



Facultatea de Electronică,
Telecomunicații și
Tehnologia Informației

SISTEME INTELIGENTE DE SUPORT DECIZIONAL

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**Curs 12 – AI-DSS în domeniul medical –
implementare și studii de caz.**

Cuprins

- AI-DSS în domeniul medical – context, nevoi, soluții
- Integrarea AI
- Aplicații
- Regularizare
- Provocări

Context/motivație

- viteză mare de analiză și procesare a datelor cu ajutorul AI
- accelerarea proceselor de digitalizare impusă de pandemie
- diagnoză și monitorizare la distanță (*remote medicine*)

Nevoi apărute ca urmare a utilizării AI în domeniul medical

- regularizări ale operațiunilor desfășurate prin intermediul AI
- mecanisme de supervizare
- “locked vs. adaptive” AI challenge

Soluții?

Ce spun pacienții?

[US Healthcare Industry 2022: Sectors, Trends & Statistics \(insiderintelligence.com\)](https://www.insiderintelligence.com)

Factors that Are Important When Engaging with Healthcare According to US Adults, March 2021 % of respondents

Ease of access to care

89%

Privacy (e.g., keeping private health information confidential)

89%

Data security

88%

Getting what you consider to be personalized care

88%

Having a care provider who is close to where you live or work

85%

Healthcare costs

85%

Coordination among all my healthcare providers

84%

Being able to monitor my health (e.g., using apps, wearable devices)

75%

Access to a health coach (e.g., someone who helps you make food and lifestyle changes to improve your well-being)

68%

Note: ages 18+

Source: CVS, "The 2021 Health Care Insights Study" conducted by Market Measurement, July 8, 2021

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InsiderIntelligence.com

AI in medicine book



Machine Learning in Healthcare... Deep Learning in Healthcare... Machine Learning and AI for... Demystify... Big Data and Machi... Machine Learning for Healthcare... Introduction to Deep Learning f...

☰ Google Scholar

🎓 Articles About 3,270,000 results (0.13 sec)

☰ Google Scholar

🎓 Articles About 4,920,000 results (0.13 sec)

☰ Google Scholar

🎓 Articles About 1,570,000 results (0.05 sec)

Avantaje

- Reducerea erorilor
- Creșterea siguranței pacienților
- Reducerea costurilor
- Creșterea interacțiunii medic-pacient
- Creșterea vitezei de diagnoză
- Reducerea timpului de stabilire a tratamentului

