AI's Impact on Healthcare and Pharmaceuticals in Saudi Vision 2030

Zeal's AI Series: Saudi Edition "November 22, 2023

Venue: Narcissus Hotel, Riyadh

Abdulmohsen Alrohaimi PhD, Shaqra Uinversity

A Growing Industry

According to Morgan Stanley, even “modest improvements in early-stage drug development success rates enabled by the use of artificial intelligence and machine learning” could result in an additional 50 novel therapies over a 10-year period, representing a more than $50 billion opportunity.

AI-enabled drug discovery more than doubling annually for five consecutive years and reaching more than $5.2 billion at the end of 2021.

If current trends continue, it will only be a matter of time before the drugs we take are no longer designed by people, but by machines. With the promise of lower costs and shorter development timeline

CRISPR/Cas9 with Artificial Intelligence

- **Jennifer Doudna and Emmanuelle Charpentier win 2020 Nobel Prize in Chemistry**
- The CRISPR-Cas9 complex is able to home in on a matching sequence with extraordinary precision. It opens completely new possibilities in gene therapy, cell therapy and immunotherapy
- Researchers have integrated CRISPR/Cas9 with artificial intelligence to improve cancer therapeutics

Saudi Vision 2030

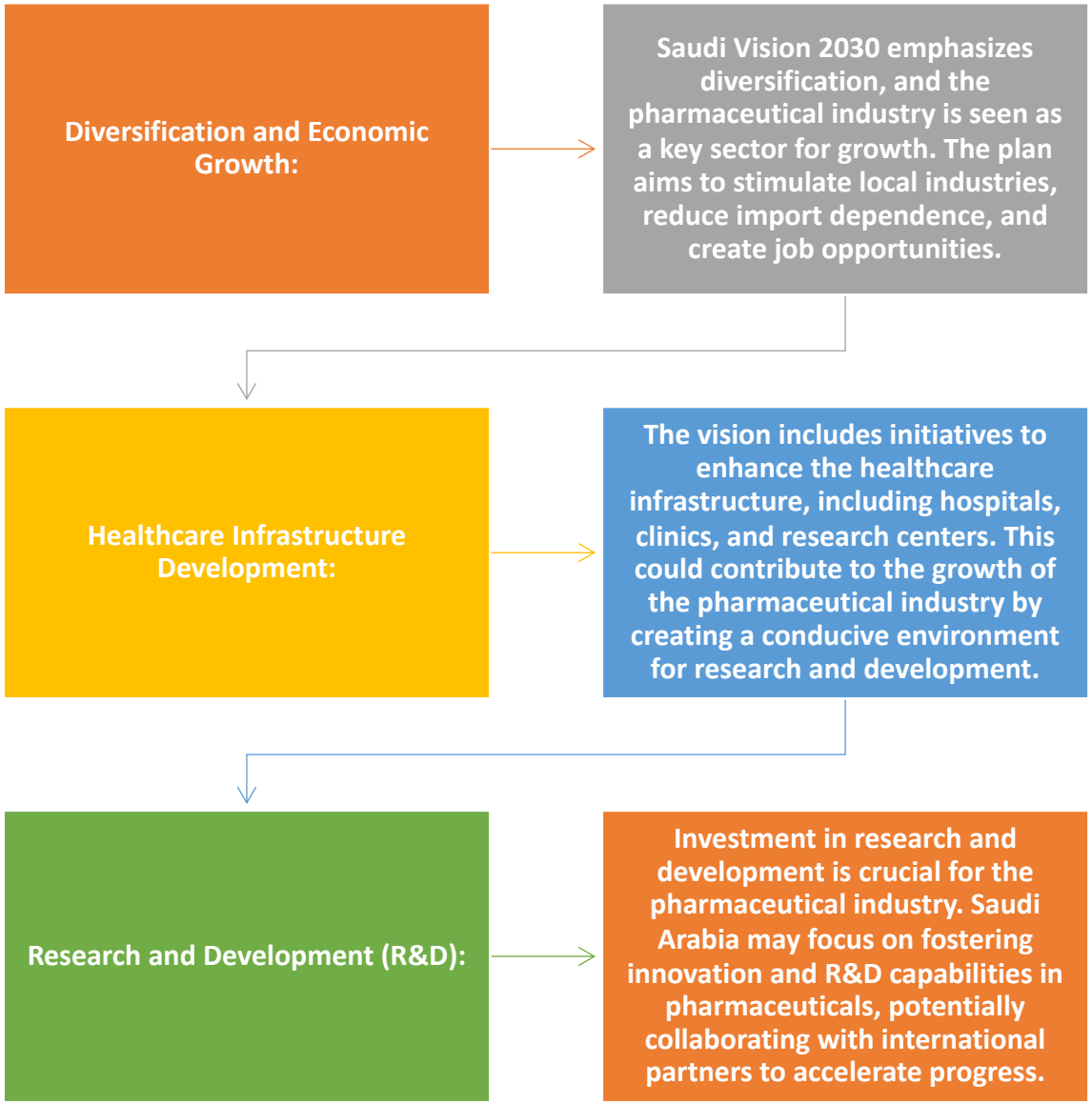
The initiative focuses on developing sectors such as tourism, entertainment, technology, healthcare, and renewable energy.

