Automotive Dataset Analysis

Picture classification and Analysis for bikes

The problem

Dataset

Tasks based on images taken from automotive set.

Task

To classification whether shown pictures are either bicycles or not and to understand the data for better decision making.

Problem statement

To filter the data and extract important information from nested json objects. To Analysis each annotators performance and its comparison with other annotators.

Look at the Data

As we can see from the graph the data provided is almost balanced data with both Not bicycle and bicycle having equal representation.
Total set of images are: 9087 out of which 4586 are of bicycles and remaining 4501 are of not bicycles.
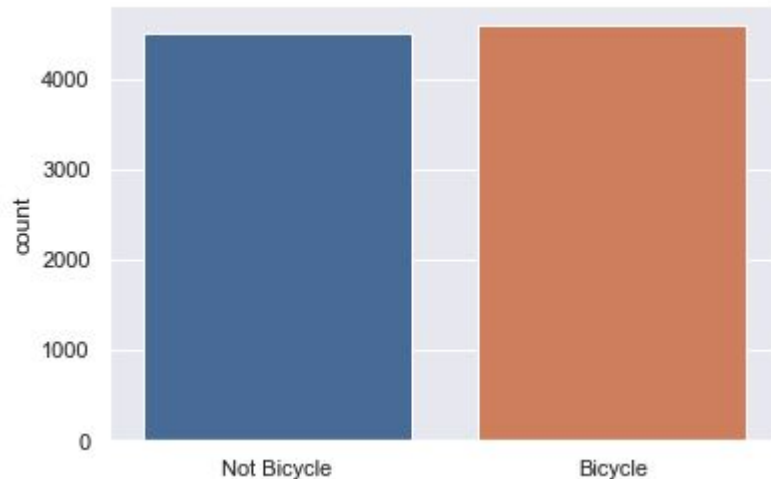
Number of Annotators who contributed

Those who answered the Questions

-Total of 22 Annotators who contributed to the project.
-On right we can see a Pie chart showing annotators and their share of contribution to the whole project.
-We can also see the number of attempted questions by each annotator in the graph below on right.
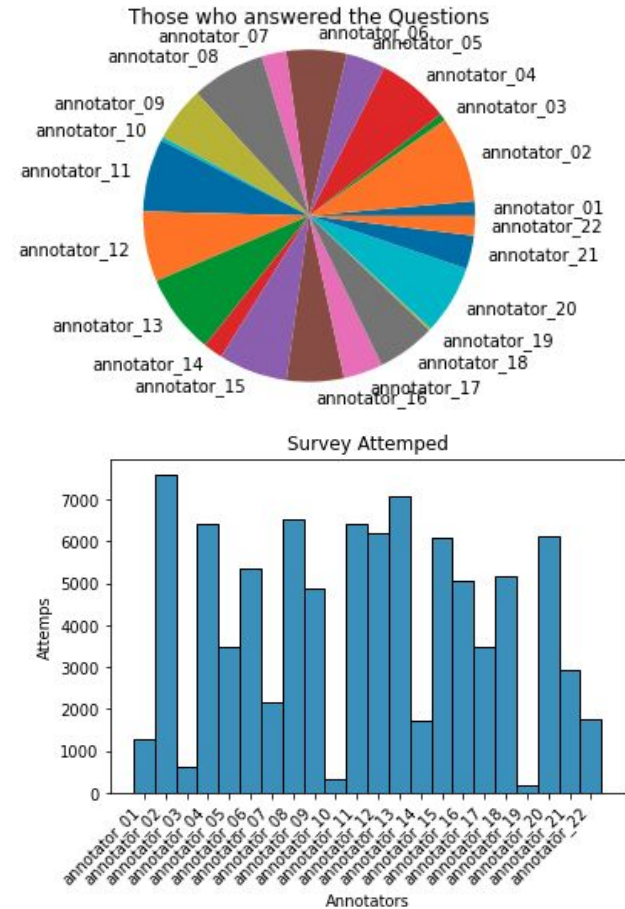
Time taken by Annotators

-Time taken by Annotators:
      Max time taken by any annotator: 42398 ms
      Min time taken by any annotator: 10 ms
      Standard Deviation of time of all annotators: 1124 ms
      Mean time of all Annotators: 1289.9 ms

-On our right we can see a box plot, which basically shows
 an overall pictorial view of time taken to attempt each question by
 all the annotators. First line shows lower quartile and middle shows mean
 the third line shows upper quartile. Remaining are the outliers.

Box Plot for Time taken for each Question
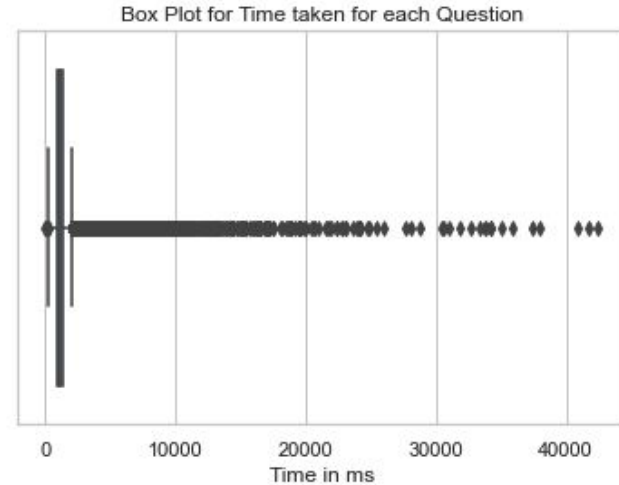
An overall look at the Annotators

Shows all the questions attempted

Questions which could not be solved due to data issues.

