MERCY CORPS AGRIFIN | 7TH ale AGRIFIN LEARNING EVENT

7th & 8th November
Nairobi, Kenya

Introduction to Artificial Intelligence (AI) and the Google Earth Engine

#ALE2023 #AgriFinALE2023

What is AI

Technology that enable computers to perform advanced tasks that mimic human intelligence and behavior.

Backbone of innovation in modern computing.

Encompasses many disciplines: Computer science, data analytics, hardware and software engineering, linguistics, neuroscience, philosophy, psychology.

Many different use cases: prediction and forecasting, object recognition, natural language processing, recommendation, intelligent data retrieval

Google

AGRIFIN LEARNING EVENT

ARTIFICIAL INTELLIGENCE
Engineering of machines that mimic cognitive functions

MACHINE LEARNING
Training of machines to perform tasks without explicit instructions

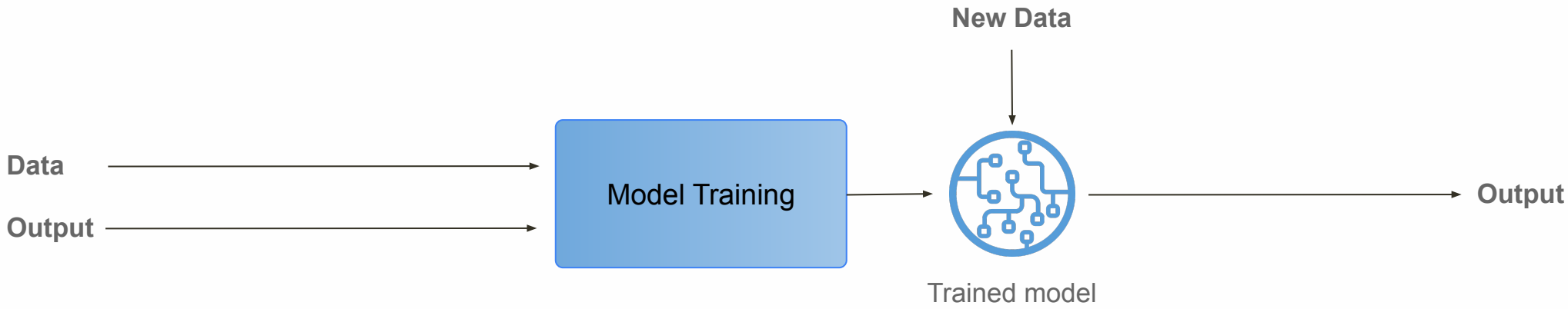
DEEP LEARNING
Machine learning based on artificial neural networks

Google

AGRIFIN LEARNING EVENT

Classical programming vs Machine Learning

Classical: Developers write rules that produce an output (e.g. **Calculator**)



Machine Learning: Developers train a model that finds rules which can be used to produce desired outputs (e.g. **Weather Forecasting**)

Google

AGRIFIN LEARNING EVENT

Benefits of AI

Automation

AI can automate workflows and processes, e..g. robots inspecting products for defects

Reduced human error

AI can eliminate manual errors in data processing, analytics, and other tasks

Elimination of repetitive tasks

AI can free human capital to work on higher impact problems e.g. transcribing calls

