

# TARSENS

R&D Projects and Products

All made possible by Celil Serhan Tezcan  
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## **Brief intro about TARSENS;**

- **Founded in 2017, supported by TUBITAK**
- **Been member of Nvidia Inception, Samsung Enterprise Alliance Program, Microsoft Bizspark program**
- **Works on high-efficiency basis.**
- **Hires Freelancers & AI Instances.**
- **Available for hire**
- **Applies for patents & licenses**
- **Spinoff YieldEstimator, Inc. been established in the US.**

# Founder Information

- **Celil Serhan Tezcan**

- Inventor & Hardworking problem solver. If there is a problem, no rules apply.
- 4<sup>th</sup> gen farmer and Agricultural Engineering BSc., Animal Genetics, Uludag University
- Erasmus Student Exchange program, Universita Degli Studi di Catania
- Biosystems Engineering MSc., Life Cycle Assessment/Analysis
- Geomatics Engineering, PhD., Quit at dissertation, Istanbul Technical University
- Experience;
  - Embedded Systems Hardware & Software development (wireless sensor networks, cameras, robots)
  - Cloud Computing, Remote Operations, AI at the Edge Expert.
  - Data Science & Data Engineering
  - Image Processing, Deep Learning, OpenCV
  - Remote and Proximal Sensing Expert
  - Precision Agriculture Expert

# Phase 1 Projects

- 2015 – Wireless Sensor Networks
- 2016 – Scalable Multispectral Camera
- 2016 – Realtime Vegetation Health Calculating Camera System
- 2016 – Act In Space, Airbus & ESA Hackathon
- 2017 – Deep learning powered multispectral vegetation health system, Patented
- 2018 – Edge AI
- 2019 – Lake surface monitoring & 99.6% accuracy mapping for digital twin of lakes
- 2020 – Vegetation mapping, 95% accuracy
- 2020 – GAN for Remote Sensing
- 2020 – YieldEstimator

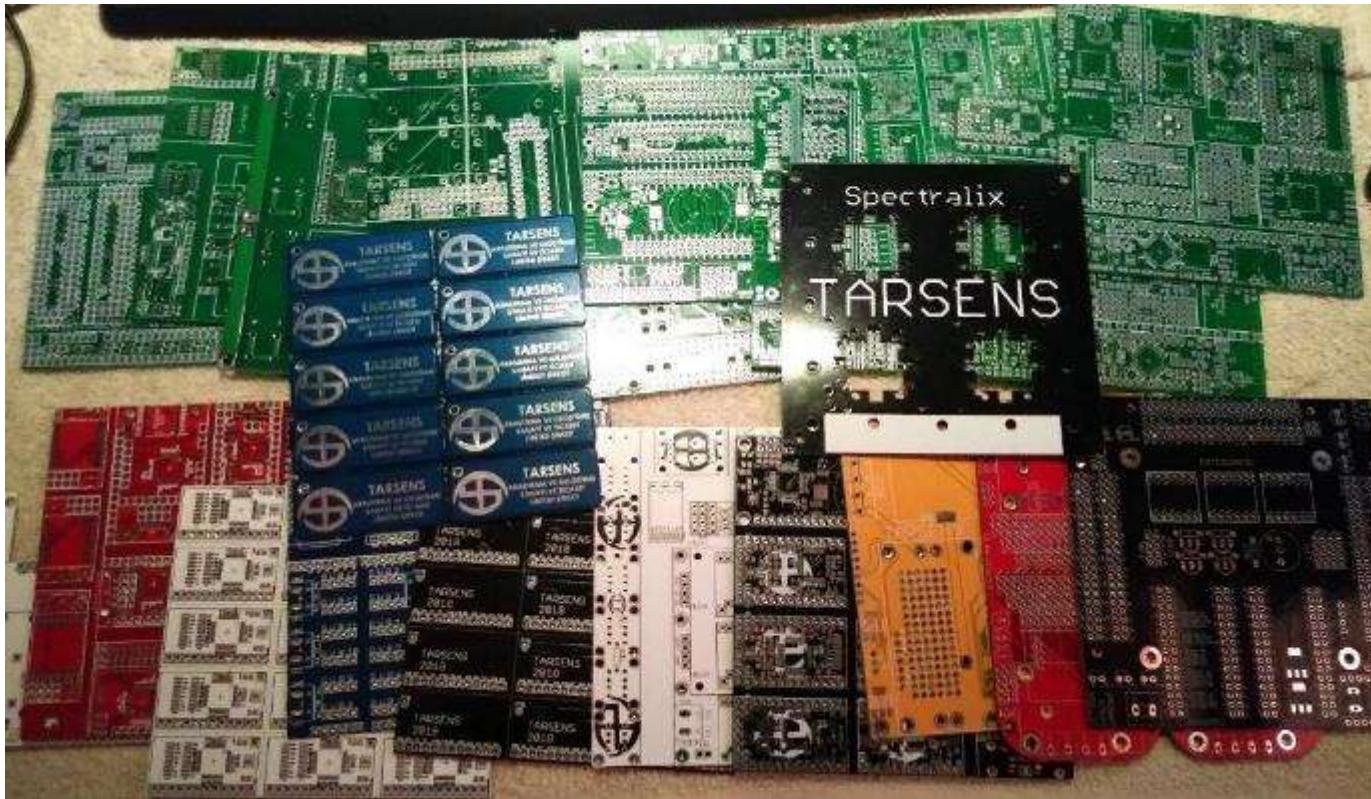
# Phase 2 Projects

- 2019 – Unmanned Ground Vehicles
- 2019 – Industrial parts classification
- 2021 – Industrial Quality Inspection, Inspectralix
  - Machine part, Bottle, Wind turbine, Solar panel, PCB
- 2022 – Road Condition Monitoring - Canada
- 2022 – ViTiMAP
- 2022 – High-speed collision avoidance (Patent pending)
- 2023 – Defense and Space Applications

# **Embedded system design and development**

- **1, 2, 4 layers PCB design**
- **Embedded system programming**
- **Very low power circuit operations**
- **Wireless sensor networks**
- **Camera, Multispectral camera and Infrared cameras**
- **Unmanned aerial and ground vehicles hardware design**

# Embedded system design and development



Thousands of working devices

# **2015 – Wireless Sensor Networks Before TARSENS R&D**

# 2015 – Wireless Sensor Networks

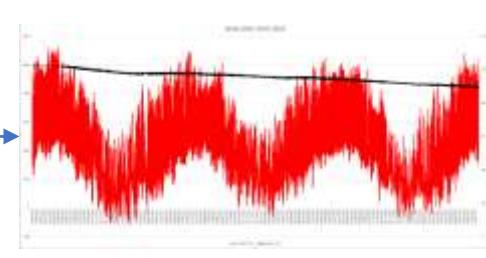
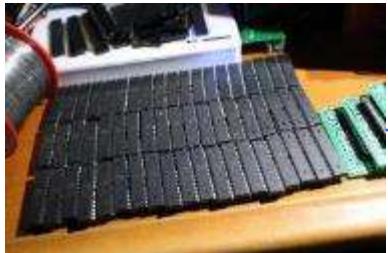
- **Battery endurance up to 8 years**
- **ISM frequency usage**
- **Switching sensors while the device is running**
- **Remote battery status monitoring**
- **1000 devices in one channel**
- **Distributed data transfer**
- **Extended temperature range**
- **Built-in Real-time clock backup and forwarding**
- **LoRA compliance**

# 2015 – Wireless Sensor Networks



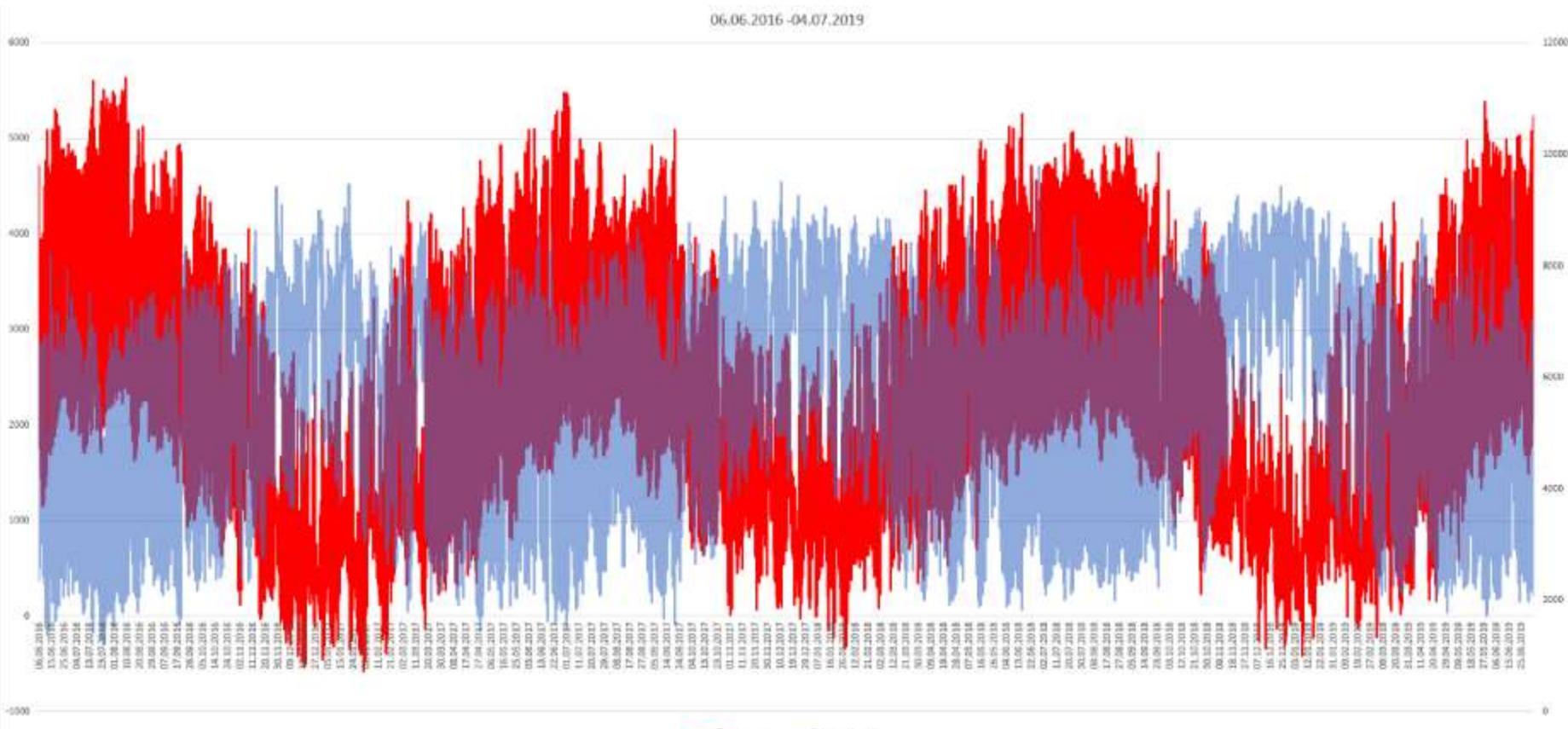
Wirelessly, Green House → Agricultural Sciences Faculty HQ → Cloud

# 2015 – Wireless Sensor Networks

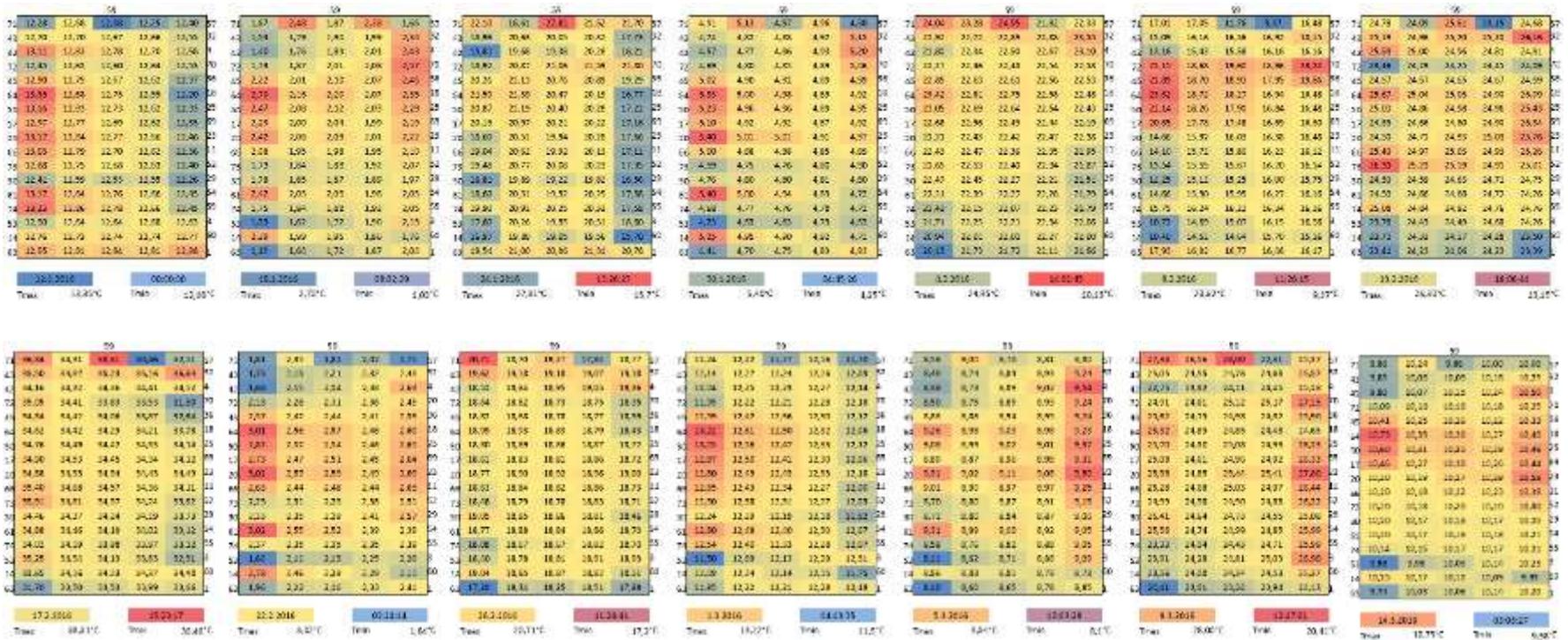


# 2015 – Wireless Sensor Networks

06.06.2016 - 04.07.2019



# 2015 – Wireless Sensor Networks



# **Agricultural Remote Sensing**

# Agricultural Remote Sensing



Where did we start? It is clear to see algal bloom on water surfaces.

