Ethical Aspects of Using Robots in Healthcare

Raja Chatila

Institute of intelligent Systems and Robotics (ISIR)

Labex SMART

Sorbonne Université - Faculty of Science and Engineering, Paris

Member CERNA, France

Member HLEG-AI, European Commission

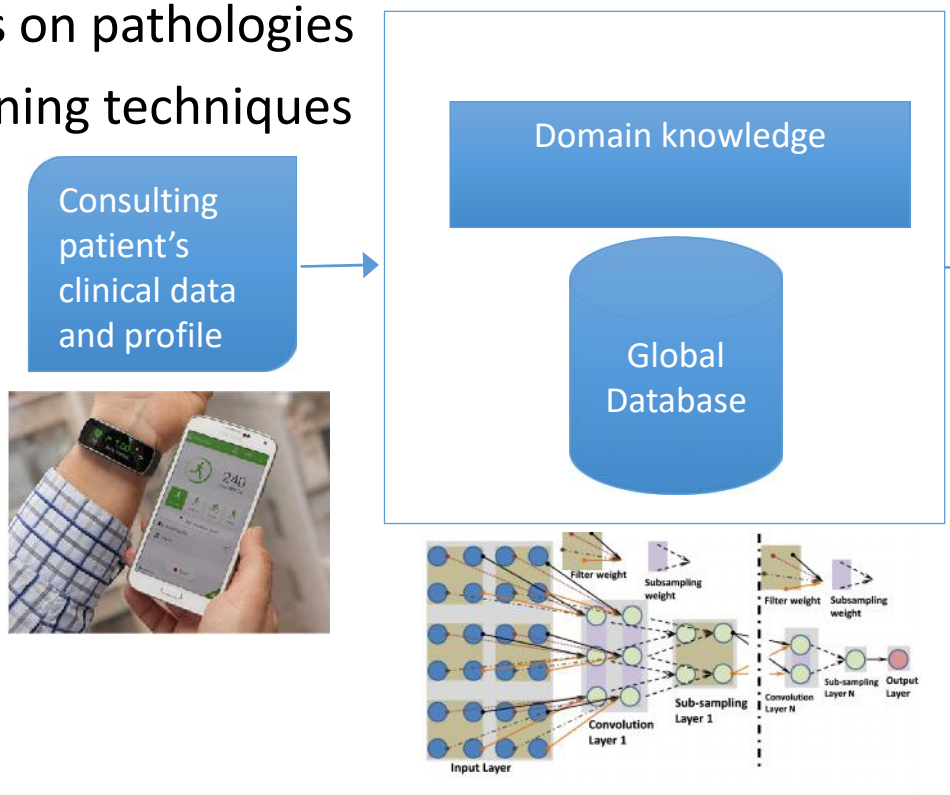
Chair, *The IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems*

AI and Robotics in Healthcare

- Processing and analysis of medical data, including imagery
- Predictive, preventive, personalized, participative medicine
- Telemedicine and virtual consultations
- Drug synthesis
- Operation room robotics and AI
- Assistance to handicapped and elderly persons
- Robot companions
- Rehabilitation and augmentation

Predictive Medicine

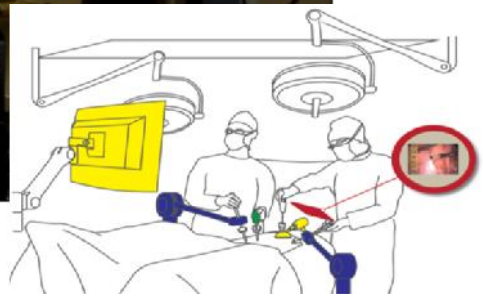
- Patient data
- Databases on pathologies
- Deep learning techniques



The Surgical Cockpit

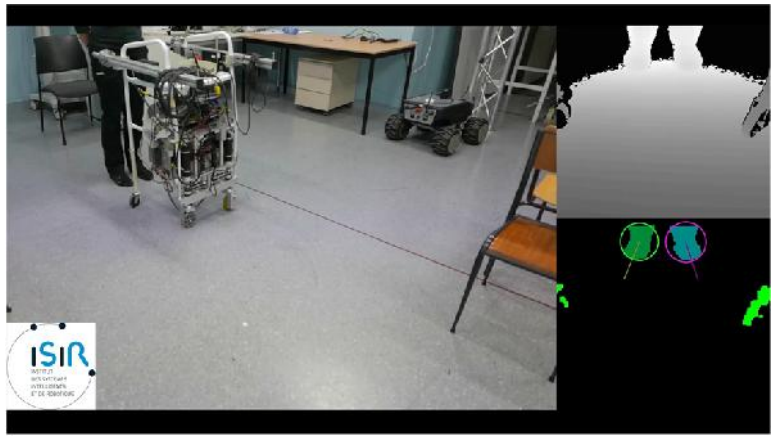
Assisted gestures, interactive instruments, Augmented reality

