

## Team - Aniruddh Nathani, Saurabh Sharma, Heet Palod

```
In [1]: import numpy as np
import pandas as pd
from nltk.corpus import stopwords
import math
import random
import nltk
nltk.download('stopwords')
from sklearn.feature_extraction.text import CountVectorizer, TfidfVectorizer

[nltk_data] Downloading package stopwords to
[nltk_data] /Users/aniruddh/nltk_data...
[nltk_data] Package stopwords is already up-to-date!
```

Explore and Cleaning the data

## Loading Data

```
In [2]: data_amazon = pd.read_csv("amazon-reviews.csv.bz2", sep="\t")

In [3]: # replacing all blank spaces (if any) with nan in the dataframe
data_amazon = data_amazon.replace(r'^\s*$', np.nan, regex=True)

#dropping nan's
data_amazon = data_amazon.dropna(axis = 0)

data_amazon.reset_index(drop = True)
data_amazon
```

Out[3]:

	date		summary	review	rating
0	2013-07-16		Awesine	Perfect for new parents. We were able to keep ...	5
1	2013-06-29	Should be required for all new	parents!	This book is such a life saver. It has been s...	5
2	2014-03-19	Grandmother watching baby		Helps me know exactly how my babies day has go...	5
3	2013-08-17		repeat buyer	I bought this a few times for my older son and...	5
4	2014-04-01		Great	I wanted an alternative to printing out daily ...	4
...	...		...	...	...
205326	2014-07-20		Five Stars	Great, just as expected. Thank to all.	5
205327	2014-07-02	Long life, and for some players, a	good econom...	I've been thinking about trying the Nanoweb st...	5
205328	2014-07-22		Good for coated.	I have tried coated strings in the past ( incl...	4
205329	2014-07-01		Taylor Made	Well, MADE by Elixir and DEVELOPED with Taylor...	4
205330	2014-07-16	These strings are really quite	good, but I wou...	These strings are really quite good, but I wou...	4

205236 rows × 4 columns

In [4]: data\_amazon.isnull().sum()

Out[4]:

```

date          0
summary       0
review        0
rating        0
dtype: int64

```

## Sampling 1000 rows of the data.

```
In [5]: np.random.seed(5)
sample_data_amazon = data_amazon.sample(15000)
sample_data_amazon = sample_data_amazon.reset_index(drop = True)
sample_data_amazon
```

Out[5]:

	date	summary	review	rating
0	2014-03-12	Nice material, fit is off. Probably don't need...	My mother bought the naturepedic mattress for ...	3
1	2014-01-10	nice	I think this rattle is really cool because it'...	5
2	2013-04-23	not bad	I love the idea of these spoons. It would be ...	3
3	2013-01-10	Great item for the kids	This is a great item but the bag that it comes...	4
4	2012-08-01	Nice glass bottle, terrible nipple	I like that these are glass bottles, but the n...	3
...	...	...	...	...
14995	2013-01-24	If only they could SLOW DOWN THE FLOW!	I purchased 1 of litterally EVERY SINGLE bottl...	4
14996	2013-06-27	Leaks	Not sure, why its called safe sippy.Using it a...	1
14997	2014-01-30	Excellent pump!	I received this pump from my insurance, but I ...	5
14998	2014-10-02	Classic Italian Shaving Goodness	What can you say about a classic? It's not th...	5
14999	2014-02-23	great for keeping the stink in the bag	I bought these when our baby was brand new, bu...	5

15000 rows × 4 columns

## Intuition of clusters.

In [ ]:

## Implement TF-IDF transform

### Transforming the subset into Bag Of Words

```
In [6]: vectorizer = CountVectorizer()

# define vectorizer
X = vectorizer.fit_transform(sample_data_amazon.review.values)

# vectorize your data. Note: this creates a sparse matrix, use .toarray() if you want a dense matrix.
words = vectorizer.get_feature_names()
BagOfWords_df = pd.DataFrame.sparse.from_spmatrix(X)
BagOfWords_df.columns = words
BagOfWords_array = X.toarray()
sum_array = list(BagOfWords_array.sum(axis = 0))
count_main = dict(zip(words, sum_array))
BagOfWords_df
```

Out[6]:

	00	000	001latte	004	008	00there	01	02	03	0300	...	zooper	zorb	zoya	zu
0	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14995	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0
14996	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0
14997	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0
14998	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0
14999	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0

15000 rows × 23473 columns

```
In [7]: count_main["better"]
BagOfWords_array.shape
```

Out[7]: (15000, 23473)

## Transforming the subset into TF-IDF matrix.

### TF calculation

```
In [8]: # finding tf {i x j} matrix on our BagOfWords.
tf_df = np.log( 1 + BagOfWords_df)
```

## IDF calculation

```
In [9]: # finding value of N.
N = BagOfWords_df.shape[0]

# finding frequency of words.
frequency_words = (BagOfWords_df > 0).sum(axis = 0)

# finding idf {j} matrix on our BagOfWords.
idf = np.log(N / ( 1 + frequency_words ))
```

## TF-IDF calculation

```
In [10]: # tf_idf {ixj} is the matrix multiplication of tf {i x j} and idf {j}
          matrices
tf_idf_df = tf_df * idf
tf_idf_df
```

Out[10]:

	00	000	001latte	004	008	00there	01	02	03	0300	...	zooper	zorb	zoya
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0
14996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0
14997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0
14998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0
14999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0

15000 rows × 23473 columns

## Implement K-means clustering

## Picking k (k = 4 chosen) random reviews and assigning them cluster centers.

NOTE : taking k = 4 for this part. In the 4th part we have converted the logic into a function which can take any value of k.

```
In [39]: cluster_tf_idf_df = tf_idf_df.copy()
```

```
In [40]: # choosing 4 clusters for our k means clustering. Picking first 4 numbers as the cluster centers.
clusterCenters_df = cluster_tf_idf_df[0:4]
clusterCenters_df
```

Out[40]:

	00	000	001latte	004	008	00there	01	02	03	0300	...	zooper	zorb	zoya	zu
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0

4 rows × 23473 columns

## Assigning all reviews into arbitrary clusters.

```
In [41]: # Assigning all of the reviews a cluster number - say 1 for initial
         stage.
         cluster_tf_idf_df["Cluster Number"] = 1
         cluster_tf_idf_df
```

Out[41]:

	00	000	001latte	004	008	00there	01	02	03	0300	...	zorb	zoya	zu	zulli
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0
14996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0
14997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0
14998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0
14999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0

15000 rows × 23474 columns

## Calculating norm of all review vectors.

```
In [42]: cluster_tf_idf_df["Review Norm Value"] = np.linalg.norm(cluster_tf_idf_df.iloc[:, :-1], axis = 1)
```

In [43]: cluster\_tf\_idf\_df

Out[43]:

	00	000	001latte	004	008	00there	01	02	03	0300	...	zoya	zu	zulli	zuric
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0
14996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0
14997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0
14998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0
14999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0

15000 rows × 23475 columns

## Calculating norm of cluster center vectors.

In [44]: clusterCenters\_df["Review Norm Value"] = np.linalg.norm(clusterCenters\_df.iloc[:, :-1], axis = 1)

/Users/aniruddh/opt/anaconda3/lib/python3.7/site-packages/ipykernel\_launcher.py:1: SettingWithCopyWarning:  
A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

See the caveats in the documentation: [http://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](http://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)

"""Entry point for launching an IPython kernel.