Integrarea AI în domeniul medical - tipuri

- Patient-oriented
- Clinician-oriented
- Administration-oriented

Termeni de specialitate

MML – Medical Machine Learning

EHR/EMR – electronic health record/electronic medical record

RPM – remote patient monitoring

IoMT – Internet of Medical Things

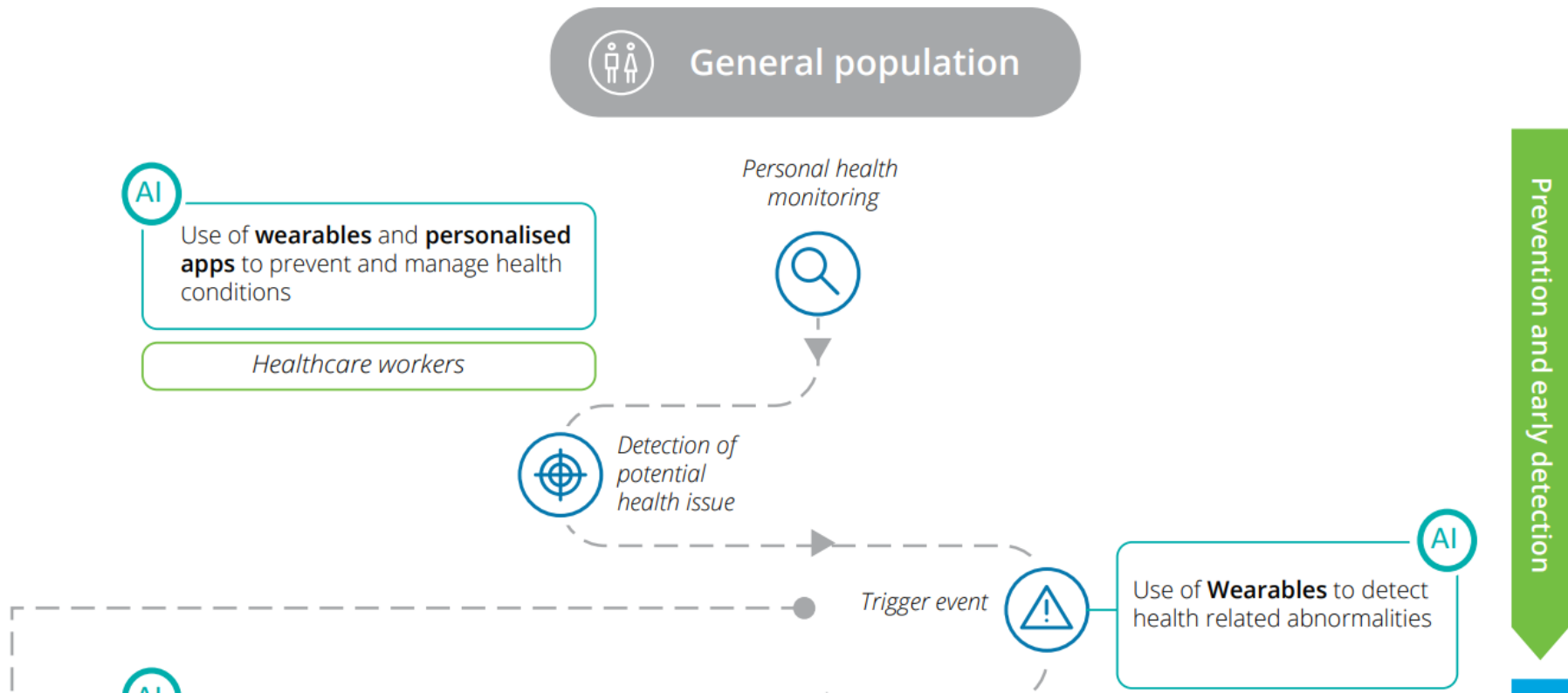
Integrarea AI în domeniul medical - prognoză

