Microsoft Research
Summit 2022

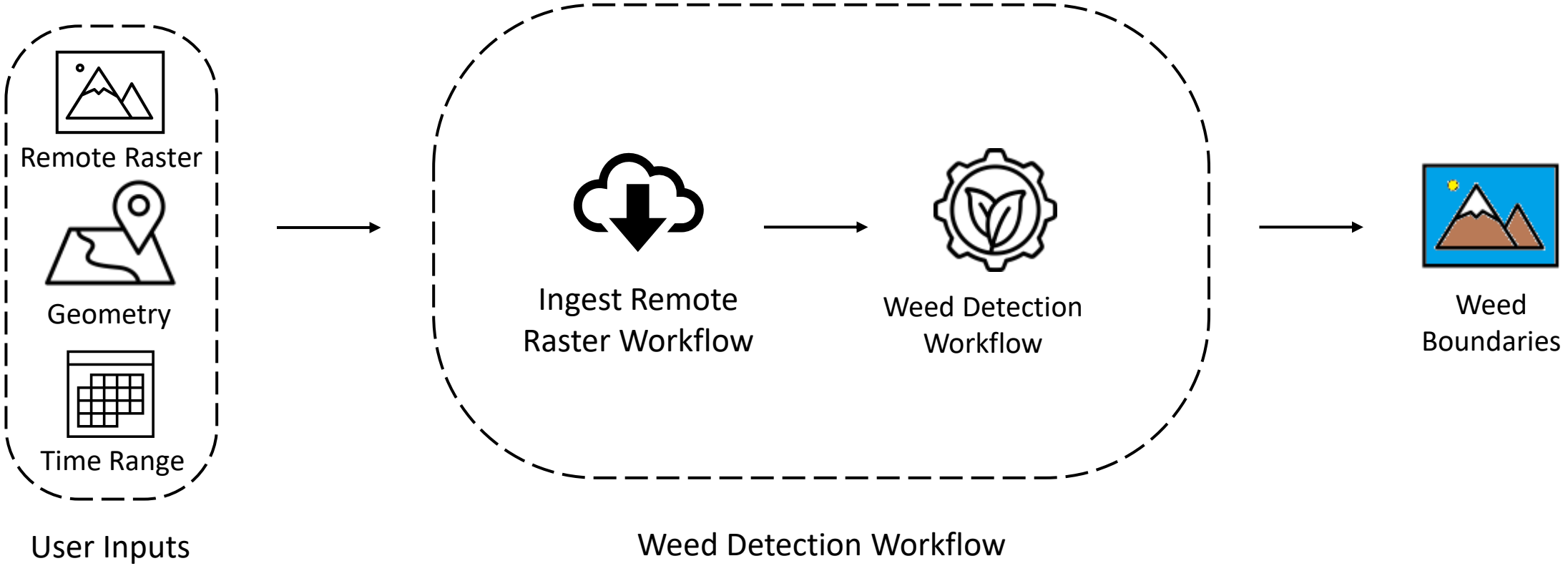
Weed Detection Workflow

Alex Crown
Microsoft Research

Outline

- Weed detection workflow overview
- Creating raster images
- Storing data in Azure
- Running the workflow
- Analyzing results

Workflow Summary



Creating a raster image

- Drone imagery is the best fit for this workflow
- Stitched images
  - Third party software (e.g., Pix4D)
  - FarmVibes.Edge (including project Visage)
    - Visage: Enabling Timely Analytics for Drone Imagery - Microsoft Research

