

DESARROLLO DE HERRAMIENTAS DIGITALES EN AGRICULTURA

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Sesión III. Observatorio de la Digitalización del Sector Agroalimentario Español

Herramientas Digitales

Tecnología de Invernaderos

Transformación Digital



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TIERRA

RATIONALE RESEARCH AIMS AND GOALS



Improve data quality and quantity

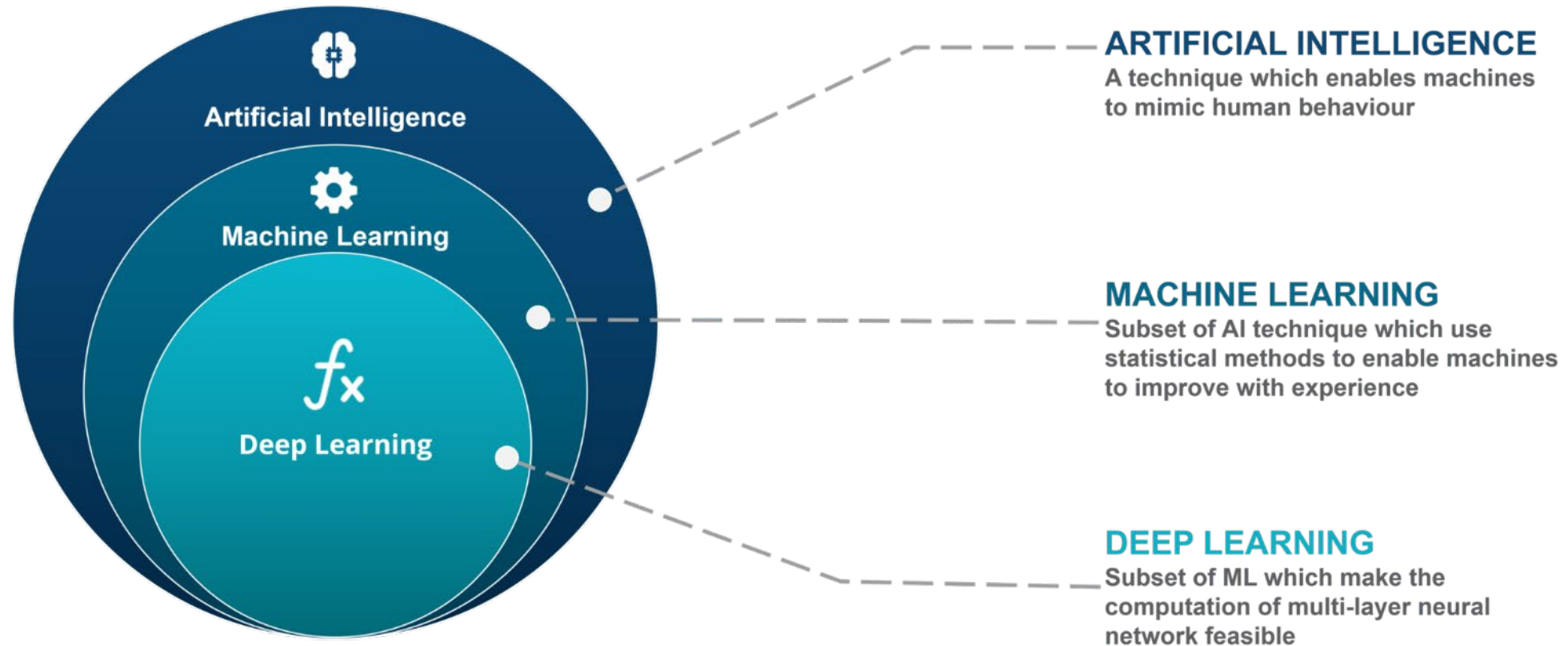


Improve data collection for consistency and efficiency

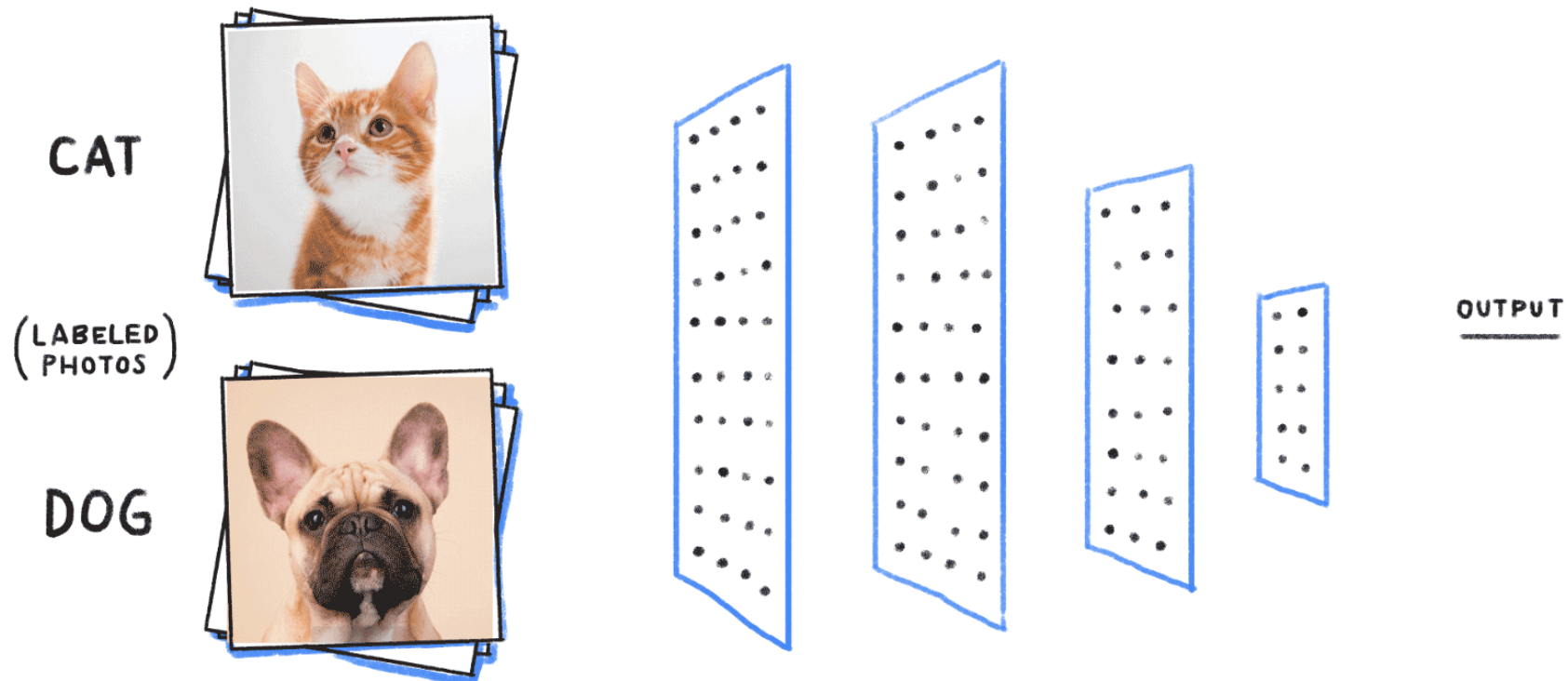


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ARTIFICIAL INTELLIGENCE OVERVIEW



DEEP LEARNING EMPOWERS ARTIFICIAL INTELLIGENCE



ARTIFICIAL INTELLIGENCE OVERVIEW AND WORKFLOW

What is artificial intelligence (AI)?

- Is it Unsupervised Learning?
- Is it Supervised Learning?
- Is it Reinforced Learning?
- Is it Deep Learning?



