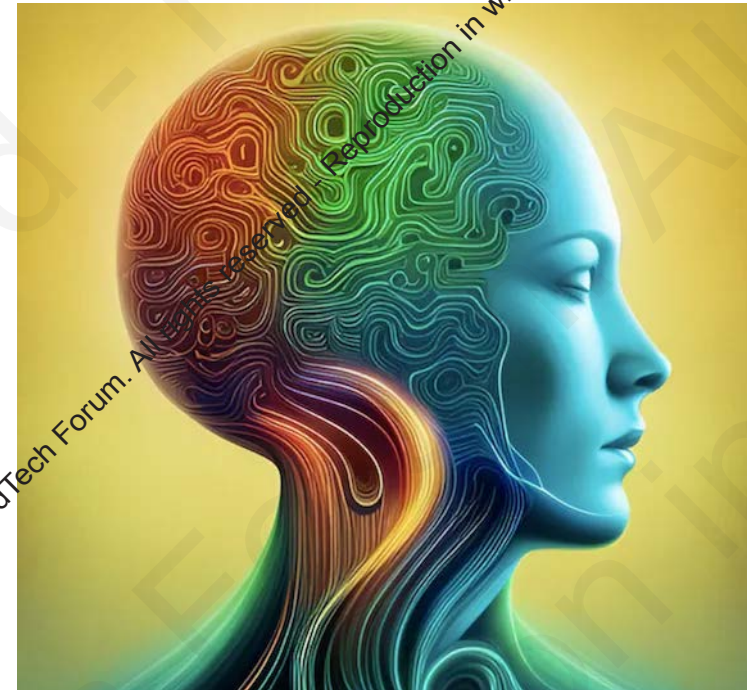


# Digital Twins at The Edge – The Digipredict Project and Beyond

Adrian M. Ionescu, EPFL, Switzerland



# Digital twins as mainstream technology for sustainable development goals

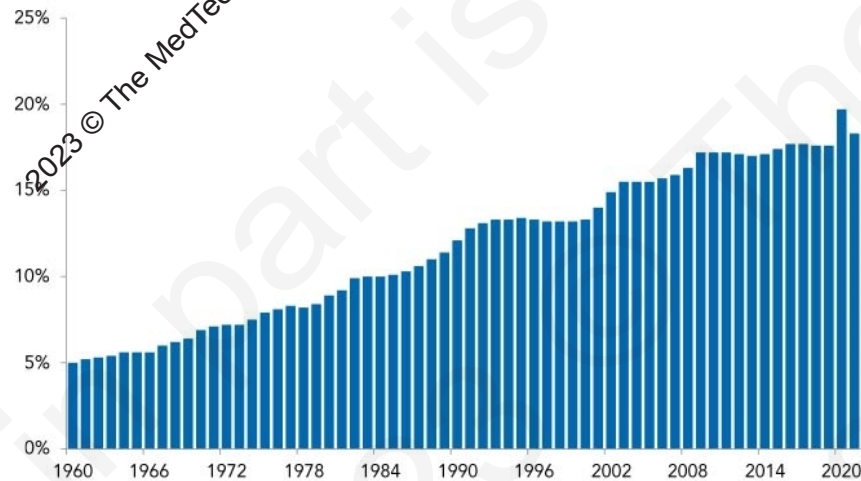


- Reactive healthcare = unsustainable 30% of GDP in the United States by 2040 & up to 97% by 2100

- Digital Twins = one source of truth for a paradigm change – towards P3 healthcare

**PETER G. PETERSON FOUNDATION** Healthcare costs in the United States have increased drastically over the past several decades

NATIONAL HEALTH EXPENDITURES (% OF GDP)



SOURCE: Centers for Medicare and Medicaid Services, National Health Expenditure Data, December 2022.  
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PGPF.ORG



- Digipredict
- Optomics
- Neurotwin
- EDITH



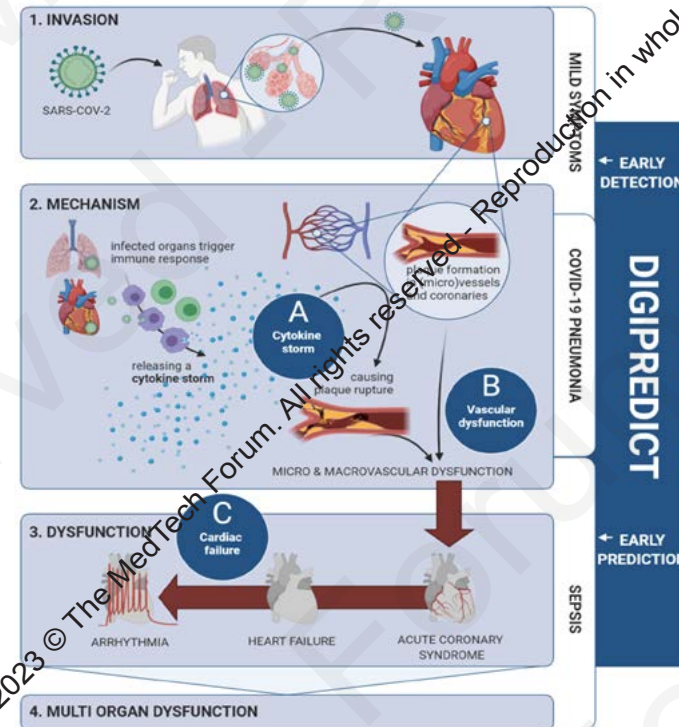
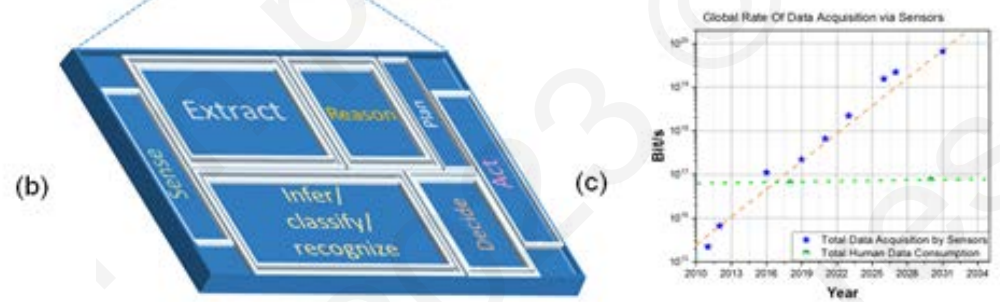
# Digital twins at the Edge: the Digipredict Project



