

Poster Session at Graduate School Information Fair

Multimodal analysis for medical big data

General Background

Introduction

What is Big data in Healthcare?

“Big data in healthcare” refers to the vast quantities of health data amassed from multiple sources including electronic health records (EHRs), medical imaging, genomic sequencing, payer records, pharmaceutical research, wearables and medical device, etc.

The purpose of healthcare data analysis:

- Improving patients predictions
- Real-time alerting
- Enhancing patient engagement
- Enhancing medical imaging
- Prevent unnecessary ER visits
- Electronic health record
- Predictive analytics in healthcare
- Reduce fraud & enhance security
- Improve telemedicine
- Prevent human errors
- Etc.

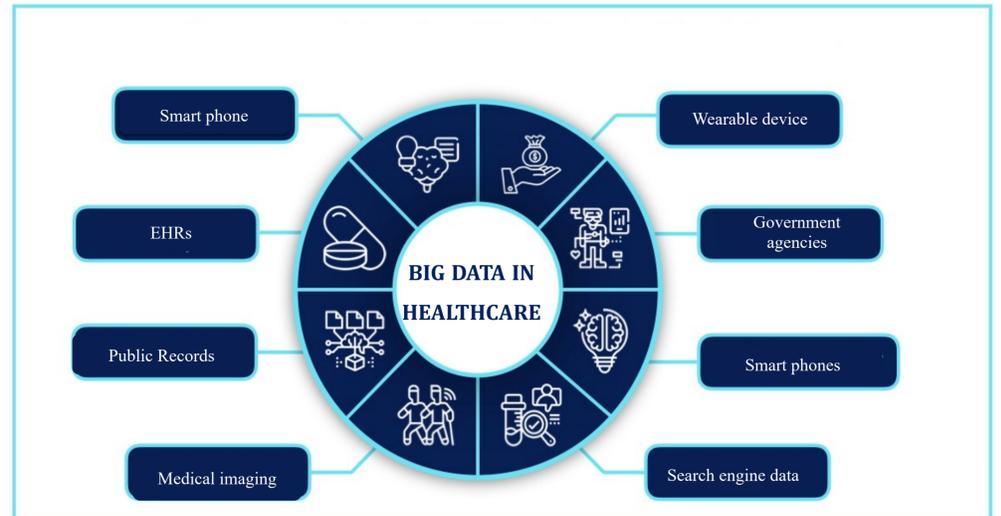


Fig. 1. Sources of the big data in healthcare industry

Data mining and machine learning in medical domain

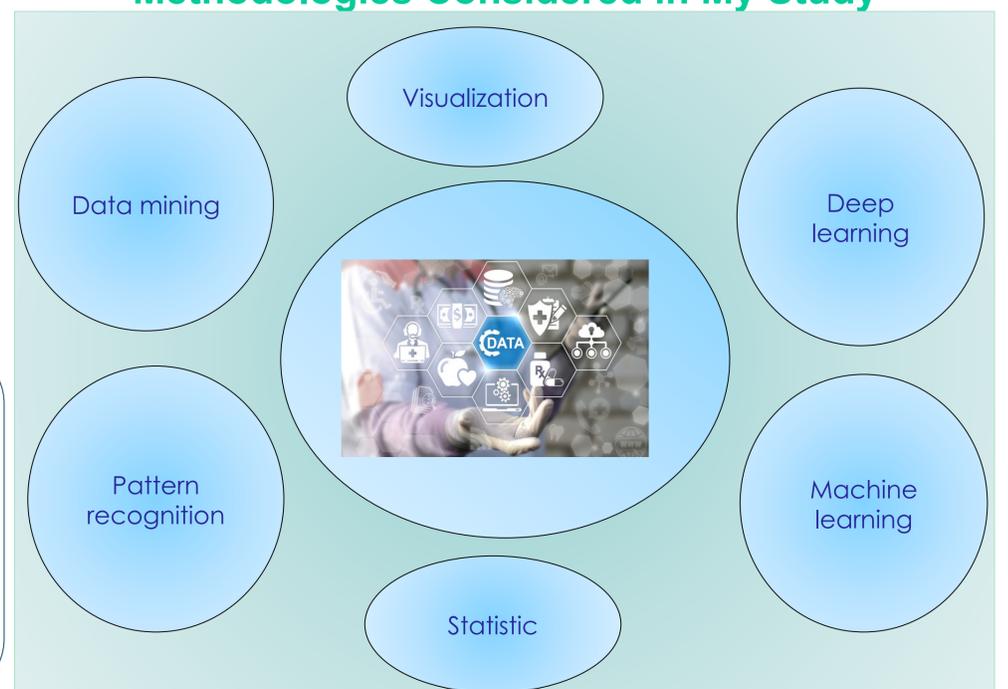
Research Challenges

- **Data Aggregation Challenges:** Big medical data comes from multiple resources. There are many types and formats of big data that need analyzing. Extracting insightful information from those multiple formats (multimodal) of data is a big challenge.
- **The scarcity of labeled medical data:** Deep learning requires a large amount of data to perform well. However, medical data requires manual labeling, which is usually provided by human annotators coming from various backgrounds. The annotation process is time-consuming, expensive, and prone to errors.

