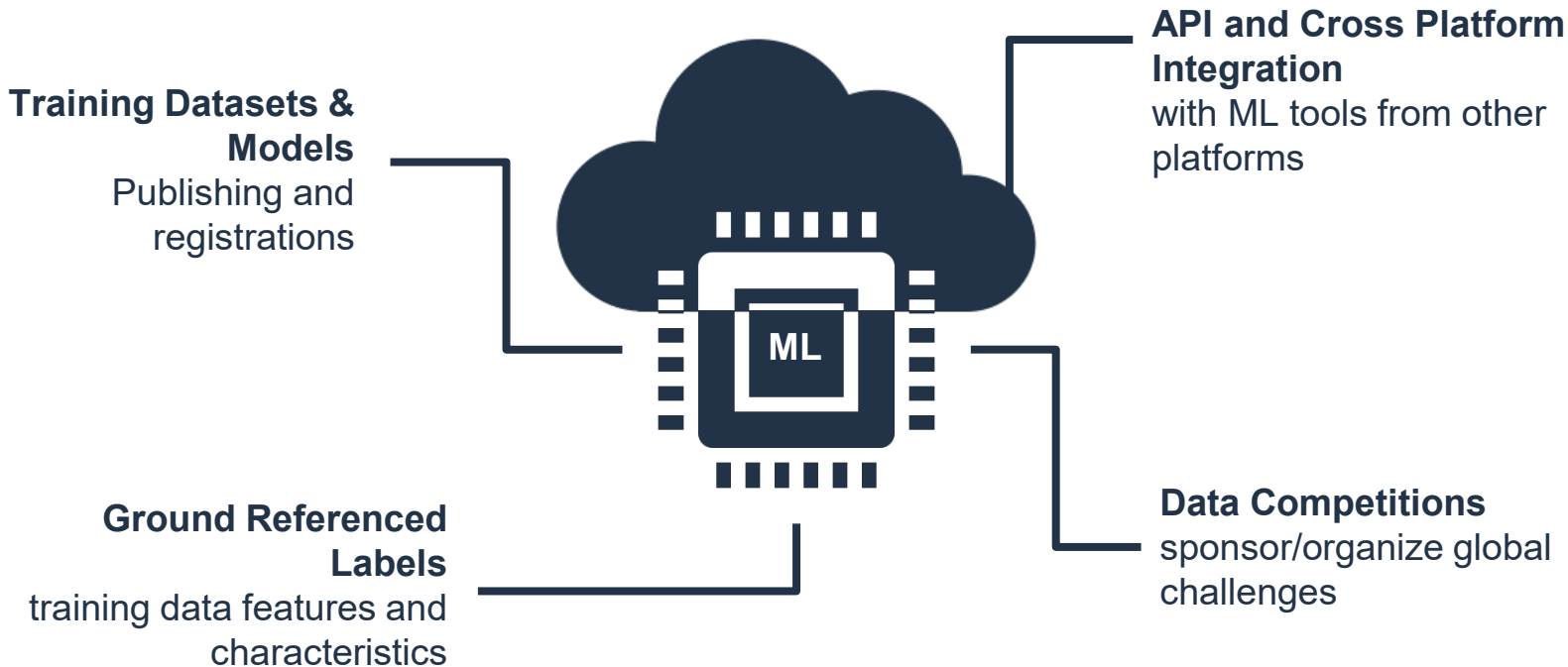
# Data Value Chain



Increasing value of data. Graphic adapted from Open Data Watch.



