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UNIVERSITÀ
DEGLI STUDI
DI URBINO
CARLO BO

SMARTPHONE BASED POSTURAL STABILITY MONITORING SYSTEM FOR FALLS PREVENTION IN THE ELDERLY

INDUSTRIAL INNOVATION PHD

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The Project

**“SMARTPHONE BASED POSTURAL STABILITY MONITORING SYSTEM
FOR FALLS PREVENTION IN THE ELDERLY”**

R&D Partners



UNIVERSITÀ
POLITECNICA
DELLE MARCHE



TECHNISCHE
UNIVERSITÄT
WIEN
Vienna | Austria



Agenda

Present

- **Introduction to Digital Health**
- **Human Standing Balance**
- **Monitoring Human Balance with Smartphone**
- **Collected Data**
- **Research investigations**

Plans

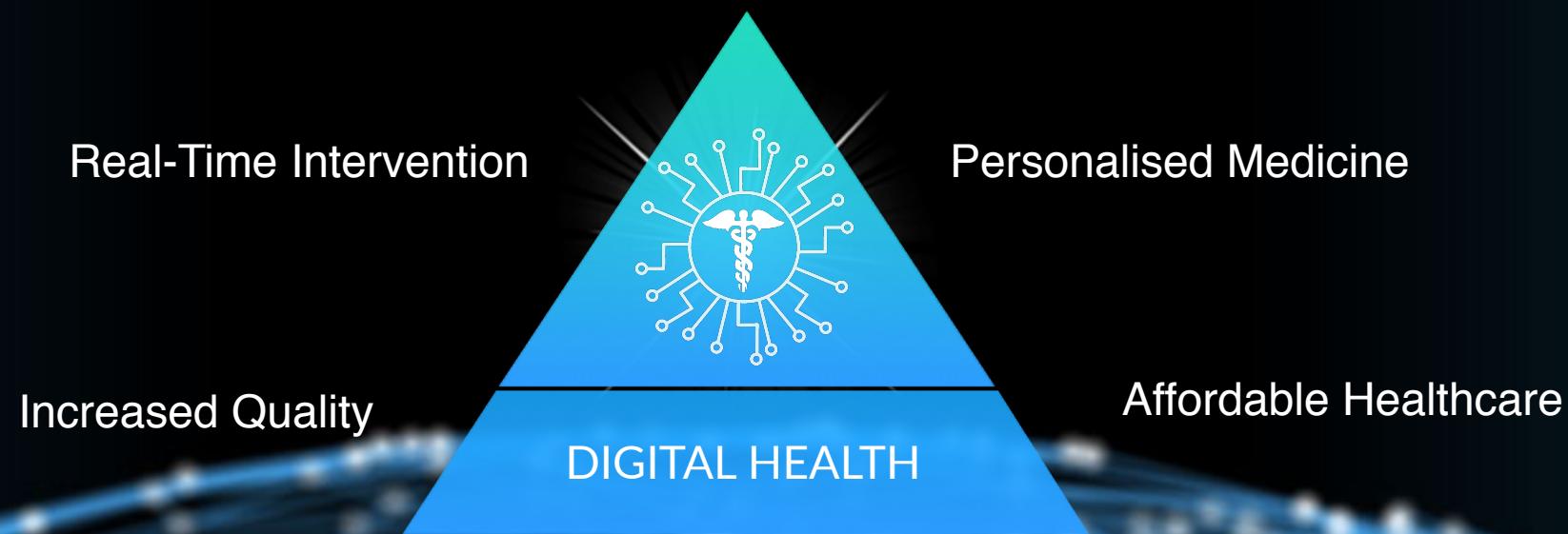
- **Forward Artificial Intelligence**
- **AI Investigations**

Conclusions

- **First Year Summary**
- **R&D Roadmap to the End**

Introduction to Digital Health

Digital Health is the **use of information and communications technologies to improve human health, healthcare services, and wellness for individuals and across populations.**



