Cyberbullying Classifier

using Machine Learning

Disruptive Technology 22ECH-102

22BCB-124 (A)

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Problem Statement

Often people are targeted and **cyberbullied** on social media platforms like **Discord**, Twitter, **Reddit** and Instagram.

We aim to make a text classifier that classifies tweets from twitter as ‘**not_cyberbullying**’ or ‘**cyberbullying**’ along with it’s type – racial, age based, gender based, etc.

How will it work?

We have a **labeled dataset** that contains more than **40 thousand** tweets from twitter that are labelled with types of cyberbullying.

We plan to **train a model** on that dataset (also on other datasets to get better accuracy if possible).

The model would be able to:

- Process a sentence
- Figure out its sentiments
- Classify its cyberbullying type.

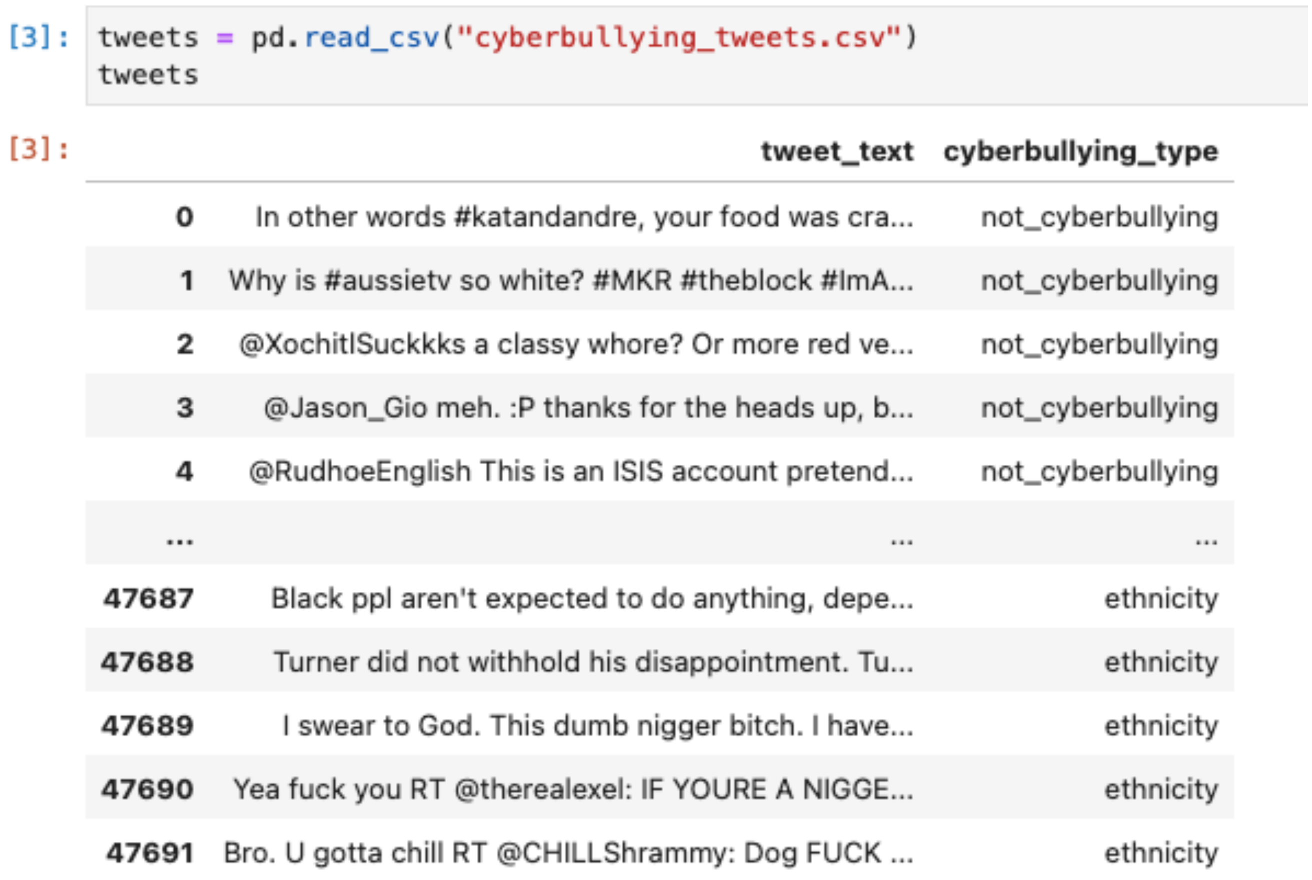
How is this different from other methods?