Attractive Opportunities in Artificial Intelligence in Healthcare Market



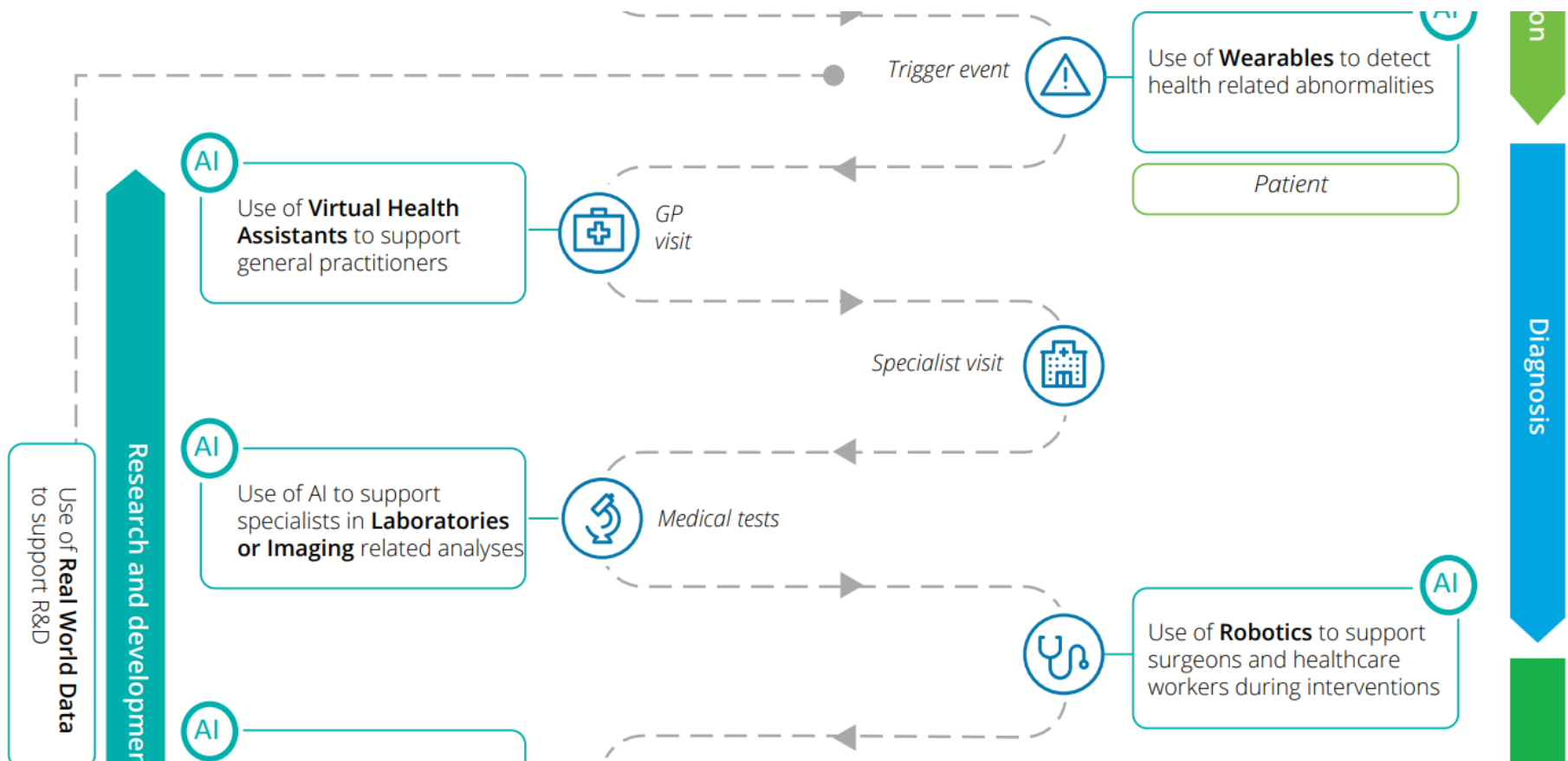
Source: Secondary Literature, Annual Reports, Press Releases, Journals, Industry News, White Papers, Expert Interviews, Blogs, and MarketsandMarkets Analysis

Flux de integrare a AI în domeniul medical



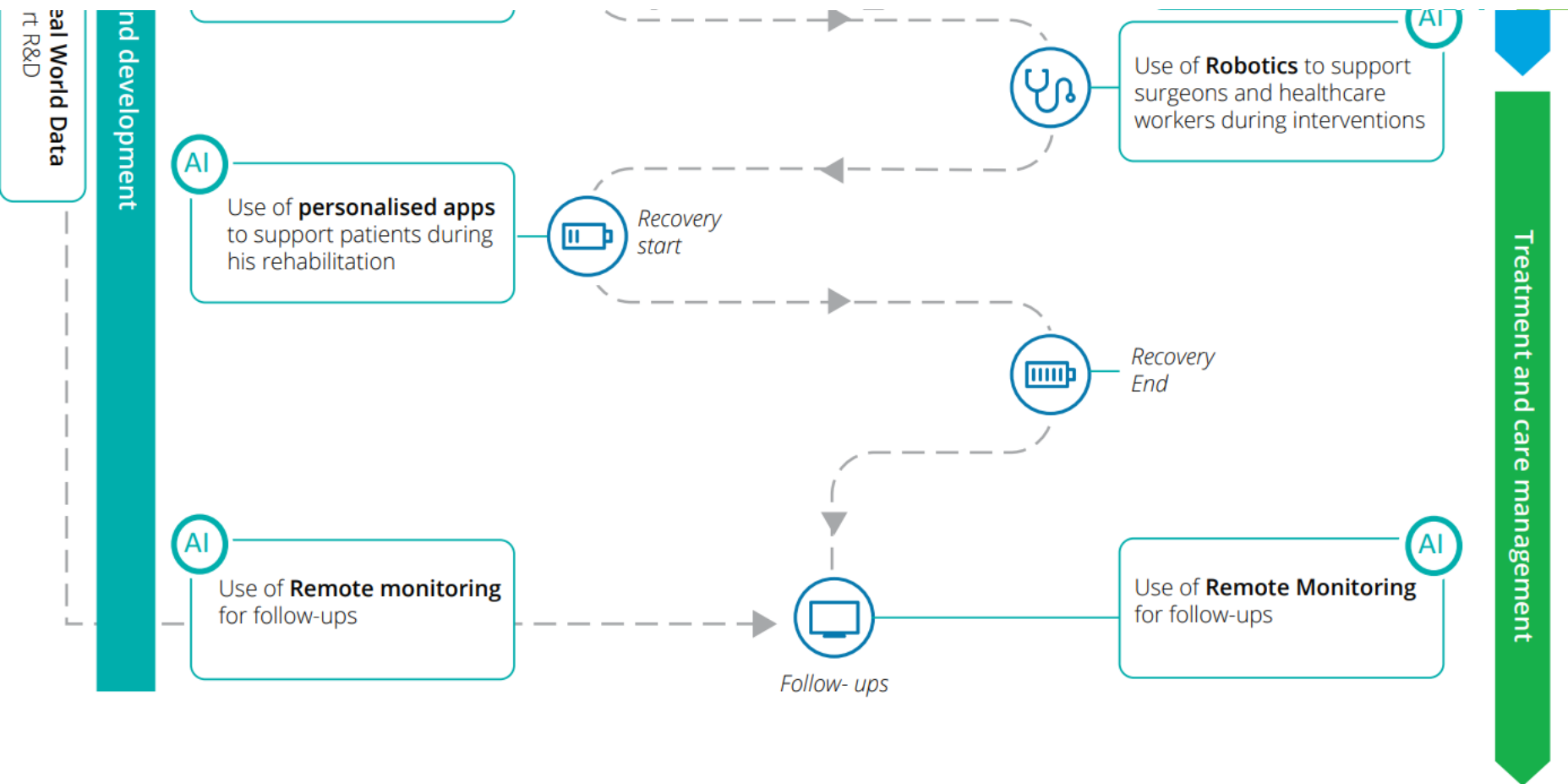
[AI-event-flyer-digital \(medtecheurope.org\)](https://medtecheurope.org)

