

The left side of the slide features a complex, repeating geometric pattern. It is composed of interlocking shapes in various shades of blue, black, and pink, creating a 3D effect of cubes and prisms.

AI for Health - Quo Vadis?

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Challenges

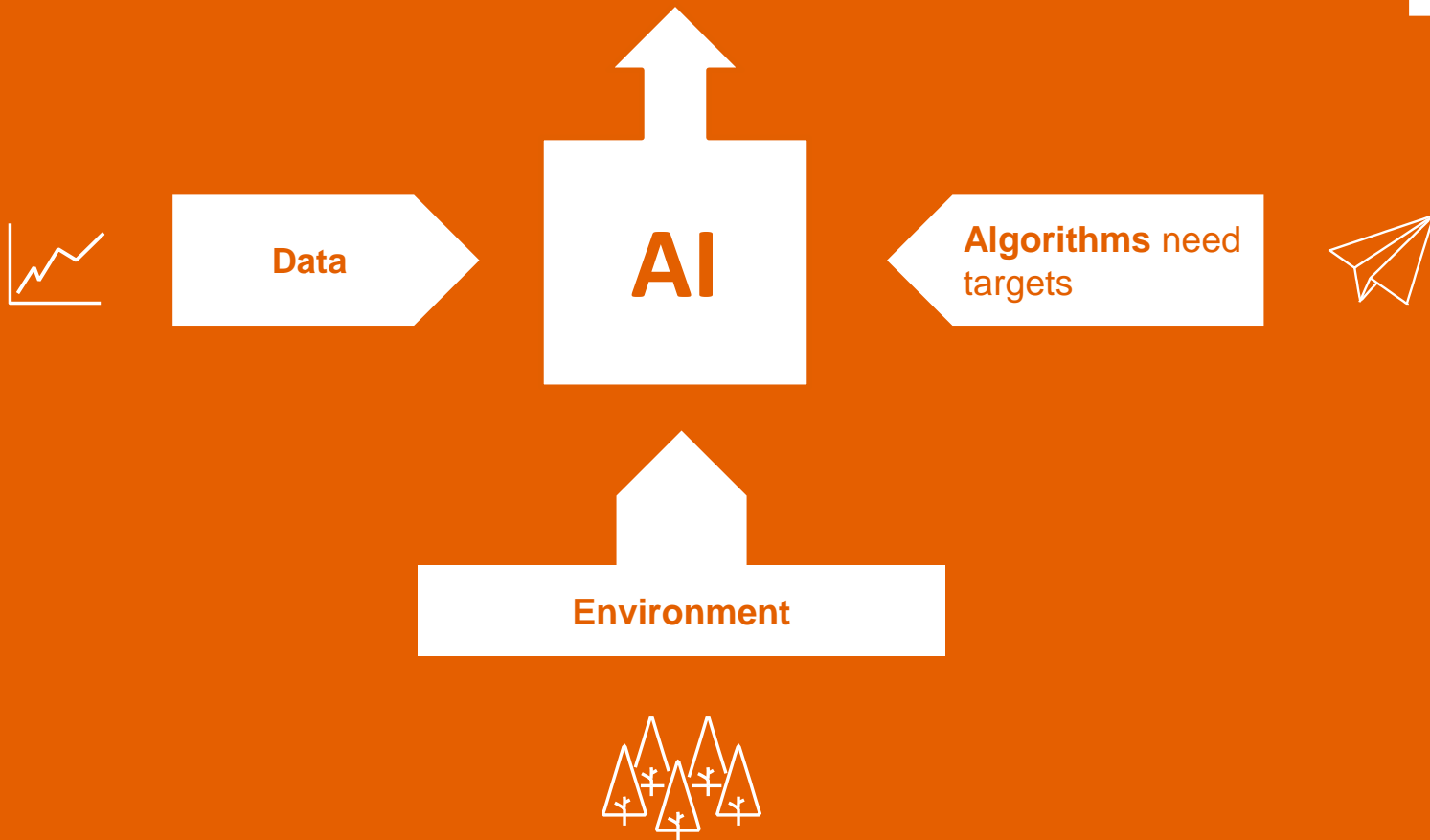
- Aging population, chronic diseases, multimorbidities
- Strain on healthcare resources
- Over 10% of EU's GDP, and increasing

