DATA SCIENCE IN HEALTHCARE

- Medicine and healthcare are two of the most important part of our human lives.
- Traditionally, medicine solely relied on the discretion advised by the doctors.
- For example, a doctor would have to suggest suitable treatments based on a patient’s symptoms.
- However, this wasn’t always correct and was prone to human errors.
- However, with the advancements in computers and in particular, Data Science, it is now possible to obtain accurate diagnostic measures.

WHAT IS DATA SCIENCE?

Data science is an interdisciplinary field that extracts knowledge and insights from many structural and unstructured data, using scientific methods, data mining techniques, machine-learning algorithms, and big data.

- THE HEALTHCARE INDUSTRY GENERATES LARGE DATASETS OF USEFUL INFORMATION ON PATIENT DEMOGRAPHY, TREATMENT PLANS, RESULTS OF MEDICAL EXAMINATIONS, INSURANCE, ETC.

- THE DATA COLLECTED FROM THE INTERNET OF THINGS (IOT) DEVICES ATTRACT THE ATTENTION OF DATA SCIENTISTS.

- DATA SCIENCE PROVIDES AID TO PROCESS, MANAGE, ANALYZE, AND ASSIMILATE THE LARGE QUANTITIES OF FRAGMENTED, STRUCTURED, AND UNSTRUCTURED DATA CREATED BY HEALTHCARE SYSTEMS.

- THIS DATA REQUIRES EFFECTIVE MANAGEMENT AND ANALYSIS TO ACQUIRE FACTUAL RESULTS.

WHY DO WE USE DATA SCIENCE IN HEALTHCARE?

- ACCORDING TO A STUDY, THE DATA GENERATED BY EVERY HUMAN BODY IS 2 TERABYTES PER DAY.
- THIS DATA INCLUDES ACTIVITIES OF THE BRAIN, STRESS LEVEL, HEART RATE, SUGAR LEVEL, AND MANY MORE.
- TO HANDLE SUCH A LARGE AMOUNT OF DATA, NOW, WE HAVE MORE ADVANCED TECHNOLOGIES AND ONE OF THEM IS DATA SCIENCE. IT HELPS MONITOR PATIENTS' HEALTH USING RECORDED DATA.
- WITH THE HELP OF THE APPLICATION OF DATA SCIENCE IN HEALTHCARE, IT HAS NOW BECOME POSSIBLE TO DETECT THE SYMPTOMS OF A DISEASE AT A VERY EARLY STAGE.

- ALSO, WITH THE ADVENT OF VARIOUS INNOVATIVE TOOLS AND TECHNOLOGIES, DOCTORS ARE ABLE TO MONITOR PATIENTS' CONDITIONS FROM REMOTE LOCATIONS.

- IN EARLIER DAYS, DOCTORS AND HOSPITAL MANAGEMENT WERE NOT ABLE TO HANDLE MULTIPLE NUMBERS OF PATIENTS AT THE SAME TIME.

- AND DUE TO THE LACK OF PROPER TREATMENT, THE PATIENTS' CONDITIONS USED TO GET WORSE. HOWEVER, NOW, THE SCENARIO HAS CHANGED.

- WITH THE HELP OF DATA SCIENCE AND MACHINE LEARNING APPLICATIONS, DOCTORS CAN BE NOTIFIED ABOUT THE HEALTH CONDITIONS OF THE PATIENTS THROUGH WEARABLE DEVICES

- THEN, HOSPITAL MANAGEMENT CAN SEND THEIR JUNIOR DOCTORS, ASSISTANTS, OR NURSES TO THESE PATIENTS' HOMES.

- HOSPITALS CAN FURTHER INSTALL VARIOUS EQUIPMENT AND DEVICES FOR THE DIAGNOSIS OF THESE PATIENTS.

- THESE DEVICES BUILT ON TOP OF DATA SCIENCE ARE CAPABLE OF COLLECTING DATA FROM THE PATIENTS SUCH AS THEIR HEART RATE, BLOOD PRESSURE, BODY TEMPERATURE, ETC.