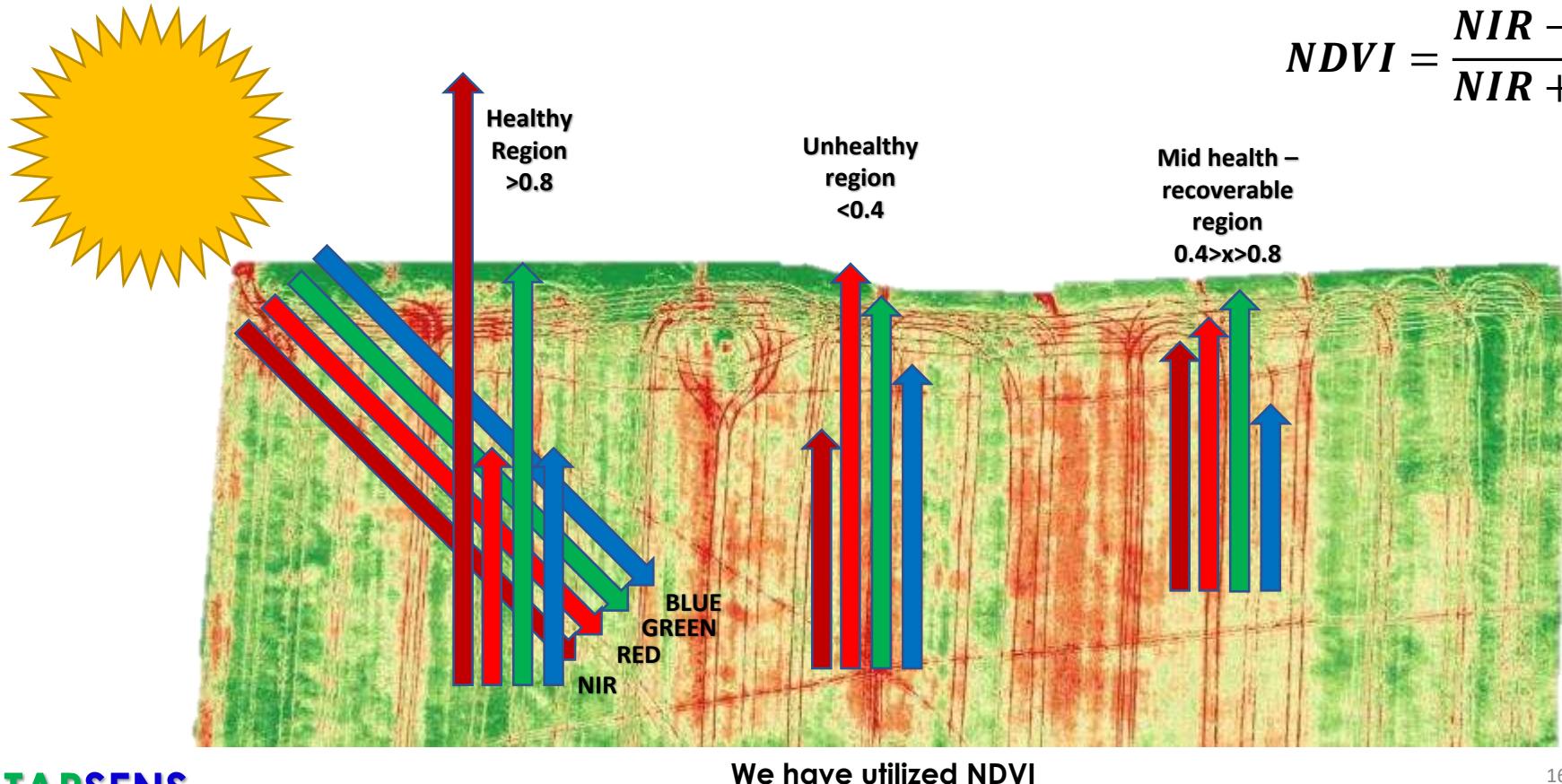
# Agricultural Remote Sensing

RGB

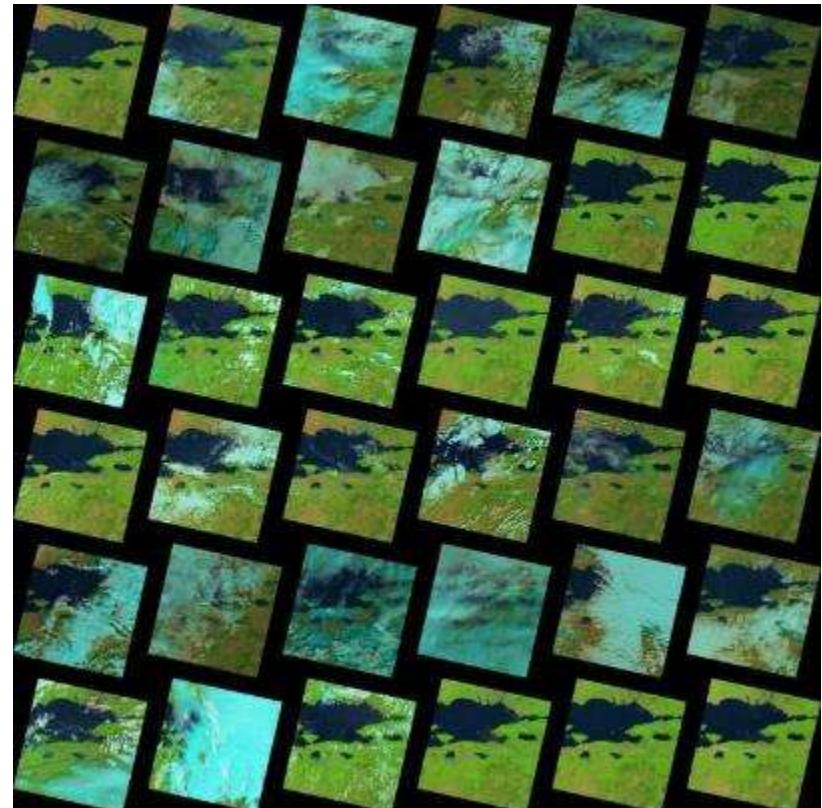
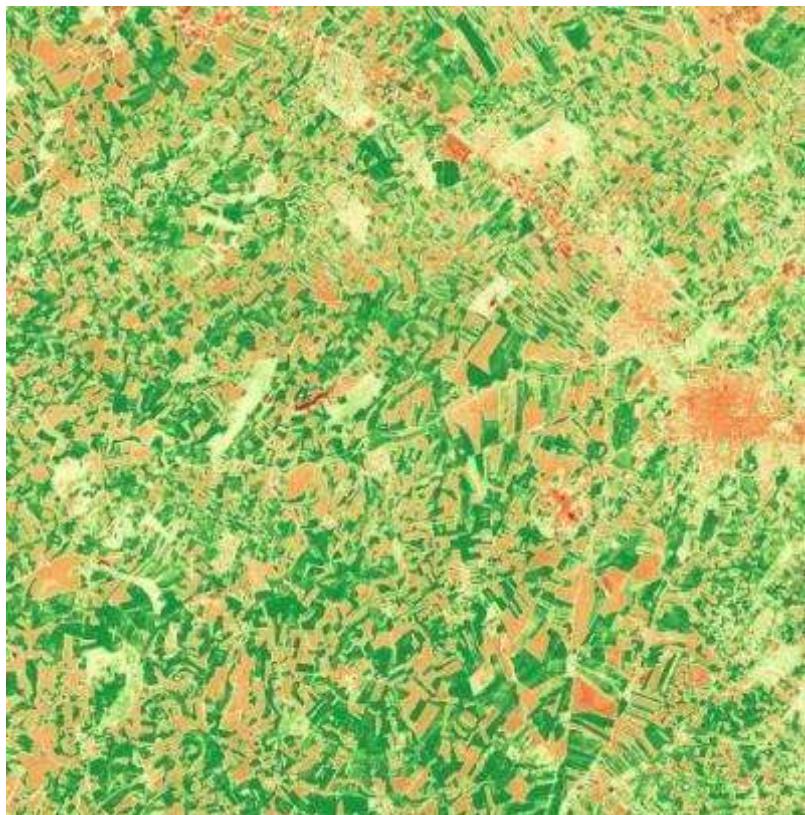
Near Infrared

# Agricultural Remote Sensing

$$NDVI = \frac{NIR - RED}{NIR + RED}$$

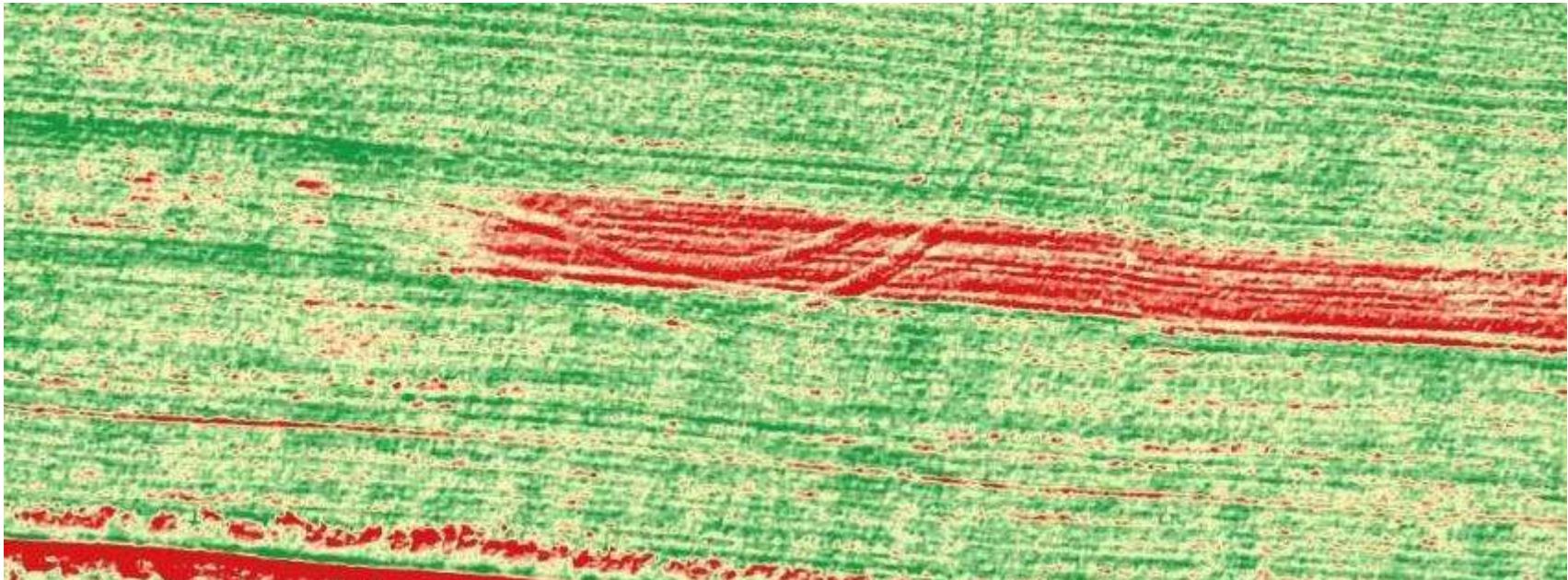


# Agricultural Remote Sensing



Satellite imagery has low spatial & temporal resolution

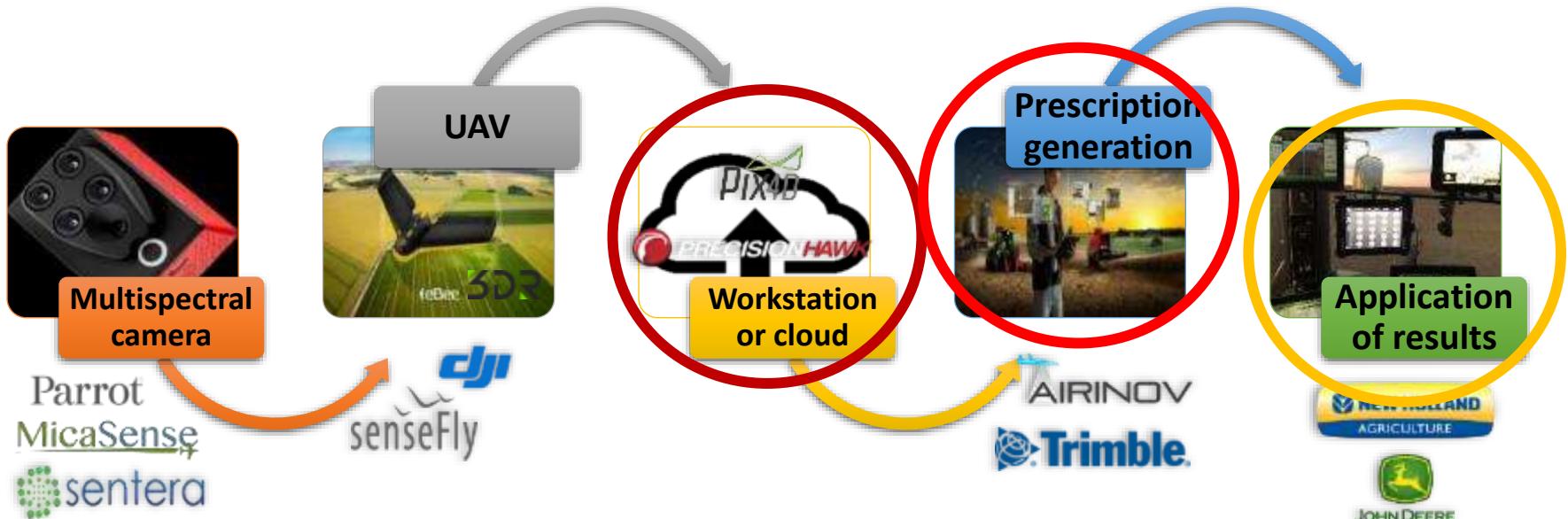
# Agricultural Remote Sensing



Landsat 8 OLI = 30m/px vs. DJI Phantom 4 = 3cm/px

UAVs have excellent spatial resolution

# Agricultural Remote Sensing



But takes too much time to process data

# Developed Functional Realtime NDVI, Before dji, in 2016



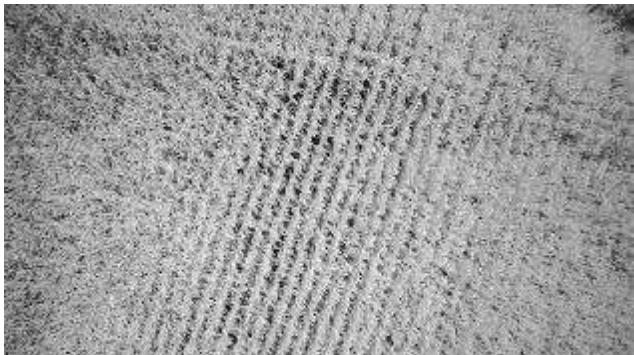
## Tested prototypes on different altitudes & speeds