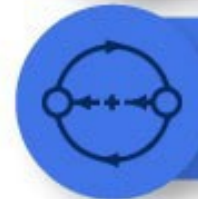
Supervised Learning

- Has labeled data that acts as a supervisor
- Learns according to the given labeled data
- Predicts the output
- Resolves classification and regression problems



Unsupervised Learning

- Does not have any labeled dataset
- Tries to find patterns and structures and make clusters of similar data types
- Does not predict any specific output



Reinforcement Learning

- Tries to find an optimized solution
- Reward and punishment based training
- Learns how to act in a certain situation



DEEP LEARNING EMPOWERS ARTIFICIAL INTELLIGENCE

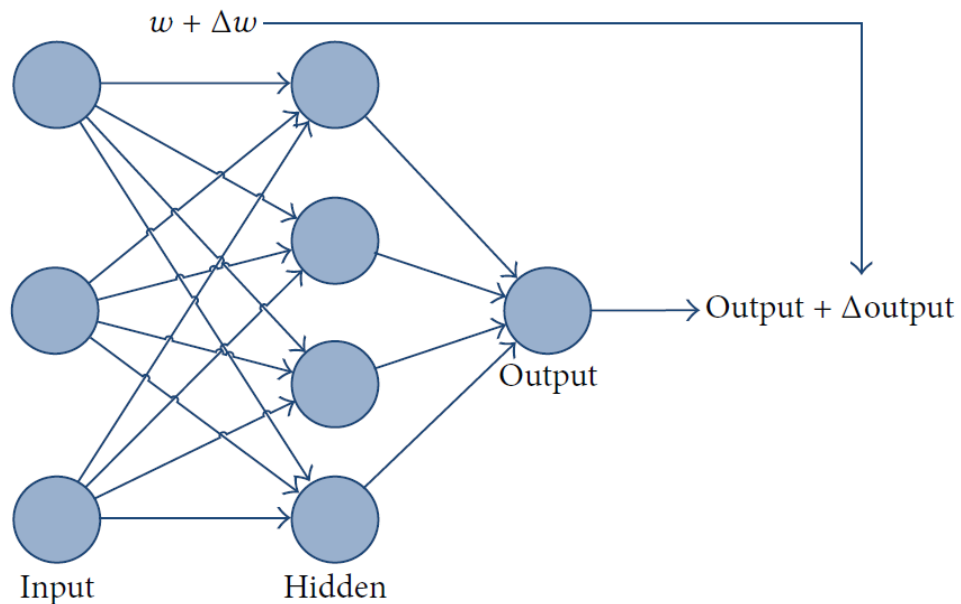
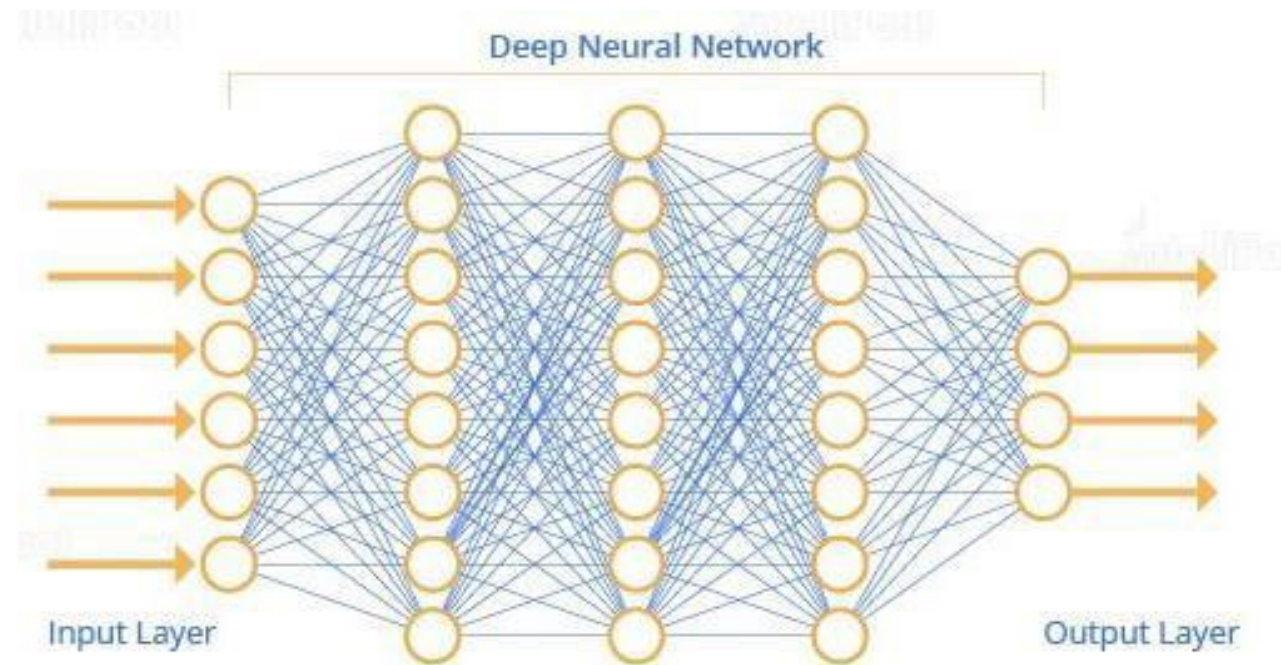
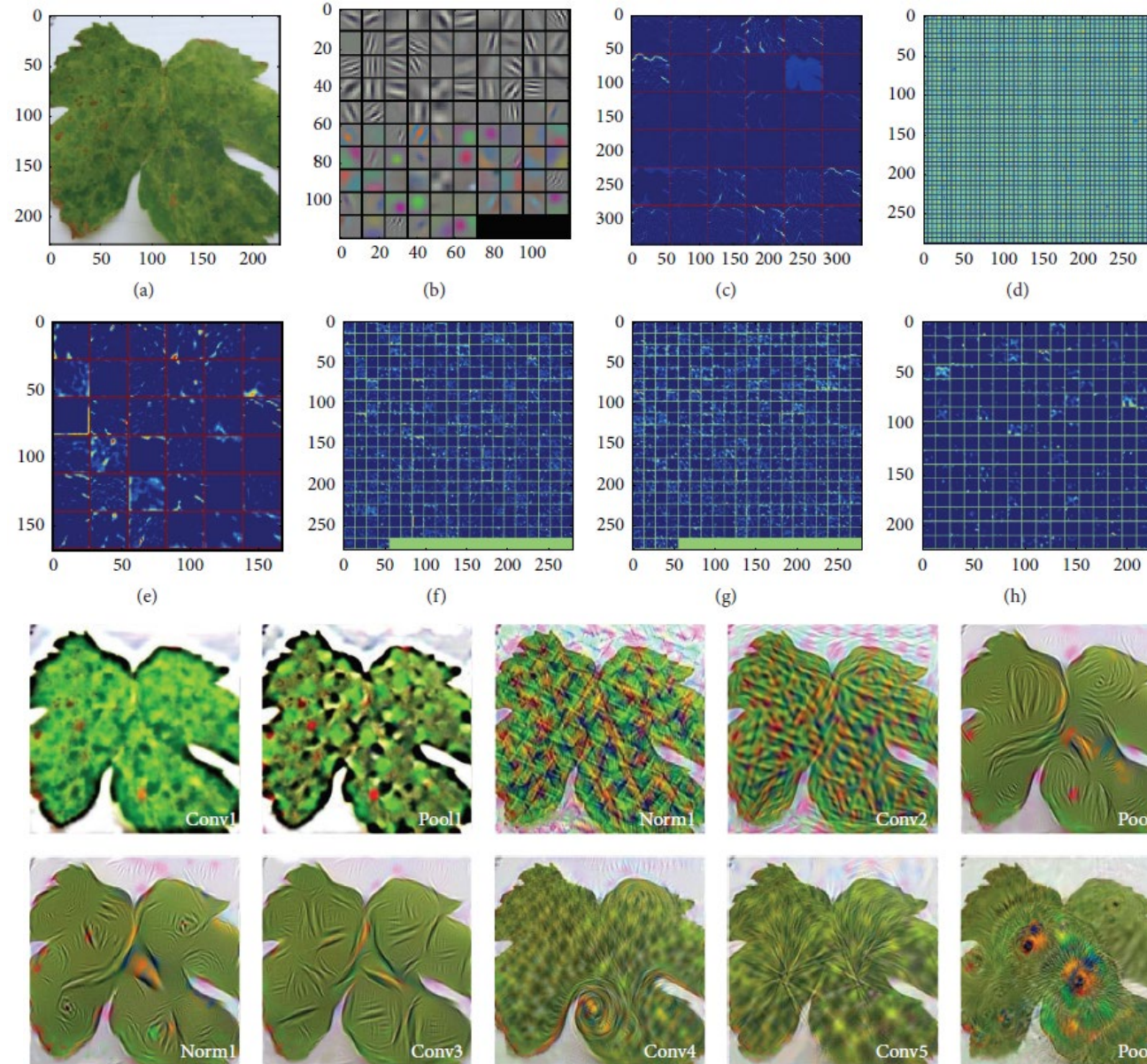


