



NIA ASSOCIATION

# Program for HealthTech

— Whitepaper —  
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**THE PRESENT DOCUMENT SERVES AS A MEDIUM FOR  
CONNECTING TO PEOPLE WHO SHARE OUR VISION FOR  
HEALTHTECH INNOVATION IN MOROCCO.**

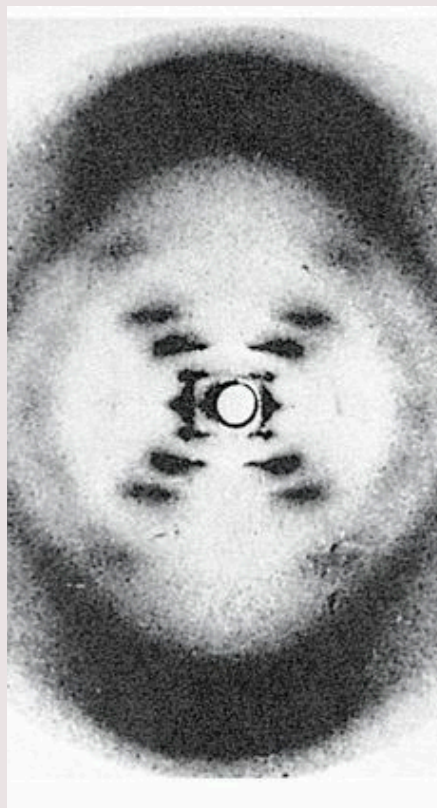
# HealthTech

HealthTech, short for Health Technology, is a broad and evolving field at the intersection of healthcare and technology. It encompasses the application of innovative technologies, digital solutions, and data-driven approaches to enhance the delivery, efficiency, and outcomes of healthcare and medical services.

**“Now I am become life.”**


Medicine has been the beneficiary of two radical developments over the past sixty years: the discovery of the structure of DNA in 1952 and the rise of information technologies in the 1960s. One would bet that the discovery of life’s code, combined with the power of computing, would have radically increased the quality and length of human life-spans.

In 1928, Dr. Alexander Fleming made a remarkable discovery when he returned from a holiday to find a



Petri dish of Staphylococcus bacteria covered in mould. He soon identified that the mould produced a self-defense chemical that could kill bacteria. This moment marked the inception of the penicillin era. By 1944, Pfizer opened the first commercial plant for large-scale production of penicillin by submerged culture in Brooklyn, New York.

Less than twenty-five years after Watson and Crick published the structure of DNA, venture capitalist Robert Swanson and biochemist Herbert Boyer founded Genentech, which went on to synthesize insulin far faster and more cheaply than almost anyone believed possible, using genetically modified E coli bacteria.



**“Biotechnology has already created one revolution. It can certainly create another.”**

In 2020, the scientific community witnessed a groundbreaking milestone when Emmanuelle Charpentier and Jennifer Doudna were awarded the Nobel Prize in Chemistry for their pivotal work on CRISPR-Cas9 technology. This revolutionary gene-editing tool, often dubbed the "genetic scissors," allows scientists to precisely edit DNA, opening up new frontiers in medicine and biotechnology. The CRISPR breakthrough represents indeed another remarkable chapter in the ongoing saga of scientific progress, promising to further transform medicine and the way we approach genetic diseases.

Today, there are presently three major and related obstacles facing biotechnology : Scarce (And/Or) Sparse Data, Absence of a strong concise vision and leadership, and a medieval approach to hospital management.

# “Healthcare, the gift that keeps on giving.”

Rethinking the design of a huge industry.

Health care system demands a human Centric Change.

The formula for a healthy society is through an optimal design of healthcare delivery.



## “MVP ! The Moroccan Value Proposition.”

Where does our nation stand concerning technological innovation? What’s our proposition of value to the World ?

