

Microsoft Research

**Summit 2022**

# **FarmVibes.AI**

## **Introduction**

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# Agenda

Motivation

Workflow Overview

Architecture

Technical Details

Next steps

# Data-driven Agriculture

Precision & regenerative agriculture has been shown to:



Improve yield



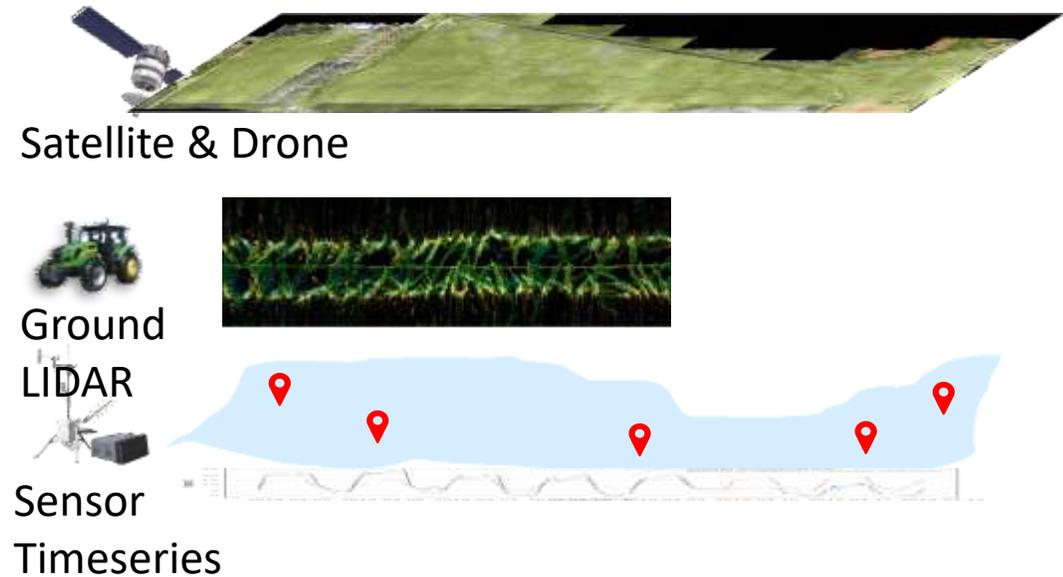
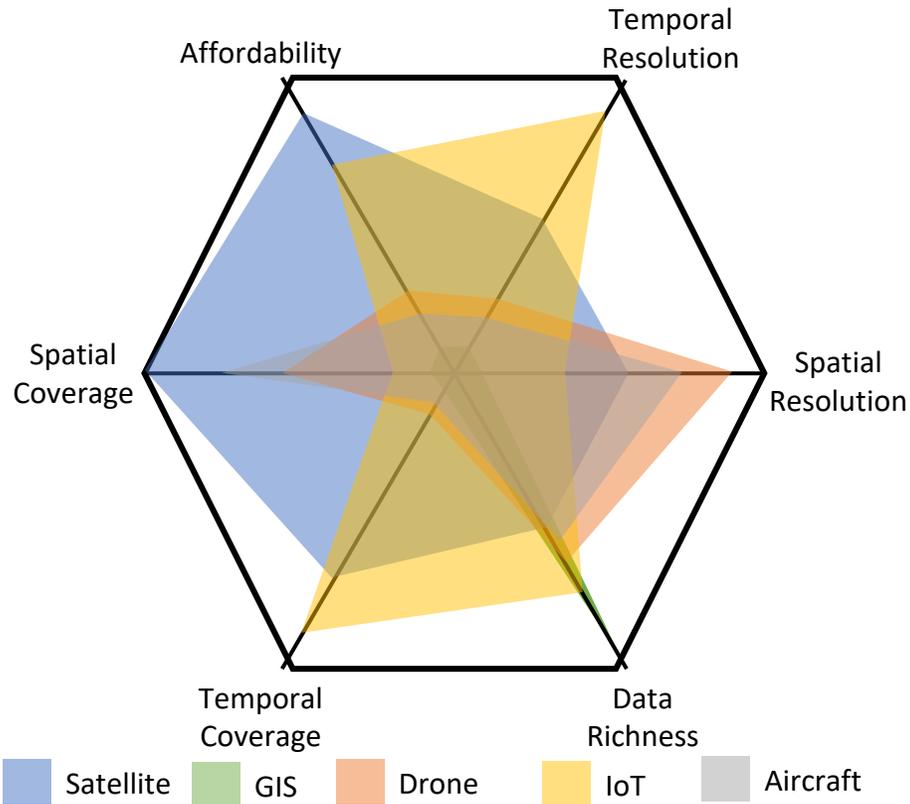
Reduce cost



