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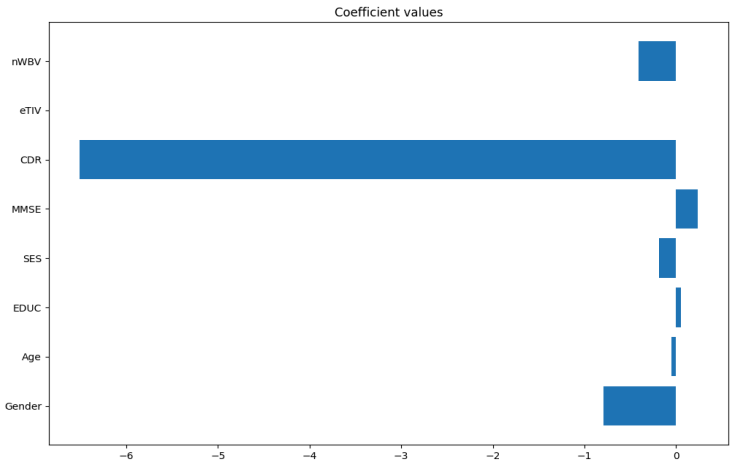
Predicting Dementia with AI

Have you ever wondered how dementia can be predicted before its symptoms are even shown in a person? Also known as memory loss, dementia is the impairment of memory, typically prevalent in old ages but can also occur in the younger stages of life. Dementia limits social skills, interferes with daily functions, and takes a toll on the body and mind's mood, behavior, psychological skills, emotional skills, etc. Some of the things that are considered when looking at what might cause dementia include gender, age, dominant hand, education, Clinical Dementia Rating (CDR), and more. While this information can help identify what might cause dementia, artificial intelligence can take it one step further by using previous training data to make predictions on whether a person is more or less likely to have dementia based on these factors. Keep reading to see how exactly AI models predict the probability of someone having dementia while it's also discussed which models did the best and worst.

Using AI to classify a person as demented or non-demented is done through training and testing data. Firstly, the AI is fed information called 'X and y training data," in which the models learn from previous inputs and outputs to make their predictions, because that's how AI works! It learns through structures and algorithms to provide

information based on what it was trained with. Think of it as if a child is given that 2+2 is 4, and then given to solve 2+3 using knowledge about how to solve 2+2. Using the training data, the result called the "y test," is outputted by the AI from the X test. The AI will use information such as gender, age, education, brain size, and CDR to make predictions.

- The graph provided here displays information on which values were taken the most into consideration when making the predictions.
- CDR has the highest coefficient value, and education and age have the lowest value.

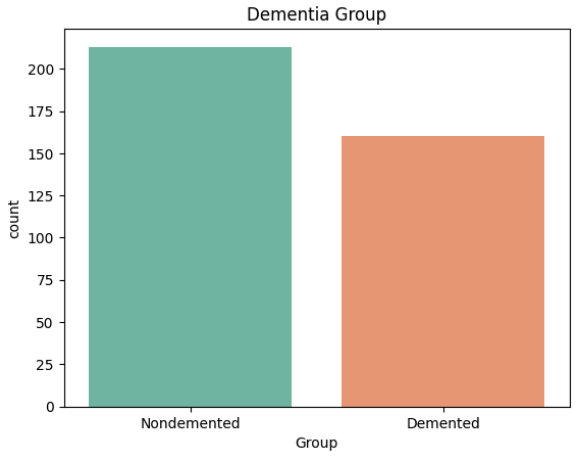


In this project, multiple classifiers were tested. Some include Random Forest, Logistic Regression, AdaBoost, and Decision Tree. Out of these, the random forest performed the best, with the most accurate result, and the decision tree performed the worst, with the least accurate result. Of course, there are many complex reasons as to why these classifiers did the best and worst. However, the main reason that the random forest classifier did the best is due to its resistance to overfitting, unlike the

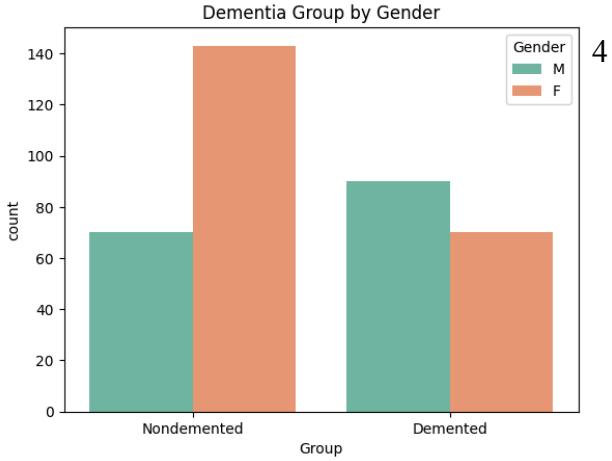
decision tree. The decision tree can only take in so much data, and since it was fed too much data, it succumbed to overfitting, in which it understood the training data but did poorly with the test data. In contrast to the decision tree, the random forest is a collection of multiple decision trees, making it a complex forest of "trees." Due to this, it was able to perform well and output accurate results.