The most simple method of **detecting vulgar speech** in cyberbullying would be checking for **keywords**.

But this is **not accurate** since the poster can modify the spellings of the words however he wants, so our program has a **high chance of failure**.

We are using an approach that uses **Machine Learning** to analyze sentiments of a sentence and decide if it should be categorized as cyberbullying.

Progress of building our Model



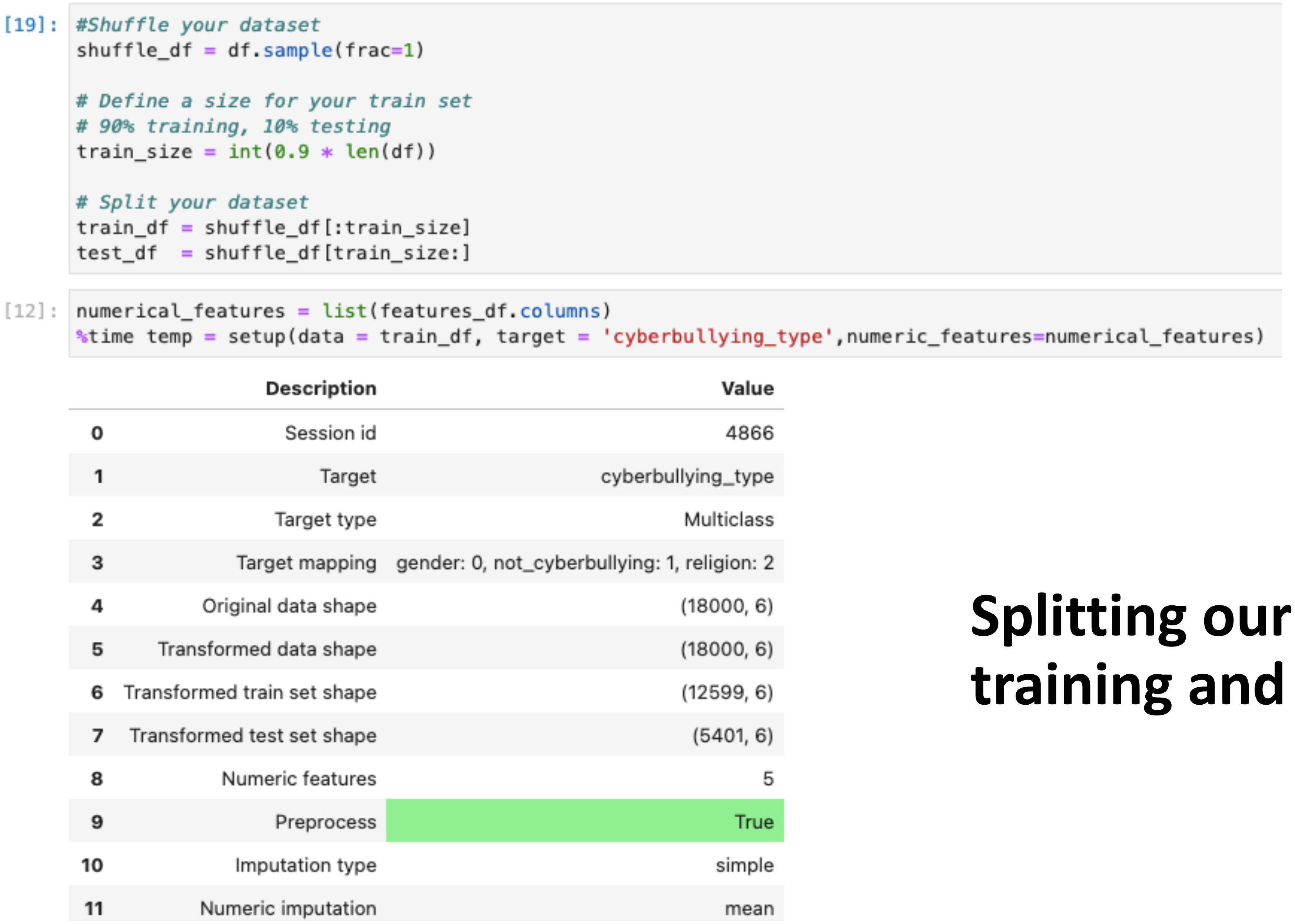
```
[3]: tweets = pd.read_csv("cyberbullying_tweets.csv")
     tweets
```

