Patrick Chavez-Nadarajah

Professor Rosenberg

CART 451 2232-AA

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MLExercise

PART A

1. Please provide a description of the initial data set you brought to class. What were the objects, how many … and why you chose those specific objects. Provide an image of each distinct object.

The two primary objects I chose for the dataset were a wooden fork and a badge pin. I chose these objects due to their physical differences: the fork is lean and tall and the pin is round and small.

2. What was the purpose of the task you were asked to do in class?

The class was designed with the purpose of teaching about Machine Learning. This is done with the website Edge Impulse. The idea is to upload images of the above items and well as other miscellaneous objects and place them into classes. The classes are then defined as datasets and the machine learns to distinguish these datasets.

3. Describe in a series of steps what you did to complete the initial task in class

1. I uploaded the 3 datasets into my Edge Impulse project.

2. In the impulse design page, I made the AI observe the dataset images (160x160 size). Using the RGB values, the AI associated objects by color.

3. After a long wait, the AI's performance in identifying objects is given to me. The results can be accessed in the "Generate features" tab in the "Image" page.

4. The "Transfer learning" and "Model testing" pages show the accuracy in how the machine identifies the objects.

5. In the Deployment page, I test the machine's accuracy using my computer's camera.

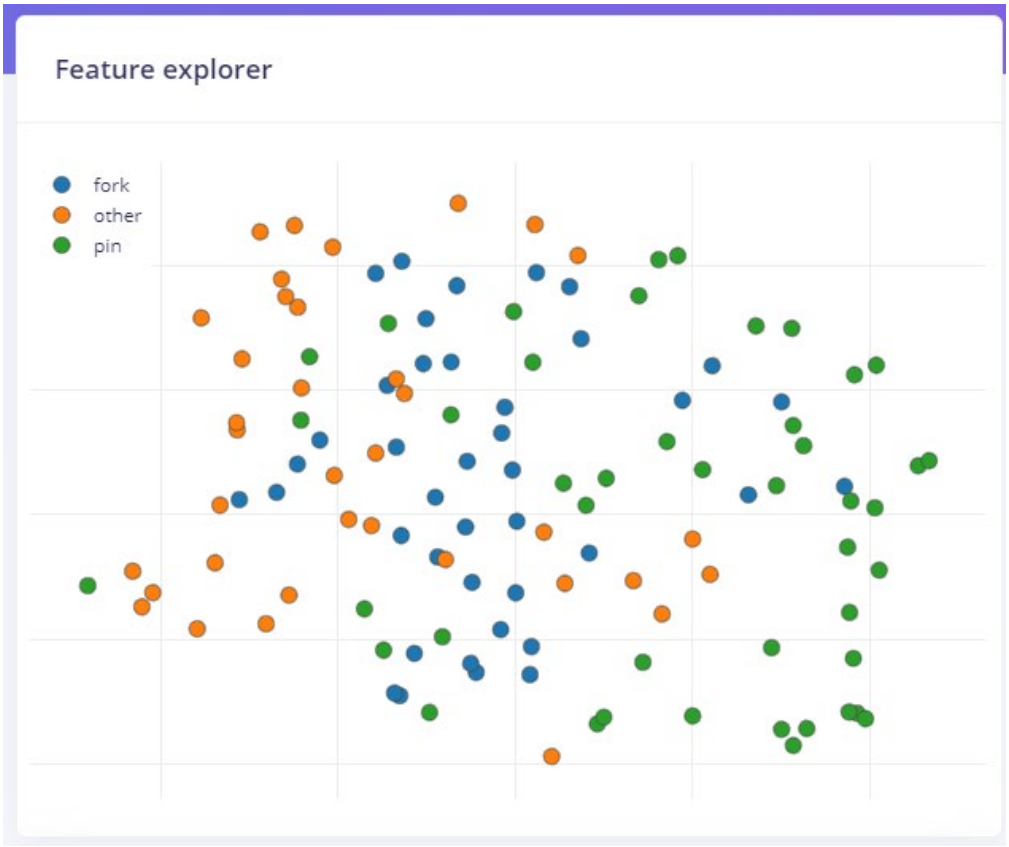
4. How well did your dataset do in terms of *Accuracy, Precision and Recall*?