Human Standing Balance

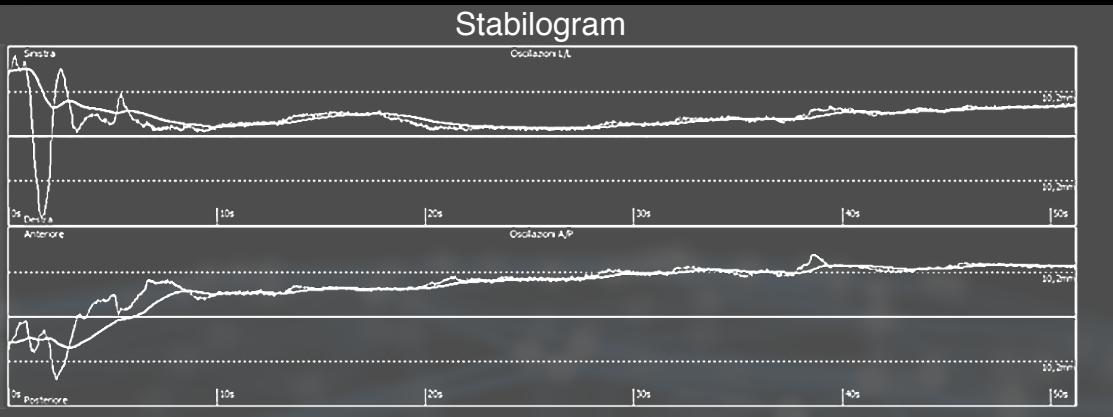
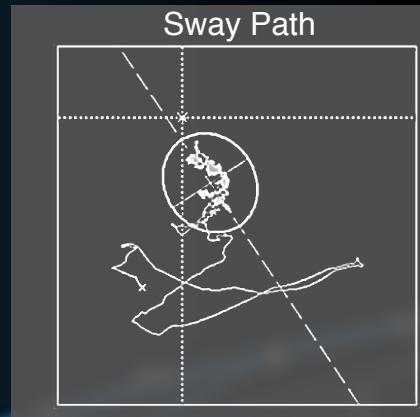
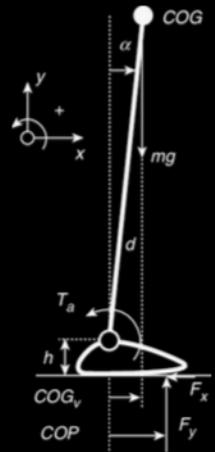
Traditional Posturographic Analysis

