# The Hardware and Software that will bring **Deep Learning Everywhere**

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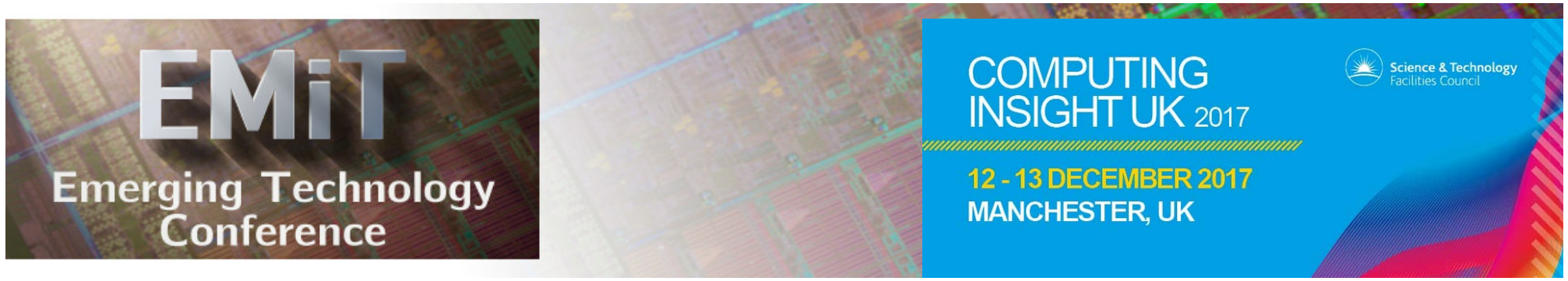


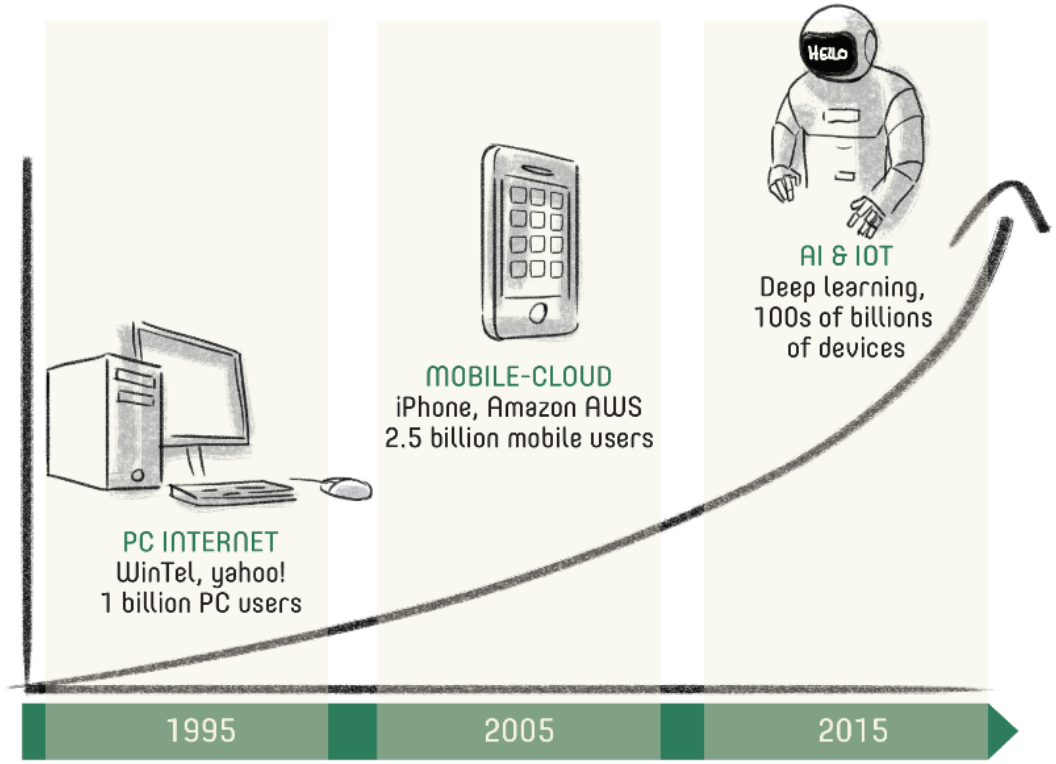
# Introduction: The Rise of IoT

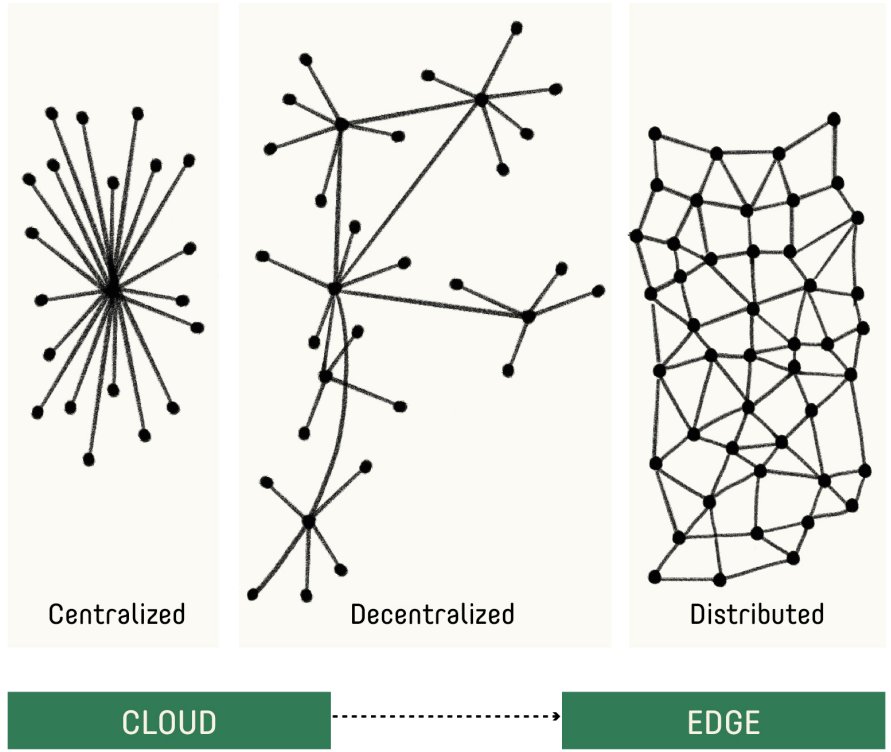
Context:

- The Rise of…
  - IoT
  - AI
  - DL

# Introduction: The Rise of IoT

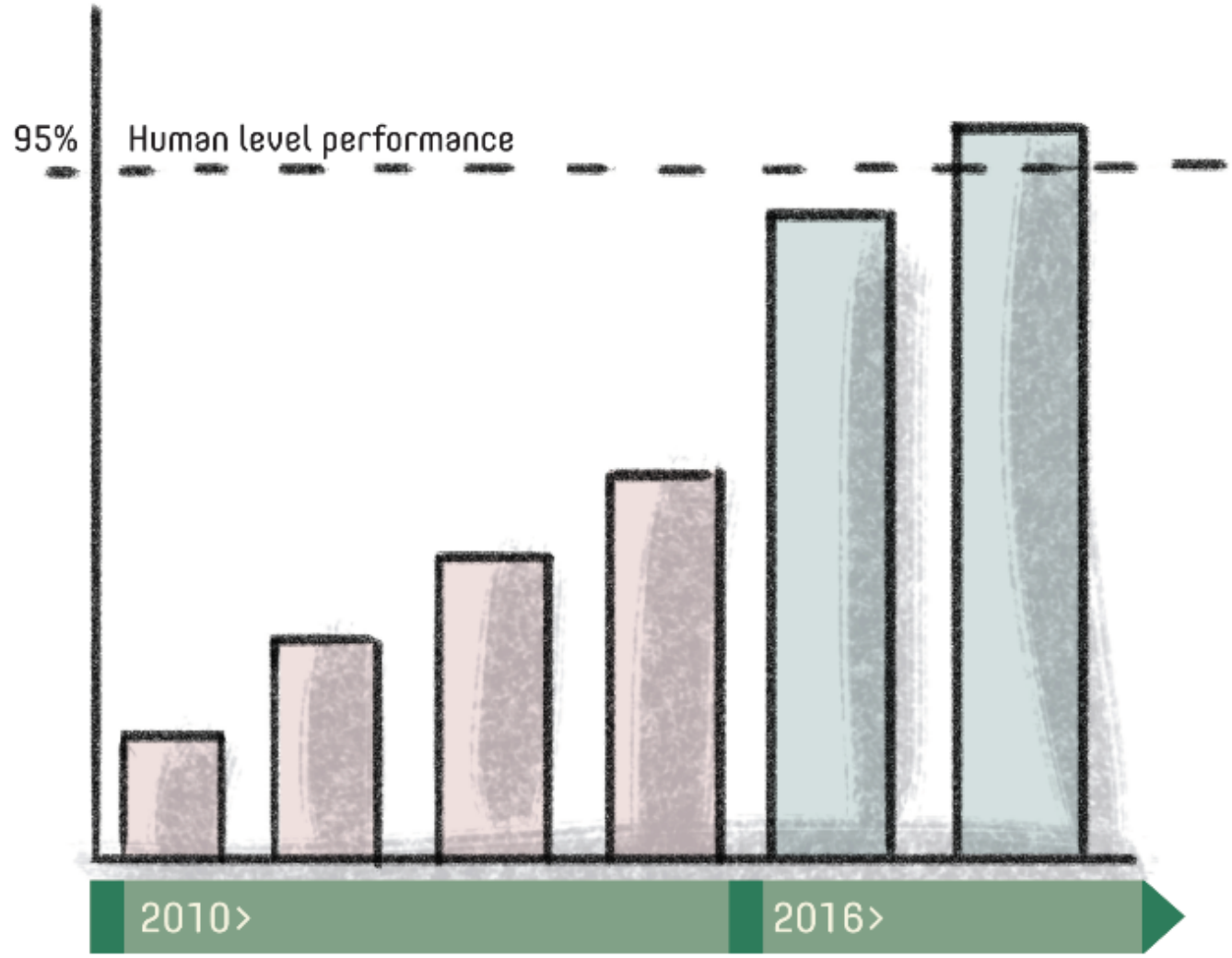
- A New Era of Computing is Emerging
- Clear Shift to Distributed and Decentralized



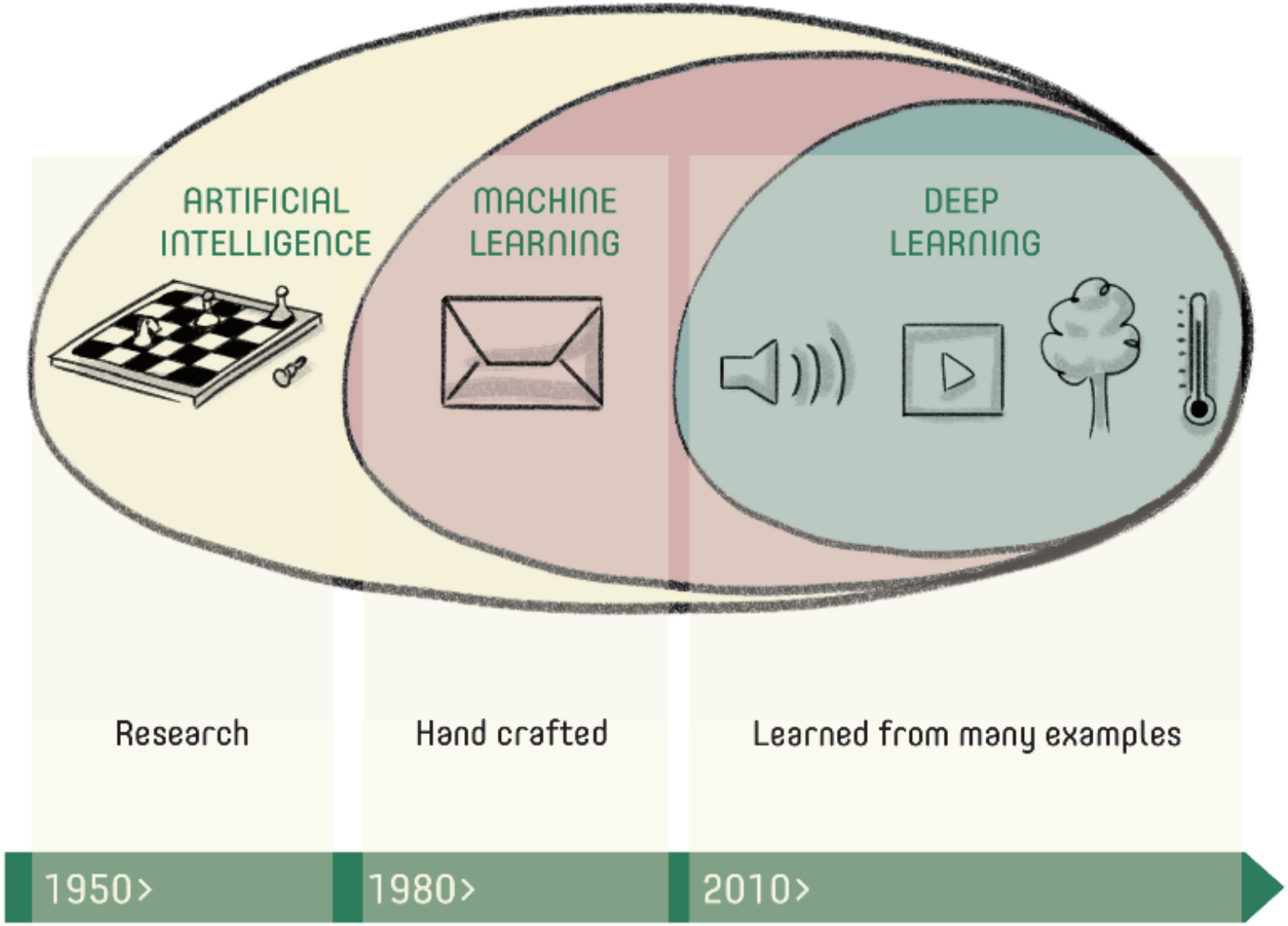



# Introduction: The Rise of AI

- Rise of AI and Machine Learning
  - Leads to “Super human” performance
- New Demands on Computing Performance



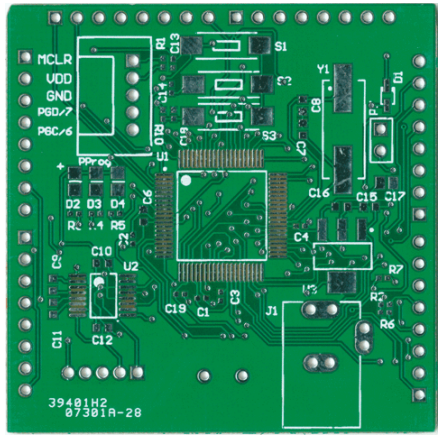
# Introduction: The Rise of DL



# Introduction: The Rise of DL

Logical conclusion => Deep Learning everywhere?

- Next, two int'l projects that focus on that



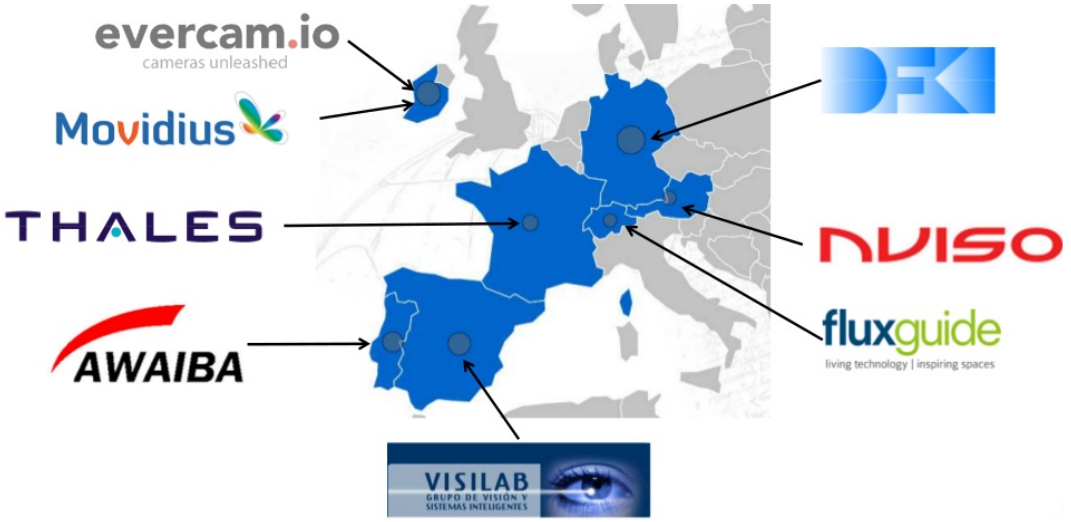

Eyes of Things

```
1130      when "M"
1131        if (ch = getc) != '-'
1132    ungetc
1133        else
1134    if (ch = getc) == "\\" #"
1135      read_escape
1136    end
1137        end
1138
1139      when "C", "c" #, "^"
1140        if ch == "C" and (ch = getc) != "-"
1141    ungetc
1142        elsif (ch = getc) == "\\" #"
1143    read_escape
1144        end
1145      else
1146        # other characters
1147      end
1148    end
1149  end
```