FIGURE 1: Simple model of ANN.



WHAT ABOUT THOSE HIDDEN LAYERS IN DEEP LEARNING?



ARTIFICIAL INTELLIGENCE OVERVIEW AND WORKFLOW

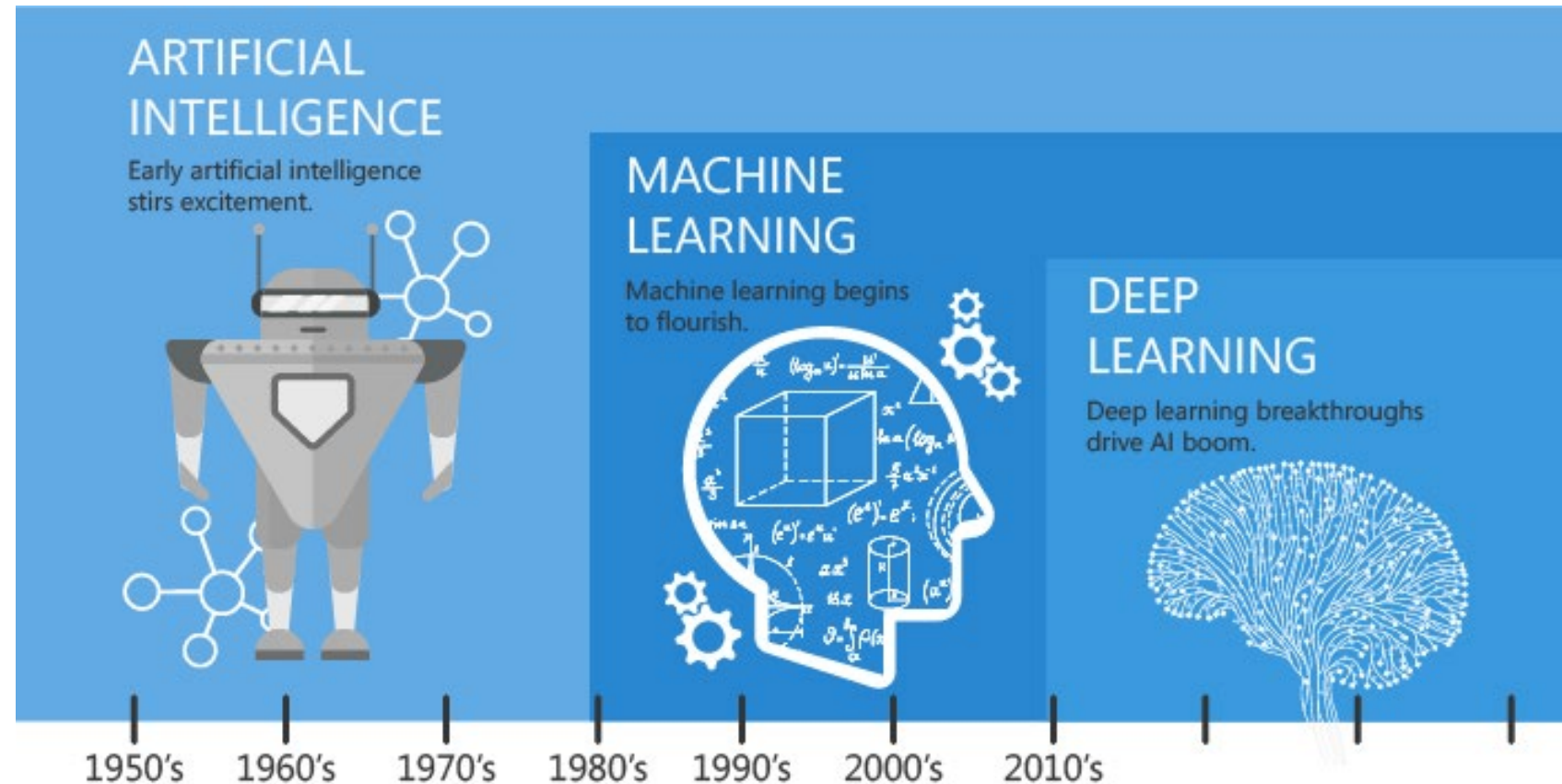
What is artificial intelligence (AI)?

Is it Machine Learning?

Is it Deep Learning?

Is it Big Data?

YES,
AI NEEDS BIG DATA.



HOW CAN WE MAKE BIG DATA (HINT: TOGETHER) WHAT IS OPEN DATA KIT (ODK)?



ODK is free and open-source software that helps millions of people collect data quickly, accurately, offline, and at scale. The software is in active use in every country in the world and is supported by a large and helpful community.

getodk.org

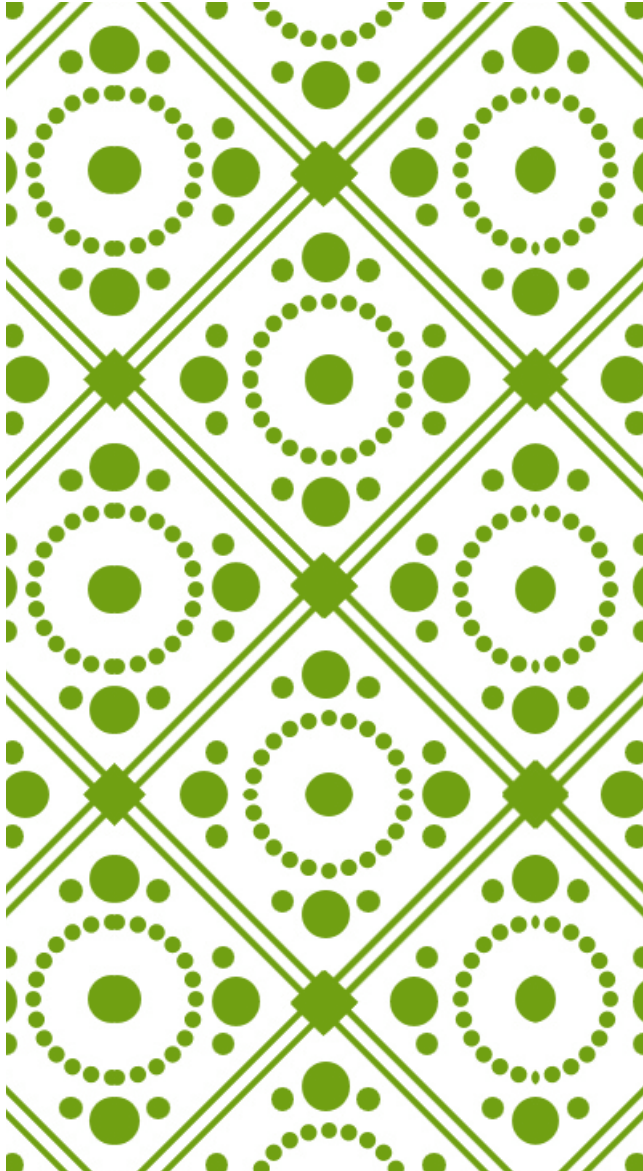


The ODK-X suite supports complex workflows via JavaScript customization and features non-sequential navigation, bi-directional synchronization, and on-device data management.

odk-x.org



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Collect data anywhere

ODK lets you build powerful offline forms to collect the data you need wherever it is.