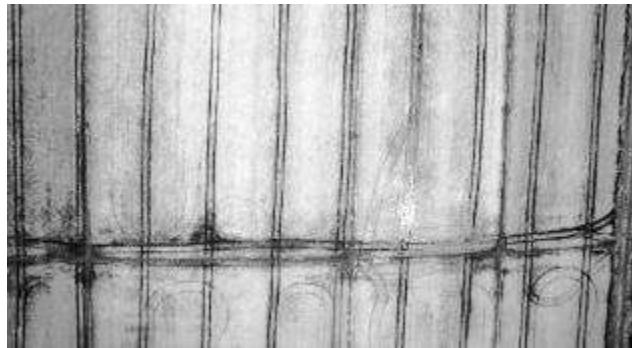
# Tested prototypes on different altitudes & speeds



# Collected data on...



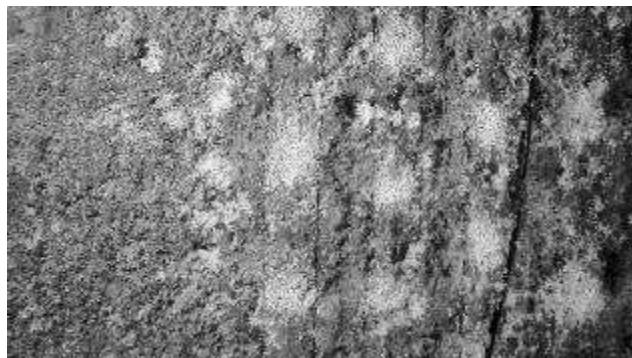
Corn



Rice



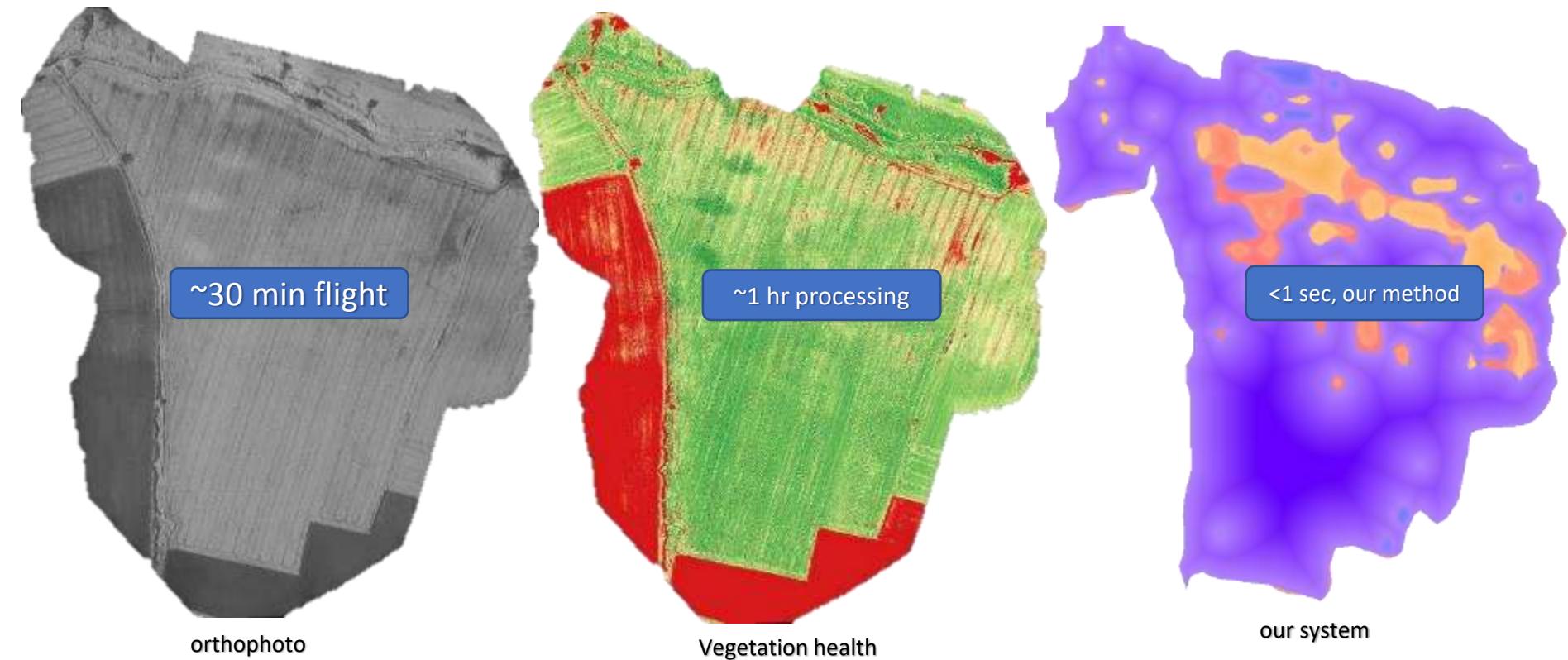
Wheat



Tomatoes

**Then utilized Deep Learning to solve calibration errors  
and increased processing speed by 20x**

# Deep Learning Powered Result Generation Revolution, 2017

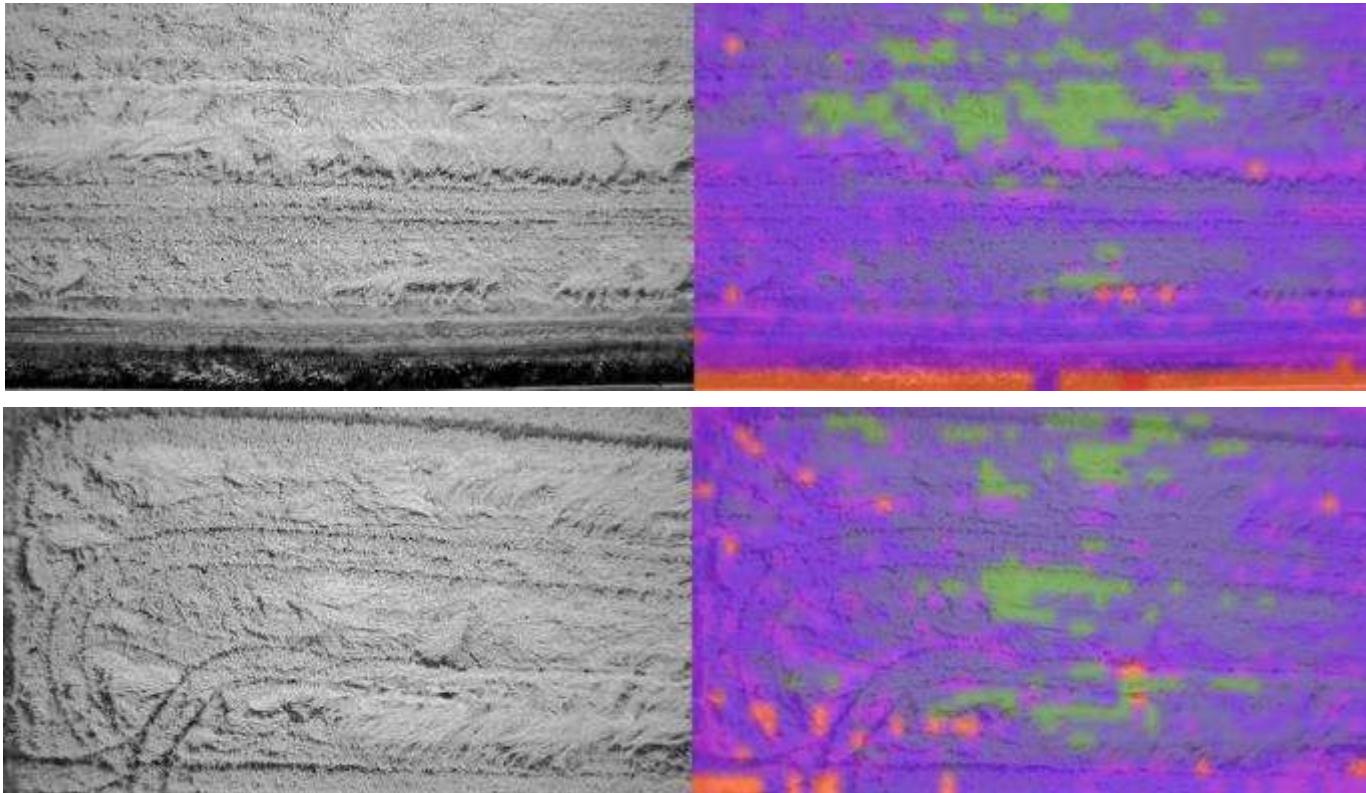


orthophoto

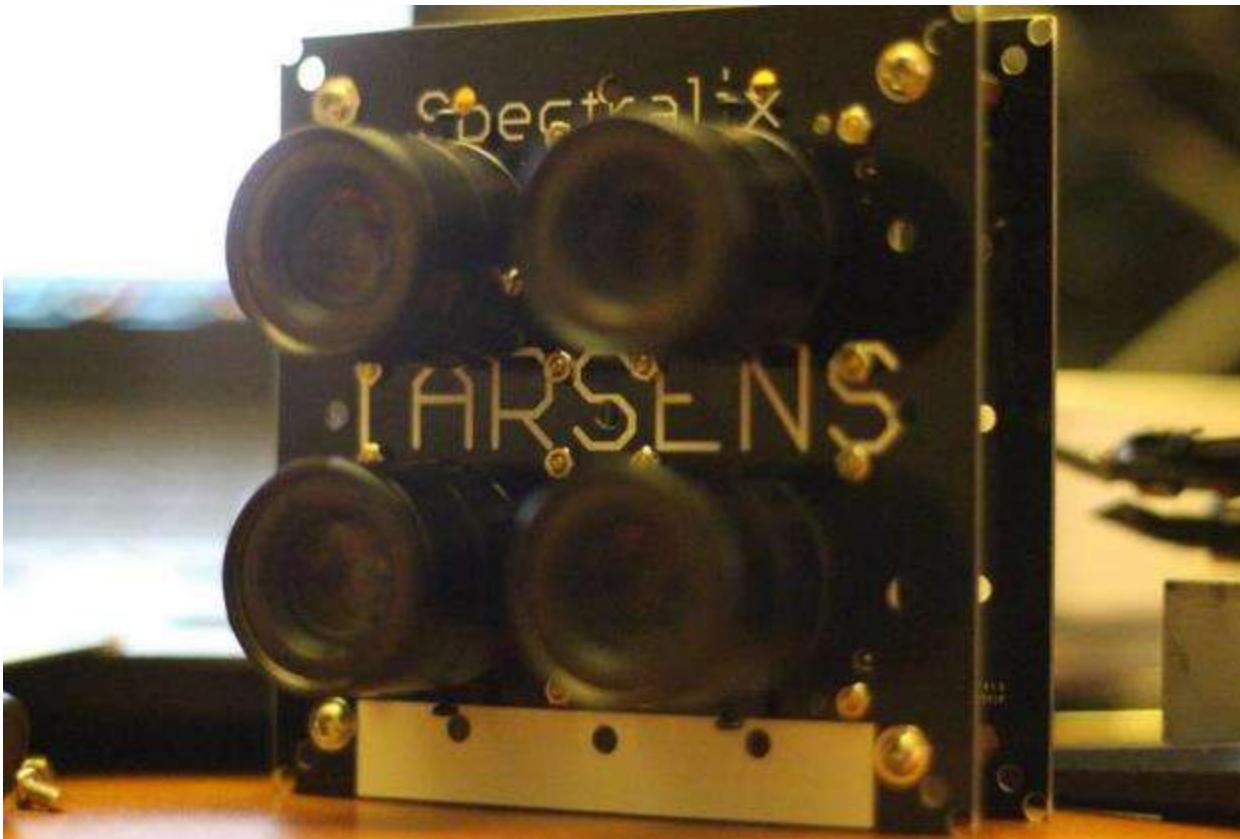
Vegetation health

our system

# Deep Learning Powered Result Generation Revolution, 2017

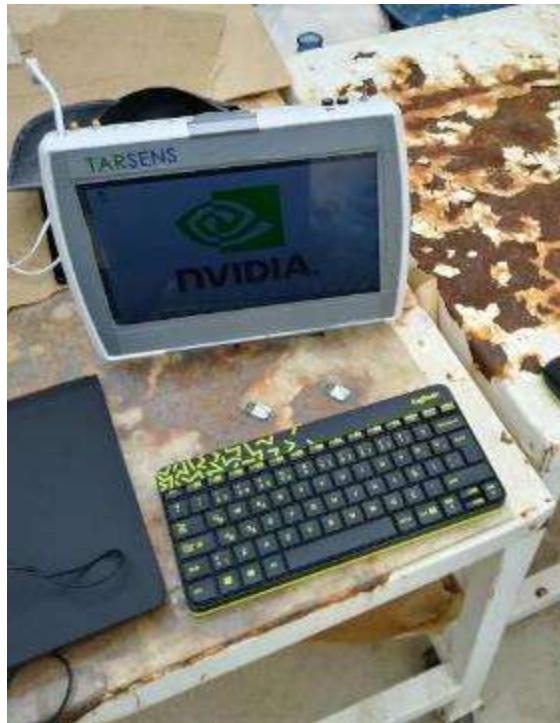


# Patent – TR 2016/17566



# **Deep Learning Edge, Tablet**

# Deep Learning Edge, Tablet



# **Lake surface monitoring using Satellite Imagery, 2019**

# **Lake surface monitoring using Satellite Imagery, 2019**

- Fresh water resources are vital for all living things.
- Terrestrial freshwater resources are like a cash source for agriculture.
- Due to global climate change, precipitation regimes have changed and the ecosystem balance has deteriorated.
- With this project, more than 7000 lake images were processed and surface areas were calculated with 99.6% accuracy.