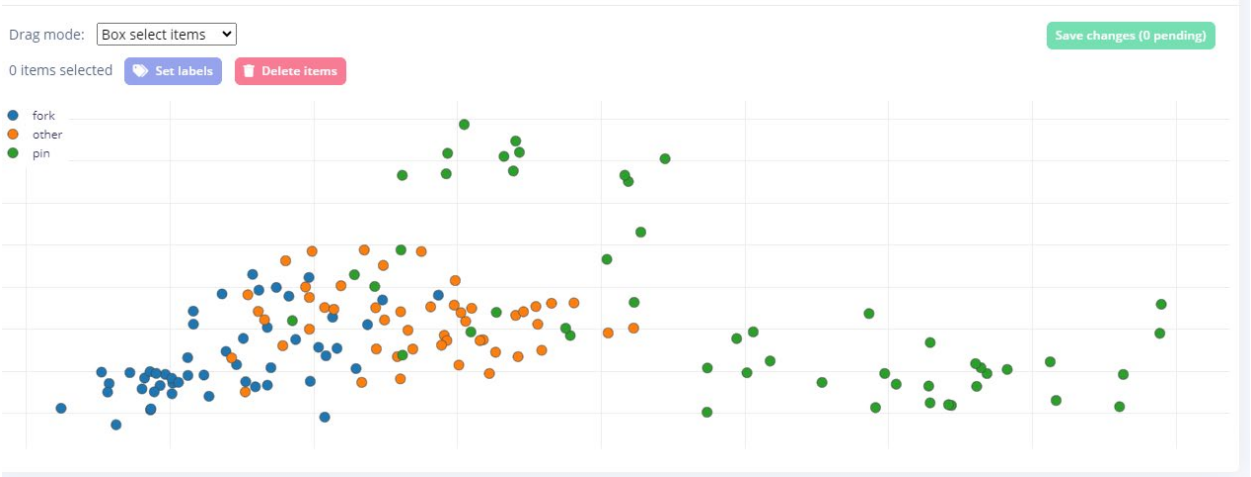
According to the Transfer Learning page, the machine has an accuracy of 92.0%. The F1 score for the fork, pin and other objects were 0.96, 0.83 and 0.93 respectively.

On the Model Testing page, the machine has an accuracy of 93.10%. The F1 score for the fork, pin and other objects were 1.00, 0.91 and 0.92 respectively.

In the Deployment page, the results of the AI were a bit finicky, but it is able to correctly identify the main objects (i.e., the fork and pin).

5. Take screen grabs of the graphs available through the Feature Explorer for both the training and test/ live classification sets. Discuss the graphs in detail.


Feature explorer
fork
other
pin


Drag mode:
Box select items
Save changes (0 pending)
0 items selected
Set labels
Delete items
fork
other
pin

From these graphs, there seems to be a lot of intermingling between the 3 datasets; this might be due to them all sharing the same white background and lighting. Furthermore, there are shapes that overlap between the main objects and the other objects. For example, the pin has a similar shape to the dental floss container; this confuses the machine and makes it categorize the floss container with the pin, as they have a similar color scheme.

6. Provide brief postulations for how you think you could get your model to perform better. What does better mean?

I believe that putting more variety into the backgrounds of my pictures could help the AI to differentiate one object to the next. The reason for this is that with the many different colors present in the background, the AI won't have to simply rely on shapes to distinguish different objects. This would also prevent different items of a similar color from getting grouped together.

In my opinion, better performance means that the AI is able to have more precise results when identifying images. Furthermore, the machine should be able to easily identify an object when the user shows it in front of a webcam.

PART B

1. Please provide a description of the data used to construct the model. What were the objects, how many … and why you chose those specific objects. Provide an image of each distinct object.

This time around, only two objects were used: my wooden fork and a wooden owl provided by Sabine. These objects were chosen due to their physical differences (a thin rectangle versus two ovals). In addition, their backgrounds are also distinct (grey versus a gradient of browns and whites).

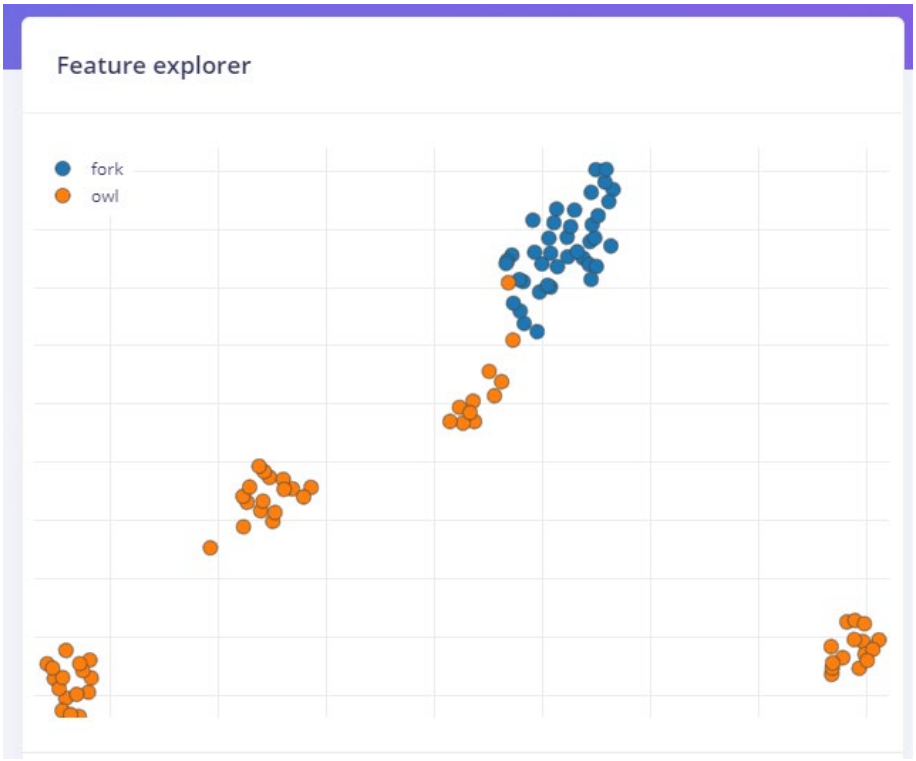
2. What was the purpose of this task in contrast to PART A