From disease surveillance to election monitoring, ODK makes the world better through data.

ODK is open source. We provide [cloud hosting](#) and [consulting services](#) for those who want to go faster.



[HTTPS://GETODK.ORG/](https://getodk.org/)



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OPEN DATA KIT (ODK.ORG)
PLATFORM INTEGRATION

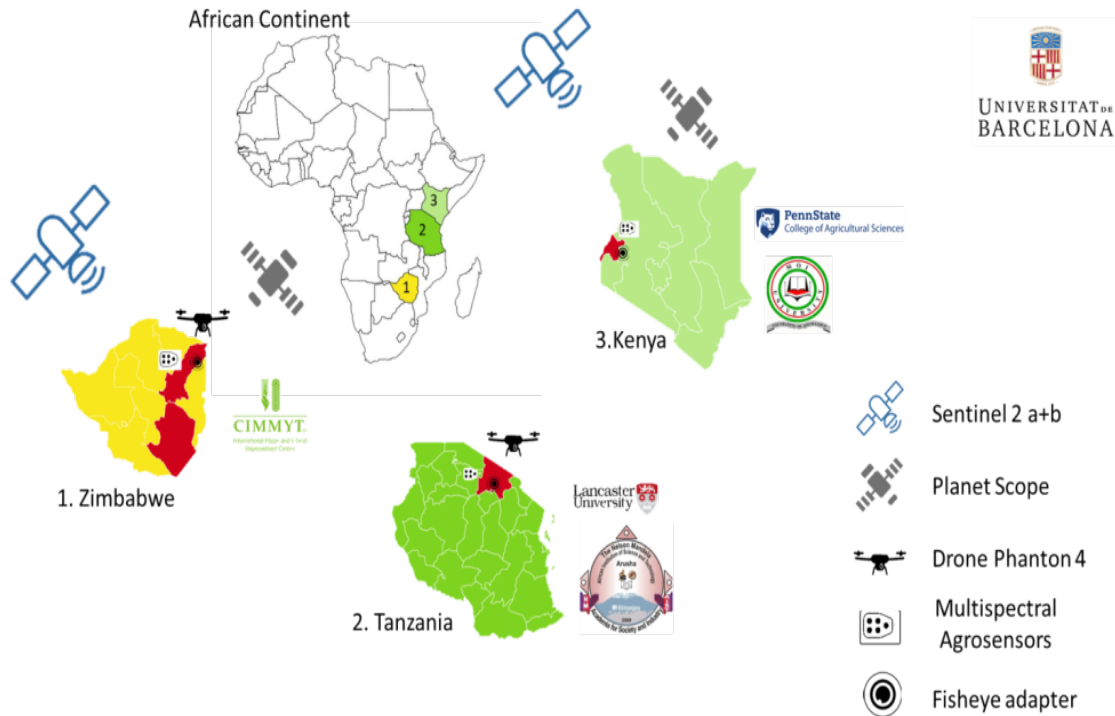
Mobile phone to
cloud integration
with ODK Aggregate,
Google Spreadsheets,
Google Maps, Google
Earth Engine (or
other servers, apps).



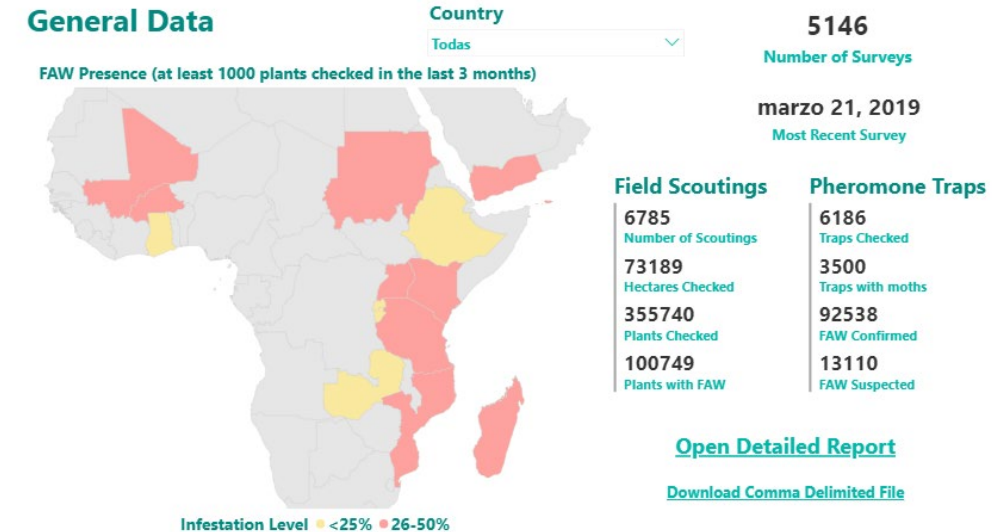
Araus and Kefauver, Current Opinions in Plant Biology, 2018.



Proof of concept for Mobile Phones, Unmanned Aerial Vehicle (UAV) and satellite remote sensing for Fall Armyworm monitoring and early warning systems



Global platform: FAW Monitoring & Early Warning System (FAMEWS)



*Fisheye lens adapter attached to mobile phone and image captured using ODK, processed using <https://www6.paca.inrae.fr/can-eye/CAN-EYE-Home/Welcome>