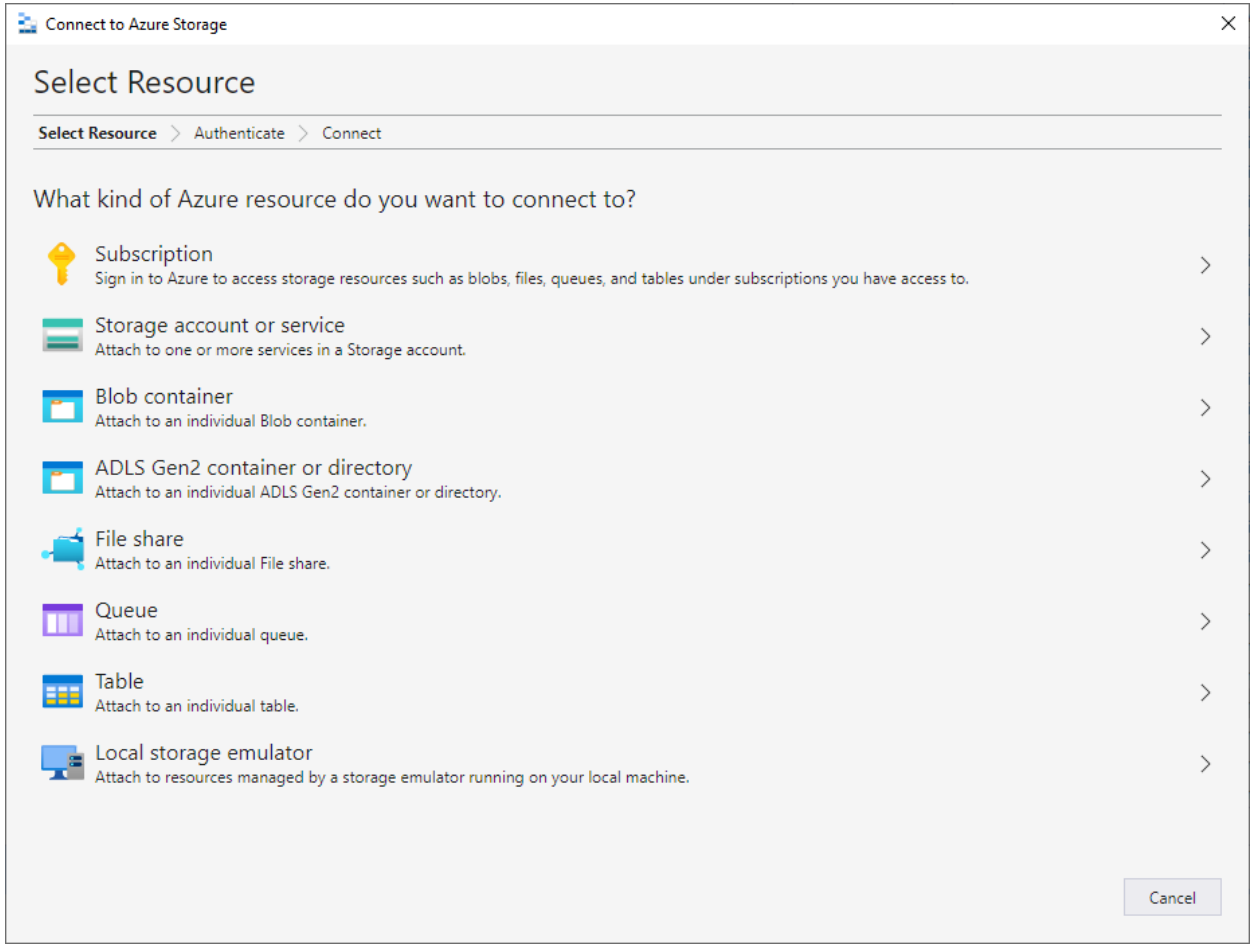
Creating raster images with FarmVibes.Edge

Using Azure Storage

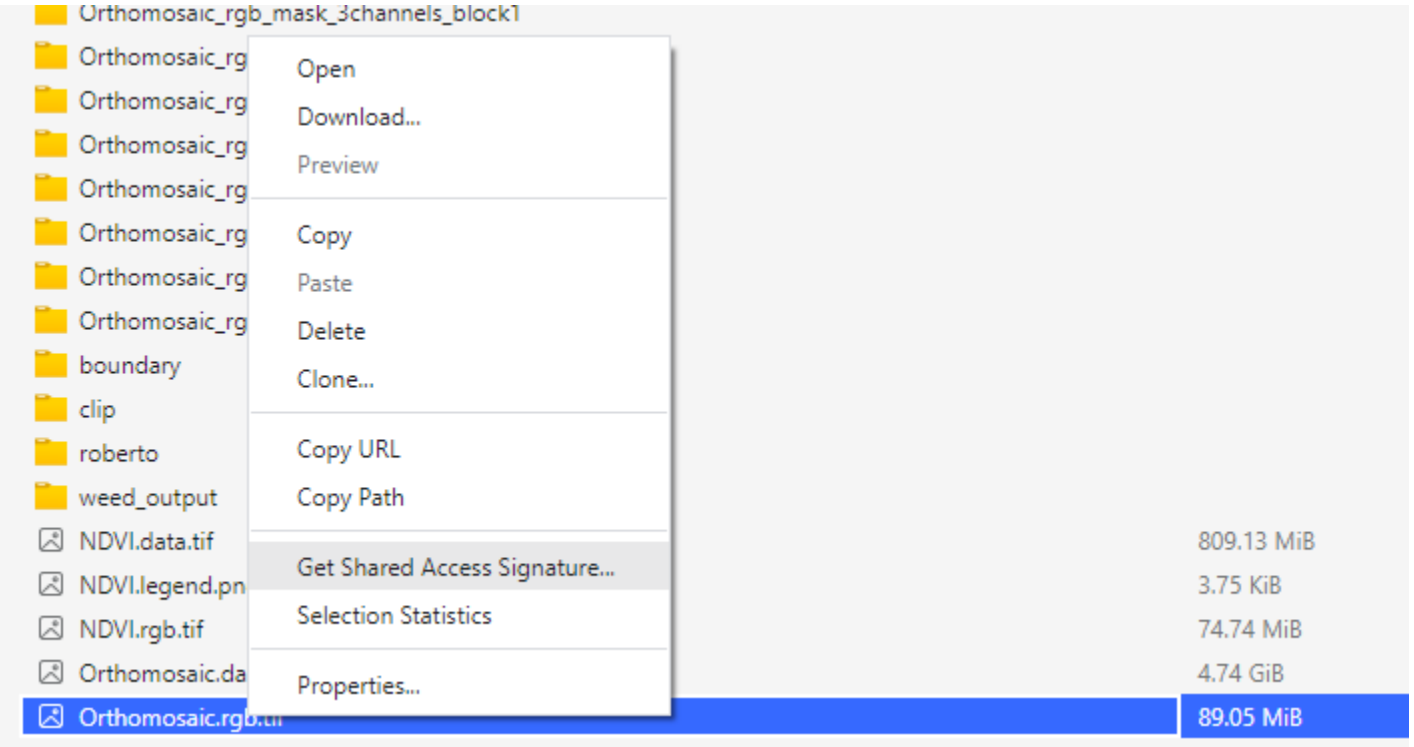
- File Storage
- Blob Storage
- Read images with signed URL
  - SAS Tokens