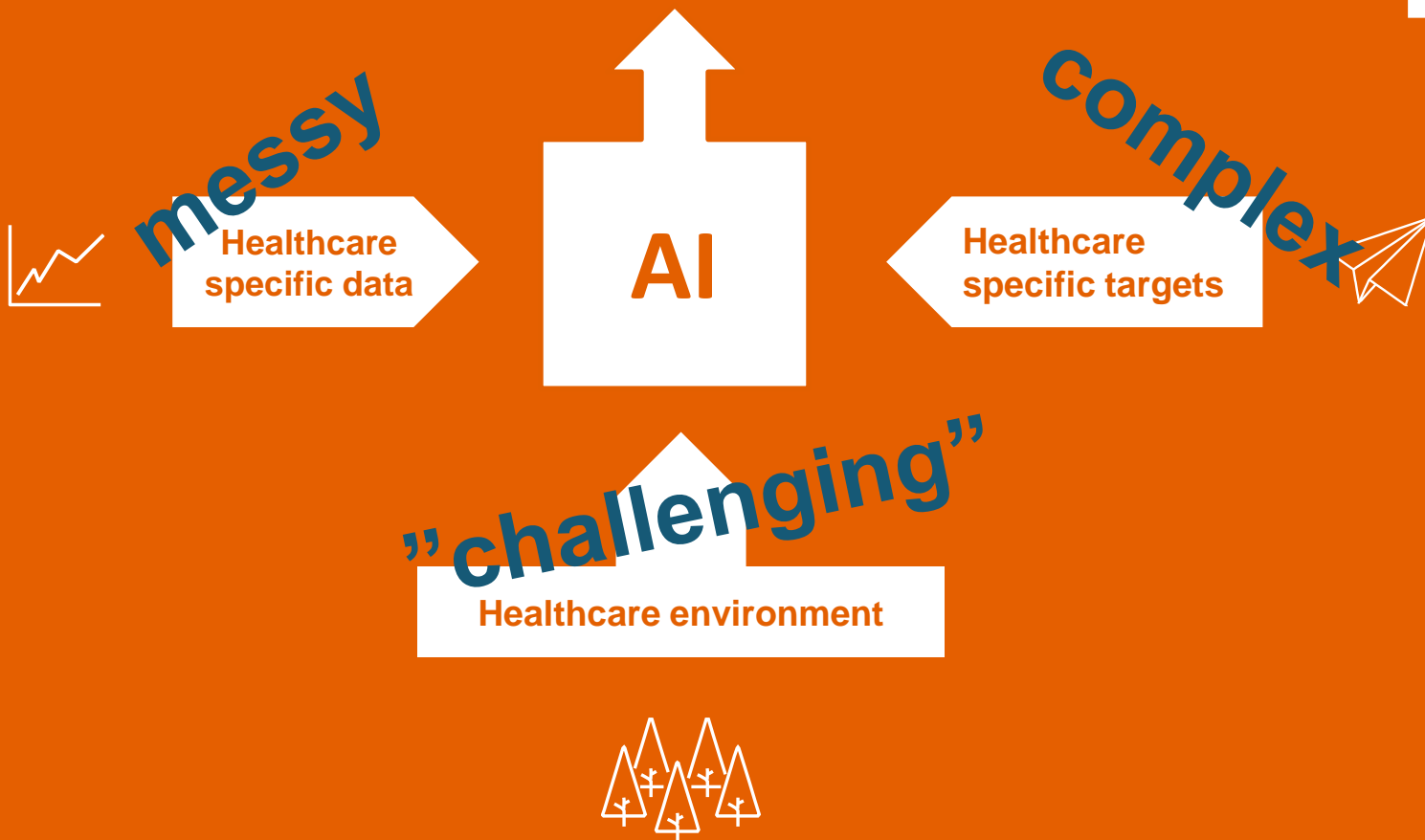
Outline

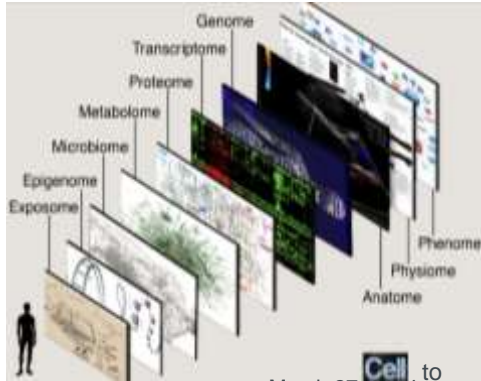
AI for Health –
what makes it special?

Expectations
Where are we now?

Where may we be going?







Cell to
March 27, 2014 pol

heterogeneous

DATA



dispersed

longitudinal



Expectations: areas where AI can get quick results



Personalised care: health care treatments to match the unique characteristics of individuals. Genomic and other ‘omics data with other health and behavioral data including data from sensors.

AI is needed to process huge amounts of data.

Automated health data analytics:

Automated analysis of complex health data - imaging, electronic health records, sensor data – reliable quantification and interpretation.

AI to pre-process, and analyse data.



Continuous citizen-centric care: Improve continuous preventive management of health of individuals by automatically monitoring and integrating information.

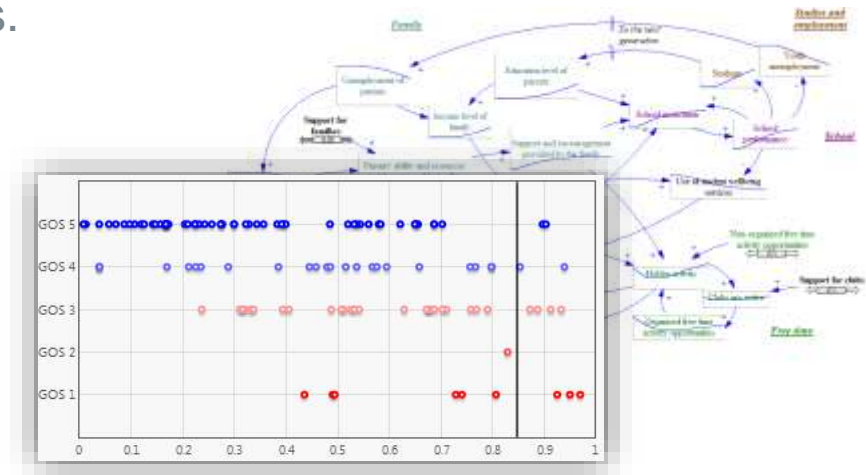
Use AI to analyse, interpret changes in health status. Engage. Motivate.



Expectations: areas where AI can generate big impact

Health and social care process development

- Provide right actions at right time on right patients/clients.
- Apply AI to improve the productivity in health and social care as well as wellness services.
- Forecasting of resource needs, predictive care path planning, predictive outcome analysis, intelligent scheduling and resource organisation.



Service automation in health and social care

- Reduce the need for routine human intervention where possible, **freeing personnel time to focus on the most value-adding care activities.**
- Application of chatbots (e.g. time booking, information enquiry, triage), AI-based user interaction, automated transformation of information between different systems, and NLP (Natural Language Processing) applications.
- An essential component here **is the accurate identification of situations where human communication is required instead of AI** (e.g. identification of life-threatening conditions).

