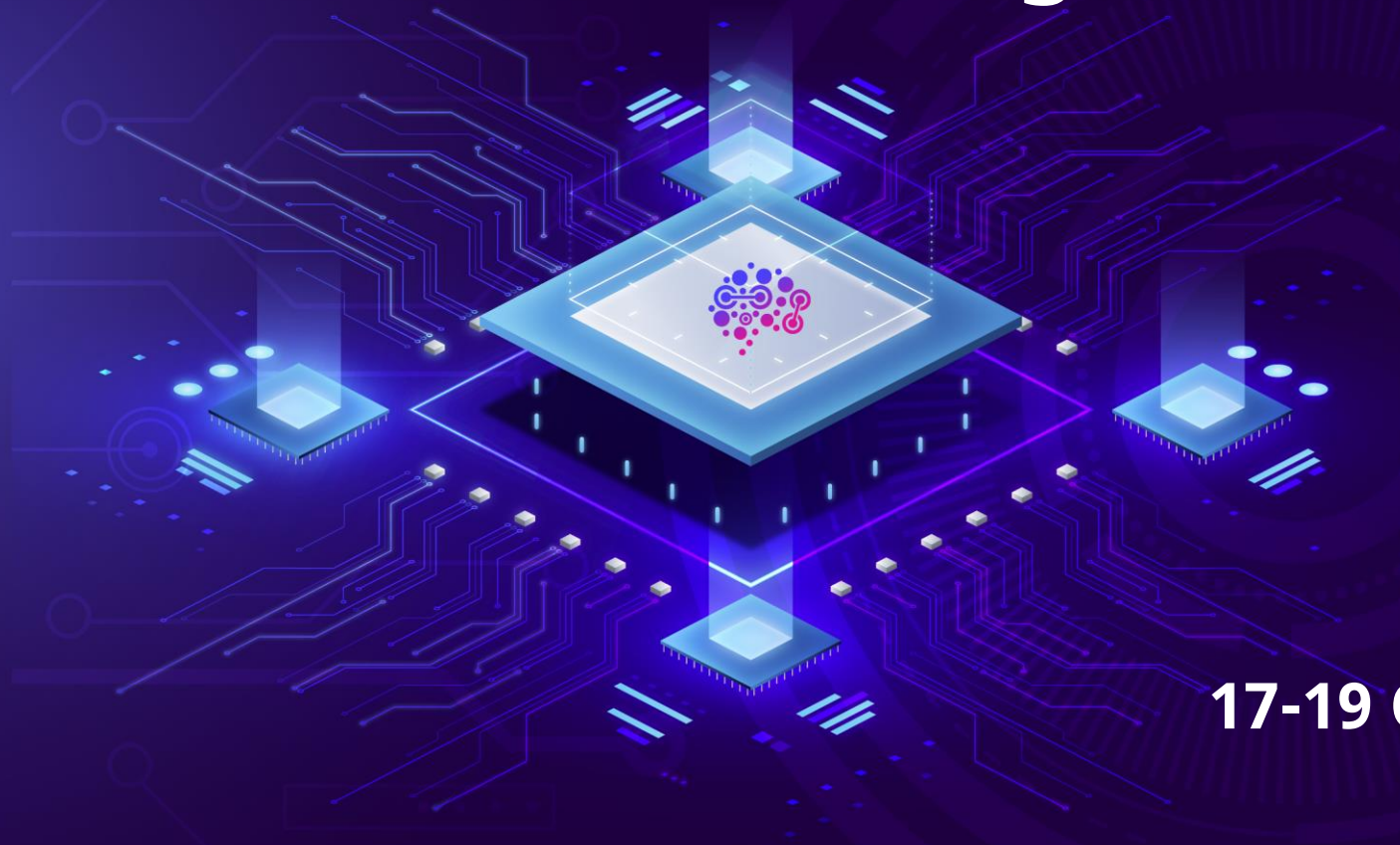
European Conference on EDGE AI Technologies and Applications - EEAI



Advancing emerging edge AI technologies and driving next generation intelligent applications.

