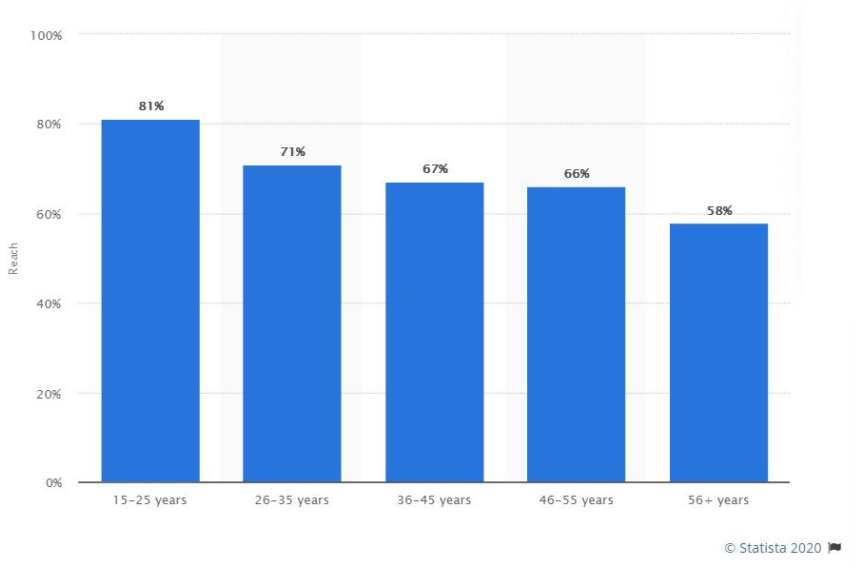
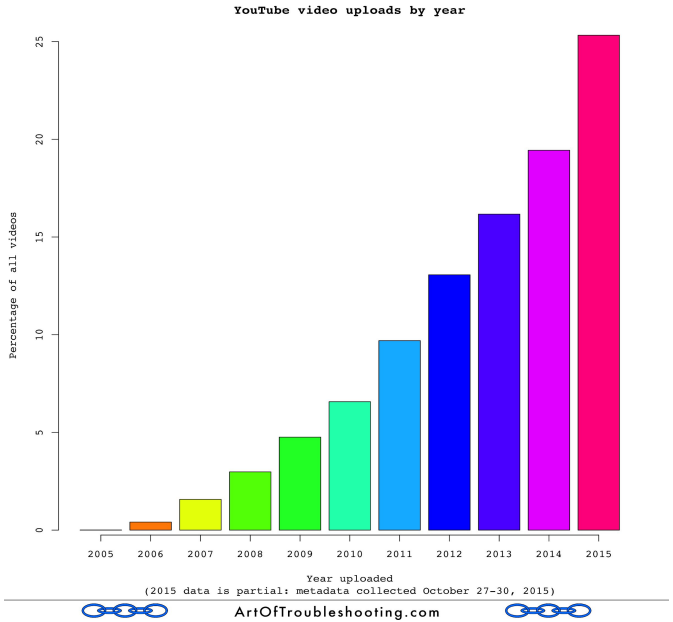
Predictors of Trending YouTube Videos

Kahang Ngau
Qingyuan Xie (Nicole)

Introduction

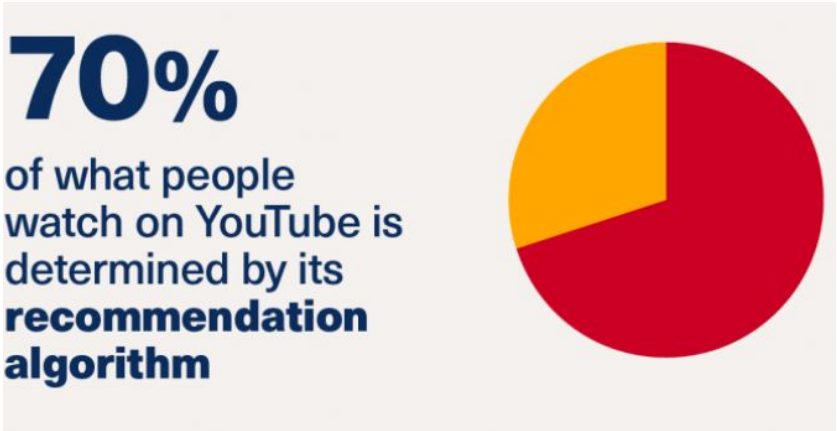
- **5 billion** videos are watched on Youtube every single day
- Female users are 38% and **male users are 62%.**





Introduction

- YouTube has a list of the top trending videos that measures user's' interaction, such as the number of views/likes/comments/shares.
- In this project, we want to explore among the trending videos, what factor(s) can predict the trending videos get the likes/dislikes/comments.