In [45]: clusterCenters\_df

Out[45]:

	00	000	001latte	004	008	00there	01	02	03	0300	...	zorb	zoya	zu	zulli	zui
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	

4 rows × 23474 columns

## Finding cosine similarity between reviews and corresponding cluster centers.

```
In [46]: # cosine similarity with the first cluster center.
# cosine similarity = (A.B) / (||A||. ||B||) = (dot product) / (product of norms of the two vectors)
dot_products = np.dot(cluster_tf_idf_df.iloc[:, :-2], clusterCenters_df.iloc[0, :-1])
norm_products = np.multiply(cluster_tf_idf_df["Review Norm Value"], clusterCenters_df["Review Norm Value"][0])
cluster_tf_idf_df["cosine_similarity_Cluster1"] = np.divide(dot_products, norm_products)
```

```
In [47]: # cosine similarity with the second cluster center.
# cosine similarity = (A.B) / (||A||. ||B||) = (dot product) / (product of norms of the two vectors)
dot_products = np.dot(cluster_tf_idf_df.iloc[:, :-3], clusterCenters_df.iloc[1, :-1])
norm_products = np.multiply(cluster_tf_idf_df["Review Norm Value"], clusterCenters_df["Review Norm Value"][1])
cluster_tf_idf_df["cosine_similarity_Cluster2"] = np.divide(dot_products, norm_products)
```

```
In [48]: # cosine similarity with the third cluster center.
# cosine similarity = (A.B) / (||A||. ||B||) = (dot product) / (product of norms of the two vectors)
dot_products = np.dot(cluster_tf_idf_df.iloc[:, :-4], clusterCenters_df.iloc[2, :-1])
norm_products = np.multiply(cluster_tf_idf_df["Review Norm Value"], clusterCenters_df["Review Norm Value"][2])
cluster_tf_idf_df["cosine_similarity_Cluster3"] = np.divide(dot_products, norm_products)
```

```
In [49]: # cosine similarity with the fourth cluster center.
# cosine similarity = (A.B) / (||A||. ||B||) = (dot product) / (product of norms of the two vectors)
dot_products = np.dot(cluster_tf_idf_df.iloc[:, :-5], clusterCenters_df.iloc[3, :-1])
norm_products = np.multiply(cluster_tf_idf_df["Review Norm Value"], clusterCenters_df["Review Norm Value"][3])
cluster_tf_idf_df["cosine_similarity_Cluster4"] = np.divide(dot_products, norm_products)
```

```
In [50]: cluster_tf_idf_df
```

```
Out[50]:
```

	00	000	001latte	004	008	00there	01	02	03	0300	...	zutano	zwingling	zzzi
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
14996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
14997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
14998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
14999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	

15000 rows × 23479 columns

**Assigning each review to a cluster by comparing cosine similarity.**

```

In [51]: cluster_tf_idf_df['Cluster Number'] = cluster_tf_idf_df.apply(lambda
a x: 1 if x.cosine_similarity_Cluster1 >= x.cosine_similarity_Cluster2
                                and x
                                .cosine_similarity_Cluster1 >= x.cosine_similarity_Cluster3
                                and x
                                .cosine_similarity_Cluster1 >= x.cosine_similarity_Cluster4
                                else
2 if x.cosine_similarity_Cluster2 >= x.cosine_similarity_Cluster1
                                and x
                                .cosine_similarity_Cluster2 >= x.cosine_similarity_Cluster3
                                and x
                                .cosine_similarity_Cluster2 >= x.cosine_similarity_Cluster4
                                else
3 if x.cosine_similarity_Cluster3 >= x.cosine_similarity_Cluster1
                                and x
                                .cosine_similarity_Cluster3 >= x.cosine_similarity_Cluster2
                                and x
                                .cosine_similarity_Cluster3 >= x.cosine_similarity_Cluster4
                                else
4,
                                axis
                                = 1
                                )

```

```

In [52]: cluster_tf_idf_df

```

Out[52]:

	00	000	001latte	004	008	00there	01	02	03	0300	...	zutano	zwillling	zzzi
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
14996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
14997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
14998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
14999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	

15000 rows × 23479 columns

## Did any of the reviews change cluster?

Yes, initially I assigned all the reviews the same cluster number i.e. 1. Now, the clusters have changed as per their cosine similarities. We have to run the algorithm again and again to get the final clusters.

## Compute mean of all reviews that belong to each cluster.

```
In [54]: # computing mean of all reviews that belong to each cluster.
new_cluster_mean_df = cluster_tf_idf_df.iloc[:, :-5].groupby('Cluster Number').mean()
new_cluster_mean_df = new_cluster_mean_df.reset_index()
new_cluster_mean_df
```

Out[54]:

	Cluster Number	00	000	001latte	004	008	00there	01	02
0	1	0.016735	0.007069	0.002185	0.002185	0.00000	0.00000	0.004030	0.005536
1	2	0.000000	0.007163	0.000000	0.000000	0.00000	0.00000	0.000000	0.009666
2	3	0.007411	0.004181	0.000000	0.000000	0.00000	0.00000	0.000000	0.001904
3	4	0.011703	0.001893	0.000000	0.000000	0.00117	0.00117	0.001079	0.000000

4 rows × 23474 columns

```
In [55]: new_cluster_mean_df["Review Norm Value"] = np.linalg.norm(new_cluster_mean_df.iloc[:, :], axis = 1)
```

```
In [56]: new_cluster_mean_df
```

Out[56]:

	Cluster Number	00	000	001latte	004	008	00there	01	02
0	1	0.016735	0.007069	0.002185	0.002185	0.00000	0.00000	0.004030	0.005536
1	2	0.000000	0.007163	0.000000	0.000000	0.00000	0.00000	0.000000	0.009666
2	3	0.007411	0.004181	0.000000	0.000000	0.00000	0.00000	0.000000	0.001904
3	4	0.011703	0.001893	0.000000	0.000000	0.00117	0.00117	0.001079	0.000000