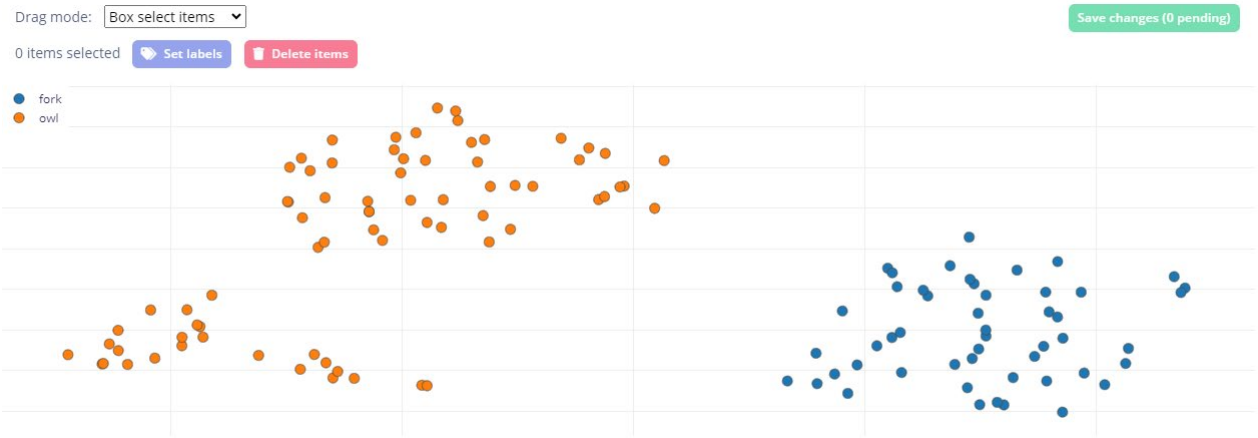
This task was made in order to see how much better the AI could distinguish objects if their backgrounds were drastically different.

3. How well did your revised dataset do in terms of Accuracy, Precision and Recall?

The results were significantly better! Both the Transfer Learning and Model Testing pages gave an F1 score of 1.00 for both objects.

4. Take screen grabs of the graphs available through the Feature Explorer for both the training and test/ live classification sets. Discuss the graphs in detail.





For the most part, the two objects are mostly distinct, so the AI has a much easier time distinguishing between the two. The only kind of overlap between the two objects is when the owl is juxtaposed with a white background, then the machine becomes confused as greyish-white is a trait associated with the fork.

5. Provide brief postulations for how this model performed in contrast to PART A. Why?

This model was much more accurate in identifying objects than PART A. The key reason for this I believe, is that the background colors for the two objects were different. In PART A, all of the objects had the same white-grey background and this caused the AI confusion when identifying the items. However, because the background colors in PART B were more diverse, there was much less overlap between the two datasets. Indeed, the only overlap that happened was when the owl had a white background.

PART C

Provide a written scenario: (not necessarily useful nor functional) – meaning you can dream up what you wish… without constraint... - for how and when such a task (Object Detection) could be used or embedded in … what, why, where, with whom.

There could be a sort of machine out in the open that asks the audience to show it an object; the machine then shows how the object was made, who bought it/gifted it to the current owner, what material the object was made of and other such inane trivia.

The machine can be easily installed in any outdoor area and used as a tourist attraction. Ideal locations for this type of machine would be shopping areas or parks. Anybody can use the machine, as long as they have an object (and cash, if the owner is greedy).

And provide a storyboard describing the scenario above as well.