Uses of Interactive Devices such as Artificial Intelligence Solutions for the Improvement of Human-Computer Interactions through Telemedicine Platforms in France

Christian BOURRET – Thérèse DEPEYROT

ACHI Conference - November 2020

IARIA

Christian Bourret

Full University Professor

Information and Communication Sciences

Deputy Director Ile-de-France Services Engineering Institute (IFIS)

Deputy Director DICEN IdF Research Team

IARIA Fellow (2019)

Thérèse Depeyrot

Consultant for the Management of innovative digital Projects in the Healthcare sector

Associate Researcher DICEN IdF Research Team

Topics

1 - Introduction

2 -   Scientific Position – Methodology

3 - Use of Data in Telemedicine and the AI Data Processing

4 - Observation of AI Applications in Telemedicine

5 - Effects of combining telemedicine and AI technologies

6 – Discussion

7 - Conclusion

Introduction

Health is an essential sector in the **digital transformation** of our society, using interactive devices.

Isaac's report = transition from curative to more **predictive** medicine.

Villani's report = importance of **Artificial Intelligence**.

Importance of social and territorial **inequalities** in health

"**Medical deserts**", with issues of **traceability** of care acts and health **pathways**, with telemedicine.

We first define our **scientific position** and the **methodology** used.

Then we present the use of **data** in **telemedicine** and Artificial Intelligence data processing.

Oservations on **AI applications** in telemedicine through cases analysis.

Effects of the **combination** of the two technologies.

After a **discussion** finally, we give a **conclusion** focusing on main **challenges** tackled and **perspectives** for future works.

2 – Scientific Position / Methodology

Research-action approach, this paper associates two researchers, one with a university position and the other with a more consulting position and implication in experimental activities.

Back and forth between **theory and practice**, by comparing practical results with theoretical issues, to produce knowledge for action.

Interdisciplinary field of **information and communication sciences**, in the perspective cf. F. Bernard articulation of the four dimensions of **links** (relationships and **interactions** in a systemic dimension), **meaning**, **knowledge** and **action**.

Complementarity of information and communication: importance of information to shape organizations / communication to foster **change** with **cooperative** dynamics.

An **ICOE** Approach: Information and Communication **Organizing Ecosystems** (Organizations, Groups, Territories, etc.).

Articulation of **Economic Intelligence** and **Quality** without forgetting the **innovation** dimension in process approaches.