- DOCTORS GET THIS REAL-TIME DATA OF THE PATIENTS' HEALTH THROUGH UPDATES AND NOTIFICATIONS IN MOBILE APPLICATIONS.

- THEY CAN THEN DIAGNOSE THE CONDITIONS AND ASSIST THE JUNIOR DOCTORS OR NURSES TO GIVE SPECIFIC TREATMENTS TO THE PATIENTS AT HOME.

THIS IS HOW DATA SCIENCE HELPS IN CARING FOR PATIENTS USING TECHNOLOGY.

BENEFITS OF DATA SCIENCE IN HEALTHCARE

- **DATA SCIENCE HELPS IN ADVANCING HEALTHCARE FACILITIES AND PROCESSES. IT HELPS BOOST PRODUCTIVITY IN DIAGNOSIS AND TREATMENT AND ENHANCES THE WORKFLOW OF HEALTHCARE SYSTEMS.**

- **THE ULTIMATE GOALS OF THE HEALTHCARE SYSTEM ARE AS FOLLOWS:**
  - TO EASE THE WORKFLOW OF THE HEALTHCARE SYSTEM
  - TO REDUCE THE RISK OF TREATMENT FAILURE
  - TO PROVIDE PROPER TREATMENT ON TIME
  - TO AVOID UNNECESSARY EMERGENCIES DUE TO THE NON-AVAILABILITY OF DOCTORS
  - TO REDUCE THE WAITING TIME OF PATIENTS

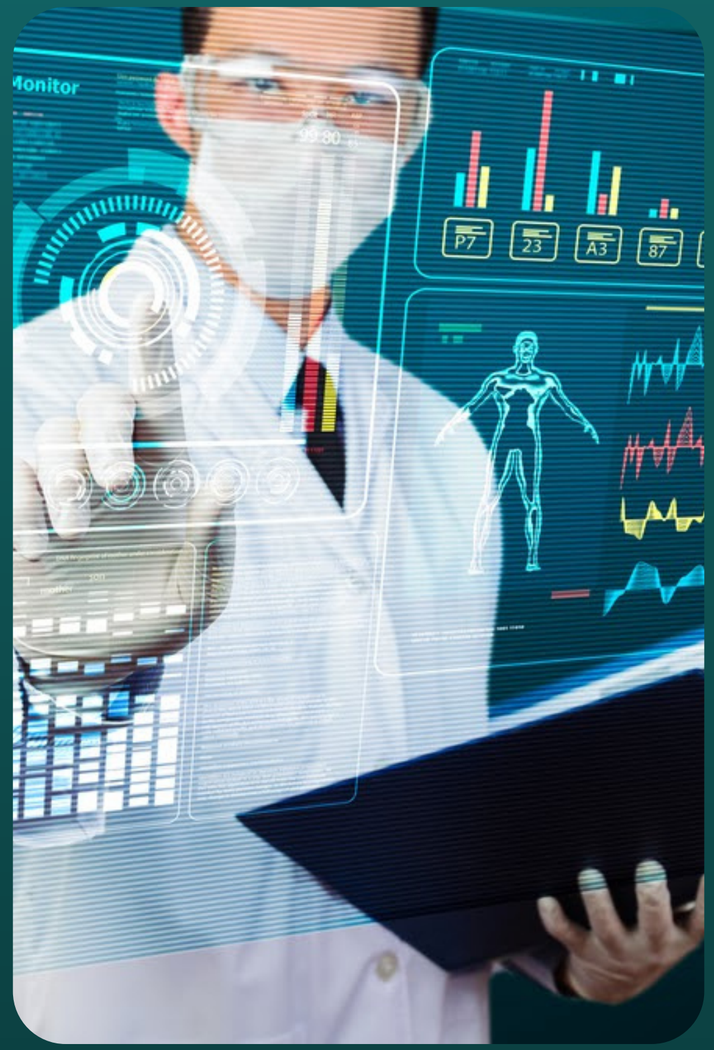
THE ROLE OF A DATA SCIENTIST IN HEALTHCARE