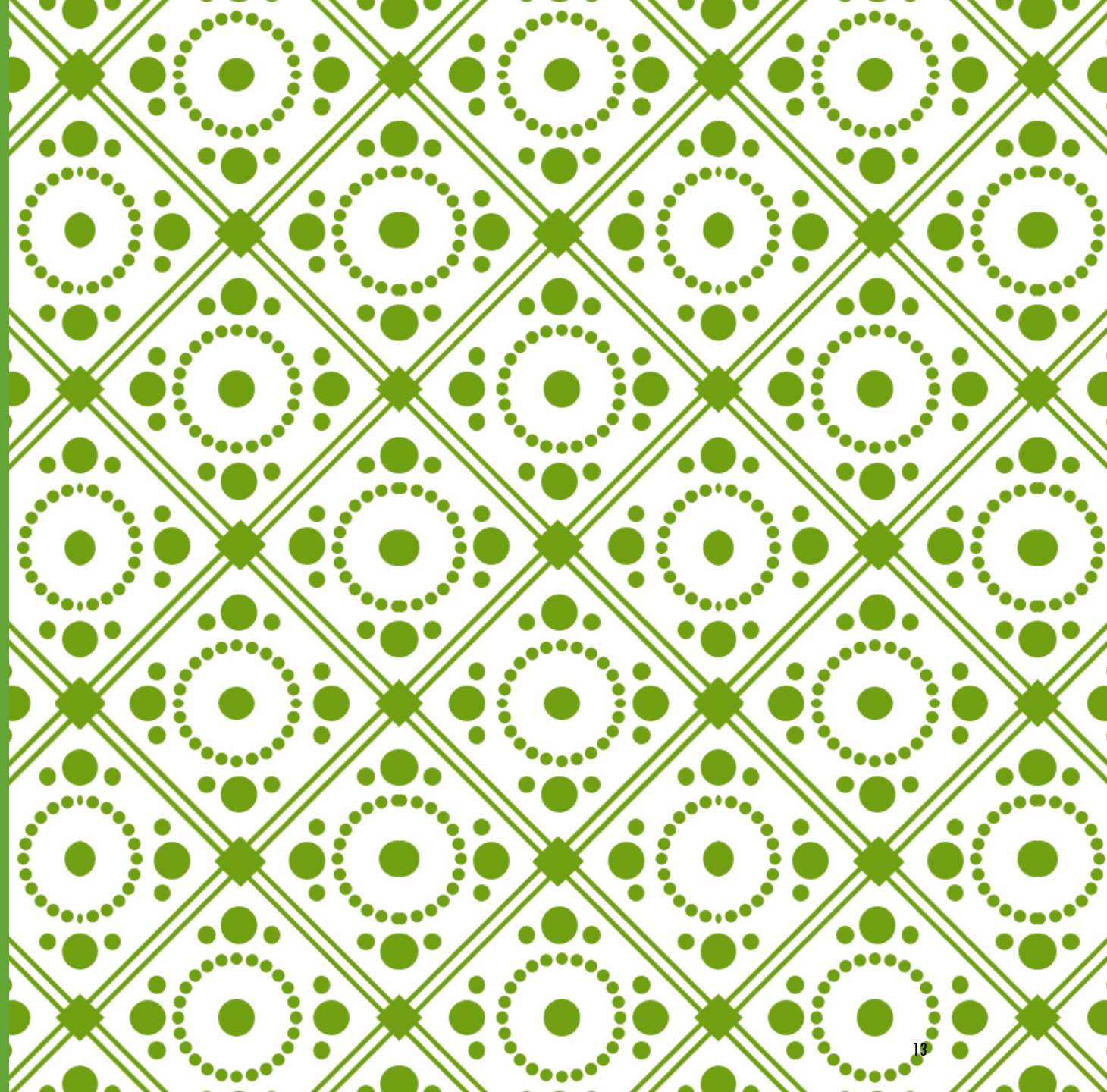
[Buchailot et al.](#), Multi-Scale Remote Sensing for Fall Armyworm Monitoring and Early Warning Systems. DOI: [10.1109/IGARSS39084.2020.9323181](https://doi.org/10.1109/IGARSS39084.2020.9323181)

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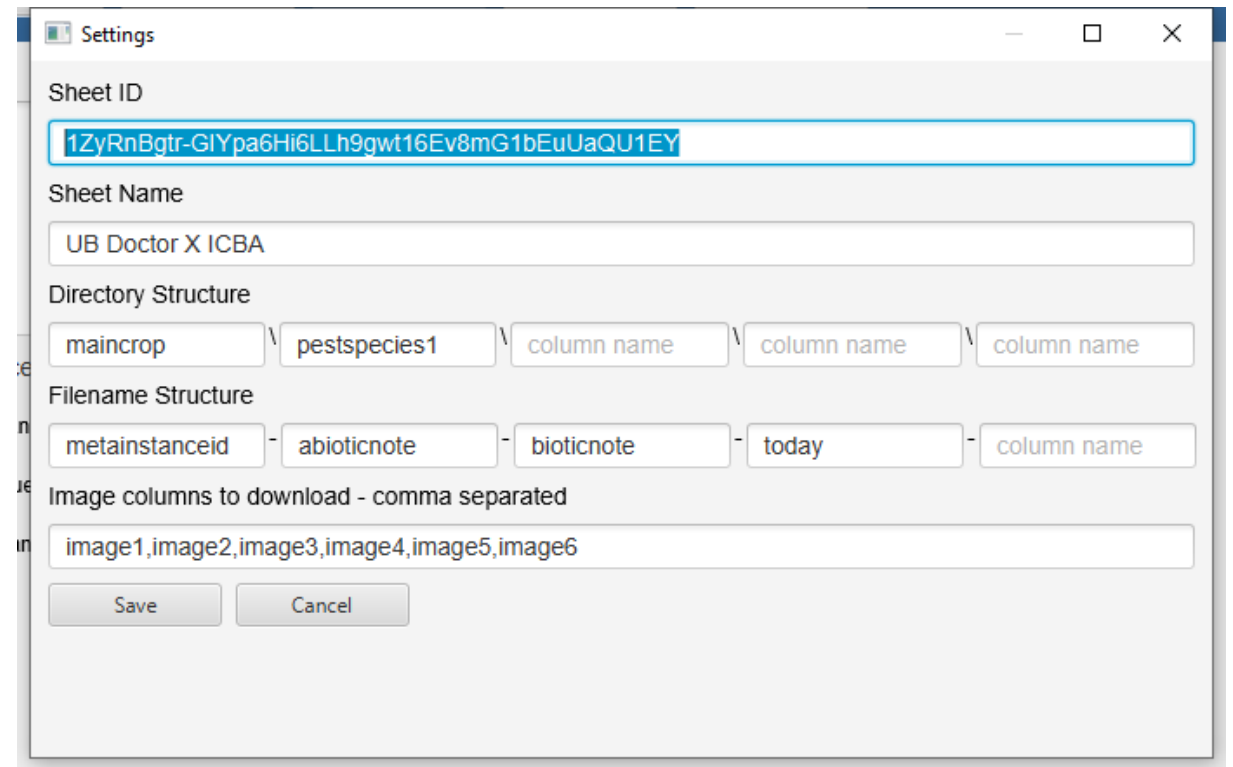
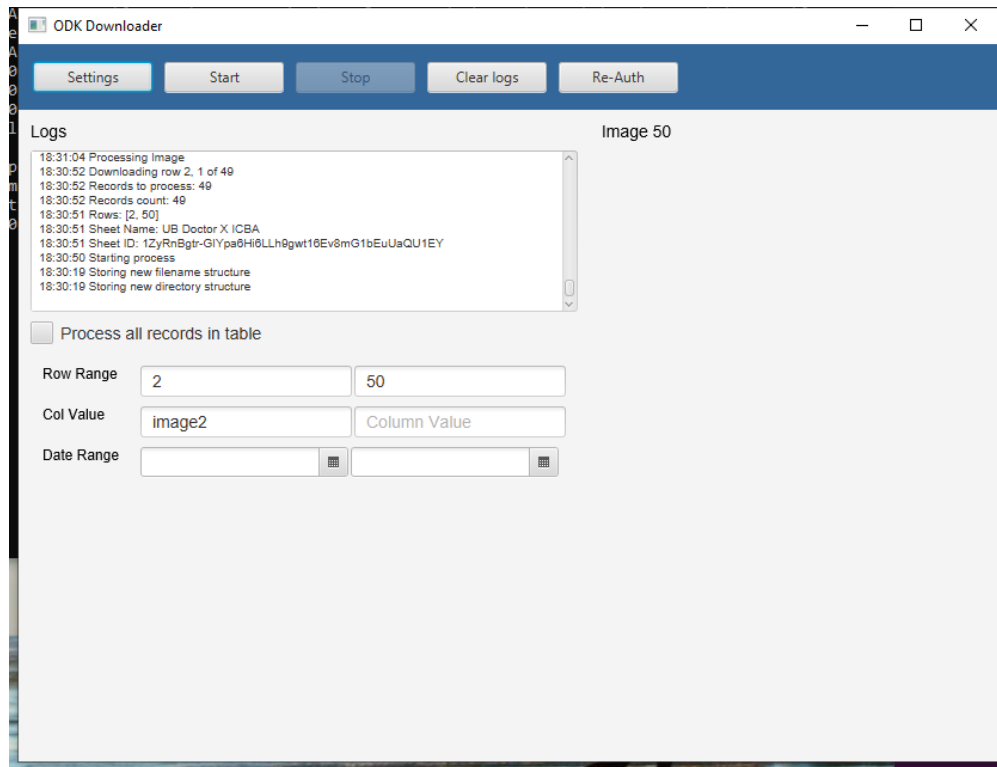
AN ODK FOR DEEP
LEARNING AND A NEW
COMPUTER APP BIG
DATA MANAGEMENT

With Deep Learning comes Big Data.