BONSEYES

# Eyes of Things

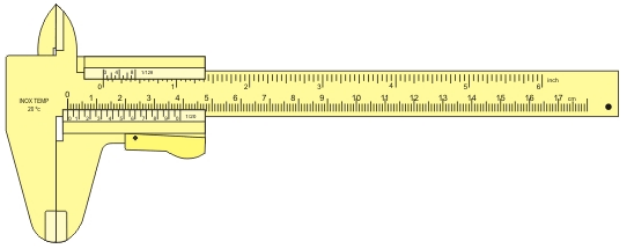
- EU's Horizon 2020 R&D Framework Programme
- 3-year project
- Started Jan 1st, 2015
- Budget, 4M€



# EoT Challenges

## Efficiency

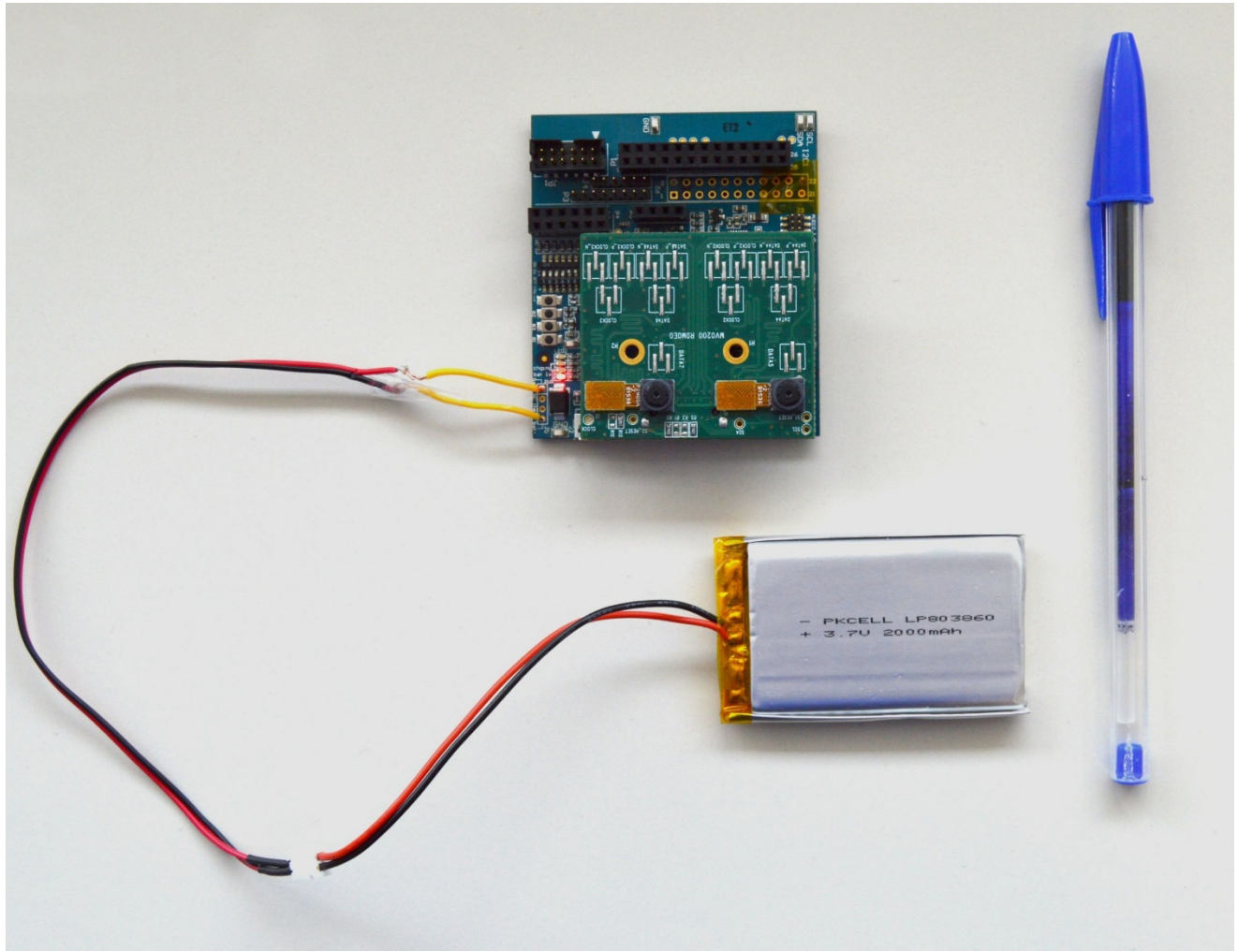
## Size



## Cost


## Flexibility

# EoT in a nutshell

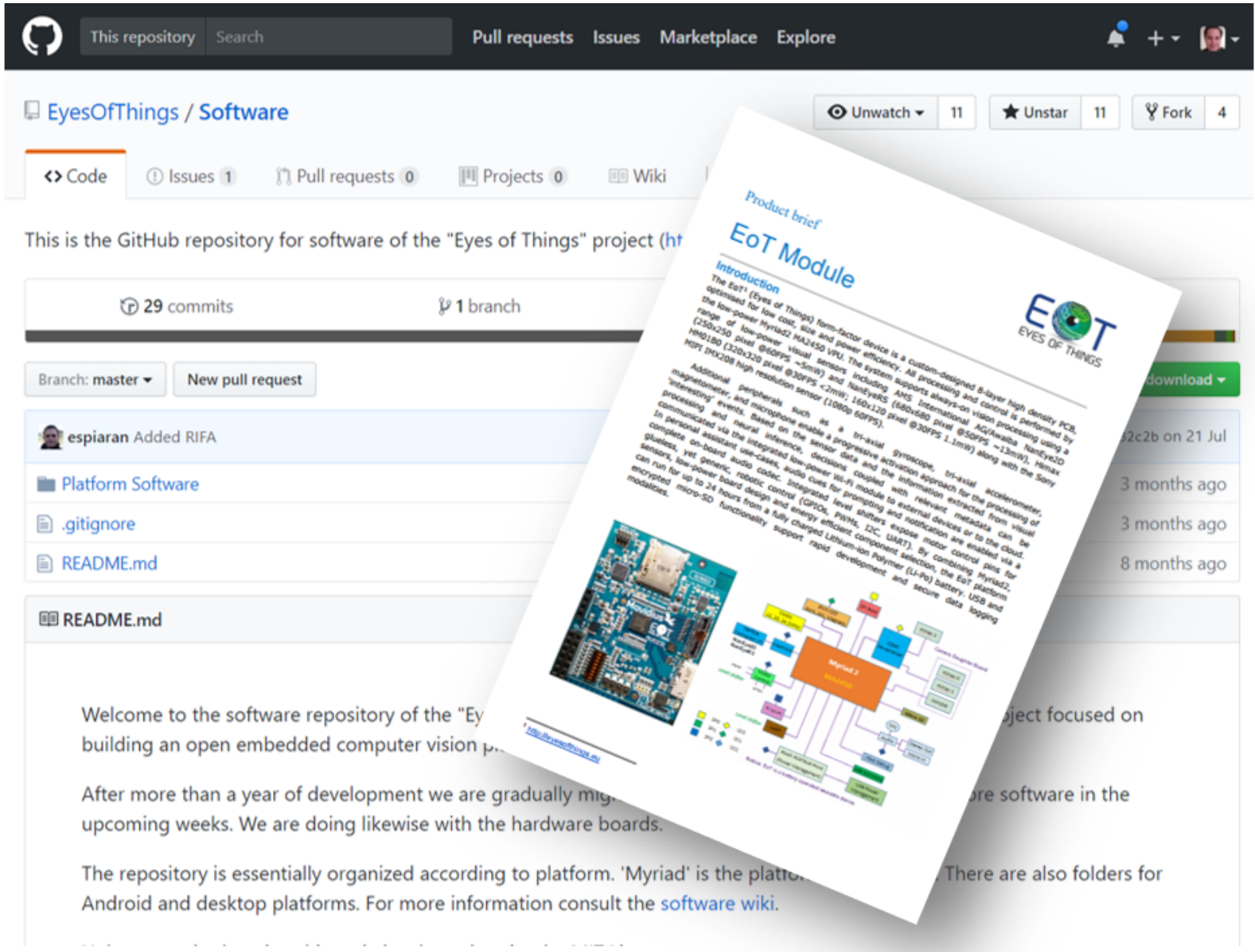



Generic vision system that can be used standalone but also embedded in more complex artifacts

For OEMs, SMEs, hobbyists..