# Radiant MLHub





# Radiant MLHub Goals



## Improving Geodiversity

Diverse geospatial training data catalogs and models



## Easing Accessibility

Open access of high-quality training data and models



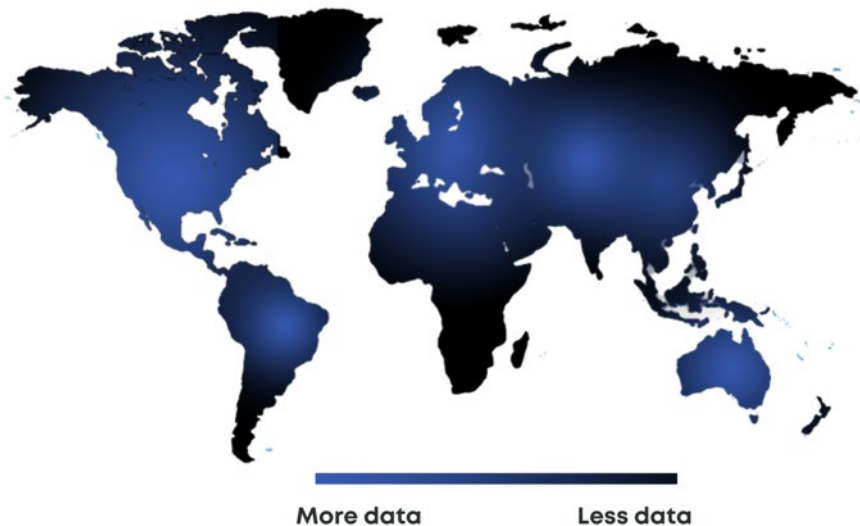
## Providing Benchmarks

High-quality data to train and validate models

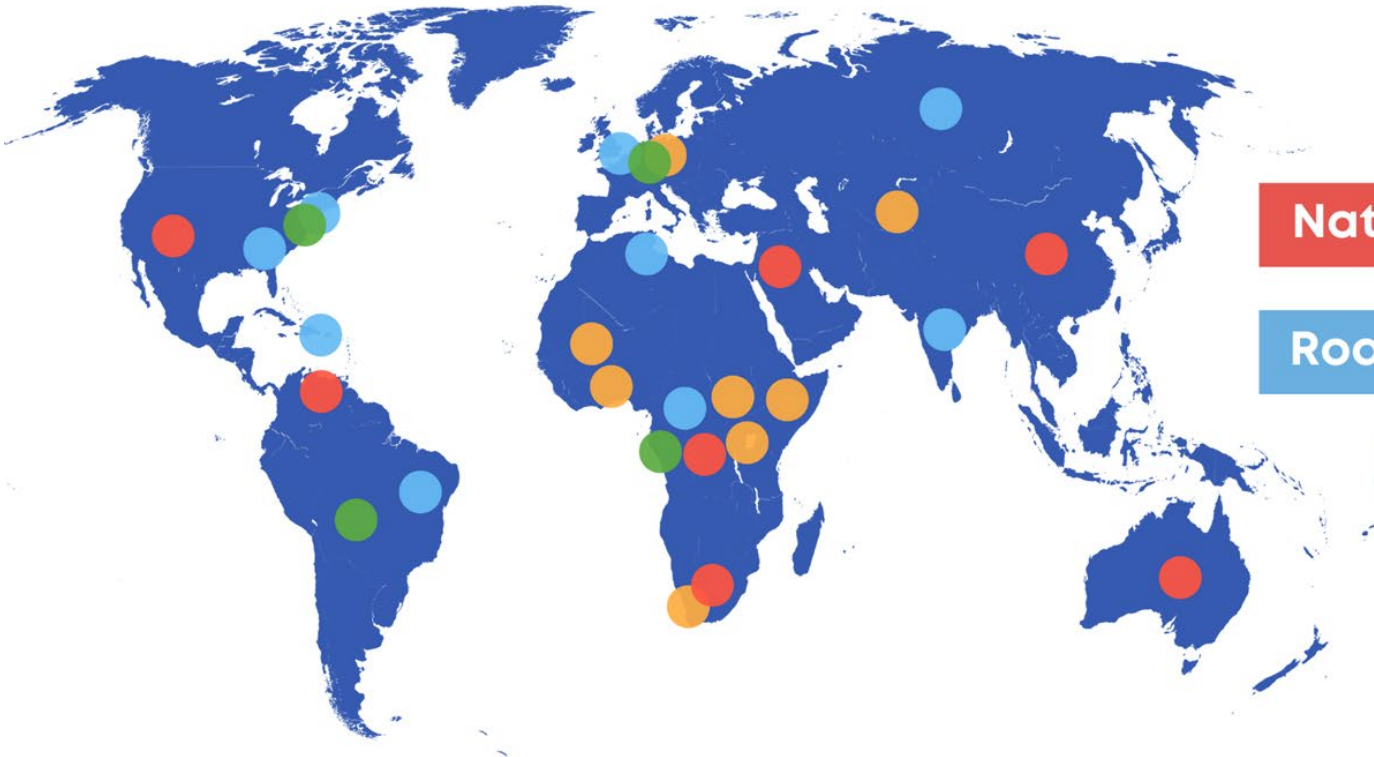


## Enhancing Interoperability

Community standardized tools to capture diverse geospatial data specifications



# Available Training Data



Crop Types

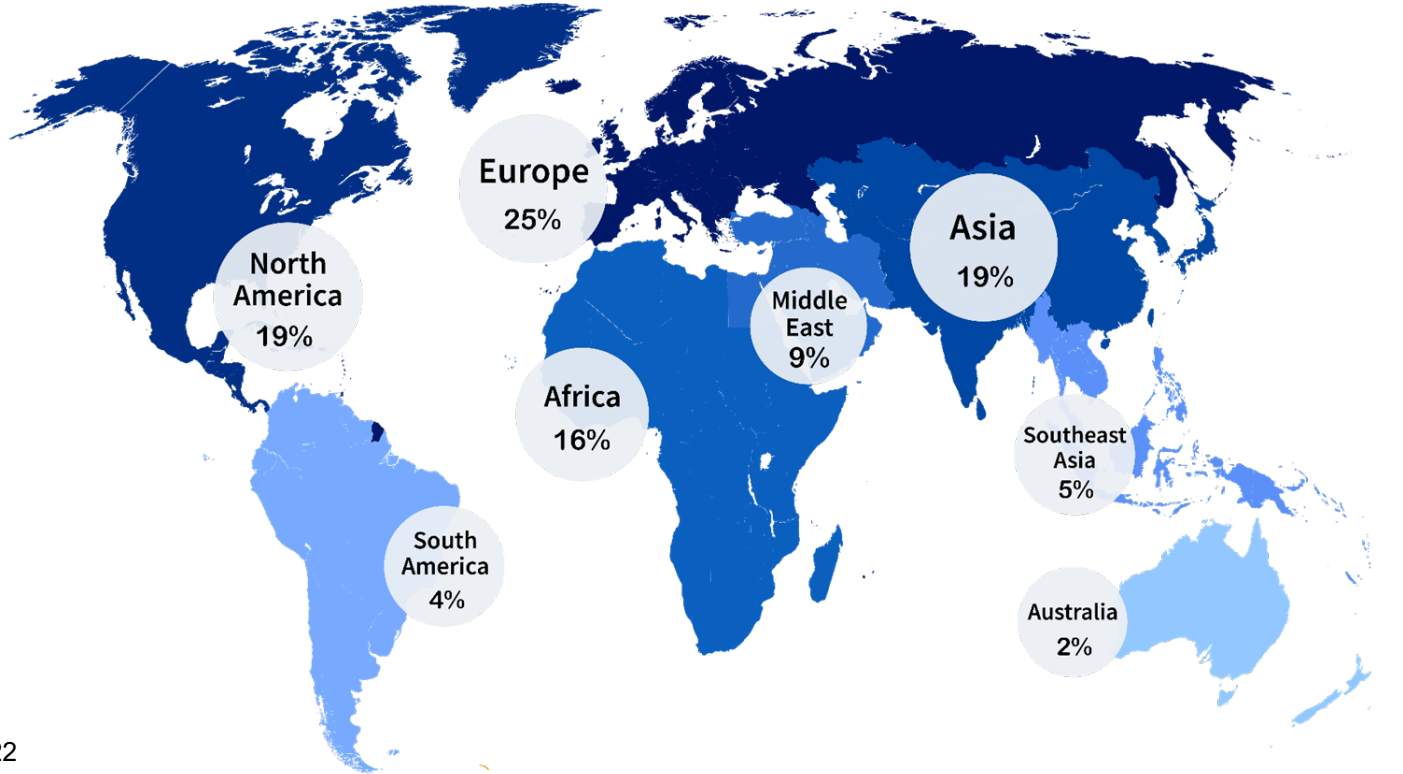
Natural Disasters

Roads & Buildings

Land Cover

\* As of April 2022


# Radiant MLHub Users



\* As of April 2022



# Open Library for Earth Observations Machine Learning

 [Sign up for API access](#)

 [Contribute a Dataset or Model](#)

**Radiant MLHub is the world's first cloud-based open library dedicated to Earth observation training data and models for use with machine learning algorithms.**

Radiant MLHub hosts open ML training datasets and models generated by Radiant Earth Foundation, partners, and community. Radiant MLHub allows anyone to access, store, register, and share open training datasets and models for high-quality Earth observations, and it's designed to encourage widespread collaboration and development of trustworthy applications.