Using Azure Storage

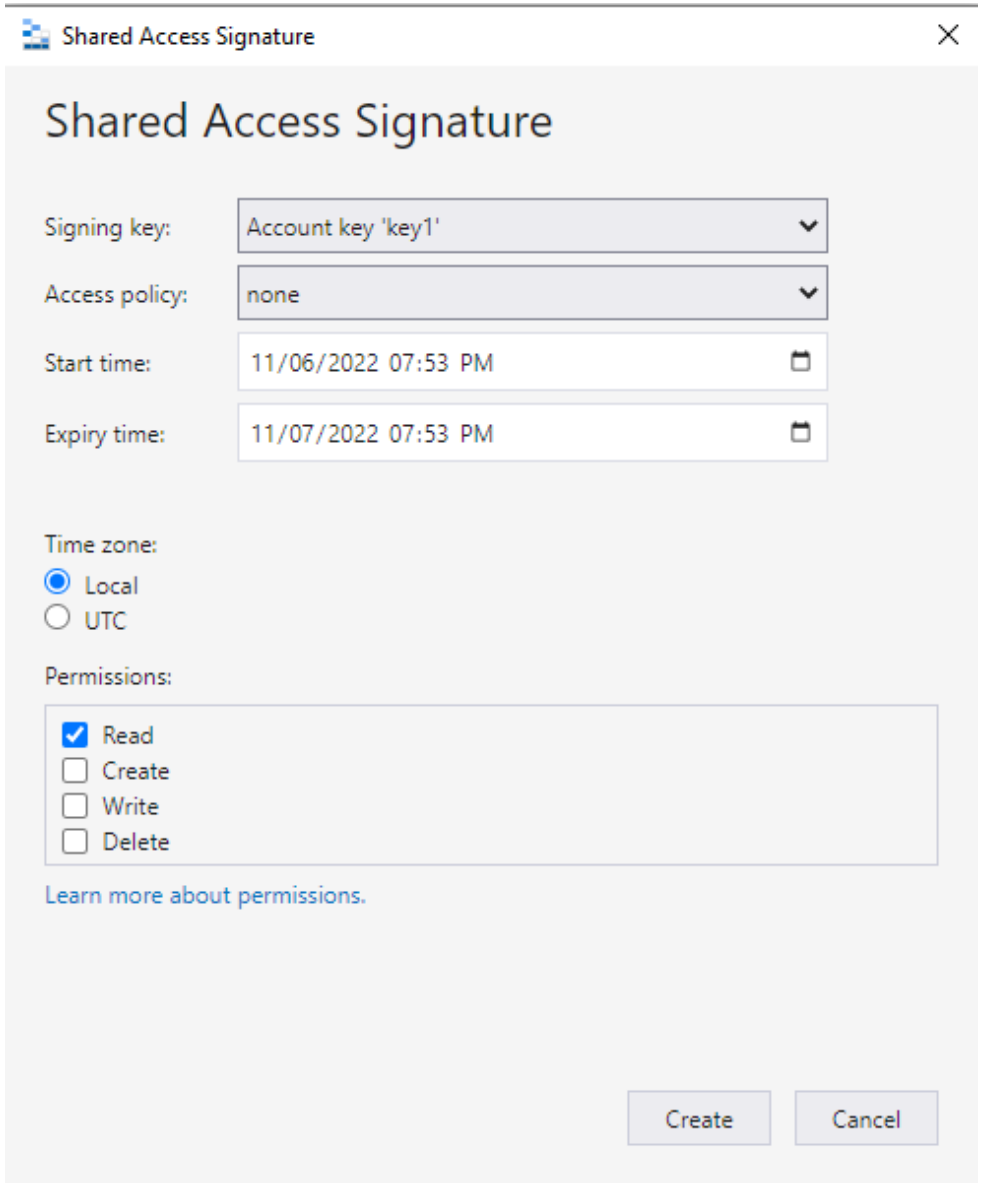
- Azure Storage Explorer



Creating SAS Tokens



Creating SAS Tokens



Inputs

Required

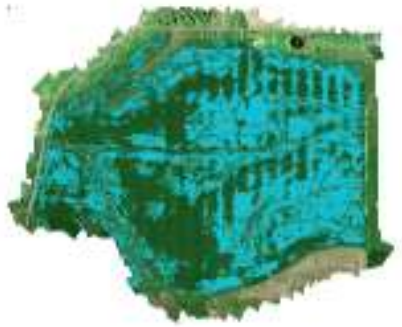
- Geometry
- Time Range
- Signed URL to Raster