Faster and accurate info processing

AI can be quicker than humans in finding patterns in data

Infinite availability

AI can work on tasks continuously

Accelerated research and development

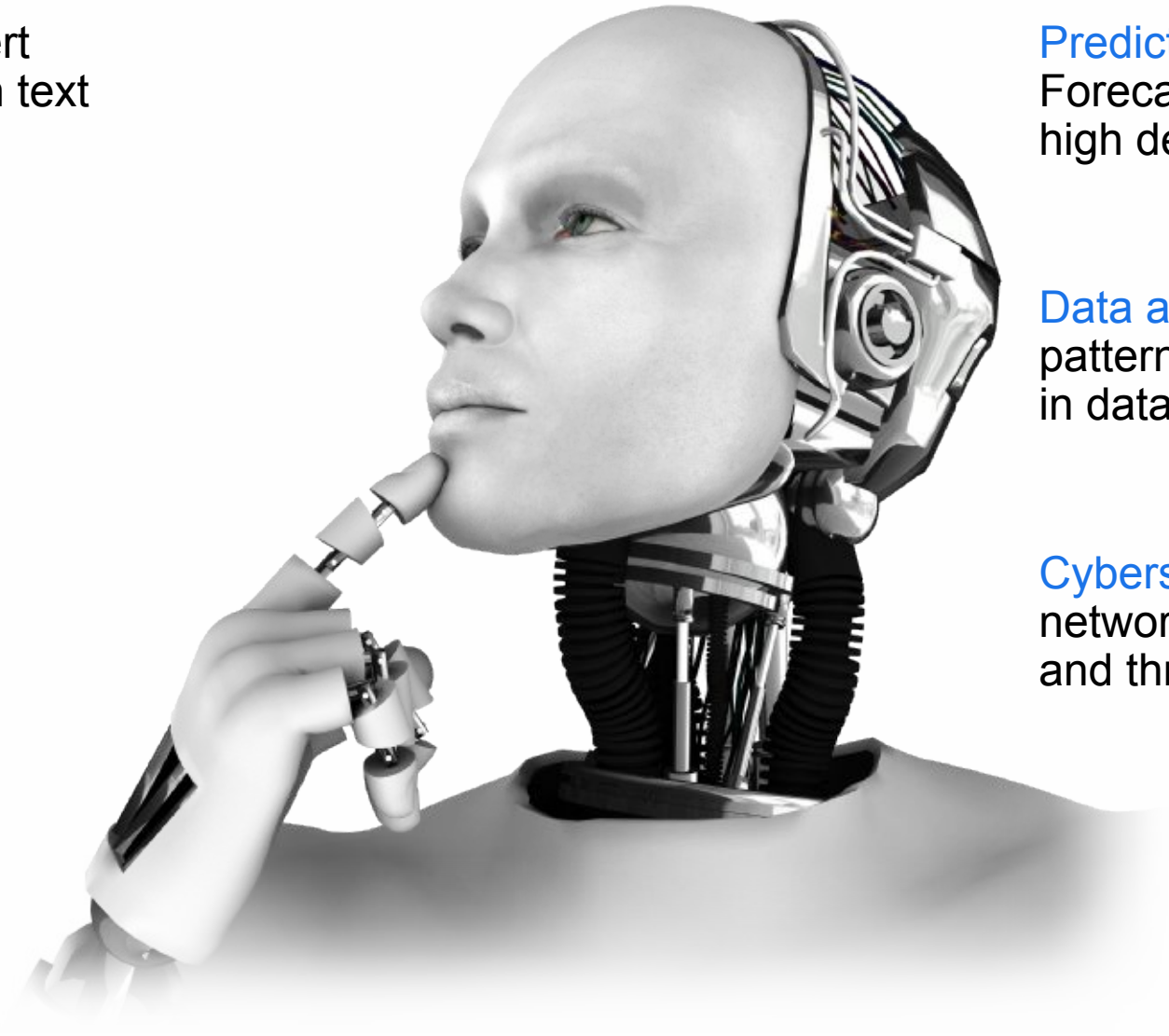
AI can analyze large amounts of data to accelerate breakthrough discoveries

General applications of AI

Speech recognition: convert spoken speech into written text

Image recognition: Identify and categorize various aspects of an image

Translation: Translate written or spoken text from one language to another



Predictive modeling: Forecast outcomes with high degree of accuracy

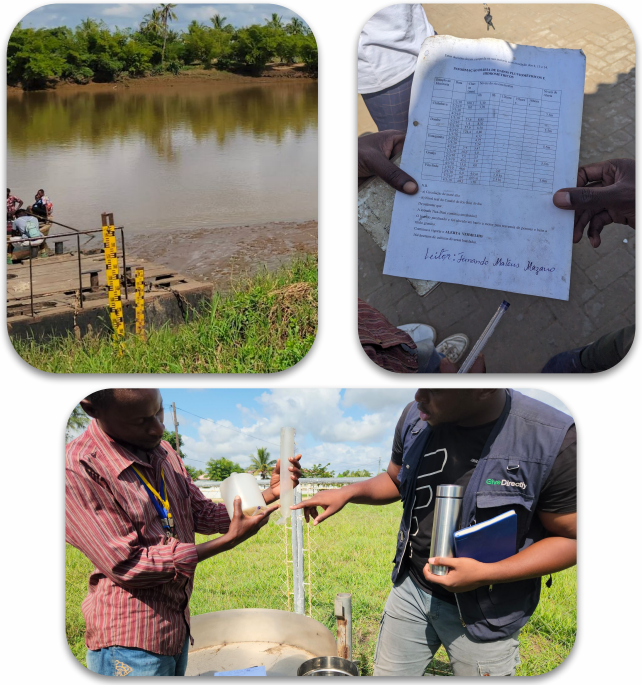
Data analytics: Find patterns and relationships in data

Cybersecurity: Scan networks for cyber attacks and threats.

