

Text Processing

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Statistical Approach

The "readfiles" function processes data from Rotten Tomatoes and Nokia files, then splits it into 80-20 training and test sets with the help of the random Python packages. A dictionary is generated cataloging word sentiment as either 'positive' or 'negative' in both datasets.

The "trainBayes" function computes the conditional probability of word sentiment by computing the averages of word frequency in positive and negative sentences.

In the "testBayes" function, the probability of a sentence being positive given the words is computed and used for predictions. (Appendix - 1.1)

Naive Bayes	Training Data	Test Data	Nokia - All Data
<i>Accuracy</i>	0.890	0.772	0.586
<i>Precision-Pos</i>	0.894	0.778	0.783
<i>Precision-Neg</i>	0.885	0.765	0.386
<i>Recall - Pos</i>	0.883	0.772	0.564
<i>Recall - Neg</i>	0.896	0.771	0.637
<i>F1 Score - Pos</i>	0.889	0.775	0.656
<i>F1 Score - Neg</i>	0.891	0.768	0.481

[Step 3.2] From the above table, the highest performance based on all the metrics is observed to be of the training data (88%-90%) of the Movies dataset. This is followed by the test data (76-78%) of the Movies dataset and the lowest performance by the Nokia dataset (38% - 78%).

One notable observation is the high positive precision in the Nokia dataset compared to the negative precision indicating an imbalance between the two sentiment classes.

The reason for the contrasting performance metrics across datasets is 3-fold. Firstly, the model could be overfitted with the training data with the hyperparameters tuned to the 'Movies' dataset, making the model struggle to generalise. Secondly, a small training set, as in this case, decreases the sparsity of the feature space, i.e. number of words. Finally, the assumption of word independence in the probabilistic model is impractical to be applied to datasets.

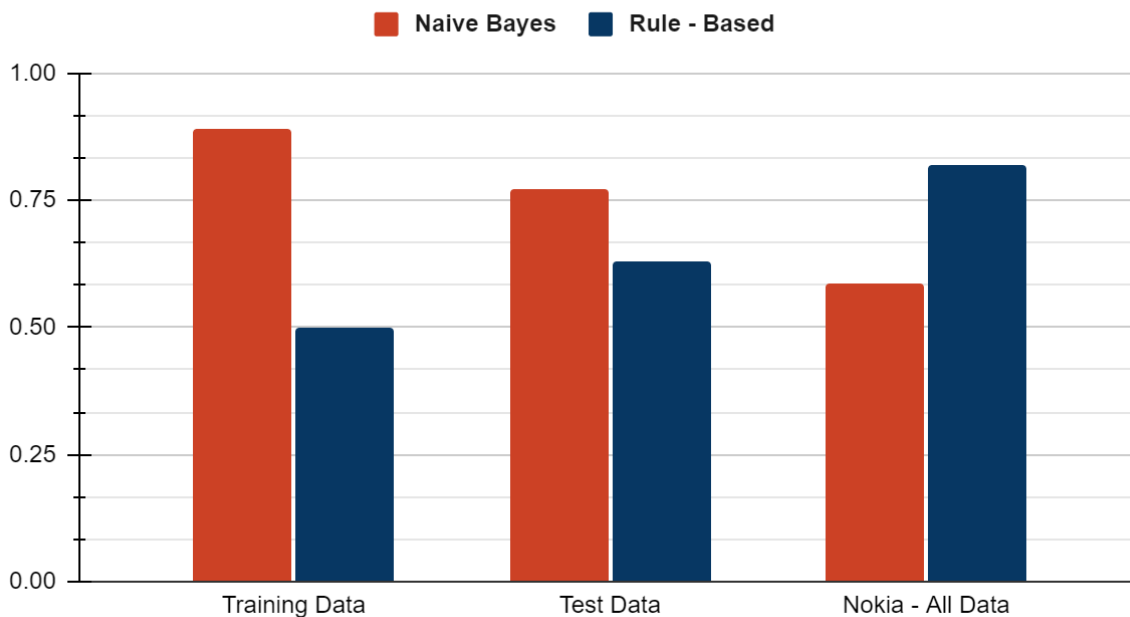
Applying cross-validation and regularization would stop the model from overfitting. A larger dataset could also help the model in increasing the feature space. The threshold tuning in the testing phase allows the calibration of the model's performance by tuning a balance between precision and recall.

Rule-Based Approach

The Rule-based approach involves predicting the sentiment of the sentence by comparing the sum of sentiments in a word with a threshold.

	Training Data	Test Data	Nokia - All Data
<i>Accuracy</i>	0.501	0.631	0.819
<i>Precision-Pos</i>	0.500	0.600	0.816
<i>Precision-Neg</i>	0.822	0.700	0.833
<i>Recall - Pos</i>	0.998	0.820	0.956
<i>Recall - Neg</i>	0.007	0.434	0.5
<i>F1 Score - Pos</i>	0.666	0.693	0.881
<i>F1 Score - Neg</i>	0.015	0.536	0.625

Accuracy - Naive Bayes vs Rule-Based



[Step 5.2] It can be observed that the rule-based model performs poorly compared to the Naive Bayes approach in the ‘Movies’ dataset whereas it outperforms in the ‘Nokia’ dataset. As the Naive Bayes approach is trained on the Movies Dataset, it performs well in the testing of the same context. In the rule-based approach, it can be concluded that the complexity of the rules is over-generalized than the Bayesian approach and hence performs better on unseen data. (Appendix 1.2)

Algorithm Improvements

[Step 5.3] To improve the rule-based approach in sentiment analysis, 4 improvements are suggested

1. ***Affin (Python package)***- Affin performs sentiment analysis on a wordlist-based approach. The sentiment of every word is defined in the lexicon aiding in computing the overall sentiment of the sentence. Affin’s score method also accumulates and provides a sentiment score based on a complete sentence.

	Training Data	Test Data	Nokia - All Data
<i>Accuracy</i>	0.512	0.531	0.439
<i>Precision-Pos</i>	0.505	0.523	0.974

<i>Precision-Neg</i>	0.782	0.8	0.348
<i>Recall - Pos</i>	0.989	0.988	0.204
<i>Recall - Neg</i>	0.038	0.046	0.987
<i>F1 Score - Pos</i>	0.679	0.684	0.337
<i>F1 Score - Neg</i>	0.073	0.088	0.514

2. **Textblob (Python Package)** - TextBlob is a Python text-processing package with an object-oriented approach. The polarity sub-method in the sentiment methods of the Textblob object provides the sentiment value of the word(s). The lexicon in this Python package is extracted from the corpus of NLTK.

	Training Data	Test Data	Nokia - All Data
<i>Accuracy</i>	0.610	0.642	0.770
<i>Precision-Pos</i>	0.574	0.607	0.777
<i>Precision-Neg</i>	0.715	0.736	0.731
<i>Recall - Pos</i>	0.850	0.862	0.940
<i>Recall - Neg</i>	0.373	0.409	0.375
<i>F1 Score - Pos</i>	0.685	0.712	0.851
<i>F1 Score - Neg</i>	0.490	0.526	0.495