17-19 October 2023, Athens, Greece

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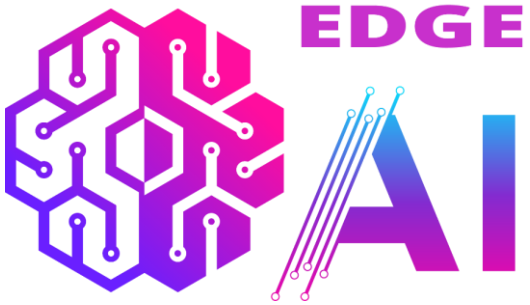

Edge-assisted Smart Agriculture for High Yield Eco-farms

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17-19 October 2023 Athens, Greece

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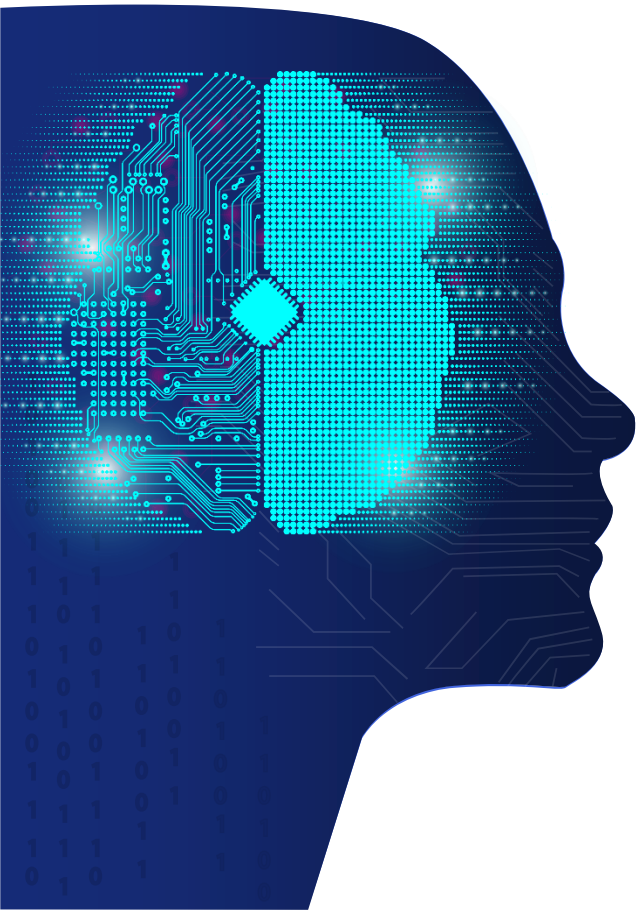
Presentation Outline



EDGE-COMPUTING AND SMART-AGRICULTURE

ABOUT THE CLEVER PROJECT

USE-CASE DEFINITION AND GOALS

DESIGN AND IMPLEMENTATION

FUTURE WORKS AND CONCLUSIONS

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Edge computing and Smart-agriculture

Smart-agriculture is an agricultural practice that uses digital technologies to improve agricultural productivity and sustainability.

Some examples:
- Irrigation control applications
- Autonomous agricultural machinery
- Connected agriculture spaces

It has several advantages, such as:
- Increased productivity
- Operation costs optimization
- Water conservation
- Reduced emissions

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Edge computing and Smart-agriculture

Edge-computing can be extremely beneficial to smart agriculture for several reasons.

Some applications may require:

Low latency:
For real-time data processing

Security:
Less data at the cloud, less risks

Scalability:
Not all the information are sent to the cloud

Reliability:
Relying on local distributed computing instead of centralized one

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About the CLEVER project

CLEVER

***C**ollaborative edge-c**L**oud continuum and*
***E**mbedded AI for a **V**isionary industry of th**E** futu**R**e*

Objective
Develop solutions for low-latency, high-data AI/ML applications in industrial settings.

Scope of Solutions
Comprehensive approach from processor architectures to middleware to innovative AI applications.

Deep Edge Computing
Move computing services closer to end-users or data sources to reduce power consumption, capacity requirements, and latency for critical applications.

Current Challenges
Balancing low latency and high data requirements from sensors in AI/ML, leading to emerging solutions like micro edge and intelligent sensors.

Federated Operation
Revolutionize edge computing platforms to operate federatedly, coordinating sparse resources for enhanced efficiency.

Overcoming Limitations
Address traditional limitations of edge computing, providing an effective framework for seamless use of federated resources in the edge-cloud continuum.

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Use-case definition and Goals

Supporting the digitization of a farm in Southern Sicily that produces oranges.

Why?