Ensure sustainability

# Challenges of Data Insights for Agriculture

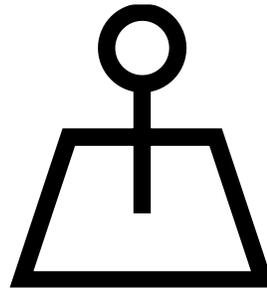
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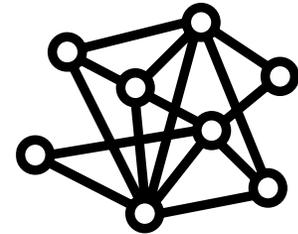
# FarmVibes.AI Toolkit



Building low code/no code insights for agriculture on top of existing data providers (e.g. FarmBeats)

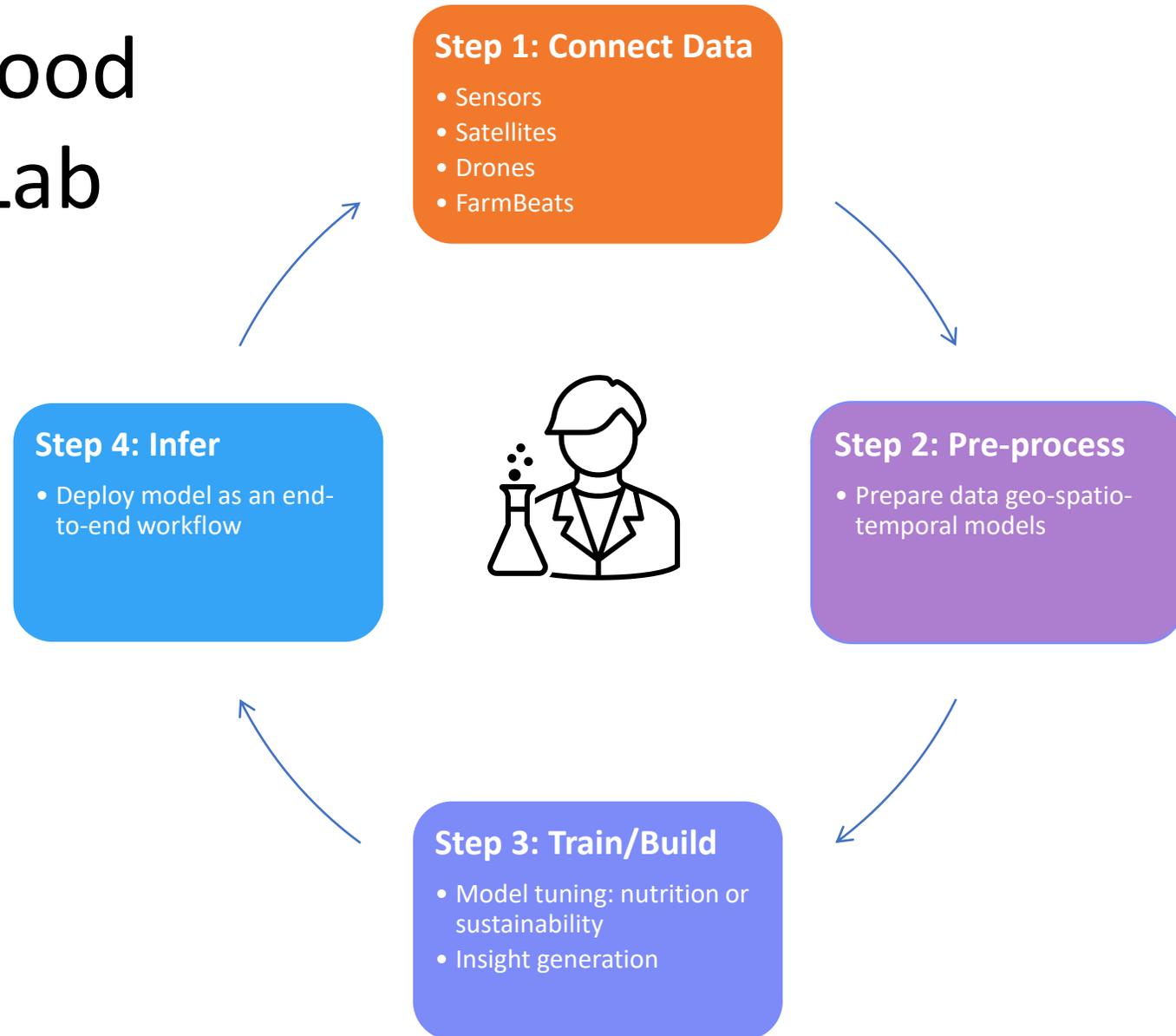


Merging multimodal field data: from IoT sensors to drones and Satellites

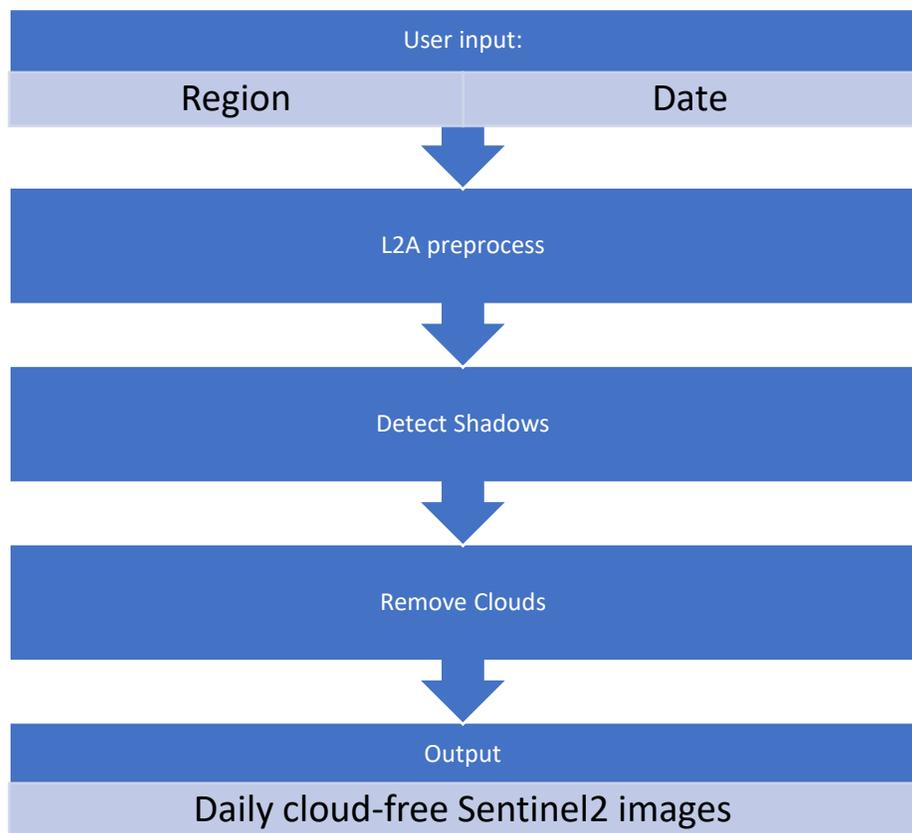


Combining different insights and training multimodal models

# Data Scientist Agri/Food Academia/Industry Lab



# Workflows



```

name: spaceeye_example
sources:
  user_input:
    preprocess.user_input
sinks:
  raster:
    split.rasters
tasks:
  preprocess:
    workflow: spaceeye/spaceeye_l2a_preprocess
  shadow:
    op: compute_sentinel2_shadow
  spaceeye:
    op: remove_clouds
edges:
  - origin: preprocess.s2_raster
    destination:
      - spaceeye.s2_products
      - shadow.rasters
  - origin: preprocess.merge_masks
    destination:
      - shadow.cloud_masks
  - origin: preprocess.merged_product
    destination:
      - spaceeye.s1_products
  - origin: shadow.cloud_and_shadow_mask
    destination:
      - spaceeye.cloud_masks
  