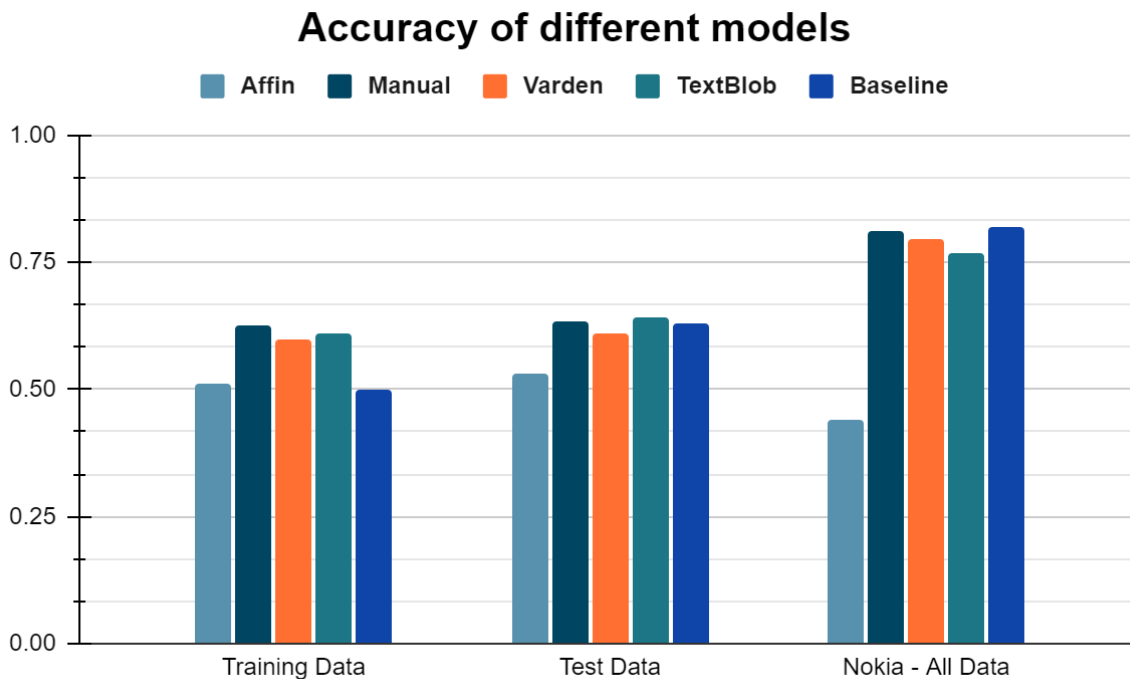
3. **Vader (Lexicon Document)** - Vader is a Python package that computes the score for positive, negative, and neutral sentiment using the Vader lexicon. The lexicon from the repository is considered to perform rule-based analysis.

	Training Data	Test Data	Nokia - All Data
<i>Accuracy</i>	0.598	0.612	0.796
<i>Precision-Pos</i>	0.567	0.585	0.794

<i>Precision-Neg</i>	0.682	0.685	0.809
<i>Recall - Pos</i>	0.824	0.840	0.956
<i>Recall - Neg</i>	0.375	0.370	0.425
<i>F1 Score - Pos</i>	0.671	0.690	0.868
<i>F1 Score - Neg</i>	0.484	0.481	0.557

4. **Manual Lexicon** - Additional rules have been added such as considering negation terms (A list of negation words is used to switch the sign of the score), exclamation marks, intensifiers, and diminishers (Dictionary with scores).

	Training Data	Test Data	Nokia - All Data
<i>Accuracy</i>	0.627	0.633	0.812
<i>Precision-Pos</i>	0.593	0.609	0.817
<i>Precision-Neg</i>	0.700	0.685	0.788
<i>Recall - Pos</i>	0.805	0.803	0.950
<i>Recall - Neg</i>	0.451	0.454	0.512
<i>F1 Score - Pos</i>	0.683	0.693	0.875
<i>F1 Score - Neg</i>	0.549	0.546	0.621



Accounting for the accuracy metric, it can be observed that Affin has scored sub-par compared to the baseline model. Even in the case of the Nokia dataset, the scores stayed consistent in the 50% range indicating that the scoring in the Affin lexicon is over-generalized.

The accuracy of using Textblob has indicated a small improvement from the baseline model. This is due to the massive lexicon sourced from the NLTK Python library. In the case of Varden, where the lexicon is used over the Python package, it projects a clear increase in performance throughout the datasets. This is indicative of considering contextual information in the dataset.

The manual lexicon is also shown to have a significant increase in accuracy proving the increase in the complexity of rules by considering negation and intensifiers facilitates better performance.

Another important trend to be noted is the contrasting higher performance of all rule-based algorithms in the Nokia dataset over the Movies dataset compared to the Naive Bayesian approach. (Appendix 1.3)

Useful Words

[Step 4.2] The most useful function ranks words based on the probability of the word being positive over the negative (predictive power). It can be inferred

from printing the positive and negative 100 terms that after a threshold (35) the words are incorrectly quantified under positive or negative. (Appendix 1.4)

A simple return function of the head and the tail and iterating it in Sentiment Dictionary indicates that a majority of the words are not present. This is because the probability of the word comes from the list of words across the training data sentences.

Algorithm Inefficiency

[Step 6.4] The errors in the Nokia dataset are printed (Appendix 1.5) in the test Bayes and test dictionary function considering the least accuracy. The following observations can be drawn

1. A large number of sentences with contrasting sentiments containing conjunctions ('but', 'although') invert the sentiment of the sentence. As the sentences are broken down into independent words, the ability to capture the sentiment has decreased.
2. The model is unable to process the context of the sentence. Even when the sentence indicates a negative sentiment due to a feature, it is considered to be positive of the overall subject.
3. Subjectivity issues can be noticed where the sentiment is not projected on the required subject. It is vital to identify the subject and then its corresponding sentiments in the sentence structure.
4. Complex sentence structure due to the addition of multiple phrases could be leading to erroneous predictions. The model is not adaptable to predict the sentiment of a larger culmination of word sentiments.
5. Negation, intensity of adjectives, and exclamation points have been observed to take a major percentage in the list of errors. Adding complexity to the rules in the test dictionary function considering these factors would improve the model.

Appendix

1.1 - Probabilistic model

The statistical approach involves the model being built with the help of the Naive Bayes Theorem which is given by,