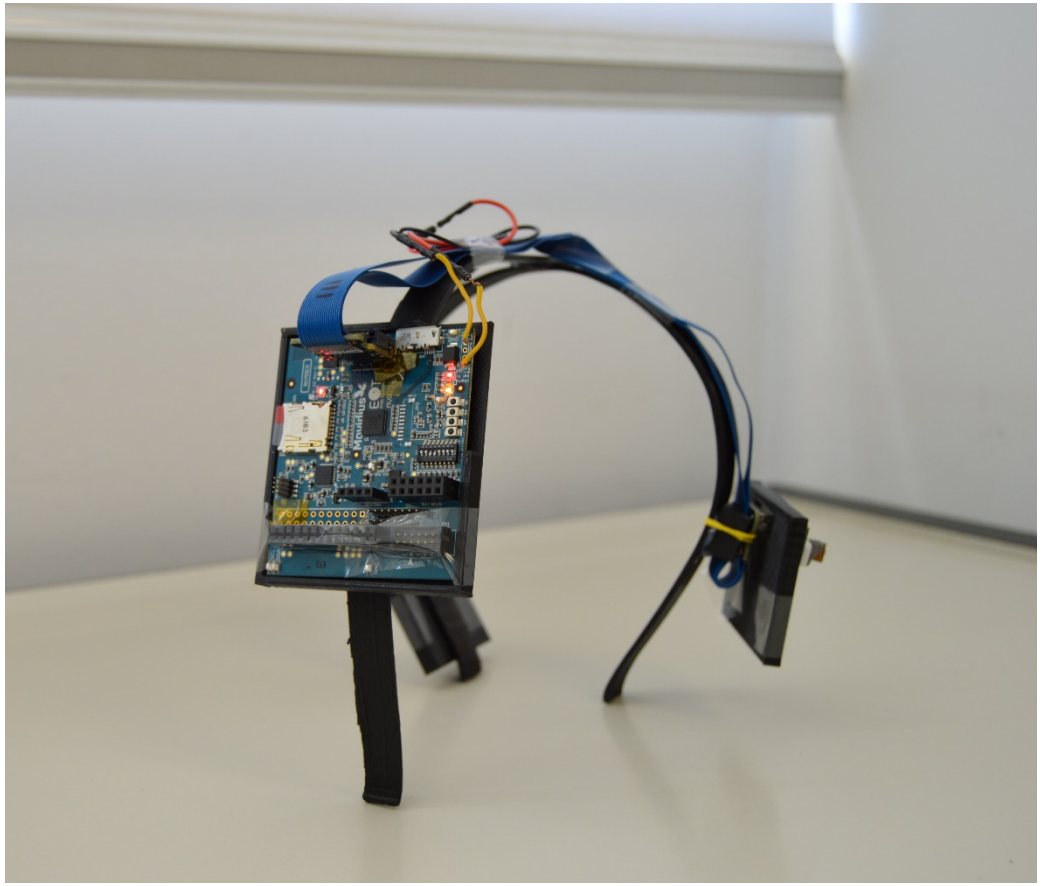
# EoT in a nutshell

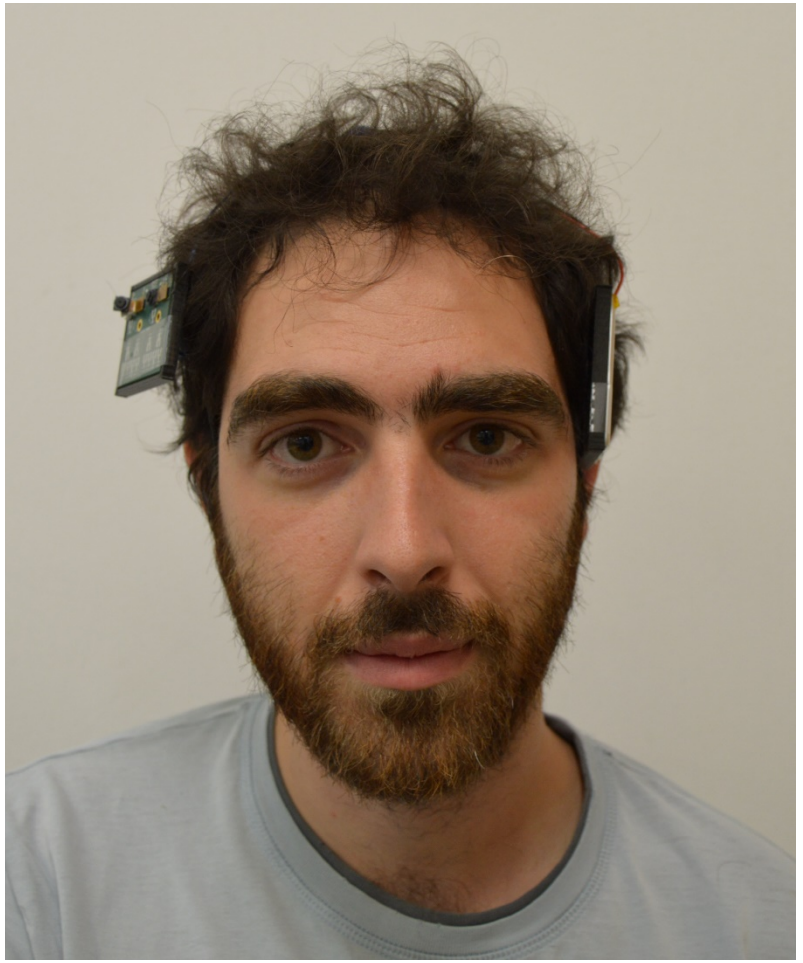
Software &
docs too!



