Artificial Intelligence (AI) in EU Health Care Research

AI & Fundamental Rights
17 September 2018
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Research and Innovation

EU Challenges and AI

- Staying at the forefront of in S&T
- Access to Data
- Inclusive: AI available/Usable for All
- Evolution of the Labour landscape & Skill gaps
- Acceptance/Ethical issues
- Safety/Liability issues
- Scattered Effort vs. Fierce International competition

Socio-economic impact

Anticipating changes in the labour market

Re-skilling the workforce

Developing, Attracting & retaining talent (EIT, Digital Opportunity Traineeships, Digital Europe Programme)

EU strategy on AI

A STRATEGY FOR EUROPE TO LEAD THE WAY

Boost technological and industrial capacity & AI uptake

Prepare for socio-economic changes

Ensure an appropriate ethical & legal framework

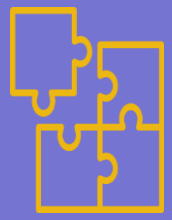
AI FOR GOOD AND FOR ALL

European Commission

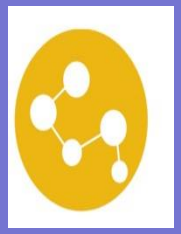
EU Investment in AI

2018-2020: €1.5 billion in = 70%+ of annual investment

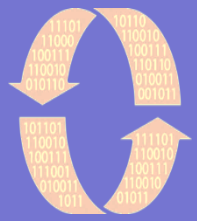
R&D and excellence centers



AI-on-demand platform



Digital Innovation Hubs



Industrial data platforms

Goal beyond 2020: Increasing investments from €4-5 billion / year today to €20 billion / year

EC Communication on AI

Coordinated approach *to make the most of the opportunities offered by AI and to address the new challenges that it brings.* ***The EU can lead the way in developing and using AI for good and for all****, building on its values and its strengths.*

It can capitalise on:

- ***world-class researchers, labs and startups***
- *the* ***Digital Single Market****. Common rules, for example on data protection and the free flow of data in the EU, cybersecurity and connectivity*
- ***Wealth of industrial, research and public sector data***

- *https://ec.europa.eu/digital-single-market/en/artificial-intelligence*
- *Artificial Intelligence for Europe {SWD(2018) 137 final} https://ec.europa.eu/digital-single-market/en/news/communication-artificial-intelligence-europe*

Addressing AI Legal & Ethics Issues

High Level Group of Experts

- *EC appoints **52 experts on AI**, comprising representatives from academia, civil society, as well as industry*
- *General objective: **support the implementation of the European strategy on AI**. This will include the elaboration of recommendations on future AI-related policy development and on ethical, legal* (initial feedback by end 2019) *and societal issues related to AI, including socio-economic challenges*

https://ec.europa.eu/digital-single-market/en/high-level-expert-group-artificial-intelligence