Big Data needs data management and
Quality Control.

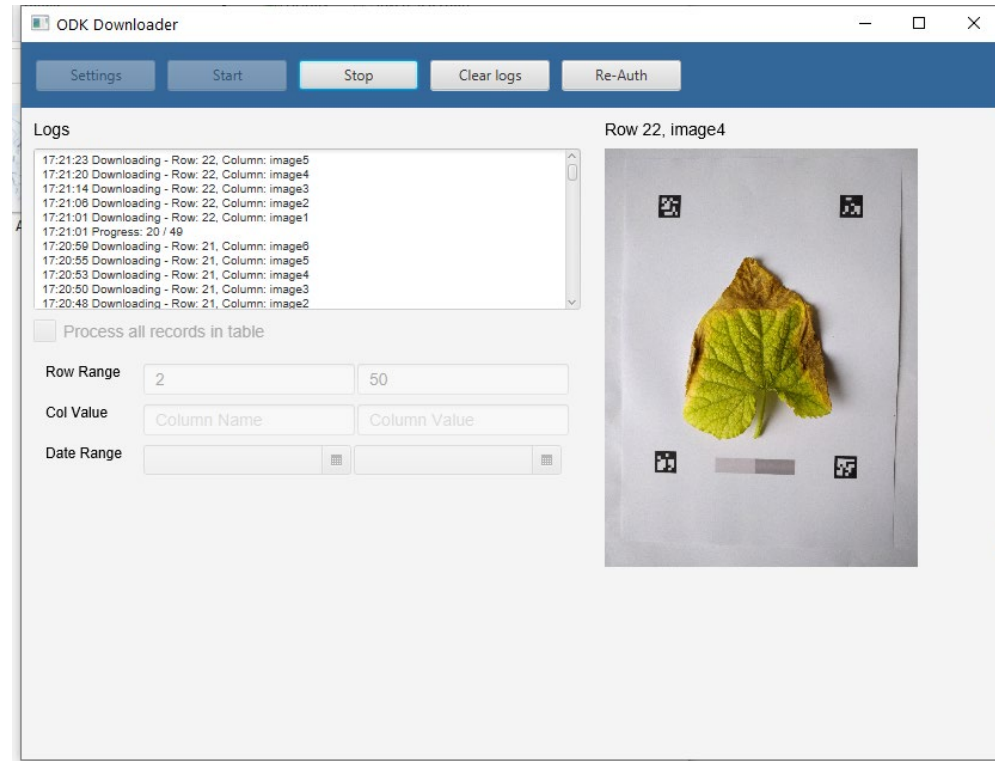
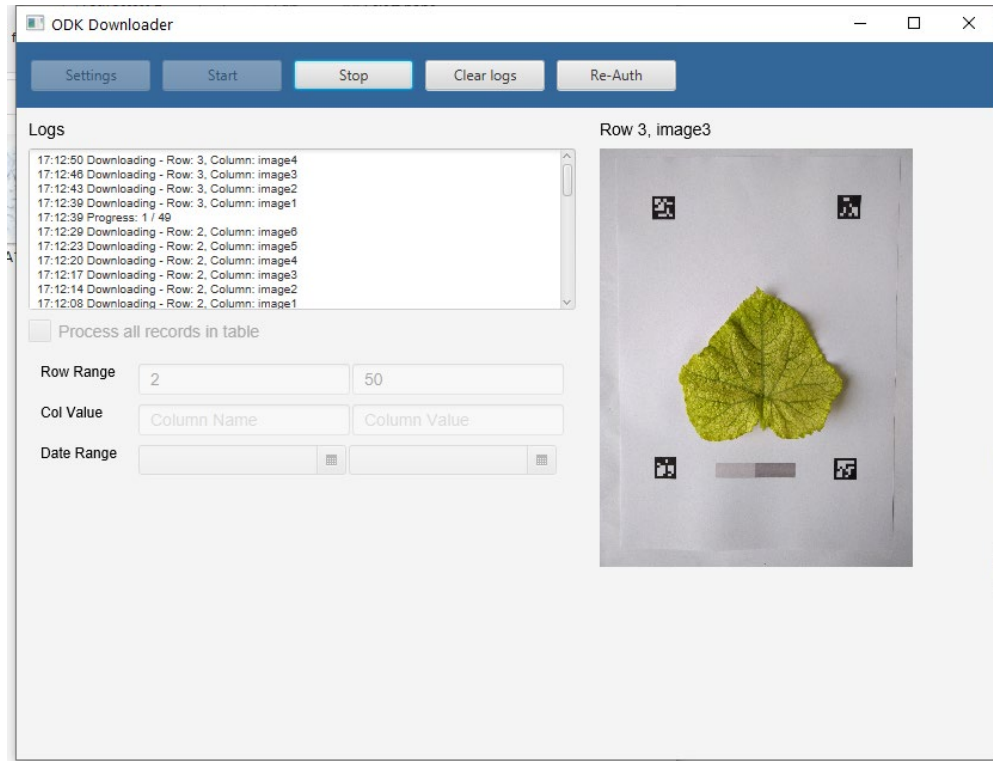