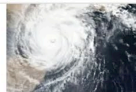
 [Browse All Datasets](#)

## Browse Datasets by Application

Crops



Tropical Storms



Building Footprints



Wildfire



Flood



Land Cover







# Radiant MLHub Python Client

The screenshot shows the documentation page for the Radiant MLHub Python client. The page has a dark blue header with the text 'radiant\_mlhub' and 'latest'. Below the header is a search bar labeled 'Search docs'. On the left side, there is a dark grey sidebar with a 'CONTENTS:' section listing various topics: Getting Started, Authentication, Datasets, Collections, ML Models, API Documentation, and CLI Tools. The main content area has a white background and features the Radiant MLHub logo (a cluster of colorful dots) and the text 'Radiant MLHub EARTH IMAGERY FOR IMPACT'. Below this is the title 'radiant\_mlhub: Python client' and a link to 'Edit on GitHub'. The main text welcomes users to the documentation for the Radiant MLHub Python client. A 'Contents:' section lists the following topics: Getting Started, Background Info, Installation, Configuration, List Datasets, Fetch a Dataset, Work with Dataset Collections, Download a Dataset, and Discovering ML Models.


radiant\_mlhub  
latest

Search docs

CONTENTS:

- Getting Started
- Authentication
- Datasets
- Collections
- ML Models
- API Documentation
- CLI Tools

» radiant\_mlhub: Python client [Edit on GitHub](#)

 **Radiant MLHub**  
EARTH IMAGERY FOR IMPACT

**radiant\_mlhub: Python client**

Welcome to the documentation for the [Radiant MLHub](#) Python client.

**Contents:**

- [Getting Started](#)
  - [Background Info](#)
  - [Installation](#)
  - [Configuration](#)
  - [List Datasets](#)
  - [Fetch a Dataset](#)
  - [Work with Dataset Collections](#)
  - [Download a Dataset](#)
  - [Discovering ML Models](#)





# Radiant MLHub Python Client

```
[ ]: import os
      os.environ['MLHUB_API_KEY'] = 'your_api_key_here'

[ ]: aoi = {
      "type": "Feature",
      "properties": {},
      "geometry": {
        "type": "Polygon",
        "coordinates": [
          [ [36.990966796875, -3.4640741915530184],
            [37.5457763671875, -3.4640741915530184],
            [37.5457763671875, -2.9156109787373894],
            [36.990966796875, -2.9156109787373894],
            [36.990966796875, -3.4640741915530184]]
          ]
        }
      }

[ ]: from radiant_mlhub import Dataset
      dataset = Dataset.fetch('ref_cloud_cover_detection_challenge_v1')
      my_filter = dict(
        ref_cloud_cover_detection_challenge_v1_test_labels=['labels'],
        ref_cloud_cover_detection_challenge_v1_test_source=['B02', 'B03', 'B04', 'B08'],
      )
      dataset.download(intersects=aoi, collection_filter=my_filter)
```



# SpatioTemporal Asset Catalog

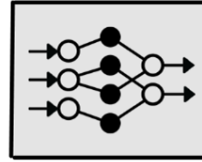
- Specification for geospatial catalogs and assets
- Enabling search and discovery
- Simple core + Extensions
  - Labeled Data
  - ML Models
- Open source and Community-driven



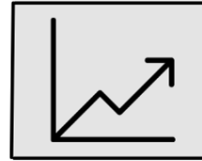
**STAC**  
SpatioTemporal  
Asset Catalog