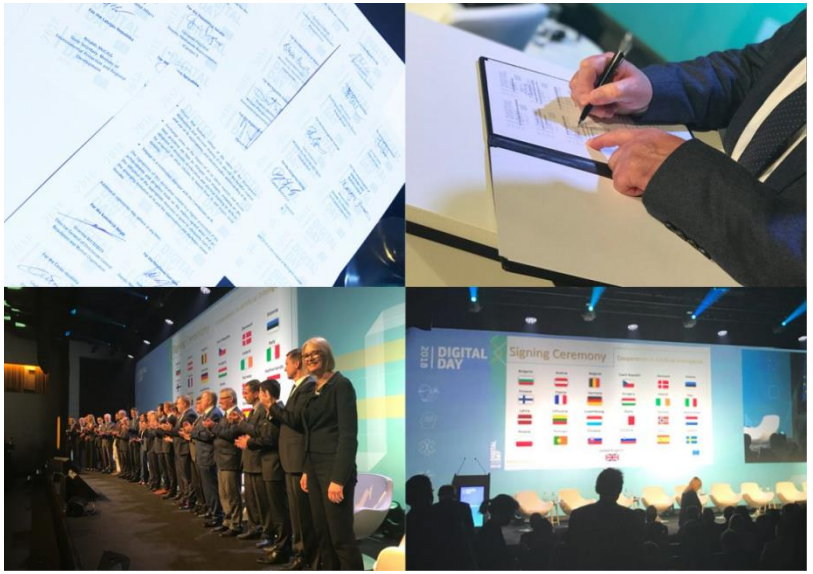
European AI Alliance

- *Multi-stakeholder platform which will **complement and support the work of the AI High Level Expert Group** in particular in preparing draft AI ethics guidelines*
- ***Full mobilisation of a diverse set of participants**, including businesses, consumer organisations, trade unions, and other representatives of civil society bodies*
- ***Encourages broad participation in the policy-making process** of the European Commission* [on AI].
- ***First Annual AI Alliance Conference in 2019**.Membership of the Alliance will grant privileged access to this event*

https://ec.europa.eu/digital-single-market/en/european-ai-alliance

EU Declaration on AI

- *On 10 April 2018 , 25 European countries signed a Declaration of cooperation on Artificial Intelligence (AI). Whereas a number of Member States had already announced national initiatives on Artificial Intelligence, they now declared a strong will to join forces and engage in a European approach to deal therewith. By teaming up, the opportunities of AI for Europe can be fully ensured, while the challenges can be dealt with collectively*.
- Coordinated plan with Member States by end of 2018
- Interaction with Member States via the European platform on national initiatives to digitise industry

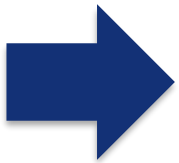


- https://ec.europa.eu/digital-single-market/en/news/eu-member-states-sign-cooperate-artificial-intelligence
- https://ec.europa.eu/digital-single-market/en/news/european-countries-join-forces-digitise-industry

AI in Health & Care (examples)

From wellness to diagnostics to operational techs

- Robot-assisted surgery
- Virtual nursing assistants
- Clinical Trial participation
- Automated Image Diagnosis
- Connected Machines
- Smart implantable devices
- Prostheses
- Companion robots
- Algorithms for more accurate and earlier diagnoses
- Radiology



- Make patient data available as a basis for the use of AI in health research taking into account the legitimate interests of patients and confidentiality of their data
- Personalised medicine
- Time and cost gains
- Better diagnoses/treatments

AI in HC Research - Challenges (examples)

Ethics

- Data – algorithms – bias
- Use of technology - good or evil
- Physicians and algorithms
- Data (patient health, diagnostics and outcomes) - "collective knowledge"
- Machine-learning-based clinical guidance – a third-party "actor" - confidentiality concerns
- Privacy, transparency
- Users' emotions/misuse of AI
- Employment – socio-economic impact
- Socio-economic inequalities (access to AI H&C techs for all?)