Output

- Zip archive containing a shapefile for each cluster

result.zip

cluster_0.shp
cluster_1.shp
…


Inputs

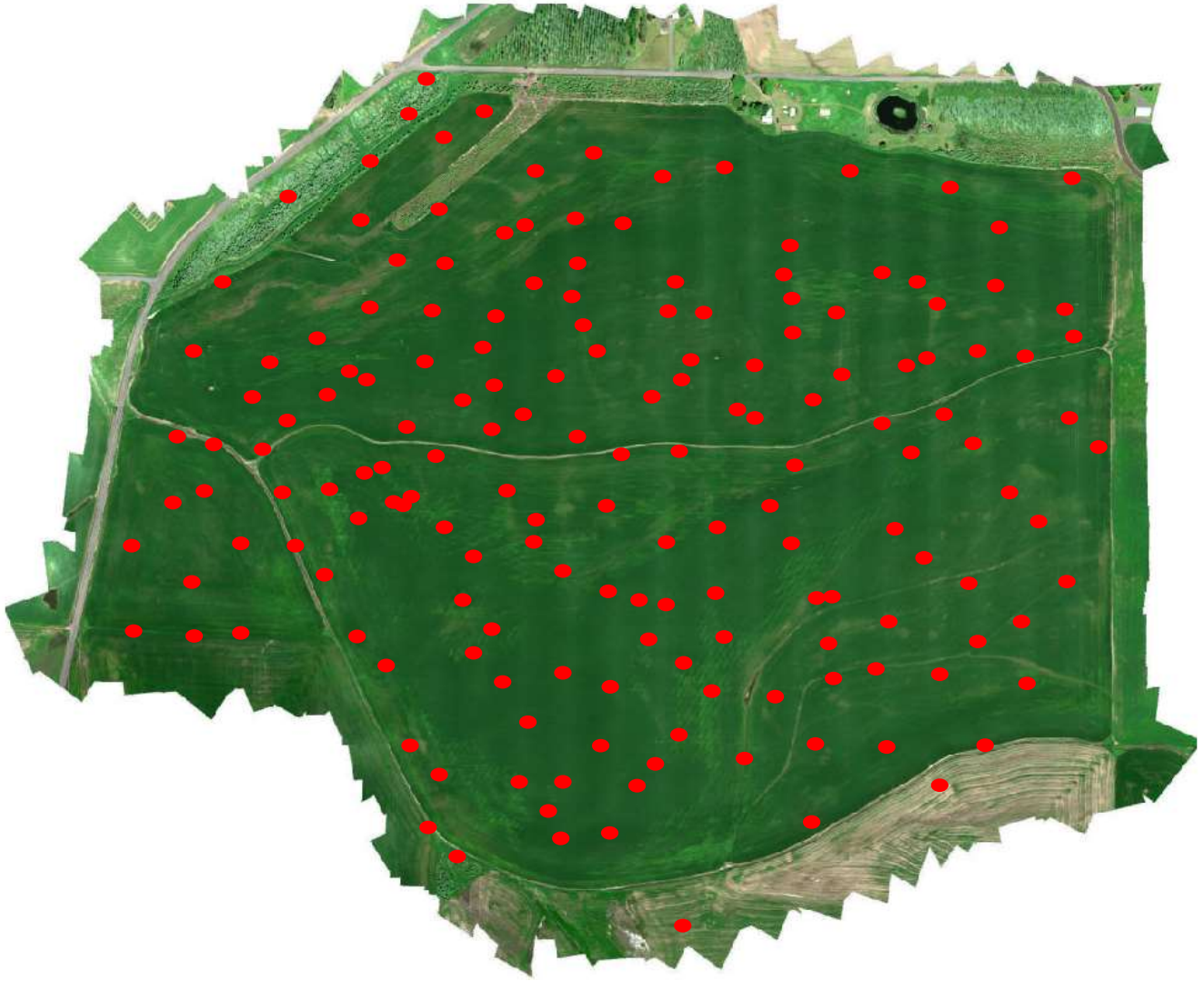
Optional

- Samples
- Buffer
- Grid Size
- Clusters
- Sieve Size
- Simplify
- Tolerance

Inputs

Optional

- **Samples**
- Buffer
- Grid Size
- Clusters
- Sieve Size
- Simplify
- Tolerance