Posture Evaluation

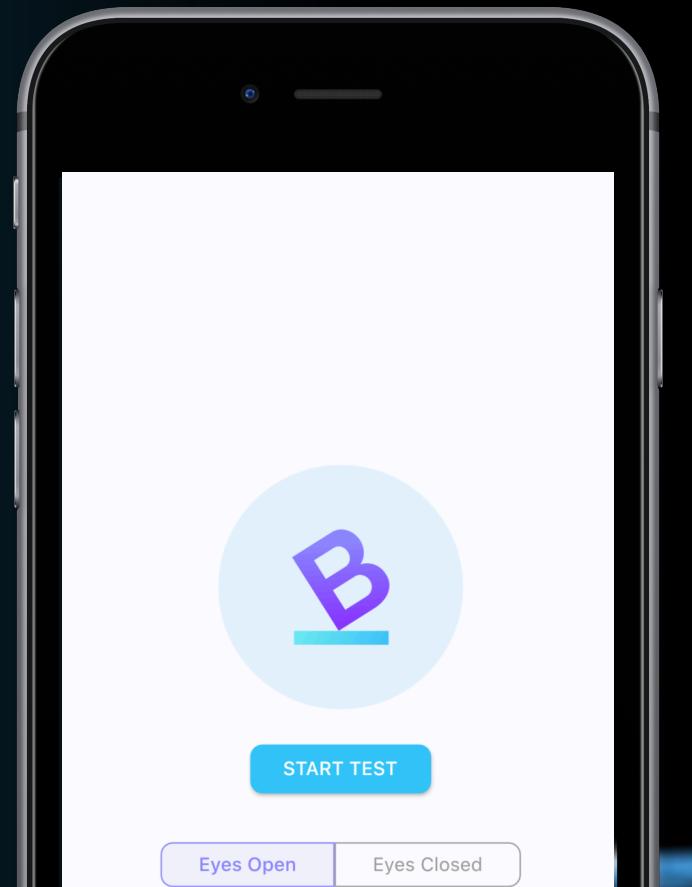
- Static
- Dynamic

Features

- Center of Pressure
- Center of Gravity



Monitoring Human Balance with Smartphone



Balance

Your personal posture evaluator

- Fall Prevention by Posture Evaluation
- Privacy Safe
- Progress Statistics



Fast.

Download it from the App Stores



Easy.

One button to press



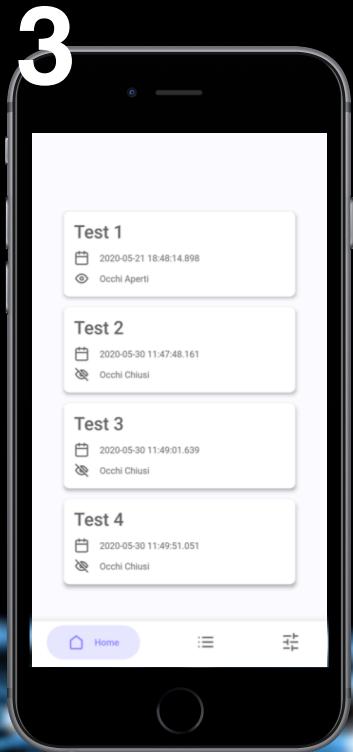
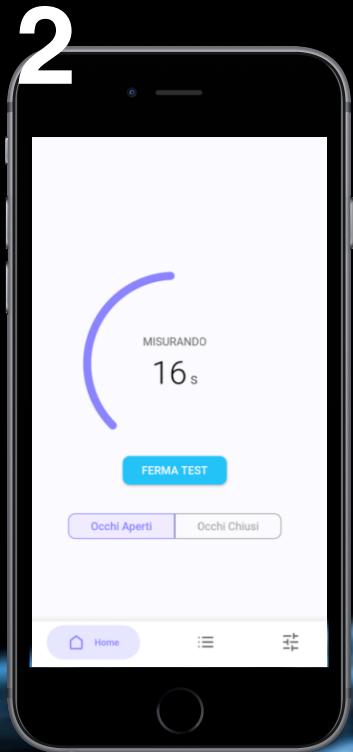
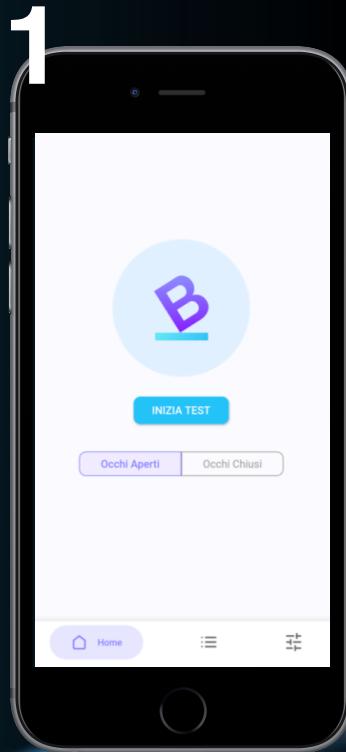
On your smartphone.