Methodology

Goals - 1. Use machine learning models to predict ‘likes’.

2. Keep track of models’ performance by conducting ‘RMSE’ and ‘R2’ evaluation.

3. Conduct feature engineering to find the most importance features.

Processes - Python / PySpark

Materials - CSV file downloaded from kaggle.com/YouTube

Technology - data preprocessing, NLP analysis, data visualization, train-test-split data, linear, decision tree, and random forest regression

Data Cleansing & Extraction

Variables to keep - 'publish_year', 'publish_month', 'publish_quarter', 'publish_dayofweek', 'publish_hour', 'category_id', 'views', 'likes', 'dislikes', 'comment_count', 'comments_disabled', 'ratings_disabled', 'video_error_or_removed', 'popular_word'

Variables to Drop - 'video_id', 'trending_date', 'publish_time', 'tag', 'channel_title', 'title', 'description', 'thumbnail_link'

- Extracted the value of year, quarter, month, dayofweek, hour from 'publish_time' column.
- Conducted NLP analysis on tokenizing 'tag', 'title' and 'channel_title' columns.
- Found the top 10 most frequent words.

text	tokens	most_common	popular_word
WE WANT TO TALK ABOUT OUR MARRIAGECaseyNeistat...	[want, talk, marriagecaseyneistatshantell, mar...	want	False
The Trump Presidency: Last Week Tonight with J...	[trump, presidency, last, week, tonight, john,...	trump	False
Racist Superman | Rudy Mancuso, King Bach & Le...	[racist, superman, rudy, mancuso, king, bach, ...	mancuso	False
Nickelback Lyrics: Real or Fake?Good Mythical ...	[nickelback, lyric, real, fake, good, mythical...	nickelback	False
I Dare You: GOING BALD!? nigahiga"ryan"|"higa"|...	[dare, going, bald, nigahiga, ryan, higa, higa...	dare	False

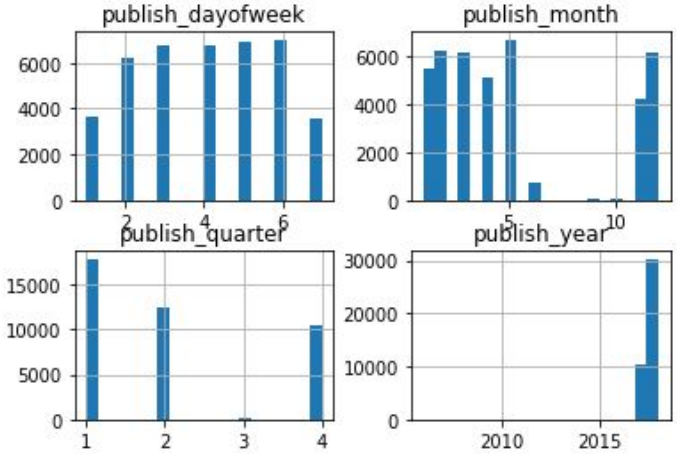
Word	Frequency
makeup	725
late	340
cat	316
trailer	285
news	234
show	221
star	219
movie	207
react	200
black	193