Tracking orange growth through autonomous classification allows farmers to:

- Gather insights about the current fruit crop
- Develop a sustainable harvesting plan
- Increasing food safety

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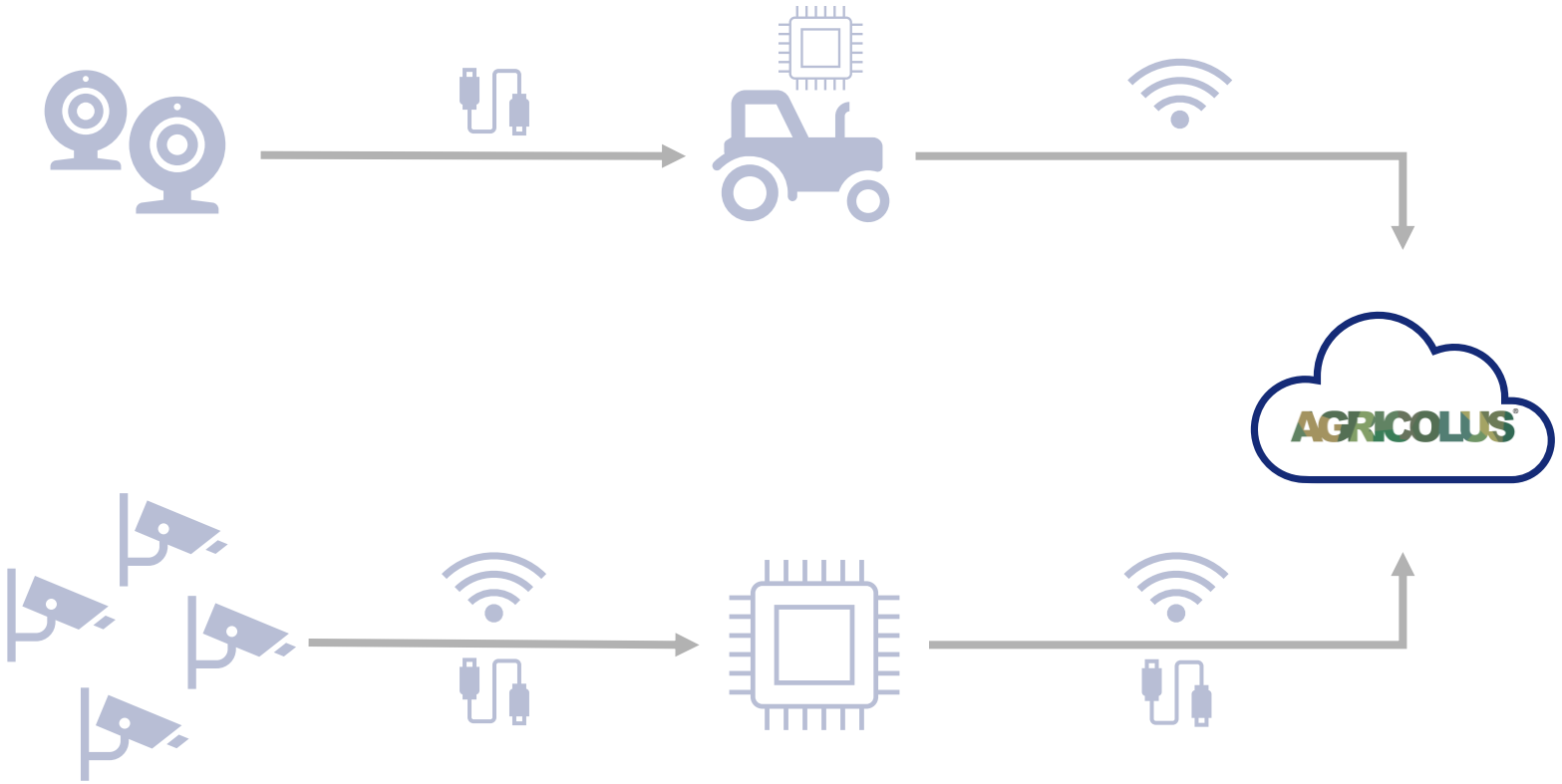
Design and Implementation

Two scenarios have been considered and studied:



Pros:
- Capillary approach
- Flexible configuration

Cons:
- Environmental limitations
- Involvement of the farmer
- Requires good coverage