Always with you

Monitoring Human Balance with Smartphone

Our Solution

By Using Accelerometers and Gyroscopes¹



¹"Standing Balance Assessment by Measurement of Body Center of Gravity Using Smartphones", Lattanzi E. et al., IEEE
Author: Mr. Giacomo Bigini

Collected Data

We do not store sensitive data

Data we store

- Sway Path
- Stabilogram

Data we are aiming to

- Personal Information
- Posture Information
- Injuries
- Deficiencies

Personal Information

- Age
- Gender
- Height
- Weight

Injuries

- Other Injuries

Postural Information

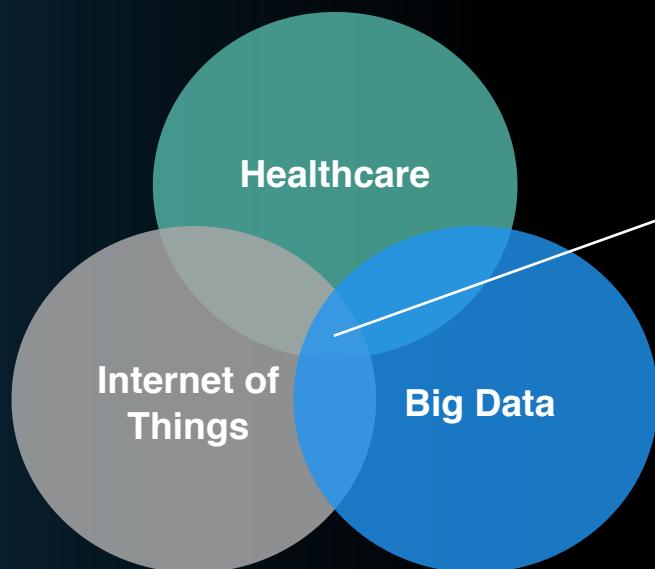
- Injuries
- Family Inheritance
- Medicines

Deficiencies

- Visual Defects
- Hearing Defects

Research Investigations

Investigating the Domain



Internet of Medical Things

OPPORTUNITIES

- Machine Learning Techniques for Personalised Medicine
- Personalised Intervention

LIMITATIONS

- Security & Privacy Regulations
- Data Management

Research Investigations

Investigating Available Solutions

Centralised Systems

- Central Authority
- Providers have the Power
- Provider is data owner



Distributed Systems

- Central Authority
- Distributed Power
- Provider is data owner



Fully Decentralised Systems

- No Central Authority
- Peers have the Power
- Creators is data owner

Recent



Research Investigations

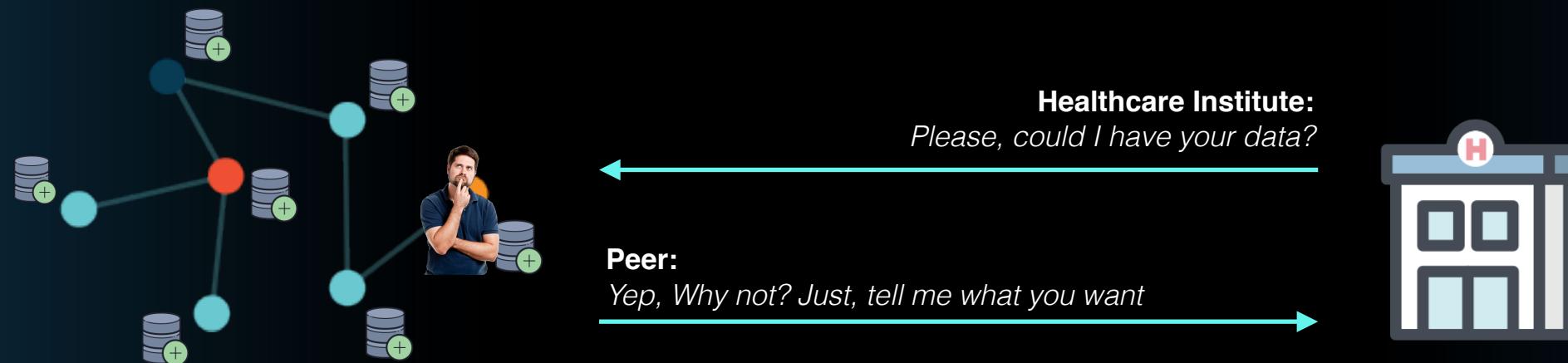
The Data Ownership Issue: an example

	Free Data	Masked Data	Leverage the National Healthcare System	Decentralised Data
Data Ownership	Anyone	Anyone	Service Provider	Creator
Privacy Risk	Critical	Low	Low (Maybe)	Best

What this actually mean?