Notion of **situation** (activity, management, information, communication, etc.) cf. Goffman, Girin with all the **ambivalence** of technology.
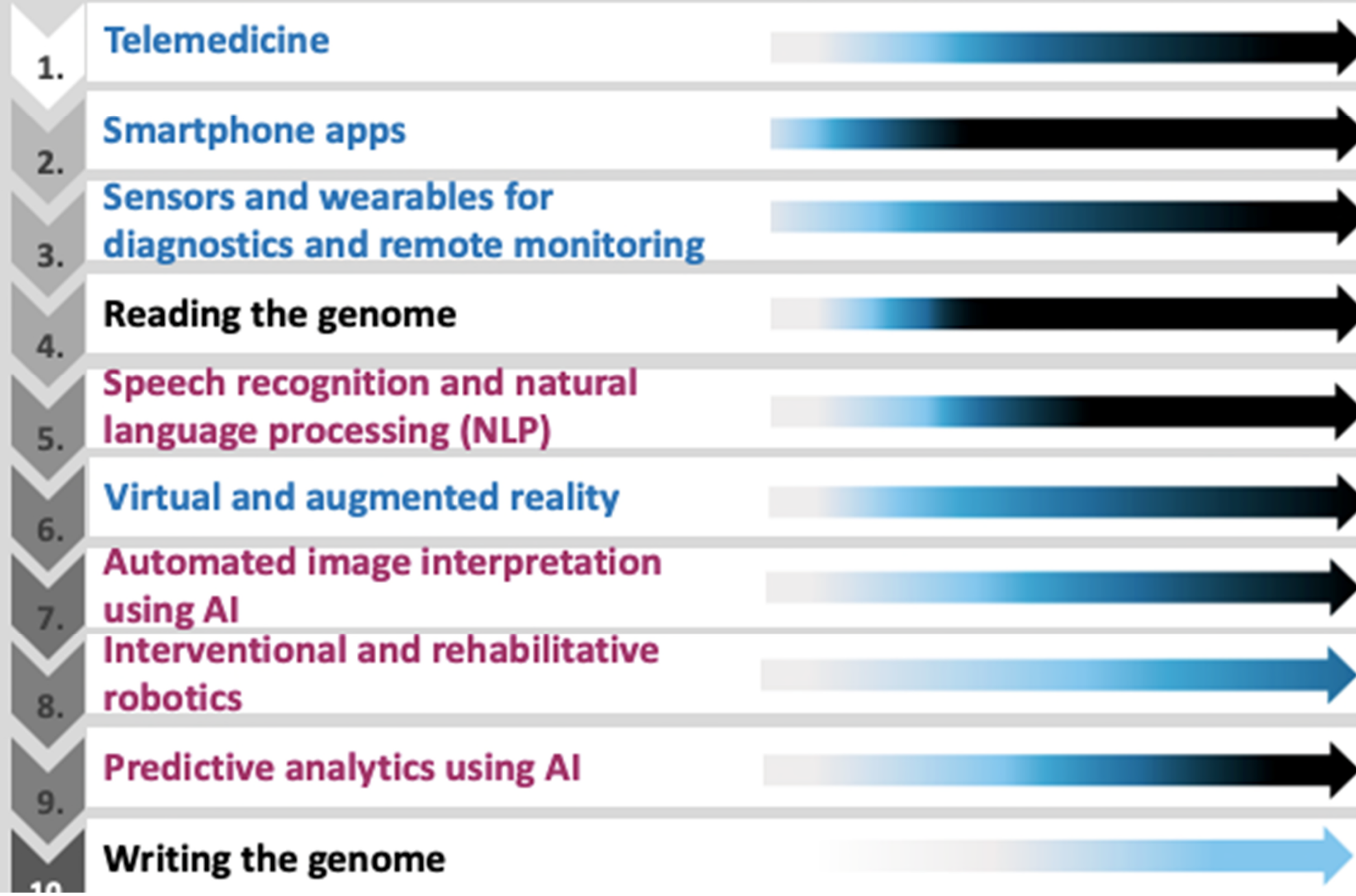
Tensions = in favor of new uses of digital technology to improve patient services (Vallancien) / standardization cf. "**uberization**" (National Board of Doctors).

"**Situational and interactionist semiotics**" (Mucchielli) integrating the dimension of **emotions** and leadership and **trust** building in complex projects.

Technological advances impacting healthcare and the magnitude of disruption

Technology (**Digital Medicine**, **Genomics**, **AI & Robotics**) Proportion of workforce affected

	2020	2025	2030	2035	2040

1. **Telemedicine**

2. **Smartphone apps**

3. **Sensors and wearables for diagnostics and remote monitoring**

4. **Reading the genome**

5. **Speech recognition and natural language processing (NLP)**

6. **Virtual and augmented reality**

7. **Automated image interpretation using AI**

8. **Interventional and rehabilitative robotics**

9. **Predictive analytics using AI**

10. **Writing the genome**

3 - The Use of Data in Telemedicine and the AI Data Processing

Use of Data in Telemedicine

Five situations or types of telemedicine: tele consultation, tele expertise, tele monitoring (for chronic diseases), tele assistance and medical answers for emergency regulation.

Considering **different types of patients** especially dependent elderly, patients with chronic diseases, outpatients after surgery in hospital.

Telemedicine **platform** as a connecting device.

Teleconsultations = instantly interactions between the patients and the doctors for providing services: medical appointment, collect of the patient's agreement, stakeholders' authentication, diagnosis and medical report, prescription (for drugs, etc.), data recording, billing and payment processes.

Integration of the **EHR** for adding data and the report of the teleconsultation, with eventually the telemedicine video record.

AI Data Processing and Solutions

Machine learning, deep learning:

Implementation of **EHR** in hospitals and the extension of Information Systems (IS) AI solutions strengthen the evolution towards a personalized, preventive, predictive and participative medicine.

Mass production of healthcare data:

Human-Computer Interactions linked i with the patients' **empowerment**.

A more global approach towards the determinants of healthcare.