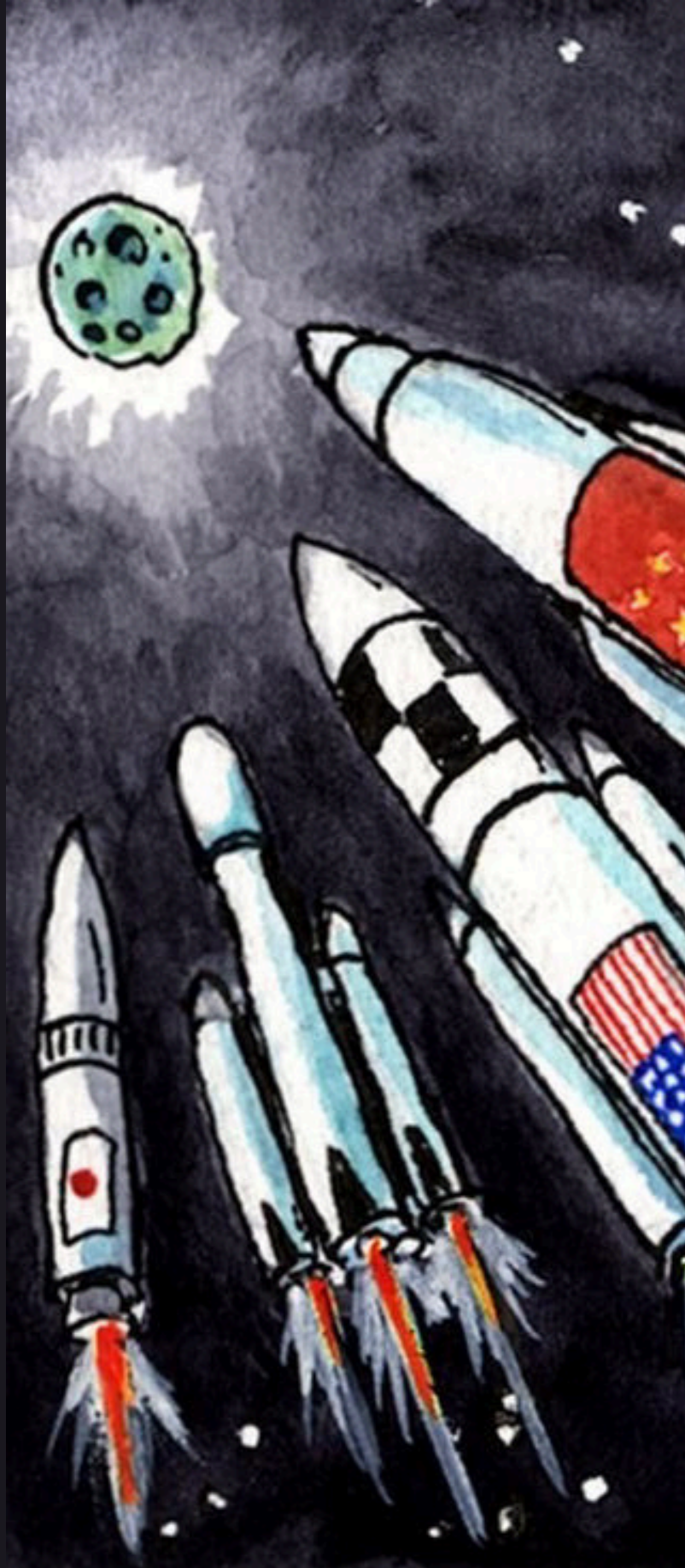
It all starts with asking the right questions and selecting worthy quests. At the dawn of the 20th Century, the Wright Brothers embarked on a quest to build the first controlled airplane. A half century later, NASA embarked on a quest to put a man on the moon. Combustion, penicillin, nuclear fission; the discovery of America, the drafting of the Constitution, history is defined by protagonists pursuing good quests. This Western model of pursuing relevant quests serves as an exemplary framework, one that Morocco can study and emulate.



# “Promise me.”

But the pressing question lingers: Can we guarantee our Technological future?

In a tale of two cities, with the ascent of Technological hubs in the East, China emerges as the global epicenter of manufacturing Industries, the world’s most mysterious producer of AI crusades, a boasting population of 1.4 billion, unwavering work ethic, and the capacity to deploy huge capital and infrastructure. On the Western front, the USA boasts its Silicon Valley folklore, a nation deeply rooted in startup culture, guided by an exemplary constitution, and driven by constructive accelerationist ideals.



As the ‘World's Masters’ grapple with trade wars and the quest for an AGI dominion, where exactly do we stand in this parade?  
Do we have some sort of insurance plan for our future?