# Lake surface monitoring using Satellite Imagery, 2019



# Lake surface monitoring using Satellite Imagery, 2019



1000 lake imagery

# Lake surface monitoring using Satellite Imagery, 2019



Lake Burdur, Turkey

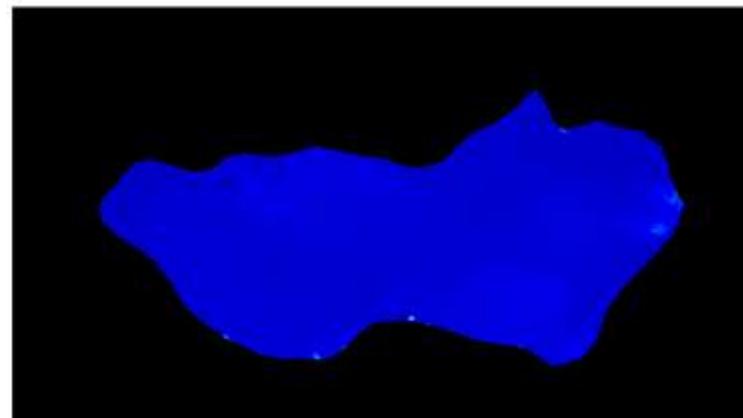
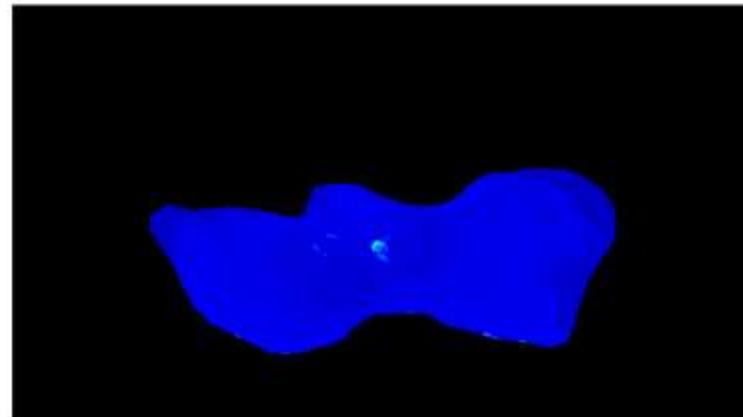


Lake Hennessey, USA

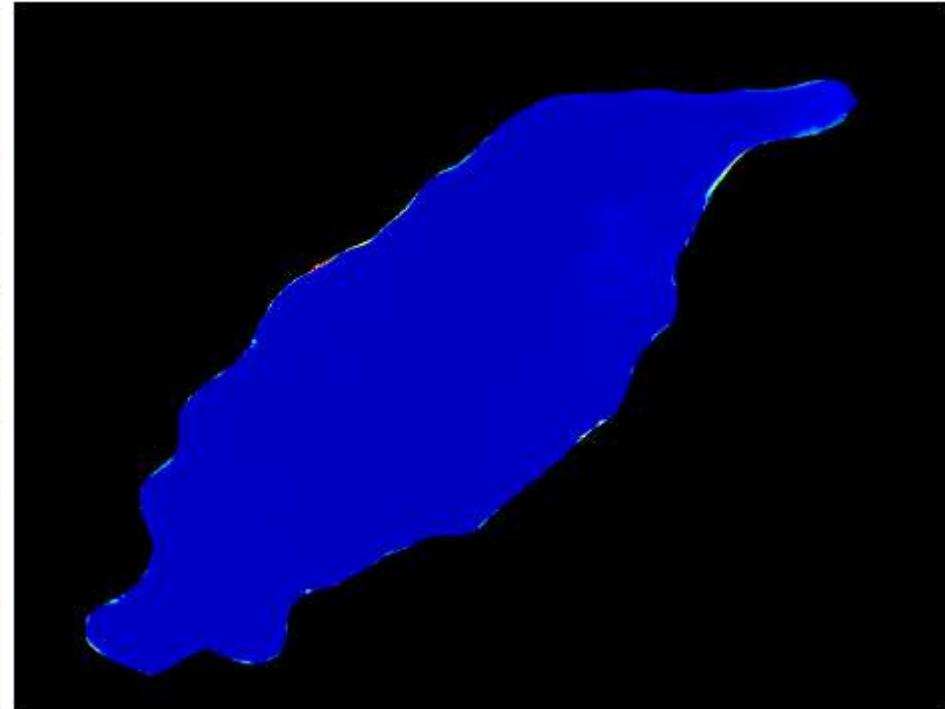


Gölmarmara, Turkey

# Lake surface monitoring using Satellite Imagery, 2019



# Lake surface monitoring using Satellite Imagery, 2019

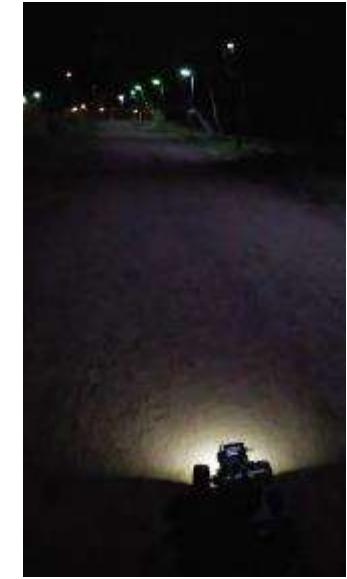


# Lake surface monitoring using Satellite Imagery, 2019

A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AU	AV	AW	AX
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# Unmanned Ground Vehicles, 2019

# Unmanned Ground Vehicles, 2019



# Unmanned Ground Vehicles, 2019



A vehicle that is separated on X Axis

# Unmanned Ground Vehicles, 2019



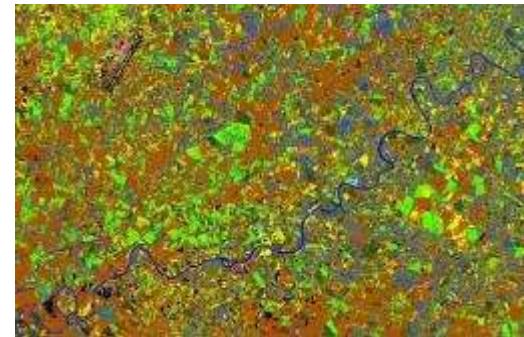
# **Vegetation Type Monitoring from Satellite Imagery**

# Vegetation Type Monitoring from Satellite Imagery

**Yield Information**

**Vegetation Information**

**Plantation & Harvesting dates**

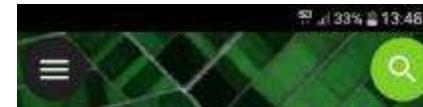


Adana, Turkey



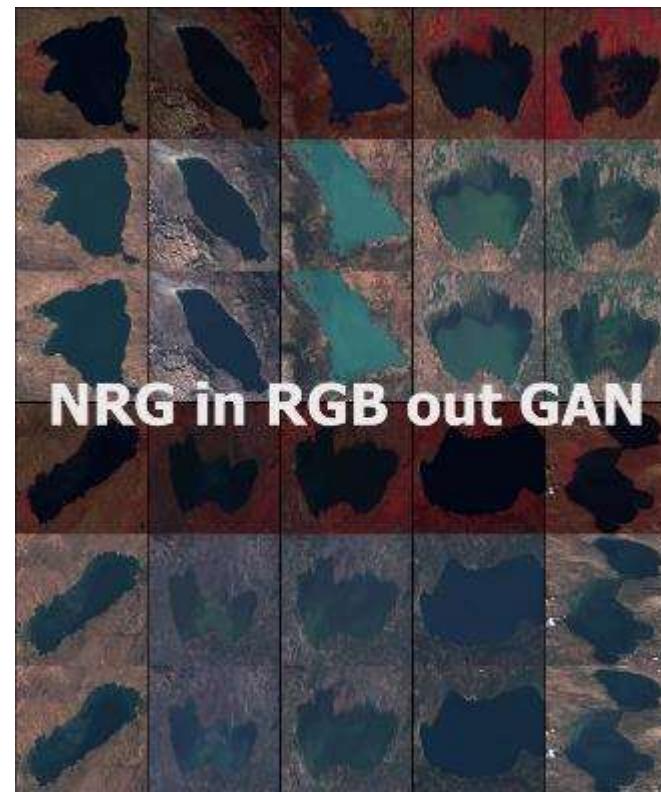
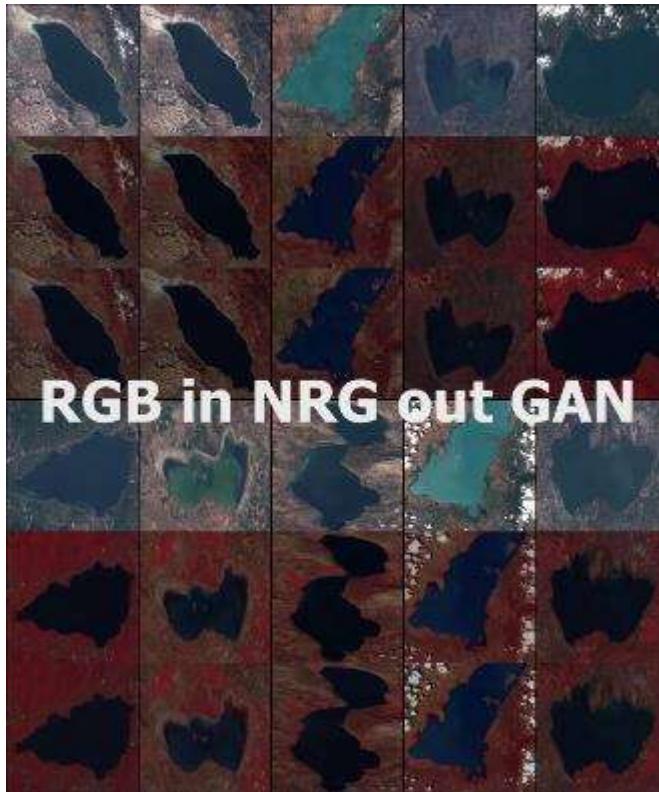
Tekirdağ, Turkey