VISION 2030 is focused on world new frontier technologies include cloud computing, fintech, AI

KSA are planning to spend 2.5% of the country's GDP or $16 Billion in 2040 into R&D primarily focusing on aging and chronic diseases

The launch of Hevolution Foundation, a $20 Billion Saudi initiative aiming to spend over $1 Billion annually to extend healthy human life for everyone on the planet

Goal of Saudi Vision 2030



Saudi Vision 2030

Technology Integration:

Saudi Arabia is leveraging advancements in technologies such as artificial intelligence (AI), data analytics, and automation to enhance drug discovery, streamline manufacturing processes, and improve overall efficiency.

Telemedicine and Digital Health:

Saudi Arabia is embracing these technologies as part of its healthcare transformation.

Precision Medicine:

Saudi Arabia is investing in genetic research and personalized medicine, potentially influencing the pharmaceutical industry's approach to drug development.

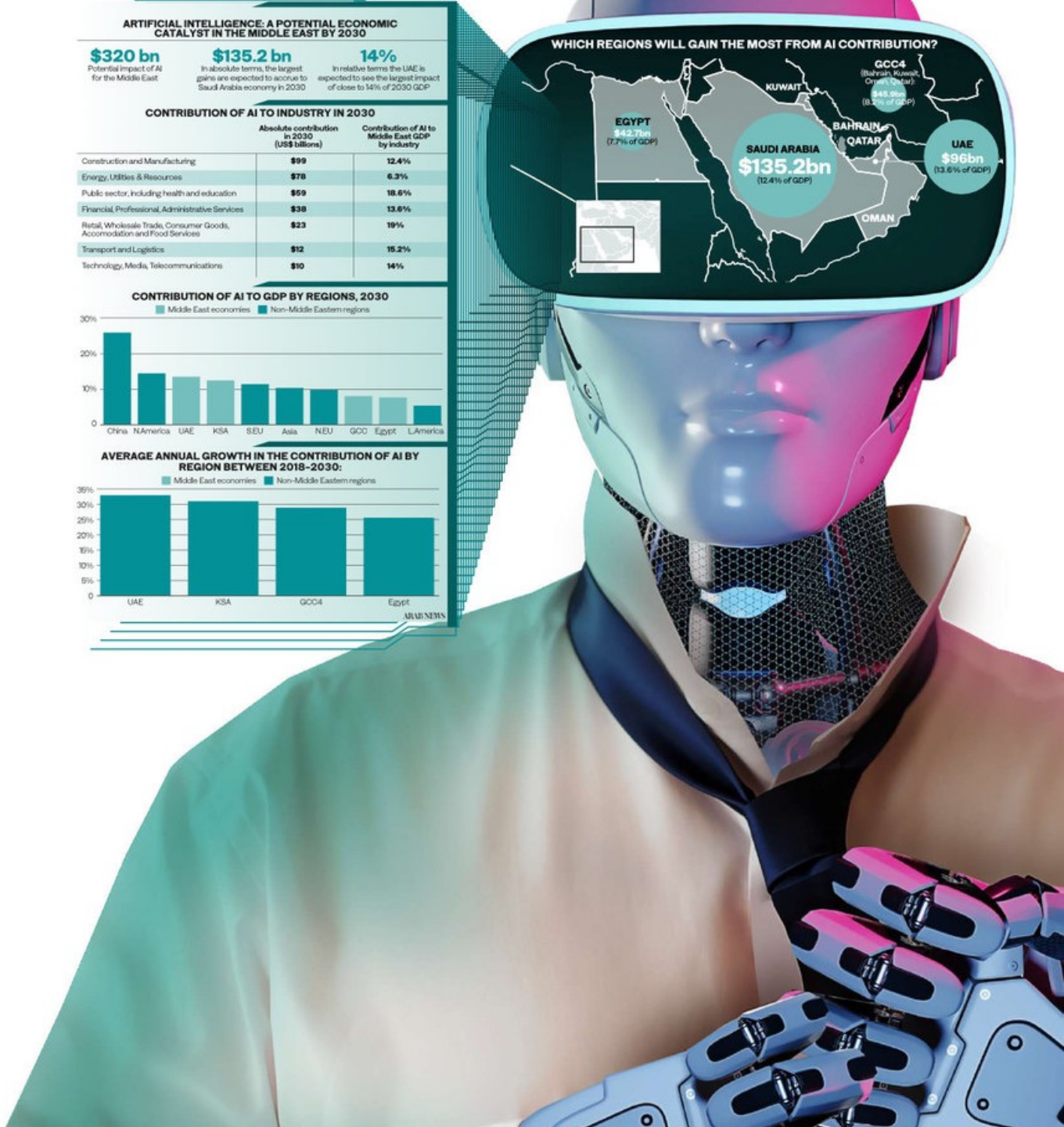
Regulatory Framework:

Saudi Arabia is working on enhancing its regulatory framework. Clear guidelines and regulations can encourage innovation and provide a stable environment for industry players.

Vision 2030 and AI

The Middle East is projected to accrue 2 percent of the total global benefits of AI in 2030, equivalent to $320 billion, with Saudi Arabia set to have the largest gains during that period with AI contributing over $135.2 billion to its economy