**C**ash

**Deciding on the right  
R&D strategy for  
Scientific advancement.**

**R**ules

Experimentation comes with a heavy cost, and cash is in short supply when it comes to scientific research, given its generally low ROI rates.

**E**verything

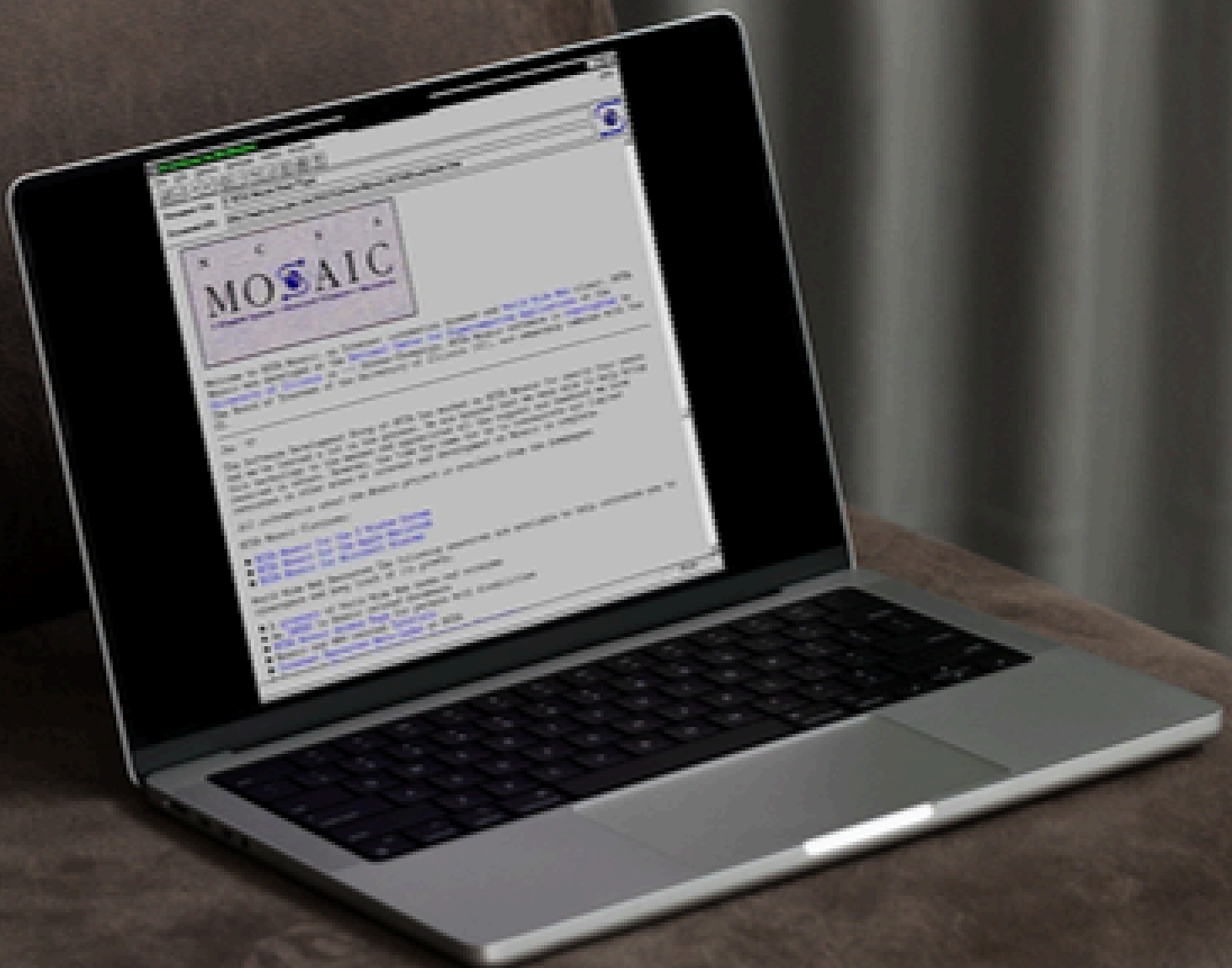
The cost of a single experiment in biology and genetics, averaging thousands of dollars, and in some cases the cost reaches ten of millions of dollars, imposes a substantial economic burden on developing countries such as Morocco, where capital allocation is a serious matter of discussion.