- **THE ROLE OF A DATA SCIENTIST IS TO IMPLEMENT ALL TECHNIQUES OF DATA SCIENCE FOR INTEGRATING IT INTO HEALTHCARE SOFTWARE.**

- **THE DATA SCIENTIST EXTRACTS USEFUL INSIGHTS FROM THE DATA TO MAKE PREDICTIVE MODELS.**

- **OVERALL, THE RESPONSIBILITIES OF A DATA SCIENTIST IN HEALTHCARE ARE AS FOLLOWS:**

  - COLLECTING DATA FROM PATIENTS
  - ANALYZING THE NEEDS OF HOSPITALS
  - STRUCTURING AND SORTING THE DATA FOR USE
  - PERFORMING DATA ANALYTICS USING VARIOUS TOOLS
  - IMPLEMENTING ALGORITHMS ON THE DATA TO EXTRACT INSIGHTS
  - BUILDING PREDICTIVE MODELS WITH THE DEVELOPMENT TEAM



APPLICATIONS OF DATA SCIENCE IN HEALTHCARE

1

Drug Discovery with Data Science

2

Tracking & Preventing Diseases

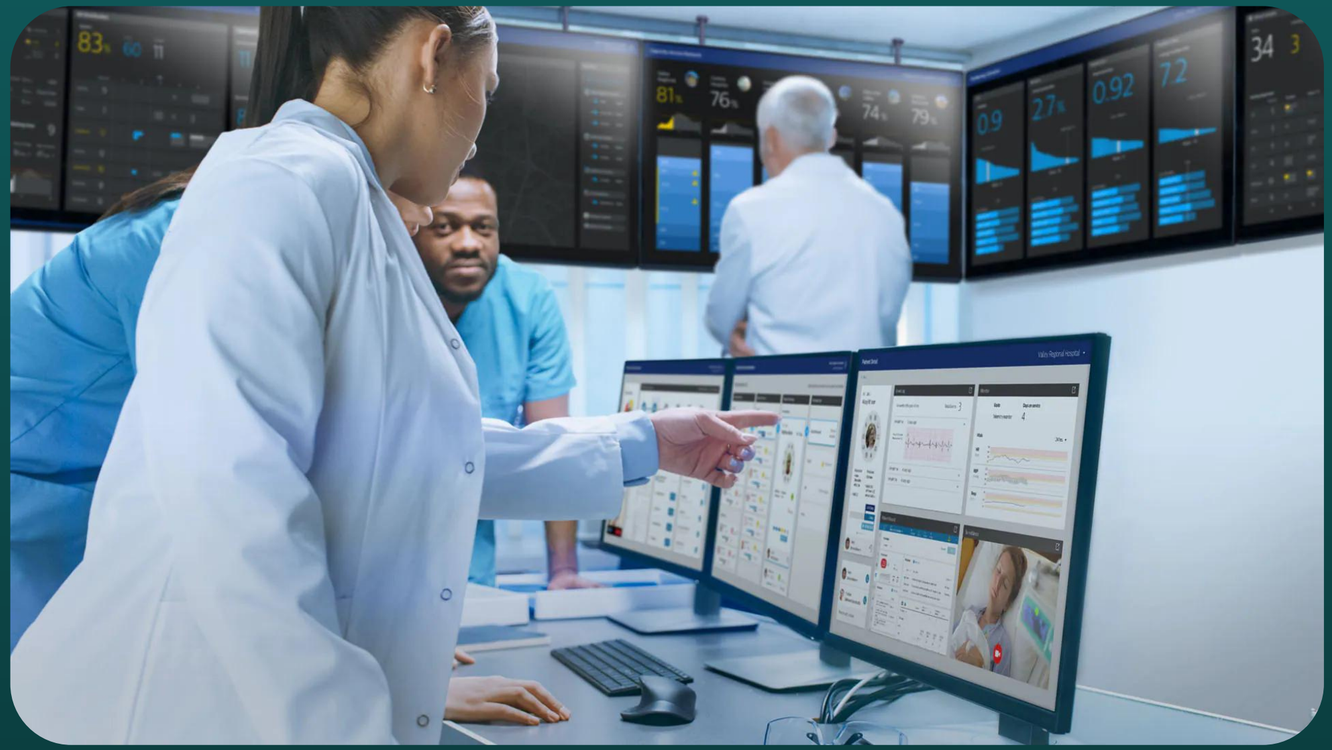
3

Predictive Analytics in Healthcare

4

Data Science for Medical Imaging

PREDICTIVE ANALYSIS IN HEALTCARE



- In today’s world, information is one of the important factors in healthcare analytics. Due to the lack of proper information about a patient, the condition can get worse.

- Thus, information or data about the patient must be collected efficiently. This data can be anything from the patient’s blood pressure, body temperature to sugar level.

- After collecting the patient’s data, it is analyzed to search for patterns and correlations in it. This process tries to identify the symptoms of a disease, the stages of the disease, the extent of damage, and many more.

- Then, the predictive analytics model built on top of Data Science makes predictions on the condition of the patient.

- Also, it helps in making strategies for the appropriate treatment that should be given to the patient.

- Therefore, predictive analytics is a very useful technique and it plays a major role in the healthcare industry.

- In short, predictive analytics is used to identify the pain points right from the initial to the final stage of care to improve both healthcare delivery and patient experience.

- The successful predictive analytics holds collecting quality data and making use of the best model that can create a positive impact in various healthcare fields.