Inputs

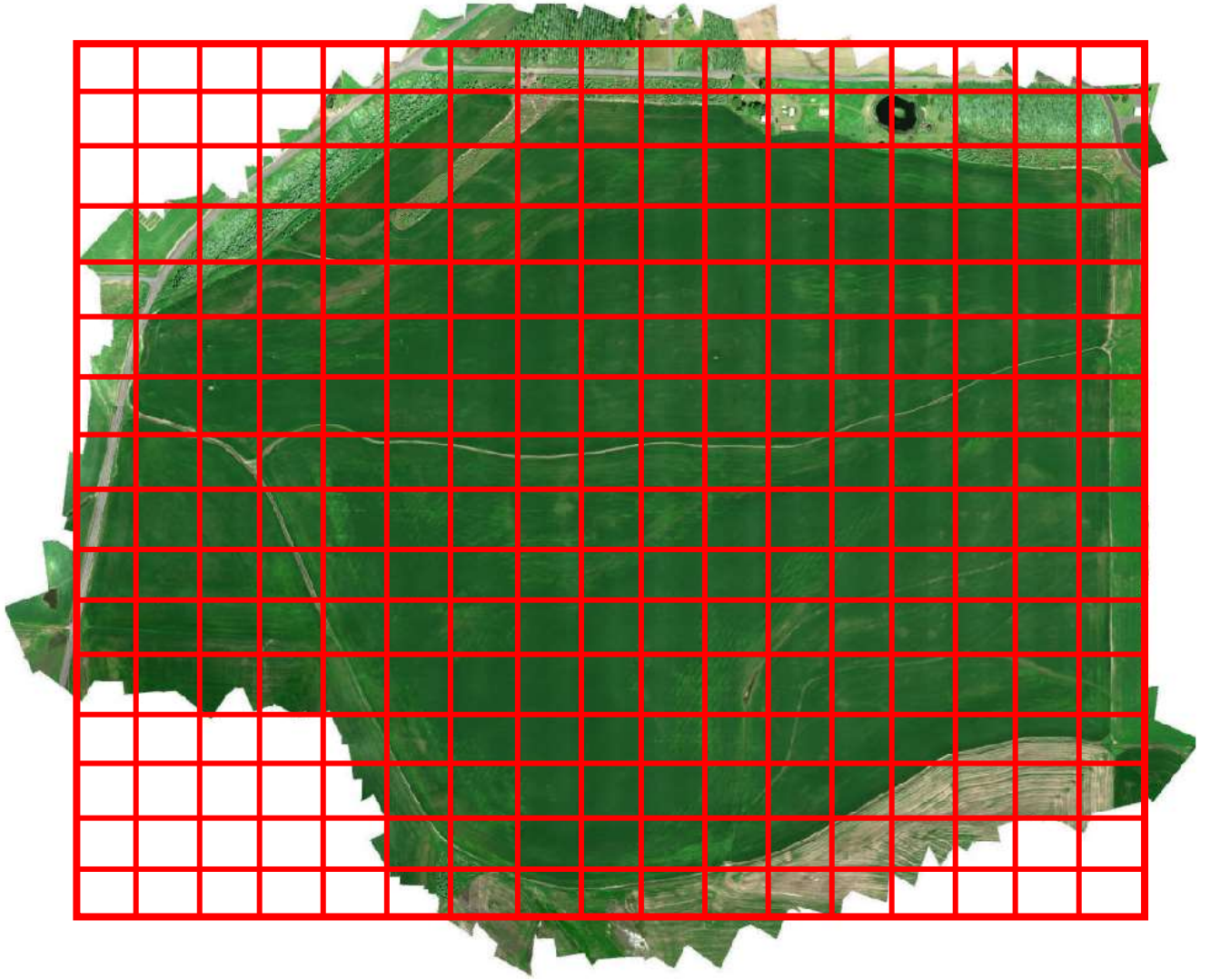
Optional

- Samples
- **Buffer**
- Grid Size
- Clusters
- Sieve Size
- Simplify
- Tolerance

Inputs

Optional

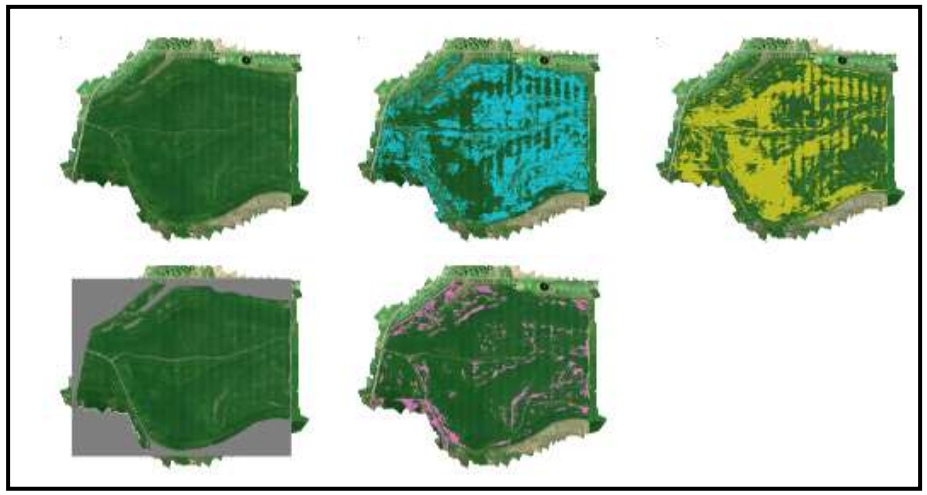
- Samples
- Buffer
- **Grid Size**
- Clusters
- Sieve Size
- Simplify
- Tolerance