**A**round

**M**e

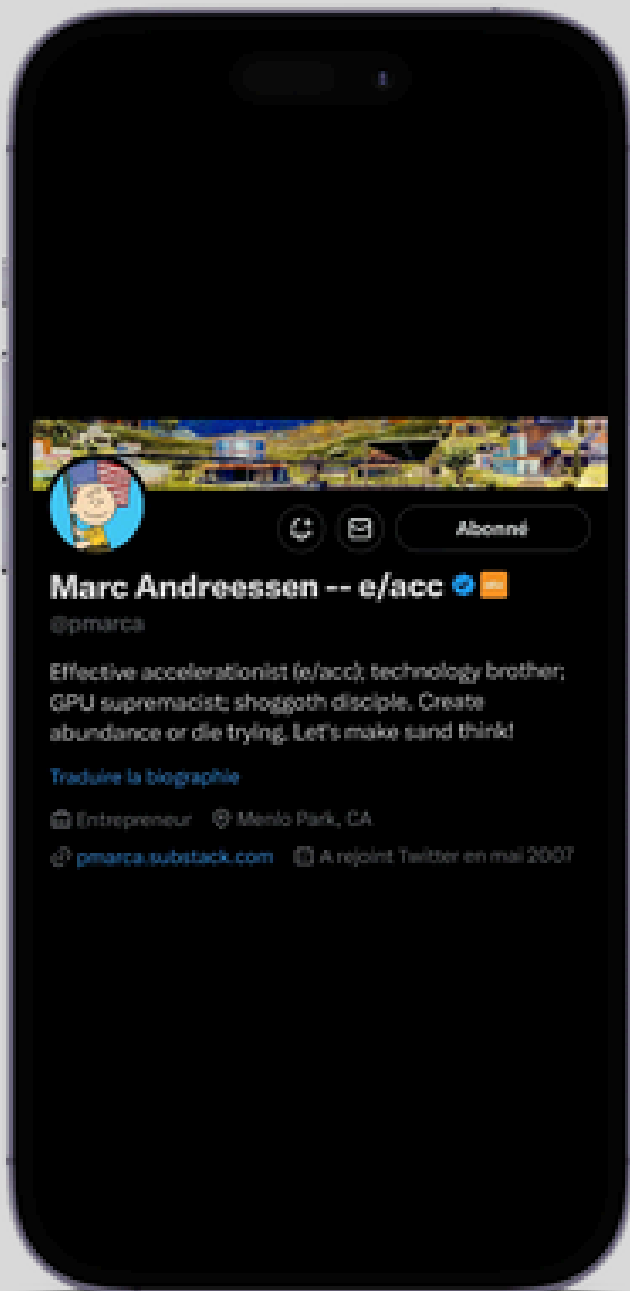
**“Advances in cloud and other computing technologies radically reduce the costs of scientific simulations and data processing, creating opportunities for even larger returns.”**

Moore's Law states that ; the number of transistors on a microchip doubles about every two years, whereas proportionally , the cost of computing is halved. This formula is a force of nature and presents a strong case for investing in software-enabled scientific research. Adopting a computational approach and concentrating on simulation-based data-driven scientific study could inspire an R&D strategy aligned with Moroccan technological and scientific policy.