Google

AGRIFIN LEARNING EVENT

Case study: Forecasting Floods



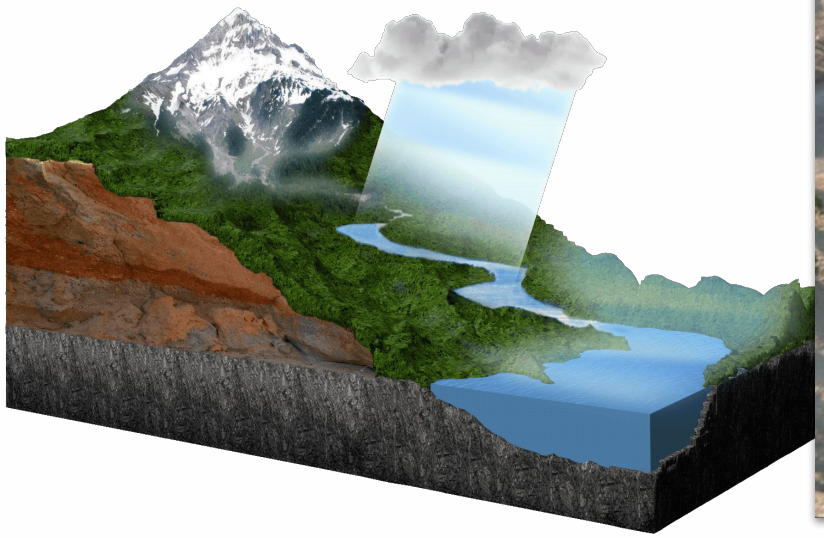
Manually monitoring rivers presents challenges and can make it difficult to predict floods

Flood warnings are usually announced in person and may not always be timely enough to take action

Relief services often react to flood events after they have occurred making it difficult to plan financially

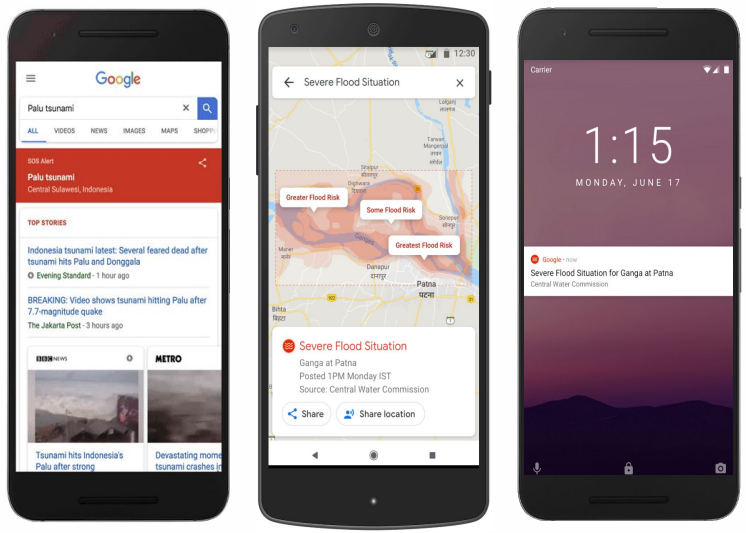
Case Study: Forecasting Floods 7 days in advance

Hydrologic model



Inundation model

Flood warning distribution



Challenge is deploying AI

Use Case

Identifying the right business problem to solve is difficult

People

Machine Learning expertise is scarce

Data

Data is scarce or hard to use

Deployment

Brittle, opinionated infrastructure that is hard to productionize and breaks between cloud and on-prem

The Future of AI

Decision trees

Engineers applied decision trees to drive machine outcomes.

Modeling and simulation

Faster computers and software paved the way to apply statistics to drive superior outcomes.