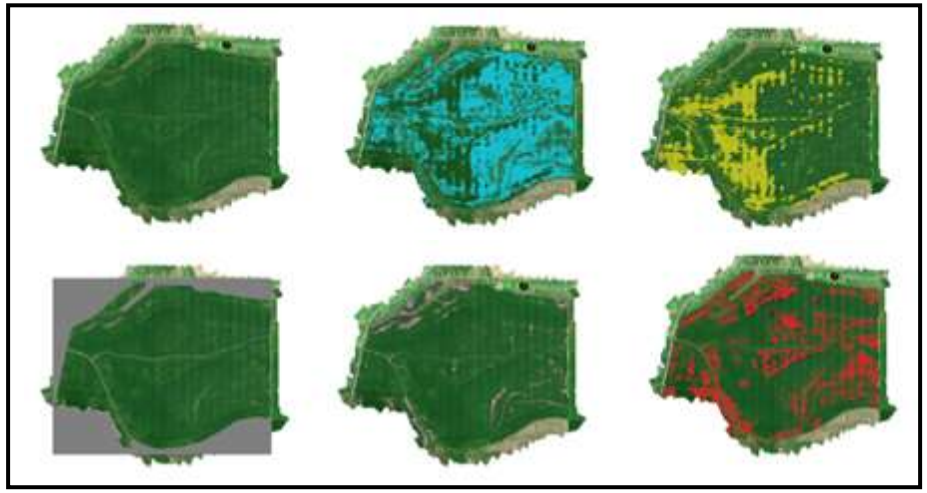


Inputs

Optional

- Samples
- Buffer
- Grid Size
- **Clusters**
- Sieve Size
- Simplify
- Tolerance

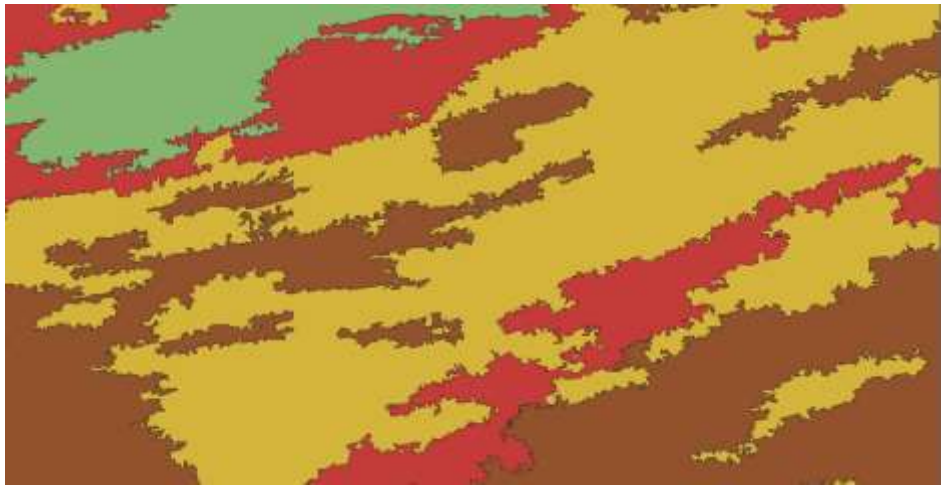


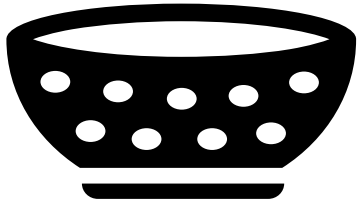


Inputs

Optional

- Samples
- Buffer
- Grid Size
- Clusters
- **Sieve Size**
- Simplify
- Tolerance