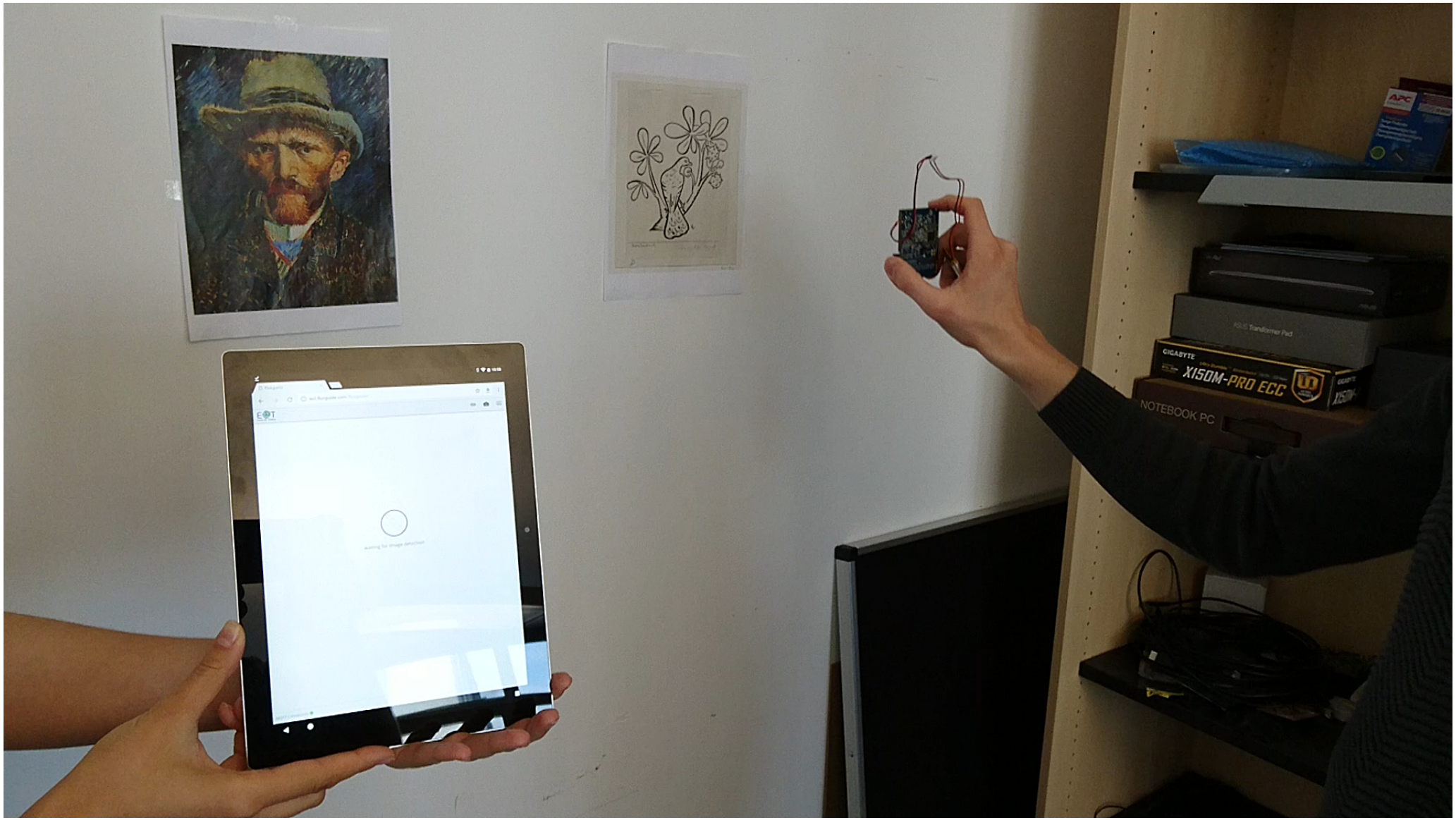
# EoT demonstrators 1 & 2


# EoT demonstrator 2



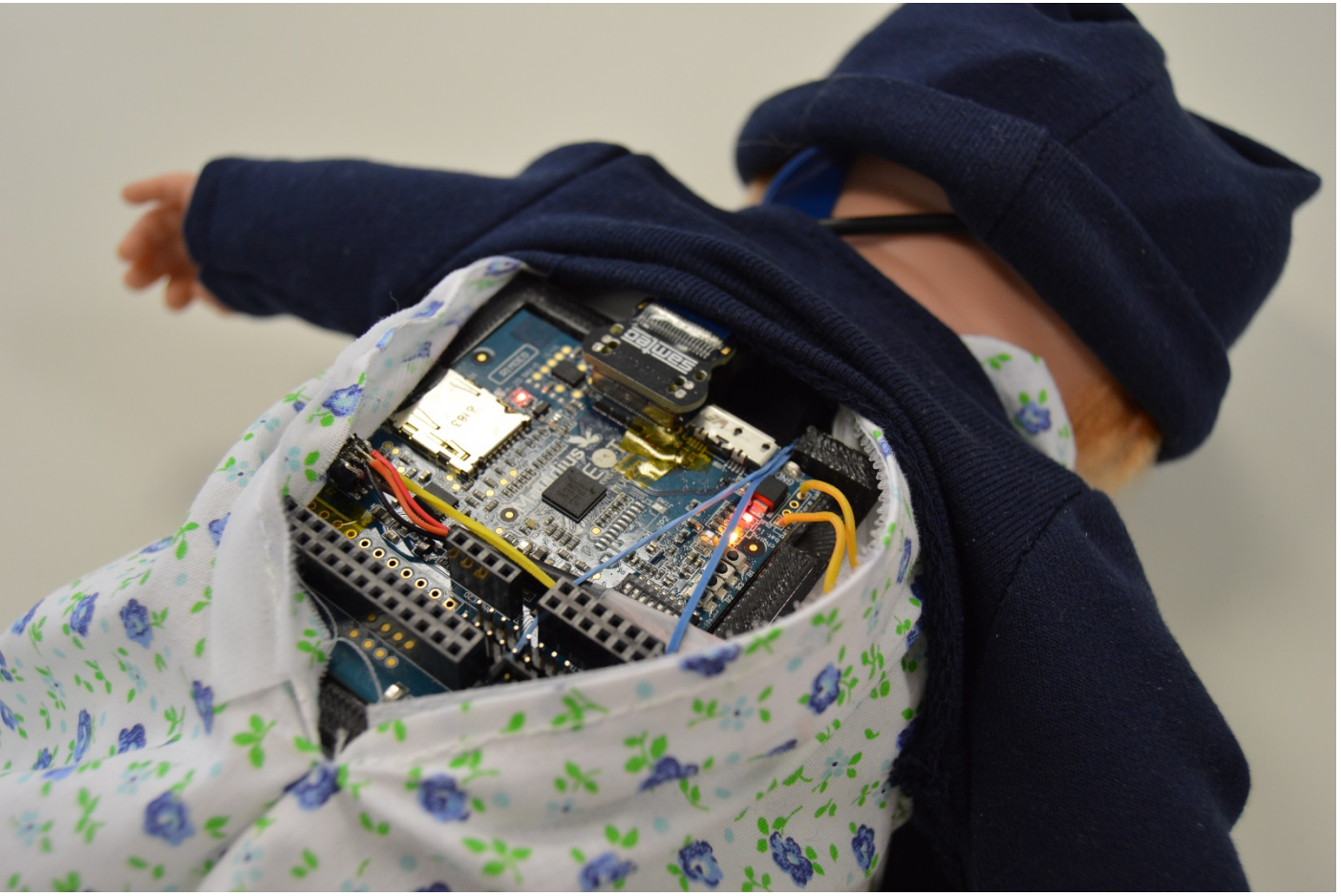


# EoT demonstrators 2



# EoT demonstrators 3 & 4

# EoT demonstrator 4



# EoT demonstrator 4

# PROJECT OVERVIEW

## ARTIFICIAL INTELLIGENCE MARKETPLACE

**Goal:** Bring AI development to low power cloud and edge devices for semi and fully autonomous distributed systems.

**Objectives:** Reduction in cost, development time in building systems of AI. Overcoming "data wall" problem of monolithic AI development of closed end-to-end systems through open architecture and marketplace.