Saudi Arabia aims to transform its workforce by training and developing a pool of 20,000 AI and data specialists and experts, of whom 5,000 will be equipped with strong skills and will be highly qualified in line with the National Strategy for Data & AI



SADA (Saudi Data and AI Authority)

- **Enabling Data-Driven Healthcare:**
- **Harnessing the power of data to enhance medical insights.**
- **Facilitating evidence-based decision-making in healthcare.**
- **Innovation in Patient Care:**
- **Empowering healthcare providers with AI tools.**
- **Improving diagnosis, treatment, and patient outcomes.**
- **Strategic Collaborations:**
- **Collaborating with health institutions for technological advancements.**
- **Forging partnerships to accelerate healthcare innovation.**

HEVOLUTION

- **Healthcare Evolution Initiative: A national initiative aligned with Vision 2030.**
- **Focused on transforming and advancing healthcare services.**
- **Synergy of SADA and HEVOLUTION:**
  - **SADA's role in providing the digital infrastructure.**
  - **HEVOLUTION's mission in evolving healthcare services.**
- **Towards a Digital Healthcare Future:**
  - **Collaborative efforts for a technologically advanced and patient-centric healthcare landscape in Saudi Arabia.**

How AI Is Being Used

Target identification

Molecular simulations

Prediction of drug properties

De novo drug design

Candidate drug prioritization

Synthesis pathway generation

Milestones in AI-Enabled Drug Discovery

In early 2020, Exscientia announced the first-ever AI-designed drug molecule to enter human clinical trials.