Pros:
- Complete field coverage
- Not affected by mobility impairment factors

Cons:
- Static configuration
- Requires careful planning

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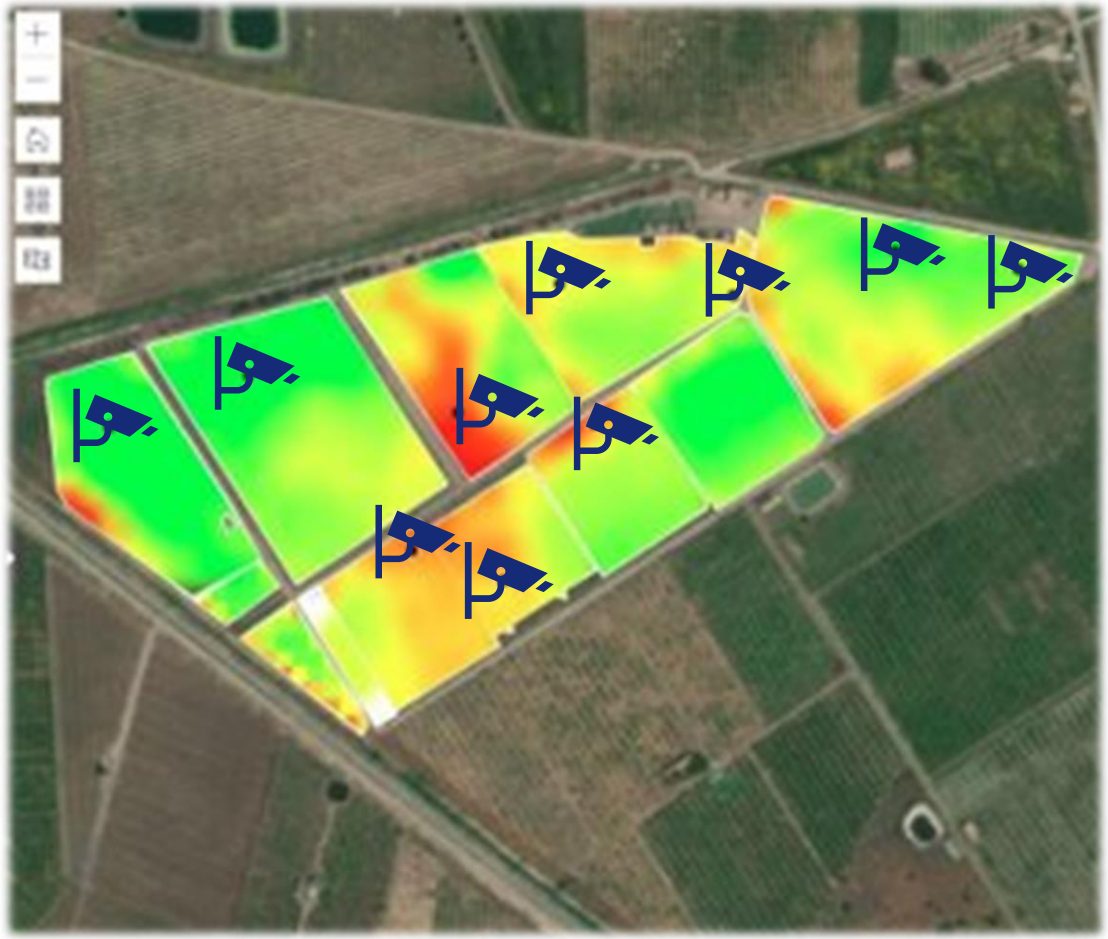
Design and Implementation

The cameras' positioning strategy is based on **Satellite images**.

By using spatial and temporal variability of vegetation indices (e.g., NDVI and NDWI), high variability spots are identified (black dots).

Optimal spots where to place static cameras



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Design and Implementation

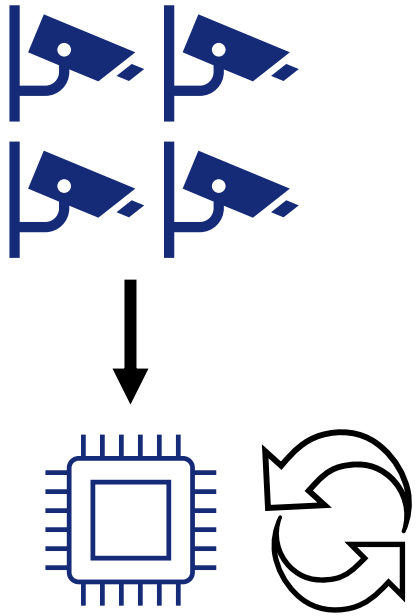
Four cameras will be deployed to monitor one hectare.