4 rows × 23475 columns

## Repeating from step 3.4 and carrying it over to around 30 iterations.

```
In [57]: # finding value counts per cluster of the initial dataframes.
cluster_tf_idf_df["Cluster Number"].value_counts()
```

```
Out[57]: 3      5486
         4      5286
         1      2831
         2      1397
         Name: Cluster Number, dtype: int64
```

```
In [ ]: def reclustering_repetitions(N, cluster_tf_idf_df, new_cluster_mean
      _df):
    for i in range(N):
        # cosine similarity with the first cluster center.
        # cosine similarity = (A.B) / (||A||. ||B||) = (dot product
        ) / (product of norms of the two vectors)
        dot_products = np.dot(cluster_tf_idf_df.iloc[:, :-6], new_cl
        uster_mean_df.iloc[0, 1:-1])
        norm_products = np.multiply(cluster_tf_idf_df["Review Norm
        Value"], new_cluster_mean_df["Review Norm Value"][0])
        cluster_tf_idf_df["cosine_similarity_Cluster1"] = np.divide
        (dot_products, norm_products)

        # cosine similarity with the second cluster center.
        # cosine similarity = (A.B) / (||A||. ||B||) = (dot product
        ) / (product of norms of the two vectors)
        dot_products = np.dot(cluster_tf_idf_df.iloc[:, :-6], new_cl
        uster_mean_df.iloc[1, 1:-1])
        norm_products = np.multiply(cluster_tf_idf_df["Review Norm
        Value"], new_cluster_mean_df["Review Norm Value"][1])
        cluster_tf_idf_df["cosine_similarity_Cluster2"] = np.divide
        (dot_products, norm_products)

        # cosine similarity with the third cluster center.
        # cosine similarity = (A.B) / (||A||. ||B||) = (dot product
        ) / (product of norms of the two vectors)
        dot_products = np.dot(cluster_tf_idf_df.iloc[:, :-6], new_cl
        uster_mean_df.iloc[2, 1:-1])
        norm_products = np.multiply(cluster_tf_idf_df["Review Norm
        Value"], new_cluster_mean_df["Review Norm Value"][2])
        cluster_tf_idf_df["cosine_similarity_Cluster3"] = np.divide
        (dot_products, norm_products)

        # cosine similarity with the fourth cluster center.
        # cosine similarity = (A.B) / (||A||. ||B||) = (dot product
        ) / (product of norms of the two vectors)
        dot_products = np.dot(cluster_tf_idf_df.iloc[:, :-6], new_cl
        uster_mean_df.iloc[3, 1:-1])
        norm_products = np.multiply(cluster_tf_idf_df["Review Norm
```

```

Value"], new_cluster_mean_df["Review Norm Value"])[3])
    cluster_tf_idf_df["cosine_similarity_Cluster4"] = np.divide
(dot_products, norm_products)

    # assigning each review to a cluster by comparing cosine si
milarity.
    cluster_tf_idf_df['Cluster Number'] = cluster_tf_idf_df.app
ly(lambda x: 1 if x.cosine_similarity_Cluster1 >= x.cosine_similari
ty_Cluster2

nd x.cosine_similarity_Cluster1 >= x.cosine_similarity_Cluster3
nd x.cosine_similarity_Cluster1 >= x.cosine_similarity_Cluster4
lse 2 if x.cosine_similarity_Cluster2 >= x.cosine_similarity_Cluste
r1
nd x.cosine_similarity_Cluster2 >= x.cosine_similarity_Cluster3
nd x.cosine_similarity_Cluster2 >= x.cosine_similarity_Cluster4
lse 3 if x.cosine_similarity_Cluster3 >= x.cosine_similarity_Cluste
r1
nd x.cosine_similarity_Cluster3 >= x.cosine_similarity_Cluster2
nd x.cosine_similarity_Cluster3 >= x.cosine_similarity_Cluster4
lse 4,
xis = 1)

    # computing mean of all reviews that belong to each cluster
.
    new_cluster_mean_df = cluster_tf_idf_df.iloc[:, :-5].groupby
('Cluster Number').mean()
    new_cluster_mean_df = new_cluster_mean_df.reset_index()
    new_cluster_mean_df["Review Norm Value"] = np.linalg.norm(n
ew_cluster_mean_df.iloc[:, :], axis = 1)
    return cluster_tf_idf_df, new_cluster_mean_df

```

```

In [58]: cluster_tf_idf_df_input = cluster_tf_idf_df
new_cluster_mean_df_input = new_cluster_mean_df
cluster_tf_idf_df_final, new_cluster_mean_df_final = reclustering_r
epetitions(1, cluster_tf_idf_df_input, new_cluster_mean_df_input)
cluster_tf_idf_df_final["Cluster Number"].value_counts()

```

```

Out[58]: 1      12747
3       1144
2       1090
4         19
Name: Cluster Number, dtype: int64

```

```
In [59]: cluster_tf_idf_df_input = cluster_tf_idf_df
new_cluster_mean_df_input = new_cluster_mean_df
cluster_tf_idf_df_final, new_cluster_mean_df_final = reclustering_repetitions(2, cluster_tf_idf_df_input, new_cluster_mean_df_input)
cluster_tf_idf_df_final["Cluster Number"].value_counts()
```

```
Out[59]: 1    13224
         2     999
         3     745
         4      32
         Name: Cluster Number, dtype: int64
```

```
In [60]: cluster_tf_idf_df_input = cluster_tf_idf_df
new_cluster_mean_df_input = new_cluster_mean_df
cluster_tf_idf_df_final, new_cluster_mean_df_final = reclustering_repetitions(10, cluster_tf_idf_df_input, new_cluster_mean_df_input)
cluster_tf_idf_df_final["Cluster Number"].value_counts()
```

```
Out[60]: 1    12096
         2    1586
         3    1099
         4     219
         Name: Cluster Number, dtype: int64
```

```
In [61]: cluster_tf_idf_df_input = cluster_tf_idf_df
new_cluster_mean_df_input = new_cluster_mean_df
cluster_tf_idf_df_final, new_cluster_mean_df_final = reclustering_repetitions(30, cluster_tf_idf_df_input, new_cluster_mean_df_input)
cluster_tf_idf_df_final["Cluster Number"].value_counts()
```

```
Out[61]: 1    11353
         2    1575
         3    1100
         4     972
         Name: Cluster Number, dtype: int64
```

```
In [69]: cluster_tf_idf_df_input = cluster_tf_idf_df
new_cluster_mean_df_input = new_cluster_mean_df
cluster_tf_idf_df_final, new_cluster_mean_df_final = reclustering_repetitions(32, cluster_tf_idf_df_input, new_cluster_mean_df_input)
cluster_tf_idf_df_final["Cluster Number"].value_counts()
```

```
Out[69]: 1    11353
         2    1575
         3    1100
         4     972
         Name: Cluster Number, dtype: int64
```

Since on 30th and 32nd iteration the clusters are giving same value count we can say that on approximately 30-32 the clusters are being repeated. Hence this is where our algorithm stops!

```
In [104]: cluster_tf_idf_df_final
```

```
Out[104]:
```

	00	000	001latte	004	008	00there	01	02	03	0300	...	zutano	zwillig	zzzi
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
14996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
14997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
14998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	
14999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	

15000 rows × 23479 columns

## 4) Play and Analyze your clusters.

### Splitting the reviews on the basis of clusters and printing them.

```
In [125]: # Cluster 1 Review types
reviews_c1 = cluster_tf_idf_df_final.index[cluster_tf_idf_df_final[
"Cluster Number"] == 1].tolist()
indices_1 = random.sample(reviews_c1, 10)
df_1 = sample_data_amazon.iloc[indices_1, -2]
for i in range(df_1.shape[0]):
    print("review" + str(i+1))
    print(df_1.iloc[i,])
    print("\n")
```

review1

I got this sponge with the intention of providing a place to lay my newborn during the first few days of sponge baths while waiting for his belly button and circumcision to heal. It functioned well enough for this purpose and I have since used it still as a place to lay the baby before and after the tub baths. My only criticism is that it is quite a bit thinner than I had expected it to be. For the price I am happy with the purchase, but did expect and wish



that it had been a little thicker and denser sponge material - I would have paid a few more dollars for it to be thicker.