Deep Learning

Deep Learning ushered the possibility to solve previously unsolvable problems.

Embedded Intelligence

Businesses view AI as an integral part of product development and operational efficiency.

Google AI Principles

AI should:

1. be socially beneficial
2. avoid creating or reinforcing unfair bias
3. be built and tested for safety
4. be accountable to people
5. incorporate privacy design principles
6. uphold high standards of scientific excellence
7. be made available for uses that accord with these principles

Applications we will not pursue:

1. likely to cause overall harm
2. principal purpose to direct injury
3. surveillance violating internationally accepted norms
4. purpose contravenes international law and human rights

Google

AGRIFIN LEARNING EVENT


Google Earth Engine

What is the Google Earth Engine?

A geospatial data processing and analytics service powered by Google Cloud Platform

Goal 1: Geographic data visualization and computation at local to global scales

Goal 2: Substantive progress on global challenges that involve large geospatial datasets

How the Google Earth Engine works

Collect Data

Tabular Data
Earth Engine + BigQuery + Shapefiles

Row	point	name	iso_time	dist2land	usa_wind	usa_pressure
1	POINT(-54.4 12.8)	MARIA	2017-09-17 06:00:00 UTC	736	55	994
2	POINT(-55.0499 13.0573)	MARIA	2017-09-17 09:00:00 UTC	706	57	992
3	POINT(-55.7 13.3)	MARIA	2017-09-17 12:00:00 UTC	646	60	990
4	POINT(-56.3727 13.4575)	MARIA	2017-09-17 15:00:00 UTC	590	62	988
5	POINT(-57 13.6)	MARIA	2017-09-17 18:00:00 UTC	542	65	986