$$P(Positive|word) = \frac{P(Word|Positive) * P(Positive)}{P(Word)}$$

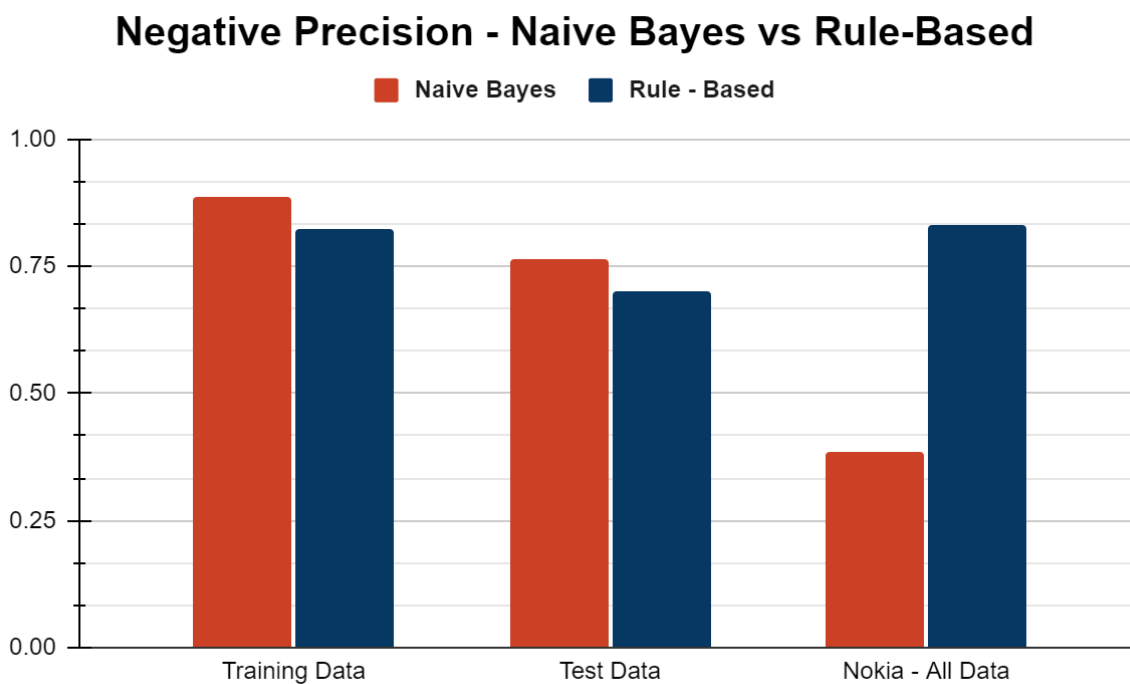
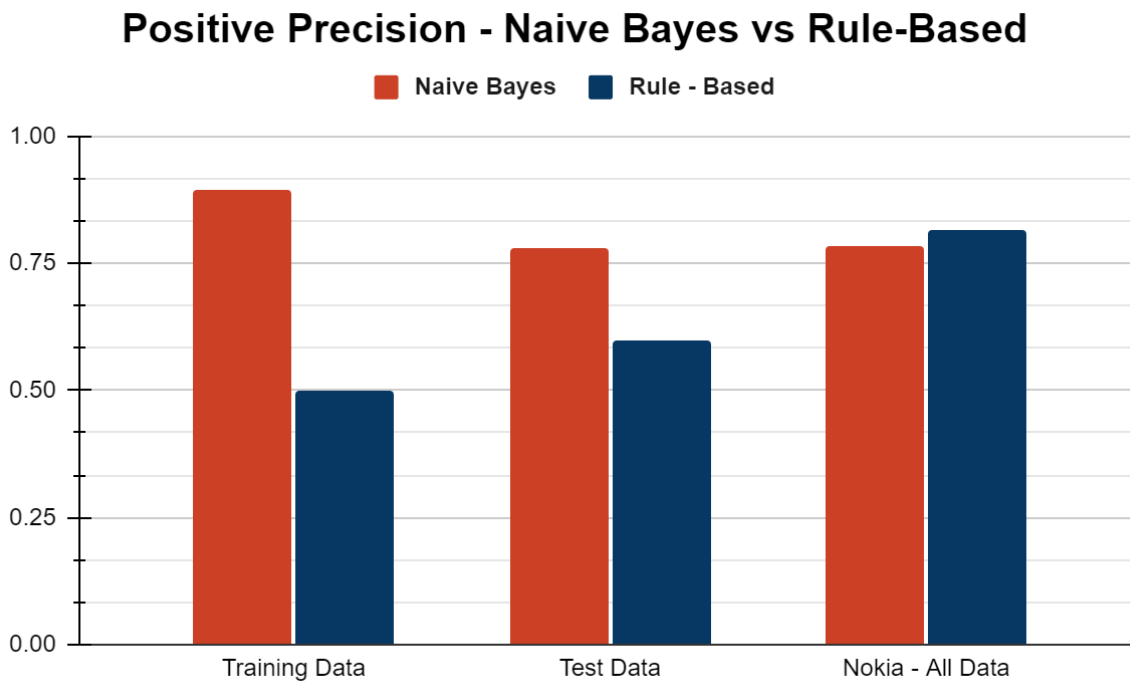
Each of the conditional probabilities of a word being positive or negative is assumed to be independent and hence given by,

$$P_{positive}(Word|Positive) = \prod_{i=0}^N P(Word_i|Positive)$$
$$P_{negative}(Word|Negative) = \prod_{i=0}^N P(Word_i|Negative)$$

The probability of a word is broken down into the sum of mutually exclusive conditional probabilities of the word given positive and negative. The modified naive Bayes equation is given by,

$$P(Positive|word) = \frac{P_{positive}(Word|Positive)}{P_{positive}(Word|Positive) + P_{negative}(Word|Negative)}$$

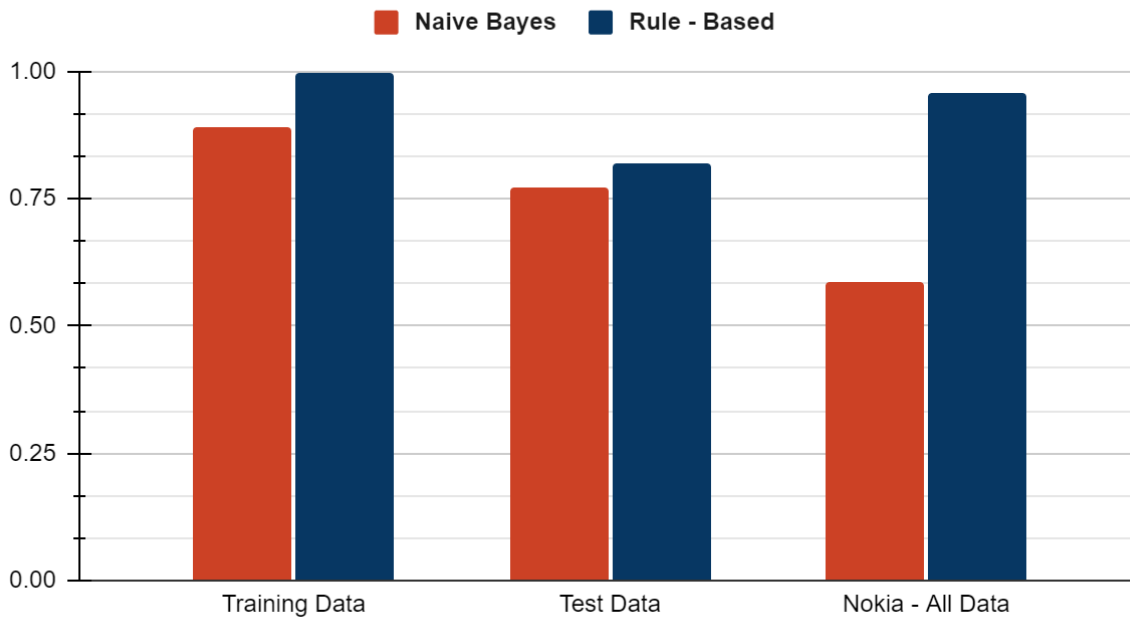
1.2 - Naive Bayes vs Rule-Based



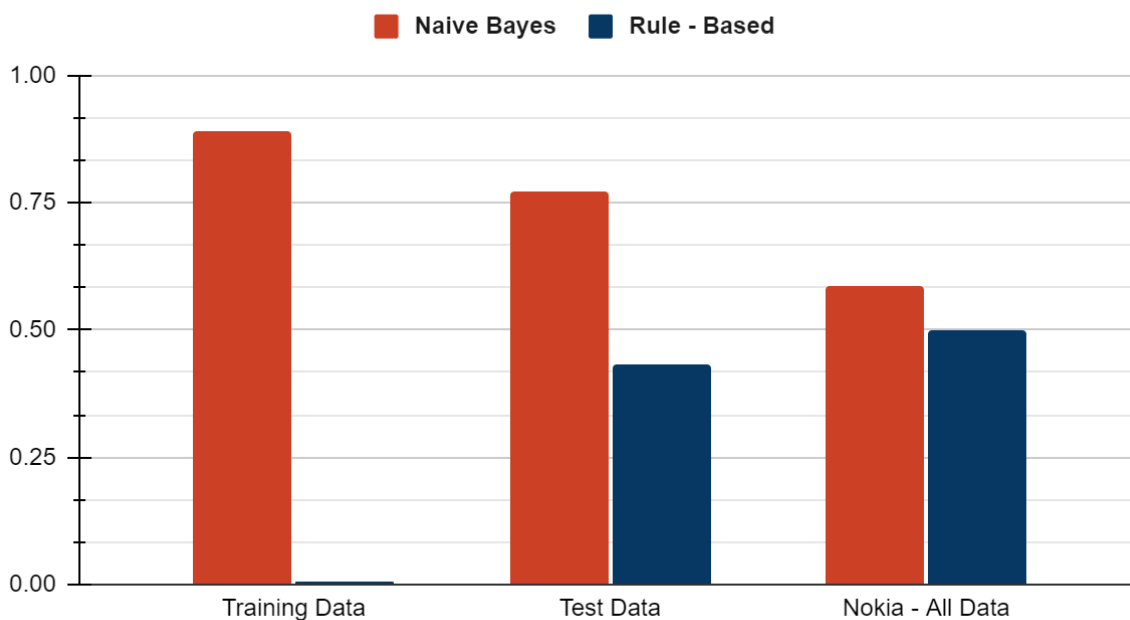
It can be observed that the Naive Bayes outperforms the Rule-based classifier in the 'Movies' data in both positive and negative precision. This is due to the classifier being trained on the same dataset. In the case of unseen data, such as

the Nokia dataset, the Rule-based classifier performs optimally compared to the statistical counterpart with the ability to generalize apart from the training data.