In July 2021, an AI system by DeepMind called AlphaFold predicted the protein structures for 330,000 proteins, including all 20,000 proteins in the human genome. The AlphaFold Protein Structure Database has since expanded to include over 200 million proteins, covering nearly all cataloged proteins known to science.

In February 2022, Insilico Medicine reported the start of Phase I clinical trials for the first-ever AI-discovered molecule based on an AI-discovered novel target—all done at a fraction of the time and cost of traditional preclinical programs.

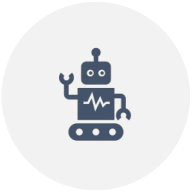
In January 2023, AbSci became the first entity "to create and validate de novo antibodies in silico" using generative AI.

In February 2023, the FDA granted its first Orphan Drug Designation to a drug discovered and designed using AI; Insilico Medicine plans to begin a global Phase II trial for the drug "early" this year.

According to Boston Consulting Group, as of March 2022, "biotech companies using an AI-first approach [had] more than 150 small-molecule drugs in discovery and more than 15 already in clinical trials." But how exactly is AI being used to accomplish these milestones, and why does it matter?

The Possible Risks and Harms

the potential to amplify errors and pre-existing biases in data sources”



Concerns about the “generalizability and ethical considerations” of using AI/ML outside of the testing environment

The limited explain ability and transparency of many AI/ML models

Data privacy and security considerations

Issues with reproducibility and replicability

Opportunities for Improvement

Three main areas of AI/ML usage

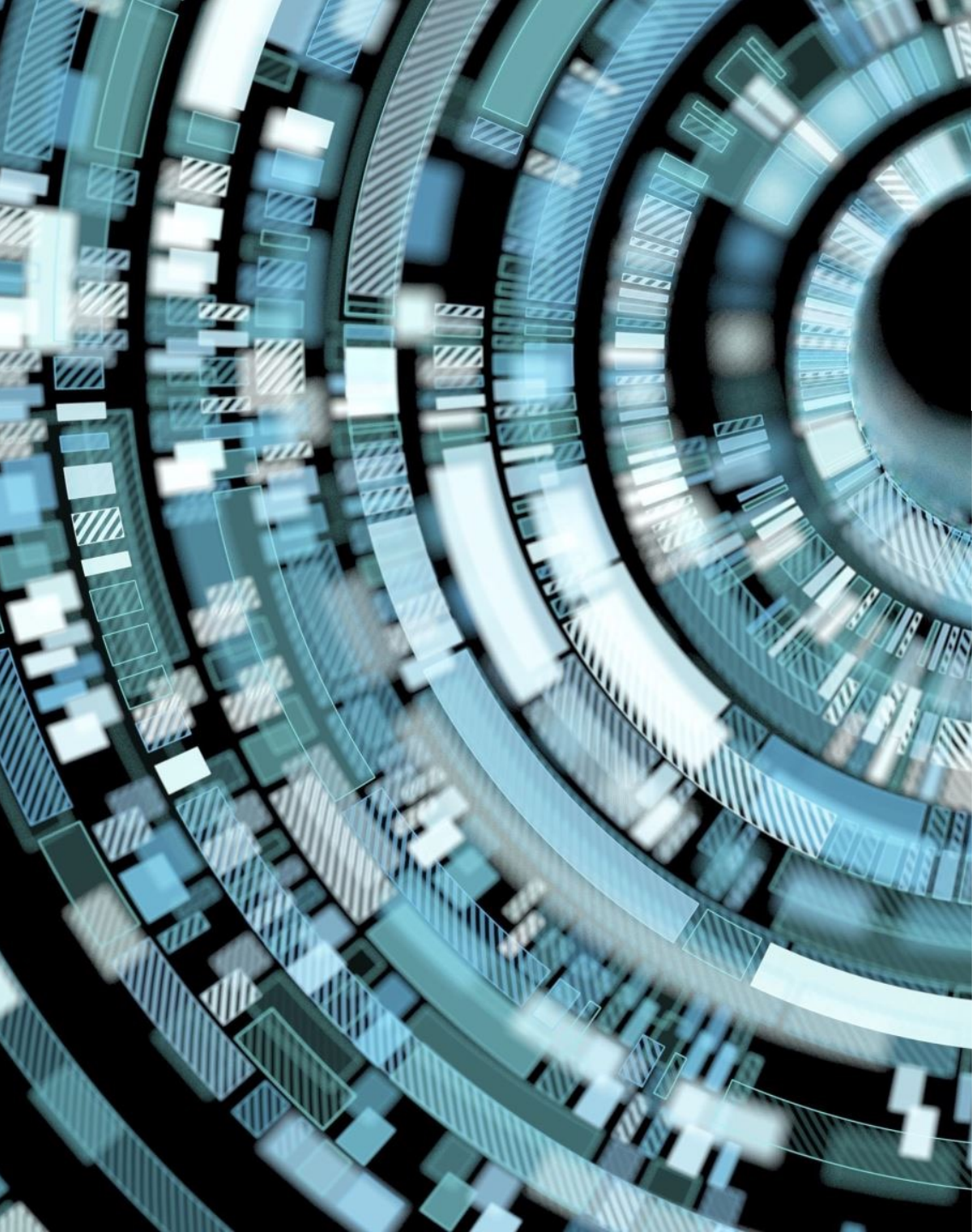
Human-led governance, accountability, and transparency;