#### review2

These aren't quite as thick as Potty Patty undies, which, depending on your needs, may be a plus or minus. Since no training pants hold very much pee, I think these are just fine; and they are cute; and they are soft and fit well. A very nice classic training pant.

#### review3

In retrospect, I wish I had just stuck with the Playtex Lil' Gripper Straw cups that we already had from my older son. As a bit of background: We never got around to introducing a bottle to my baby but the possibility of an overnight business trip when my younger son was 7 months old made me decide that we'd just skip the traditional bottle and move right to a straw (which, developmentally, is better than a spout). My older son started drinking from a straw at 7 months of age but he was willing to let someone help hold the bottle/cup for him. However, with this baby, he needs to do everything himself so I thought that the handles might help him since he wasn't quite able to hold the larger cup himself. The handles are great. But all the other negatives you read in the other reviews are spot on. It says this is leak-proof, but it's patently not the case. The straw doesn't have a valve like the other straw cups do. I guess that's because you (as the parent) are supposed to be able to squeeze the cup to help your little one figure out how the straw is supposed to work. Maybe my kids are straw prodigies or something, but both of them figured out how to work a straw in just a few minutes - even with a valve. That meant that when my son tipped this cup over while in his car seat, half the liquid ended up in his lap. The diameter of the straw is the same as those for the "regular" Playtex cups, but the length of the part "outside" the cup is not. So to avoid the spillage issue, I just used a valve straw that I already had and simply didn't bother closing the lid. My son is now 9.5 months and we've since moved onto a larger, insulated straw cup which helps with the "bubbling" issues as the temperature of the liquid changes. In the end, I wish I'd have saved my money.

#### review4

beautiful for fall

#### review5

This product is worth having if, like me, you find yourself needing a place to quickly "park" your guitar without putting it back in the guitar stand. I use it on a desk next to my chair and music stand. Works great -- only suggestion I have it to perhaps make a version with a sticky tape underside, or a way of semi-permanently a

ttaching it the spot where you want it so it doesn't move around. I wound up using a very small wood screw to attach it to my desk so it stays fixed. Overall -- I like it.

#### review6

We bought this but only used it once- do not spend the money. Babies get out of swaddles so we ended up using the Organic SwaddleMe with velcro, which is just a really good product and worked for us perfectly. We try to use this once since we tend to like this company's products, but it was terrible. The snaps do not let you adjust the swaddle to fit your baby so it is either too loose or too tight and does not actually work well as a swaddle. Do not waste your money on this (or anything with snaps really) as it cannot be adjusted.

#### review7

I've used the sizes small and medium, from the time my son grew out of newborn size disposables to now, age 15 months. I have not tried any other type of cloth diaper. I use some disposables as well (at night, for example).WHAT I LIKE:-They work well. No leaks, blowouts, etc. Very absorbent and they catch all the poo. The poo seems not to spread as much because of the fleece. My baby was exclusively breastfed the first 6 months of using these diapers. Now that he eats regular food, I use a flushable diaper liner to help catch the poo. It bunches in the diaper (as it would in any diaper) but still does a decent job.-Soft against my baby's bottom.-Easy to maintain and clean. Quick rinse cycle followed by hot wash, tumble dry or line dry to save energy. It only takes a couple minutes to restuff the diapers once they are dry.-Easy to change the diaper. They seem less messy to me, because more of the poop sticks to the diaper instead of being spread all over your baby. Super easy to pull out the insert and drop the two pieces in the pail. The snaps are easy to use, and very secure.-Less waste, less buying. I hate the mounds of garbage produced with disposables. I love that I never have to run out to the store because I'm low on diapers. I can just run a wash. And after a few months of use, these pay for themselves.WHAT I DON'T LIKE:-The fit. Plan to put your baby in clothes that are one size up from what s/he would wear with disposables, at least when the baby is small. The first few months this diaper's crotch came practically to my son's knees. Now that he's a toddler it's not as much of an issue, but he still has a "bubble butt." The liner isn't all that bulky, but the pocket is puffy. This is mostly an aesthetic problem, but it can be a practical problem too if you ever want to switch to a disposable while you're out or for a nap - the clothes that you had on your child won't fit. You almost need two options for bottoms each day if you switch back and forth with disposables.-The opening where you stuff the insert in does not have a flap to cover it. If you don't put the diaper on properly (check to make sure the insert is fully inside the pocket), you will have wicking onto clothes. This could be a problem if you have other caregivers change the diaper who don't know how to do

it correctly. Other pocket diapers have a flap to cover the opening; however I wonder if that makes it messier to pull out the insert after a poop?BOTTOM LINE: Gets the job done and very user-friendly, but the puffiness and bulkiness can be a problem. I'm going to purchase some other brands for comparison, to try to find one that works as well but with a trimmer fit. I wish I had done that before stocking up on Fuzzibunz. BTW I work with 12 diapers for my toddler and wash every other day, although I use a disposable at night.

#### review8

My son was very unhappy with the plastic Graco highchair that we first tried. It blocked his view and was overly confining both of which agitated him. He is very happy in the Tripp Trap and I know it will last for years. It is also very attractive. On the downside, I was not at all impressed (nor was my son) with the baby seat and had something made out of leather instead. Also, I wish there was an affordable option for a tray for the early finger food days. The concept of eating right off of a placemat on the table is great and will work when my son is a bit bigger, but my table is too high for him currently even with the seat at the highest notch and a tray would be much more practical than buying a whole new dining table!

#### review9

I love my carseat. I travel between Hawaii and California every two weeks and we take this with us. It is big...but I don't mind because it is such a solid seat! My daughter likes that it sits high up and she can see out the window. It is also easy to move between cars with the different types of attachments. The one flaw is that it is REALLY hard to clean. Peeling all the pieces off, washing, air drying and then muscling them back on is an all day affair. I still love it. My husband is a firefighter and we both think that this seat is ultra safe

#### review10

These bottles serve great for their purpose, and they do fit into the pump, but the bottoms of the bottles are too wide to fit into the BASE holder of the pump. Seems odd that they would make them too not fit their own product. But other than that these work just fine as storage bottles.