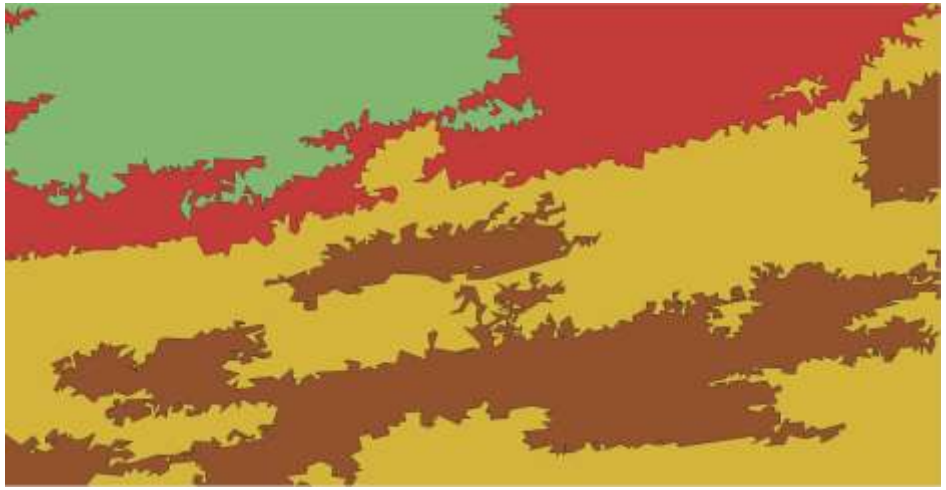




Inputs

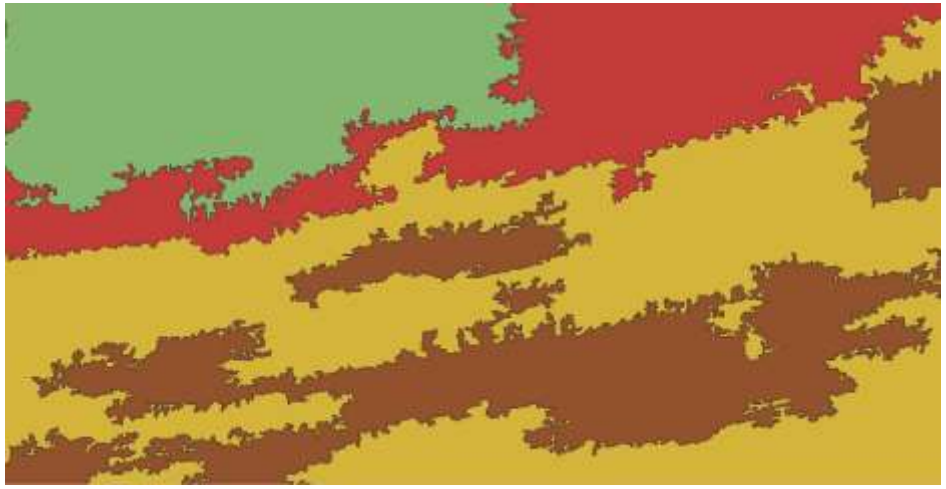
Optional

- Samples
- Buffer
- Grid Size
- Clusters
- Sieve Size
- **Simplify**
- Tolerance



Some Simplification

No Simplification



Inputs

Optional

- Samples
- Buffer
- Grid Size
- Clusters
- Sieve Size
- Simplify
- **Tolerance**

Low Tolerance

High Tolerance

Running the Workflow

Notebook:
farmvibes-ai/notebooks at main · microsoft/farmvibes-ai (github.com)

Running the Workflow

Install dependencies

```
$ cd notebooks/weed_detection/
$ conda env create -f ./weed_detection.yaml
$ conda activate weed_detection
```

Running the Workflow

Create a client

```
import geopandas as gpd
from vibe_core.client import get_default_vibe_client
from vibe_core.data import ExternalReferenceList
from datetime import datetime
from shapely import geometry as shpg
from urllib import request

client = get_default_vibe_client()
```

Running the Workflow

Generate the input

```
url = "https://demostorage.file.core.windows.net/demofield/WeedImages/weed
boundary_shape_file = "demo_field/boundary.shp"

now = datetime.now()
data_frame = gpd.read_file(boundary_shape_file).to_crs("epsg:4326")
assert data_frame is not None
geometry = shpg.mapping(data_frame.geometry.iloc[0])
url_hash = str(hash(url))

inputs = ExternalReferenceList(id=url_hash, time_range=(now, now),
                               geometry=geometry, assets=[], urls=[url])
```

Running the Workflow

Start the workflow

```
run = client.run(workflow='farm_ai/agriculture/weed_detection',
                 name="weed_detection_example", input_data=inputs)
```

```
params = {"clusters": 5, "simplify": "none"}
run = client.run(workflow='farm_ai/agriculture/weed_detection',
                 name="weed_detection_example", input_data=inputs,
                 parameters=params)
```

Running the Workflow

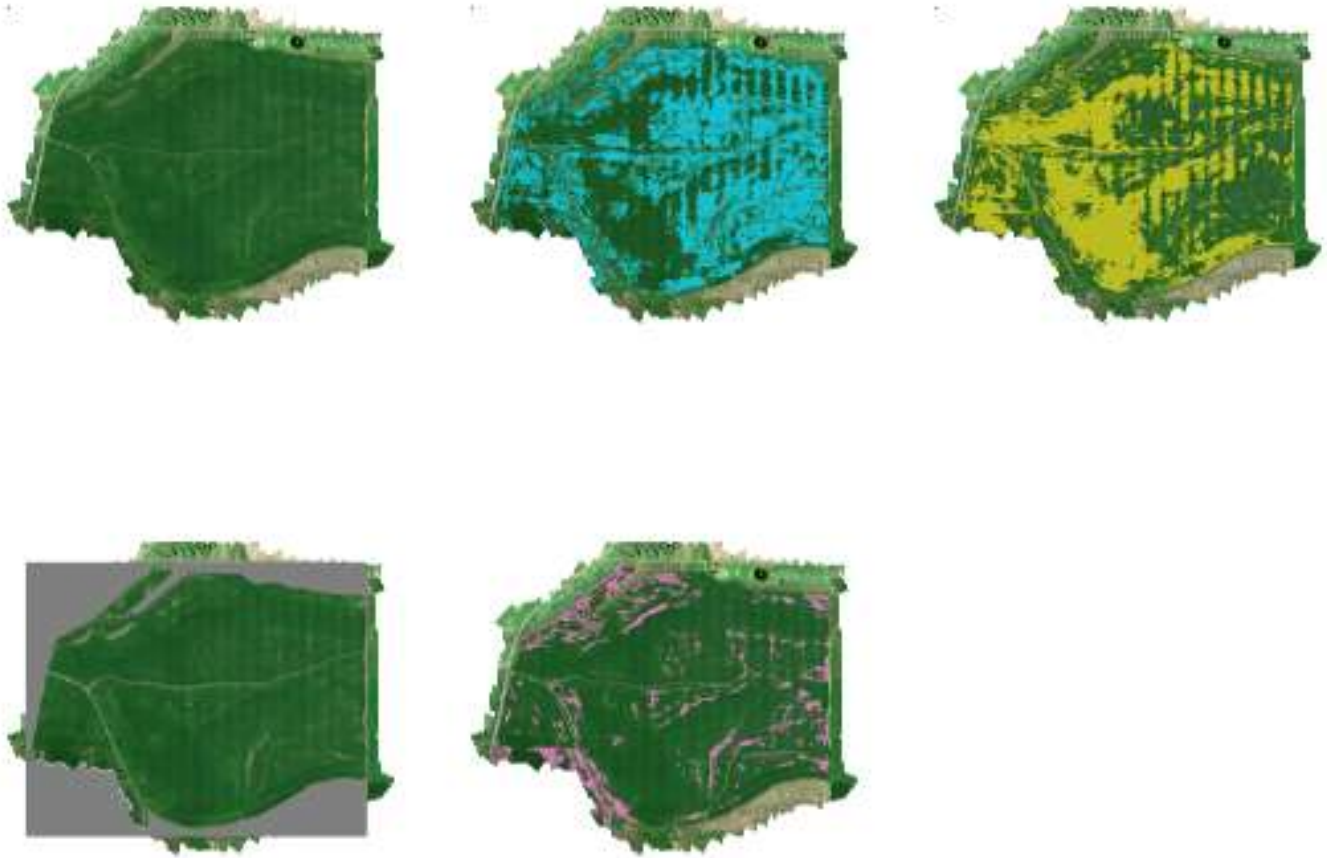
Get the results

```
run.monitor()
# Output is a DataVibeDict
output = run.output
# There was only one input raster to the weed detection workflow so there is only one DataVibe in the result
dv = output['result'][0]
# The DataVibe output by a weed detection workflow instance has only one asset
asset = dv.assets[0]
# Get the asset path containing the generated shape files
archive_path = asset.path_or_url
print(archive_path)
```

