



21 September
University
For Medical & Applied
Sciences



Bioinformatics in Medical Devices

Dr. \ Awadh Ali Mohammed

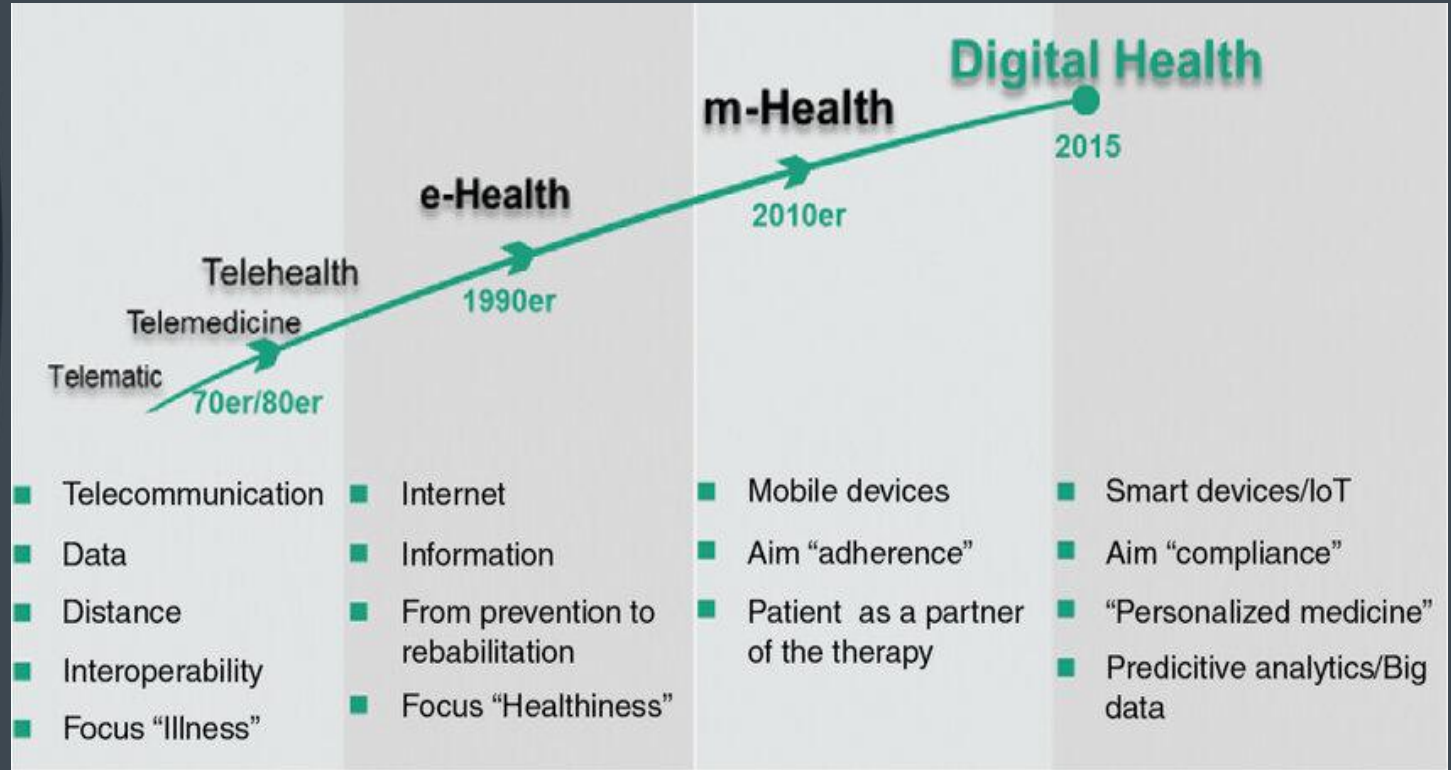
Faculty of Medical Technology



Titles

- **Bioinformatics From telematics to Digital Health – A brief history.**
- **Bioinformatics uses in medical devices.**
- **Bioinformatics in Wearable Devices.**
- **Bioinformatics in Prosthetic Devices.**
- **Bioinformatics in Diagnostic Devices.**
- **Bioinformatics in Therapeutic Devices.**
- **Top 9 AI Applications In Healthcare.**
- **Conclusion.**