**Cluster 1 Conclusion: on analyzing reviews I see that reviews are mostly related to baby products. Most reviews have bottles, diapers, pump, toddler, pants as keywords.**

```
In [130]: ## Cluster 2 Review types
reviews_c2 = cluster_tf_idf_df_final.index[cluster_tf_idf_df_final[
"Cluster Number"] == 2].tolist()
indices_2 = random.sample(reviews_c2, 10)
df_2 = sample_data_amazon.iloc[indices_2, -2]
for i in range(df_2.shape[0]):
    print("review" + str(i+1))
    print(df_2.iloc[i,])
    print("\n")
```

review1

I got this with subscription box (Citrus Lane) and it is amazing. My LO loves it! It is perfect in her carseat clipped on or just on it's own. It's also gender neutral.

review2

My daughter has developed a flat spot on her head, and this does seem to be helping. When she lays on the floor her head is propped up well. The material is super soft, it seems to be made really well and looks just like the photo listed. However, If you're buying this for a carseat, I would recommend something else. This DOES NOT fit in our Graco Snuggly carseat. I still love the product so far, it seems to really be helping.

review3

Since the first time my daughter noticed the outlets she has been obsessed with them. That's why I got these ones for her room and the living room, where she spends most of her time, and got the simpler ones for the rest of the house. They are hard enough that she can't take them out, but not too hard that I can't remove them with one hand.

review4

My mother bought this for me and honestly, I had no intent on using it. My mother in law got it out when we were trying to figure out how to put my infant down without constant holding (because of suffocation etc). She slept wherever this darn thing went. We put it in the rocking swing and the bouncer AND the stroller. All of which were just not quite plush enough for a newborn and didn't keep her snuggled in enough to keep her head straight, so this little thing would do it. Someone was always up with her, but this was nice so she would actually go down. It was a lot like the infant insert in her car seat.. making everything suddenly infant sized. Secondly.. after a few poops and a spit up or two we noticed it held up well in the wash. She's large enough now at 3 months that we really only keep it attached to the stroller. Loved this silly little thing. Thanks mom!

review5

I ordered this rattle for my granddgt who is 6 mo; she loved it. It is soft, cute & the taggies are an added bonus.

#### review6

Everything the other reviewers have said is true. What else can I add? This is a great toy. My two and a half year old daughter is not afraid of dark, but is just mesmerized by the stars. And, during the day, she carries the ladybug with her to play. It is true it needs to be placed in the middle of a room to have the full star map, but my daughter keeps it in her bed and does not mind about this. And she usually falls asleep before the stars fade (45 minutes). We also have the sound sheep, which is another very helpful and soothing aid to help the baby sleep. I believe the company that manufactures these toys knows its stuff.

#### review7

I bought one for my God child who is 6mths old and she loves it. I couldn't be happier;

#### review8

We used this "night light" in our room when our infant was still sleeping in there near us at night. She got used to seeing the lights as she went to sleep, so when we transitioned her to her crib in the nursery a few months after she was born, the lights were familiar. We also took the turtle with us when we traveled, so she would have something familiar there too. Worked great! We love the soft light, and assume it will be something our daughter keeps for much longer than the rest of her "baby" toys.

#### review9

I bought this for my daughter's new baby. She reports back to me that she likes it and their baby loves his baths in it now that he is 5 months old.

#### review10

This is a pretty simple toy but my 5 month old daughter loves it. She was always trying to reach for my phone, and my phone cover is almost the same color as this toy. She likes to chew on the ring, open and close the phone, and press the buttons. I like that the noises are not too loud (aka not too annoying for me). It also says hello and goodbye in English and Spanish. It is one of the few toys she likes enough to roll over for when she was learning. For the price you can't beat it!

**Cluster 2 conclusion: on analyzing reviews I see that reviews are mostly related to lights, and baby products again but where baby is mostly a girl. Most reviews have daughter, rattle, granddaughter, night lights, as keywords.**

```
In [132]: ## Cluster 3 Review types
reviews_c3 = cluster_tf_idf_df_final.index[cluster_tf_idf_df_final[
"Cluster Number"] == 3].tolist()
indices_3= random.sample(reviews_c3, 10)
df_3 = sample_data_amazon.iloc[indices_3, -2]
for i in range(df_3.shape[0]):
    print("review" + str(i+1))
    print(df_3.iloc[i,])
    print("\n")
```

review1

These teethers have been well-liked by my baby and he has used them plenty, even now, at almost one year old, he still chews on them. A good thing about these teethers is that they float in the water, so one can take them to bath.

review2

I love how pacifiers no longer get stolen by gnomes anymore thanks to Skipit, the guard dog. He is the defender of the paci. No gnome even dares to approach my son with Skipit around. Because of Skipit's loyalty and protection, my son sleeps better at night knowing that the paci-thieving gnomes won't come around to take his paci away. THANK YOU, BUNNIES BY THE BAY FOR SKIPIT!

review3

FTM here, when we brought our son home we quickly realized that we can't just put him in his crib and leave him there until he cried or etc. We used this to keep him at hand during the day in the living room. He loved it, the incline is just right, its easy to clean, simple to assemble and cost effective. It makes the frequent feedings and diaper changes of a newborn so much easier. I've recently put it away as my son is now sitting and rolling and has simple outgrown it. It was also a great help when he had a cold and stuffy nose, helped him sleep better and let everything drain out.

review4

I have a 2 month old and he can hold his head up, but when he's asleep his head plops right down. I imagine for a baby that doesn't hurt, but when we would take him out of his car seat, there would be marks from the straps on his cheeks. These are perfect and super soft. They even help with keeping his head more upright while he's asleep.

## review5

LOVE LOVE LOVE!!! The turtle is wonderful. The wave effects and ocean sounds are very soothing. The automatic timer is great, although I wish it had options. It has one set time. We are, usually, able to put our one month down while still awake and he 'puts himself to sleep' when we have this on. He is currently sleeping in our room, and my husband and I find it very relaxing as well. When our son moves into his nursery, we are planning to buy a second for ourselves. I am not one to buy 'non-practical' baby items, this was one of the few things I decided to splurge on and I am very glad I did.

## review6

Our little boy falls asleep much more quickly and sleeps a TON more soundly when he is swaddled. We have found the fleece version to be more secure than the cotton ones, but a little too hot during the summer months. Pros of the Kiddopotamus:-much quicker than blankets-more secure than any blanket we've tried (the best blanket we found, if you're interested, was the stretchy thermal Gerber one)-held our little man's arms tight for the first 6 to 8 weeks Cons:-our little guy is a little older he is able to get his hands up by his face. We thought this might be a good thing, as he likes to suck on his fingers, but we've found that when we reswaddle him with his arms by his sides he falls asleep quickly.

