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Machine Learning Applications – Opioid Epidemic and Diabetes Diagnosis

Initially, I used the Python programming language to analyze diabetes data (from University of California - Irvine (UCI) Machine Learning Repository) and make diagnosis. I learnt basic machine learning workflow steps including data exploration & cleaning, feature engineering basics, model selection, and generating visual maps (Fig 1 below shows heat map from the diabetes data in order to find correlation of certain features with diabetes diagnosis). Next, I used the R programming language to conduct a machine learning project on CDC's opioid overdose data. I used ICFNJ and Novo Nordisk funds to secure a MacBook which provided higher processing power to enable me to work with large data files. I was able to make various types of plots and analysis to summarize the data into a more comprehensive manner. It took a long time to procure the MacBook even after FDU received the funds in October 2019 due to administrative constraints beyond our control. I made quick progress in importing the dataset and creating different plots within no time. The research outcomes from this project resulted in representing the dataset in a visual form making it easier for analysis (Fig 2 below is an example of calculating morphine milligram equivalents (MME) to analyze some opioid data). This project helped me understand how machine learning in a medical setting can help enhance medical diagnosis dramatically. I learnt the mathematics behind machine learning, its uses, and its benefits in the real world. I was able to apply some knowledge I had about machine learning from my classes at FDU along with help from my professor to complete this project.
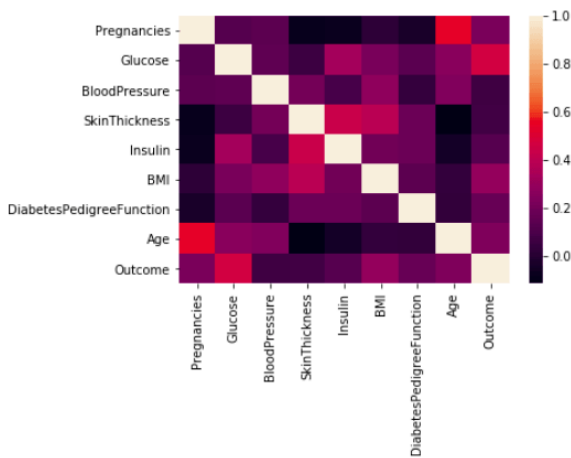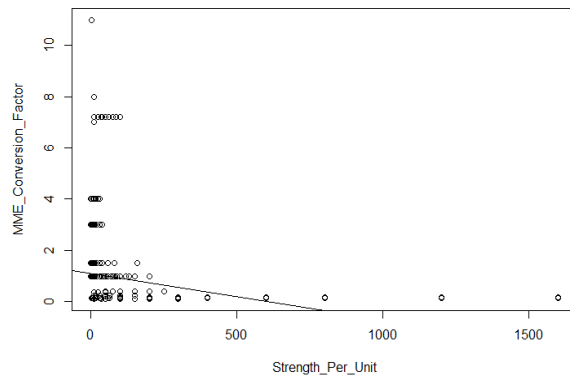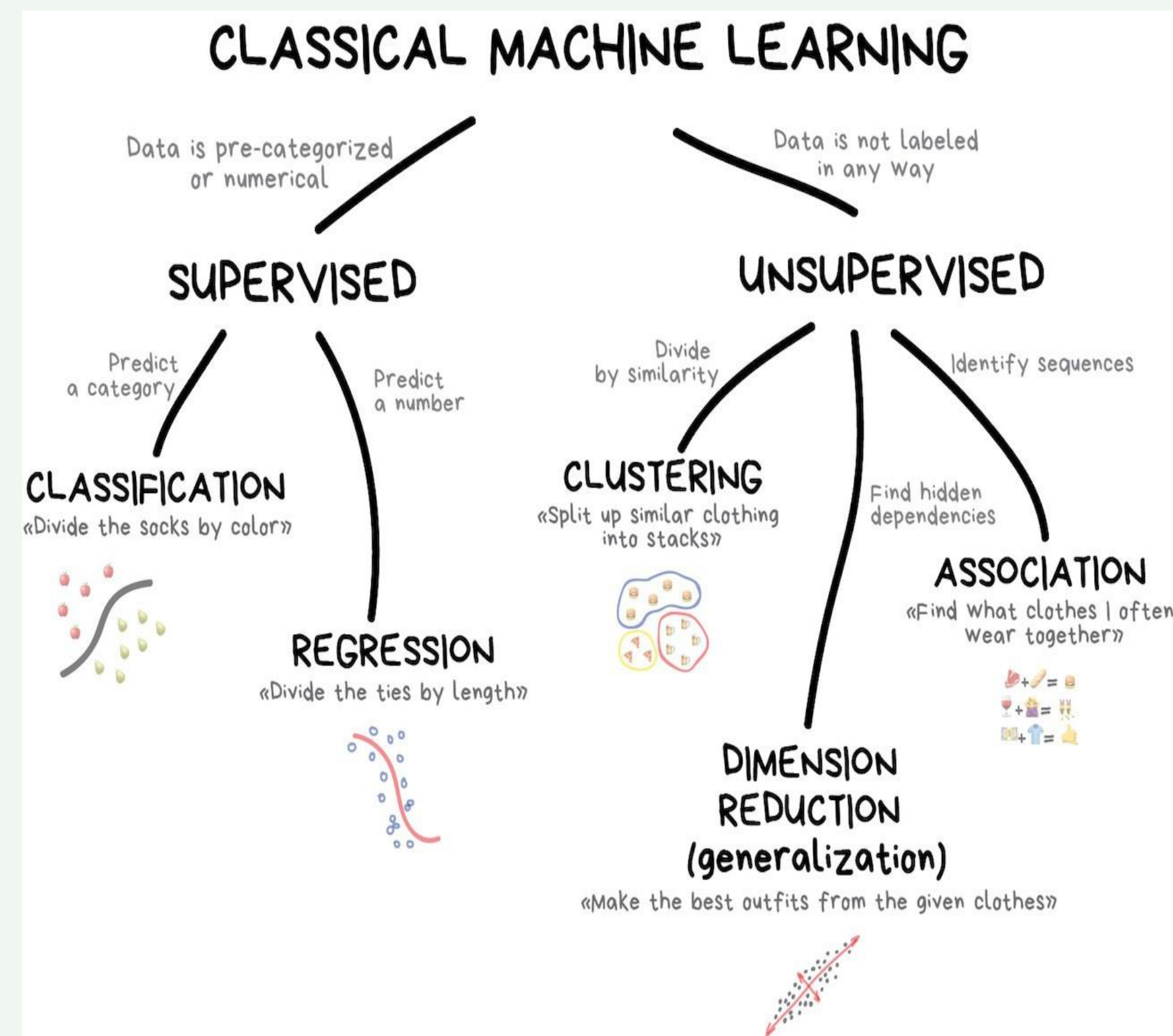