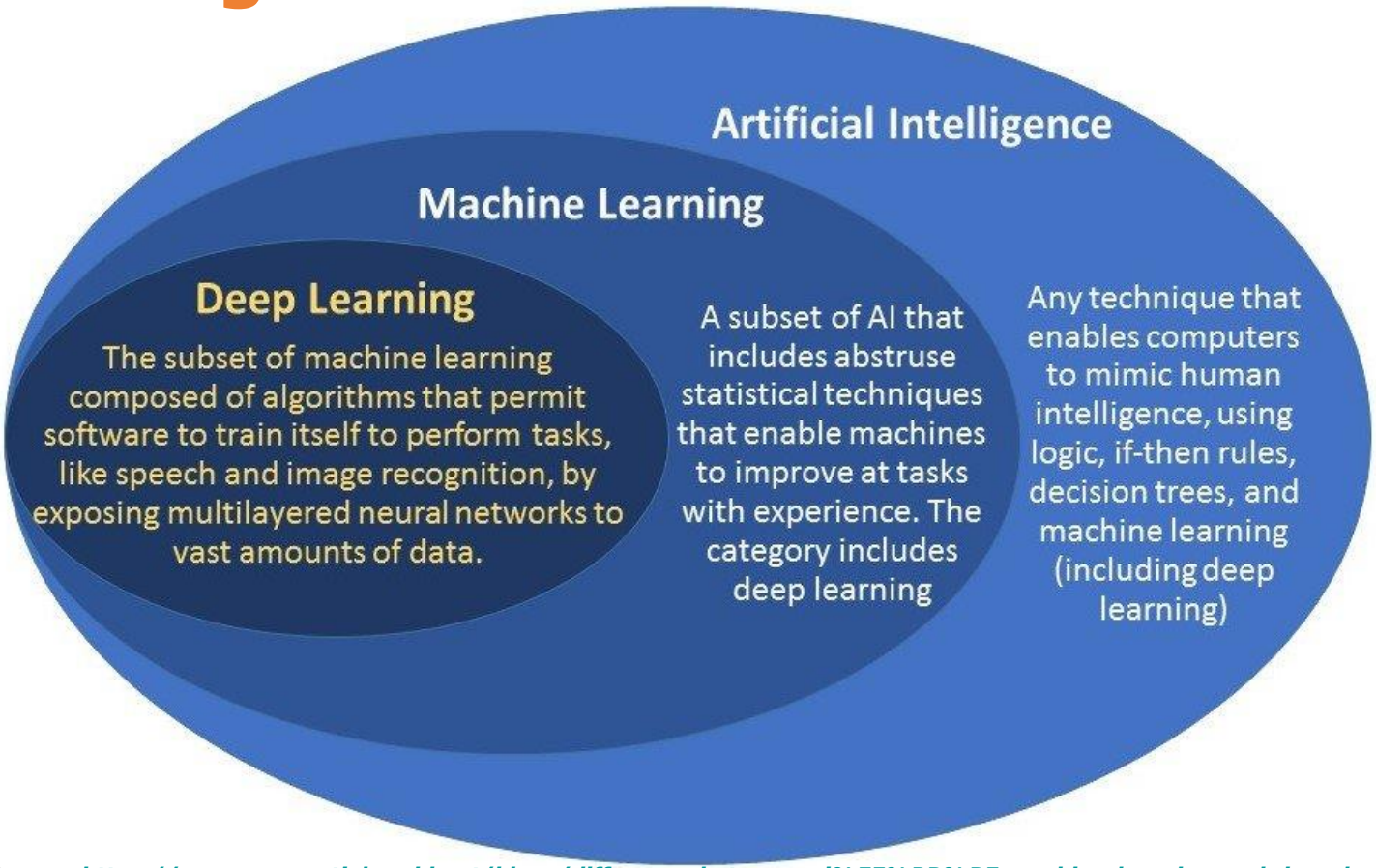
Legal

- Data protection
- Technical safety and failure – liability
- Certification of users' skills
- Ownership of data
- Lack of legal approval process for the wider use of certain AI techs

Technology

- Interoperability with other soft/hardware
- Lack of sufficient high quality data to train AI tools
- Insufficient maturity of the products available on the market

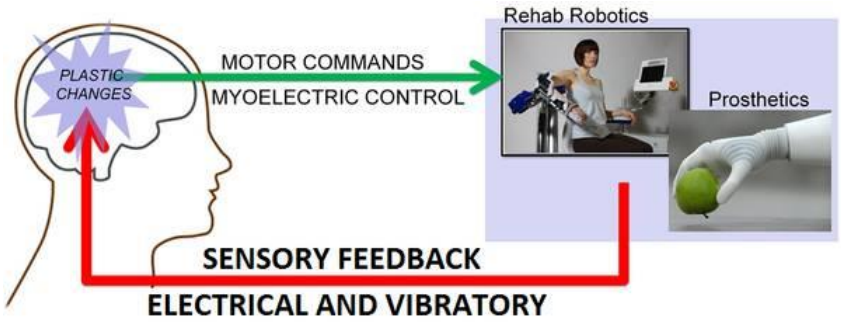
AI in Health Research & Care - From Big Bata to algorithms to machines….