**Timeline:** 36 month

**Partners:** 14

**Initial Funding**: 8.5M EUR from EU H2020 and Swiss SERFI

BONSEYES | ARTIFICIAL INTELLIGENCE MARKETPLACE

**Downloads**

Conference Paper

Project Flyer

**Online Video Link**

https://vimeo.com/226269994

EYES OF THINGS

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 643924

http://www.eyesofthings.eu

BONSEYES | ARTIFICIAL INTELLIGENCE MARKETPLACE

http://www.bonseyes.com

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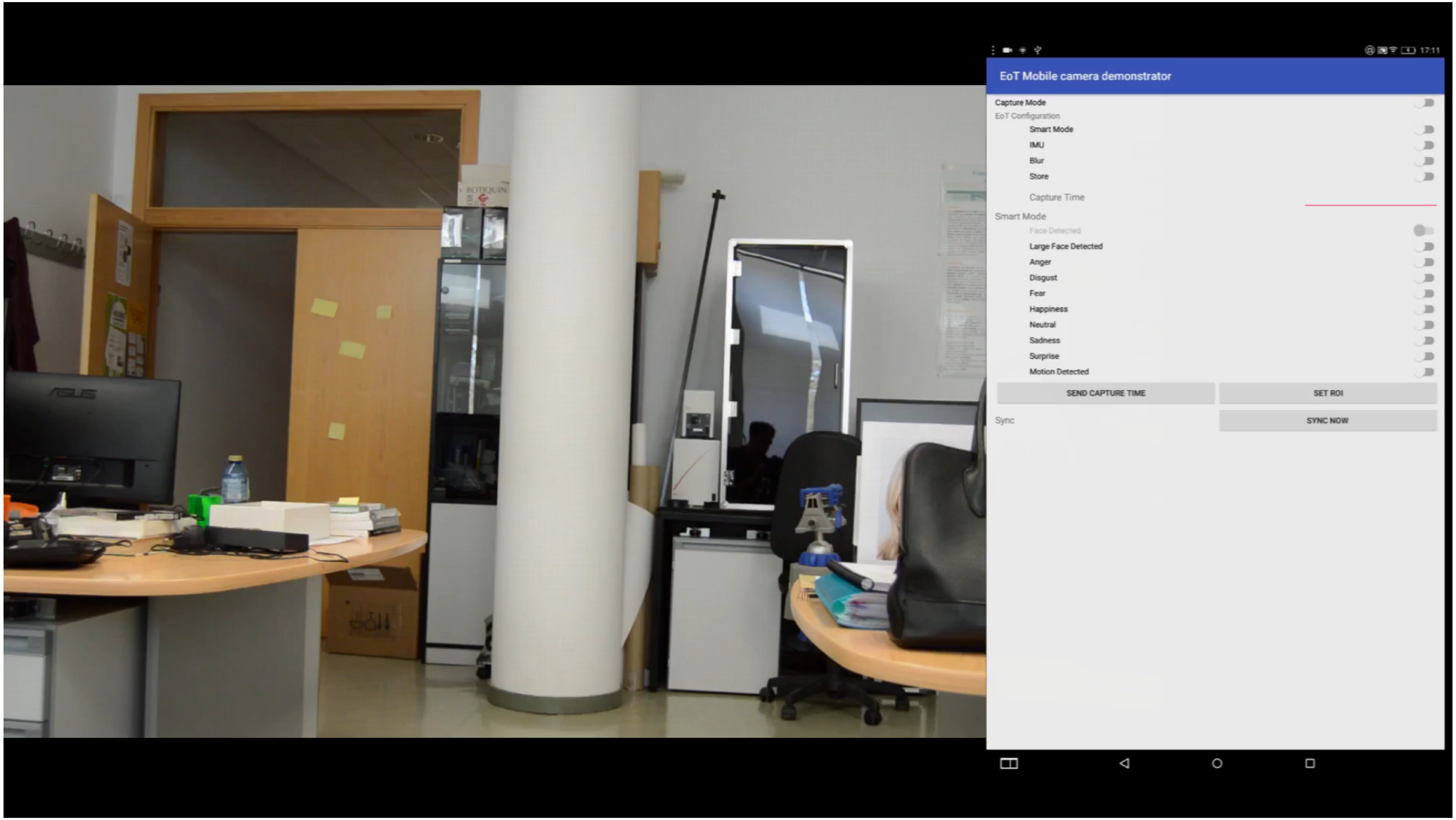
EYES OF THINGS

BONSEYES | ARTIFICIAL INTELLIGENCE MARKETPLACE

This is my thank you dance!

# EoT demonstrators 3 & 4



# PROJECT CONSORTIUM

## LEADING EUROPEAN AI RESEARCHERS, SMES, IP PROVIDERS, AND INDUSTRY PARTNERS

Countries : 9

UK, Ireland, Serbia, Spain, Germany, Switzerland, Austria, Sweden, Greece

Partners : 14

nViso SA, University of Castilla-La Mancha, Trinity College Dublin, FHNW, University of Edinburgh, Sciprom, ICCS, Technischen Universität München, University of Applied Sciences and Arts of Western Switzerland, Syno, ARM, ZF, RT-RK

Expertise : Compiler optimization, machine learning, computer vision, processor IP, embedded systems, application development, automotive manufacturing and components, and embedded software development.

# REDEFINING USER EXPERIENCES

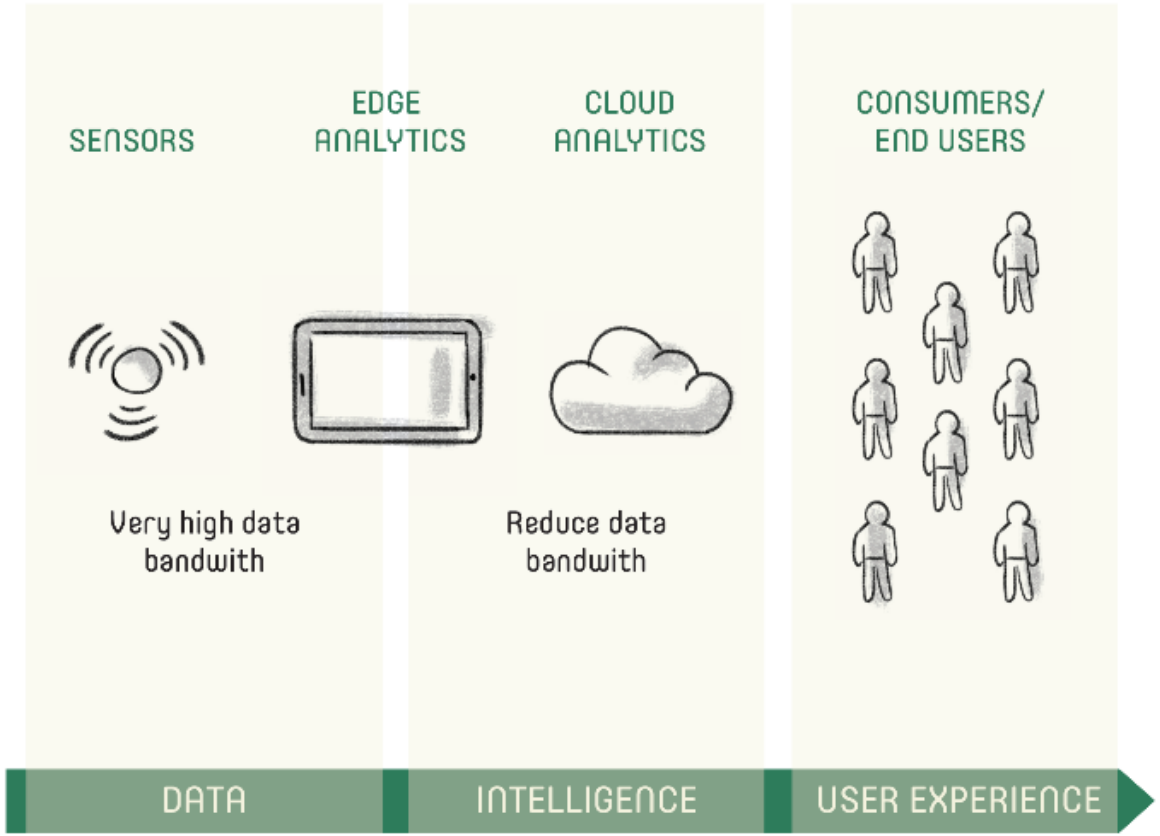
## IMPROVES SIGNIFICANTLY WITH DATA AND COMPUTE POWER

### Indispensable to Business to Consumer Products

- Asian tech leaders predict artificial intelligence and cognitive computing will be the most disruptive technology impacting the global business-to-consumer (B2C) marketplace.
- Companies rapidly leveraging AI to enter into new markets and taking leadership positions.