Migration of Intelligence to the Edge for autonomous intelligent systems

## Digipredict FET Proactive project

- Problems to solve
  - Early detection & prediction: COVID-19 and sepsis
  - Personalized supportive therapy



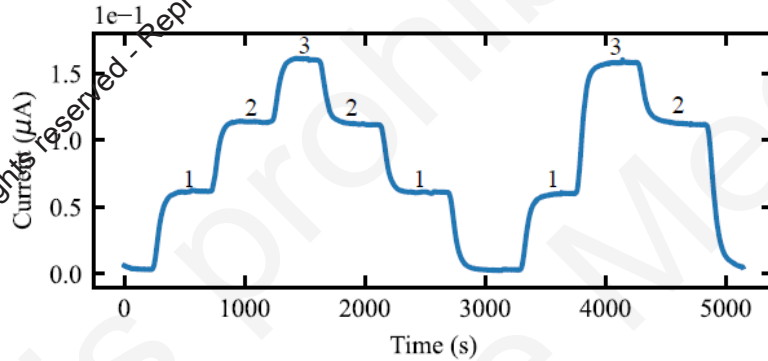
## Solutions:

- **Digital Fingerprints** based on dynamics of biomarkers
- A **Digital Twin at the Edge** based on wearables for P3 Healthcare

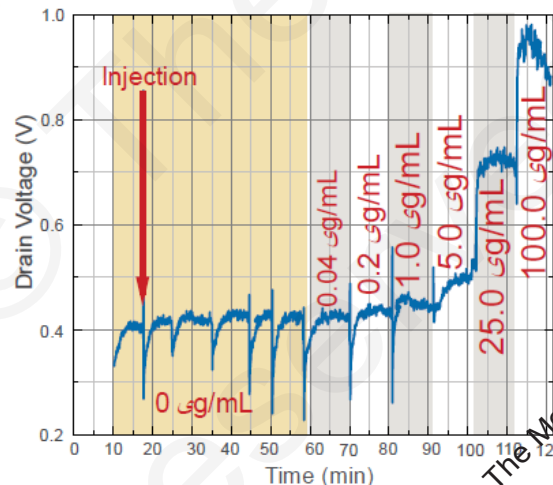
# Dynamic digital fingerprints based on biomarkers in the interstitial fluid (ISF)



## Lactate



## CRP



### ISF extraction & microfluidics

- hollow microneedle arrays (Ascillion, Xsensio SA)

### Real-time continuous monitoring of key biomarkers with wearables

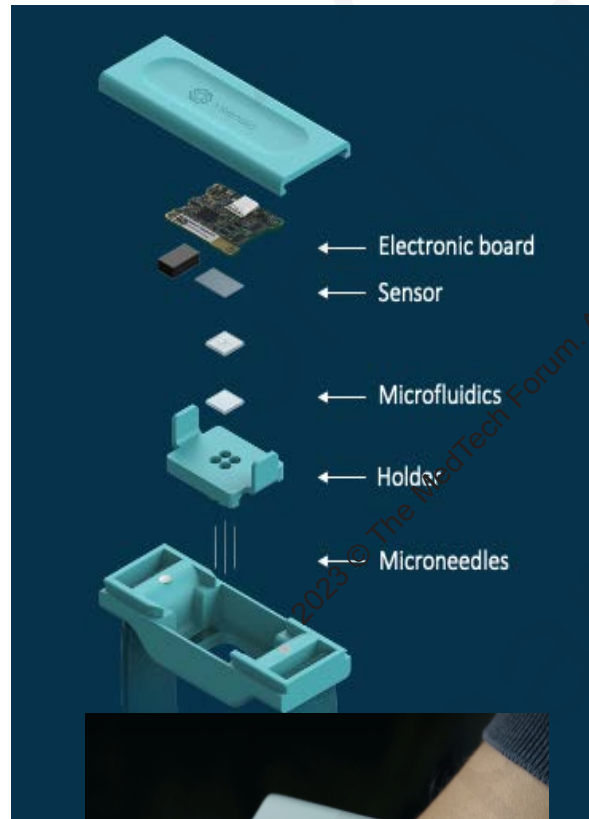
- Lactate, pH
- Proteins: CRP, NT-proBNP, PSP

### Organ-on-Chip technology

- Physical DT – efficacy of drugs and adverse effects

### Data visualisation and ML

- Dynamics, explainable AI
- Predictive AI models



Xsensio SA ©

Four key future technologies for Digital Twins: AI, cloud, IoT and extended reality.