Bioinformatics from Telematics to Digital Health – A brief history





Bioinformatics uses in medical devices

1

Wearable Devices

Bioinformatics can be used to develop new sensors and algorithms that can detect a variety of health parameters, from heart rate to blood sugar levels

2

Prosthetic Devices

Bioinformatics plays a significant role in the development of prosthetic devices by analyzing biological data, creating models, developing algorithms, and contributing to the overall improvement of these devices.

3

Diagnostic Devices

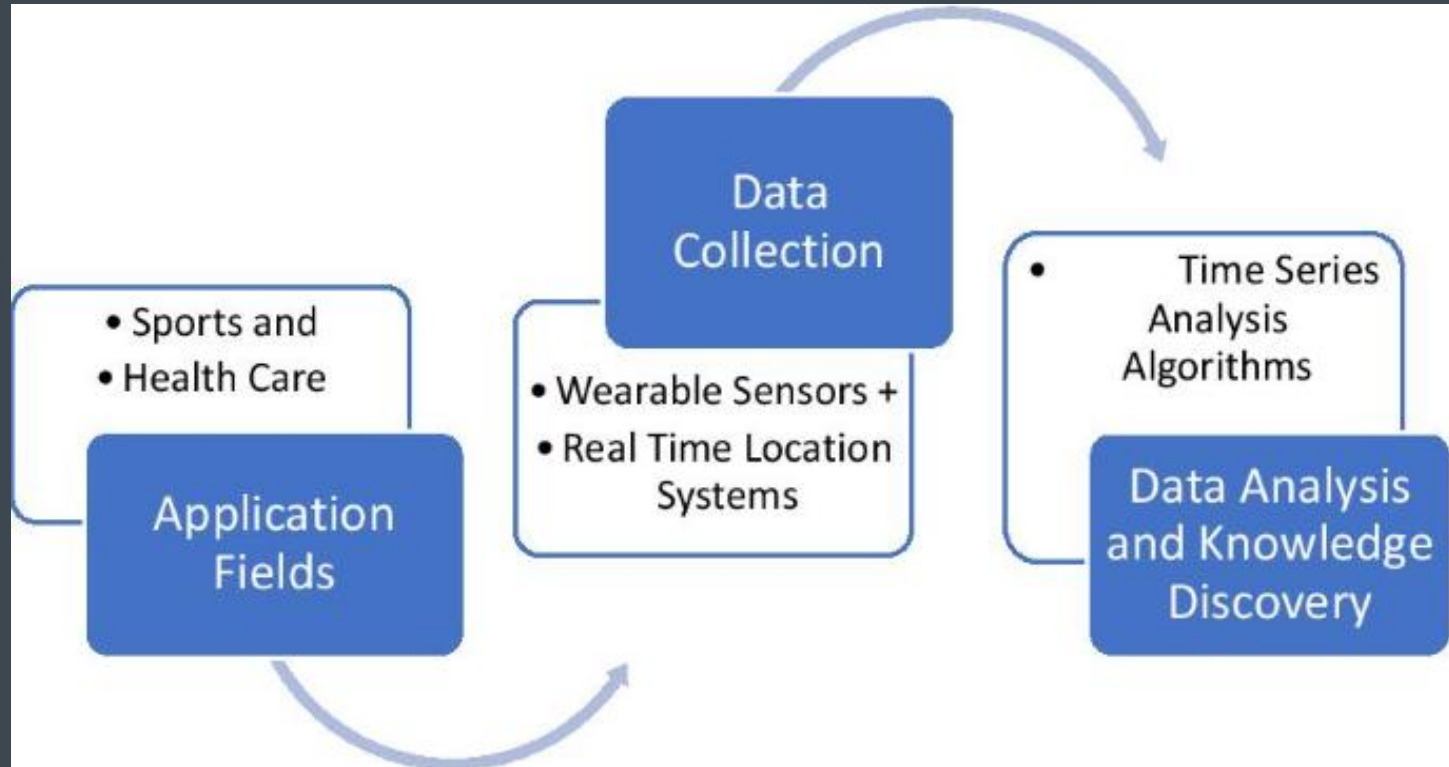
Bioinformatics plays a critical role in the development and use of diagnostic devices, helping to improve diagnosis, treatment, and patient outcomes. It used in: Data analysis, Disease prediction, Personalized medicine, Drug discovery, and Quality control.

