Sketch Recognition using Artificial Intelligence

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Abstract:

This paper is about an AI project that helps people learn about animals. The AI can recognize hand-drawn sketches of animals and other objects and provide information about them. I was motivated to start this project because of my interest in art and wanted to build an AI system that could learn to detect art created by humans. I used different supervised classification algorithms such as Logistic Regression, Random Forest and Ridge Classifier to train our model. Random Forest classifier performed the best among all the models we used with an accuracy of 72.8%. I used Python and used Google's Quickdraw to collect images and data.

Introduction:

In this project, I am using different supervised classification algorithms to predict the type of animal from a human-drawn sketch. We are collecting a dataset of sketches of different animals and labeled them accordingly. The goal of this project is to develop a model that can accurately predict the type of animal based on a sketch. We are using various algorithms such as Logistic Regression, Random Forest, and Ridge Classifier to train our model. We are also evaluating the performance of these algorithms by comparing their accuracy. The results of this project will help us to understand the strengths and limitations of each algorithm and select the best one for our task. Ultimately, the model we develop will have the potential to be used in educational or entertainment applications.

Dataset:

I got my dataset from an app called quickdraw. These doodles are a unique data set that can help developers train new neural networks, help researchers see patterns in how people around the world draw, and help artists create things we haven't begun to think of.
The quickdraw dataset is a collection of different types of images. I decided to use owls, parrots, sun, crocodile, dog, helicopter, frog headphones, clouds, and tornadoes. I decided to use these images because of how unique they look on the quick draw app and how it would be a challenge for the AI I created.
There are 10,000 images in my dataset, which means there are 1,000 samples for each type of image. I decided to use 8,500 images in the training dataset and 1,500 in my testing dataset.
To preprocess the images we normalized the images. This means we took the images and made all the RGB values to be between 0 and 1 rather than 0 and 255.