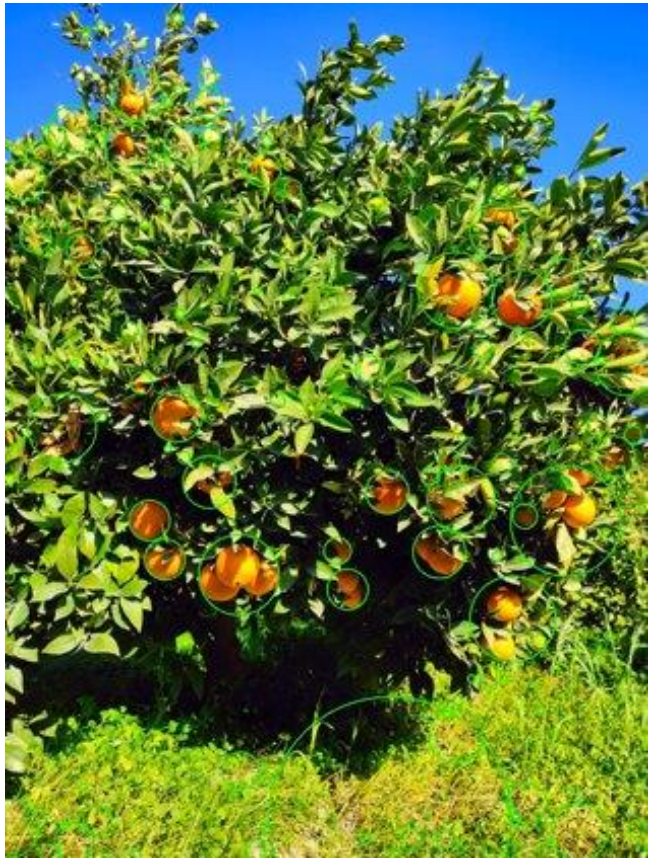
The Edge site will deploy an AI model that will be able to:

- Count the number of oranges
- Classify their maturity level
- Determine oranges' size

The site is equipped with:

- Hardware/Video-transcoding accellerators
- Tensor unit for RISC-V accellerator





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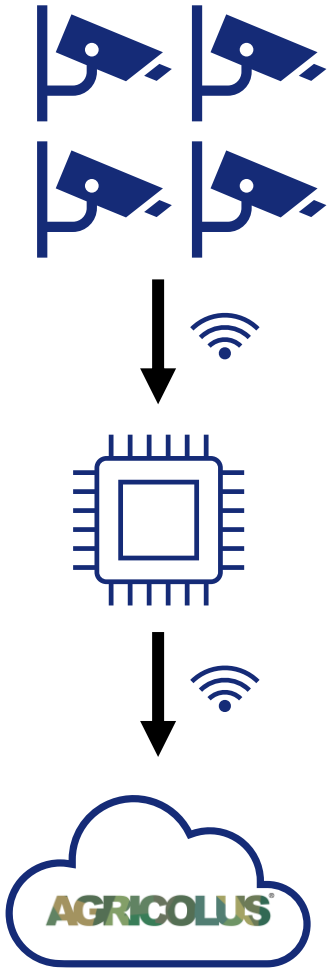
Design and Implementation



The interconnection the different entities will be based on:

- WiFi/5G
- NB-IoT/BTLE

Once the data is processed at the Edge, the Cloud will offer reports and real-time monitoring to be accessed remotely from the farmers.

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Future work and Conclusions

Considering the possibilities that the architecture offers, the use case could be extended to support:

- Intelligent water and nutrient decision support system
- Automated fruit harvesting from a remotely controlled robot

CLEVER project wants to facilitate the development of AI applications in a federated edge to support a transparent cloud-edge continuum.

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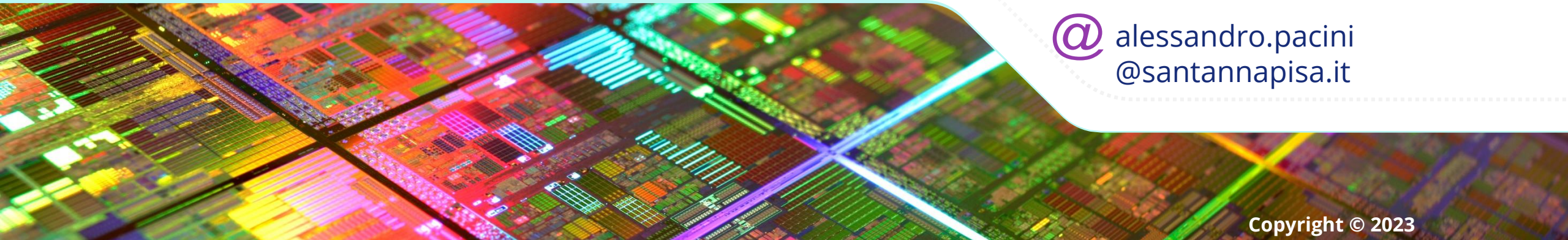
EDGE AI

Thank You

For your attention



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