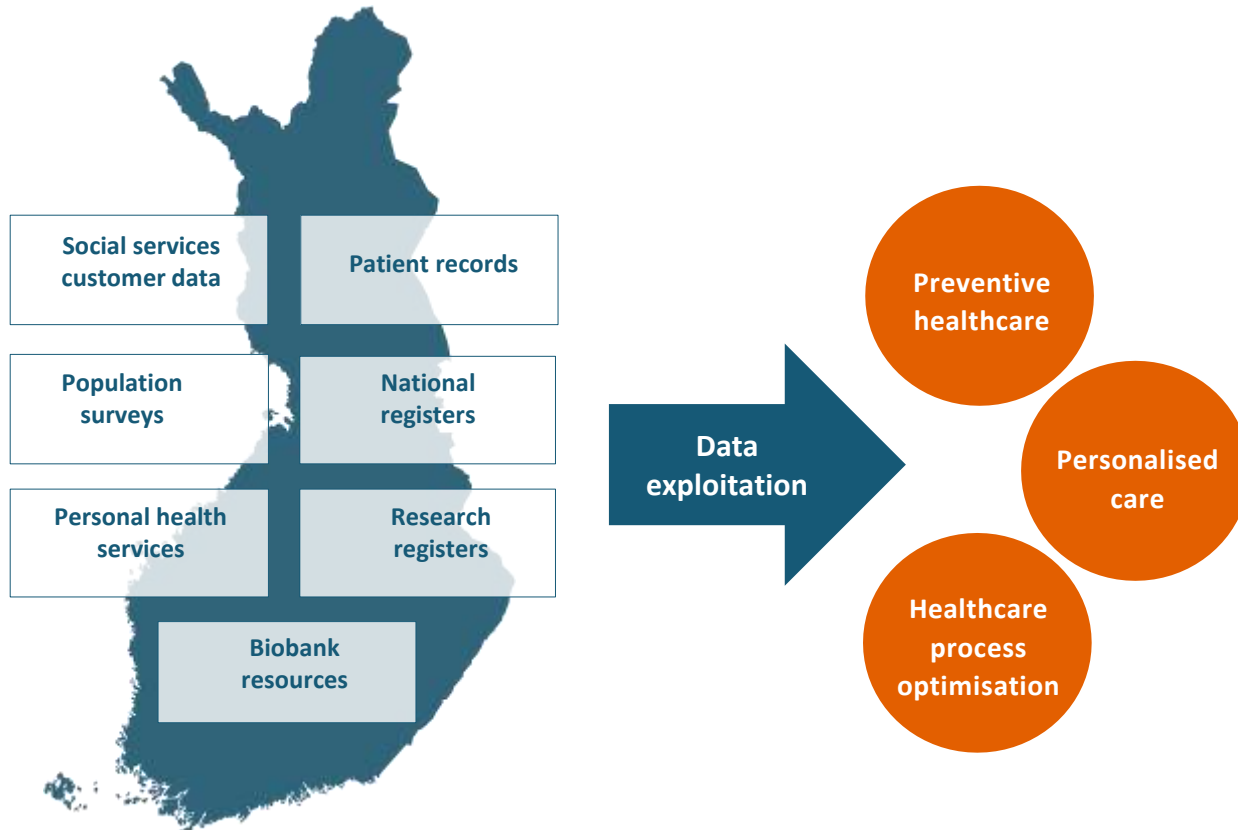
Expectations: areas where AI can generate big impact