Analysis

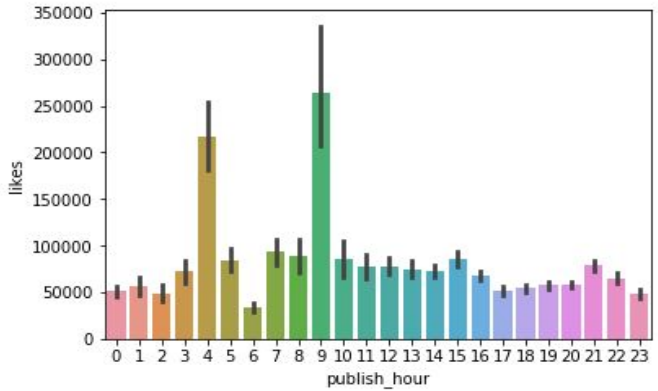
Correlation between dislikes, views, comment counts and likes

	dislikes	views	comment_count	likes
dislikes	1.000000	0.472213	0.700184	0.447186
views	0.472213	1.000000	0.617621	0.849177
comment_count	0.700184	0.617621	1.000000	0.803057
likes	0.447186	0.849177	0.803057	1.000000

Distribution of published dayofweek, month, quarter, and year

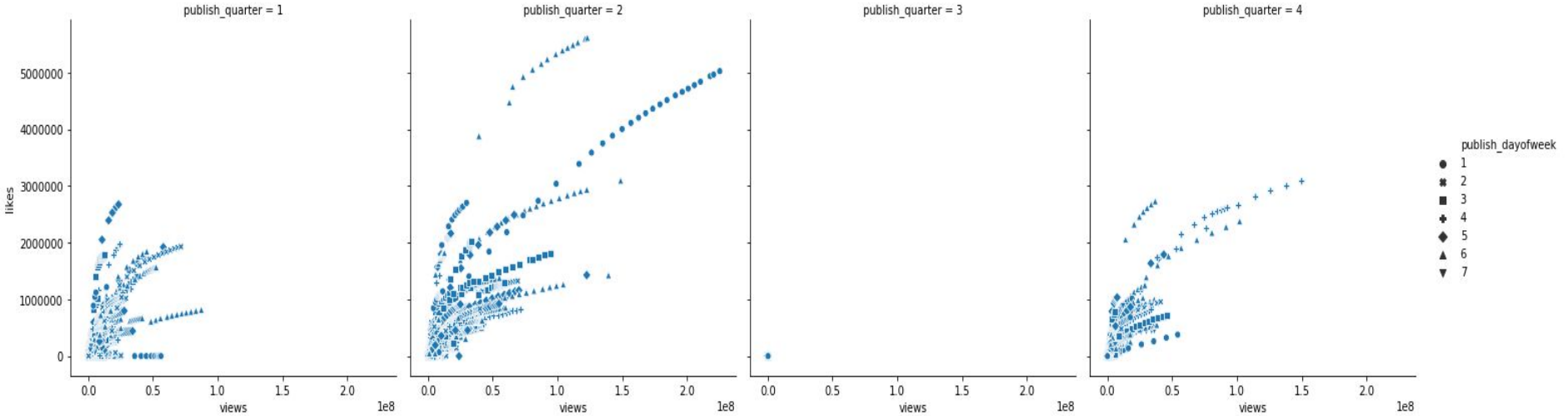


Distribution of publish_hour



More on Analysis

Views vs Likes among dayofweek distributed on quarters

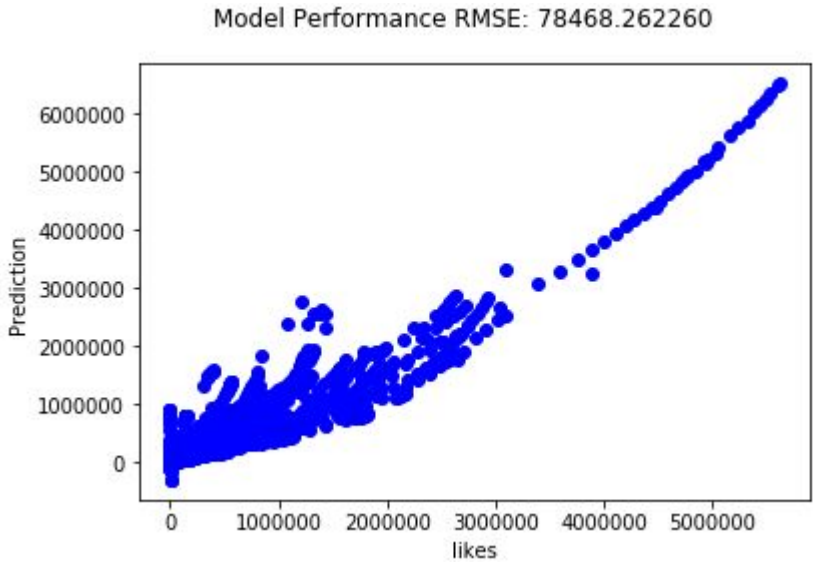


Results - Linear

```
RMSE is 78468.26225960495