4

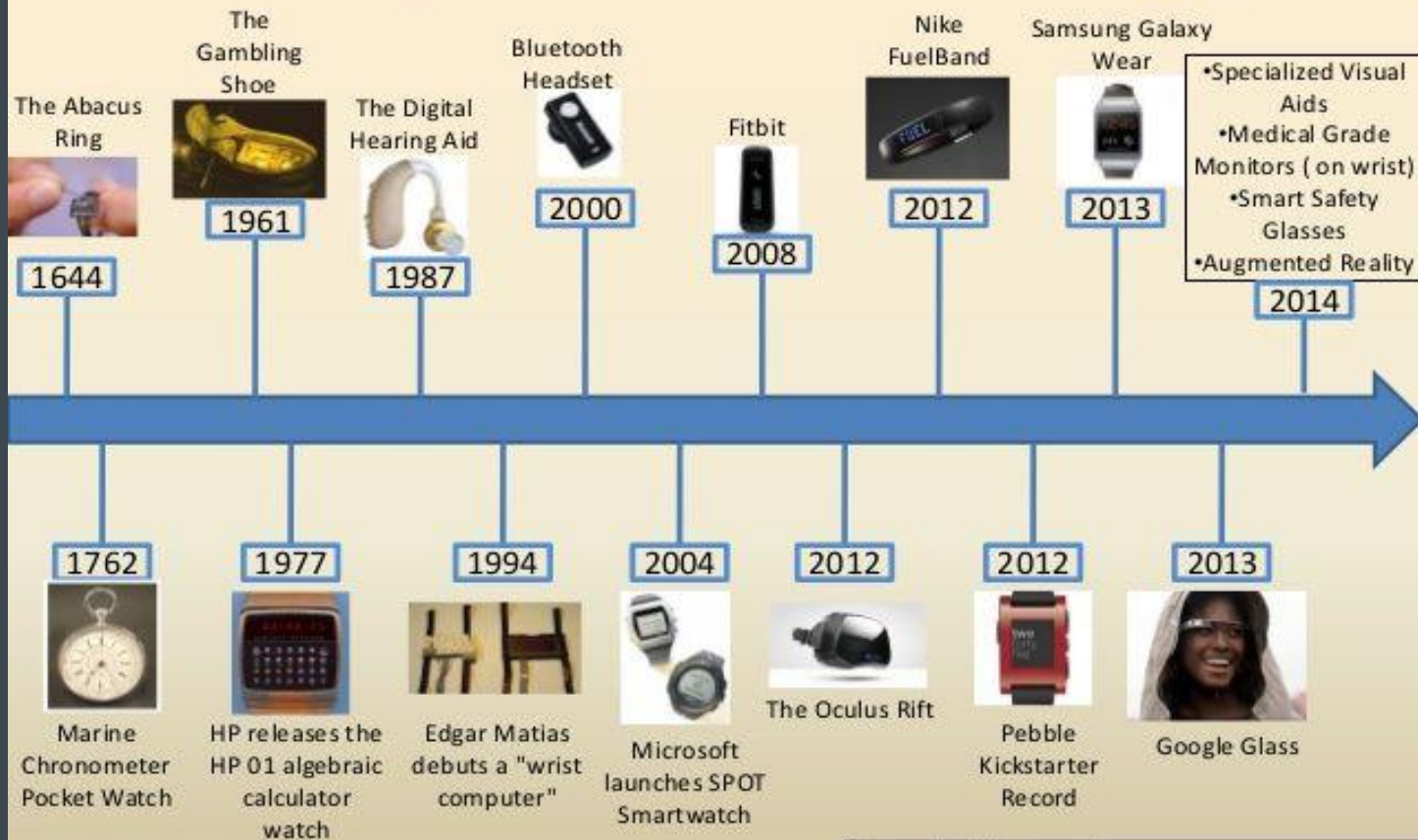
Therapeutic Devices

Bioinformatics plays a critical role in the development and implementation of treatment devices, improving patient outcomes, and advancing medical technology. It used in: Design and development, Personalized medicine, Monitoring and analysis, and Data sharing and collaboration.