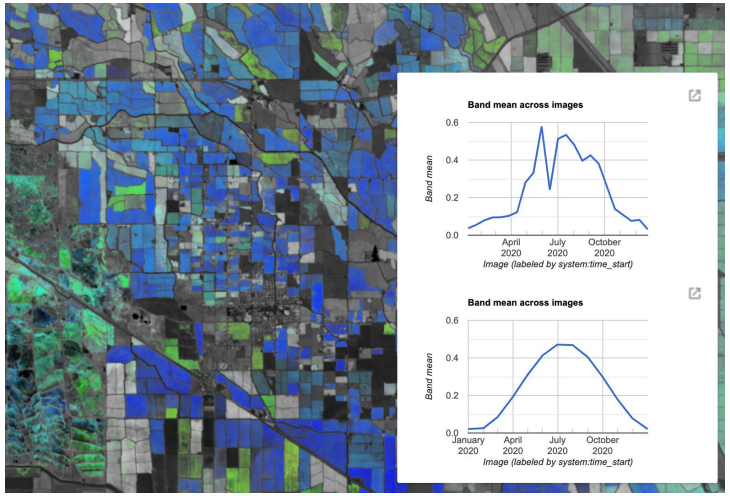
+

Raster (Imagery) Data
Earth Engine data + planet data + GeoTIFFs

Compute + Analyze

- Computations on images (per pixel)
- Machine learning
- Time series analysis

Visualize + Report



Google

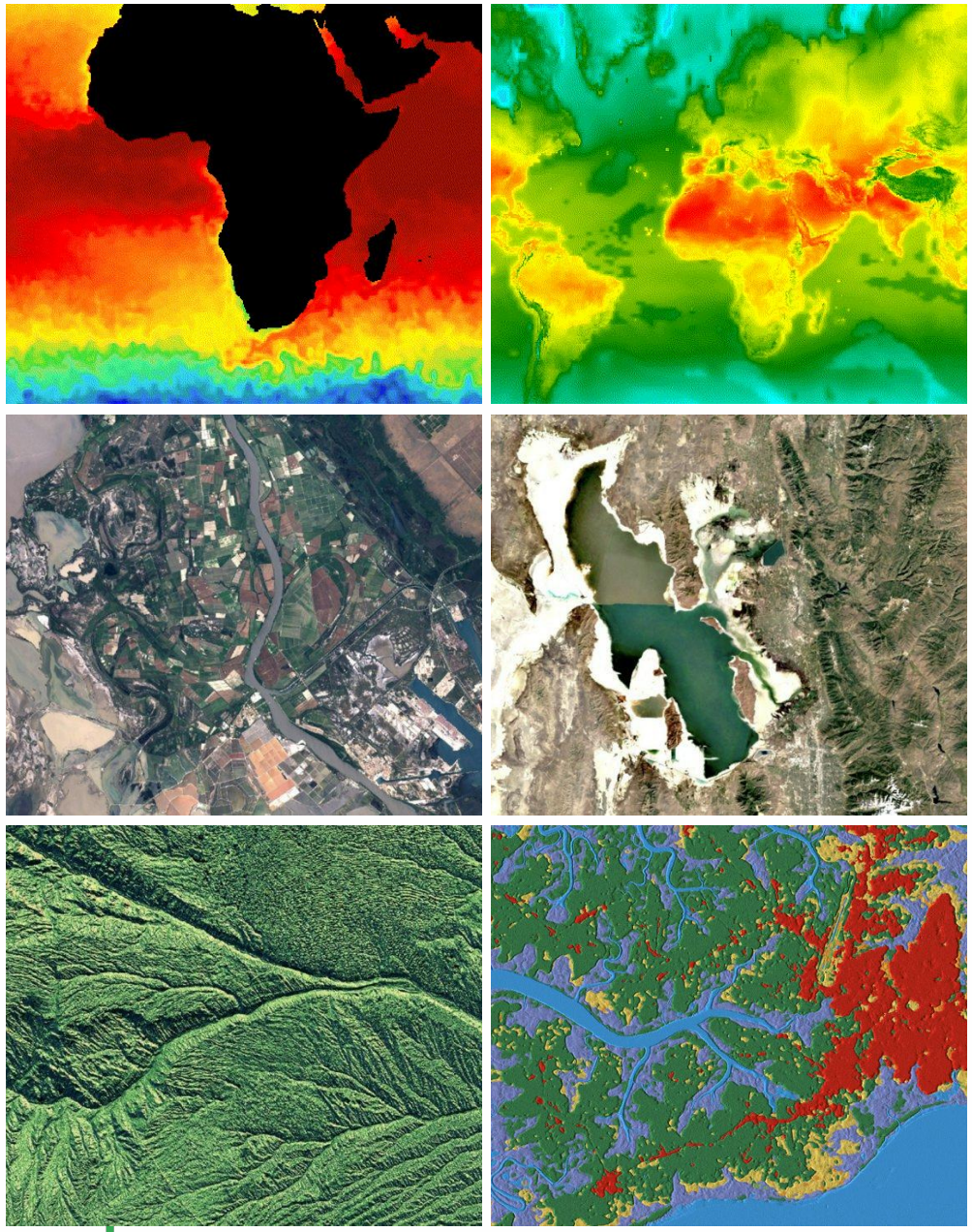
AGRIFIN LEARNING EVENT

Powered by Google’s data and compute infrastructure

Allows users to focus on geospatial analytics and data science (instead of downloading, preprocessing, and managing data

Google

AGRIFIN LEARNING EVENT



Earth Engine Data Catalog

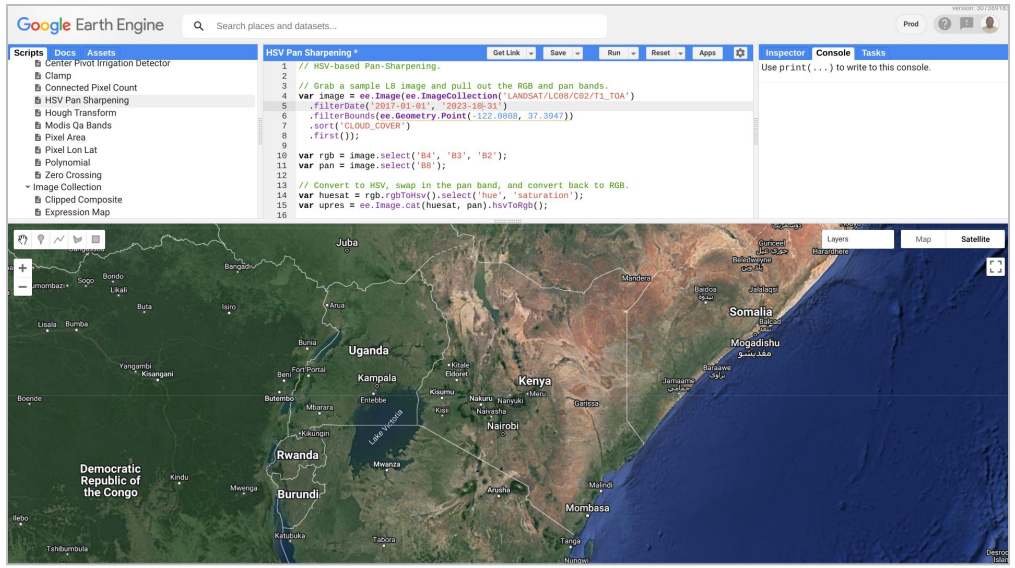
Includes climate and weather, satellite imagery, geophysical data (terrain and land cover maps)