We now have our models which did the best and worst out of the tested ones, but what are the next steps? Well, it only makes sense to take it further and test out more powerful models. By looking at more powerful classifiers, more accurate results could be outputted using a model like a neural network. It's much higher in complexity and therefore could eliminate the possibility of overfitting to give the best results possible.

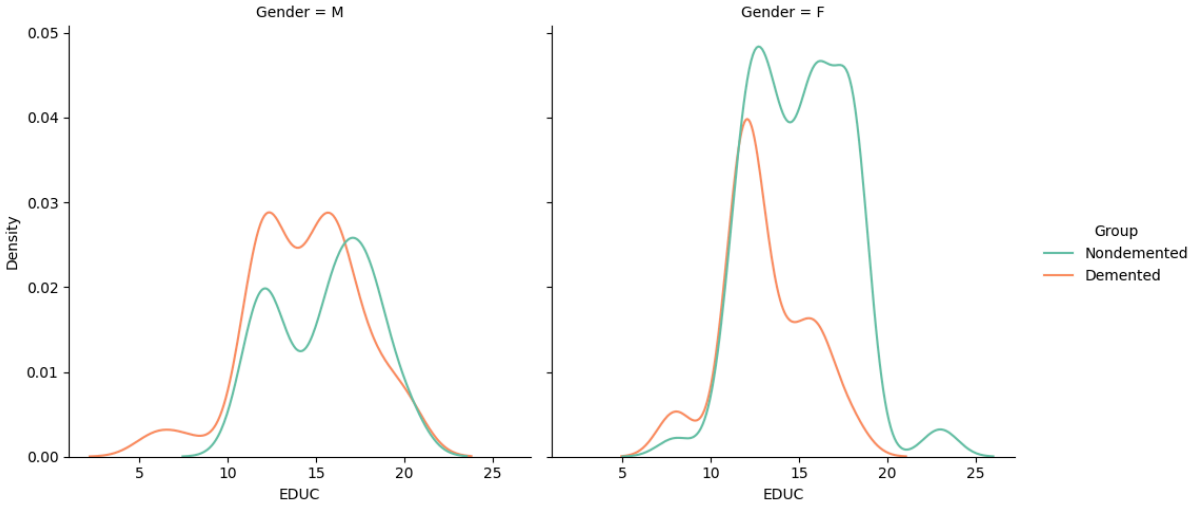
- Look to the next page to see some more classifiers that were tested and their models.



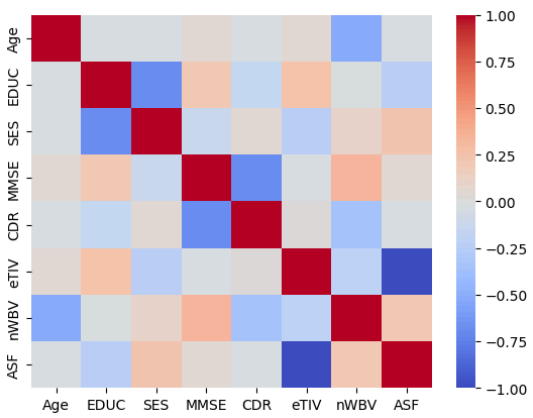
Countplot (dementia group)



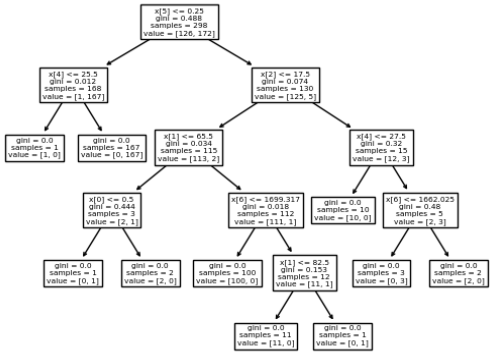
Countplot (dementia group by gender)



Displot (gender + education)



Heatmap



Decision Tree

AI is quickly developing and improving every day. It has come to a point in time where it can make the work of humans easier, which is shown in this project. While doctors or scientists could've done the same and told a patient if they are prone to having dementia based on certain factors, the AI models can do the same but in a much quicker and more efficient way by learning from past data. In the future, I hope to take this project further by implementing the AI models into a web app for people all around the world to use. This way, I can use my interest in AI to benefit others and to expand my knowledge of the artificial intelligence world.