Report - 2020018
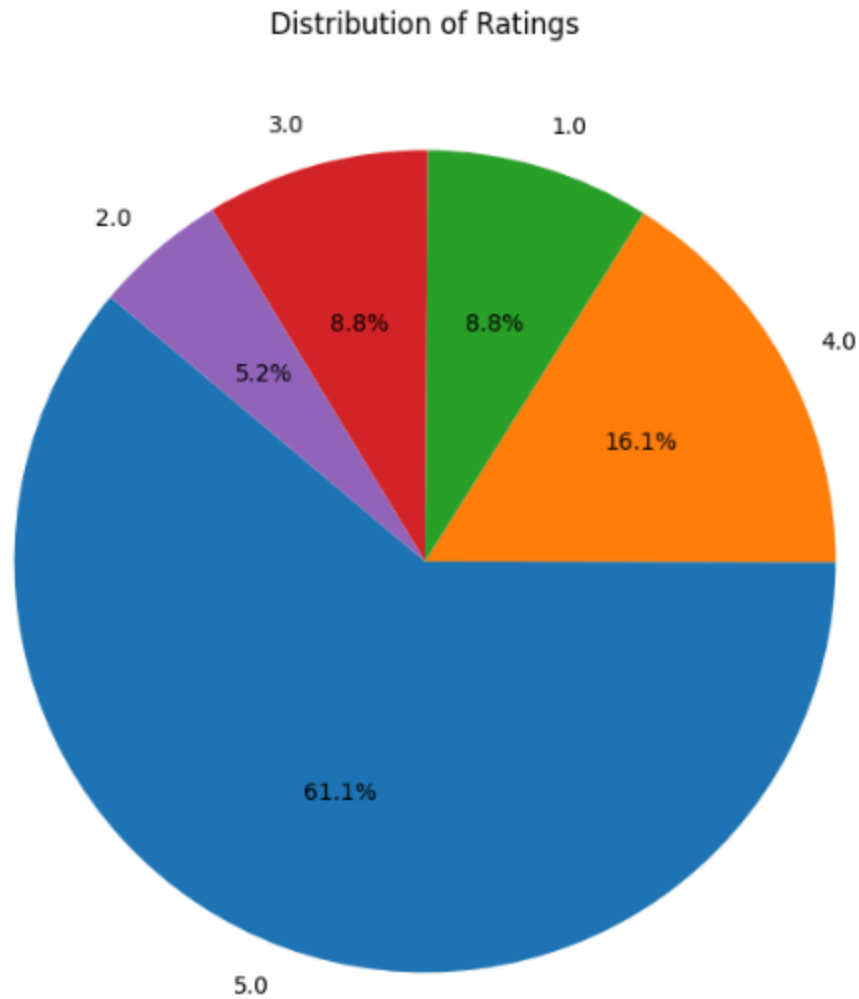
1) 5-core dataset and metadata were downloaded from the provided link.
2) For the assignment, I took the product as 'Television'.
3) The total number of rows after merging was 7576, and the number of distinct products was 447
4) Descriptive stats:

```
Number of Reviews: 7373
Average Rating: 4.153940051539401
Number of Unique Products: 224
Number of Good Rating: 6337
Number of Bad Rating: 1036
Number of Reviews corresponding to each Rating: overall
1.0      651
2.0      385
3.0      646
4.0     1187
5.0     4504
```