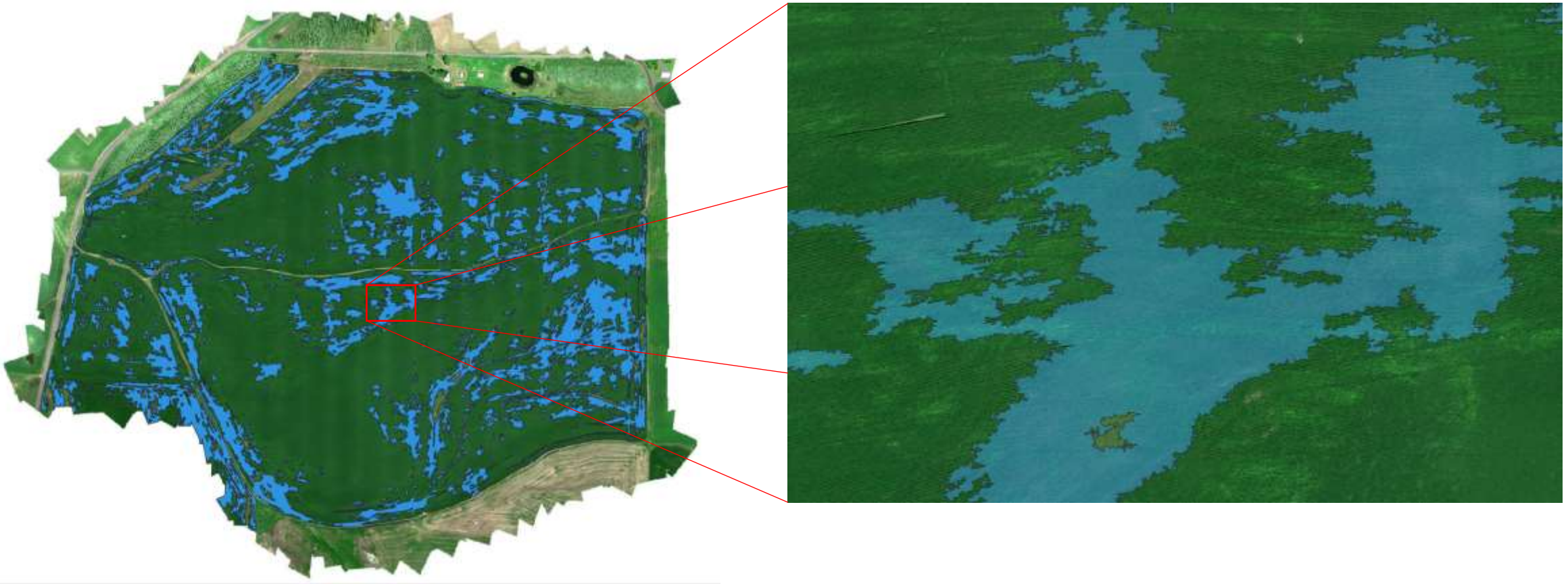
Visualizing Results

- GeoPandas
- QGIS

GeoPandas



QGIS



Microsoft Research
Summit 2022

Thank you

Stay in touch:

acrown@microsoft.com