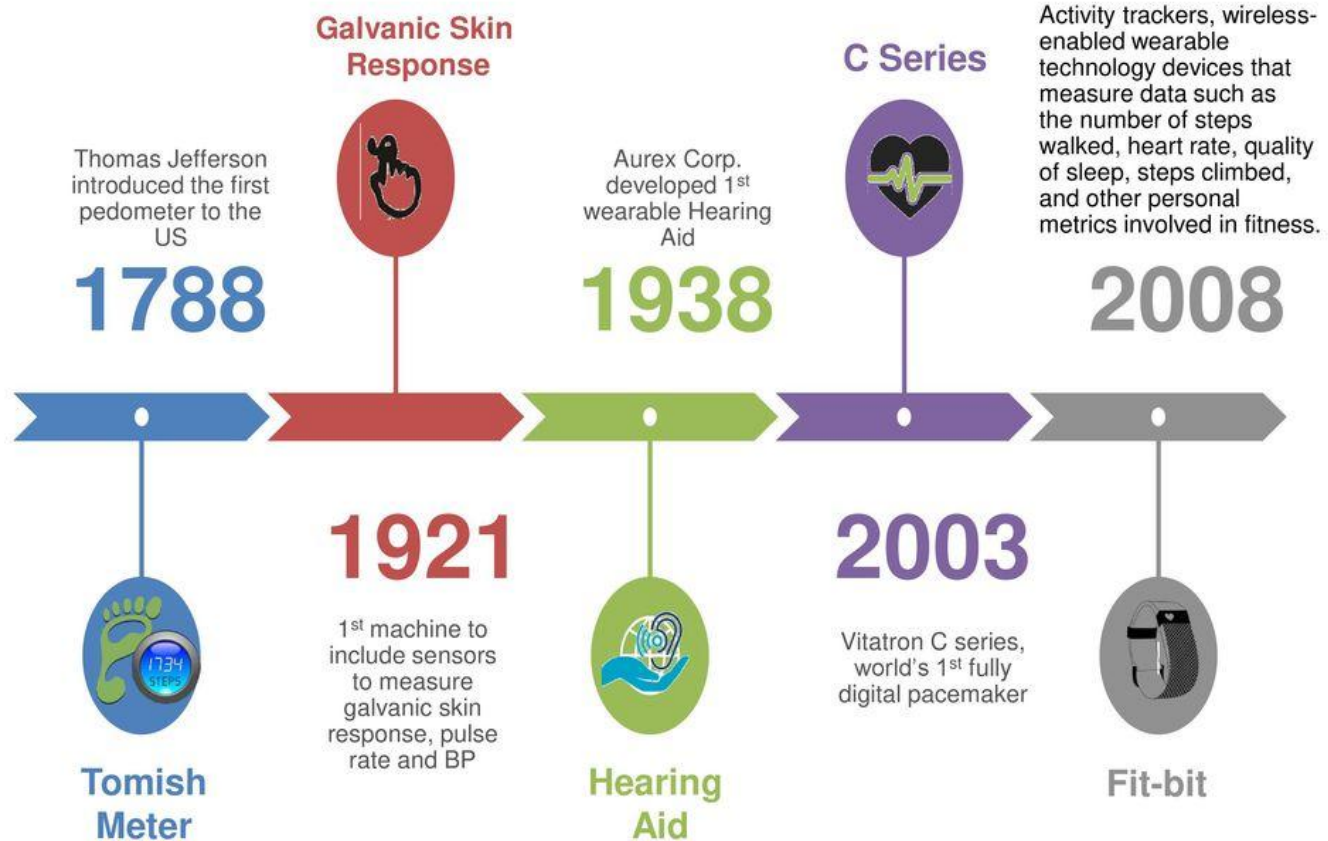
Bioinformatics in Wearable Devices



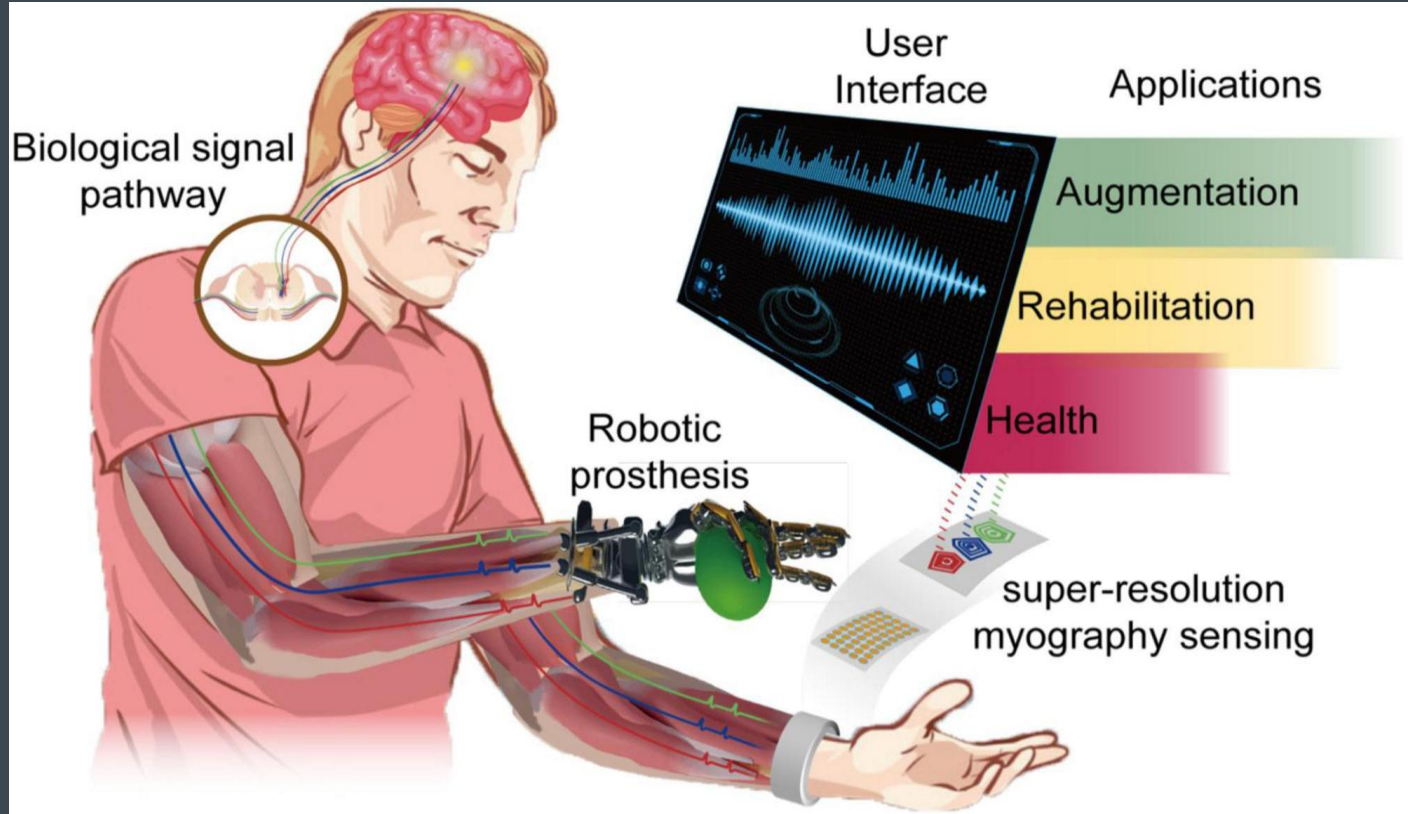
History of Wearable Technology



History of Wearable Health Monitoring Devices



Bioinformatics in Prosthetic Devices



History of Prosthetic Devices



applications



1500's
Ambroise Paré
Silver nose, ear,
and eye



1560's
Tycho Brahe
Metal nose



1830's
"Gunner with
the Silver
Mask"



1940's
Acrylic resin
eyes



1970's
Silicone
maxillofacial
prosthetics



2010's
3D Printed
Silicone
prosthetics

1400

1600

1800

1900

2000

Beyond

materials

1500's
Silver
Gold
Iron

1800's
Paper,
porcelain,
celluloid,
leather,
wood

**Late
1800's**
Vulcanite
rubber

1930's
Prevulcanised
latex

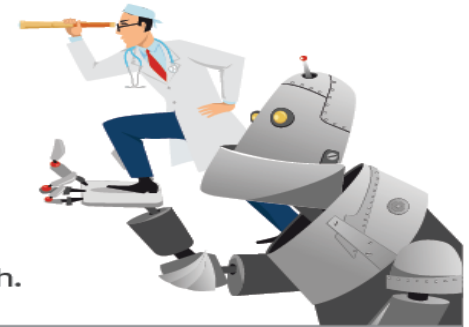
1946
Silicones
enter market
(not as
prosthetic
material)

1970's
Silicones
become
preferred
prosthetic
material

Bioinformatics in Diagnostic Devices