## review7

Great stool for kids to learn how to wash hand, my son use it in front of his indoor trampoline and he loves it

## review8

While this seems safe (no accidents thank goodness) my son seems to have a hard time because of the sides being so constricting. My husband's car seat is a little more open around the head area. Once I turned him around he is a little happier. Safety is the number one concern and that's why I choose it!

## review9

I bought this for my 8-month old son because he's an incredibly messy eater and practically needs a clothes-change after every meal. I found this smock to be cumbersome for a child this young. It's a little too bulky and too much work when you have a hungry baby on your hands. This will be great to use as an art smock when he gets older.

## review10

Purchased for traveling by myself with baby and needed an easy to use carrier that would help me through the airports. So glad I went

t with this product. It was so easy to use and my 3 month old loved it. He could enjoy time out of his stroller while I remained hands free. He likes it so much that he often falls asleep in it. I keep it in the car and take it with me everywhere.

**Cluster 3 conclusion: on analyzing reviews I see that reviews are mostly related to small products like batteries and baby products again but where baby is mostly a "boy". Most reviews have son, teething, month old, child as keywords.**

```
In [129]: ## Cluster 4 Review types
reviews_c4 = cluster_tf_idf_df_final.index[cluster_tf_idf_df_final[
"Cluster Number"] == 4].tolist()
indices_4 = random.sample(reviews_c4, 10)
df_4 = sample_data_amazon.iloc[indices_4, -2]
for i in range(df_4.shape[0]):
    print("review" + str(i+1))
    print(df_4.iloc[i,])
    print("\n")
```

review1

This cleansing cream from La Roche-Posay is:

- Thicker than usual gel cleansers
  - Has some fine particulates that act as exfoliants
  - Has something in it that kind of gives your face a little shine.
- This might be what they are referring to as the "brightening"
- Feels pretty neutral on your skin overall

Good product choice!

review2

Good skin care.

review3

Love this! Most tinted lip protectors have a flat color, this is a bit of a frosted shade. Perfect. It feels smooth and soft and keeps my lips hydrated and protected.

review4

I have used the Jane Iredale PurePressed powder for years. Love it and won't use anything different. It doesn't cause my skin to break out. I was excited to find out that I can purchase through Amazon since it is significantly less expensive than paying retail at a Salon. You are able to change the level of coverage you want by how you apply the powder. I don't wear foundation with this powder.



## review5

I love Elizabeth Arden products (particularly her Red Door perfume). I decided to try Visible Difference Special Body Care Lotion. It is lightly scented and not overwhelming at all. It is light and only a dash of lotion can be applied over legs and body. Once applied it gets absorbed by the skin very quickly. Beautiful light scent lingers for a long time. I apply my regular perfume before going to work and it does not interfere with the lotion. Skin is very soft after lotion application.

I absolutely love this body lotion and will use it in the future. Particularly when going to the office or when going out and for special occasions. I strongly recommend it. It is suitable for all generations.

## review6

This face serum works great. I use it for my smile wrinkles next to my eyes. It works by increasing the water content in your superficial layers of your skin, improving the appearance of fine lines and wrinkles. It moisturizes your skin and makes it look healthy. It sort of puffs up your skin and then the wrinkles are less pronounced.

## review7

Ok, first of all..have used less than a month so longer range results I couldn't tell you. You put this on then rub any excess in. This is not the "mask" that you apply then wash off. It does cool your face, I'm thinking a little menthol somewhere in the ingredients? After 1 month skin should feel more supple, refreshed, renewed. It makes my skin feel soft and smooth, hasn't broken out and seems to help calm the face flushes I get. Says it has B3 added to it(?) Allergy/sensitive skin tested, no parabens. I can find no symbols showing no animal testing. Ingredients beside the famous Vichy volcanic thermal water and glycerin: denatured alcohol, many glycols, castor oil, carbomer..perfume too. I'm assuming that is the green tea, jasmine water, and bamboo light fragrance you can smell. Only to be used 1-3 times a week. I'm going to keep using this is a good size jar for the money

## review8

I like the way it makes your skin look, which is natural and not caked on!

## review9

We both have been using the Meg 21 Cleanser prior to sleep and it's been amazing. The cleanser is easy on and easy off. Leaves no residue and our skin feels silky smooth. There is no lasting fragrance

and the overall verdict is that its a hit.

review10

This thick creamy eye fix is working. If it comes in close contact with my eye I experience some tearing which is the only negative result I have experienced. There is no discernable fragrance. The instructions provide a photo of the amount to apply which is very helpful. The photos attached to my review were taken 3 weeks apart. I have used many eye products from drug store to premier brands and this provided the best hydration and wrinkle reducer.

Update:I have reached the end of the tube and an oily substance gushes out before any cream that is still in there. Feels like there is product I can't utilize.

**Cluster 4 conclusion: on analyzing reviews I see that reviews are mostly related to skin care products. Most reviews have skin, lotions, fragrance, hydration, skin-feels, lips as keywords.**

**Conclusion: the algorithm is picking up words and their frequency of occurring in a particular category to cluster them. It does a pretty good job but I think if I increase the number of clusters, I can better a better hang of different types of products clustered into same clusters.**

**Playing with different values of k.**

**Note: First generalizing the function for any random k value.**

**Function for k means clustering.**

```

In [59]: def k_means_clustering(k, cluster_tf_idf_df_NEW):

    # choosing clusters for our k means clustering. Picking first 4
    numbers as the cluster centers.
    clusterCenters_df = cluster_tf_idf_df_NEW[0:k]
    clusterCenters_df

    # Assigning all of the reviews a cluster number - say 1 for ini
    tial stage.
    cluster_tf_idf_df_NEW["Cluster Number"] = 1
    cluster_tf_idf_df_NEW

    cluster_tf_idf_df_NEW["Review Norm Value"] = np.linalg.norm(clu
ster_tf_idf_df_NEW.iloc[:, :-1], axis = 1)

    clusterCenters_df["Review Norm Value"] = np.linalg.norm(cluster
Centers_df.iloc[:, :-1], axis = 1)

    # cosine similarity with the all cluster centers.
    # cosine similarity = (A.B) / (||A|| . ||B||) = (dot product) /
    (product of norms of the two vectors)
    for j in range(k):
        dot_products = np.dot(tf_idf_df.iloc[:, :], clusterCenters_d
f.iloc[j, :-1])
        norm_products = np.multiply(cluster_tf_idf_df_NEW["Review N
orm Value"], clusterCenters_df["Review Norm Value"][j])
        cluster_tf_idf_df_NEW[str("cosine_similarity_Cluster" + str
(j+1))] = np.divide(dot_products, norm_products)

    cluster_tf_idf_df_NEW_temp = cluster_tf_idf_df_NEW.iloc[:, -k:]
    new_list = list(cluster_tf_idf_df_NEW_temp.idxmin(axis = 1))
    for i in range(len(new_list)):
        cluster_tf_idf_df_NEW.loc[i, ['Cluster Number']] = int(new_
list[i].strip("cosine_similarity_Cluster"))

    new_cluster_mean_df = cluster_tf_idf_df_NEW.iloc[:, -(k+1)].gro
upby('Cluster Number').mean()
    new_cluster_mean_df = new_cluster_mean_df.reset_index()
    new_cluster_mean_df["Review Norm Value"] = np.linalg.norm(new_c
luster_mean_df.iloc[:, :], axis = 1)

    return cluster_tf_idf_df_NEW, new_cluster_mean_df