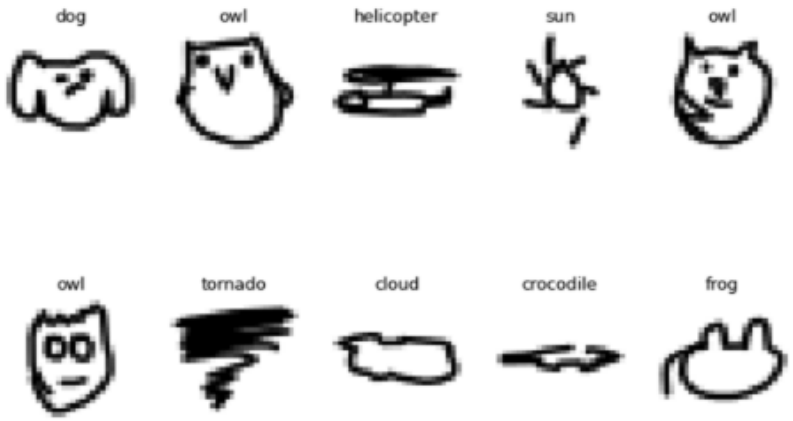


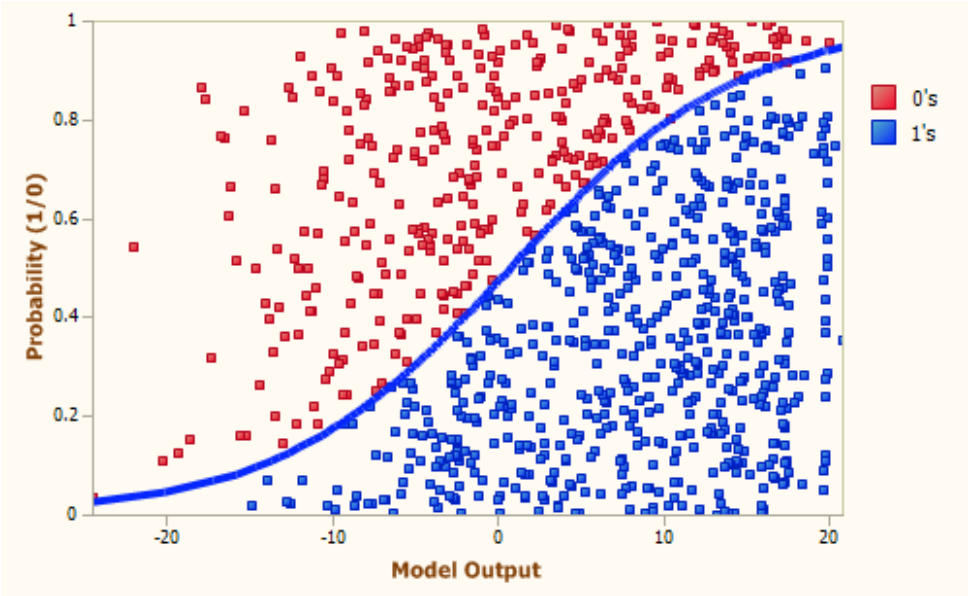
Figure 1: Visualization of our data

Methodology:

For logistic regression I experimented with changing the max iterations. For Random Forest Classifier i changed the Number of estimators and finally for the Ridge classifier Max Iterations.

Logistic Regression:

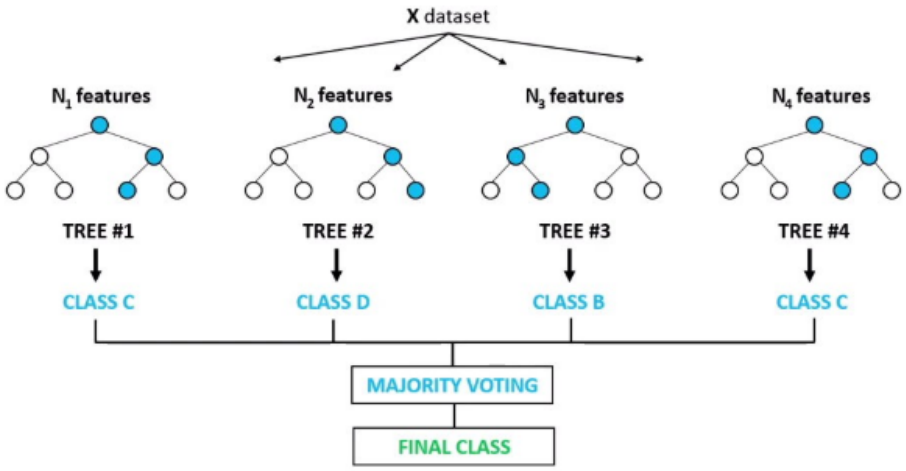
Logistic Regression is a technique used for supervised classification problems. In the case of the sketch recognition problem logistic regression takes an image, for example a sketch of a frog, and outputs a probability between 0 and 1 of how likely this image is a frog. To improve the model's performance, we can choose how many times the AI model runs the model by tuning a parameter known as "Maximum Iteration", the performance of the AI model is proportional to this parameter. In the results section we discuss the effect of changing this value.



Random Forest Classifier:

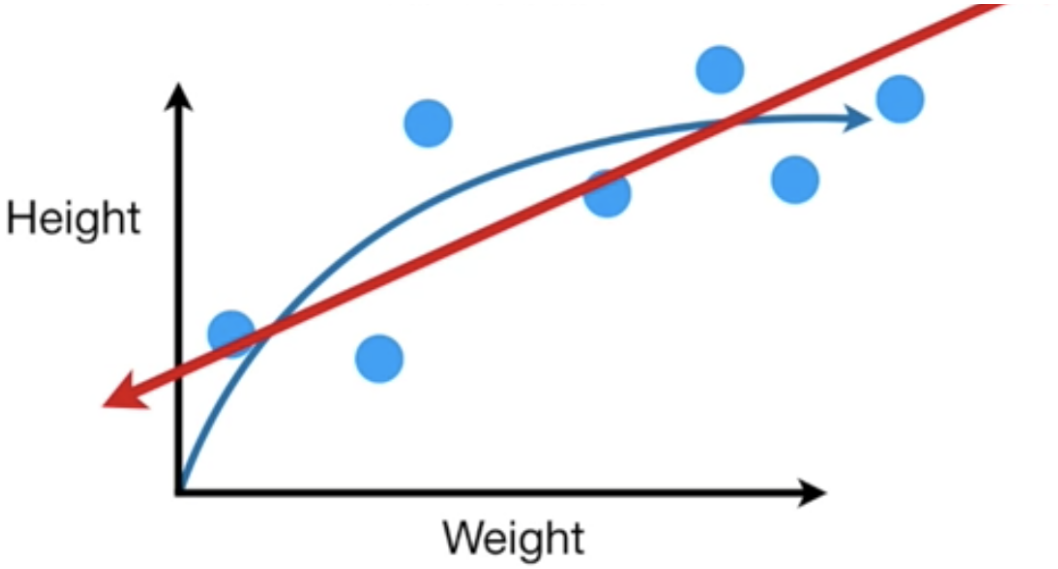
Random Forest classifiers is a way for a computer to make predictions using a group of simple models called decision trees. It combines the answers from multiple trees to make a final prediction. It is more accurate than using just one decision tree because it takes into account multiple answers and reduces the risk of being wrong. Like Logistic Regression we can change certain values of the Random Forest Classifier to alter the performance, however

in this case we alter the number of decision trees.



Ridge Classifier:

Ridge Classifier is a type of linear classifier that is trained using Ridge Regression. Ridge Regression is a regularization technique used to prevent overfitting by adding a penalty term to the cost function. The Ridge Classifier uses this regularization technique to improve the generalization of the model, making it more robust to outliers in the training data.



Results:

These are the results for all of my models and as you can see random forest classifier is the best accuracy.

Logistic Regression:

Max iter	Accuracy
1	10.2%
2	32.1%
3	52.06%
4	54.13%
5	59.13%
10	63.0%
50	**66.53%**
100	**66.53%**
200	64.53%
300	63.26%

Random Forest Classifier:

Num Estimators	Accuracy
1	42.73%
2	42.19%
3	46.46%
4	51.13%
5	53.93%
10	60.06%
50	68.86%

100	72.2%
150	72.53%
200	**72.8%**

Ridge Classifier:

Max Iter	Accuracy
1	58.26%
2	58.26%
3	58.26%
4	58.26%
5	58.26%
10	58.26%
50	58.26%
100	58.26%
200	58.26%
300	**58.26%**

Discussion:

Logistic Regression:

The best numbers for max_iterations on logistic regression is 50-70 if the max_iterations were put at 80+ the numbers / percentages would start to go down which would be less useful for my AI model. But the highest max_iteration we can do is 50 at a percentage of 67.9

Random Forest Classifier:

The best number of estimators for Random Forest Classifier is the higher the better for example 100 number of estimators was 72 . 2% 200 number of estimators was 72.8 this shows how the more number of estimators the better this model performs which is why this random forest classifier is my best model

Ridge classifier

Surprisingly any max_iteration for this model would be the same percentage of 58.26 which is kinda weird showing how this is my worst performing model yet.

Conclusion:

In conclusion, the goal of this project is to make an AI model that doesn't require lots of images to show results of different kinds of animals and natural disasters. These images are sketches that humans have drawn. The AI models that I used were Random Forest Classifier, Logistic Regression and ridge classifier. The best model in accuracy was the Random Forest Classifier with a percentage of 72.8% accuracy being the highest out of them all. It required a 200 Number of estimators to get a percentage of 72.8, In the random forest classifier the higher number of estimators made the percentage get even higher. The model that surprised me the most was the Ridge classifier because of the fact that all the percentages were the same, A percentage of 58.26% no matter what Max iterations you put which is very surprising