AI could save lives and improve medical diagnoses

Artificial intelligence in healthcare must combat the hype that inflates the technology's potential. But there are success stories about what AI algorithms could accomplish.



**20,000
lives**

The U.K. National Health Service plans to use AI to improve early cancer diagnosis. The healthcare system believes early diagnosis may prevent 20,000 cancer-related deaths annually by 2033.

SOURCE: NATIONAL HEALTH SERVICE



**50,000
proteins**

Machine learning could aid early diagnosis by evaluating blood samples. An author of a study by vendor Aruba Networks predicted that machine learning may one day pull 50,000 different proteins from a blood sample, compared to just 30 today.

SOURCE: ARUBA NETWORKS



**70%
accuracy**

Researchers from Google and Verily Life Sciences found that AI could analyze retinal images to predict heart attack risks with an accuracy of 70%.

SOURCE: NATURE BIOMEDICAL ENGINEERING



**1
pixel**

Examining data by the pixel, AI can infer from 500 mammographies which images warrant more review by radiologists.

SOURCE: LOGICALIS PRINCIPAL CONSULTANT KIM GARRIOTT

Image Analysis and Visualization Benefits



- Optimized images analysis
- Reducing medical errors
- Less work for human
- Better diagnosing
- Time saving
- Improved performance
- Case rating by prioritization
- Earlier detection of cancers

EVOLUTION OF DIGITAL RADIOGRAPHY



W. RONTGEN

1895



MRI

1973

Film...

1980

CT SCANNER



EMI - G. Hounsfield



Phosphorous Plates

1983



DICOM - PACS

1991



Direct Radiography
(Flat Panel)

1992

Direct Radiography
(CCD)



1994



2019
Flat Panel

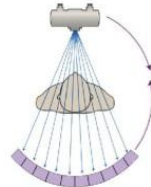
- Wireless
- Ultra Thin
- 1 Sec. speed
- Plug & Play
- Unbreakable
- Lower cost than CR