TIme series data stretching up to 40 years

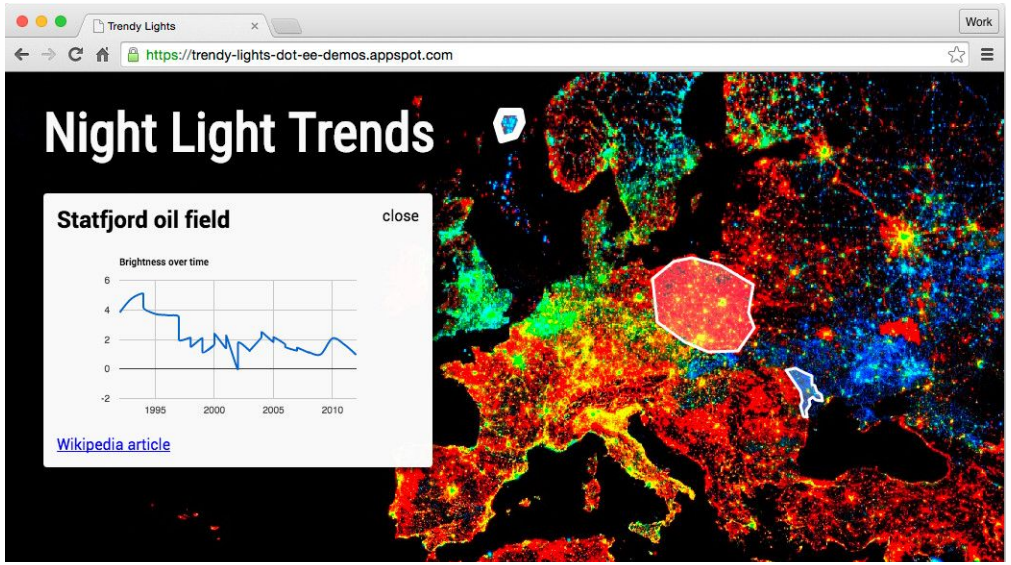
Self-imports supported

Google

AGRIFIN LEARNING EVENT



Code Editor (Interactive Platform)



Client Libraries (Javascript and Python)

Earth Engine Platform

Simple to use interactive development environment

Python and Javascript Application Programming Interfaces

Parallel processing for speed and scale

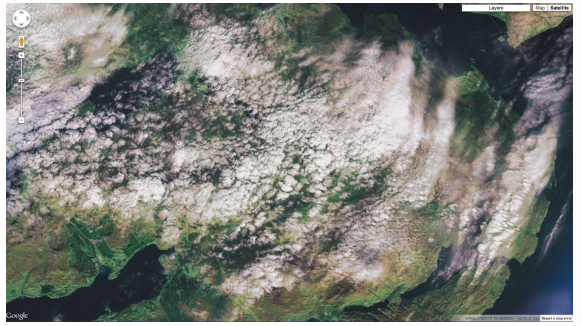
A rich user community focused on sustainability, social and environmental impact

Google

AGRIFIN LEARNING EVENT

Example Application: Cloud Cover Removal

Leverage a time series stack of satellite imagery, and creating a cloud free mosaic.