# Vegetation Type Monitoring from Satellite Imagery

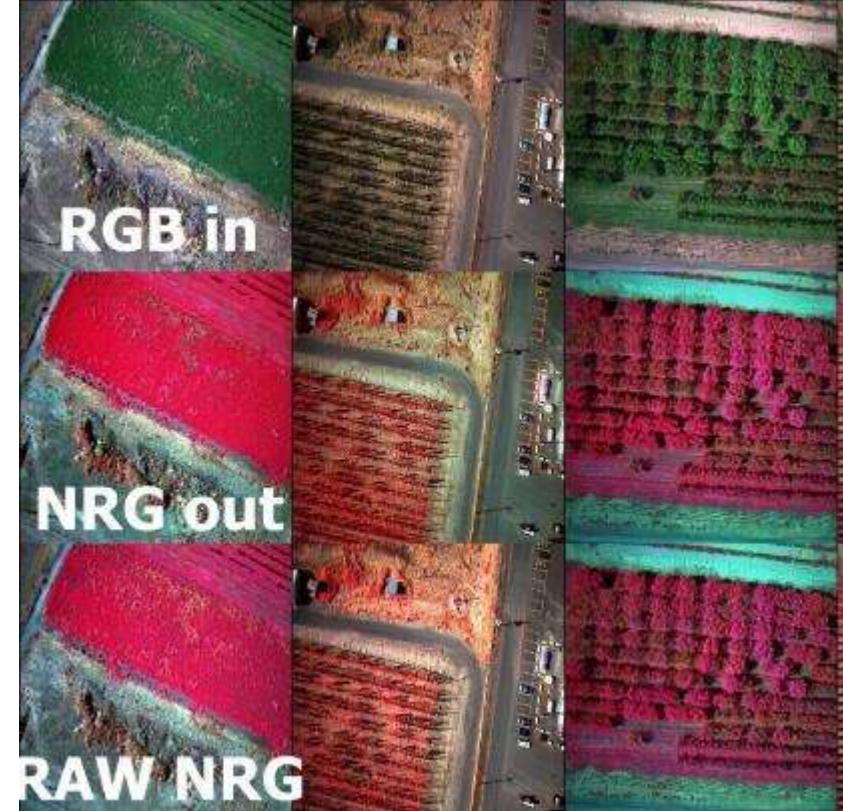
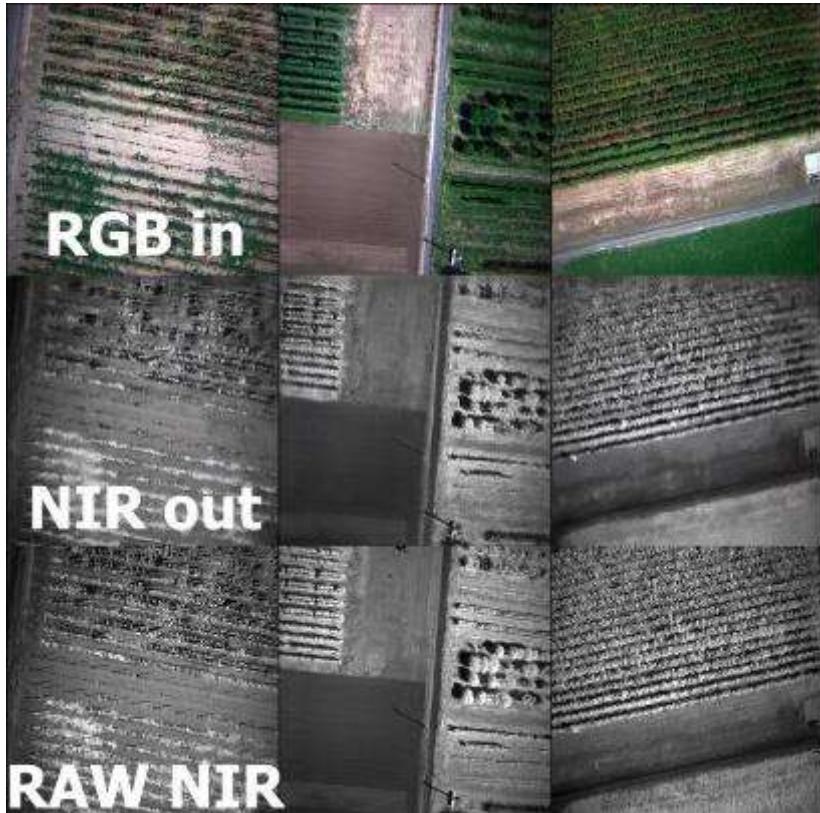


# **Generative Adversarial Networks for Remote Sensing, 2020**

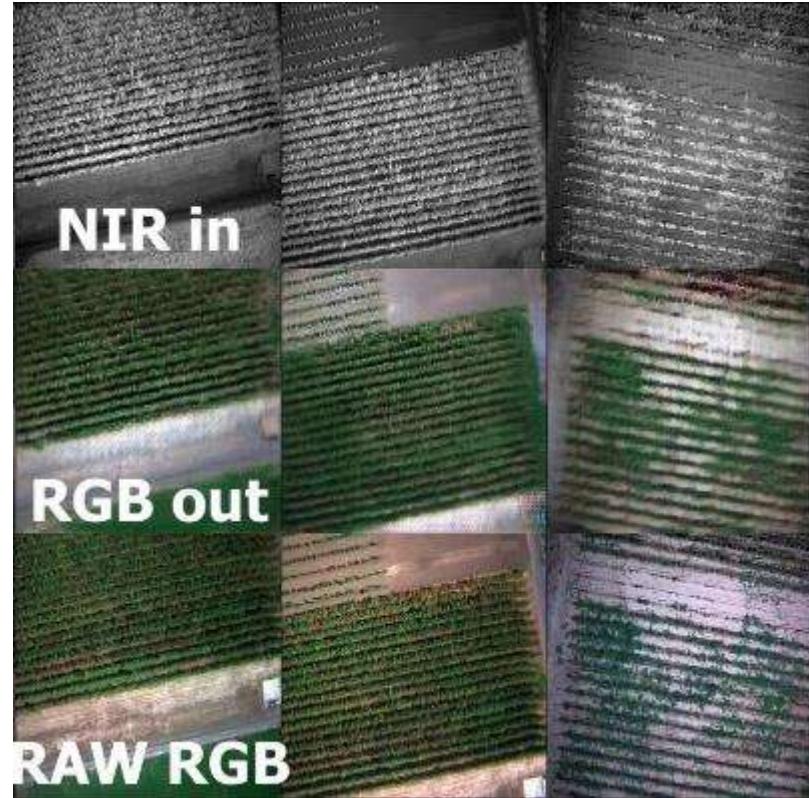
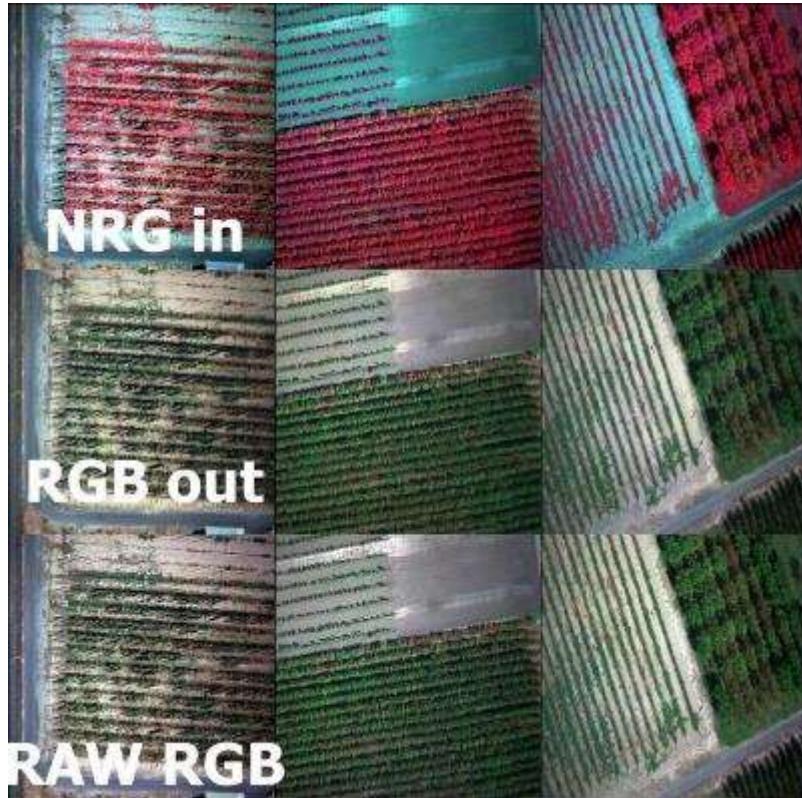
# GAN for Remote Sensing, “for fun” projects, 2020



# GAN for Remote Sensing, “for fun” projects, 2020



# GAN for Remote Sensing, “for fun” projects, 2020



# **YieldEstimator, 2020**

# YieldEstimator



# YieldEstimator



# **YieldEstimator**



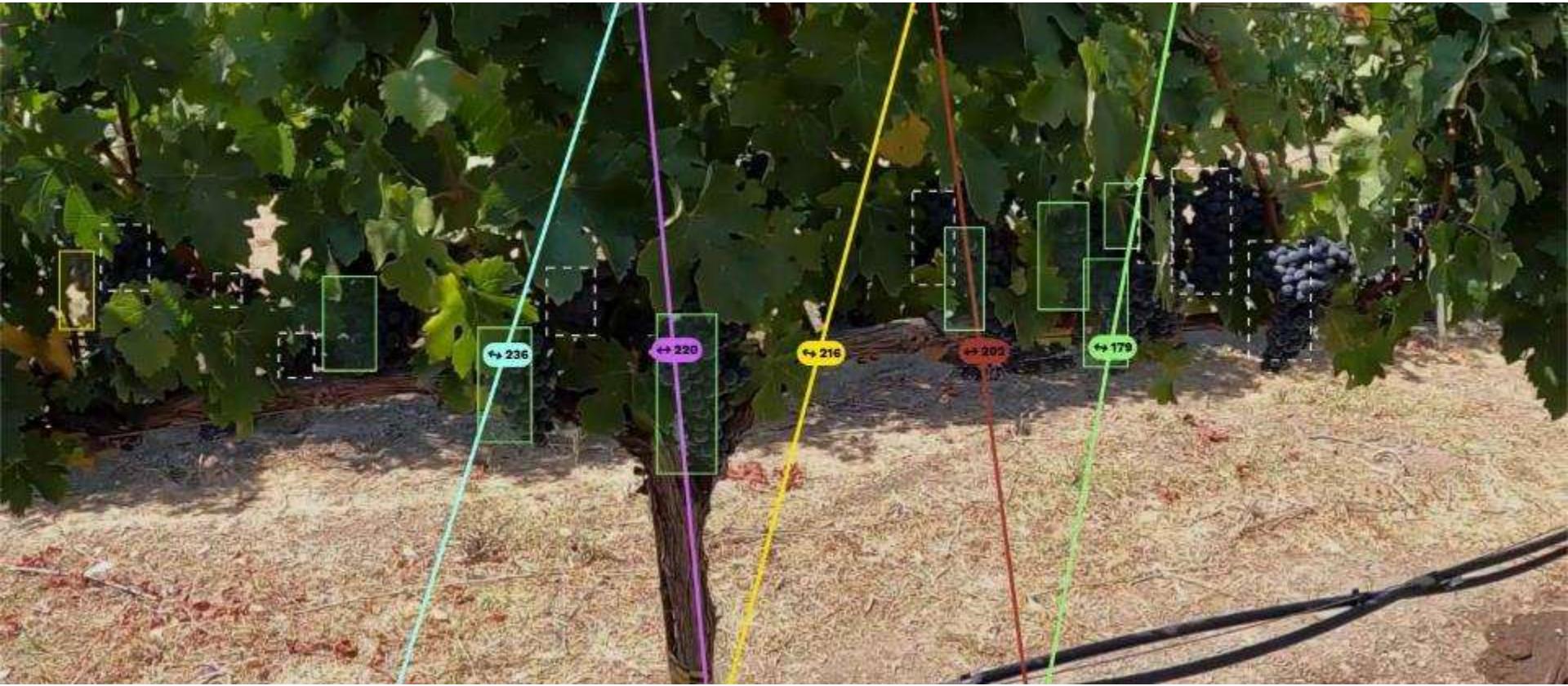
## 1<sup>st</sup> demo

**TARSENS®**

# YieldEstimator



# YieldEstimator

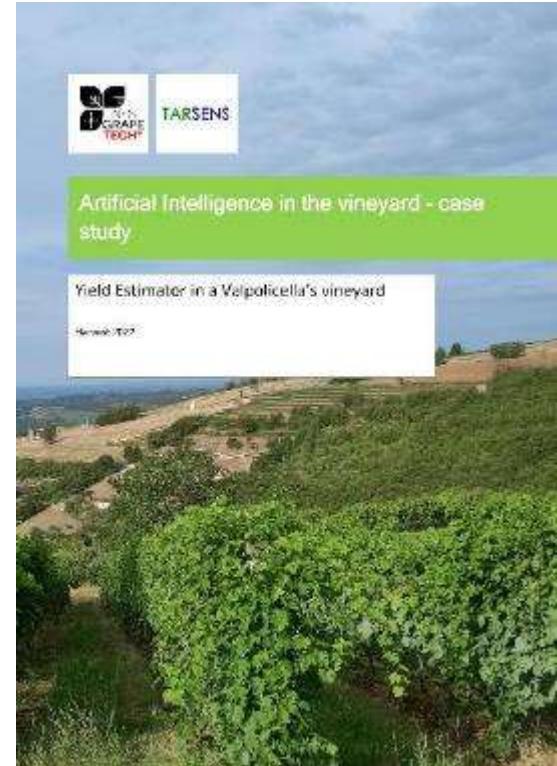
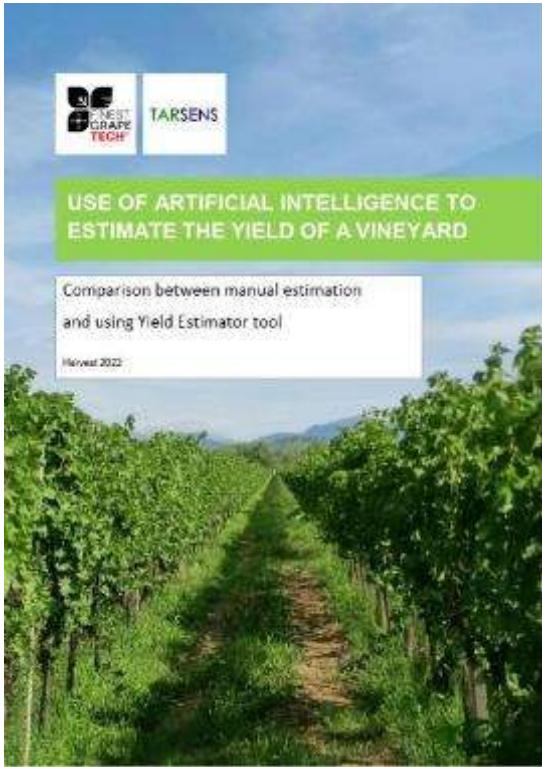