HISTORY OF CT SCANNER

EMI- "The Beatles" Company
Inventor: G. Hounsfield



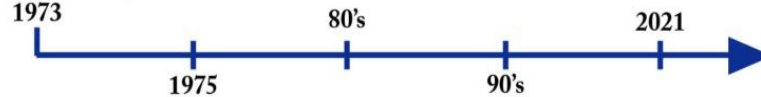
**TRANSLATE/
ROTATE**
(1 Slice in 5 minutes)



ROTATIONAL
(Rotates 180 degrees,
1 Slice in 3 seconds)



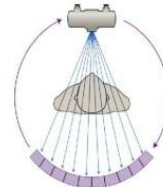
MULTI-SLICE
(Thousands of Slices
per second)



1973
1975
80's
90's
2021

First GE CT Scanner
installed in Latin America
Place: Bogotá, Colombia
Eng. Rodolfo Gutierrez (EMI)

HELICAL

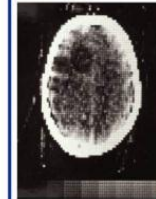


(Rotates continuously,
1 Slice in 0.25 seconds)

RESULTS:

1973
First Head
CT

2021
CT -
3D Angiography



APPLICATIONS:

- Trauma
- Cardiology
- Orthopedics
- Vascular
- Oncology
- MR/CT
- PET/CT
- Others

Bioinformatics in Therapeutic Devices

Can Artificial Intelligence Replace Human Therapists?



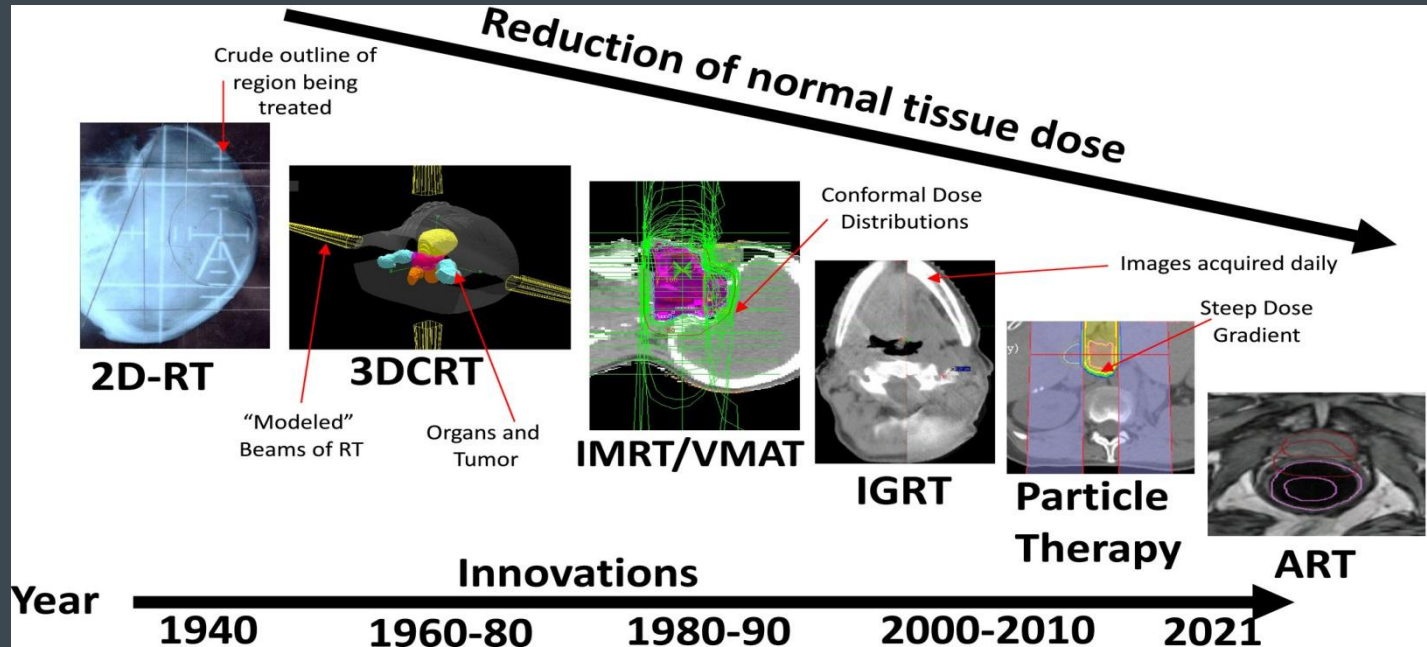
Robotic Surgery: A hi-tech path to the future of healthcare



