

DataEthics4All Summer 2023 Cohort

AI & Data with an Ethics 1st Perspective



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Introduction

- Siyona

Goal & Overview

- AI classification model
- Classify MRI images of knees
 - based on ACL tear
 - healthy/unhealthy
- Used a K-means model
 - in Python



Importance of the Project

- Increased Industry Application
- AI assisting doctors
- Connecting tech to our lives
- Supporting our future
- Making developments will impact us



Background & Relevant Work

- Nicky

Responsibility

- **Important factors to consider when developing AI**
 - ethics
 - software bugs
 - misidentification
 - overfitting

Ai Is Learning to “read Minds,” Paving the Way for Hands-Free VR ...,
morganton.com/life-entertainment/nation-world/technology/ai-is-learning-to-read-minds-paving-the-way-for-hands-free-vr-experiences/video_19dca366-2111-5f8f-885e-37beae924773.html. Accessed 26 Aug. 2023.

AI in the Health Field

- **Previous attempts at using AI and MRI images**
 - Interpreting brain waves
 - Failures of past attempts

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Research Paper Background Sources

-Nicky

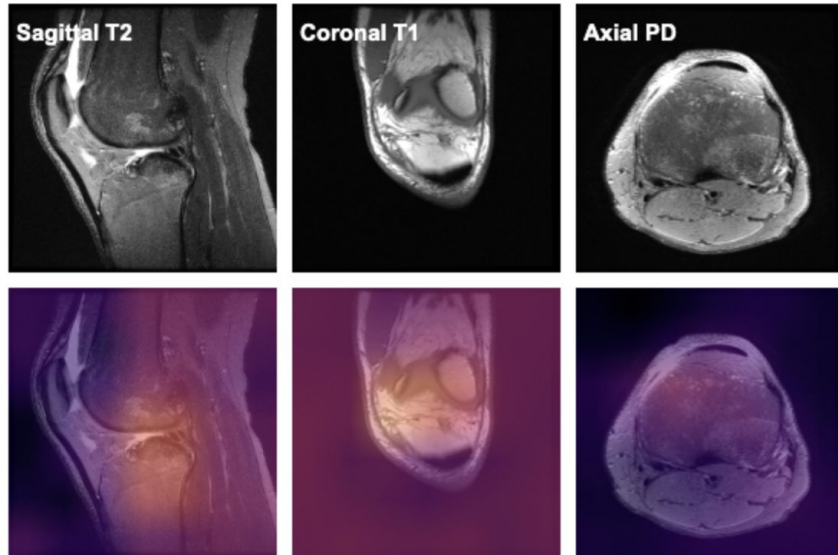
- https://docs.google.com/document/d/1Qd5h_5Zy3meTMFBRNvFHVYb9_EglQIG0476JGOaSnUE/edit
- *Ai Is Learning to “read Minds,” Paving the Way for Hands-Free VR ...*, morganton.com/life-entertainment/nation-world/technology/ai-is-learning-to-read-minds-paving-the-way-for-hands-free-vr-experiences/video_19dca366-2111-5f8f-885e-37beae924773.html. Accessed 26 Aug. 2023.

Methodology Overview

- Dan

Dataset – Dan

- The dataset we used is a set of MRI images of knees taken from multiple different angles
- Classification of type of Knee Injury:
 - Abnormal, ACL tear, and meniscal tear
- **Our Project was on Classifying: ACL Tear Vs. No ACL Tear**
- Images for Multiple Angles of the Knee: 3 Total
 - Each focus on a set:
 - Axial
 - Coronal
 - Sagittal



<https://stanfordmlgroup.github.io/projects/mrnet/>

Process- Dan

- Model was trained using **Scikit-Learn's K-means model**
 - Determining center point
 - Assigning other points to one of these points which creates clusters
- In our case, we had two separate clusters: with or without an ACL tear
- The data was split into two separate groups:
 - 400 images for training and 100 images for validation
- After training the model, accuracy is calculated by comparing the list of predictions from the algorithm and a list with the actual categorization

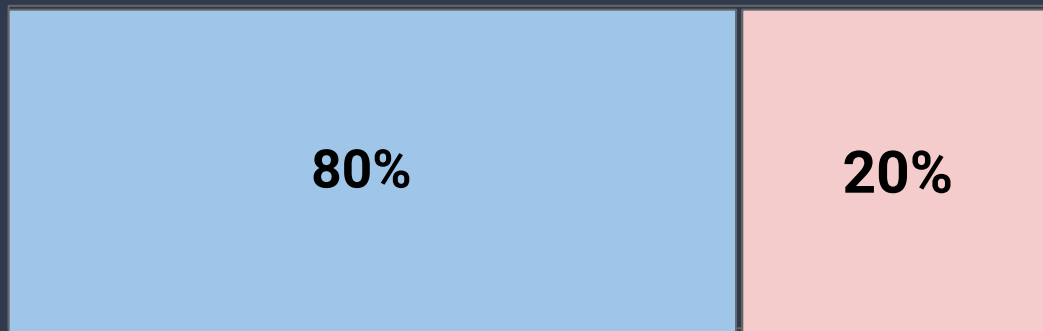
Methodology: A Closer Look

-Julia

Training & Validation Split

Pixel values were drawn from 80% of the knee image data to be used as training data

The other 20% was set aside as validation data to later be used to test the model