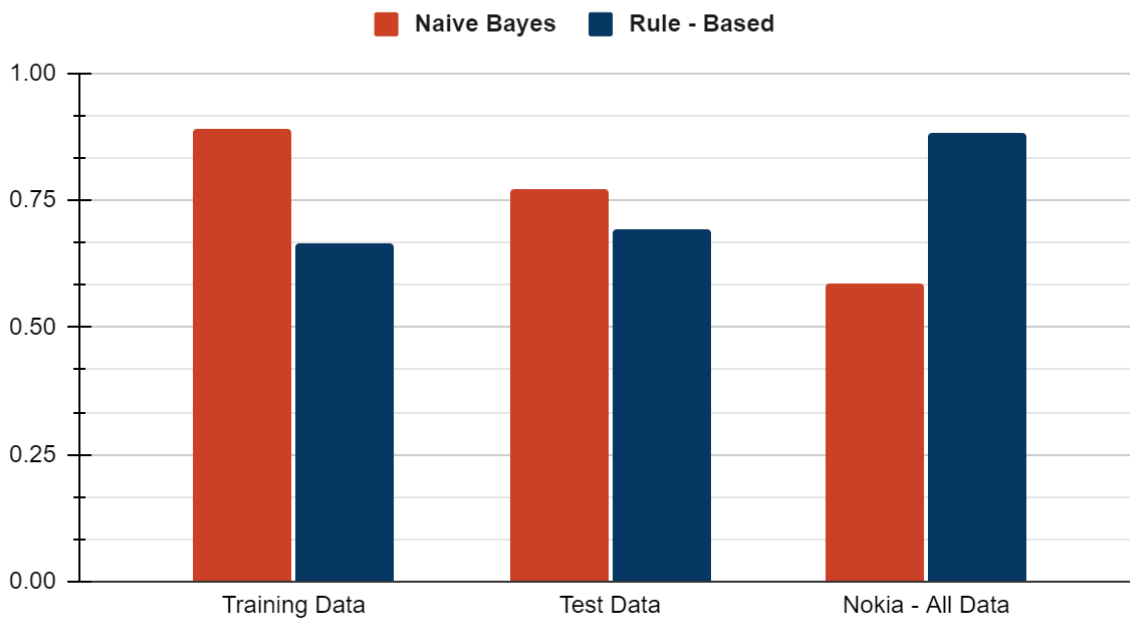
Positive Recall - Naive Bayes vs Rule-Based



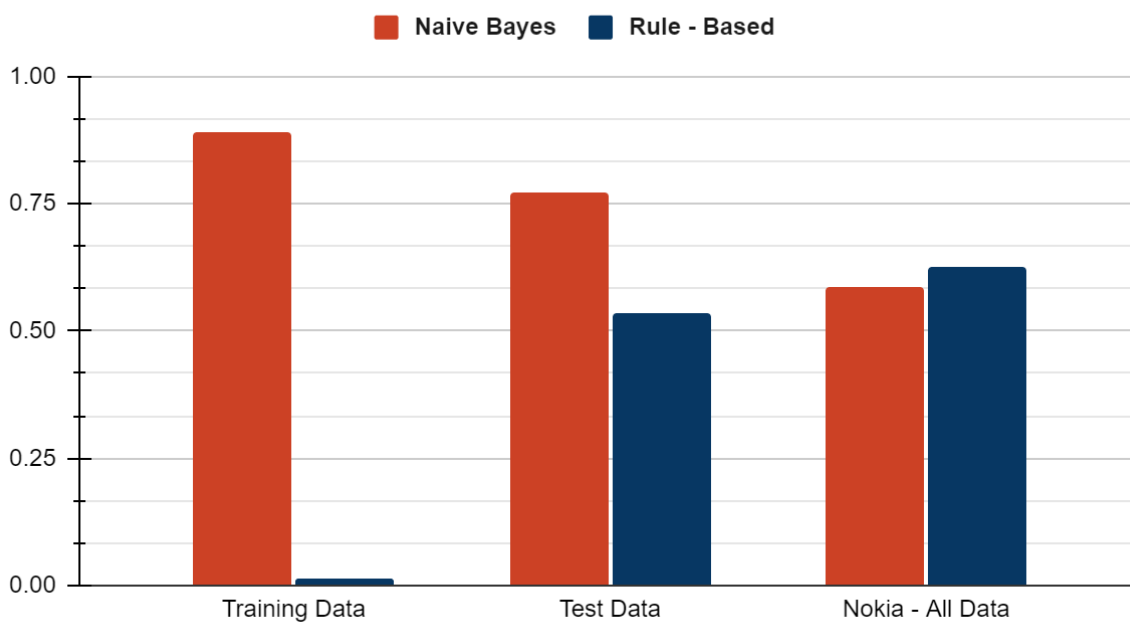
Negative Recall - Naive Bayes vs Rule-Based



Positive F1 score - Naive Bayes vs Rule-Based



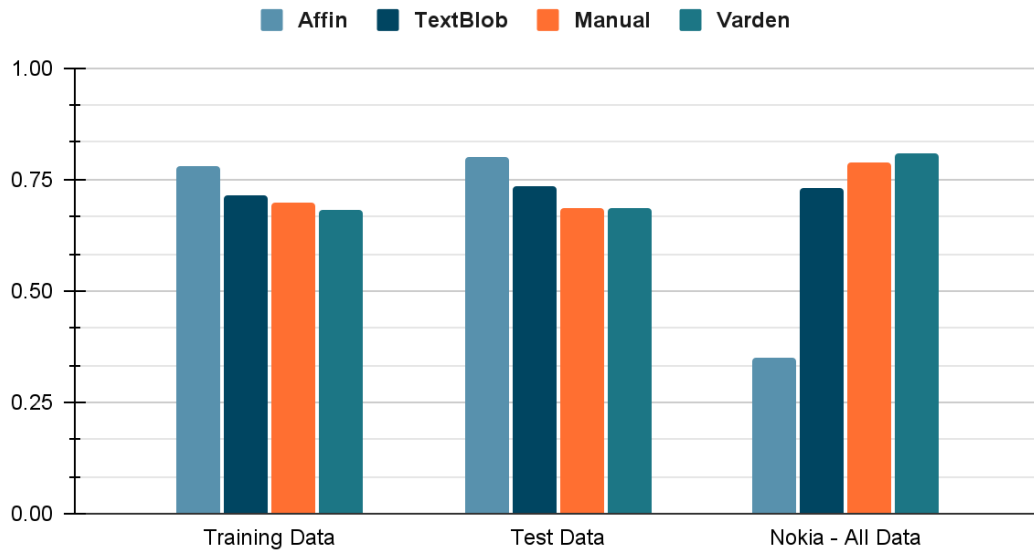
Negative F1 score - Naive Bayes vs Rule-Based