Enhanced Parallax Correction

# YieldEstimator



# YieldEstimator



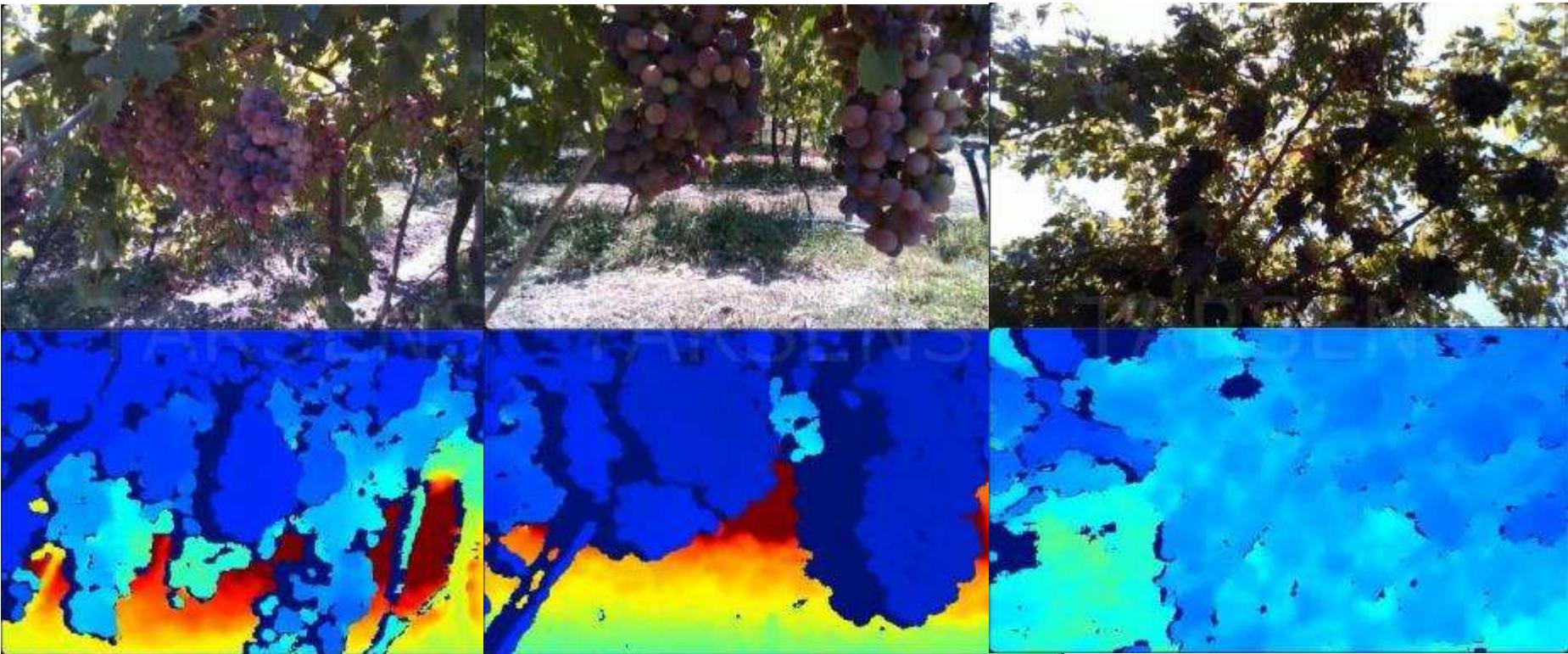
# YieldEstimator & Caterpillar Xs



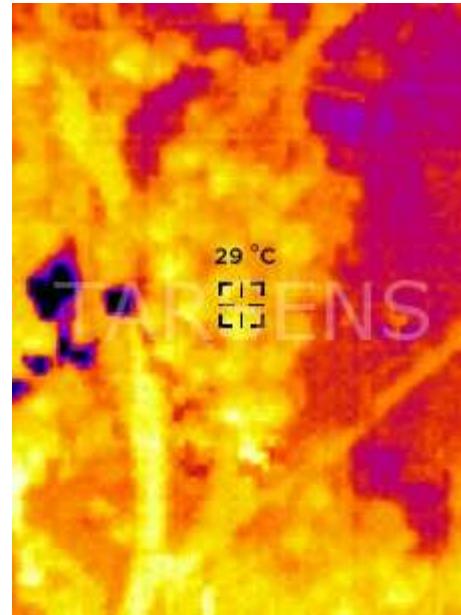
# YieldEstimator Edge



# DepthEstimator, 2021



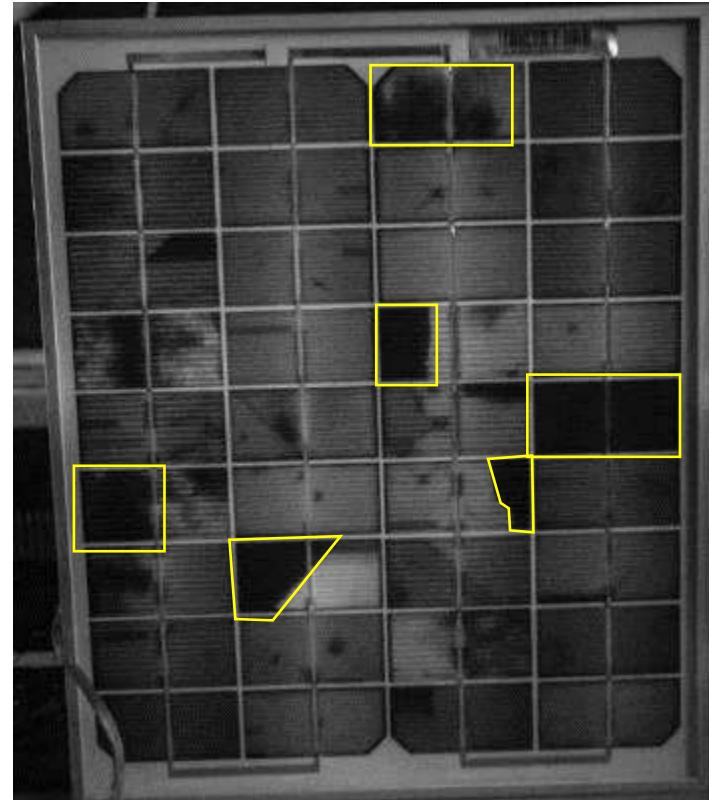
# ViTi Thermal, 2021



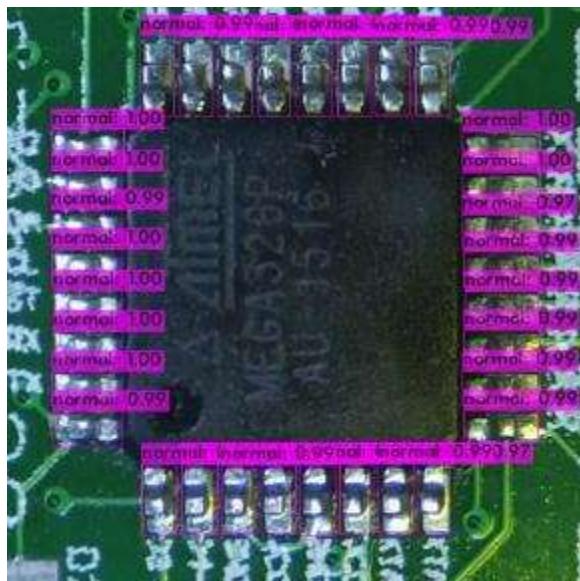
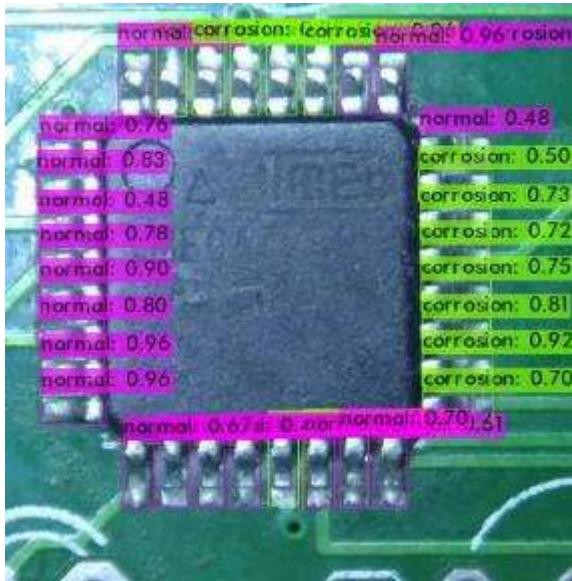
# Inspectralix, 2021



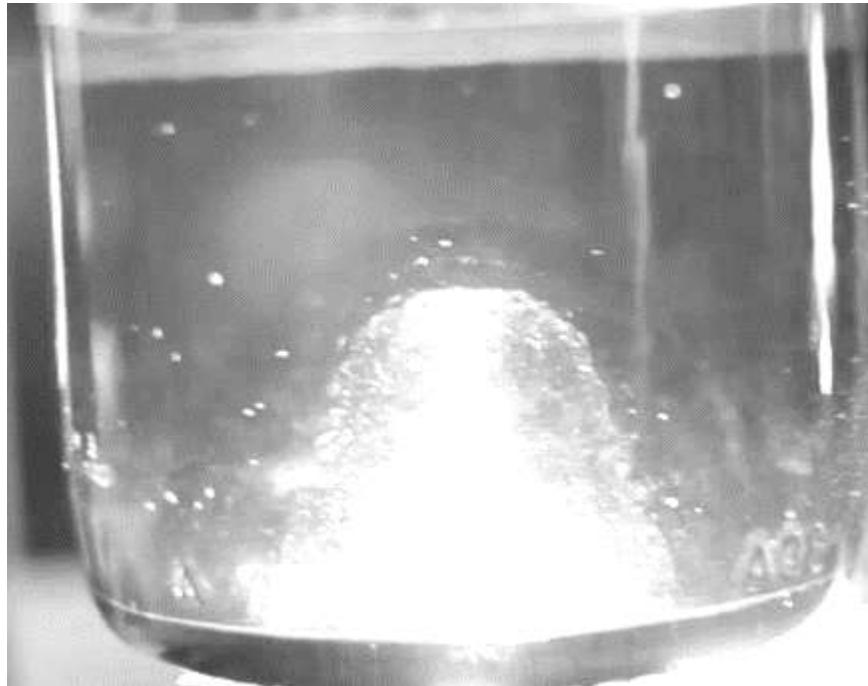
# Inspectralix, 2021



Inspectralix, 2021



# Inspectralix, 2021



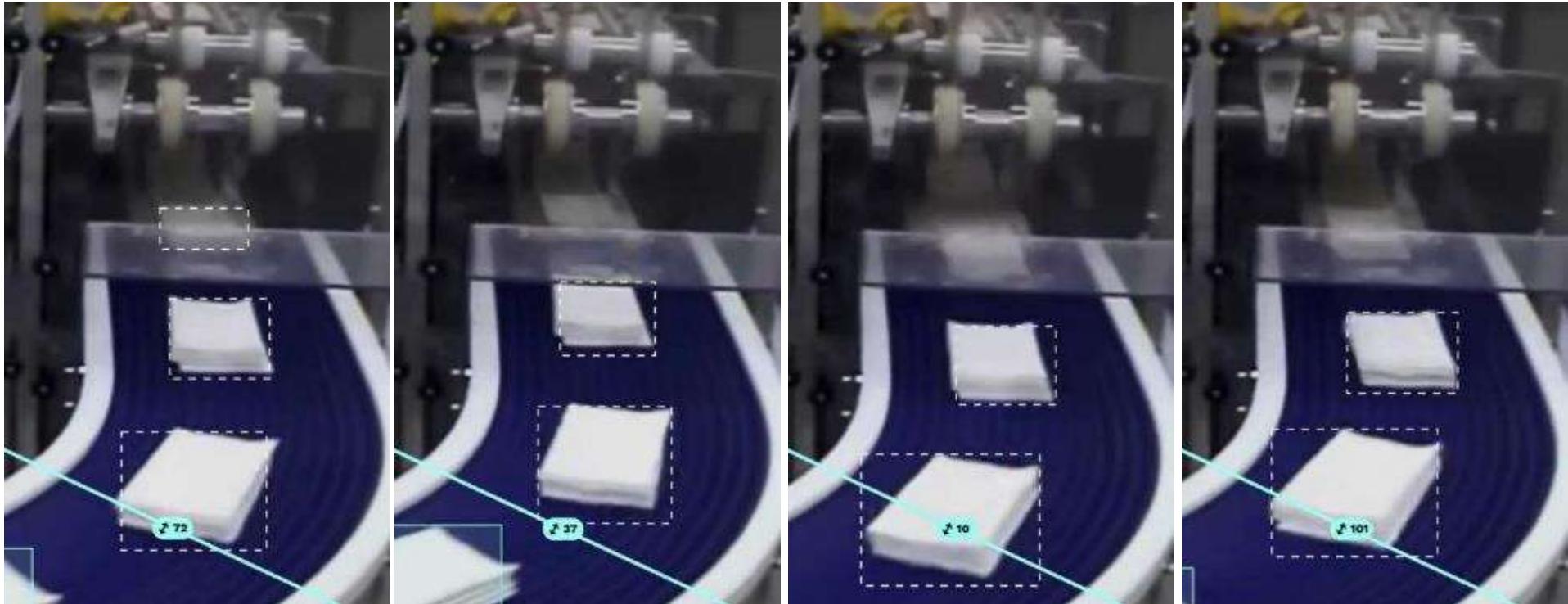
# Inspectralix, 2021



# Inspectralix, 2021



# Inspectralix, 2021



# DiseaseSpotter, 2022



# Unreal Bunches, 2022



# Unreal Bunches, 2022

Utilizing GAN for Better Detection



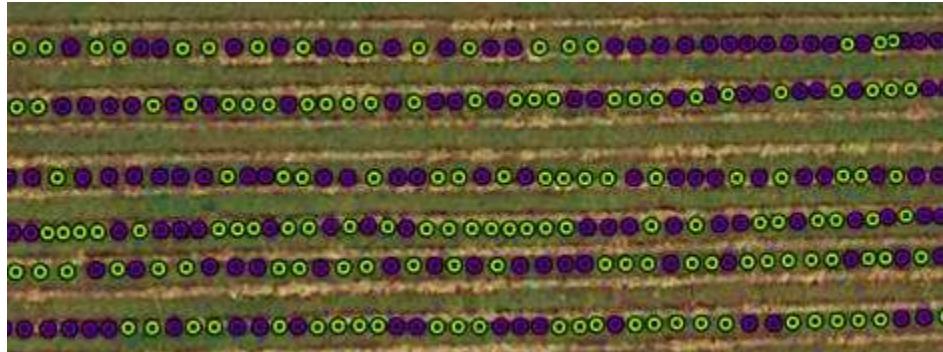
# Road Condition Monitoring – 2022, Canada

Due to global climate change and increased traffic on roads, the infrastructure started cracking faster than ever before. We have developed a novel application for tracking the problems.