Informed society public health decisions

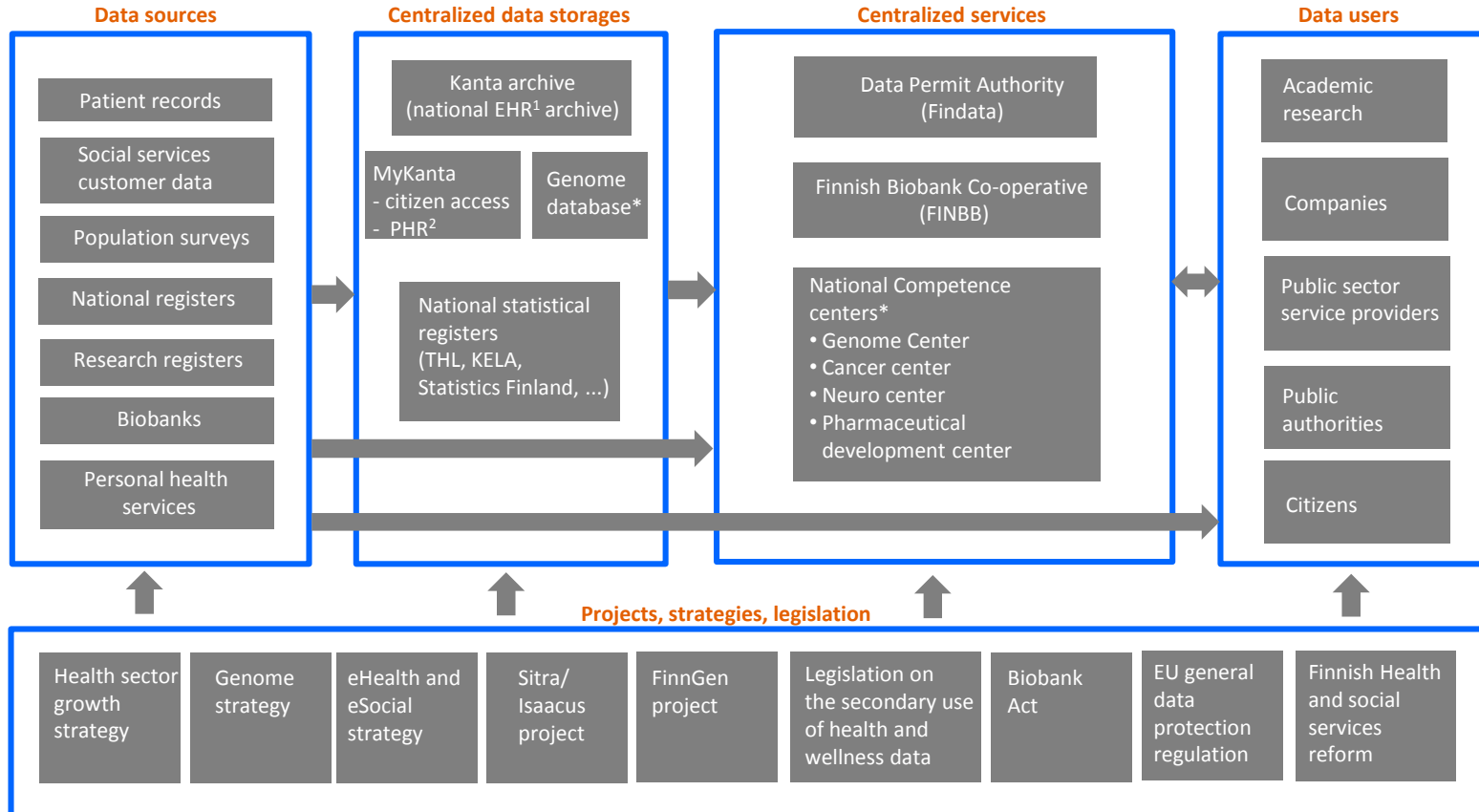
- The impacts of health-related policy decisions in society are difficult to predict and require complex modelling of the entire system (society).
- Improve health and social wellbeing related decision making on individual, organizational, and societal levels via systematic and intensive use of data.
- AI can help in planning the optimal population-level strategies e.g. for disease screening and other public health campaigns.



Emergence of good quality data sources



Finnish health data exploitation infrastructure



* under development or planning

¹ Electronic Health Record

² Personal Health Record

Success stories

For example.