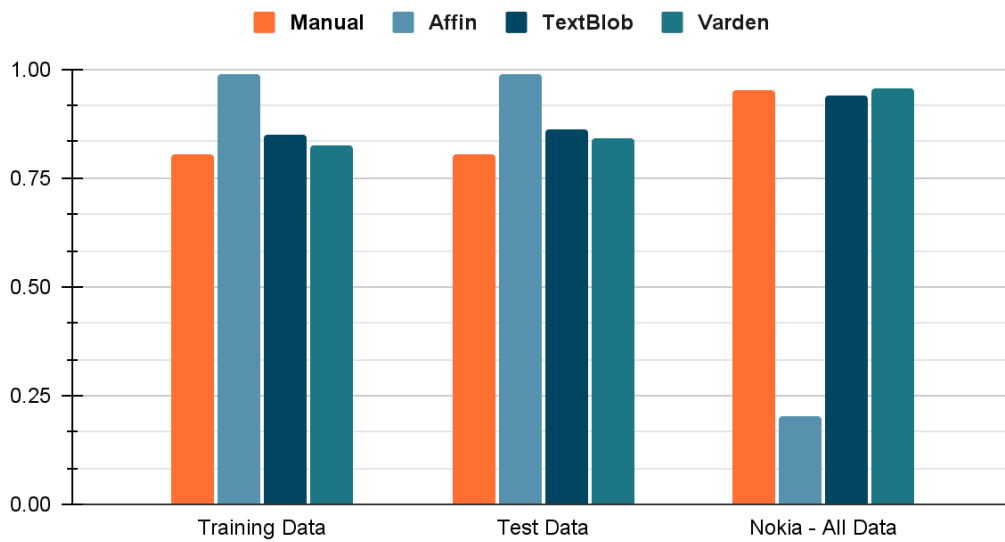
1.3 - Algorithm Improvements

The following graphs present the comparisons of other performance measures from accuracy such as positive and negative precision, positive and negative recall, and positive and negative recall

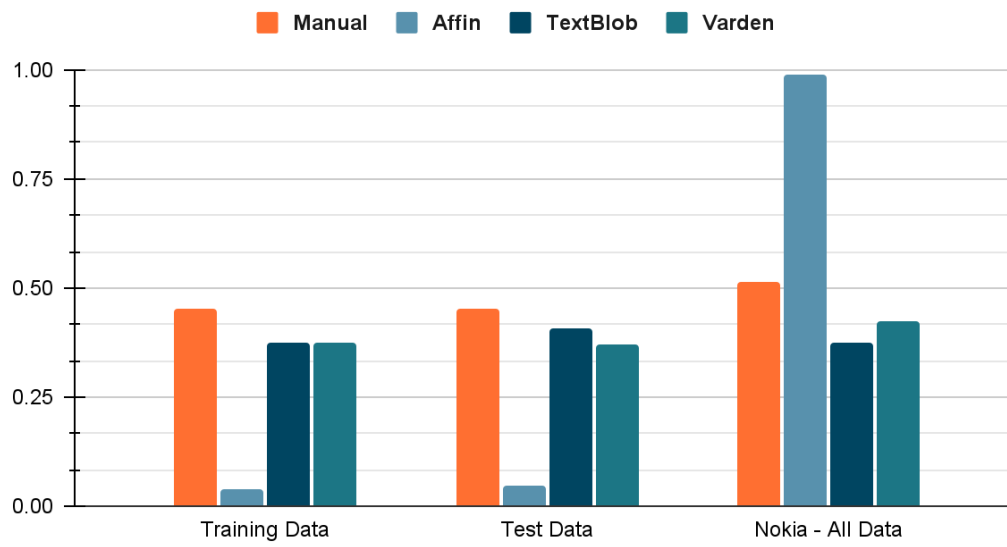
Negative Precision Comparison



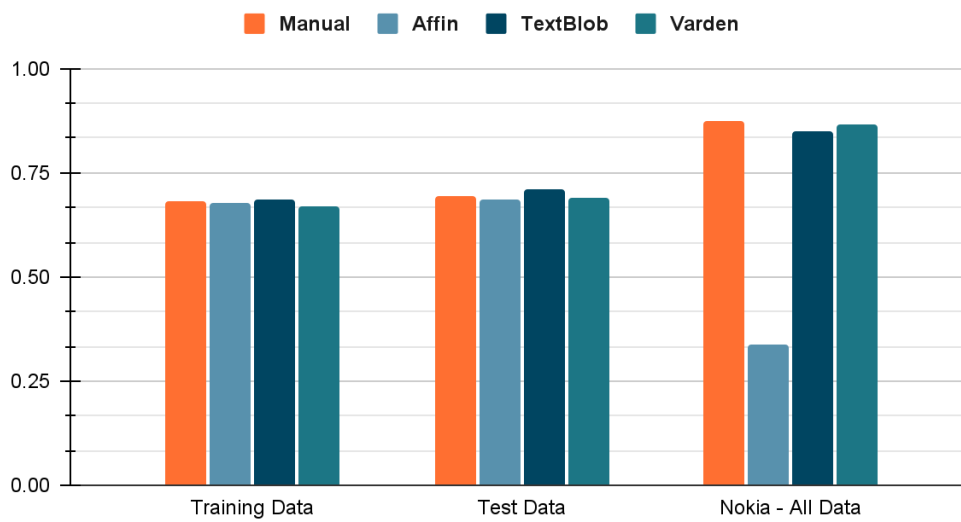
Positive Recall Comparison

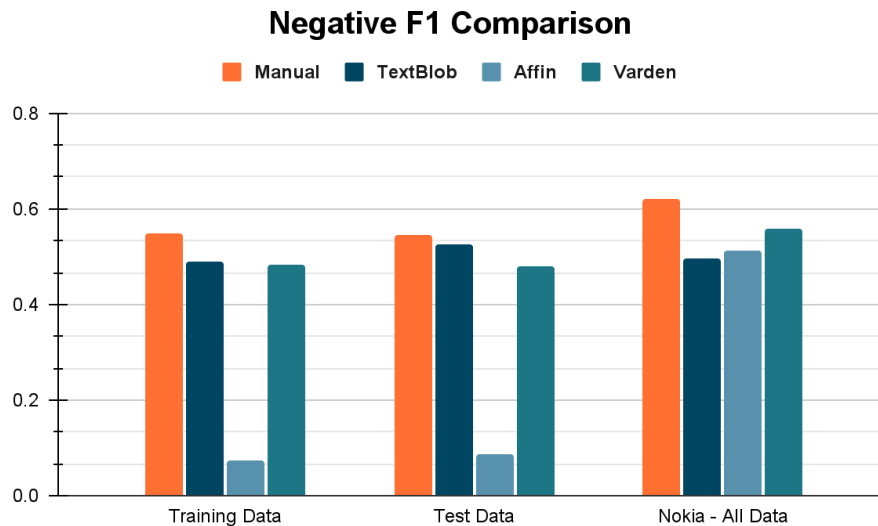


Negative Recall Comparison



Positive F1 Comparison





1.4 - Helpful Words

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NEGATIVE:
['boring', 'generic', 'badly', 'unfunny', 'routine', 'mediocre', 'lame', 'poorly', 'mindless', 'stale', 'pointless', 'unless', 'annoying', 'tiresome', 'disguise', 'apparently', 'offensive', 'stupid', 'dull', 'empty', 'harvard', 'can', 'bore', 'junk', 'excuse', 'pass', 'amateurish', 'banal', 'cliché', 'wasted', 'fatal', 'shoot', 'seagal', 'uninspired', 'numbers', 'stealing', 'meandering', 'animal', 'chan', 'kung', 'trite', 'paper', 'product', 'incoherent', 'plodding', 'lifeless', 'supposed', 'waste', 'bother', 'inept', 'cable', 'missed', 'unintentional', 'ballistic', 'stiff', 'crap', 'conceived', 'ill', 'busy', 'unintentionally', 'hollow', 'ask', 'witless', 'pow', 'pathetic', 'writers', 'pile', 'crass', 'comparison', 'choppy', 'clumsily', 'leaden', 'disaster', 'relentlessly', 'lousy', 'sara', 'inane', 'unnecessary', 'tuxedo', 'pinocchio', 'impostor', '51', 'flat', 'tv', 'skip', 'halfway', 'wannabe', 'muddled', 'store', 'serving', 'horrible', 'obnoxious', 'saug', 'sadly', 'handful', 'flash', 'putting', 'commentary', 'six', 'vapid']