[3]:

	tweet_text	cyberbullying_type
0	In other words #katandandre, your food was cra...	not_cyberbullying
1	Why is #aussietv so white? #MKR #theblock #ImA...	not_cyberbullying
2	@XochitlSuckkks a classy whore? Or more red ve...	not_cyberbullying
3	@Jason_Gio meh. :P thanks for the heads up, b...	not_cyberbullying
4	@RudhoeEnglish This is an ISIS account pretend...	not_cyberbullying
...	...	...
47687	Black ppl aren't expected to do anything, depe...	ethnicity
47688	Turner did not withhold his disappointment. Tu...	ethnicity
47689	I swear to God. This dumb nigger bitch. I have...	ethnicity
47690	Yea fuck you RT @therealexel: IF YOURE A NIGGE...	ethnicity
47691	Bro. U gotta chill RT @CHILLShrammy: Dog FUCK ...	ethnicity

Vulgar Speech Dataset

Credits : Kaggle



```
[19]: #Shuffle your dataset
      shuffle_df = df.sample(frac=1)

      # Define a size for your train set
      # 90% training, 10% testing
      train_size = int(0.9 * len(df))

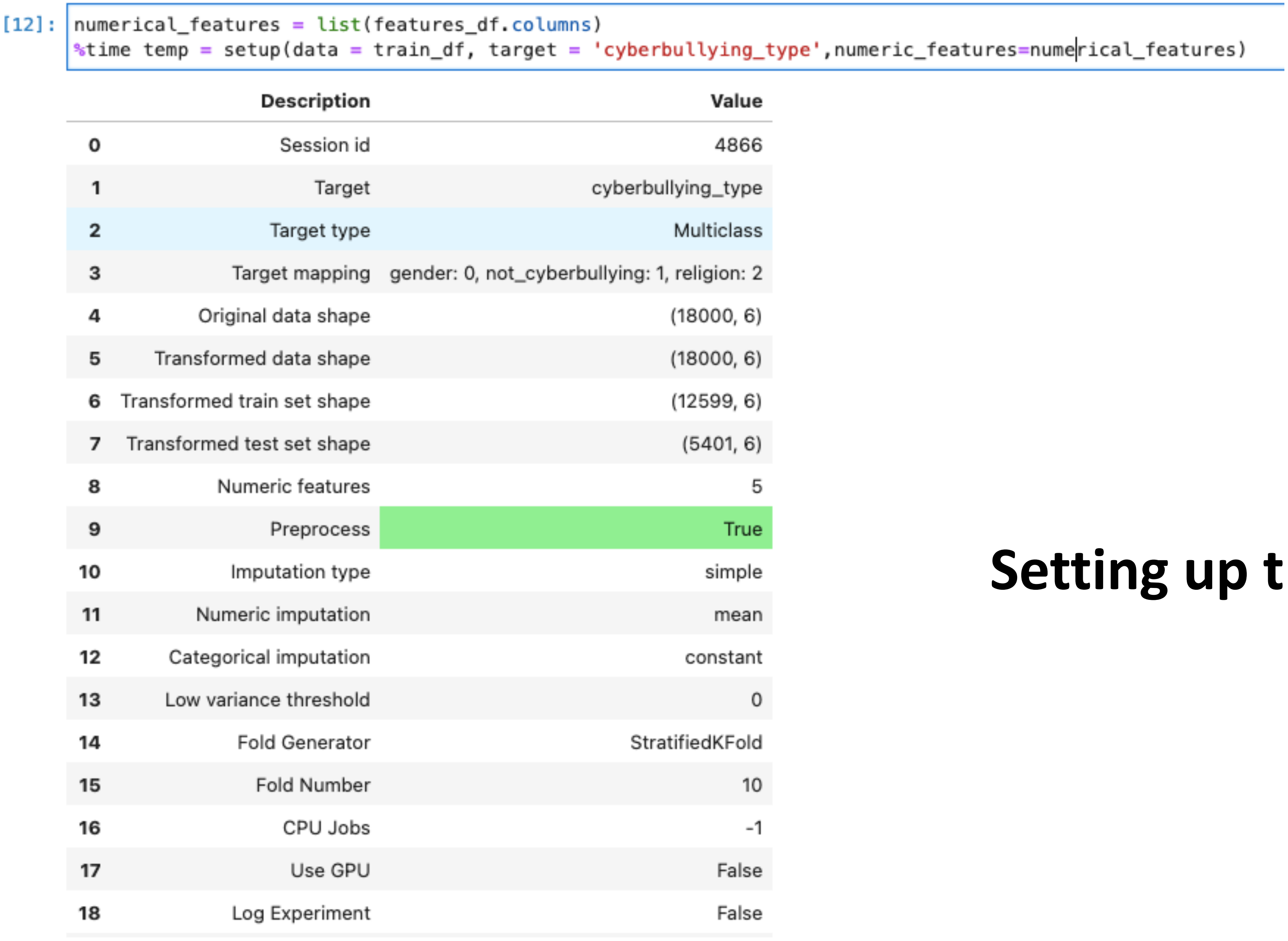
      # Split your dataset
      train_df = shuffle_df[:train_size]
      test_df  = shuffle_df[train_size:]
```

```
[12]: numerical_features = list(features_df.columns)
      %time temp = setup(data = train_df, target = 'cyberbullying_type',numeric_features=numerical_features)
```