THE NEED FOR PREDICTIVE ANALYSIS TOOLS

- PREDICTIVE ANALYTICS TOOLS THAT IDENTIFY PATIENTS WITH CHARACTERISTICS THAT HAVE A HIGH RATE OF READMISSION CAN HELP PHYSICIANS TO KNOW ABOUT THE FOLLOW-UP AND HOW TO DESIGN PERSONALIZED HEALTHCARE PLANS TO MINIMIZE THE PATIENT'S FREQUENT VISITS TO THE HOSPITAL.

- THIS KIND OF TOOL WILL HELP THE HEALTHCARE PROVIDERS TO DEVELOP ACCURATE DECISIONS THAT REDUCE HEALTHCARE COSTS, IMPROVE PATIENT OUTCOMES AND INCREASE OPERATIONAL EFFICIENCY.

Main Techniques in Predictive Analytics

Data Mining

- Data modeling is a predictive analytics tool that employs statistical methods to analyze historical data.
- As a result, it helps to create a detailed model of how the same data evolves over time, allowing to predict future events.
- Being a statistical-based tool, data mining outlines the possibilities for potential future outcomes. To achieve the best fidelity, the model has to be regularly updated and recalculated.
- With help from other tools, this process can be streamlined into a real-time modeling tool.

ARTIFIFCIAL INTELLIGENCE

- Artificial Intelligence is a field of computer science that can be effectively described as a combination of complex machine learning algorithms with data processing methods. At its core, its purpose is to replicate intelligent human behavior.
- As one of the examples of predictive analytics in healthcare, AI is used to manage patient data and produce calculated predictions based on it. The potential impact of AI on the industry cannot be overstated, as it might eliminate human error from it as a whole.

Main Techniques in Predictive Analytics

Machine Learning

- Machine learning is a part of the AI science field, with specific algorithms being developed to achieve autonomous learning by machines.
- The algorithms developed progress over time, meaning the more data sets they analyze, the better they become.
- This makes machine learning a perfect tool for predictive analytics in the healthcare industry. With the large data sets available, machine learning algorithms gain experience faster and provide better predictions based on this data.