POSITIVE:
['conduct', 'simplicity', 'spite', 'hopeful', 'lane', 'subversive', 'despair', 'harrowing', 'moore', 'desperation', 'intoxicating', 'joyous', 'haunting', 'portrait', 'evocative', 'masterful', 'hearts', 'lovers', 'format', 'understands', 'poem', 'unflinching', 'deadpan', 'depiction', 'splendid', 'integrity', 'exquisitely', 'current', 'nuanced', 'sobering', 'ingenious', 'delightfully', 'superbly', 're sist', 'frailty', 'pianist', 'portrayal', 'sadness', 'absorbing', 'touching', 'intimate', 'thoughtful', 'warm', 'unique', 'undeniably', 'bourne', 'wrenching', 'russian', 'jealousy', 'transcends', 'brea thtaking', 'sly', 'defy', 'gradually', 'richly', 'answers', 'delightful', 'startling', 'd', 'resonant', 'sides', 'heartbreaking', 'timely', 'groom', 'record', 'smarter', 'martha', 'captures', 'ton', 'captivating', 'spare', 'wry', 'wonderful', 'playful', 'iranian', 'detailed', 'lively', 'polished', 'respect', 'nicely', 'vividly', 'heartwarming', 'provides', 'tender', 'gem', 'wonderfully', 'deftly', 'realistic', 'mesmerizing', 'delicate', 'chilling', 'vivid', 'refreshingly', 'riveting', 'refreshing', 'affecting', 'powerful', 'inventive', 'unexpected', 'engrossing']
Ratio of words in powerlist present in the sentimentDictionary: 0.1644360496492175
File: trainData - Rule-Based - Affin

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NEGATIVE:

['unfunny', 'mediocre', 'generic', 'badly', 'poorly', 'routine', 'boring', 'pointless',
 'mindless', 'shoot', 'stale', 'bore', 'stupid', 'apparently', 'annoying', 'tiresome',
 'unless', 'dull', 'chan', 'harvard', 'holes', 'save', 'offensive', 'product', 'disguise',
 'junk', 'meandering', 'animal', 'tired', 'wasted', 'plodding', 'uninspired', 'pinocchio',
 'pretentious', 'stealing', 'waste', 'amateurish', 'horrible', 'banal', 'trite', 'lousy',
 'conceived', 'supposed', 'ill', 'inept', 'cable', 'kung', 'pathetic', 'sadly', 'incoherent',
 'preachy', 'seagal', 'sara', 'inane', 'plain', 'tv', 'store', 'endeavor', 'fatal',
 'unintentional', 'pile', 'comparison', 'produce', 'stiff', 'leaden', 'lifeless',
 'numbingly', 'tuxedo', 'serving', 'soggy', 'benigni', 'impostor', 'lame', 'flat',
 'coherent', 'numbers', 'halfway', 'unintentionally', 'wannabe', 'muddled', 'fails',
 'unfocused', '100', 'sink', 'ask', 'pseudo', 'settles', 'arts', 'relentlessly', 'witless',
 'pow', 'wilson', 'handful', 'missed', 'writers', 'looked', 'crass', 'vapid', 'schneider',
 'thrown']

POSITIVE:

['secretary', 'delicious', 'smartly', 'nuanced', 'sobering', 'washington', 'quietly', 'marvel', 'richly', 'conduct', 'subversive', 'simplicity', 'gently', 'straightforward', 'ramsay', 'portrayal', 'intoxicating', 'color', 'masterful', 'joyous', 'intimate', 'vivid', 'beauty', 'grandeur', 'lane', 'hearts', 'undeniably', 'startling', 'buoyant', 'bourne', 'd', 'lovers', 'gut', 'potent', 'droll', 'treat', 'timely', 'grown', 'poem', 'unflinching', 'breathtaking', 'splendid', 'ingenious', 'explores', 'answers', 'spite', 'resist', 'gradually', 'rewarding', 'sadness', 'smarter', 'touching', 'unique', 'wrenching', 'format', 'honesty', 'tour', 'understands', 'scale', 'transcends', 'frailty', 'sly', 'literary', 'hopeful', 'changing', 'evocative', 'martha', 'resonant', 'unexpected', 'polished', 'captivating', 'tender', 'provides', 'sides', 'lively', 'jealousy', "world's", 'captures', 'playful', 'iranian', 'spare', 'respect', 'vividly', 'heartwarming', 'wonderfully', 'detailed', 'realistic', 'wonderful', 'wry', 'mesmerizing', 'chilling', 'powerful', 'warm', 'gem', 'ages', 'refreshingly', 'riveting', 'inventive', 'refreshing', 'engrossing']