Quality, reliability, and representativeness of data

Model development, performance, monitoring, and validation

Stakeholder Engagement

FDA provide several other mechanisms to engage with stakeholders and highlighted existing avenues for discussing relevant AI/ML issues with the agency including the Critical Path Innovation Meetings (CPIM), ISTAND Pilot Program, Emerging Technology Program, and Real-World Evidence Program.



Ethical issues in artificial intelligence in healthcare

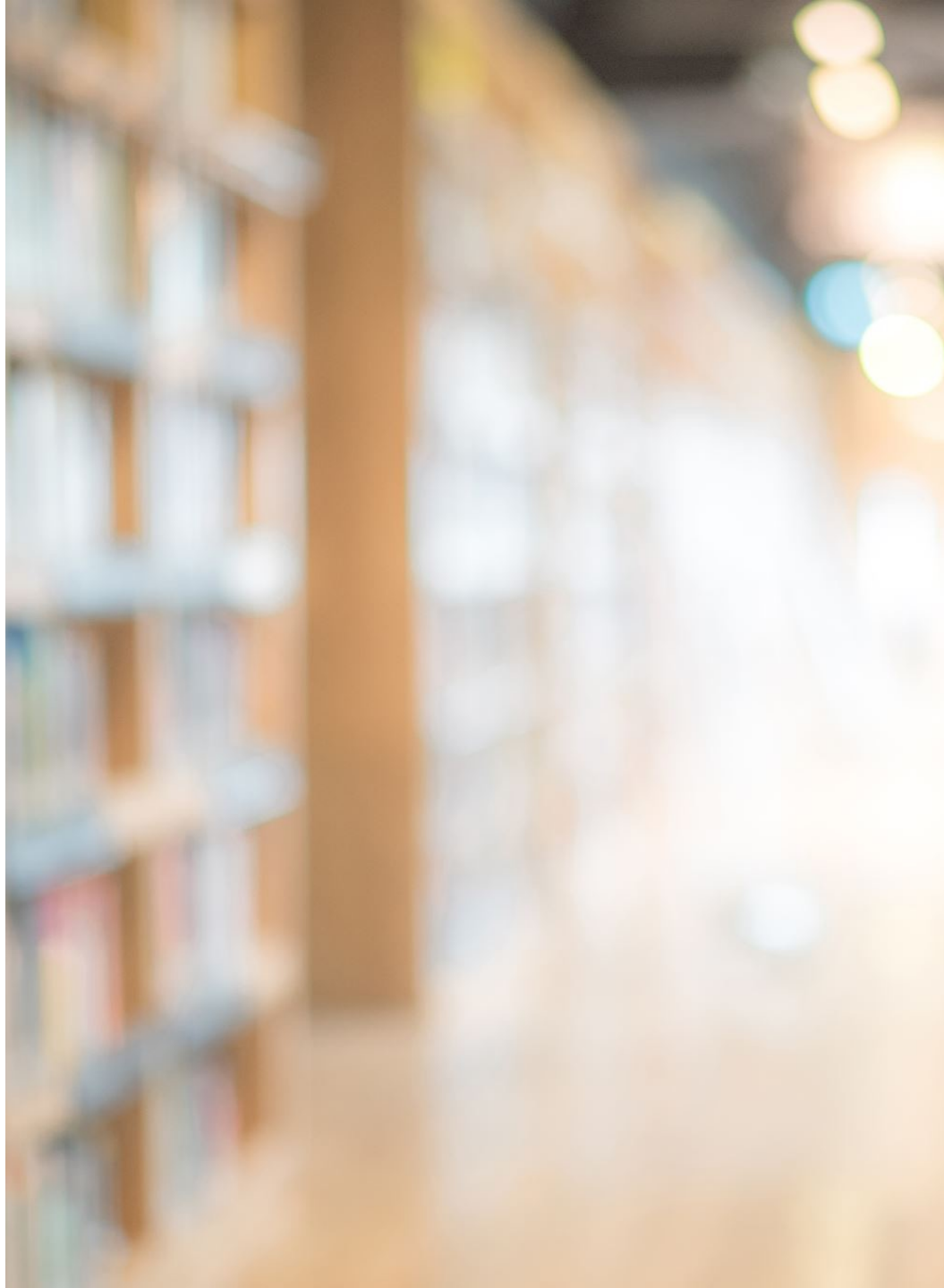
- Privacy and data security
- Bias and fairness
- Transparency and accountability
- Informed consent
- Medical liability
- Data quality and representativeness
- Resource allocation
- Patient autonomy