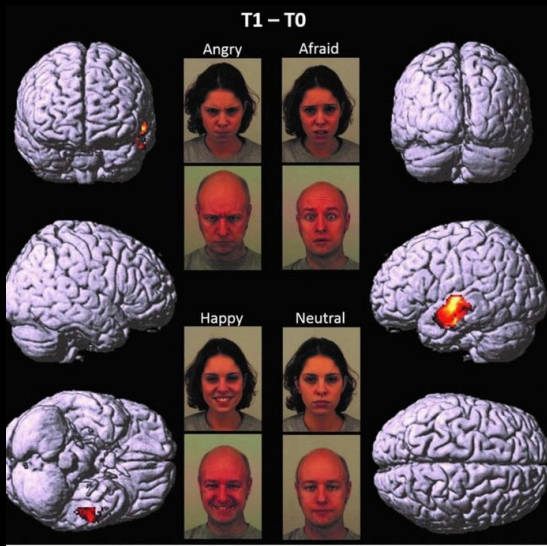


# “Software is eating the world”



Marc Andreessen, is the visionary behind the first web browser ; 'Mosaic', or as he states in his Twitter bio; an {<Effective accelerationist> ; <Tech bro> ; <GPU supremacist>; <Shoggoth disciple>. <Create abundance or die trying. Let's make sand think!>}. Anyway... In 2011, Marc Andreessen made a public declaration on his personal blog that has been coined ever since: 'Software is eating the world.' In this proclamation, he highlights how various major industries, ranging from movies to agriculture and national defense, have transitioned to operating primarily through software. Software serves as a medium for intelligent design, acting as a catalyst for innovation and technological advancement. Given that the cost of goods sold (COGS) for software products approaches an asymptotic limit of zero, in stark contrast to most other models, we are presented with a compelling case for the software industry as the economic holy grail of the century.

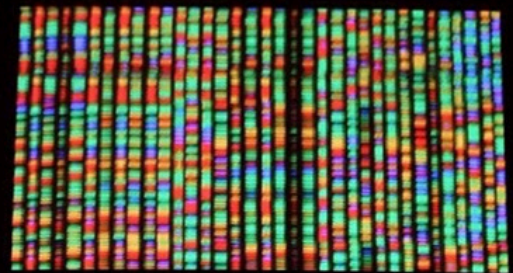
# “Harnessing the Code of Life.”



## Computational methods are Cost-effective.

Investing in simulation-based and computational approaches in genomics and biology offers significant advantages. These methods eliminate the need for costly laboratory infrastructure, allowing rapid experimentation and hypothesis testing without extensive material setups. They also facilitate the creation of robust predictive models to simulate biological systems under diverse conditions.

While a combination of computational and experimental methods is often ideal, prioritizing computational approaches can effectively accelerate scientific progress, especially in countries with limited research budgets. And in a world where Data is Hailed as the new oil of the nations, the case of bioinformatics and computational methods of life sciences stands strong. Bringing this vision to life depends primarily on addressing the challenge of accessing Big Data and ensuring the excellence of human expertise required for the complex Processing of Data. The central area of focus and action should be on nurturing fundamental science, primarily Mathematics and Computer Sciences, as they form the core of this expertise and specialized Know-How. This, in turn, paves the way for making interdisciplinary collaboration a limitless catalyst for scientific advancement across various knowledge domains.



With the present thesis, we aspire for our Nation to harness the potential of computing and software. This can only be achieved by cultivating our human capital, and promoting experimental sciences, ultimately earning an attractive return on our investment.

## **“Attention is all you need.”**

The search for a thinking machine.