```

# Submitting Workflows

## Rest API

POST workflows runs:

- start executing a workflow
- workflow definition: existing workflow or workflow definition

## Python client

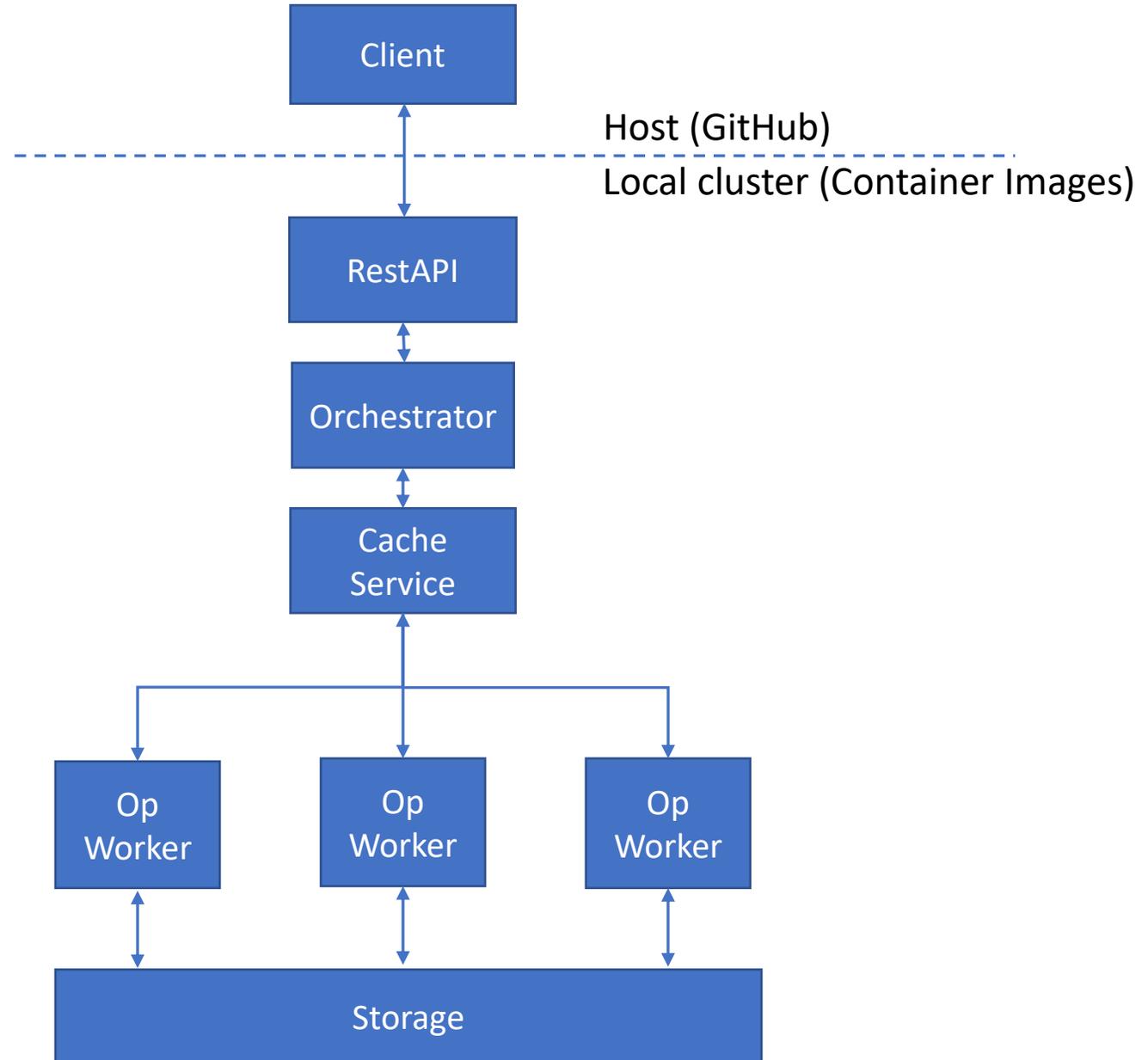
```
In [2]: from datetime import datetime
from shapely import wkt
from vibe_dev.client.remote_client import default_vibe_client

with open("spaceeye_tiles/10ugu.wkt") as f:
    geometry = wkt.load(f)
    time_range = (datetime(2020, 1, 1), datetime(2020, 1, 10))

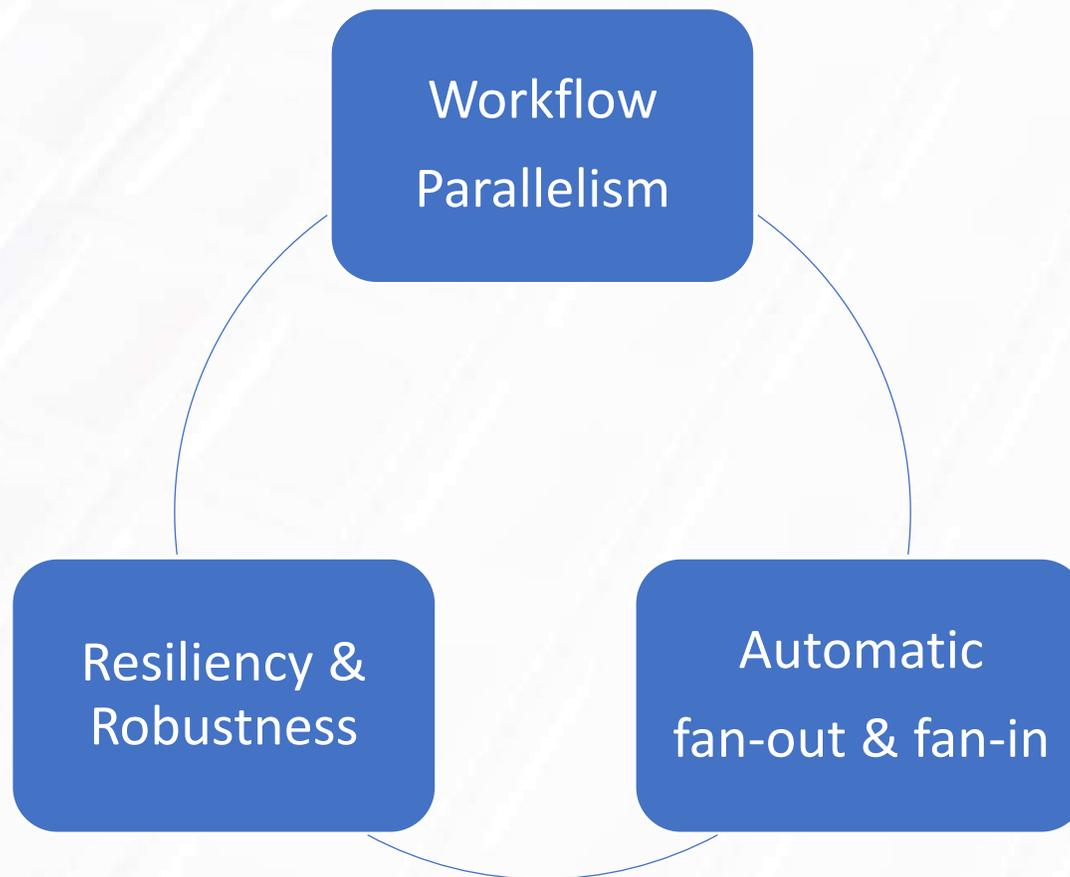
client = default_vibe_client()
run = client.run("spaceeye/spaceeye_l2a_preprocess", geometry, time_range, "workflow_name")
print(run)

VibWorkflowRun(id=c4e704b6-c635-4ce7-8945-42117691e435, name=workflow_name, workflow=spaceeye/spaceeye_l2a_preprocess, status=pending)
```