Source: ***https://www.geospatialworld.net/blogs/difference-between-ai%EF%BB%BF-machine-learning-and-deep-learning/***

MyoSENS

SEVENTH FRAMEWORK PROGRAMME



Project results

- Closed-loop control system for prosthetics and rehabilitation robots to help the neuromuscular system to learn via feedback signals as the devices are used
- Industry - two rehabilitation robotic devices: the RehaArm for the upper limb and shoulder area, and Amadeo for finger and hand rehabilitation
- Academia: software for online acquisition and processing of multichannel EMG signals, which has been integrated into the two robotic systems

MURAB

European Commission

Horizon 2020 Programme

Project outcomes (expected)

- Robot that can perform biopsies using a combination of magnetic resonance imaging (MRI) and ultrasound
- Improve results when diagnosing breast cancer and muscle disease
- Significant reduction in the fail rate of the current technology. Current technology has a 10 – 20% fail rate, meaning it misses nearly 1 in 5 breast cancers

European Commission

EuroPOND
European Progression Of Neurological Disease initiative

Horizon 2020 Programme

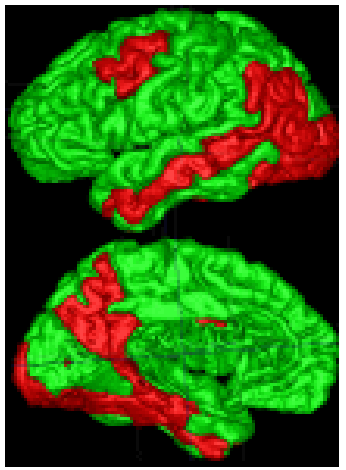
www.europond.eu

Project outcomes (expected)

- Computational models/algorithms predictive of the disease progression in individual patients
- Speed-up early diagnosis and better match treatments for patients' needs

Highly interdisciplinary team

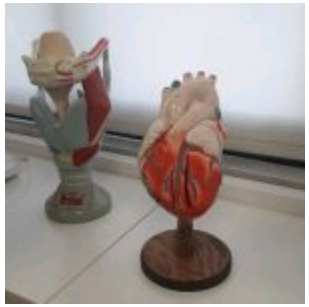
- Computer scientists
- Statisticians
- Neuroimaging experts
- Neurologists
- Epidemiologists



European Commission

OActive

www.oactive.eu



REPOTRIAL

http://www.repo-trial.eu/

Project outcomes (expected)

- Increased understanding of the Osteoarthritis onset and development
- Predict recurrences and suggest preventive steps
- Deliver accurate, personalized treatments