1.5 - Error messages - Naive Bayes (Test Bayes), Rule-Based (Test Dictionary)

```
File Edit Selection View Go Run Terminal Help
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS SQL CONSOLE
Python Debug Console

ERROR (neg classed as pos 0.00):
ERROR (neg classed as pos 0.00):the day finally arrived when i was sure i 'd leave sprint .
ERROR (neg classed as pos 2.00):the colors on the screen are not as crisp as i 'd have liked them to be .
ERROR (neg classed as pos 0.00):the buttons on the phone are small , even for my small fingertips , but you get used to them rather quickly .
ERROR (neg classed as pos 0.00):the volume .
ERROR (neg classed as pos 2.00):i have excellent hearing but the volume level on this phone is especially quiet .
ERROR (neg classed as pos 0.00):i assumed they had exceptional service , but their reception in my area ( los angeles ) is horrendous .
ERROR (neg classed as pos 1.00):since i received the phone , i spent countless hours on the phone with customer service reps who promised t-zones would work " in 24 hours " .
ERROR (neg classed as pos 0.00):i must have heard this about a dozen times over the span of 2 weeks , when t-zones never worked .
ERROR (neg classed as pos 0.00):however , the calls constantly drop in my area and i experience mega-static , to the point where i 'd have to dial numbers 6-7 times to get a clear line .
ERROR (neg classed as pos 1.00):the volume level of the phone is not all that good .
ERROR (neg classed as pos 2.00):some of the higher pitched rings are very easy to hear , but not easy to listen to .
ERROR (neg classed as pos 0.00):the vibration is not top .
ERROR (neg classed as pos 1.00):they are not wovable good .
ERROR (neg classed as pos 0.00):if also does n't have voice activated dialing . big minus ! !
ERROR (neg classed as pos 0.00):when i got it home , i discovered that the menu options for sending messages via either text or email simply were n't there :
ERROR (neg classed as pos 0.00):only con i can think of is no camera ...
ERROR (neg classed as pos 0.00):there are some features in the user interface that i find a little inconvenient .
ERROR (neg classed as pos 0.00):the menu options appear one at a time , taking up the whole screen , and one has to scroll down one by one , or have memorized where they are in the menu order , to sele
ct them by using the number keypad .
ERROR (neg classed as pos 1.00):so loud , really , that it does n't work terribly well as a silent ringer option .
ERROR (neg classed as pos 0.00):- some features in the user interface
ERROR (neg classed as pos 0.00):- no voice activated dialing ( what were they thinking
ERROR (neg classed as pos 1.00):- no option for caller-id pictures or individualized ringtones .
ERROR (neg classed as pos 0.00):- no proprietary headset jack
ERROR (neg classed as pos 0.00):only if we could get one camera in it . .
ERROR (neg classed as pos 0.00):it also has a stock tracking app built in ( also useless ) and a somewhat useful application which converts all types of metrics ( currency , length , area , etc ) .
ERROR (neg classed as pos 2.00):regarding pc software support nokia suite does not work with some versions of xp as i tried to connect my phone via infrared port on my laptop .
ERROR (neg classed as pos 1.00):although i find it more convenient to use t-touch dialing , this phone does not have voice dialing .
ERROR (neg classed as pos 0.00):the keypad is a decent size , but the power on/off key is small and difficult to press .
ERROR (neg classed as pos 0.00):one other issue is that the headphone jack is unique to nokia , so standard headphones will not work .
ERROR (neg classed as pos 0.00):the only problem that i have found with the internet service is that it does not access mls ( real estate broker software ) very well at all .
ERROR (neg classed as pos 1.00):this model does have the traditional key arrangement , it 's just that they are really close to one another , and have unconventional shapes , so it takes a big getting
used to for someone like me with big hands .
ERROR (neg classed as pos 0.00):the internet functions of the phone - wap and gprs - will only work through t-mobile 's services , because they have deleted the menu options that would enable you to co
nfigure the phone to be used on a different network .
ERROR (neg classed as pos 0.00):when talking the voice is not very clear .
Nokia ( All Data , Rule-based )
Accuracy : 0.8195488771804511
Precision - Positive : 0.8165137614678899
Precision - Negative : 0.8333333333333334
Recall - Positive : 0.956989247311828
Recall - Negative : 0.5
F1 Score - Positive : 0.8811881188118812
```

```
File Edit Selection View Go Run Terminal Help
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS SQL CONSOLE
Python Debug Console

ERROR (neg classed as pos 0.99):after several years of torture in the hands of at&t customer service i am delighted to drop them , and look forward to august 2004 when i will convert our other 3 family
-phones from at&t to t-mobile !
ERROR (neg classed as pos 0.52):i spent hours setting up the stations ( accepts about 13-14 , i believe ) , though the reception is unpredictable .
ERROR (neg classed as pos 0.60):the colors on the screen are not as crisp as i 'd have liked them to be .
ERROR (neg classed as pos 0.60):the menu options are uncreative , as you can 't see a full screen of menu items to pick from ; you have to scroll up and down to find what you 're looking for ( yes , th
is is minor , but not when you 're trying to keep your eye on the road ! ) .
ERROR (neg classed as pos 0.82):the volume
ERROR (neg classed as pos 0.85):i have excellent hearing but the volume level on this phone is especially quiet .
ERROR (neg classed as pos 0.87):i assumed they had exceptional service , but their reception in my area ( los angeles ) is horrendous .
ERROR (neg classed as pos 0.53):also , their t-zones , although cheap ( $ 4.99 / mo . ) never works .
ERROR (neg classed as pos 0.90):some of the higher pitched rings are very easy to hear , but not easy to listen to .
ERROR (neg classed as pos 0.65):the more subtle tones that were included with the phone are hard to hear at times .
ERROR (neg classed as pos 0.67):the vibration is not top .
ERROR (neg classed as pos 0.86):i am bored with the silver look .
ERROR (neg classed as pos 0.60):they are not wovable good .
ERROR (neg classed as pos 0.62):it also does n't have voice activated dialing . big minus ! !
ERROR (neg classed as pos 0.72):we got two phones for the t-mobile family plan ( indeed very easy to switch to the family plan ) and one came with a broken headphone ( can hear but cannot be heard ) an
d one died today after less than two weeks of use .
ERROR (neg classed as pos 0.68):negative : impossibly tiny and difficult to operate , barely visible , power button .
ERROR (neg classed as pos 0.70):the screen is easily scratched but if you have the warranty you should be able to swap it out .
ERROR (neg classed as pos 0.84):the fact that the " 0 " key is the space key for text input is a bit confusing , as many phones use the " # " key instead .
ERROR (neg classed as pos 0.53):there are some features in the user interface that i find a little inconvenient .
ERROR (neg classed as pos 0.73):- some features in the user interface
ERROR (neg classed as pos 0.58):- no proprietary headset jack
ERROR (neg classed as pos 0.94):it's quiet .
ERROR (neg classed as pos 0.97):the keypad is a decent size , but the power on/off key is small and difficult to press .
ERROR (neg classed as pos 0.71):one other issue is that the headphone jack is unique to nokia , so standard headphones will not work .
ERROR (neg classed as pos 0.54):one complaint ... the screen is too easily scratched !
ERROR (neg classed as pos 0.63):i find the lack of entertaining games on this phone quite disturbing .
ERROR (neg classed as pos 0.82):my only gripe about the hardware is the buttons .
ERROR (neg classed as pos 0.80):one downside : as of this writing , t-mobile has n't updated their t-zone system to fully support the 6610 .
ERROR (neg classed as pos 0.53):when talking the voice is not very clear .
Nokia ( All Data , Naive Bayes )
Accuracy : 0.5827867669172933
Precision - Positive : 0.7697841726618705
Precision - Negative : 0.7725527559053118
Recall - Positive : 0.5752688172043011
Recall - Negative : 0.6
F1 Score - Positive : 0.6584615384615384
F1 Score - Negative : 0.463768115942029

ERROR (neg classed as pos 1.00):the headset that comes with the phone has good sound volume but it hurts the ears like you cannot imagine !
ERROR (neg classed as pos 1.00):the phone comes with okay ringtones , some decent backgrounds / screensavers , but the phone has very little memory ( mine had 230kb as it arrived from amazon , so you d
o n't have too many options on what you can put on there ) .
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File Edit Selection View Go Run Terminal Help
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS SQL CONSOLE
Python Debug Console

ERROR (pos classed as neg 0.16):i like my phones to be small so i can fit it in my pockets .
ERROR (pos classed as neg 0.20):overall this is a slightly better than average phone .
ERROR (pos classed as neg 0.37):this is the best phone i have seen .
ERROR (pos classed as neg 0.03):you can do * so * much more with the pc suite , i.e. free ringtones from midi files , free graphics from any picture on your computer , and if you know how to program jme you can even make your own apps / games .
ERROR (pos classed as neg 0.00):the phone 's sound quality is great ( turn up the volume if its too quiet , people , this thing will get loud ) i dont have any complaints about this phone and the only thing that i miss from my 8290 is voice dialing .
ERROR (pos classed as neg 0.01):i just purchased this phone and i think this is the coolest phone i ever had .
ERROR (pos classed as neg 0.00):the first night i got this phone i put it next to me when i went to bed just to listen to my favorite music station and the handset itself doesnt weight anything its too light and feel so comfy with it .