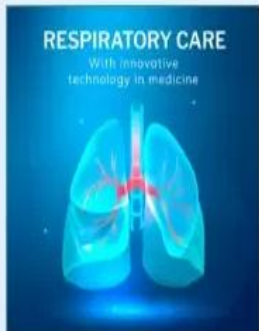
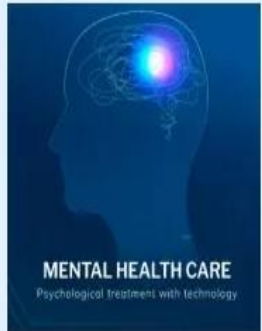
Benefits:

- Shorter hospital stays
- Reduced pain and discomfort
- Faster recovery time
- Reduced infection risk
- Reduced blood loss and need for transfusions
- Minimal scarring
- Better outcomes for patients

Historic Evolution of Radiation Technology Over the Past 30 Years



2-Dimensional Radiotherapy (2D-RT), 3D-RT, Intensity-Modulated RT/Volumetric Modulated Arc Therapy (IMRT/VMAT), Image-Guidance Radiotherapy (IGRT), Particle Therapy, and Adaptive Therapy (ART).



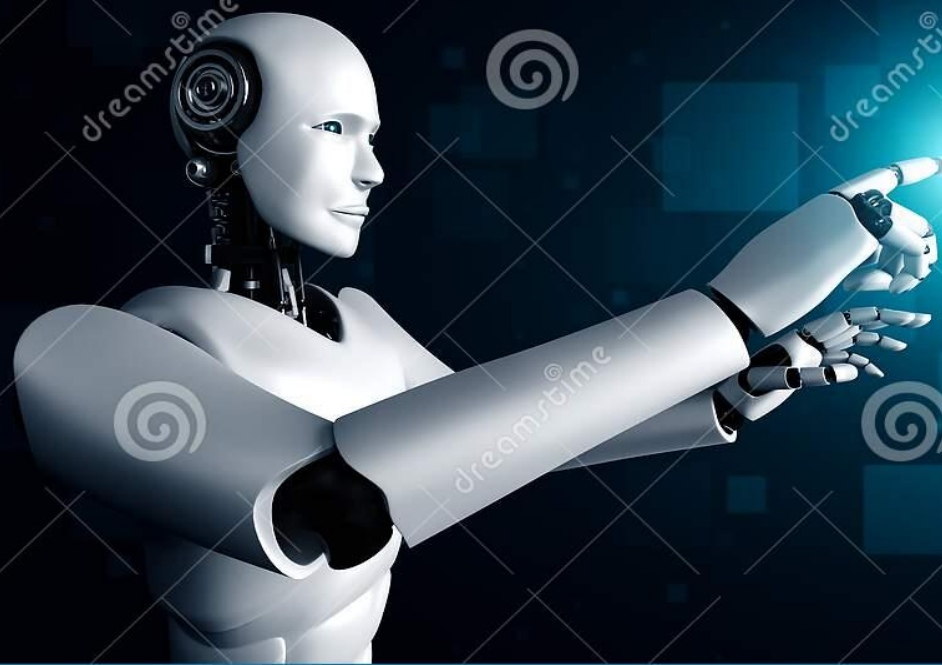
Top AI Applications In Healthcare



Conclusion



The use of bioinformatics in medical devices is critical for the future of healthcare. It enables the development of personalized treatments, improves the safety and efficacy of medical devices, and leads to faster diagnosis and treatment. While there are challenges to implementing bioinformatics in medical devices, the future looks promising, with integration with EHRs, AI, and wearable devices on the horizon.



**Thank
You**