5) Preprocessing was done for each step discussed in the assignment
6) Relevant Stats:

```
Top 20 most reviewed brands: title
2019 upgrade hdtv antenna   digital amplify hd television antenna 6080 mile range 4k hd vhf uhf freeview television local channel wdetachable signal amplifier and 165 ft long coax cable      568
mohu television antenna leaf 30 paperthin indoor hdtv antenna for free television mh110502 certify refurbish                                                                                    365
august dta240 high gain digital television aerial   portable indooroutdoor digital antenna for usb television tuner   atsc television   dab radio   with magnetic base                           314
mohu leaf 30 television antenna indoor 30 mile range original paperthin reversible paintable 4kready hdtv 10 foot detachable cable premium material for performance usa make mh110598            300
videosecu television wall mount tilt low profile ultra slim television mount bracket for most 26quot 47quot lead lcd plasma television some up to 55quot television with vesa 200x100 to 400x400 1fe   232
vizio remote for e422vle e472vle e552vle m320s1 m370s1 e320ia0 m370s1 e422v1 model television                                                                                                  213
kabeldirekt digital coaxial audio video cable 6 ft satellite cable connector   coax male f connector pin   coax cable for satellite television   pro series                                    199
meiso television wall bracket tilt 26quot   55quot inch vesa 100x100 400x400 black universal lead curve qle qe 4k lcd ole suhd uhd television mount flexible adjustable mount ma01               186
august dta206 digital television extendable antenna   portable indooroutdoor aerial for usb television tuner   digital television   dab radio   with magnetic base and extendable rod            176
milemont wall television bracket for 2635 inch flat panel television                                                                                                                           169
neewer 6x9 feet18x28 meter photo studio 100 percent pure muslin collapsible backdrop background for photography video and television background only    black                                   168
hdtv antenna 1iger ultrathin indoor antenna 35 mile range   receive hd television signal for free   plug directly into your television   include adhesive amp stand                             144
antenna direct c2 clearstream television antenna                                                                                                                                               139
55quot outdoor television cover top premium quality weather resistant soft non scratch interior make in usa television up to 60quot                                                             134
mini stealth television television remote color may vary whiteblack                                                                                                                            128
heavyduty full motion television wall mount   articulating swivel bracket fit flat screen television from 42rdquo to 70rdquo vesa 400 x 600 compatible ndash tilt swing out arm with 10 hdmi cable   123
television aerial   indoor high gain portable television and radio antennadta420                                                                                                               121
kanto fmx2 full motion articulate television wall mount for 37inch to 80inch television                                                                                                         101
edimensional reald circular polarize 3d glass for passive 3d television 4 pair                                                                                                                  89
hdmi extender   male to female extension cable 10 foot highspeed 4k   support 1080p and 3d blu ray player 3d television roku boxee xbox360 ps3 ps410 ft   20b hdcp 22 compliant                  84
Name: count, dtype: int64
Top 20 least reviewed brands: title
3year dop   television plan 250300                                                                                                                                                              5
neewer 5 piece of 6 x 9ft18 x 28 m photo studio muslin collapsible background backdrop whiteblackbluegreygreen for photographyvideo and television backdrop only                                 5
mvpower 10x10 ft   3x3 m photo backdrop background screen cloth nonwoven fabric for studio photography video shooting and television white                                                       5
2019 new television antennaindoor amplify digital hdtv antenna 120 mile range with 4k 1080p hd vhf uhf freeview television for life local channel broadcast for all type of home smart television black02   5
sony bravia klvs32a10 32inch lcd wega hdready flat panel television                                                                                                                             5
sony grand wega kdf55e2000 55inch 31cd rear projection television                                                                                                                               5
4year service plan for television 1000 to 149999                                                                                                                                                5
sanyo dp26746 26quot 720p hd lcd television                                                                                                                                                     5
element 32quot widescreen hd lcd television f1x3220f                                                                                                                                            5
lg mkj36998101 television remote control genuine original equipment manufacturer oem part                                                                                                      5
sony 148072212 television remote control genuine original equipment manufacturer oem part                                                                                                      5
new generic oem replacement philip 312124000730 television remote control for philip television                                                                                                5
philips television remote control                                                                                                                                                              5
3year dop   television plan 175200                                                                                                                                                              5
esddi background photography backdrop screen for video television make of pure nonwoven fabric 6 x 10ft2 x 3 m black and white                                                                   5
naxa electronic nt52 digital television converter box                                                                                                                                           5
paper thin hd digital television antenna   blimark portable indoor television antenna with amplifier receive up to 5090 mile long range 1080p 4k television channel fre e programme reception 10 ft coaxial cable   5
hcdz replacement remote control for toshiba 55wx800 ct90257 75003640 ct90276 75006721 371x96 integrate high definition lcd television                                                           5
samsung aa5900784a television remote control genuine original equipment manufacturer oem part for samsung                                                                                       5
mountit heavy duty full motion television wall mount articulating fireplace television wall mount fit lcd lead plasma flat screen curve tv up to 175 lbs mi310b                                  5
Name: count, dtype: int64
Most positively reviewed:   omnimount sw2 table top swivel fit up to 42inch flat27inch crt television espresso discontinue by manufacturer
Count of Ratings: Year
2011     71
2012    186
2013    506
2014   1081
2015   1516
Name: overall, dtype: int64
```