My Approaches

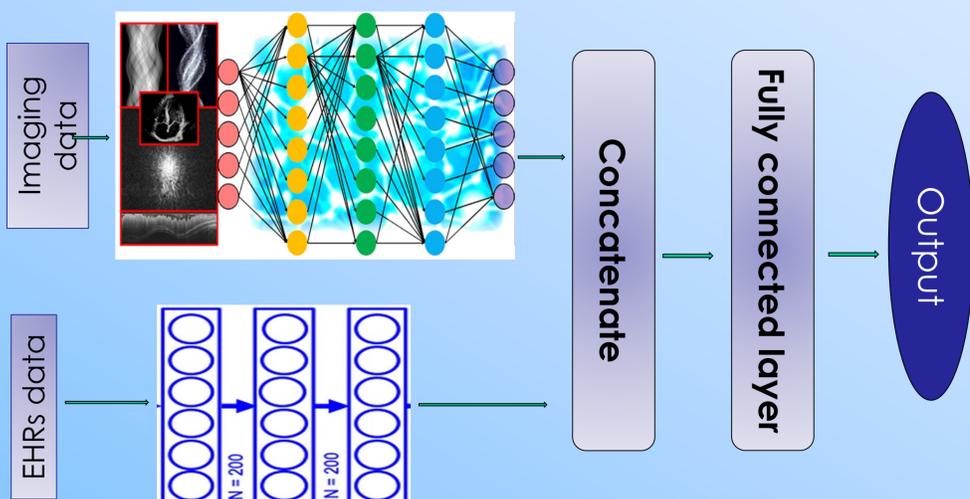
- The relationship or associations between elements of data will be identified.
- Using transfer learning approaches for medical imaging with labeled data and unlabeled data.
- A multimodal approach for the predictive model will be designed. Data fusion will be applied to integrate data from multiple modalities using ML and DL techniques

Methodologies Considered in My Study

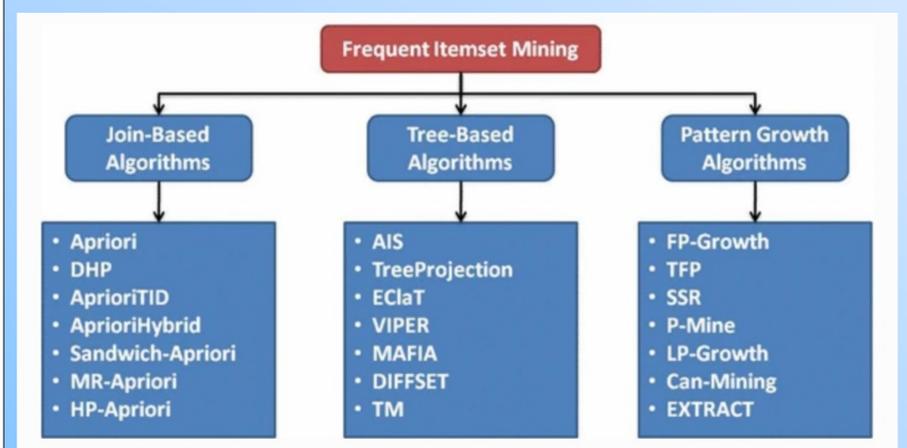


Recent study

Multimodal machine learning



Frequent pattern mining for medical data



References:

- [1] Amal, Saeed, et al. "Use of Multi-Modal Data and Machine Learning to Improve Cardiovascular Disease Care." *Frontiers in Cardiovascular Medicine* 9 (2022).
- [2] Topol, Eric J. "The big medical data miss: challenges in establishing an open medical resource." *Nature Reviews Genetics* 16.5 (2015): 253-254.
- [3] Siuly, Siuly, and Yanchun Zhang. "Medical big data: neurological diseases diagnosis through medical data analysis." *Data Science and Engineering* 1.2 (2016): 54-64.
- [4] Sohail, Muhammad Noman, et al. "A comprehensive looks at data mining techniques contributing to medical data growth: a survey of researcher reviews." *Recent developments in intelligent computing, communication and devices* (2019): 21-26.