R2 is 0.8758320590091677
```

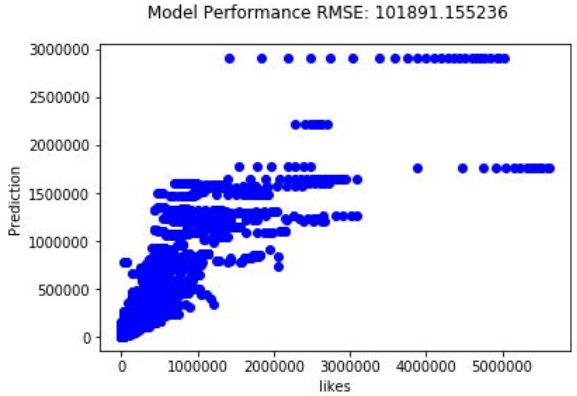
- Converting all boolean type of data into integer type (0 and 1).
- First conducted machine learning model : **Linear Regression Model**

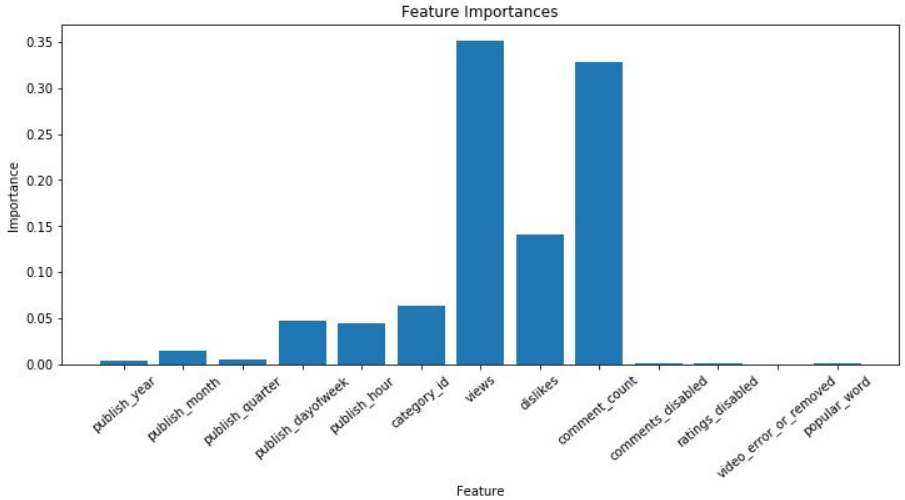
	feature	coefficients
0	publish_year	3364.640779
1	publish_month	2793.543244
3	publish_dayofweek	822.035956
4	publish_hour	191.208605
8	comment_count	3.853985
6	views	0.017658
7	dislikes	-1.967947
5	category_id	-1167.214029
11	video_error_or_removed	-6574.256070
2	publish_quarter	-7266.364985
9	comments_disabled	-8703.393732
12	popular_word	-15261.954468
10	ratings_disabled	-71219.648402