ISIR



Assistive devices and robots

ISIR
GEMA



EPFL

Robotized systems

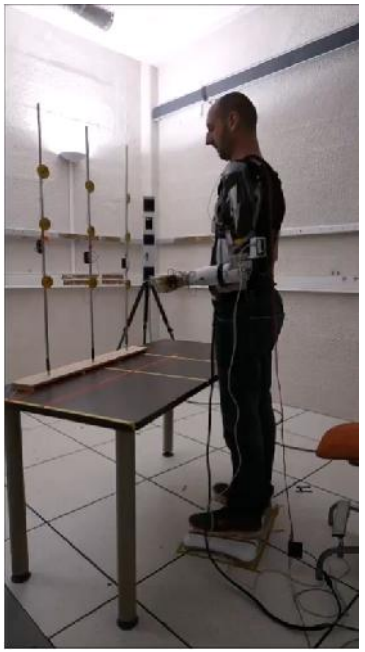
Brain-machine interfaces

Robot Companions

Alice

Paro

Active Prostheses to enhance sensory-motor capacities for amputees



Risks and tensions

- Privacy
- Human dignity and autonomy
- Isolation
- Emotional bonding
- Dependence on technology
- Transformation and enhancement of the human being
- Medicine without doctors

Ethical Principles

- Beneficence: “Do Good”
- Non maleficence: “Do no Harm”
- Autonomy: “Preserve Human Agency”
- Justice: “Be Fair”

Recommendations of the CERNA (2014)

- **Medical ethics**. Researchers in reparative or assistive robotics should, in coordination with healthcare professionals and patients, apply the principles of medical ethics in order to make informed choices between the requirements of care efficacy and safety, patient independence and integrity, and privacy protection. These questions should not only be considered from the legal standpoint; ethical thinking and deliberation help to make individual adjustments on a case-by-case basis rather than apply a general rule. Researchers should solicit and follow opinions published by operational medical ethical committees in view of establishing a connection between emerging robotic technology and positions expressed in such opinions.
- **Autonomy and integrity**. Researchers working on reparative robotic systems should seek to preserve the autonomy of equipped individuals by maintaining them in position to control their actions as far as possible. Researchers should also seek to preserve the integrity of functions other than those being repaired.
- **Reversibility**. Researchers intentionally working on robotic devices for human enhancement must ensure that the resulting augmentation remain reversible. Devices should be removable without causing harm to the person and without loss of the initial functions.
- **Societal effects of enhancement**. Researchers should investigate societal effects of human enhancement induced by the devices they develop, including effects on the social behaviour of equipped individuals and, reciprocally, on the social behaviour of the unequipped persons

Additional Ethical Issues for AI-Based Systems

- **Transparency**: disclosing (by the designer) the principles and values on which the systems are built and the decisions are taken.
- **Accountability**: identifying responsibility and liability of humans who are behind the machines.
- **Explicability**, **auditability, traceability**: the capacity of the system to state the reasons for which it decides to take its decision.
- **Neutrality/Fairness**: that the system and the data are not biased.

Dependable and Resilient Systems

- **Availability**: readiness for correct service;
- **Reliability**: continuity of correct service;
- **Robustness**: delivery of correct service despite possible expected or unexpected adverse situations (not in system specification).
- **Safety**: absence of catastrophic consequences on the user(s) and the environment;
- **Confidentiality**: absence of unauthorized disclosure of information;
- **Integrity**: absence of improper system alterations;
- **Maintainability**: ability to undergo, modifications, and repairs.
- **Security**: availability for authorized users only + confidentiality + integrity (with 'improper' meaning 'unauthorized').

Conclusions

- Respecting the classical ethical principles in the medical practice
- Add AI/Robotics specific principles
- Technical dependability as a means to help respecting and implementing principles
- Validation and certification requirements