If data was corrupted

Duration to attempt

Answered Correct

Percentage of correct answered

Percentage of correct answered against total attempted out of the pool

	annotator_01	annotator_02	annotator_03	annotator_04	annotator_05	annotator_06	annotator_07	annotator_08	annotator_09
Attempted	1280	7596	630	6421	3475	5337	2175	6537	4860
cant_solve	0	0	0	0	0	0	0	0	0
corrupt_data	0	0	0	0	0	0	0	0	0
duration	1077	1178	1460	1114	1562	1497	1578	1435	1199
answered_correct	607	3844	335	3048	1731	2435	1044	3149	2383
percentage_correct	47	51	53	47	50	46	48	48	49
adjusted_percentage	7	42	4	34	19	27	11	35	26

annotator_10	...	annotator_13	annotator_14	annotator_15	annotator_16	annotator_17	annotator_18	annotator_19	annotator_20	annotator_21	annotator_22
315	...	7078	1725	6088	5061	3485	5170	170	6126	2950	1745
0	...	0	0	0	0	0	0	0	0	0	0
0	...	0	0	0	0	0	0	0	0	0	0
1253	...	1155	1595	1365	1270	992	1593	1638	1173	1239	879
123	...	3581	862	3117	2570	1788	2486	81	3077	1446	858
39	...	51	50	51	51	51	48	48	50	49	49
1	...	39	9	34	28	20	27	1	34	16	9

Annotators Performance Comparison

-Graph on the right shows the bar chart of all the correct Percentages of answers given by the annotators in blue versus Amount of questions attempted and correct answered. Higher orrange bar means annotator answered more questions and gave more right answers.

-Graph below shows the averaged out time of each annotator for all the questions attempted.
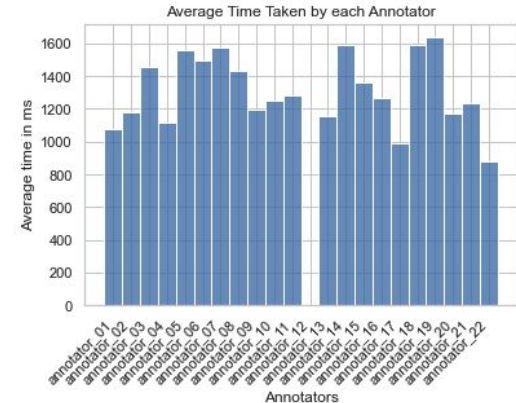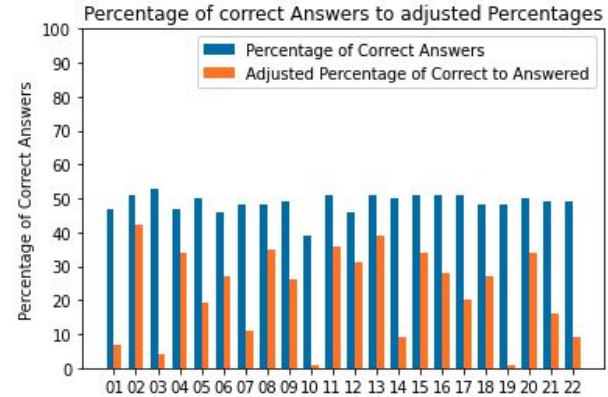

Percentage of correct Answers to adjusted Percentages

Average Time Taken by each Annotator

Image Classification using Tensorflow

-Images are converted into arrays of 3 Dimensions
-The data is divided between train and val(testing)
-CNN model is used having 3 Convolutional layers with max-pooling layers.
-To avoid overfitting dropout layer is added after 3rd maxpool.
-Below we can see the graphs for accuracy and and loss for both training and validation.
-The Neural network was run for 500 epochs as the x axes represents.

Training and Validation Accuracy

Training and Validation Loss
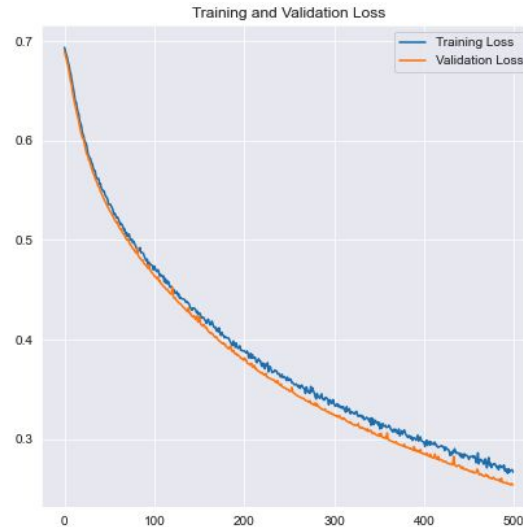
Results of Classification

-Here we can see precision recall and F1-Score of the results

-The results looking promising as average weighted average Precision is 0.91 which is higher than that of annotators.

$$Recall = \frac{TP}{TP + FN}$$

$$Precision = \frac{TP}{TP + FP}$$

	precision	recall	f1-score	support
Not a Bicycle (Class 0)	0.92	0.90	0.91	2310
Bicycle (Class 1)	0.90	0.91	0.91	2233
accuracy			0.91	4543
macro avg	0.91	0.91	0.91	4543
weighted avg	0.91	0.91	0.91	4543

F1 = 2 * (precision * recall) / (precision + recall)