Ethical issues in artificial intelligence in healthcare

Addressing these challenges requires collaboration among healthcare professionals, policymakers, and technologists to develop ethical guidelines and regulations for AI in healthcare.

Shaqra University Unveils Groundbreaking Initiative:

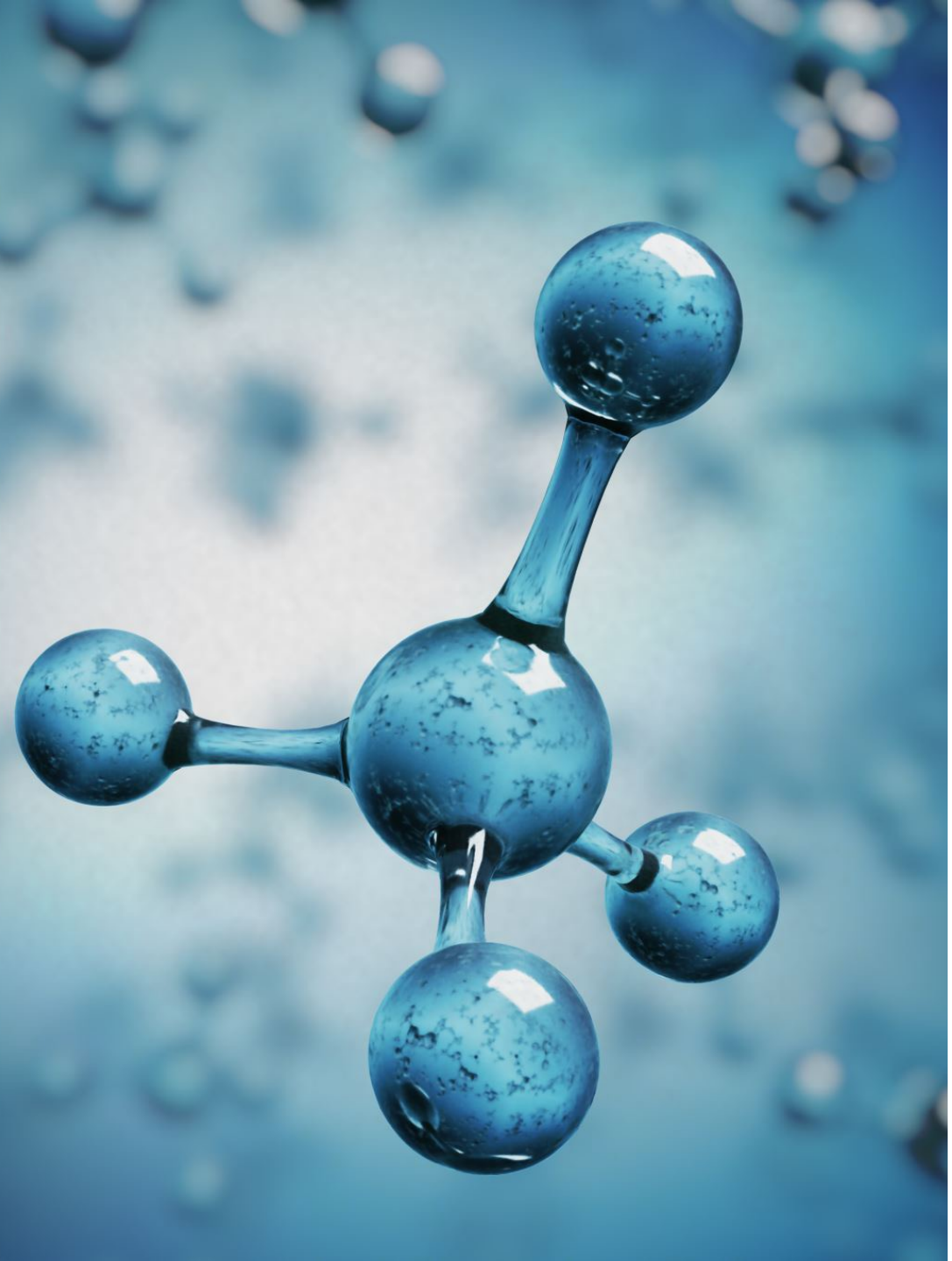
Shaqra University is thrilled to announce the upcoming launch of a pioneering initiative - The Saudi Scientific Association for Artificial Intelligence Applications in the Pharmaceutical Industries and Health Research. In its final stages of approval, this association represents a significant leap towards integrating cutting-edge technology into the realms of healthcare and pharmaceuticals.



Shaqra University Unveils Groundbreaking Initiative: Scientific Reseacrh Project

Utilizing CRISPR Technology for Gene Mutation Applications

- **According to a study published in the Annals of Saudi Medicine, the most prevalent genetic disorders in Saudi Arabia are hematologic (32%), endocrine (21%), metabolic (11%) and immunological (10%) diseases.**
- **Saudi Human Genome Program (SHGP) is a project that aims to sequence 100,000 human genomes over the next five years to conduct world-class genomics-based biomedical research in the Saudi population**
- **1. The project targets the sequencing of genomes of individuals with genetic disorders, which will help identify the mutations and respective genes that predispose individuals to the diseases**
- **2. The SHGP will provide the necessary infrastructure to solve cases and understand disease in the Saudi population.**