Integration not only medical, but **social**, psycho-social information.

Different uses of AI:

Retrieval of the Appropriate Information

Automatic Analysis of Medical Imaging

AI Advice for Prescriptions with Machine learning algorithms.

4 - Observation of AI Applications in Telemedicine

Analysis of New Trends for AI in Telemedicine

Especially for the patients' **orientation**.

Data collection before a **consultation**

The example of Lemonaid Health.

Personalized **Diagnosis** Support

 The telemedicine application Ada Health (Germany)

 A Case Example of Telemedicine Using AI :

MédecinDirect as is a telemedicine platform

Analysis Based on the Reasons for the Consultation

Decision Support System

5 - Effects of combining telemedicine and AI technologies

The Impacts for the Doctors

Complementarity of AI and telemedicine.

AI contributes to **securing** the whole process of a teleconsultation.

The New Scopes for the Patients

Development of teleconsultations not only results of recent changes in regulation and of the context of "**medical desertification**", but also of the patients' **current needs**.

6 – Discussion

The interactive devices studied (AI, telemedicine) are very **promising** and should constitute major levers of the digital transformation to make the health system evolve from a purely curative and fee-for-service medicine to a more **preventive** medicine cf. Isaac's report.

But with the **ambivalence** of technology (Ellul).

In France, engineers have always occupied a privileged place, with the risk of technological "**solutionism**" and only **technocentric** approaches.

Importance of integration of **new project management methods** (known as "**agile**").

Method to develop **trust** in complex projects as the Fears - Attractions - Temptations (**FAcT**) - in Mirror method (Le Cardinal).

"Medical deserts" being also "**digital deserts**" with specific work on **AI and rurality**, data and weakened territories or smart cities and smart territories.

Another essential aspect about **evaluation** of the impact of these new devices and their **added value** in improving services for both health professionals, patients and their families with the notion of "**health democracy**".

A new "**territorialization**" of health management, with the affirmation of "**Healthcare Interface Organizations**" – HIO (Healthcare Networks, multi-professional healthcare centers, home hospitalization, etc.) to overcome the **barriers** between primary care sector and the hospitalization sector.

New **coordination professions** and also to give meaning to data, not only data scientist but also human data mediation.

Not forget the **human dimension** of healthcare (M.J. Thiel).

7 - Conclusion

Complementarity of AI and Telemedicine.

With the rise of more uses in telemedicine, we are witnessing a new step in the **transformation** of the healthcare system, with major challenges to overcome. In a context of Augmented Man and Everything is Internet.

The digital process in telemedicine is based on a **Human- Computer Interactions,** both requiring and producing data and exchange them.

The use of AI strengthens the requirements of the information systems **interoperability**.

Implementation of AI solutions = also complex **ethical questions** about the use of medical and behavioral personal data (**privacy**), with the upcoming extension to genetics. From an ethical point of view, beyond the patients' free consent, the use of their healthcare data mandates a differentiated exploitation according to their sensitivity.

Opportunities but also risks (**ambivalence**) with temptations to use AI for services to patients without any human interaction: risk of any only "**solutionist**' approach, but medicine is managing human beings and not only materials or connected objects.

Importance of these challenges shaping the **whole future of our society**. Health is an essential sector to observe the issues and challenges of the digital transformation of our entire society.

Thank you very much for your Attention !

Questions ?

christian.bourret@univ-eiffel.fr
t.depeyrot@ndv-consulting.com

Abstract

The health sector, like all sectors of our society, is strongly impacted by digital transformations. We propose to consider it through new uses of Interactive Devices in the scope of Artificial Intelligence (AI) solutions for the improvement of Human-Computer Interactions, principally through Telemedicine Platforms in France. First of all, we define our scientific position and the methodology used. Secondly, we present the use of data in telemedicine and Artificial Intelligence data processing. Furthermore, we consider observations of AI applications in telemedicine, through cases analysis. We then analyze the effects of the combination of the two technologies. We discuss the main challenges of this digital transformation with the risk of a "solutionist" and "technocentric" approach, sometimes forgetting that health is above all based on a human dimension and interactions. We also outline the question of territories. Finally, we give a conclusion focusing on the main challenges undertaken as well as provide some perspectives.