# STAC ML-Model Extension

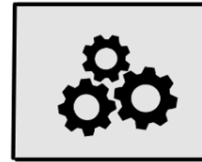
## ML Model Extensions



Models



Performance  
Metrics



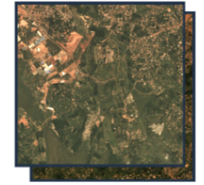
Deployment  
Environments

## Label Extension

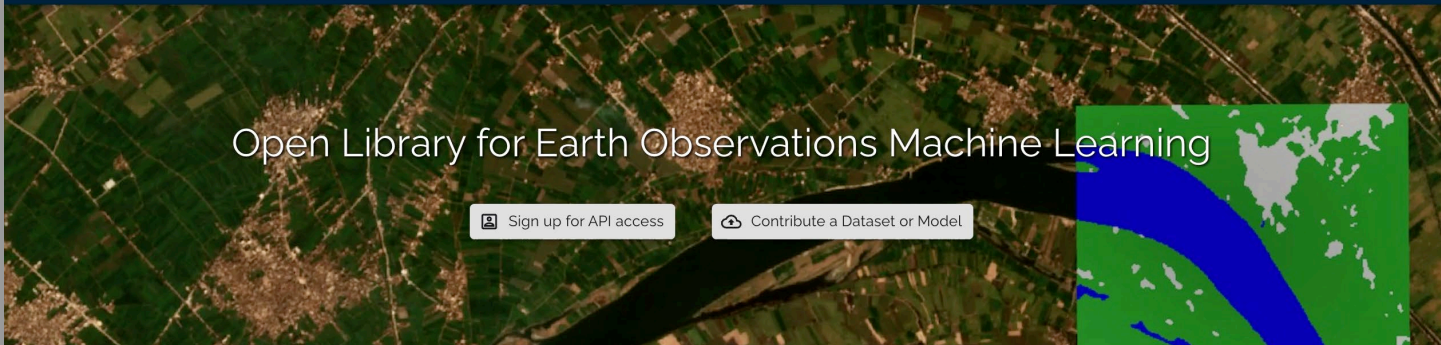


Training Labels +  
Model Predictions


## STAC Core




Source Imagery



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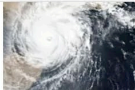
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 [Browse All Datasets](#)


## Browse Datasets by Application


**Crops** 

**Tropical Storms** 

**Building Footprints** 

**Wildfire** 

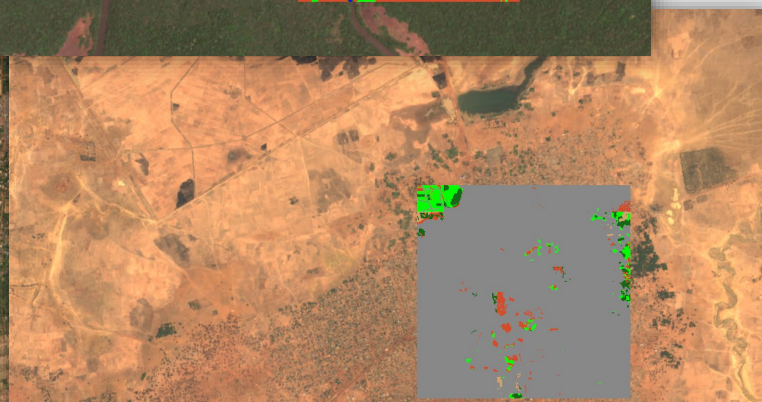
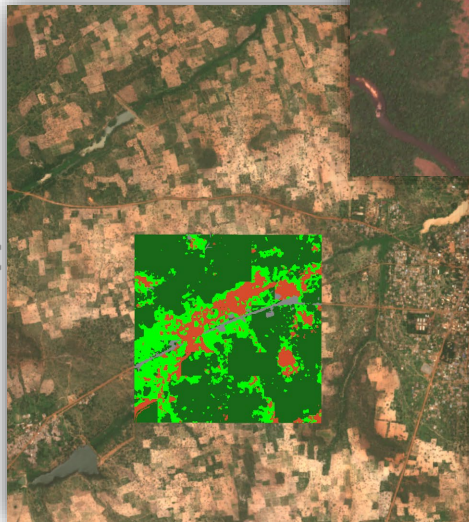
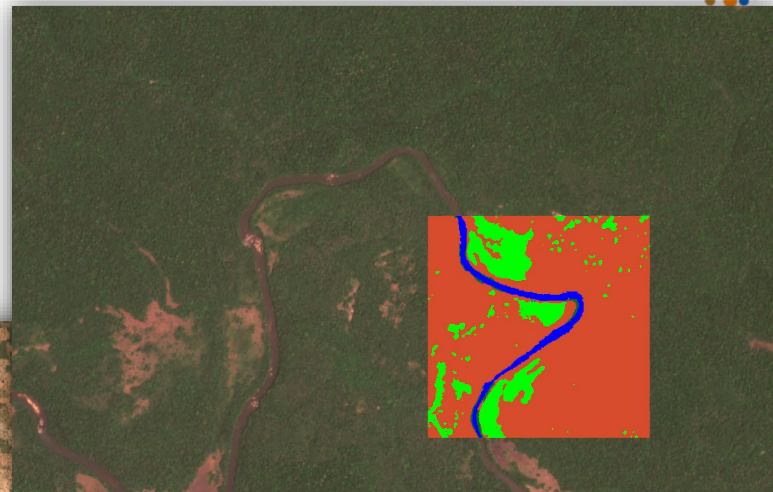
**Flood** 