	Description	Value
0	Session id	4866
1	Target	cyberbullying_type
2	Target type	Multiclass
3	Target mapping	gender: 0, not_cyberbullying: 1, religion: 2
4	Original data shape	(18000, 6)
5	Transformed data shape	(18000, 6)
6	Transformed train set shape	(12599, 6)
7	Transformed test set shape	(5401, 6)
8	Numeric features	5
9	Preprocess	True
10	Imputation type	simple
11	Numeric imputation	mean

Splitting our dataset into training and testing parts

Setting up training dataset



```
[12]: numerical_features = list(features_df.columns)
      %time temp = setup(data = train_df, target = 'cyberbullying_type',numeric_features=numerical_features)
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	Description	Value
0	Session id	4866
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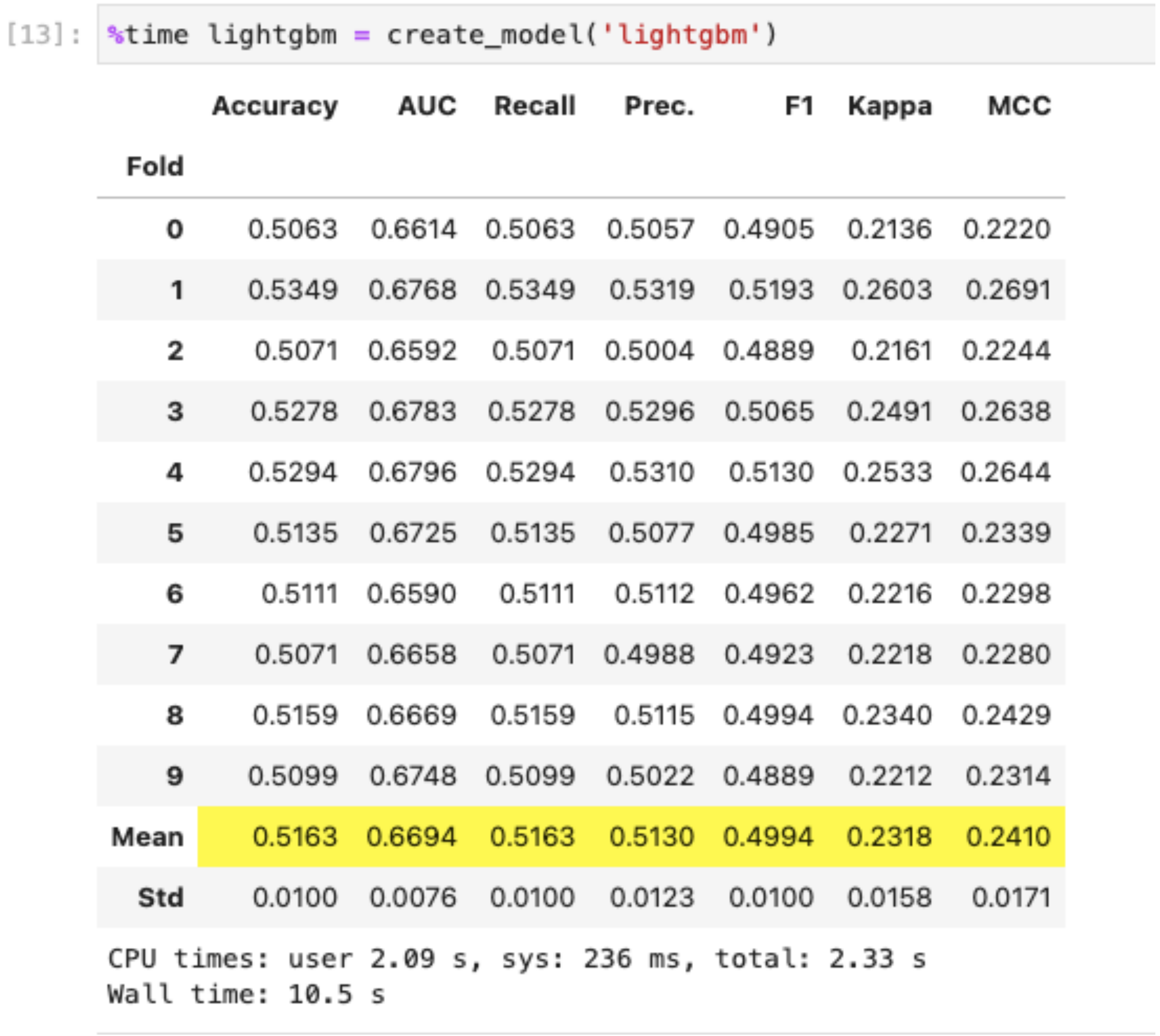
7	Transformed test set shape	(5401, 6)
8	Numeric features	5
9	Preprocess	True
10	Imputation type	simple
11	Numeric imputation	mean
12	Categorical imputation	constant
13	Low variance threshold	0
14	Fold Generator	StratifiedKFold
15	Fold Number	10
16	CPU Jobs	-1
17	Use GPU	False
18	Log Experiment	False

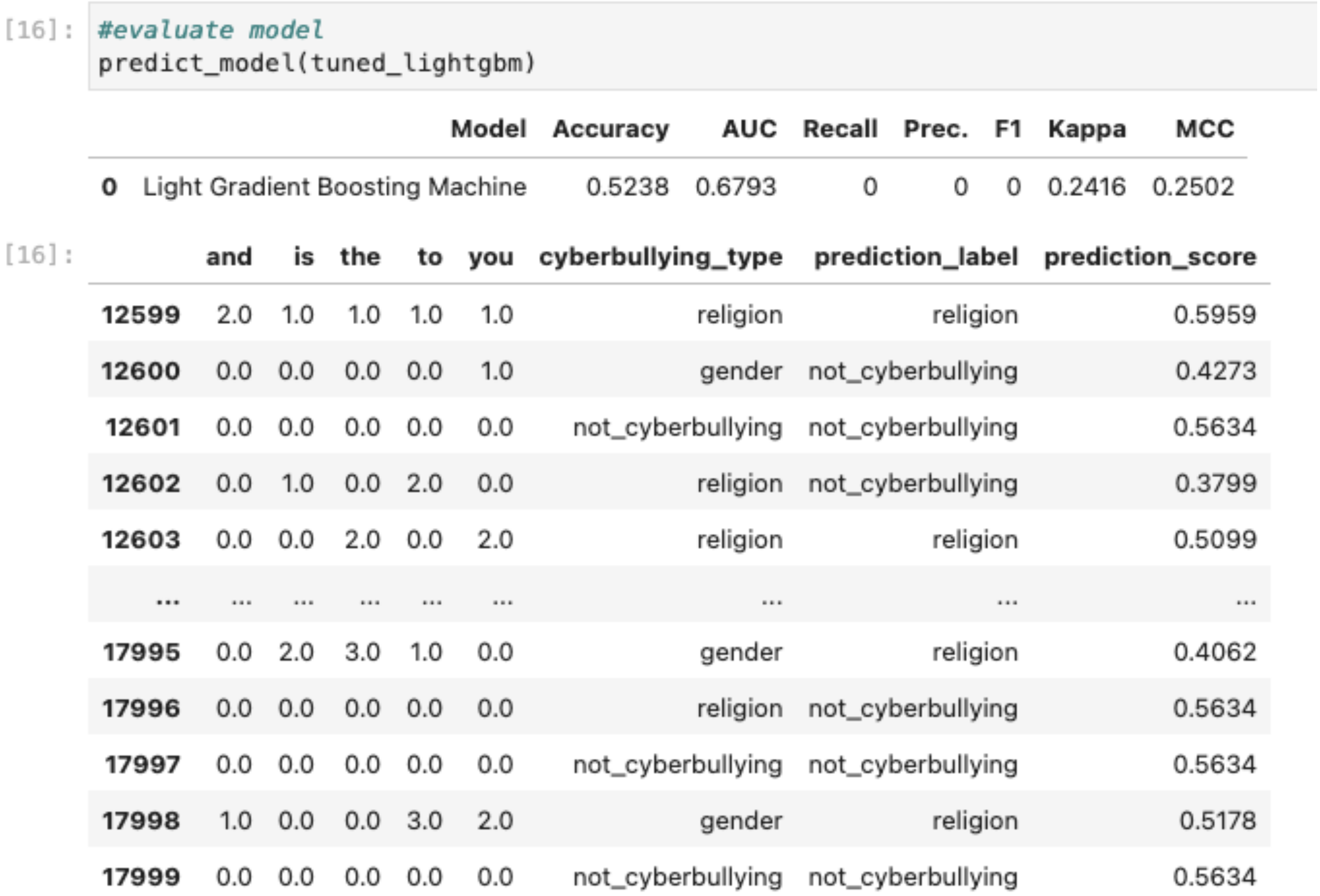
Creating a Light Gradient Boosting Machine Model