```

**Function for repeating the algorithm N times.**

```

In [60]: def reclustering_repetitions(N,k,cluster_tf_idf_df_NEW, new_cluster
_mean_df):
    for _ in range(N):
        # cosine similarity with the first cluster center.
        # cosine similarity = (A.B) / (||A||. ||B||) = (dot
product) / (product of norms of the two vectors)
        for j in range(k):
            dot_products = np.dot(cluster_tf_idf_df_NEW.iloc[:,
:-(k+2)], new_cluster_mean_df.iloc[j,1:-1])
            norm_products = np.multiply(cluster_tf_idf_df_NEW["
Review Norm Value"], new_cluster_mean_df["Review Norm Value"][j])
            cluster_tf_idf_df_NEW["cosine_similarity_Cluster1"]
= np.divide(dot_products, norm_products)

        # assigning each review to a cluster by comparing cosin
e similarity.
        cluster_tf_idf_df_NEW_temp = cluster_tf_idf_df_NEW.iloc
[:, -k:]
        new_list = list(cluster_tf_idf_df_NEW_temp.idxmin(axis
= 1))
        for i in range(len(new_list)):
            cluster_tf_idf_df_NEW.loc[i, ['Cluster Number']] =
int(new_list[i].strip("cosine_similarity_Cluster"))

        # computing mean of all reviews that belong to each clu
ster.
        new_cluster_mean_df = cluster_tf_idf_df_NEW.iloc[:, :-(k
+1)].groupby('Cluster Number').mean()
        new_cluster_mean_df = new_cluster_mean_df.reset_index()
        new_cluster_mean_df["Review Norm Value"] = np.linalg.no
rm(new_cluster_mean_df.iloc[:, :], axis = 1)

    return cluster_tf_idf_df_NEW, new_cluster_mean_df

```

**Trying the algorithm for k = 15 and different values of N until clusters are same.**

```
In [61]: cluster_tf_idf_df_NEW = tf_idf_df.copy()
# clustering into k clusters.
k = 15
cluster_tf_idf_df_NEW, new_cluster_mean_df = k_means_clustering(k,
cluster_tf_idf_df_NEW)

# running the algorithm N=1 times.
N = 1
cluster_tf_idf_df_NEW_input = cluster_tf_idf_df_NEW
new_cluster_mean_df_input = new_cluster_mean_df
cluster_tf_idf_df_NEW_final, new_cluster_mean_df_final = reclustering_repetitions(N, k, cluster_tf_idf_df_NEW_input, new_cluster_mean_df_input)
cluster_tf_idf_df_NEW_final["Cluster Number"].value_counts()
```

/Users/aniruddh/opt/anaconda3/lib/python3.7/site-packages/ipykernel\_launcher.py:13: SettingWithCopyWarning:  
A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

See the caveats in the documentation: [http://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](http://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)  
del sys.path[0]

```
Out[61]: 6      5176
15     3636
7      1845
2      1599
11     997
8       747
14     491
3       192
5        96
4        90
10       58
13       53
9        15
1         3
12        2
Name: Cluster Number, dtype: int64
```

```
In [63]: cluster_tf_idf_df_NEW = tf_idf_df.copy()
# clustering into k clusters.
k = 15
cluster_tf_idf_df_NEW, new_cluster_mean_df = k_means_clustering(k,
cluster_tf_idf_df_NEW)

# running the algorithm N=30 times.
N = 5
cluster_tf_idf_df_NEW_input = cluster_tf_idf_df_NEW
new_cluster_mean_df_input = new_cluster_mean_df
cluster_tf_idf_df_NEW_final, new_cluster_mean_df_final = reclusteri
ng_repetitions(N,k,cluster_tf_idf_df_NEW_input, new_cluster_mean_df
_input)
cluster_tf_idf_df_NEW_final["Cluster Number"].value_counts()
```

/Users/aniruddh/opt/anaconda3/lib/python3.7/site-packages/ipykerne  
l\_launcher.py:13: SettingWithCopyWarning:  
A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

See the caveats in the documentation: [http://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](http://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)  
del sys.path[0]

```
Out[63]: 6      5176
15     3636
7      1845
2      1599
11     997
8       747
14     491
3       192
5        96
4        90
10     58
13     53
9       15
1        3
12      2
Name: Cluster Number, dtype: int64
```

```
In [81]: cluster_tf_idf_df_NEW = tf_idf_df.copy()
# clustering into k clusters.
k = 15
cluster_tf_idf_df_NEW, new_cluster_mean_df = k_means_clustering(k,
cluster_tf_idf_df_NEW)

# running the algorithm N=30 times.
N = 30
cluster_tf_idf_df_NEW_input = cluster_tf_idf_df_NEW
new_cluster_mean_df_input = new_cluster_mean_df
cluster_tf_idf_df_NEW_final, new_cluster_mean_df_final = reclusteri
ng_repetitions(N,k,cluster_tf_idf_df_NEW_input, new_cluster_mean_df
_input)
cluster_tf_idf_df_NEW_final["Cluster Number"].value_counts()
```

/Users/aniruddh/opt/anaconda3/lib/python3.7/site-packages/ipykerne  
l\_launcher.py:13: SettingWithCopyWarning:  
A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

See the caveats in the documentation: [http://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](http://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)  
del sys.path[0]

```
Out[81]: 6      5176
15     3636
7      1845
2      1599
11     997
8       747
14     491
3       192
5        96
4        90
10       58
13       53
9        15
1         3
12        2
Name: Cluster Number, dtype: int64
```

```
In [86]: ## Cluster Review types
for i in range(k):
    print("CLUSTER NUMBER: " + str(i+1))
    reviews = cluster_tf_idf_df_NEW_final.index[cluster_tf_idf_df_NEW_final["Cluster Number"] == i+1].tolist()
    if i == 0 or i == 11:
        indices = random.sample(reviews, 2)
    else:
        indices = random.sample(reviews, 10)
    df = sample_data_amazon.iloc[indices, -2]
    for i in range(df.shape[0]):
        print("Review" + str(i+1))
        print(df.iloc[i,])
        print("\n")
    print("\n\n")
```

CLUSTER NUMBER: 1

Review1

Nah

Review2

Perfecto

CLUSTER NUMBER: 2

Review1

I needed an inexpensive music stand for my guitar lessons. This worked well for that.

Review2

My son didn't like these at first, but now he drinks from them fine. They are good for transitioning from the bottle. I am hoping to have an easier time with my smaller one than I did with his older brother.