ODK DOWNLOADER, ODK DATABASE SUPPORT SOFTWARE BY THE UNIVERSITY OF BARCELONA



ODK DOWNLOADER, ODK DATABASE SUPPORT SOFTWARE BY THE UNIVERSITY OF BARCELONA

<https://gitlab.com/alexiakl/odk-downloader>



ODK DOWNLOADER QUALITY CONTROL

<https://gitlab.com/alexiakl/odk-downloader>

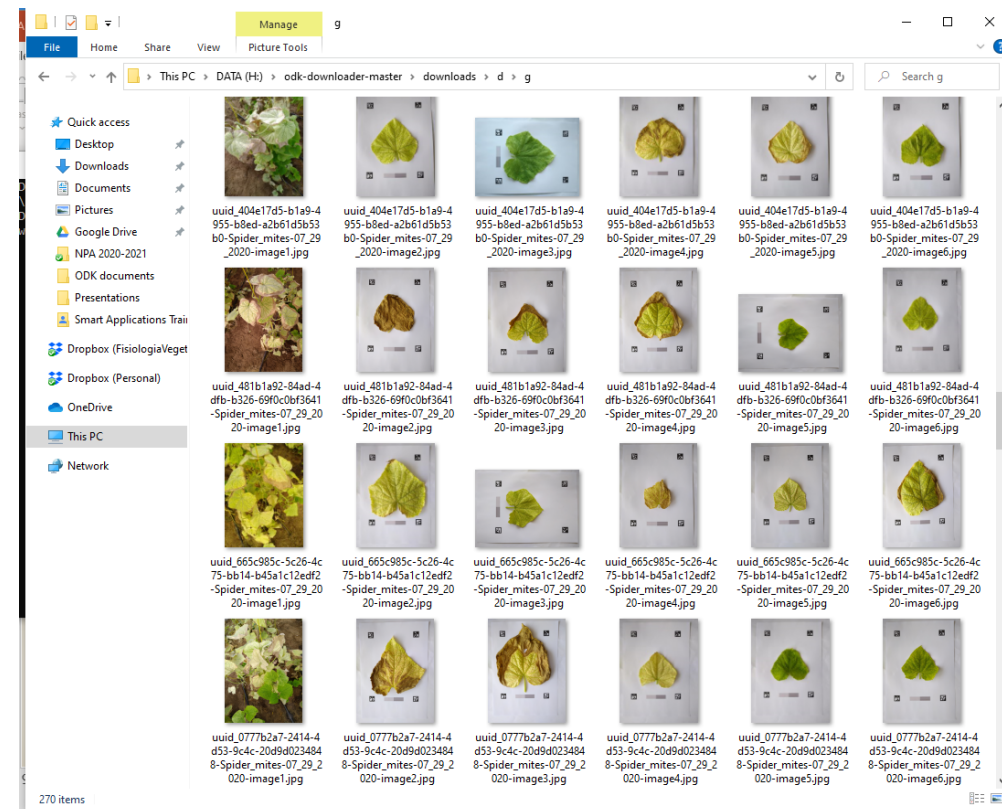
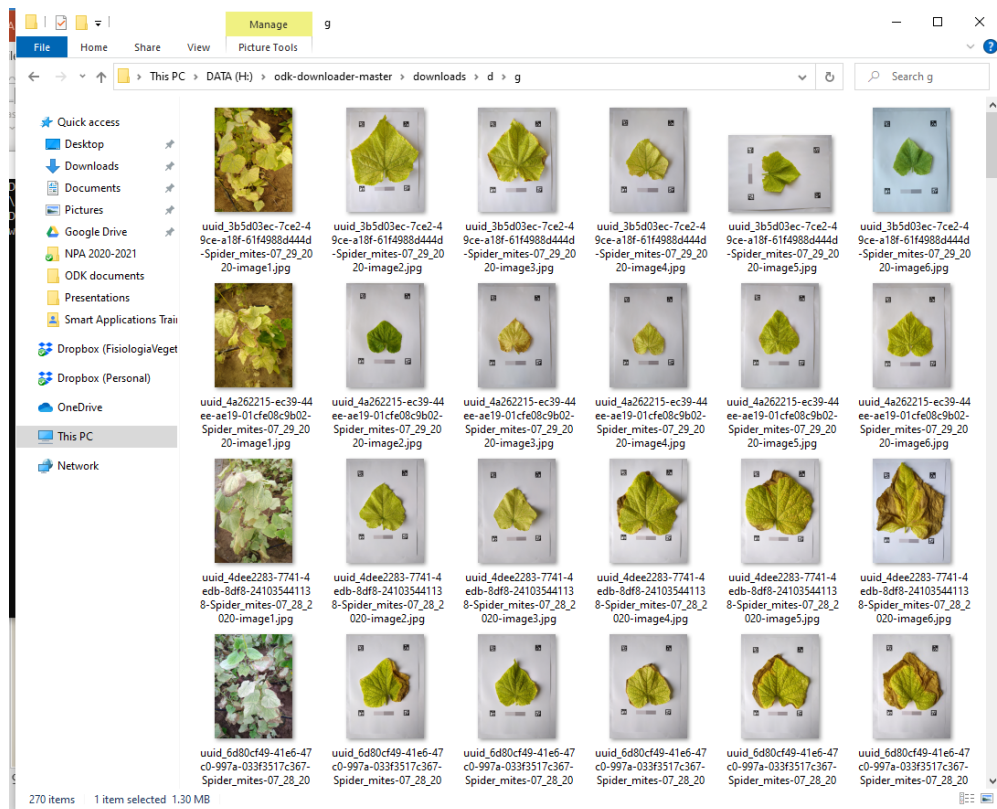
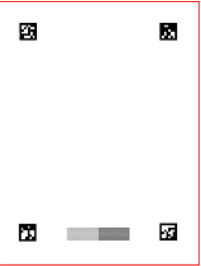


IMAGE CLASSIFICATION + ML FOR PLANT DISEASE RECOGNITION



(1)

Image acquisition

>>>

Database

acquisition



ODK

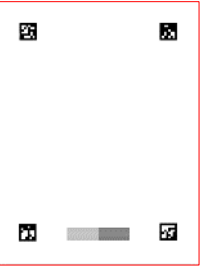


Image classification using machine learning techniques: from database to plant disease recognition



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IMAGE CLASSIFICATION + ML FOR PLANT DISEASE RECOGNITION

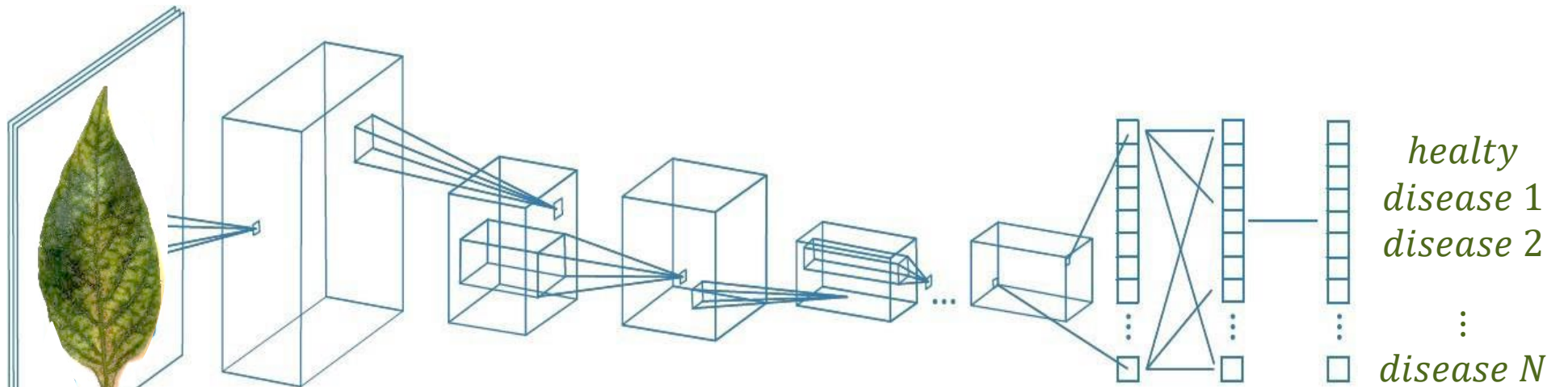
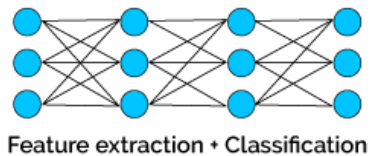


(2+3) Features extraction + Classification >>> quantify + recognize

Feature extraction



Classification



Convolutional Neural Networks (CNN)

Image classification using machine learning techniques: from database to plant disease recognition