```
[13]: %time lightgbm = create_model('lightgbm')
```

Fold	Accuracy	AUC	Recall	Prec.	F1	Kappa	MCC
0	0.5063	0.6614	0.5063	0.5057	0.4905	0.2136	0.2220
1	0.5349	0.6768	0.5349	0.5319	0.5193	0.2603	0.2691
2	0.5071	0.6592	0.5071	0.5004	0.4889	0.2161	0.2244
3	0.5278	0.6783	0.5278	0.5296	0.5065	0.2491	0.2638
4	0.5294	0.6796	0.5294	0.5310	0.5130	0.2533	0.2644
5	0.5135	0.6725	0.5135	0.5077	0.4985	0.2271	0.2339
6	0.5111	0.6590	0.5111	0.5112	0.4962	0.2216	0.2298
7	0.5071	0.6658	0.5071	0.4988	0.4923	0.2218	0.2280
8	0.5159	0.6669	0.5159	0.5115	0.4994	0.2340	0.2429
9	0.5099	0.6748	0.5099	0.5022	0.4889	0.2212	0.2314
Mean	0.5163	0.6694	0.5163	0.5130	0.4994	0.2318	0.2410
Std	0.0100	0.0076	0.0100	0.0123	0.0100	0.0158	0.0171

```
CPU times: user 2.09 s, sys: 236 ms, total: 2.33 s
Wall time: 10.5 s
```



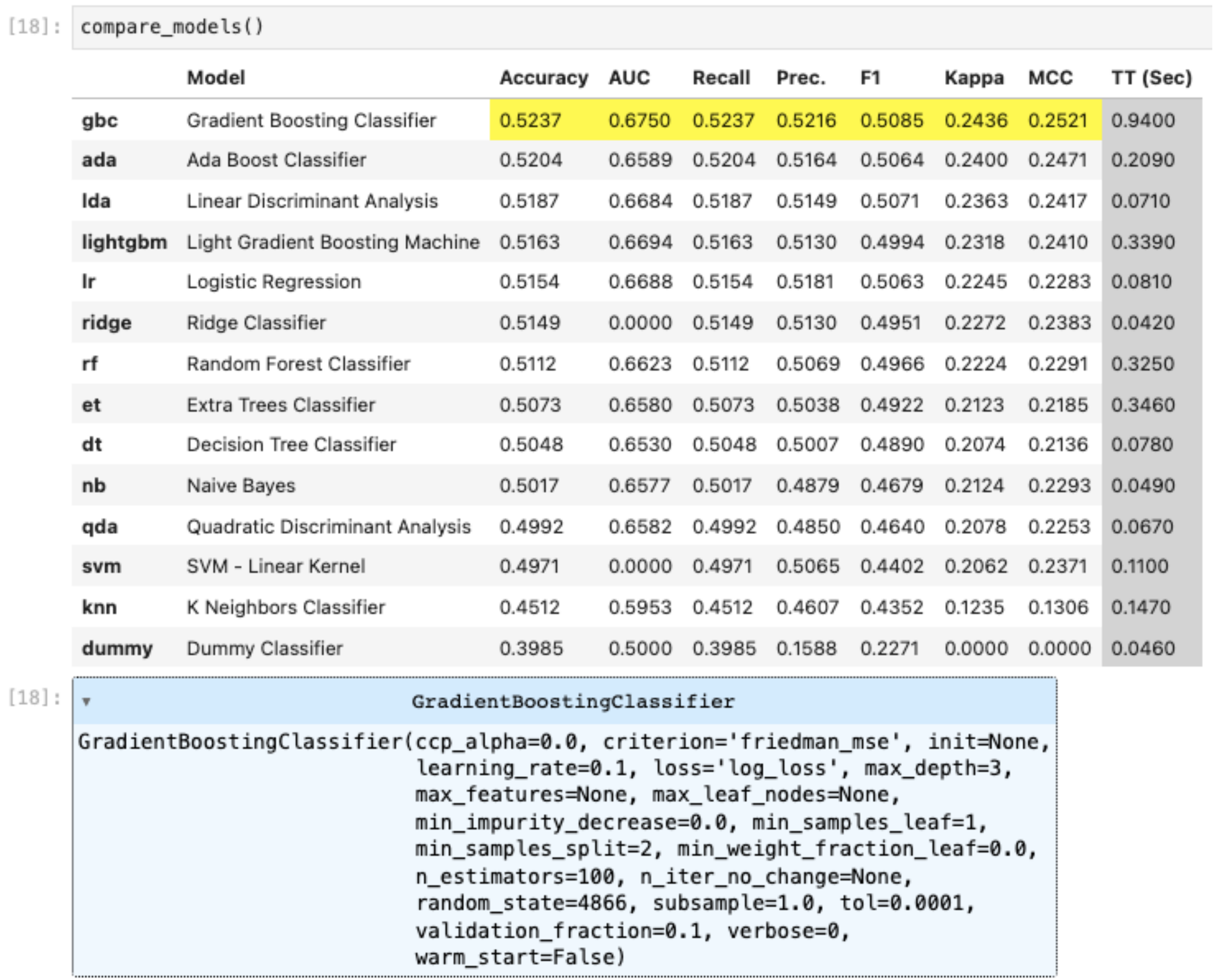
```
[16]: #evaluate model