Good Reviews Word Cloud

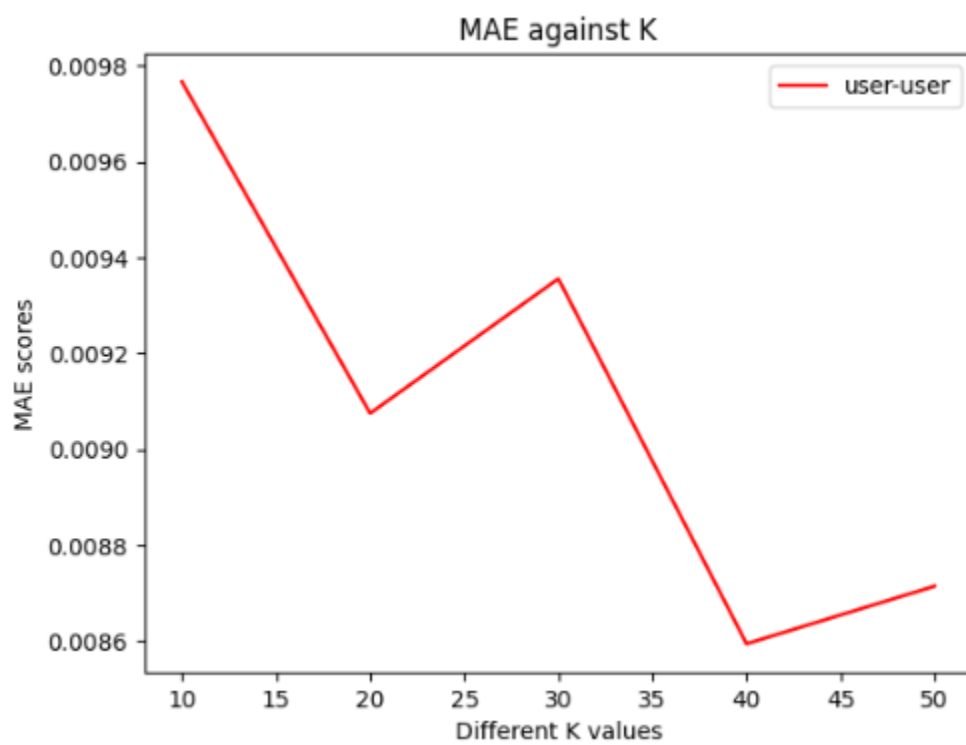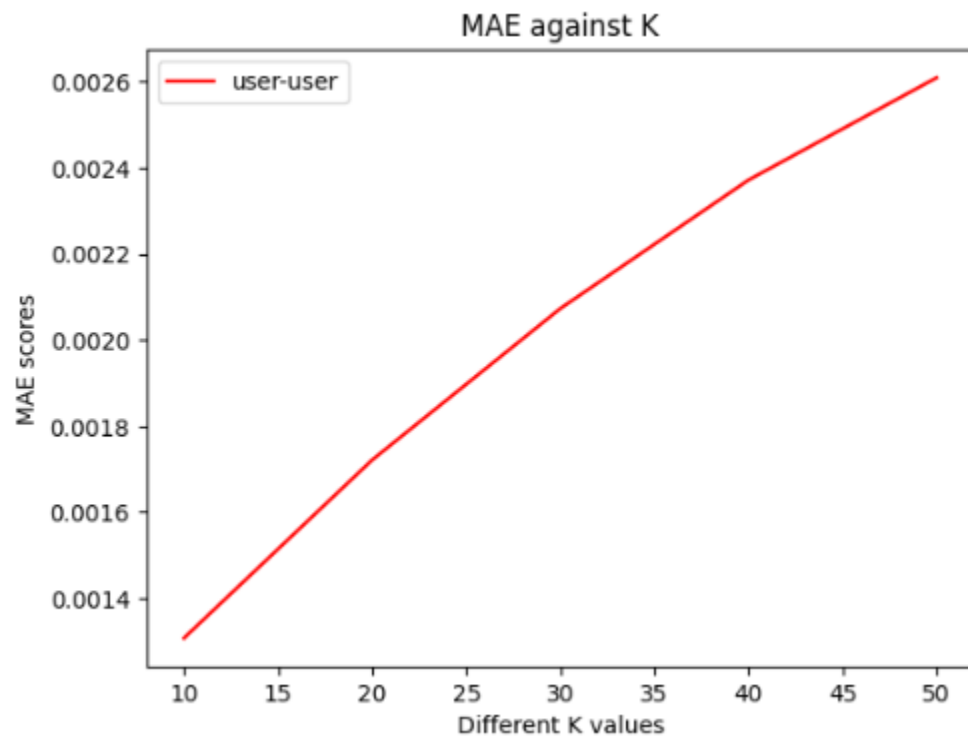Bad Reviews Word Cloud