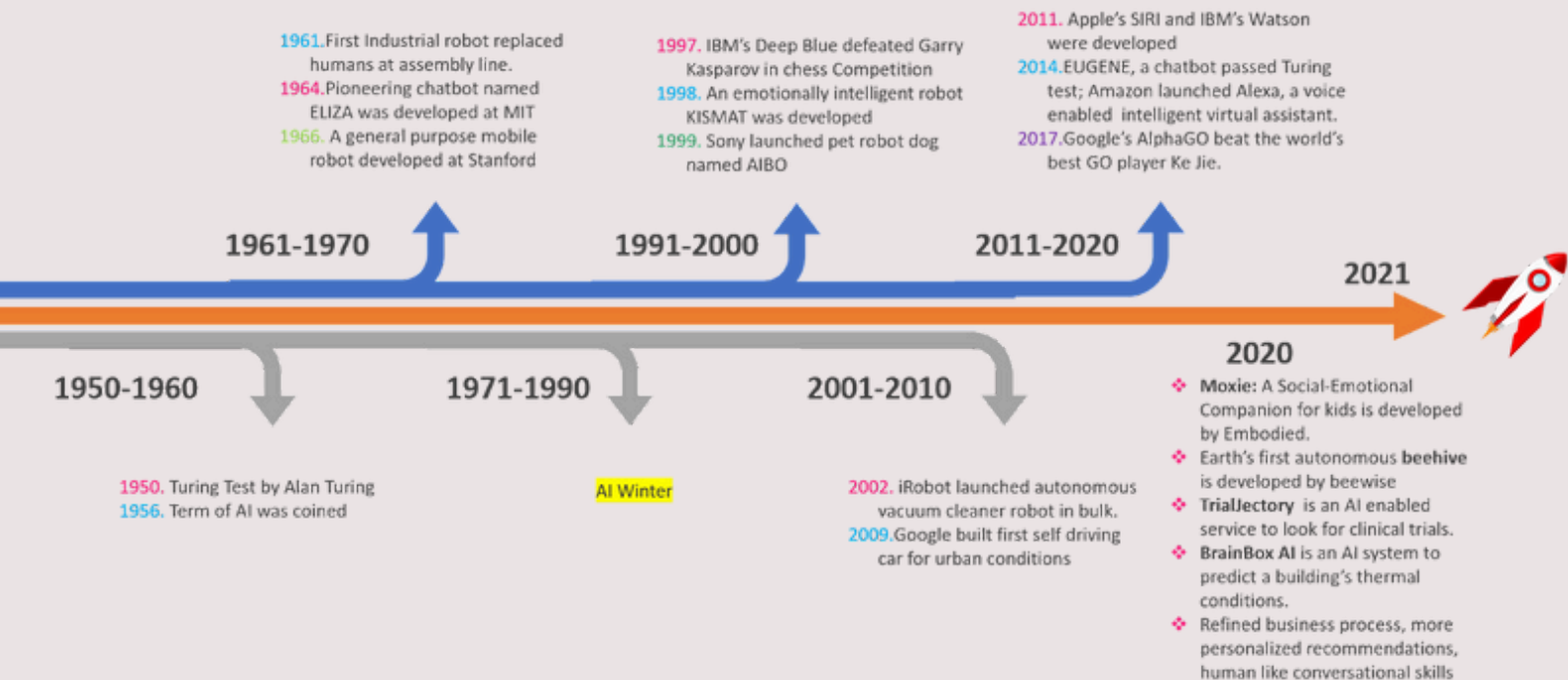
On May 11, 1997, Garry Kasparov faced IBM's Deep Blue supercomputer in a high-stakes chess match in Manhattan. As the final game unfolded, Kasparov, filled with anxiety and self-recrimination after an early mistake, realized his impending defeat within an hour. He resigned and graciously shook hands with Joseph Hoane, an IBM engineer who aided Deep Blue's development. Kasparov's quick loss sent shockwaves through the AI community.



In the wake of the last wave of monumental advancements in AI, epitomized by the awe-inspiring prowess of large language models like GPT, the world has witnessed an intellectual renaissance.

This remarkable innovation has not only unlocked unprecedented understanding and creativity in machines but has also woven a transformative tapestry of human-computer symbiosis, reshaping industries, transcending language barriers, and unveiling the boundless potential of artificial intelligence to illuminate our collective future.

“Catch up! Software ate the world, now AI is Eating Software.”



# “Machine learning is just statistics. On steroids. Lots and lots of steroids”

— Ilya Sutskever, Chief Scientist of OpenAI.

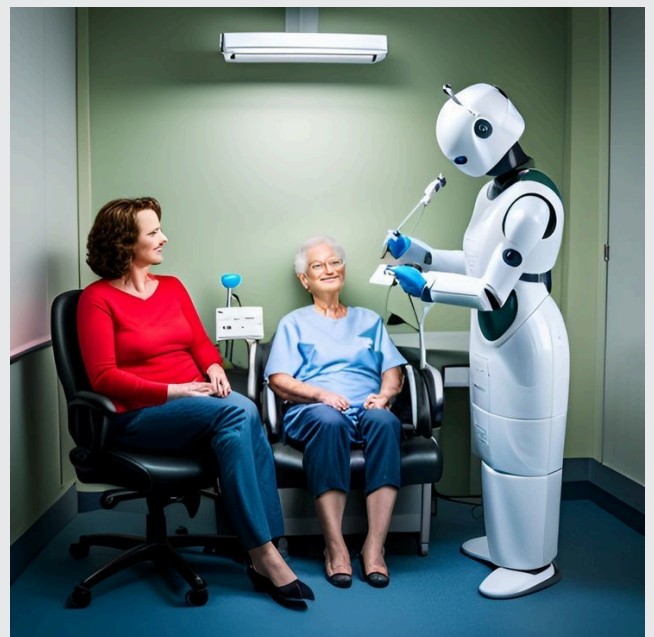


Artificial Intelligence promises to change the practice of medicine in hitherto unknown ways, but many of its practical applications are still in their infancy and need to be explored and developed better. Medical professionals also need to understand and acclimatize themselves with these advances for better healthcare delivery to the masses.