Training the Model

- Model: KMeans
- KMeans is a clustering algorithm.
 - It generates clusters based off of means that it selects from data it is given
 - Keeps updating the means until the values stop changing
 - This is called the training phase of the model
- You input to the model the desired number of clusters
 - The number of clusters is dependent on the number of classes in the data.
- Using the training data it was given, the KMeans model created two clusters
 - Each Cluster represents a mean value for the pixels of the images
- Ideally, the clusters should only have images that are similar to each other
 - We would see this by little overlap in the graph of the clusters

Validating the Model

- A training accuracy is calculated
- Then the KMeans model should be tested with the validation data that was set aside to evaluate how well it can classify data it has never seen before
- The model classification of the validation data to a cluster should be compared with the actual label of each validation data point
- A validation accuracy percent would then be calculated

Results

KMeans Model- Closest to Ideal

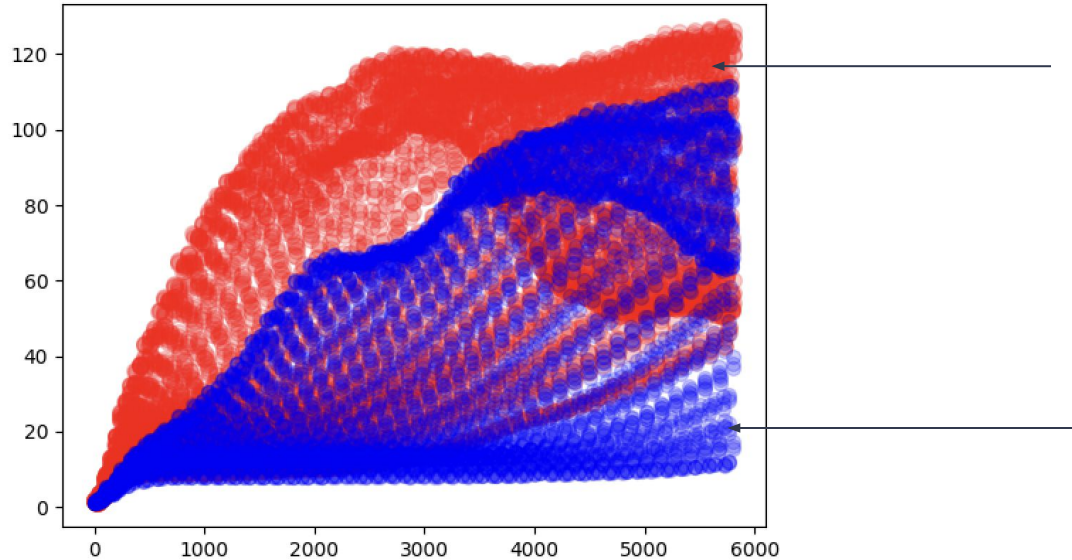


Image Caption:

This figure is a graph that shows the final centers of Alexa's KMeans model after it finished training. This should ideally be a complete split between the clusters.

- These parts of the clusters are not overlapping, as it can be seen by the colors
- This means that the model is able to cluster these data points into the right group
- These data points were easier for the model to classify than the ones in the middle
- However, there is a lot of overlap overall, meaning that the model has a lot of room for improvement

Discussion & Conclusions – Alexa

- We noticed how unbalanced the data ended up being and that's something we should fix.
- We didn't get a lot of time with checking the accuracy.
- Deep learning was brought up and it is definitely something we could experiment with..
- We could add on to the code using the other data we were given.
- Experiment with the different types of data.

Our Individual Learnings

Siyona

- Different forms of AI
 - How they can help and harm
- Ethical use of data
- Data privacy and how it can be breached
- Python basics
- Designing a K-means model
 - Inputting data and plotting

Dan

- Basic machine learning concepts
 - Manipulating data
 - Graphing data
 - Using python libraries for machine learning(scikit learn, numpy, matplotlib, etc)
 - Reading files using python
- Manipulating multiple forms of data in Python
 - Text, images, numerical, musical, video
- Usage of AI and its limitations
 - AI ethics

Alexa

- Invasion of privacy when it comes to AI.
- Collecting and analyzing data.
- Limitations that AI should probably have.
- Responsible AI and data use.
- How AI can be very useful in daily life.
- AI can be harmful if you have bad intentions and use it wrongfully.
- Figured out how to use kmeans.
- Learned how to plot data on python.
- How to go through data using code/python.
- I've created apps in the past, simple functioning ones of course, but now with the knowledge I gained from this cohort I will definitely explore into the AI world more and would look to implement AI into the apps I create in the future.

Nicky

- Data Preprocessing
- Python Basics
- Overview of AI, ML, and data analytics
- Python libraries (Numpy, Matplotlib, Pandas)

Julia

- Uses of AI
 - AI is useful in a wide variety of fields including healthcare, finance, entertainment, and many more
 - AI also has diverse personal applications, for example many people know and use chatGPT
- AI has applications to all of the following concepts: Data Science, Big Data, and Machine Learning
 - Data Science: involves breaking down data in order to discover patterns and uncover meaning
 - Big Data: deals with extremely large sets of data that require very advanced tools to break down (e.g. demographics, social media user interactions)
 - Machine Learning: the process of teaching computers to learn from data without being specifically programmed
- AI fuels big data, machine learning, and data science by enabling data processing, learning, and insights extraction
- There are several different types of data that you could have (called datatypes)
 - Image
 - Video
 - Numeric
 - Text
- Although these are different data types, they all ultimately become represented and manipulated as numbers when it comes to working with them on computers