Distribution of Ratings

Year with maximum reviews: 2016
Year with maximum customers: 2016

7) "Bag of words" model was used as the feature engineering technique

8) ML models had the following results:

```
Model: Logistic Regression
              precision    recall  f1-score   support

     Average      0.349     0.239     0.284       159
         Bad      0.691     0.613     0.649       266
        Good      0.882     0.932     0.906      1419

    accuracy                         0.826      1844
   macro avg      0.640     0.594     0.613      1844
weighted avg      0.808     0.826     0.815      1844

Model: Multinomial Naive Bayes
              precision    recall  f1-score   support

     Average      0.214     0.019     0.035       159
         Bad      0.684     0.301     0.418       266
        Good      0.810     0.978     0.886      1419

    accuracy                         0.798      1844
   macro avg      0.569     0.433     0.446      1844
weighted avg      0.741     0.798     0.745      1844

Model: SVM
              precision    recall  f1-score   support

     Average      0.000     0.000     0.000       159
         Bad      0.765     0.282     0.412       266
        Good      0.806     0.992     0.889      1419

    accuracy                         0.804      1844
   macro avg      0.524     0.424     0.434      1844
weighted avg      0.731     0.804     0.744      1844

Model: Random Forest
              precision    recall  f1-score   support

     Average      0.714     0.063     0.116       159
         Bad      0.800     0.301     0.437       266
        Good      0.814     0.992     0.894      1419

    accuracy                         0.812      1844
   macro avg      0.776     0.452     0.482      1844
weighted avg      0.803     0.812     0.761      1844

Model: Gradient Boosting
              precision    recall  f1-score   support

     Average      0.357     0.031     0.058       159
         Bad      0.761     0.383     0.510       266
        Good      0.822     0.982     0.895      1419

    accuracy                         0.814      1844
   macro avg      0.647     0.466     0.488      1844
weighted avg      0.773     0.814     0.767      1844
```

9) Collaborative Filtering:

MAE against K

MAE against K

10) Top 10 products by User Sum Ratings:

```
title
2019 upgrade hdtv antenna   digital amplify hd television antenna 6080 mile range 4k hd vhf uhf freeview television local channel wdetachable signal amplifier and 165 ft long coax cable   2253.0
mohu television antenna leaf 30 paperthin indoor hdtv antenna for free television mh110502 certify refurbish                                                                                 1522.0
august dta240 high gain digital television aerial   portable indooroutdoor digital antenna for usb television tuner   atsc television   dab radio   with magnetic base                        1245.0
mohu leaf 30 television antenna indoor 30 mile range original paperthin reversible paintable 4kready hdtv 10 foot detachable cable premium material for performance usa make mh110598        1194.0
videosecu television wall mount tilt low profile ultra slim television mount bracket for most 26quot 47quot lead lcd plasma television some up to 55quot television with vesa 200x100 to 400x400 1fe  1015.0
vizio remote for e422vle e472vle e552vle m320sl m370sl e320ia0 m370sl e422v1 model television                                                                                               1003.0
kabeldirekt digital coaxial audio video cable 6 ft satellite cable connector   coax male f connector pin   coax cable for satellite television   pro series                                 952.0
meiso television wall bracket tilt 26quot   55quot inch vesa 100x100 400x400 black universal lead curve qle qe 4k lcd ole suhd uhd television mount flexible adjustable mount ma01           864.0
milemont wall television bracket for 2635 inch flat panel television                                                                                                                        756.0
august dta206 digital television extendable antenna   portable indooroutdoor aerial for usb television tuner   digital television   dab radio   with magnetic base and extendable rod        706.0
```