Alan Turing's groundbreaking work in the 1950s laid the foundation for modern computers and Artificial Intelligence. His "Turing test" concept challenged AI to achieve human-level cognition, sparking significant interest in the 1980s and 1990s.

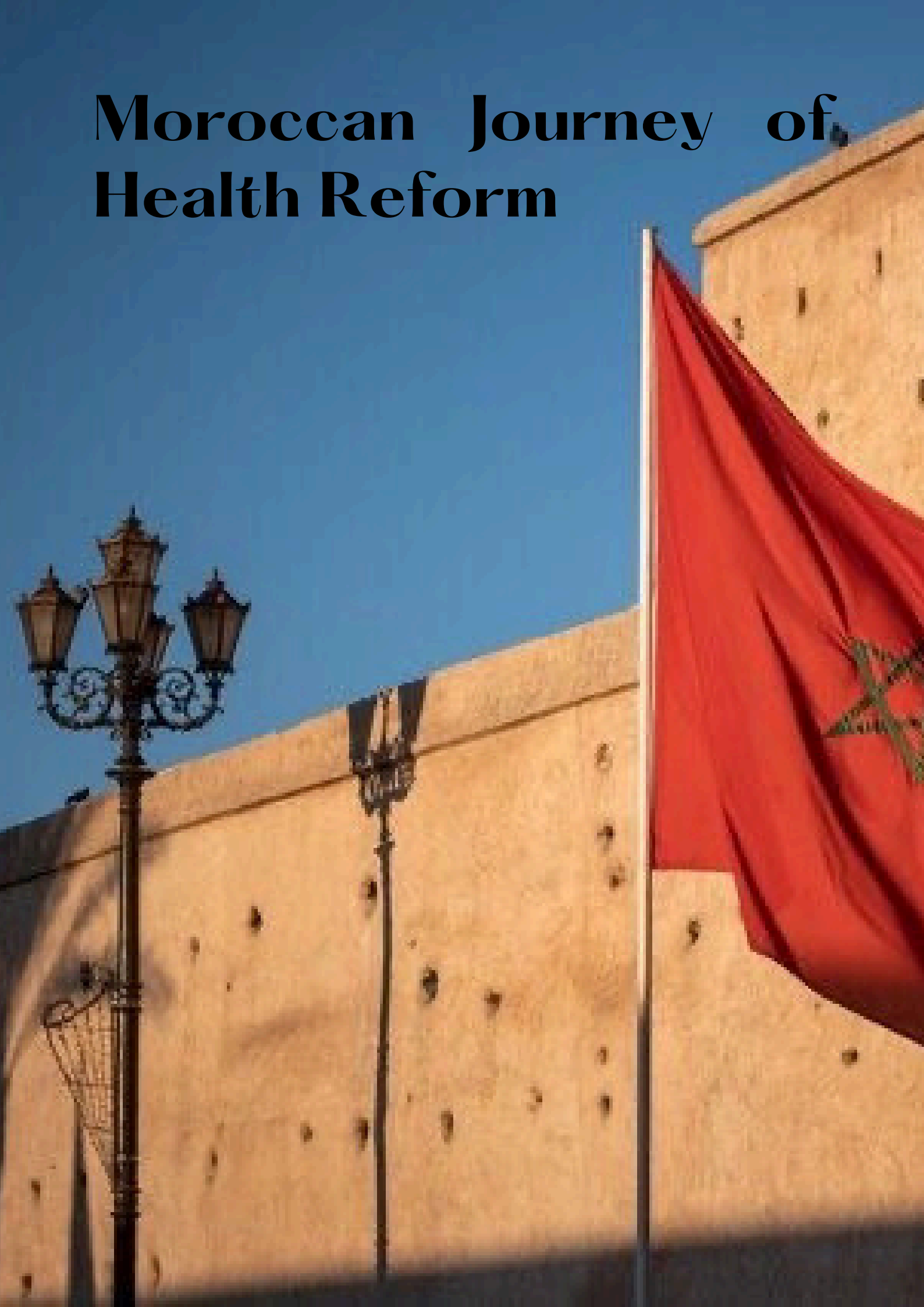
In healthcare, AI techniques like fuzzy expert systems, Bayesian networks, artificial neural networks, and hybrid systems have found applications.