# ViTiMAP, 2022

By using and utilizing GPS equipped cameras, we were able to geolocate grape bunches in vineyards



Veraison Tracking



Bunch Count

# **ViTiMAP, 2022**



**Bunch counting**

**Vineyard elevation**

**Vehicle speed**

# YieldEstimator Academy, 2023



# Custom Object Detection Models

For counting, observing, machine vision



**TARSENS**

ai@tarsens.com



Custom Model Creation

<https://tarsens.com>



# Custom Object Detection Models

For counting, observing, machine vision



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# Custom Object Detection Models

For counting, observing, machine vision



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# **Agricultural Precision Insurance, 2023**

**Using YieldEstimator & ViTiMAP know-how, a system based on before and after comparison has been started to be developed.**

**In this way, it is aimed to detect disaster damage sensitively and accurately by comparing the images taken before the disaster with the images taken after the disaster.**

**Development continues.**

# **Augmented Sensing, 2023**

**Aiming to combine remote & proximal sensing for  
precision agriculture.**

**Development continues.**

**TRiO, 2023**

**Traditional stereo cameras are unable to measure all dimensions, with TRiO, we are aiming to make unmanned aerial vehicles fly through narrow gaps at really high speeds.**

**Patent pending. ID: TR2022/014624**

# VitiERP, 2024

# Viti ERP

by TARSENS

<b>Sensor Beez</b>  Sensor Beez wireless sensor network system is compatible with VitiERP for vineyard & wine cellar environmental variable monitoring.  <a href="#">Read More &gt;</a>	<b>Inspectralix</b>  Wine Bottle inspection system for factories. It detects foreign objects inside the bottles and tracks the fill rate.  <a href="#">Read More &gt;</a>	<b>Yield Estimator</b>  Yield Estimator software helps you to get most accurate and field proven yield estimation whenever you need.  <a href="#">Read More &gt;</a>	<b>Depth Estimator</b>  Depth Estimator software helps you to get accurate pruning, shading, bunch size information whenever you need.  <a href="#">Read More &gt;</a>	<b>Disease Spotter</b>  Disease Spotter software helps you to get accurate pest & disease information whenever you need.  <a href="#">Read More &gt;</a>	<b>Harvestobot</b>  Leaf thinning, pruning, bunch harvesting system. In development.  <a href="#">Read More &gt;</a>
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# **Advisory Services**

# Advisory Services



# Advisory Services



# Press

# National Press

## AI initiative of Turkey, TRAI Meetup 17



# National Press

- Uludag University, good ideas award, 2016, 3<sup>rd</sup> placement



# National Press

- AIRBUS ve ESA Sponsored, Act-In-Space Hackathon 3<sup>rd</sup> placement, 2016



# National Press

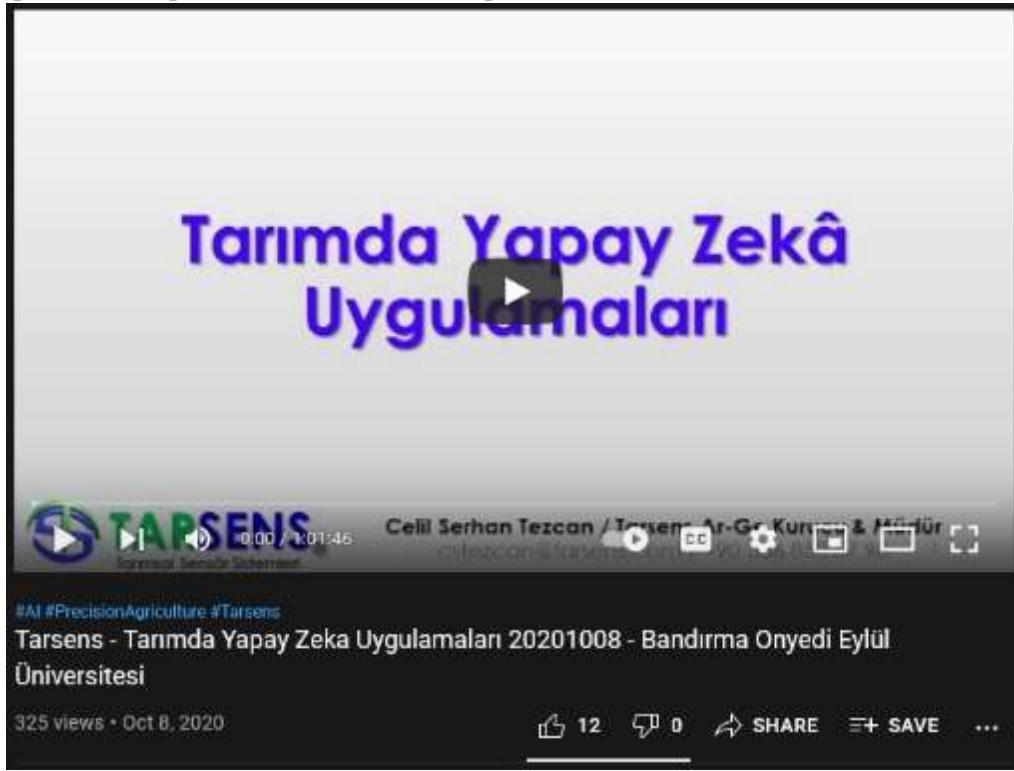
- TRAI Summit & Çiftçi TV, 2018



[youtube.com/watch?v=nnCUIzi8gDM](https://youtube.com/watch?v=nnCUIzi8gDM)

# National Press

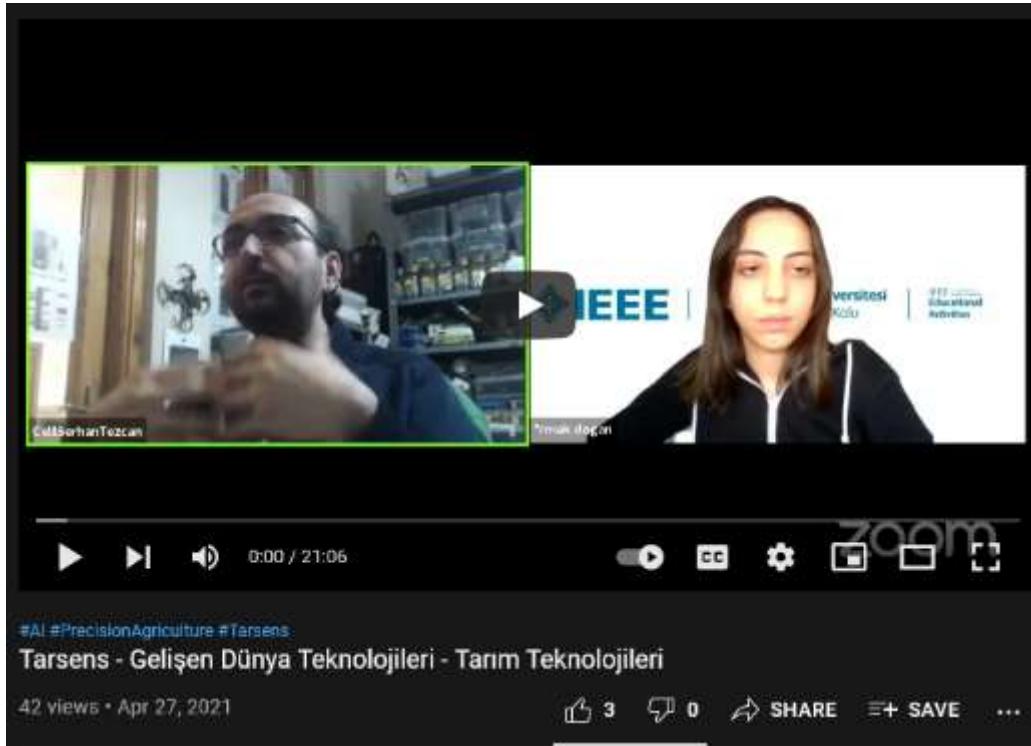
- Bandırma Onyedi Eylül University Webinar



[youtube.com/watch?v=Yh2CJBpQfvc](https://youtube.com/watch?v=Yh2CJBpQfvc)

# National Press

- 5G & Agriculture, IEEE Student Branch



[youtube.com/watch?v=kf6XdDSI5Jw](https://youtube.com/watch?v=kf6XdDSI5Jw)

# National Press

- nVIDIA Jetson Meetup



# National Press

- AgroTV, Agricultural Technology 3 episodes



# National Press

**YieldEstimator** on almost all news channels in Turkey.

- <https://www.haberler.com/yapay-zekayla-baglardaki-rekolte-olculdu-14311175-haberi/>
- <https://www.posta.com.tr/yapay-zekayla-baglardaki-rekolte-olculdu-2359468>
- <https://www.milliyet.com.tr/yerel-haberler/balikesir/bandirma/yapay-zekayla-baglardaki-rekolte-olculdu-6567602>
- <https://www.cnnturk.com/yerel-haberler/balikesir/bandirma/yapay-zekayla-baglardaki-rekolte-olculdu-1685527>
- <https://www.iha.com.tr/balikesir-haberleri/uzum-rekoltesi-suni-zeka-ile-olculuyor-3143604/>
- <https://www.sabah.com.tr/balikesir/2021/08/05/uzum-rekoltesi-suni-zeka-ile-olculuyor>
- <https://www.haberturk.com/balikesir-haberleri/89571871-uzum-rekoltesi-suni-zeka-ile-olculuyorinsan-gucu-ile-2-ayda-yapilacak-isi-2-dakikada>
- <https://beyazgazete.com/haber/2021/8/5/uzum-rekoltesi-sun-i-zek-ile-olculuyor-6171892.html>
- <https://www.hurriyet.com.tr/yerel-haberler/balikesir/bandirma/yapay-zekayla-baglardaki-rekolte-olculdu-41866776>
- <https://balikesirkenthaberleri.com/2021/08/05/uzum-rekoltesi-yapay-zeka-ile-olculuyor/>
- <https://www.koydenhaber.com/2021/08/05/uzum-rekolte-olcumunu-bu-kez-farkli-bir-yontemle-yaptilar/uzum-rekoltesi-suni-zeka-ile-olculuyor-insan-gucu-ile-2-ayda-yapilacak-isi-2-dakikada-yapiyor-3/>
- <https://www.youtube.com/watch?v=84ncXY5Mu8U>



**YAPAY ZEKAYLA DAĞLARDAKİ REKOLTE ÖLÇÜLDÜ**

Yapay zeka ile en iyi rekolte tahmini yapıldı.

# International Press

ESA & AIRBUS Backed Act In Space Hackathon, Success Stories, 2016



# International Press

## Global Forum for Innovations in Agriculture, Abu Dhabi, 2018



A screenshot of a computer screen displaying the website of the Abu Dhabi Agriculture and Food Safety Authority. The URL in the address bar is 'www.adafsa.gov.ae'. The page features the authority's logo and Arabic and English names. A navigation menu includes links for About us, Policies &amp; Legislations, Media Center, Supplier, Awareness Program, and Violation Reporting. Below the menu, a 'HOT NEWS' section is visible.

### SPECTRALIX: ARTIFICIAL INTELLIGENCE USE IN PRECISION AGRICULTURE DATA ACQUISITION AND PROCESSING

#### Spectralix: Artificial Intelligence Use in Precision Agriculture Data Acquisition and Processing

The precision agriculture business has several offers on the image gathering and recognition. Today, farmers mostly use UAVs and multispectral cameras to gather data, process using whether high-end computers or cloud computing with Pix4D like software. But in EMEA area, due to lack of knowledge for using UAV, processing data and describing it, they created a camera with AI to capture, process data real-time.