# Architecture



# Workflow Orchestration



# Cache

Op Output

- Cached after execution

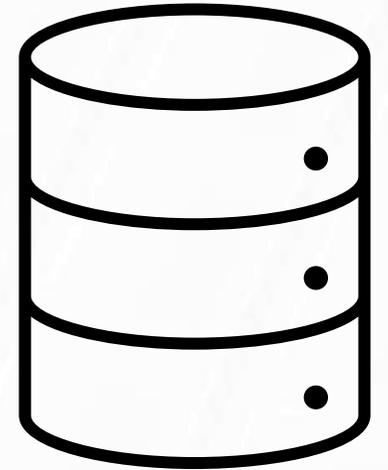
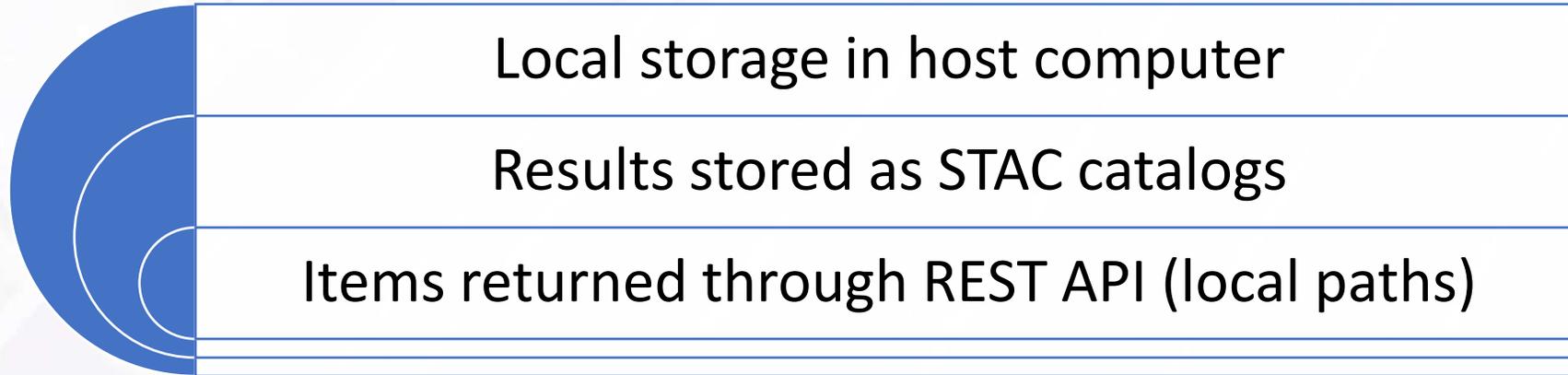
Repeated workflow execution

- No cost

Incremental input range

- Incremental compute

# Storage



# Workflows included in OSS

## Data Ingestion

Airbus  
CDL  
Elevation  
Landsat  
NAIP  
Sentinel1  
Sentinel2  
SoilGrids  
SpaceEye  
User provided raster  
User provided geometry  
Weather

## Data Processing

Clip  
Raster Gradient  
Indices (NDVI, ...)  
Linear trends  
Reprojections  
Thresholds  
Timeseries statistics

## Farm AI

Canopy Cover  
Change detection  
Emergence  
Methane  
NDVI Summaries  
Weed detection  
Soil carbon what-if  
Conservation practices  
Land degradation

## ML

Crop land  
segmentation  
Dataset generation  
Driveways detection

# What we will be discussing next...

## Tutorials:

How to install and basics of FarmVibes.AI OSS  
Model training and inference in FarmVibes.AI

## Deep dives in workflows:

SpaceEye

Weed detection

Terrace detection

Land degradation estimation

# What is Next

Continued work on new workflows

Other deployment options

More model training examples

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**Thank you**

 [aka.ms/farmvibes](https://aka.ms/farmvibes)

 [www.github.com/microsoft/farmvibes-ai](https://www.github.com/microsoft/farmvibes-ai)

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