Notably, healthcare emerged as a major focus of AI research investment in 2016. Two key approaches have been used for medical diagnosis: the flowchart-based method, which relies on extensive data but lacks the nuanced observations of a human doctor, and the database approach, employing deep learning to recognize patterns. Google's "artificial brain" project is a prime example of the latter, demonstrating the potential for AI to learn and improve its diagnostic accuracy over time.



*AI generated image*

# Moroccan Journey of Health Reform



2020

## In the midst of the global COVID-19 crisis: “Coopération internationale en santé 2020”

*“Dans un contexte mondial caractérisé par l’émergence de la Pandémie de la Covid-19, l’année 2020 a été une année sans précédent, mais également pleine d’opportunités, faisant ressortir le meilleur de tout un chacun en le poussant à innover. [...] En effet, l’émergence de cette crise sanitaire a incité, à travers l’adoption de solutions innovantes, à réorienter la coopération internationale vers le développement du transfert de technologies, de l’expertise et du savoir- faire. C’est ainsi que le Royaume du Maroc a renforcé sa coopération en santé en interpellant tous ses partenaires internationaux, bilatéraux et multilatéraux à agir ensemble contre cette crise”.*

2021

## Financing Strategy: “Stratégie nationale de financement de la santé 2021”

Ensuring a package of services for the entire population through sustainable healthcare financing.

Building upon the momentum generated by the COVID-19 national response plan, the government initiated a comprehensive health sector reform process in July 2020. This reform process was subsequently integrated into the New Development Model and the government's program in 2021.

**Quotation from the Ministry of Health Document Release :**

*“La stratégie de financement de la santé a été développée de manière à en faire un levier pour la mise en œuvre des futures réformes structurelles du système de santé[...].*

*Le développement et l’adoption de la stratégie du financement de la santé est, certes, une étape cruciale vers un financement pérenne de la santé. Toutefois, la phase de mise en œuvre exige une mobilisation de tous les acteurs pour l’atteinte effective de ses objectifs.”*

2022

## The Framework Law 06–22 : “Loi–cadre N°06–22, relatif au système national de santé”.

### Préambule :

*“La promotion du secteur de la santé, son développement et le rehaussement de ses performances est une responsabilité partagée entre l’Etat, les collectivités territoriales et les Établissements publics d’une part, et de secteur privé, la société civile, les organisations professionnelles et la population, d’autre part. En effet, la réforme en profondeur du système national de santé est devenue une nécessité impérieuse et une priorité nationale parmi les priorités de la politique générale de l’Etat tendant à valoriser le capital humain [...]”*

The Framework Law 06-22 on Health Reform introduced several key provisions, including the enhancement of governance and the digitization of the health information system, the enhancement of human resources for health, and the restructuring of healthcare service delivery.

### Chapitre II : Droit et devoir de la population

*Article.7 : “l’Etat oeuvre particulièrement à encourager et développer la recherche scientifique dans le domaine du médicament et des sciences médicales et sanitaires.”*

### Chapitre VII : Des ressources humaines, de la formation, de la recherche et de l’innovation dans le domaine de la santé

*Article.27: “l’Etat ainsi que les autres organismes publics et privés œuvrent à la prise de toutes les mesures nécessaires à l’encouragement des acteurs concernés à développer des projets de recherche innovants et à réaliser des programmes scientifiques spécialisés dans les domaines de santé revêtant un caractère de priorité nationale. ”*





**2023**

## **Moroccan Health Reform Program**

"Morocco is currently implementing one of the most ambitious and comprehensive health system reforms in the world, demonstrating its commitment to human capital development," —The World Bank officially reported.

# Manufacturing Innovation, What Formula?



**We are NIA,  
National Institutional Acceleration.**

The aim of the HealthTech Program is to establish a multidisciplinary space for scientific conception, catalyzing breakthrough innovations in medicine and health technologies to address national industrial challenges.

**Join Our mission**



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