ERROR (pos classed as neg 0.43):for a specific location , i still think its a great phone .
ERROR (pos classed as neg 0.25):nokia was my first nonflip phone , and i 'm glad i decided to go with them .
ERROR (pos classed as neg 0.24):i could make phone calls from locations i previously could not ( like my apartment ) .
ERROR (pos classed as neg 0.19):i highly recommend this phone to anyone .
ERROR (pos classed as neg 0.27):the hands-free speakerphone is quite powerful ( like the motorola phone , i used to own ) .
ERROR (pos classed as neg 0.11):the pc sync feature is superb that comes with nokia pc suite software ( with data cable or infrared port or bluetooth ) .
ERROR (pos classed as neg 0.03):the mobile text messaging , chat , picture sharing etc. other nicities , that you would enjoy .
ERROR (pos classed as neg 0.07):i can recommend this phone to anyone , anytime .
ERROR (pos classed as neg 0.03):not only is it the perfect size ( not too small , not too large ) , it also has all the features a high-tech phone user would want .
ERROR (pos classed as neg 0.14):however , the battery life is good enough you should n't be overly concerned with turning this phone off .
ERROR (pos classed as neg 0.36):it has great battery life , fm radio , excellent signal , hands free speakerphone ( which i have to say is probably my favorite function ) and downloadable java apps .
ERROR (pos classed as neg 0.45):great phone ..
ERROR (pos classed as neg 0.09):i have had no problems with the phone .
ERROR (pos classed as neg 0.13):great phone , i 'd buy another .
ERROR (pos classed as neg 0.14):this phone is great as a whole and is not like others with one or two good qualities .
ERROR (pos classed as neg 0.28):great phone , easy to use , excellent network , no regrets ! ! !
ERROR (pos classed as neg 0.01):i purchased this phone for just 50 $ and there is no end to what i can do with it .
ERROR (pos classed as neg 0.04):this is probably your best bet if you are looking for a phone in this price range , or like me , do not have the patience to deal with annoying flip phones .
ERROR (pos classed as neg 0.13):i month , no problems , great phone i 'm very pleased with my 6610 phone .
ERROR (pos classed as neg 0.02):the sound quality is excellent , except , maybe a * tad * too quiet at times when there are quieter talkers on the other end of the line .
ERROR (pos classed as neg 0.02):i have not had any distortion problems with this phone and am more pleased with this phone than any i 've used before .
ERROR (pos classed as neg 0.17):first let me say that it is much smaller than it looks on the web and it also looks better .
ERROR (pos classed as neg 0.42):it has a classic design yet looks hip .
ERROR (pos classed as neg 0.02):this phone is a great phone and is not like others with one or two good qualities .
ERROR (pos classed as neg 0.01):but anyway , the only thing you should really look at here is the fact that the phone does have voice dialing .
ERROR (pos classed as neg 0.44):the 6610 excels as a cell phone , thank god .
ERROR (pos classed as neg 0.27):the nokia 6610 is a relatively new phone , and what a great phone it is .
ERROR (pos classed as neg 0.04):when i turned the phone on , the first thing that hit me is how good the screen is .
ERROR (neg classed as pos 0.70):the gps connection is sometimes slow , and writing instant messages with the included aol instant messenger software is a pain , but the other t-zones applications are quite useful .
ERROR (pos classed as neg 0.49):all my questions or problems have been quickly and satisfactorily resolved .
ERROR (pos classed as neg 0.41):nokia makes a great phone , that 's clear .
ERROR (pos classed as neg 0.27):this phone is god with a huge array of features built into it .
ERROR (pos classed as neg 0.67):but , i would definitely recommend this phone .
ERROR (pos classed as neg 0.39):it is crystal clear .

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File Edit Selection View Go Run Terminal Help
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS SQL CONSOLE
Python Debug Console

VI-2(Code data VI-2)Sentiment_final.py'
Naive Bayes
ERROR (pos classed as neg 0.01):there is much which has been said in other reviews about the features of this phone , it is a great phone , mine worked without any problems right out of the box .
ERROR (pos classed as neg 0.03):i have had the phone for a week , the signal quality has been great in the detroit area ( suburbs ) and in my recent road trip between detroit and northern kentucky ( Cincinnati ) i experienced perfect signal and reception along i-75 , far superior to &#38; t 's which does not work along several long stretches on that same route .
ERROR (pos classed as neg 0.06):the speaker phone is very functional and i use it in the car , very audible even with freeway noise .
ERROR (pos classed as neg 0.00):the infrared is a blessing if you have a previous nokia and want to transfer your old phone book to this phone , saved me hours of re-entering my numbers .
ERROR (pos classed as neg 0.07):there 's the brief synopsis : the phone is tiny , cute , feels kind of * plastic-like * ( as if it might break ) , but seems pretty sturdy .
ERROR (pos classed as neg 0.03):i do like this phone overall ( would give it a 3.5 ) , but unfortunately , i am returning it .
ERROR (pos classed as neg 0.15):it-mobile is trying very hard , and again -- they do have pretty good car 's .
ERROR (pos classed as neg 0.01):while i like the performance of the phone in every regard , i would buy another one solely upon the apparent indestructibility of it .
ERROR (pos classed as neg 0.32):from the speakerphone that can be used up to 15 feet away with clarity , to the downloadable poly-graphic megatones that adds a personal touch to this nifty phone .
ERROR (pos classed as neg 0.47):whether you 're taking a brisk jog , waiting for a bus or just having lunch at the park , you 'll be glad you had the fm radio .
ERROR (neg classed as pos 0.90):great battery life , perfect size , but a tid bit quieter than i would like .
ERROR (pos classed as neg 0.17):while i had the phone , the positive features were : good sound quality and an excellent fm phone and earpiece .
ERROR (pos classed as neg 0.27):this phone is a winner ...
ERROR (pos classed as neg 0.42):anything this phone does , it does perfectly .
ERROR (pos classed as neg 0.40):you can adjust the volume to be heard anywhere or so that it does n't make that big of a disturbance .
ERROR (pos classed as neg 0.02):this phone is one of the few phones that have an fm radio tuner built in .
ERROR (pos classed as neg 0.12):this radio receives fairly decent reception but not nearly as good as a normal radio , but as long as the stations are coming in clearly the phone 's radio should work perfectly .
ERROR (pos classed as neg 0.23):i bought this phone for my trip to south africa and it worked almost perfectly .
ERROR (pos classed as neg 0.03):anywhere i went in south africa this phone received full bar reception .
ERROR (pos classed as neg 0.31):another benefit of this phone is that it is truly an international phone ; the 6610 is sold in almost everywhere in the world .
ERROR (pos classed as neg 0.21):when you put this phone in your pocket you forget it is there ; it is unbelievably small and oh , so light .
ERROR (pos classed as neg 0.40):this is a benefit for many reasons , one being just for appearance , your pants wo n't be bulging with this phone in your pocket .
ERROR (pos classed as neg 0.03):i 've used the speakerphone for almost two hours once and the battery did not even go down one single bar .
ERROR (pos classed as neg 0.15):this phone has many other features , ir , ; just to name one , the features above i view as the most beneficial .
ERROR (pos classed as neg 0.28):overall , i highly recommend this phone .
ERROR (pos classed as neg 0.40):size - extremely small and convenient will fit in your pocket and not bother you .
ERROR (pos classed as neg 0.48):nice little phone ... light compact .
ERROR (pos classed as neg 0.00):but , then again , the ringer can be so loud that i heard it ringing inside my office , when i was already out on the street ...
ERROR (pos classed as neg 0.21):i like the speakerphone function a lot .
ERROR (pos classed as neg 0.30):i like the automatic key lock function .
ERROR (pos classed as neg 0.16):the phone is very light weight .
ERROR (pos classed as neg 0.40):while going for a cellphone , i was fully determined to buy a nokia only as it is the best in cellphones .
ERROR (pos classed as neg 0.24):and really this is the best phone one could have .
ERROR (pos classed as neg 0.45):it has all the features one would need in a cellphone .
ERROR (pos classed as neg 0.02):this phone is very user-friendly , easy to manipulate &#38; ; very convenient to scroll in menu etc .
ERROR (pos classed as neg 0.02):its speakerphone option allows us to do long talks conveniently , lying on bed &#38; ; phone lying by your pillowside .
ERROR (pos classed as neg 0.40):i am enjoying my phone a lot .
ERROR (pos classed as neg 0.26):battery life is very good , i use it every day and i have to charge it every 5 or 6 days or so .
ERROR (pos classed as neg 0.28):nokia's have always had good sound quality and this is no exception .
ERROR (pos classed as neg 0.01):the loud speaker function on the 6610 is great because you do n't need to put your phone right next to your ear to talk .
ERROR (pos classed as neg 0.16):i like my phones to be small so i can fit it in my pockets .

Ln 603, Col 2 Spaces 4 UTF-8 CRLF Python 3.11.0 64-bit
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Citations

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2. Loria, S., 2018. textblob Documentation. *Release 0.15*, 2
<https://textblob.readthedocs.io/>
3. Hutto, C.J. & Gilbert, E.E. (2014). VADER: A Parsimonious Rule-based Model for Sentiment Analysis of Social Media Text. Eighth International Conference on Weblogs and Social Media (ICWSM-14). Ann Arbor, MI, June 2014.
<https://github.com/cjhutto/vaderSentiment>