      predict_model(tuned_lightgbm)
```

	Model	Accuracy	AUC	Recall	Prec.	F1	Kappa	MCC
0	Light Gradient Boosting Machine	0.5238	0.6793	0	0	0	0.2416	0.2502

[16]:

	and	is	the	to	you	cyberbullying_type	prediction_label	prediction_score
12599	2.0	1.0	1.0	1.0	1.0	religion	religion	0.5959
12600	0.0	0.0	0.0	0.0	1.0	gender	not_cyberbullying	0.4273
12601	0.0	0.0	0.0	0.0	0.0	not_cyberbullying	not_cyberbullying	0.5634
12602	0.0	1.0	0.0	2.0	0.0	religion	not_cyberbullying	0.3799
12603	0.0	0.0	2.0	0.0	2.0	religion	religion	0.5099
...	...	...	...	...	...	...	...	...
17995	0.0	2.0	3.0	1.0	0.0	gender	religion	0.4062
17996	0.0	0.0	0.0	0.0	0.0	religion	not_cyberbullying	0.5634
17997	0.0	0.0	0.0	0.0	0.0	not_cyberbullying	not_cyberbullying	0.5634
17998	1.0	0.0	0.0	3.0	2.0	gender	religion	0.5178
17999	0.0	0.0	0.0	0.0	0.0	not_cyberbullying	not_cyberbullying	0.5634

Testing the Model