- Deep learning for (medical) image analysis
- AI for life sciences
- Assistive technologies: Chatbots and NLP



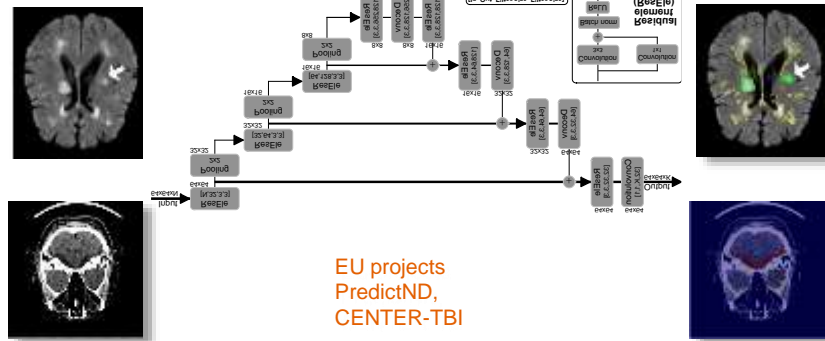
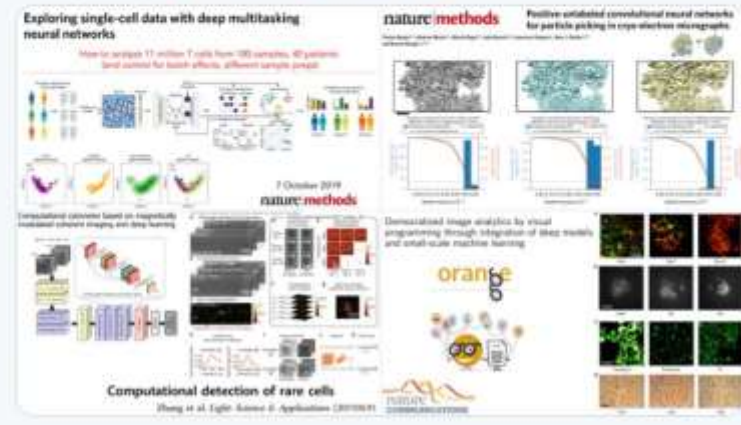
A robot retrieving drugs in the pharmacy of a major hospital. Alibaba Health in three major Chinese Hospitals. Photo: Agence France-Presse



Eric Topol @EricTopol · 12h

Deep neural network #AI advances for life science are running laps around medicine. Here are 4 in just the past week:

1. 11 million T cells [nature.com/articles/s4159...](https://www.nature.com/articles/s4159...)
2. Cryo-EM [nature.com/articles/s4159...](https://www.nature.com/articles/s4159...)
3. Rare cells [nature.com/articles/s4137...](https://www.nature.com/articles/s4137...)
4. Image analytics [nature.com/articles/s4146...](https://www.nature.com/articles/s4146...)



EU projects
PredictND,
CENTER-TBI

However...