Flux de integrare a AI în domeniul medical



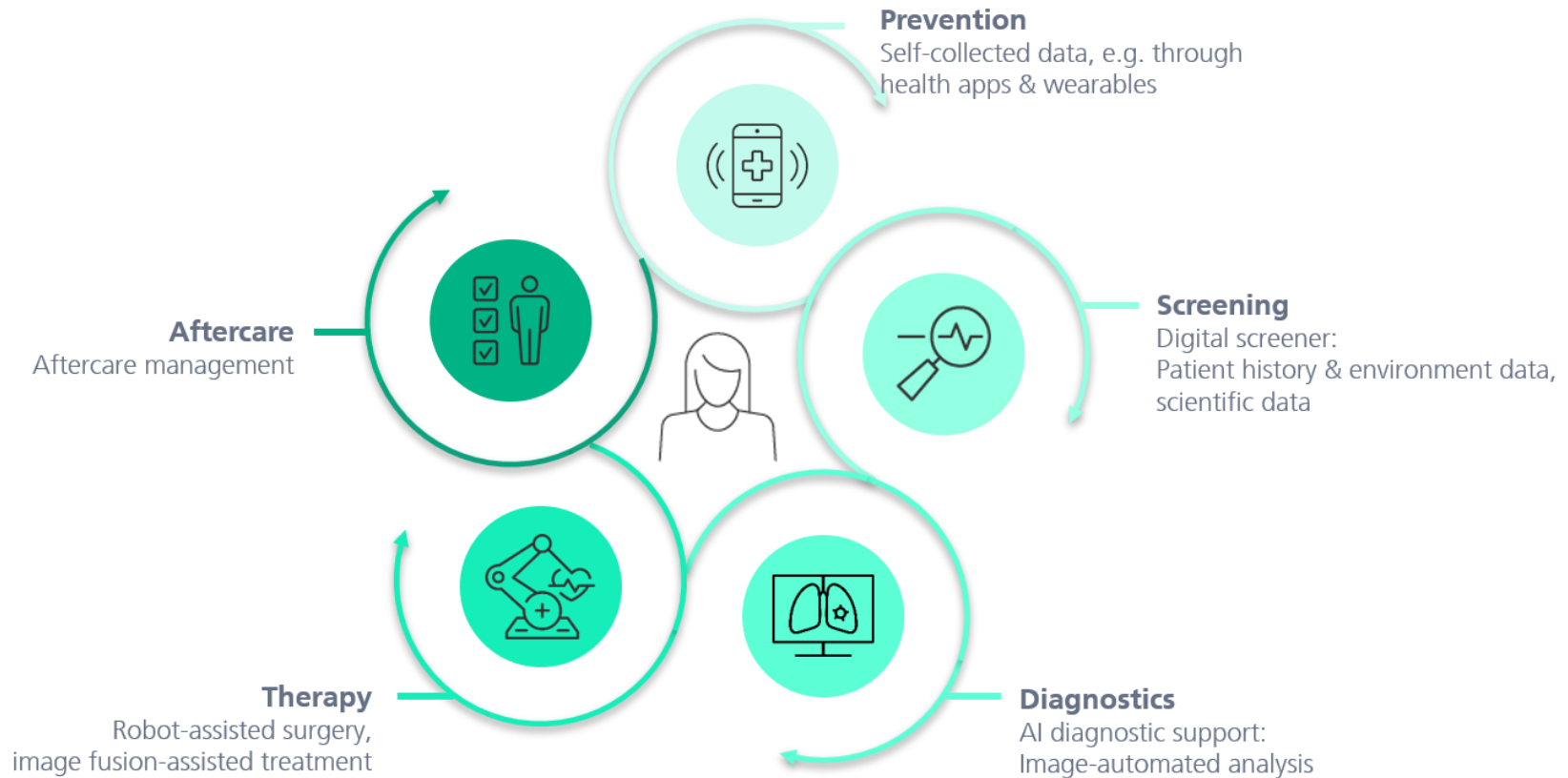
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Flux de integrare a AI în domeniul medical