```
[18]: compare_models()
```

	Model	Accuracy	AUC	Recall	Prec.	F1	Kappa	MCC	TT (Sec)
gbc	Gradient Boosting Classifier	0.5237	0.6750	0.5237	0.5216	0.5085	0.2436	0.2521	0.9400
ada	Ada Boost Classifier	0.5204	0.6589	0.5204	0.5164	0.5064	0.2400	0.2471	0.2090
lda	Linear Discriminant Analysis	0.5187	0.6684	0.5187	0.5149	0.5071	0.2363	0.2417	0.0710
lightgbm	Light Gradient Boosting Machine	0.5163	0.6694	0.5163	0.5130	0.4994	0.2318	0.2410	0.3390
lr	Logistic Regression	0.5154	0.6688	0.5154	0.5181	0.5063	0.2245	0.2283	0.0810
ridge	Ridge Classifier	0.5149	0.0000	0.5149	0.5130	0.4951	0.2272	0.2383	0.0420
rf	Random Forest Classifier	0.5112	0.6623	0.5112	0.5069	0.4966	0.2224	0.2291	0.3250
et	Extra Trees Classifier	0.5073	0.6580	0.5073	0.5038	0.4922	0.2123	0.2185	0.3460
dt	Decision Tree Classifier	0.5048	0.6530	0.5048	0.5007	0.4890	0.2074	0.2136	0.0780
nb	Naive Bayes	0.5017	0.6577	0.5017	0.4879	0.4679	0.2124	0.2293	0.0490
qda	Quadratic Discriminant Analysis	0.4992	0.6582	0.4992	0.4850	0.4640	0.2078	0.2253	0.0670
svm	SVM - Linear Kernel	0.4971	0.0000	0.4971	0.5065	0.4402	0.2062	0.2371	0.1100
knn	K Neighbors Classifier	0.4512	0.5953	0.4512	0.4607	0.4352	0.1235	0.1306	0.1470
dummy	Dummy Classifier	0.3985	0.5000	0.3985	0.1588	0.2271	0.0000	0.0000	0.0460

```
[18]: ▾ GradientBoostingClassifier
GradientBoostingClassifier(ccp_alpha=0.0, criterion='friedman_mse', init=None,
                           learning_rate=0.1, loss='log_loss', max_depth=3,
                           max_features=None, max_leaf_nodes=None,
                           min_impurity_decrease=0.0, min_samples_leaf=1,
                           min_samples_split=2, min_weight_fraction_leaf=0.0,
                           n_estimators=100, n_iter_no_change=None,
                           random_state=4866, subsample=1.0, tol=0.0001,
                           validation_fraction=0.1, verbose=0,
                           warm_start=False)
```

Comparing different model accuracies

Thank You