airbnb NETFLIX Google TESLA

FROM SENSOR TO USER EXPERIENCE



# CREATES STRONG DATA NETWORK EFFECTS

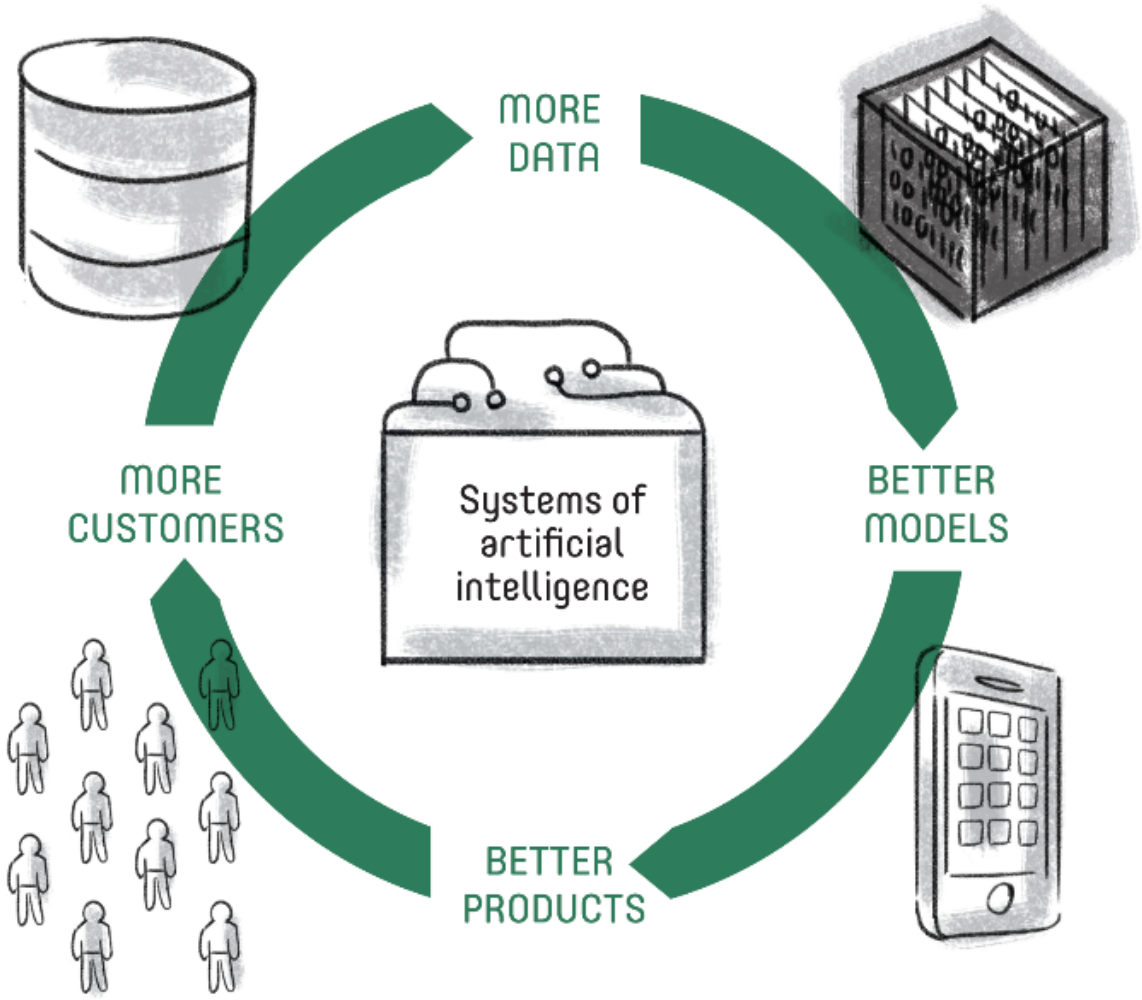
## SYSTEMS IMPROVES SIGNIFICANTLY WITH CLOSED LOOP END-TO-END SYSTEMS

### High Barriers to Entry

- Structural investment required
- Systems improving overtime through increasing generation of new data
- Loyalty by continually improving experience

### Chicken/Egg Problem for New Comers

- Not enough data to compete/attract users
- Struggle to maintain critical mass
- Latecomers to AI will face significant barriers to entry that are almost impossible to surpass



# RACE THE BUILD THE "DATA WALL"

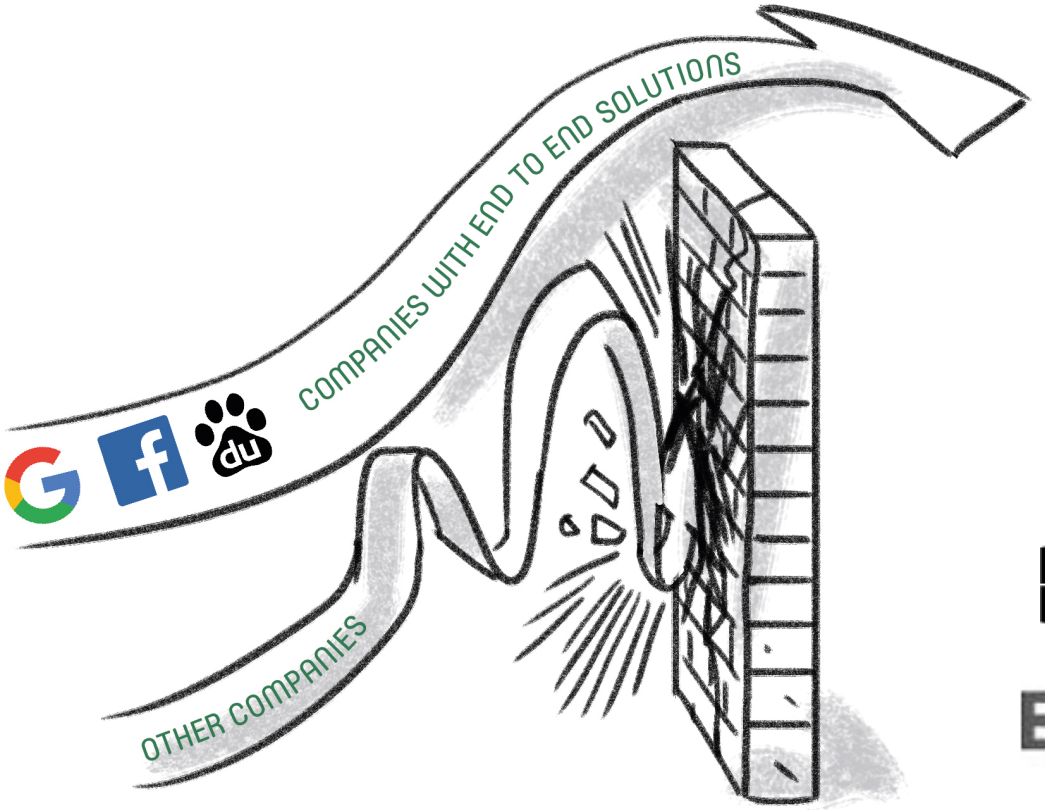
## CLOSED LOOP END-TO-END SYSTEMS CREATE SIGNIFICANT BARRIERS

### First Mover Advantage

- Closed end-to-end systems
- Huge data requirements & computing requirements
- Open source creates illusion of inclusiveness

### Skills Shortage

- Acquisitions by Google, Facebook, Apple for AI engineers
- Accelerated by Large internet companies challenging new markets (Automotive, Home Automation)