[AI-event-flyer-digital \(medtecheurope.org\)](http://medtecheurope.org)

Digital medical experience



[Artificial Intelligence in Medicine - Fraunhofer IKS](#)

Unde poate ajuta AI în medicină?

- Detecție boli și stabilire diagnostic
- Tratament personalizat
- Imagistică și radiologie
- Chirurgie robotică
- Eficientizare teste clinice
- Dezvoltare de noi medicamente
- Automatizarea proceselor administrative

[Artificial Intelligence in Medicine | IBM](#)

Unde poate ajuta AI în medicină?

- ❑ Detecție boli și stabilire diagnostic



Detecting **lung cancer**
from CT Scans



Assess **cardiac health**
from electrocardiograms



Classify **skin lesions**
from images of the skin



Identify **retinopathy**
from eye images

[Artificial Intelligence in Medicine | The Top 4 Applications \(datarevenue.com\)](https://www.datarevenue.com)

Unde poate ajuta AI în medicină?

- ❑ Dezvoltare de noi medicamente

The 4 Stages in Drug Development



Identify **target** molecules



Discover **effective** drugs



Speed up **clinical** trials



Find **biomarkers** for diagnostics

[Artificial Intelligence in Medicine | The Top 4 Applications \(datarevenue.com\)](https://datarevenue.com)

Unde poate ajuta AI în medicină?

DynaMed® and Micromedex®
with Watson™

Provide AI-powered support to clinicians to help them make more informed, evidence-based decisions.

IBM® Watson Annotator for
Clinical Data

Extract key clinical information, like diagnoses, medications and more, from clinical notes and other medical records.

IBM® Watson Assistant for
Health Benefits

Answer real-world questions about complex health plan benefits quickly and easily.

IBM® Clinical Development

Manage clinical trials end-to-end, including an AI component to ease medical coding.

[Artificial Intelligence in Medicine | IBM](#)

Unde poate ajuta AI în medicină?

[Vicarious Surgical | Surgical Robotics Technology](#)



THE VICARIOUS SURGICAL ROBOT

Technology So Advanced, You Won't Know It's There.

The Vicarious Surgical robot design intends to maximize visualization, precision, and control of instruments in robotic-assisted minimally invasive surgery. It's almost as if **the surgeon is transported** into the patient's body.



Unde poate ajuta AI în medicină?