Deep Learning Algorithms

- Deep learning is a subcategory of machine learning that deals with artificial neural networks.They are built to mimic the biological neural networks of the human brain.
- However, with modern multi-layered processing capabilities, artificial neural networks exceed the powers of the human mind and can be effectively used to make precise predictions.
- One of the major use cases for predictive analytics in healthcare is its use in medical imaging analysis.
- It helps detect minor deviations in various medical images, from MRI screenings to microscopy images, thus helping to diagnose an issue at its early stages.

THE BENEFITS OF PREDICTIVE ANALYTICS IN HEALTHCARE

HERE ARE SOME BENEFITS OF PREDICTIVE ANALYSIS IN HEALTHCARE:

- REDUCING COSTS ON APPOINTMENT NO SHOW AND READMISSION PENALTIES
- SPEEDING UP ADMINISTRATIVE TASKS SUCH AS DISCHARGE PROCEDURES AND INSURANCE CLAIMS SUBMISSION
- PREVENTING RANSOM AND OTHER CYBERATTACKS BY ANALYZING ONGOING TRANSACTIONS AND ASSIGNING RISK SCORES
- PROACTIVELY PREPARING FOR UPCOMING POPULATION HEALTH TRENDS
- ACQUIRING NEW PATIENTS THROUGH PERSONALIZED CAMPAIGNS

PREDICTIVE ANALYTICS SURELY BENEFITS HEALTHCARE PROVIDERS. BUT THERE ARE THINGS TO CONSIDER

PREDICTIVE ANALYTICS IN HEALTHCARE OFFERS MANY BENEFITS AND, AS THE INDUSTRY AMASSES MORE AND MORE DATA, THE ALGORITHMS WILL IMPROVE IN ACCURACY. HOWEVER, THESE TYPES OF TOOLS BRING THEIR OWN RISKS. HERE ARE HREE MAIN RISK FACTORS ASSOCIATED WITH IMPLEMENTING PREDICTIVE ANALYTICS SOLUTIONS IN HEALTHCARE:

- GAINING DOCTORS’ ACCEPTANCE
- ETHICS AND MORAL HAZARDS
- ALGORITHM BIAS AND LACK OF REGULATIONS

- TODAY, MORE NUMBER OF HEALTHCARE ORGANIZATIONS STARTED IMPLEMENTING NEW ADVANCED DIGITAL TECHNOLOGIES LIKE MACHINE LEARNING AI-BASED HEALTHCARE SOFTWARE LIKE EHR, THE PATIENT PORTAL TO ANALYZE THE DATA IN A BETTER WAY AND ALSO TO PREDICT FUTURE HEALTHCARE MARKETING TRENDS. SO, PREDICTIVE ANALYTICS HAS A BRIGHT FUTURE IN THE HEALTHCARE SECTOR.

- PREDICTIVE ANALYTICS IN HEALTHCARE OFFERS A WONDERFUL OPPORTUNITY TO IMPROVE PATIENT CARE AND REDUCE HEALTHCARE COSTS.

- IN THE FUTURE OF HEALTHCARE, THE PROVIDERS WHO THINK CAREFULLY ABOUT THEIR INVESTMENTS IN TECHNOLOGY WILL BE ABLE TO DELIVER BETTER CARE FOR THEIR PATIENTS AND INCREASE PRACTICE PRODUCTIVITY.

TEAM MEMBERS AND THEIR CONTRIBUTION

A020- VARAD KARLEKAR

Slide 8,9- Benefits and roles

A021- VANSH PARMAR

Slide 11-14- Predictive analysis in healthcare

A022- RAHUL PUROHIT

Slide 15-17: The need and main techniques of predictive analysis, **PPT**

A023- RITIKA AMARESH

Slide 1-4: introduction

A024- HARSHIL KAMDE

Slide 5-7: Why do we use DS in healthcare

A025- KUNAL AJGAONKAR

Slide 18-20: Benefits and Risks

THANK YOU FOR LISTENING!!