MACHINE LEARNING AND AI FOR HEALTHCARE

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DATA
#1

Turning Data into Information: Using Big Data

- data value
- advances in analysing big data

- data analysis:

understand the information

identifying most important data for business objectives, outcomes, and decisions.

Stakeholders ---- knowledge ----.\> type of results and the reasoning approach

- IBM----80 % big data---unstructured(mixture)
- Data needs to be processed to be of value.
- resources are required— time, talent, and money

data science analytics taxonomy(based on results):

- 1)Descriptive Analytics
- 2)Diagnostic Analytics
- 3)Predictive Analytics
- 4)Prescriptive Analytics

Descriptive Analytics

- first form of big data analysis
- brings insight to the past
- focussing on the question of what happened
- analyzing data from history
- data aggregation and data mining

limitation

- lack of available human expertise or proper organizational -----> data collecting unused
- Data can become more valuable through dataset linking.
- limited ability to guide decisions because it is based on a snapshot of the past.
- Although this is useful, it is not always indicative of the future.

Diagnostic Analytics

- focus on why something happened
- decision trees
- data discovery
- data mining
- correlations

Predictive Analytics

- predict the likelihood of a future outcome
- attempts to fill in missing data with best-guess estimates
- uses historical and current data
- forecast the likelihood of future events or actionable outcomes
- regression analysis
- multivariate statistics
- data mining
- pattern matching
- predictive modeling
- machine learning

- Predictive analytics is in the midst of disruption.
- The last 5 years of innovation ------. Wearable technology and mobile apps ------ spot conditions such as asthma, atrial fibrillation and COPD

points:

- real-time data that allows near real-time clinical decision-making
- medical sensors and connected devices ----- fully integrated
- clinicians need to be experienced
- As well as using the individual patient's data------ population-level data

- Population health management tools:

highlight those most at risk of hospital readmission

at risk of developing costly chronic diseases

responding adversely to medication

use case

1)Realizing Personalized Care

- low carb program app

_ integration data----panceratic cancer

_send notification to users

2)Patient Monitoring in Real Time

- vital signs in real time

_respond more promptly to unexpected changes

_predictive analytic:determine the likelihood of an emergency before it can be detected with a bedside visit.

Prescriptive Analytics

- make decisions for optimal outcomes
- what should we do?
- data and analytics .....what action to take....smarter decisions
- provide recommendations regarding actions
- take advantage of the predictions

- Prescriptive analytics enables the optimization of population health management through identification of appropriate intervention models for individuals from risk stratified populations—combining clinical, patient, and wider available health data.

examples:

high risk readmission

metabolic syndrome--where to focus tx & which tx

Pharmaceutical companies ---drug developement--clinical trial(copliance & complications)

- contextual analytics....>wider data—such as environmental, location, and situational data

- Use Case: From Digital To Pharmacology

Different treatment pathways work differently for different people. Collected on a large scale, physicians can prescribe therapies based on the latest evidence-based and predictive and prescriptive analyses of patient populations.

Reasoning:

- A system can determine conclusions with information available in a knowledge base using three main methods: deduction, induction, and abduction.

Deduction

Deductive reasoning allows you to make statements that are necessitated by facts that you know:

1. It rains every Saturday.
2. Today is Saturday.

p--->q

Most reporting systems and business intelligence software is deductive

Induction

Inductive reasoning enables you to make statements based on the evidence you have accumulated until now.

evidence is not the same as fact.

Substantial evidence for something only very likely to be true in an inductive approach, rather than absolute.

p--->q

Statistical learning is about inductive reasoning:
looking at some data,
scientifically guessing at a general hypothesis,
making statements
predictions on test data based on this premise.

Abduction

- Abduction is an adaptation of inductive reasoning.
- Abductive reasoning attempts to use a hypothesis p to explain a proposition q.
- abduction, reasoning flows in the opposite direction to deductive reasoning.
- The best hypothesis, that is, the one that most effectively explains the data, is inferred to be the most probably correct one.

A classic example is the following:

- • (q) Observation: When I woke up, the grass outside my window was wet.
- • (p) Knowledge base includes information: Rain can make the grass wet.
- • Abductive inference: It probably rained at night.

- how to prioritize explanations to investigate.
- Big datasets provide opportunities for induction and inference through machine learning.

DATA

#2

How Much Data Do I Need for My Project?

- Although big data is defined by the fact it is stored in distributed systems, when it comes to creating machine learning algorithms, it's about quality and not quantity.

- important features
- noise
- 10/000 or 5000

- The future of evidence-based medicine is the realization of data-driven, personalized healthcare.

- Data-driven healthcare occurs when there is a synergetic partnership between healthcare providers, patients, and data obtained from all clinical documentation

DATA

#3

Challenges of Big Data

- Data Growth
- Infrastructure
- Expertise
- Data Sources
- Quality of Data
- Security
- Resistance
- Policies and Governance
- Fragmentation
- Lack of Data Strategy
- Visualization
- Timeliness of Analysis
- Ethics
- Data and Information Governance

Data Stewardship

Data Security

Data Availability

Data Content

Master Data Management (MDM)

DATA

#4

USE CASES & DEPLOY

- Data governance provides several benefits over and above those that are internal:

1. Protecting the interests of datastakeholders—particularly the data “giver”
2. Standardizing procedures and processes for streamlined repetition and minimization of error
3. Reducing costs and improving effectiveness
4. Greater transparency and accountability between data transfer parties

glucose single lab
vs
3 months & metadata

Deploying a Big Data Project

- Understand how the project will impact your organization
- Find the skills and technology you need
- Implement the project
- gaps between current and future capabilities
- Develop the project in a test environment and present results to users in a meaningful way.

- Big Data Tools:
- hadoop
- MongoDB(NOSQL)
- R
- PYTHON

THANK YOU