[PathAI | Pathology Transformed](#)



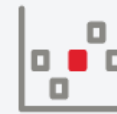
Accurate

AI-based pathology can produce more accurate results, reducing the subjectivity that can result in significant error rates.



Reproducible

AI and Image Analysis can improve the reproducibility of pathological diagnoses.



Predictive

AI-based pathology can precisely predict response to new therapies.

Unde poate ajuta AI în medicină?

[BenevolentAI | AI Drug Discovery](#)

AI-Enabled Drug Discovery




We bring the most advanced technologies together with cutting edge science to decipher complex disease biology, de-risk drug development, and discover more effective therapies for patients in need. We believe we can build a healthier world in which no disease goes untreated. **This is the future we are creating at BenevolentAI.**

Unde poate ajuta AI în medicină?

[Check your symptoms and find the right care |
Buoy \(buoyhealth.com\)](https://www.buoyhealth.com)

Buoy Health's symptom checker

How it works

-  Tell us your symptoms — takes less than 5 minutes.
-  Learn the most likely causes based on your symptoms and health history.
-  See home care options and treatments from medical experts.



[More on our medical expertise](#)

This tool is not a substitute for professional medical advice, diagnosis, or treatment. If you are experiencing a life-threatening emergency that requires immediate attention please call 911 or the number for your local emergency service.

Unde poate ajuta AI în medicină?

Wearable devices for:

fall detection

activity recognition

eating monitoring

fitness tracking

hydration monitoring

stress detection

emotion recognition

sleep monitoring

arrhythmia detection

seizure detection

[Machine Learning for Healthcare Wearable Devices: The Big Picture - PMC \(nih.gov\)](#)

Regularizarea AI în domeniul medical

- Artificial Intelligence Act (2021) – Comisia Europeană
- Artificial Intelligence/Machine Learning (AI-ML)-Based Software as a Medical Device (SaMD) Action Plan (2021) – FDA (SUA)

Niveluri de risc în utilizarea AI:

- inacceptabil, ridicat, mediu, scăzut
- AI în medicină -> risc ridicat

[How the challenge of regulating AI in healthcare is escalating \(ey.com\)](#)

Regularizarea AI în domeniul medical

Criteria de îndeplinit pentru ca un sistem bazat pe AI să primească aprobare:

1. Adequate **risk assessment** and mitigation systems
2. **High quality of the datasets** feeding the system to reduce risks and discriminatory outcomes
3. Logging of activity to ensure **traceability** of results
4. **Detailed documentation** providing all information necessary on the system and its purpose, for authorities to assess its compliance
5. Clear and adequate **information to the user**
6. Appropriate **human oversight measures** to reduce risk
7. High level of **robustness, security and accuracy**

[How the challenge of regulating AI in healthcare is escalating \(ey.com\)](#)

Provocări

- Disponibilitatea datelor (în special pentru boli rare)
- Lipsa de încredere a pacienților
- Transparența și trasabilitatea deciziilor – *black box*, sisteme ce nu își pot explica deciziile
- Mentenanță și actualizare continuă
- Confidențialitate și protecția datelor
- Alert fatigue* – sistemul generează un număr ridicat de alerte; unele alerte critice ar putea fi ignorate
- Discriminare – *fair AI, algorithmic bias*

[AI has come to healthcare: What are the pitfalls and opportunities? | MobiHealthNews](#)

[PAIR \(People + AI Research\) Measuring Fairness \(pair.withgoogle.com\)](#)

Provocări

❑ Vor fi medicii înlocuiți de AI în viitor?

- empatie
- creativitate și abilități de rezolvare a problemelor complexe

Ex. House MD

- alegerea metodei/tratamentului final (human-in-the-loop)
- manevre/proceduri care nu pot fi efectuate de roboți

Ex. resuscitare, intubare, manevra Heimlich

- Tech vs. Human devine Tech plus Human

[5 reasons why Artificial Intelligence won't replace physicians - Hunimed](#)

- AI-DSS în domeniul medical – context, nevoi, soluții ✓
- Integrarea AI ✓
- Aplicații ✓
- Regularizare ✓
- Provocări ✓

În episodul următor: **Decizii strategice în mediul economic.**
Studii de caz.