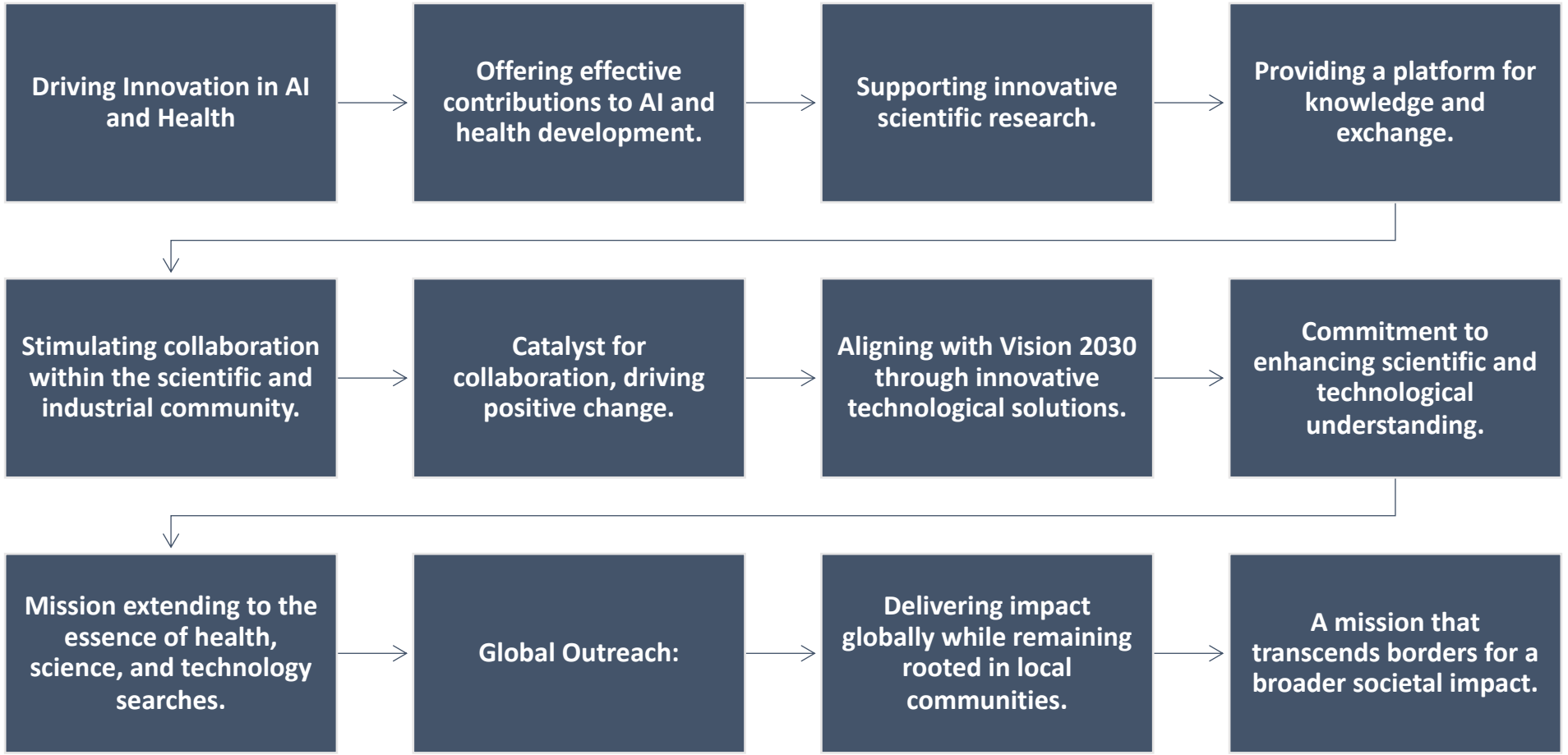


The Saudi Scientific Association for Artificial Intelligence Applications in the Pharmaceutical Industries and Health Research

Vision:

- **Pioneering Transformation in AI for Health**
- **Becoming leaders in AI applications for pharmaceuticals and health research.**
- **Striving for a revolutionary shift in scientific and technological exploration.**
- **Key driver of progress and innovators in effective solutions.**
- **Enhancing the quality of life and addressing community needs.**
- **Achieving scientific and technological excellence.**
- **Providing a stimulating environment for researchers and innovators.**
- **Contributing to advancements in the Kingdom of Saudi Arabia and beyond.**

Mission


Driving Innovation in AI and Health
Offering effective contributions to AI and health development.
Supporting innovative scientific research.
Providing a platform for knowledge and exchange.
Stimulating collaboration within the scientific and industrial community.
Catalyst for collaboration, driving positive change.
Aligning with Vision 2030 through innovative technological solutions.
Commitment to enhancing scientific and technological understanding.
Mission extending to the essence of health, science, and technology searches.
Global Outreach:
Delivering impact globally while remaining rooted in local communities.
A mission that transcends borders for a broader societal impact.

We extend our heartfelt appreciation to Mr. Mohamed Zeeshan and the entire Zeal Forum team for the invaluable opportunity to share our knowledge.

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