Before

After

Land use change over time enables many GEE use cases

Wide range of use cases unlocked with geospatial data

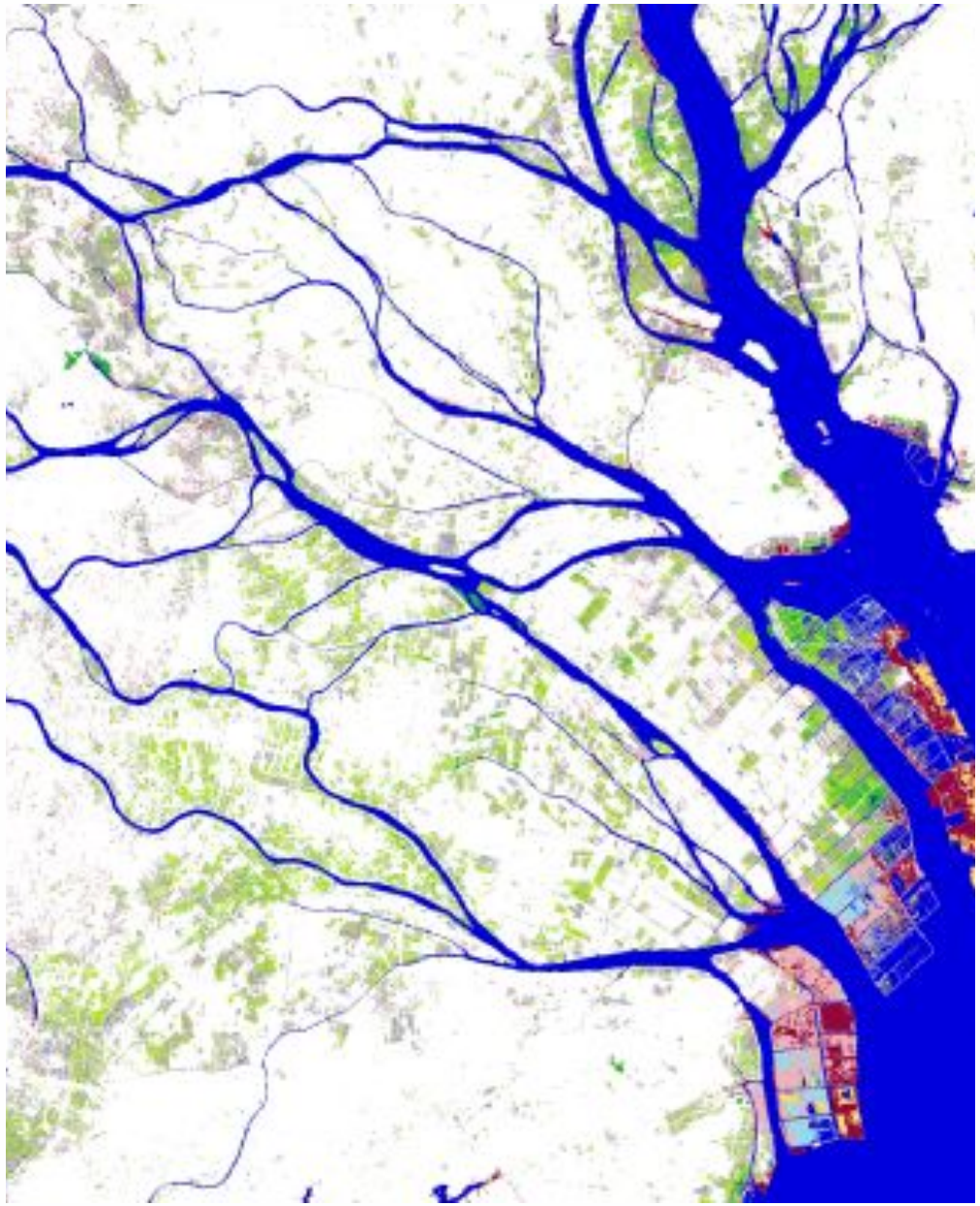
Climate Risk: Understand climate risk exposure for operations (eg. flood, wildfire, drought, etc)

Protecting Natural Resources: Enable sustainable forest management and monitor land cover change and climate events response.