Random Forest

RMSE is 101891.15523644455
R2 is 0.79063967577177





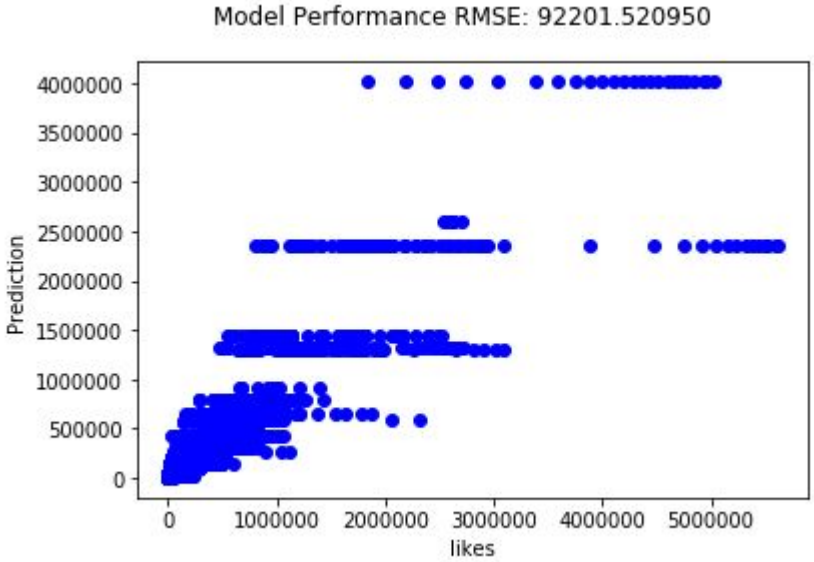
	feature	importance
6	views	0.351620
8	comment_count	0.327768
7	dislikes	0.140892
5	category_id	0.063606
3	publish_dayofweek	0.046731
4	publish_hour	0.044798
1	publish_month	0.014333
2	publish_quarter	0.005496
0	publish_year	0.003685
12	popular_word	0.000699
9	comments_disabled	0.000193
10	ratings_disabled	0.000179
11	video_error_or_removed	0.000000

Decision Tree

```
RMSE is 92201.52095038704
R2 is 0.8285657546307985
```

- Conduct Decision Tree Regression model, with MaxBin 40.

	feature	importance
8	comment_count	0.632317
6	views	0.195621
3	publish_dayofweek	0.069893
4	publish_hour	0.043563
5	category_id	0.030750
7	dislikes	0.027855
0	publish_year	0.000000
1	publish_month	0.000000
2	publish_quarter	0.000000
9	comments_disabled	0.000000
10	ratings_disabled	0.000000
11	video_error_or_removed	0.000000
12	popular_word	0.000000



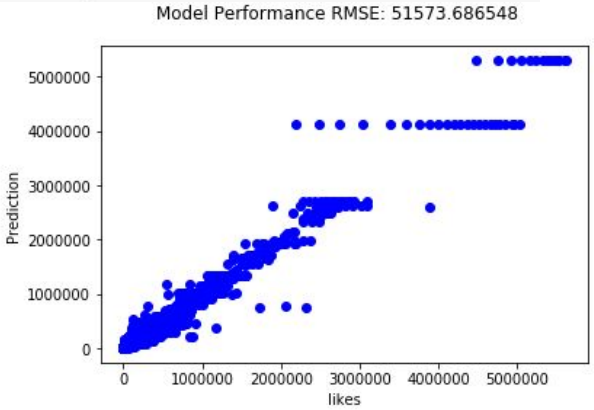
Decision Tree - Hyperparameter Tuning

- Conduct Hyperparameter Tuning on setting the ParamGrid and Cross Validation.

```
paramGrid = (ParamGridBuilder()
             .addGrid(dt.maxDepth, [2, 5, 10])
             .addGrid(dt.maxBins, [10, 20, 40, 80, 100])
             .build())

cv = CrossValidator(estimator=dt, evaluator=evaluator, estimatorParamMaps=paramGrid,
                    numFolds=3, parallelism=4, seed=345)
```

```
RMSE is 51573.68654842105
R2 is 0.9463613594300854
```



Conclusion

- Decision Tree Regression model after hyperparameter tuning does the best among other models.
- Two features appeared as important on all three models' feature importance: views & comment_count.
- Based on the Linear regression model, we can see the strong positive correlation(p>.6) between several variables: likes & views, comment_count & views, likes & comment_count, comment_count & dislikes.
- Saturday as the day of the week when videos get the most views, so if you post a video on that day, the chance of the video being seen is relatively higher than you post on other days of the week.
- One possible explanation of why Saturday as the day of the week when videos get the most views, relating back to the Youtube users' demographic, as the majority of users are male around their ages of 20-30's, that's when the most of viewers get off from work or schools.