#### SPEAKER

Cell Serhan Tascan, Founder & CEO, Tarsens

# International Press

Nikkei's Agritech Summit, Tokyo, 2018



With Real-time Demo

# International Press



## With Two Real-time Demos

# International Press



## YieldEstimator



### Viticulture Edition

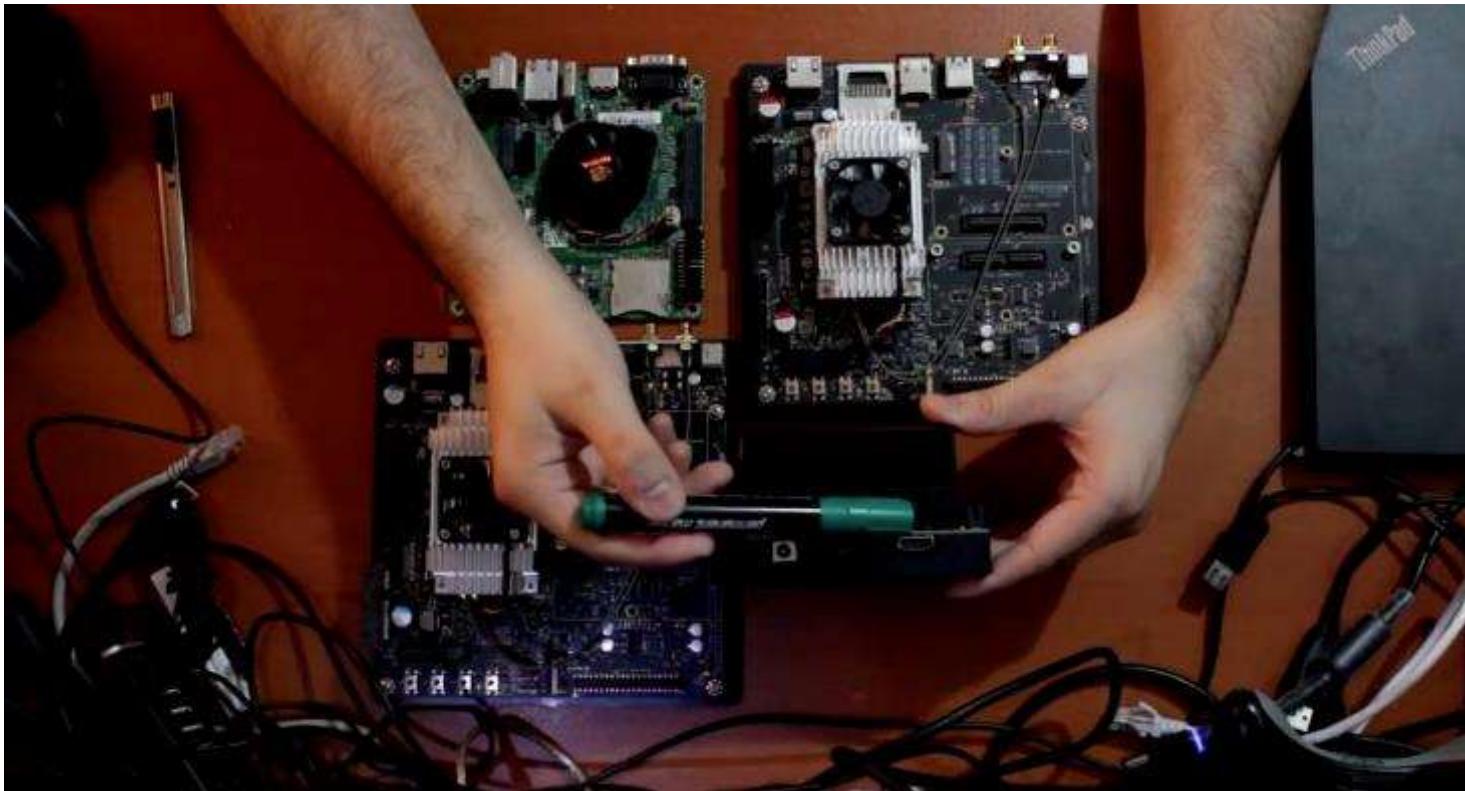
“we are removing guesswork from yield estimation”

Presenter: Celil Serhan TEZCAN, Founder of TARSENS R&D, [ai@tarsens.com](mailto:ai@tarsens.com)

# International Press



# Educational – Inspection of Embedded Systems



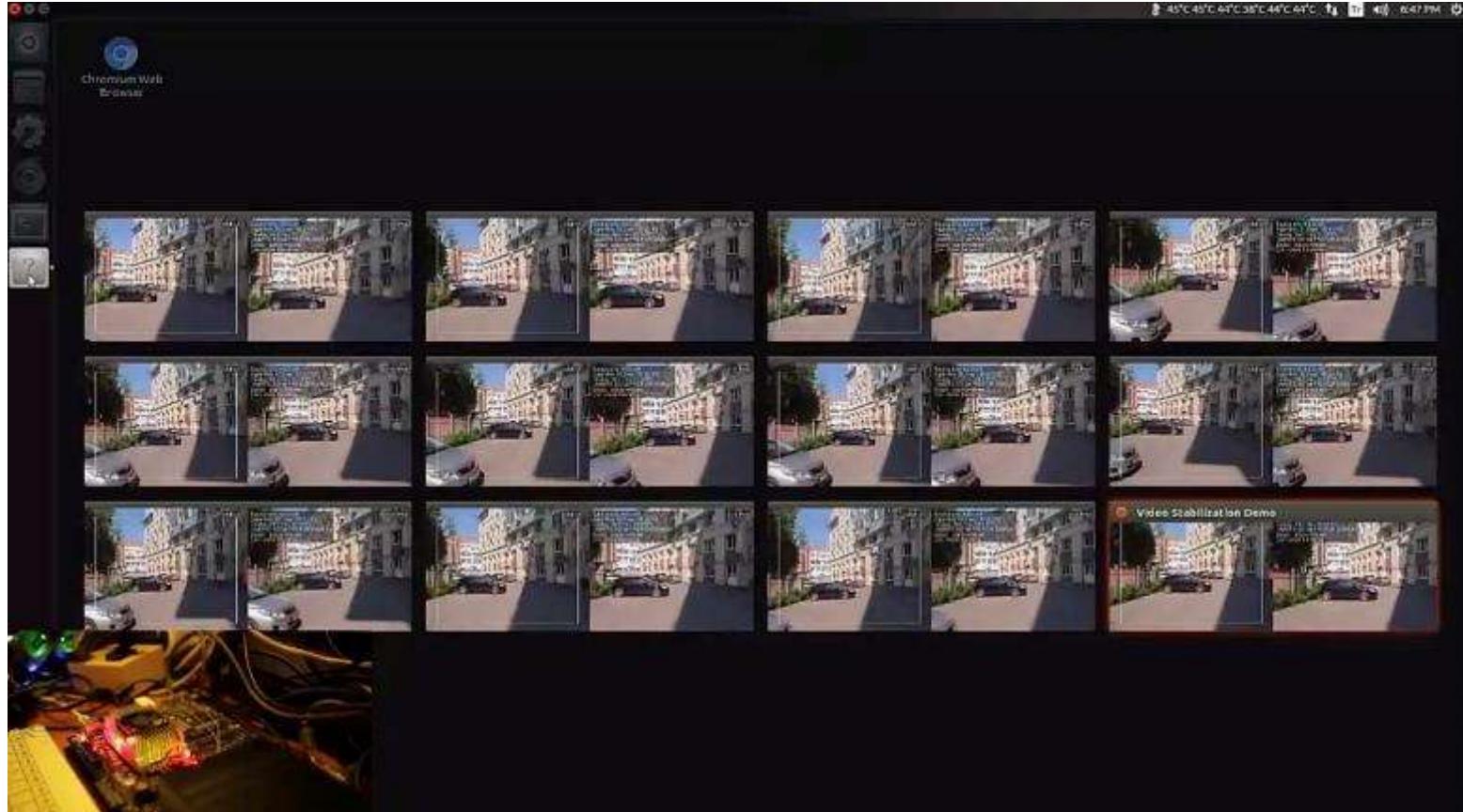
# Educational – Live debugging



# Educational – Performance Tests & Power Consumption

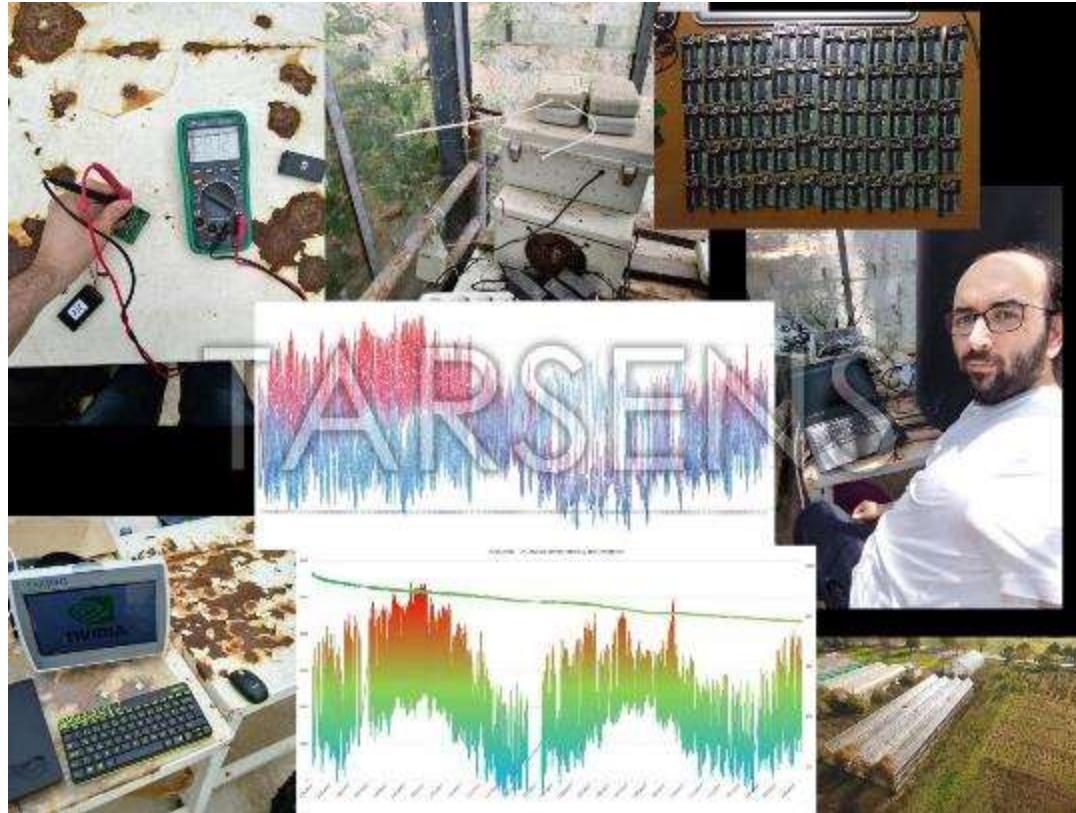


# Educational – Performance Tests



**To sum up.**

# Wireless Sensor Networks



Available at [github.com/cstezcan](https://github.com/cstezcan)

# Embedded Systems



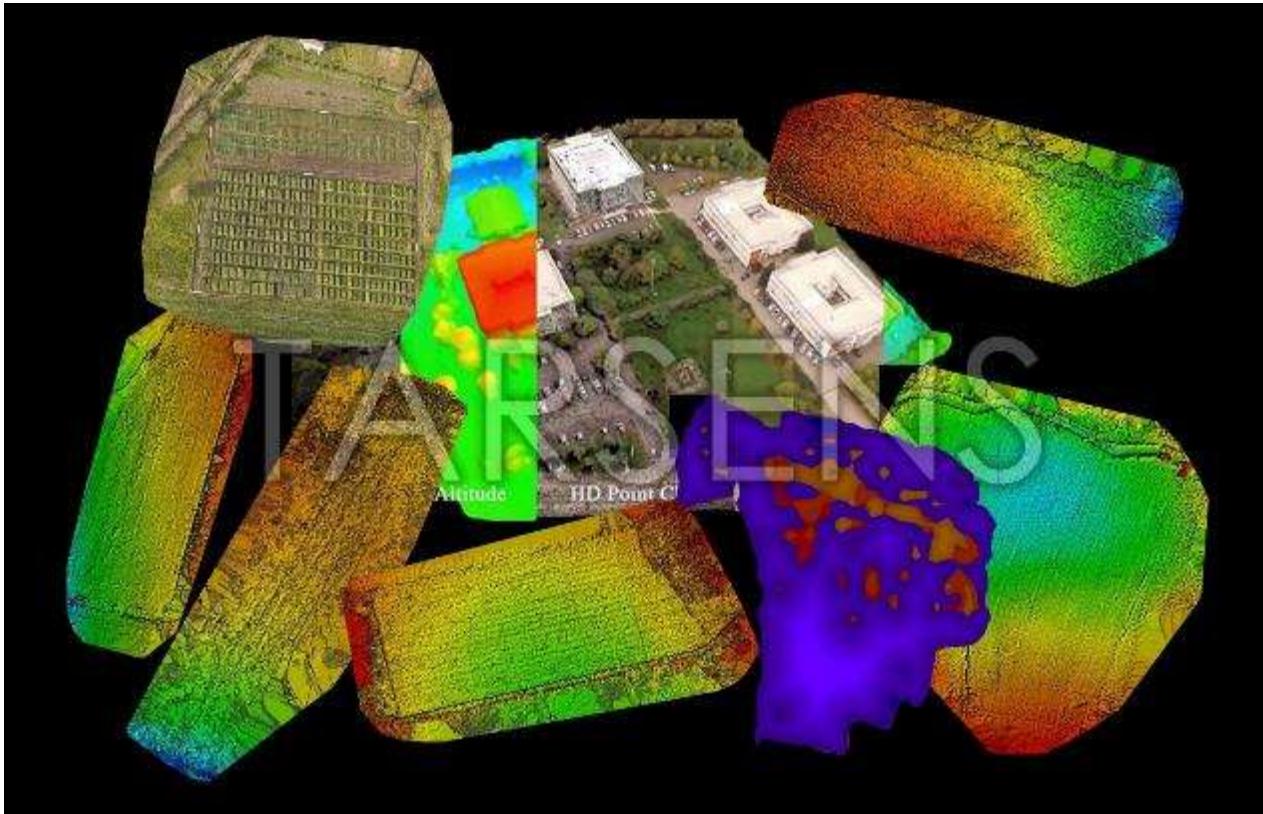
Available at [github.com/cstezcan](https://github.com/cstezcan)

# UAVs



Available at [github.com/cstiezcan](https://github.com/cstiezcan)

# Mapping & Modelling



Available at [github.com/cstezcan](https://github.com/cstezcan)

# Multispectral Imaging



Available at [github.com/cstezcan](https://github.com/cstezcan)

# Realtime Image Processing



Available at [github.com/cstezcan](https://github.com/cstezcan)

# AI at the Edge systems



Available at [github.com/cstezcan](https://github.com/cstezcan)

# Robotics & Mapping & Monitoring



Available at [github.com/cstezcan](https://github.com/cstezcan)

# Object Detection Model Development



Available at [github.com/cstezcan](https://github.com/cstezcan)



# Thank you!

**TARSENS<sup>®</sup>**

Celil Serhan Tezcan / Tarsens Ar-Ge SAN. TİC. LTD. ŞTİ.  
[ai@tarsens.com](mailto:ai@tarsens.com) / +90 506 850 57 98