Sustainable Sourcing: Enable global supply chain transparency and traceability to footprint

Google

AGRIFIN LEARNING EVENT



Case Study: Global Surface Water

Who: European Commission's Joint Research Centre

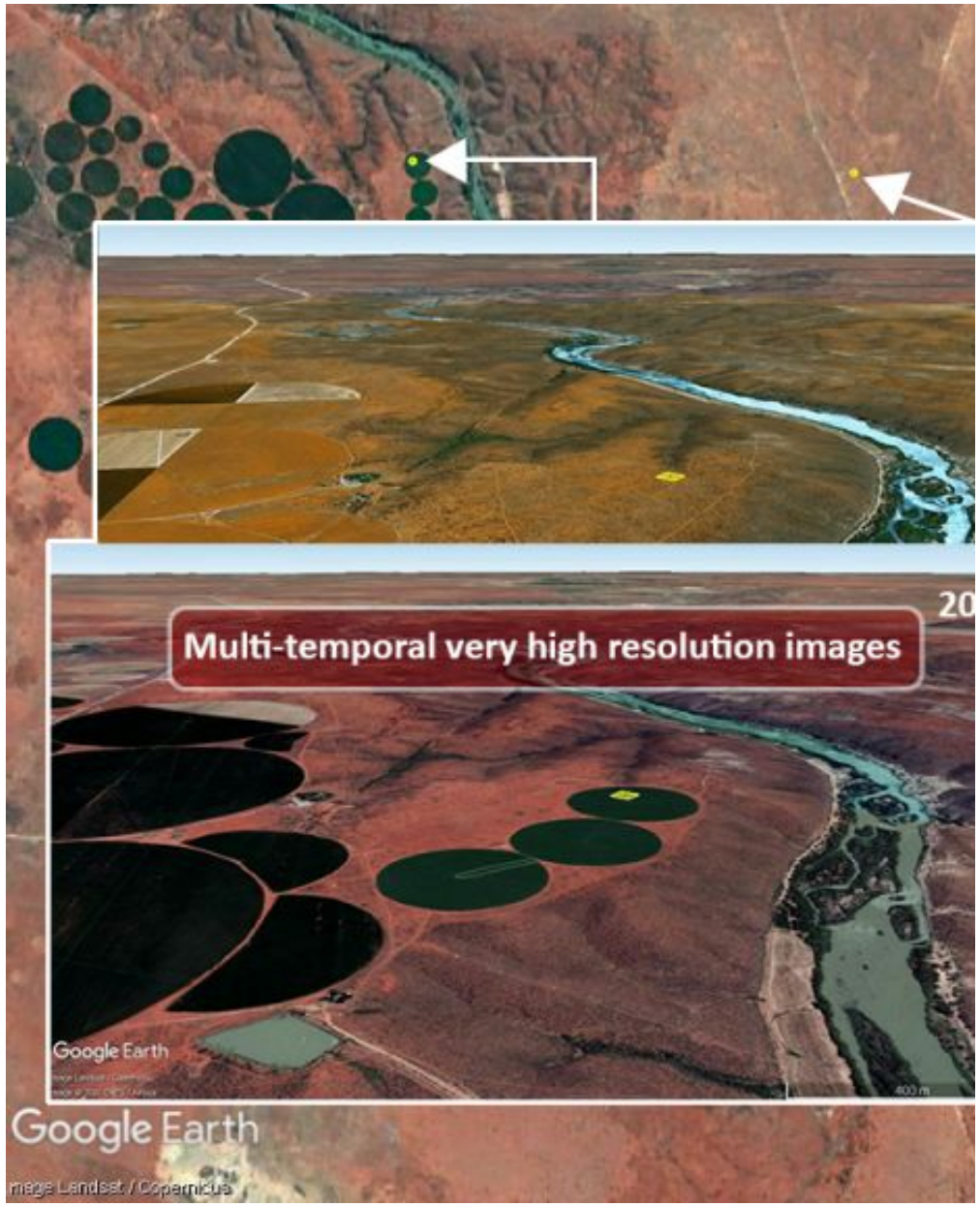
How: Analyzed Landsat images collected over 3 decades to identify permanent and seasonal water bodies

Why:

- Ensure security of global water supply for agriculture, industry, and human consumption
- Water-related disaster reduction and recovery
- Study of water pollution and disease spread

Google

AGRIFIN LEARNING EVENT



Case Study: Collect Earth

Who: Food and Agriculture Organization (FAO)

How: Visualize and analyze plots of lands

Why:

- Assess and monitor deforestation and other forms of land use changes
- Greenhouse gas reporting in agriculture, forestry and other land use sectors

Google

AGRIFIN LEARNING EVENT

MERCY CORPS AGRIFIN | AGRIFIN LEARNING EVENT

Thank You!