Horizon 2020 Programme

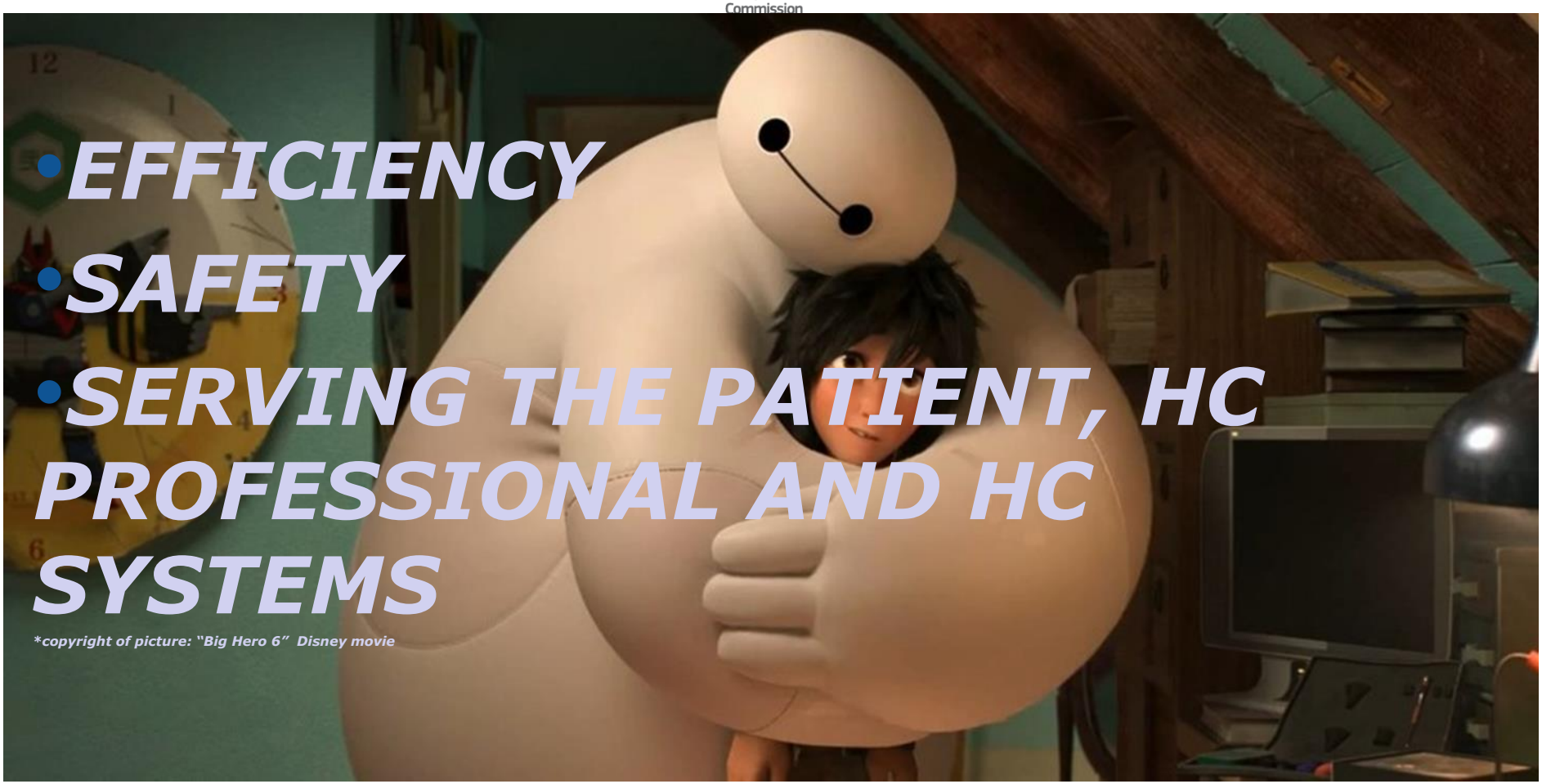
Project outcomes (expected)

- Optimise the efficacy and precision of drug repurposing trials
- Screen for potentially beneficial effects of registered drugs in mechanistically related disease phenotypes
- Validate promising in silico-repurposed candidate drugs up to the clinical level
- Systems-based (integrative / whole-body) approach which will create "virtual patient cohorts"

Societal Challenge 1 Work Programme 2018-2020 – possible "entry doors" for AI

- ***SCI-DTH-01-2019**: Big data and Artificial Intelligence for monitoring health status and quality of life after the cancer treatment*
- ***SCI-DTH-03-2018:** Adaptive smart working and living environments supporting active and healthy ageing*
- ***SCI-DTH-05-2019**: Large scale implementation of digital innovation for health and care in an ageing society*
- ***SCI-DTH-11-2019:** Large Scale pilots of personalised & outcome based integrated care*
- ***DT-TDS-01-2019**: Smart and healthy living at home*

- http://ec.europa.eu/programmes/horizon2020/sc-1-health-demographic-change-and-wellbeing-work-programme-2016-2017-preparation
- http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-health_en.pdf



- *EFFICIENCY*
- *SAFETY*
- *SERVING THE PATIENT, HC PROFESSIONAL AND HC SYSTEMS*

**copyright of picture: "Big Hero 6" Disney movie*