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ALGORITHMS IN PRACTICE

Python + libraries + open source and collaborative software

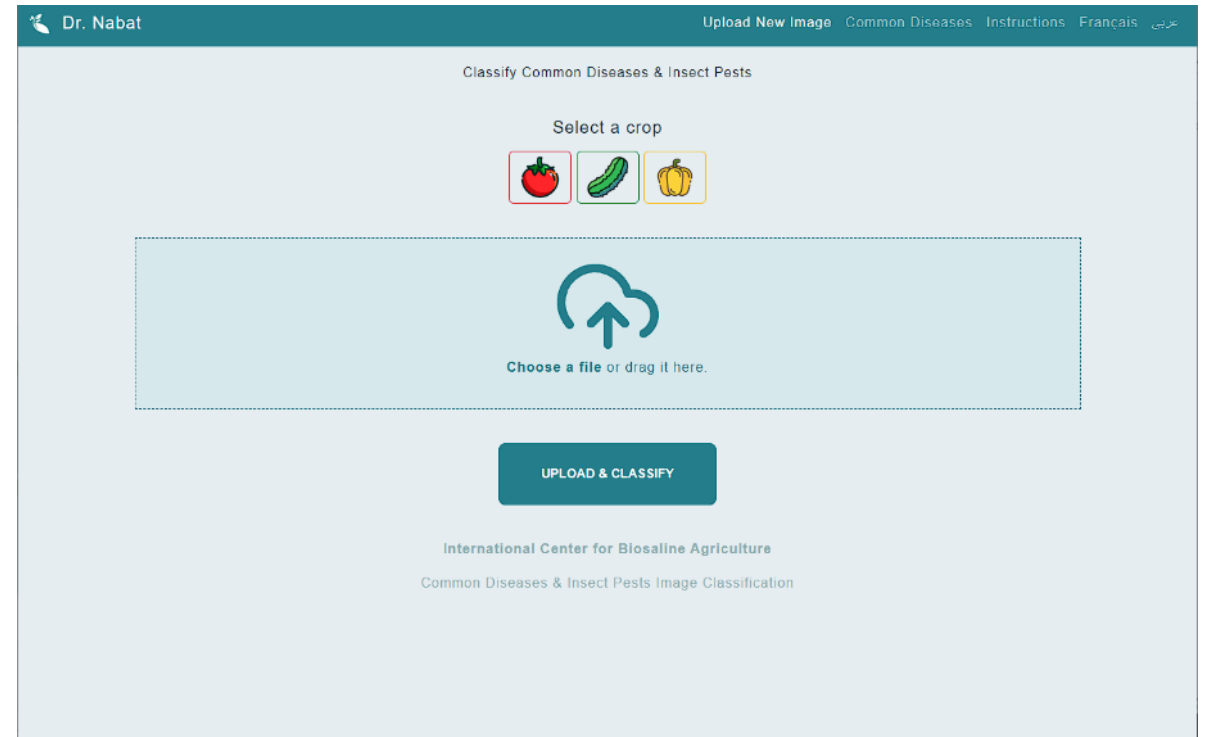


Image classification using machine learning techniques: from database to plant disease recognition



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COMMON DISEASES & INSECT PESTS IMAGE CLASSIFICATION

Dr. Nabat Upload New Image Common Diseases Instructions Français عربي

List of supported Diseases


Cucumber	
Potassium Deficiency Potassium	Conditions & Geo Aeration deficit, compaction, high soil pH (especially with plants adapted to acidic soil). All Tunisia, UAE and Egypt
Symptoms <ul style="list-style-type: none"> Growth is stunted, internodes remain short and leaves small. Leaves are bronzed and discolored yellowish green at the margins; the main veins are sunken. 	Control Chemical Control <ul style="list-style-type: none"> 1. Adjust the nutrient solution via reducing Ca and Mg concentrations and increasing K concentrations by: <ul style="list-style-type: none"> A. Increase potassium nitrate (KNO₃) concentration, B. Add potassium sulfate (K₂SO₄); or C. If sodium chloride (NaCl)
Cucumber Mildew	Conditions & Geo Wet, heavy or compact ground

Dr. Nabat Upload New Image Common Diseases Instructions Français عربي

Cucumber

Bacteria wilt
Bacteria Diseases
Erwinia tracheiphila or Curtobacterium flaccumfaciens pv. flaccumfaciens

Confidence: 99%

	Conditions & Geo In hot, wet weather and wilting is very quick Tunisia and Egypt
Symptoms <ul style="list-style-type: none"> Leaves first appear dull green, wilt during the day and recover at night Leaves eventually yellow and brown at the margins, completely wither and die The speed of wilting varies 	Control Chemical Control <ul style="list-style-type: none"> Pesticides will not cure a cucurbit plant infected with bacterial disease. Dust plants with insecticide in the spring before the cucumber beetles have a



ALSO AVAILABLE AS AN ANDROID APP:
[PLAY.GOOGLE.COM/STORE/APPS/DETAILS?ID=ORG.DRNABAT](https://play.google.com/store/apps/details?id=org.drnabat)

The screenshot shows the Google Play Store interface for the 'Dr. Nabat' app. At the top, the Google Play logo is on the left, and navigation tabs for 'Games', 'Apps', 'Movies', 'Books', and 'Kids' are in the center. On the right, there are search, help, and profile icons. The app title 'Dr. Nabat' is prominently displayed, followed by the developer 'International Center for Biosaline Agriculture'. Below this, it shows '100+ Downloads' and a 'PEGI 3' rating. A green 'Install on more devices' button is present, along with a share icon. A note states 'This app is available for some of your devices'. The bottom section features a carousel of seven app preview cards. The first card is a collaboration banner, while the others show the app's interface for checking plant diseases, identifying symptoms, and viewing a list of supported plant diseases. A right-pointing arrow is visible on the last card.



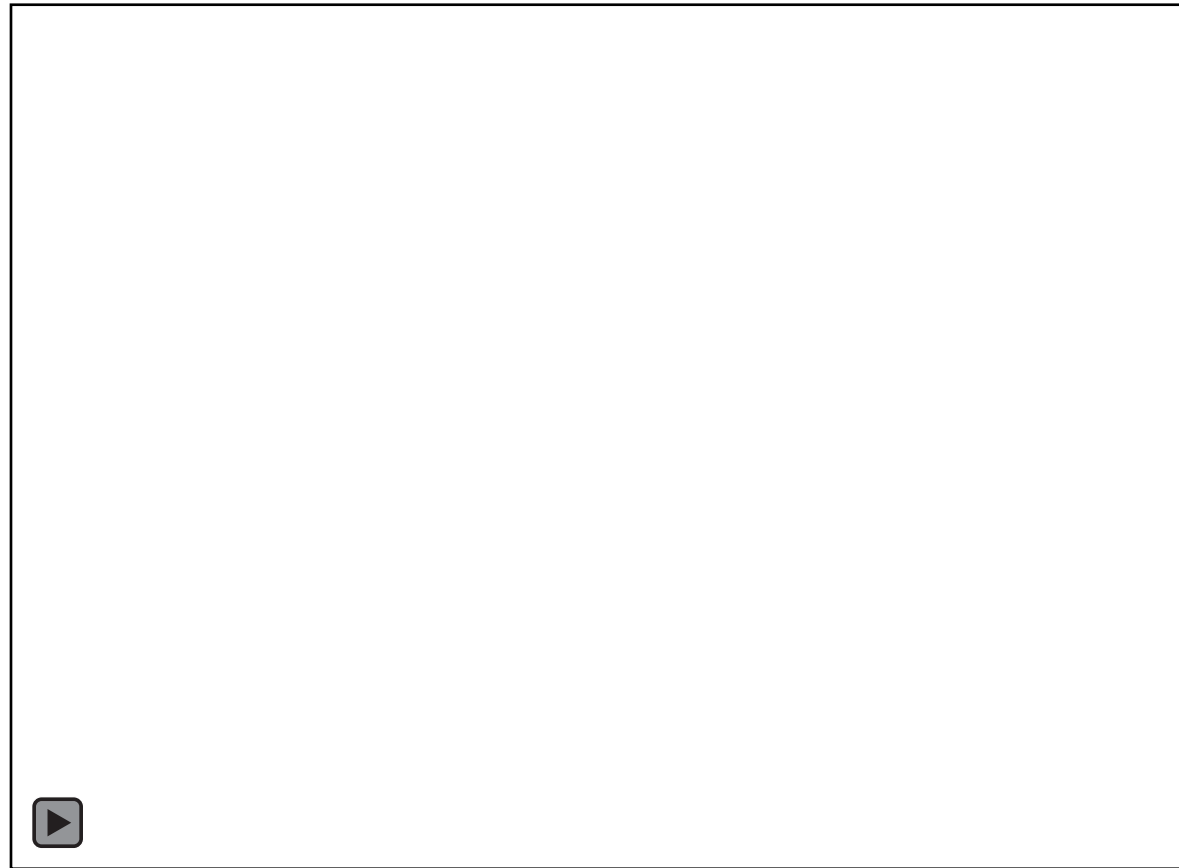
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PROF. SHAWN CARLISLE KEFAUVER

Ayuda RYC2019-027818-I financiada por MCIN/AEI/10.13039/501100011033 y por El FSE invierte en tu futuro

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