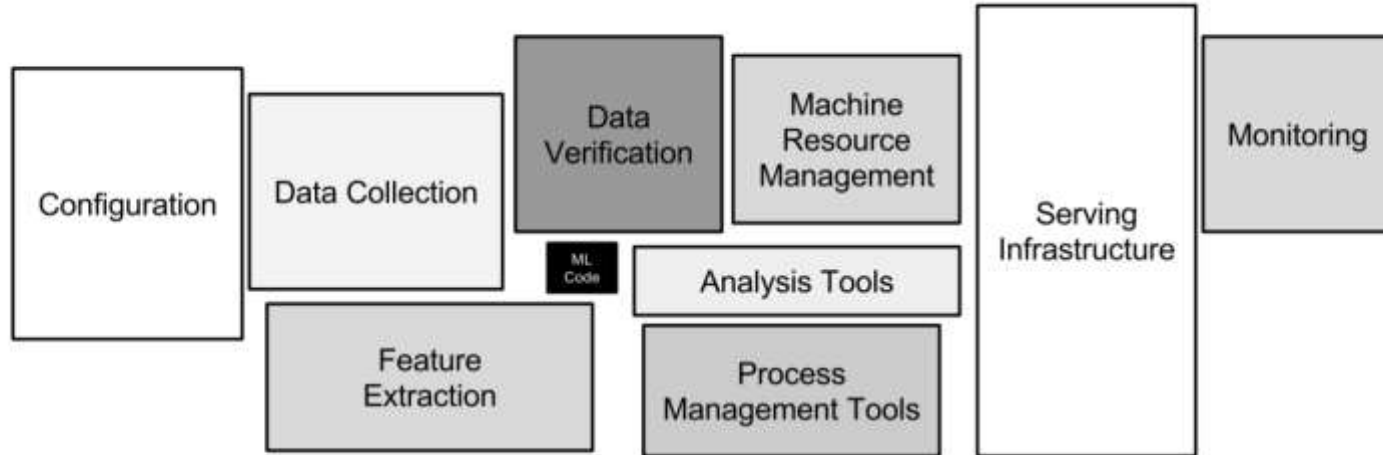


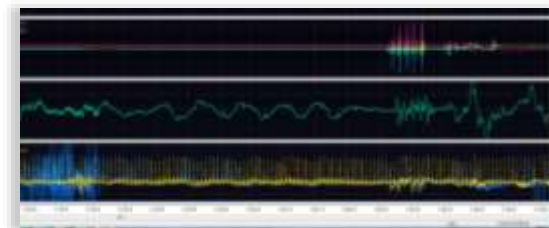
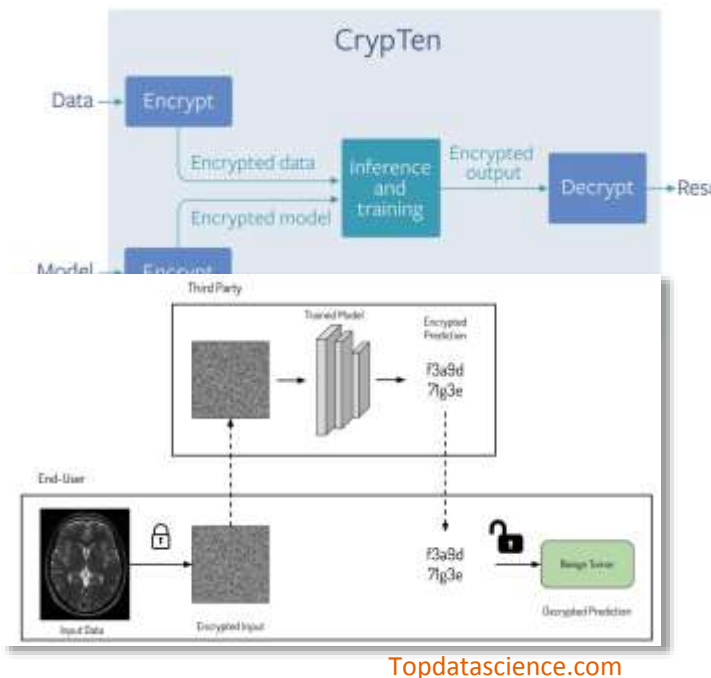
Figure 1: Only a small fraction of real-world ML systems is composed of the ML code, as shown by the small black box in the middle. The required surrounding infrastructure is vast and complex.

Google Research Team “Hidden Technical Debt in Machine Learning Systems

<https://papers.nips.cc/paper/5656-hidden-technical-debt-in-machine-learning-systems.pdf>

Things that need active work

- **Access to data** for training AI:
 - Standardisation, integration
 - Legislation, culture
- **Learning**
 - Privacy preserving AI
 - Learning without (sufficient) (quality) annotations
 - semi- and self-supervised learning
 - Feature engineering - not dead yet?
- **Proper verification and validation practices** for AI-based systems
 - Technical as well as healthcare validation