Fig 1: Heat Map showing correlations

Fig 2: MME conversion factors versus Strength Per Unit for opioids

Opioid Overdose Epidemic With Machine Learning

What is Machine Learning? (ML)

CLASSICAL MACHINE LEARNING

- Makes prediction models based on data provided by the user
- Compilation of algorithms used to analyze different data sets

How does ML work?

SONG A - FAST TEMPO SOARING INTENSITY
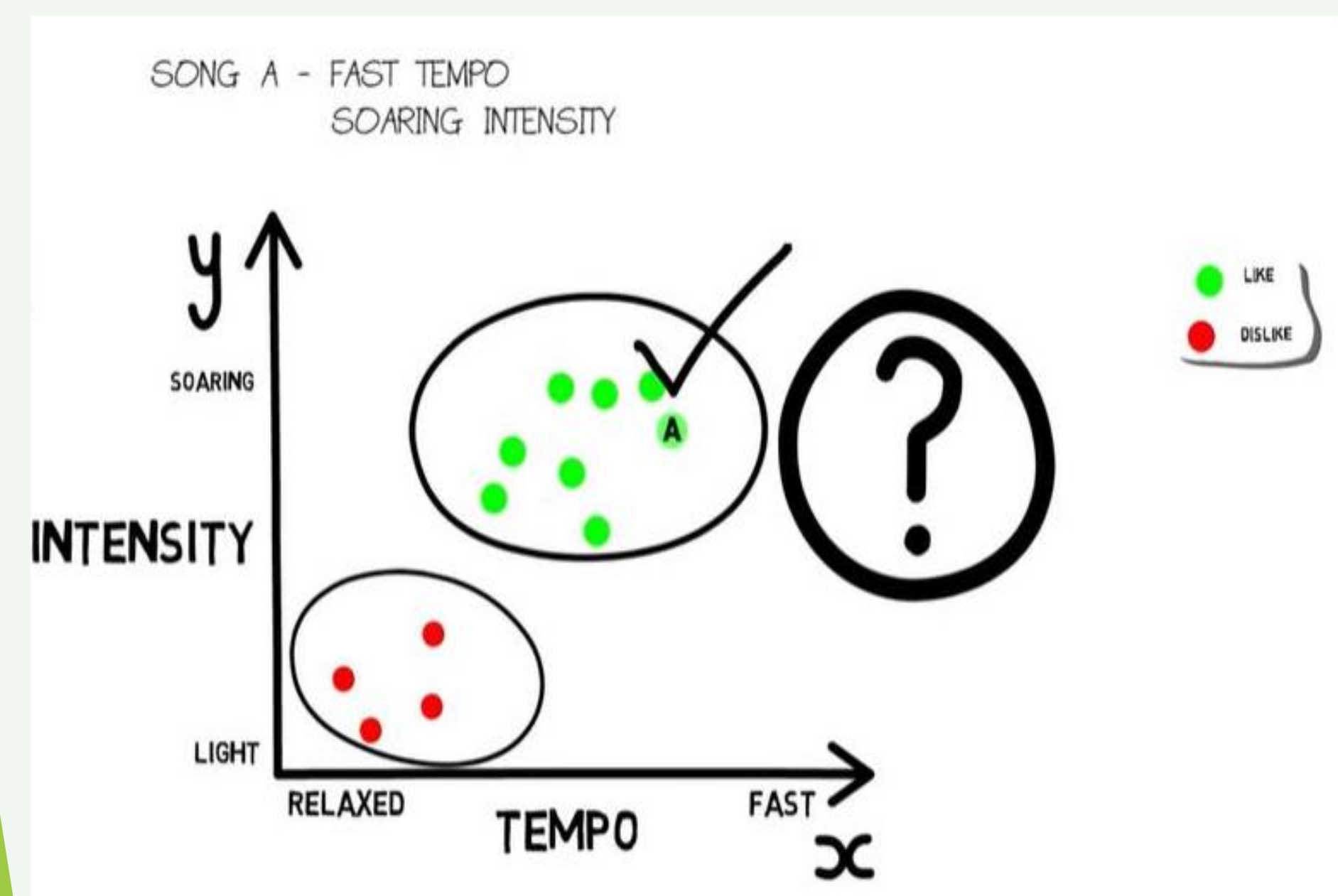
- Different types of ML - Supervised Learning, Unsupervised Learning, Reinforcement Learning

ML can help medical professionals make diagnosis easier by bridging gap between large data sets and human knowledge

Given a number of elements (with certain characteristics/features), we can build ML models to make predictions

For example, we can identify people affected by **Diabetes** or analyze the **Opioid Overdose Epidemic**

Around **46 PEOPLE** die every day from overdoses involving **prescription opioids.**

➢ Recent US Drug Overdose Deaths 70,237 (in 2017)

➢ 47,000 from opioids, ~ *130 per day!*

➢ More than a third ~17,000 from prescription opioids* ~ *46 per day!*

* does not include deaths associated with pharmaceutical fentanyl, tramadol, and other synthetic opioids used as pain medications