**Land Cover** 



# LandCoverNet

- First global geodiverse LC Training Dataset
- Multi-Sensor (Sentinel-1, -2 and Landsat 8)
- 590M labeled pixels at 10 m resolution
- 7 classes based on annual time series



Funders:



Microsoft

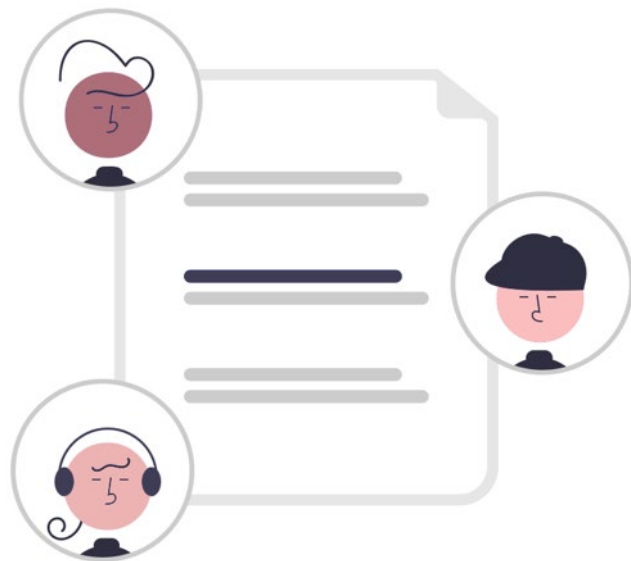
In-kind Technology Support:





# Community of Practice

- Technical support services for ecosystem players
- Training data standards and best practices
- Innovative technology standards
- Workshops and technology sprints
- Model metadata standards





# Outreach & Education



- Publishing ML4EO industry news
- Highlight best practices on ML and EO
- Disseminate information produced by community of practice
- Convene networking events
- Build community capacity through workshops, training, tutorials



# AI FOR EARTH OBSERVATION

How might we ensure open access to high-quality, machine learning-ready Earth observation data on a sustainable basis?

The **ii**2030  
Journey

Join us on September 2 and September 16 at 2.30pm CET for an online consultation to explore this question further.



# Partners and Collaborators





# Thank You!



[www.radiant.earth](http://www.radiant.earth)  
[www.mlhub.earth](http://www.mlhub.earth)



MLHub Slack Channel  
[bit.ly/MLHubSlackSignUp](https://bit.ly/MLHubSlackSignUp)



GitHub Page  
[github.com/radiantearth](https://github.com/radiantearth)

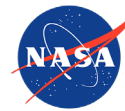


@OurRadiantEarth

# Funders



BILL & MELINDA  
GATES foundation



Partner



Enabling Crop  
Analytics at Scale

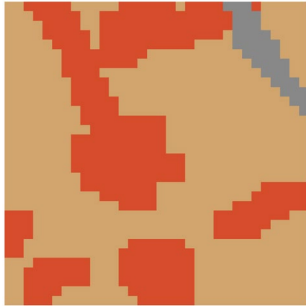




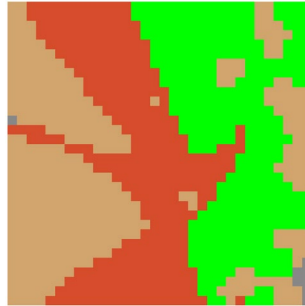
# Sample Labels from three users



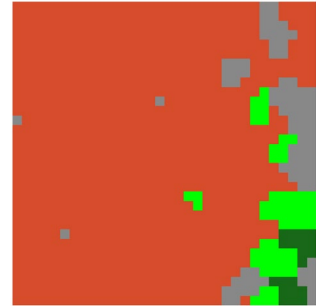
Score: 0.638



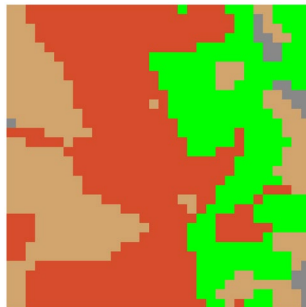
Score: 0.668



Score: 0.566



Consensus label



Consensus score