Trends

'Serious Wearables' and AI

- moving from gadgets to inputs for actual clinical decision support



Pharma and AI

- Digital endpoints
- AI for drug development
- Real-world data analysis

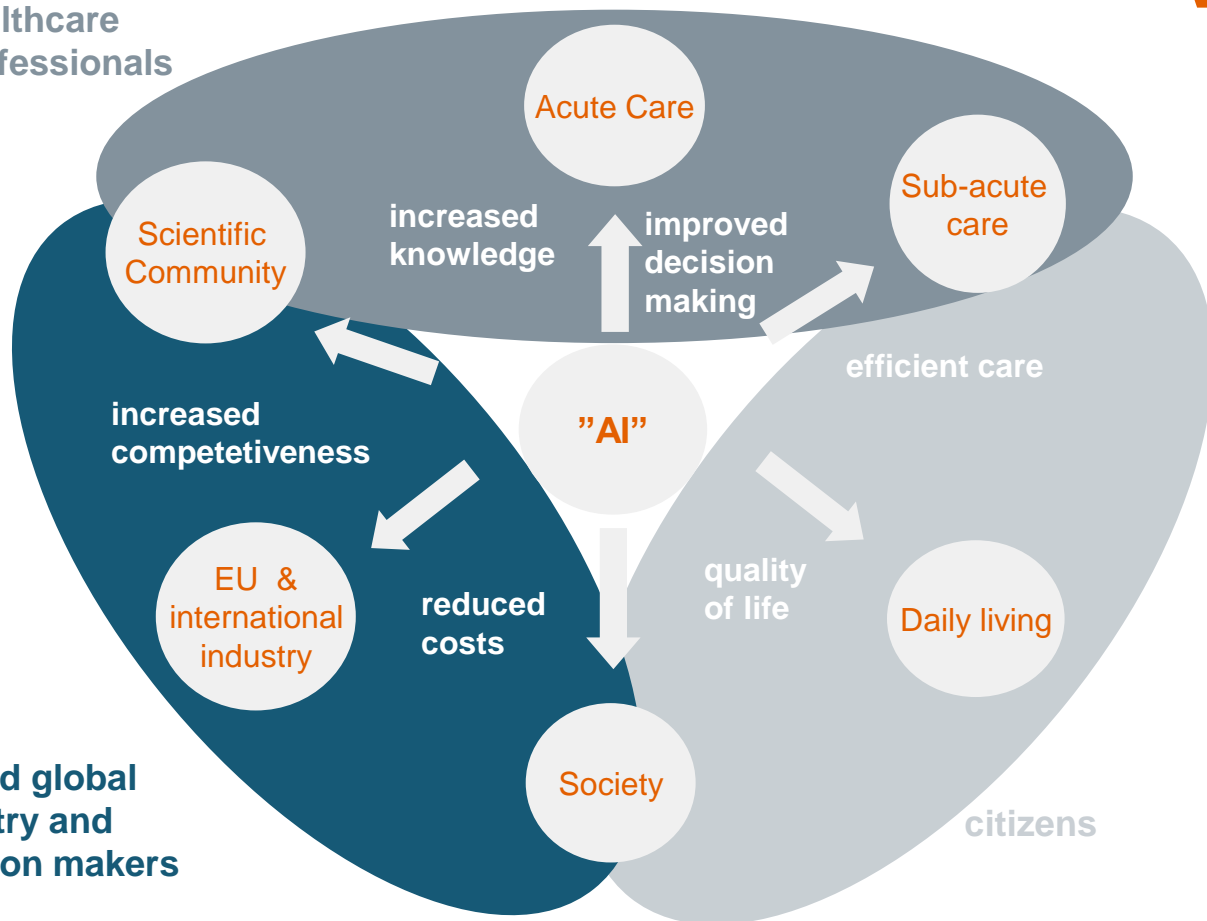
Environment and Health and AI

- Exposome
- Climate change and Health

Leading Companies
Advanced AI in Healthcare and Drug Discovery



healthcare
professionals



EU and global
industry and
decision makers

Next?

Impacts as AI
targets?