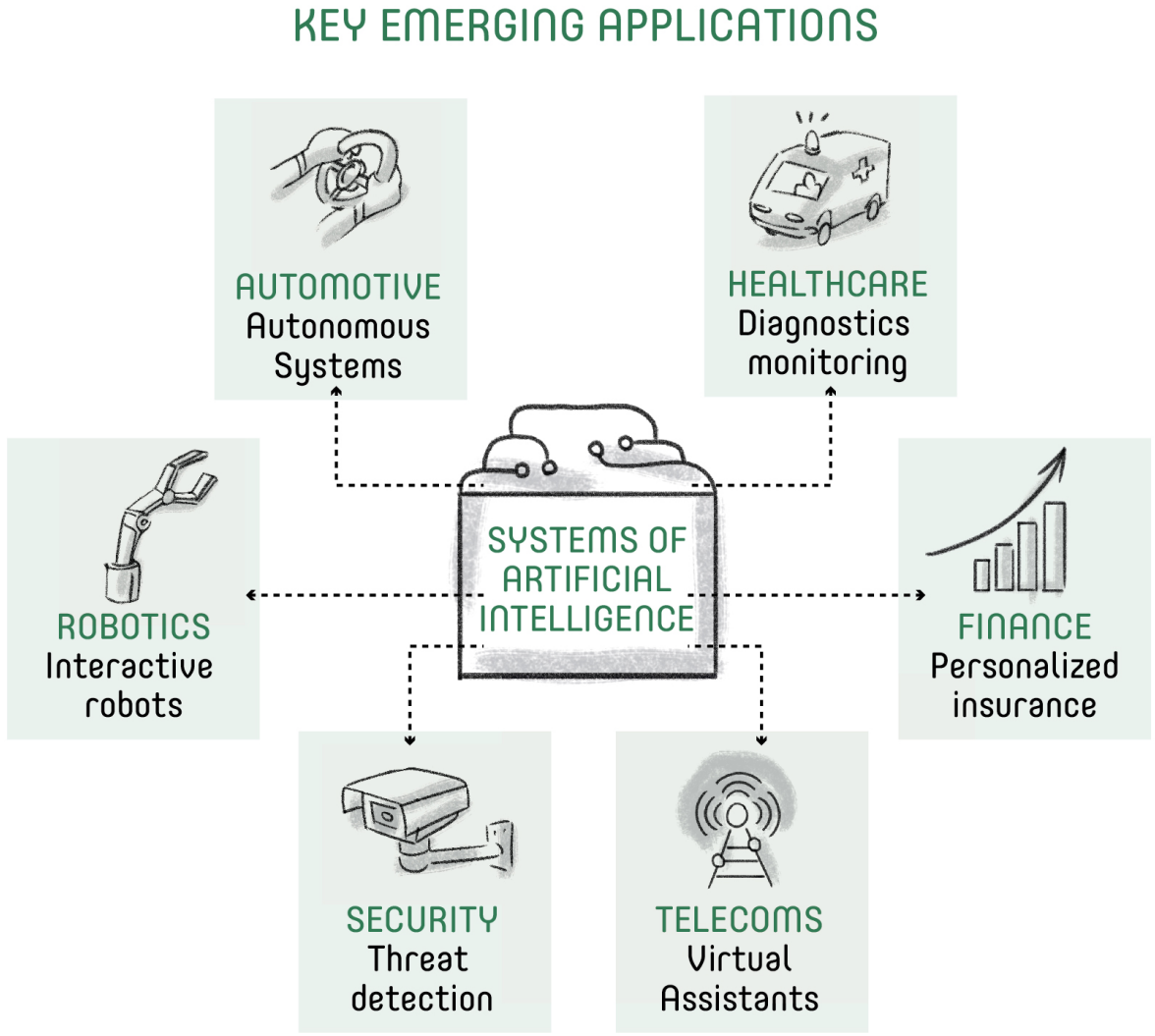


# IMPACTS EVERY INDUSTRY

## BUT MANY NEED INTELLIGENCE AT THE EDGE

Increasingly autonomous physical systems with various dynamics and satisfying multiple critical constraints including safety, security, power efficiency, high performance, size and cost require intelligence on the edge or with a hybrid cloud model. Key drivers include:

- Security, privacy, and control of data
- Meet low latency requirements
- Lower energy consumption
- Lower costs of production

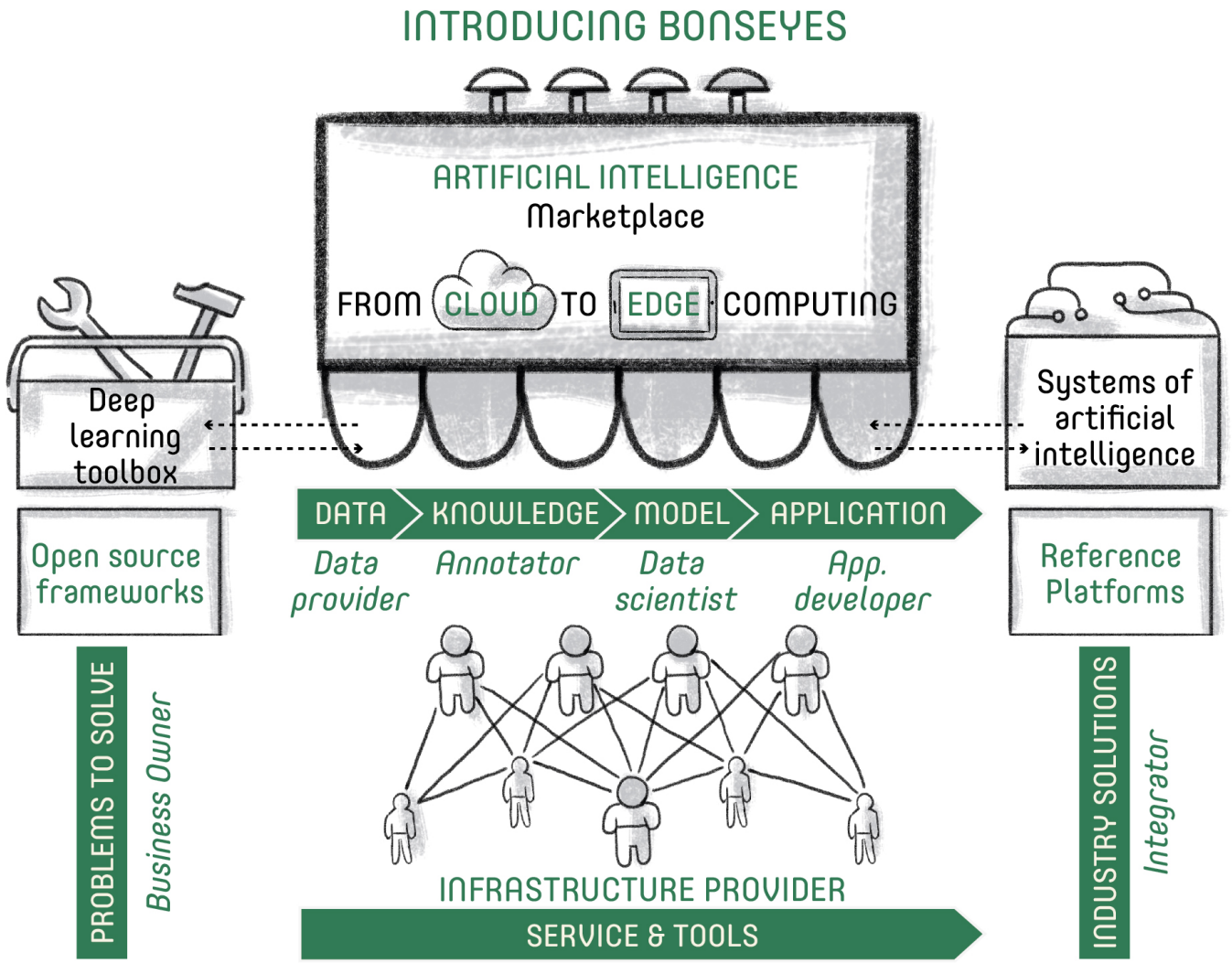


# BONSEYES MARKETPLACE

## ARTIFICIAL INTELLIGENCE MARKETPLACE

Bonseyes aims to solve two key challenges: the strong industrial need to address data network effects and data wall problems of building systems of artificial intelligence at the European level. It aims to:

- Address the programming and design challenges of distributed architectures and autonomy of systems.
- Reduce the time of development and cost of ownership of the ever-growing roles of data analytics and machine learning in distributed and autonomous systems.



# DEMONSTRATORS

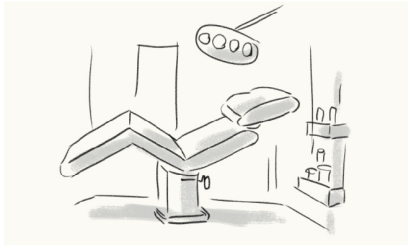
## ARTIFICIAL INTELLIGENCE DEMONSTRATORS IN CONSUMER, AUTOMOTIVE, AND HEALTHCARE

Understanding emotional reactions of consumers to enable a virtual assistant make financial recommendations and under risk profiles.

### EMOTIONAL VIRTUAL PERSONAL ASSISTANT

nVISO

### HEALTHCARE EVIDENCE BASED MEDICINE

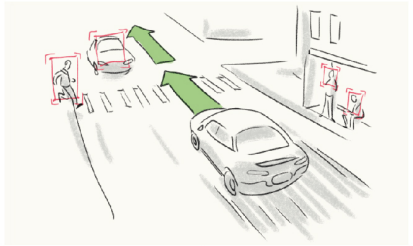


MRI

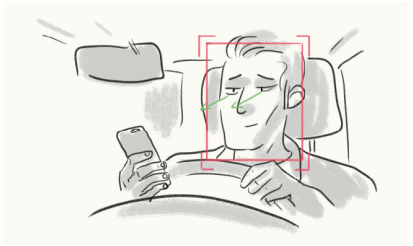
Assisting clinicians by machine recognition for better patient outcomes in pre-screening and surgery.

Understand situations of potential risk in autonomous driving scenarios requiring human intervention.

### AUTOMOTIVE COGNITIVE COMPUTING



### AUTOMOTIVE INTELLIGENT SAFETY



Monitor the driver and trigger alerts or activate safety systems in situations of immenent danger.

ZF + nVISO