Research Investigations

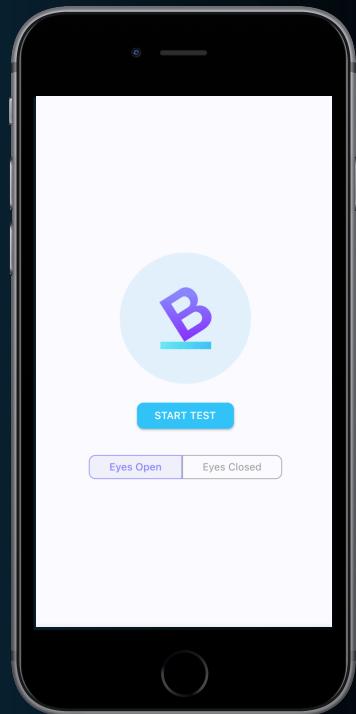
Forward a User Centric Data Management System Approach for Healthcare



A Review on Blockchain for the Internet of Medical Things:
Definitions, Challenges, Applications, and Vision

Authors: Bigini G., Freschi V., Lattanzi E.

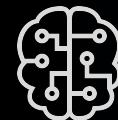
Forward Artificial Intelligence



Balance

Fostering your healthy posture behaviours while enjoying life

- Fall Prevention by Posture Evaluation
- Privacy Safe
- Progress Statistics
- NEW! You Own Your Data
- Personalised Recommendations

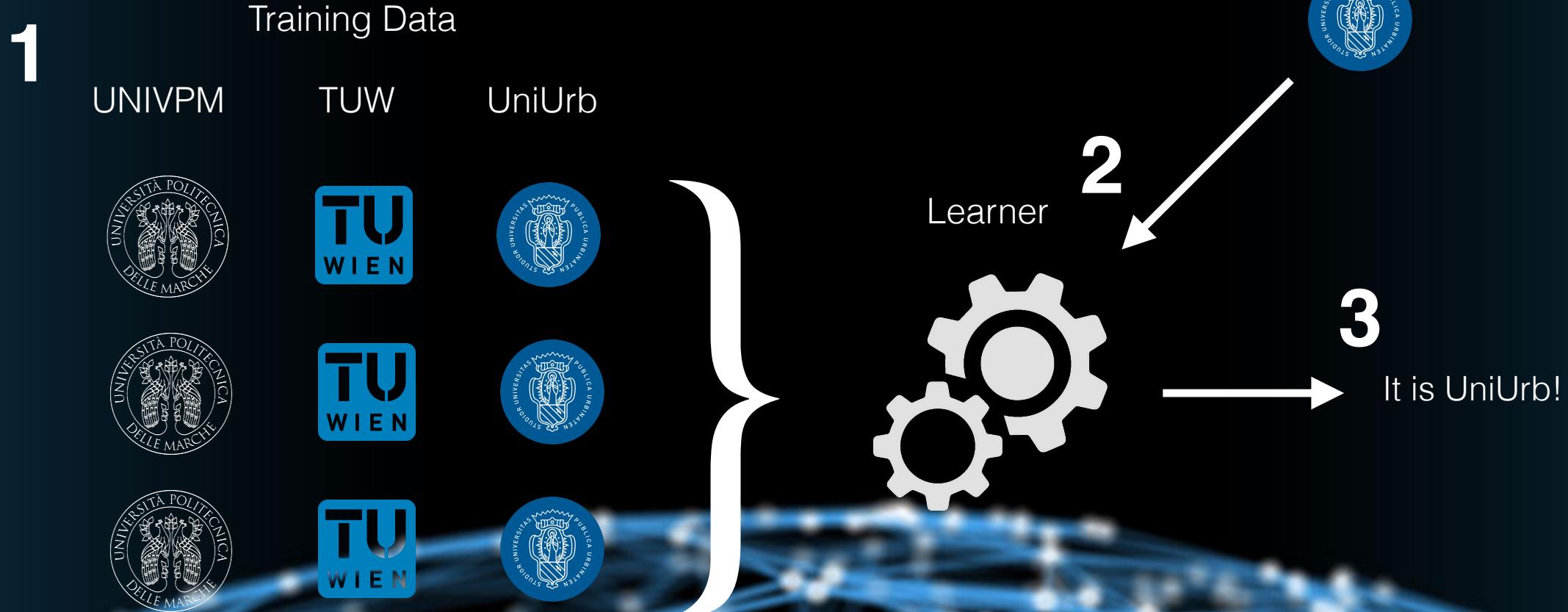


Artificial Intelligence

But How?

AI Investigations

Machine Learning Made Simple



AI Investigations

The Learning Issue

Traditional Machine Learning needs:

- Data in known positions
- Need for data masked
- Need for a central authority
- Authority is the final owner

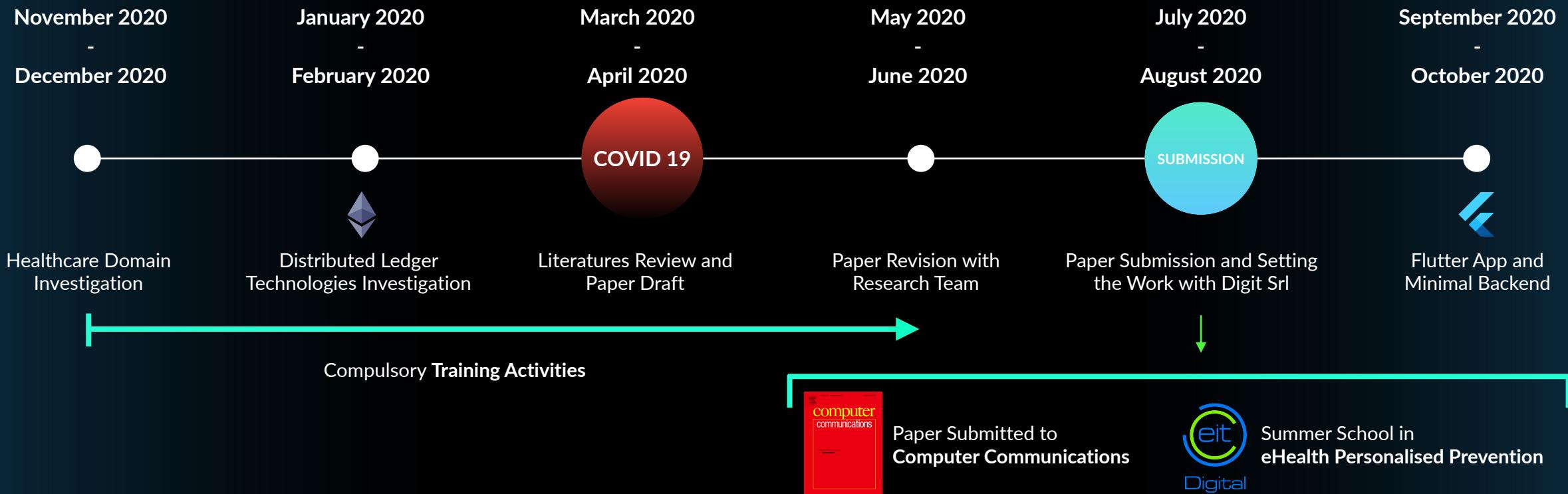


Decentralised Machine Learning should:

- Data in available positions
- No need for data masking
- No need for a central authority
- Creator is the unique owner



First Year Summary



R&D Roadmap to the End