Review3

My twins love these toys - I bought them recently - and they love playing with them in the bathtub!

Review4

I was excited for this, and it will definitely get the job done, but I like my plain old babies more than brand new ones better.

Review5

The key with these is not to throw them out when using them unless



they become soiled. If you are out and about, changing your child's diaper and no mishaps happen in the process these can be folded up and used again. Only the plastic back touches outer surfaces.. the patterned part is what touches your baby. I love these! You can definitely get your money's worth provided you do not throw them away every time you use them. They are sturdy enough to use again and again. Only throw them away when they get soiled!!

#### Review6

These bibs are made of an extremely light nylon style material similar to a rain jacket. The bibs are long, wide on the shoulders, and have a large 3-1/2" deep pocket to catch a good portion of the debris that a baby drops while eating. The design works pretty well even when it's fastened at its smallest - the pocket still gapes slightly forward in order to catch the falling food. That being said you probably could use this on babies a little less than 6 months (the stated size). The soft part of the velcro is a strip just short of 3" long so there is a lot of room for growth here. The velcro is a tad loud but not a deal breaker by any means. At least the soft part is towards the baby's skin/clothing so you don't have to worry about discomfort and damage from the rough catches/loop portion. So far they are easy to clean (flipping the pocket inside out) and wash well with the laundry.

#### Review7

I read a ton of reviews for different potties, debated lots... chose this one and am completely satisfied. So glad I didn't pay the higher price for one of the others. This one works great. It's stable, the handles are easy to grip for baby (18-mo.), the hole is the right size (not too big, not too small), the pee shield as functional as any of them can be! I'd totally recommend it.

#### Review8

I have had this pump for about 2 months. The pump works great & definitely better than the Medela pump I have (step below the pump in style). The flanges that come with this are bigger than the standard Medela ones, 27mm & I notice that I get more milk when I use those as opposed to the 24mm breastshields. Love the built in battery, I can pump anywhere regardless of the outlet location. You would not believe how handy that is. I love the 3 year warranty, 3 week money back guaranty, and that this pump can be used by more than one user. The one thing that I don't like is the CARE button, where you can record your baby's cry. I love the idea, but the design of the button is all wrong. It is easily pressed while in the bag, and recorded over. So instead of it playing my babies cry, it plays me talking to someone, or the noise of the bag as I walk along. Luckily I don't really need the button for let down, but if this is one of the main reasons you want this pump, rethink. Apparently the company is aware & keeping that in mind for future incarnations. I would have given this pump a 5 star rating, except for the

issue with the CARE button.

#### Review9

These breast shields can be used interchangeably with all my Medela pumping parts. I have a set just like this made by Medela and they are just as good! MUCH CHEAPER! The yellow part with the membrane is shaped slightly different, but they still serve the same purpose and will fit Medela flanges as well. I wish I had more!

#### Review10

I purchased the clarsonic Mia a few months ago after trying almost everything under the sun and moon to clear up my acne. I am 35 and would still have regular (nonhormonal) breakouts...quite embarrassing and somewhat depressing as well!

I bought the clarsonic after trying a knock off brand with no success...the other brand which was supposedly designed specifically for acne actually caused me to break out worse!

I used the cleanser and brush that came with the system to start and get an idea of whether it would be worthwhile to keep going. To my surprise the cleanser that came with the Mia actually did start clearing up my skin within a matter of weeks!

I still had a few stubborn spots so I decided to try the acne cleanser and brush head and I am SO happy that I did! I am on my second full bottle of cleanser and have repurchased acne brush heads-I am now a believer that both the cleanser and brush head can make a significant difference in the success of clearer skin.

I would like to note that no skin condition disappears overnight and that when you first start using any skincare system there may be problems that come to the surface--these are problems that should be worked through to be taken care of instead of hidden--when skin problems are hidden in my experience all that happens is the problem gets worse!

I highly recommend this to anyone looking to clear up their skin. If you are unsure what might work best for your skin go into a beauty store that sells them and ask for their opinion on what might be the best products!

I would post a picture of my skin but since I cannot find any before pictures it wouldn't show the vast difference :)

#### CLUSTER NUMBER: 3

##### Review1

Like sex for your eyes! It feels so amazing! I have dryer under eyes and after a night with this cream I'll never go to sleep without it!

##### Review2

This crib sheet feels great. My problem with it is that it doesn't have elastic around the edge. Instead it is open flaps and it just looks messy and is easy for the kiddo to pull up.

#### Review3

This was an excellent buy, small, compact and doesn't break the bank. Baby girl sleeps 5 to 6 hours a night in the napper.

#### Review4

fun toy

#### Review5

This is the perfect product for a teething baby! Put some frozen bananas in it for a sure way to calm your teether!

#### Review6

It seems like all the bottle with a tube in it will reduce baby colic, and this is the only bottle I have tried so far. I guess it does it is designed to do, but washing is a hassle.

#### Review7

Wimmer Ferguson Infant Stim Mobile To Go is a perfect combination of hanging circles with painted basic geometric figures in primary colors and their simple mixtures. Those geometric figures form shapes that resemble simplified every day objects, like a house, butterfly, droplets, bee, fish, baby face, web, etc. Simple and strong blue clamp allows to attach it to edges, flats, rods, etc. Everything about the mobile stimulates imagination and inspires to think and play. Its very well made, durable, practical, aesthetic, and - above all - cheerful.

#### Review8

I have very dry hands and just spent 2 weeks in the drying southwest. This hand moisturizer is a life saver. It feels great and defends my hands against cracks and fissures. I've already ordered a back up tube.

I have had great luck with all of the Baxter of California products I have used; this is another winner.

#### Review9

The only problem I had with this pacifier was the color! Since it's clear, it was very hard to find it in the crib during the night with low lights. Nowadays my baby prefers her thumb, so she doesn't accept the pacifier anymore.

## Review10

The clay included softens up well and makes for easy impressions, squirming baby aside. The three-pack allowed us to make ornaments for all the grandparents and aunts and uncles in our family, plus one for ourselves. The circle mold/cutter included is really big (about four inches in diameter), so I thought it would make the ornaments too heavy to hang easily. I just used the top of a water glass instead and that worked well; I found I could get three baby-h and ornaments from each package of clay that way.

## CLUSTER NUMBER: 4

## Review1

This Crabtree & Evelyn hand cream is a very high quality product. It's a luxurious and rich hand cream that's very effective at adding moisture to my dry hands. This is a thick cream and only a small amount is needed with each application. My hands absorb this cream quickly and immediately feel noticeably softer after each use without feeling greasy or sticky. This cream feels similar to L'Occitane dry skin hand cream and seems of equal quality to me. The Crabtree & Evelyn cream does have a moderately strong scent (as does L'Occitane), so for those who don't like fragrance this may not be the best choice. I'm not a huge fragrance fan, but I find the scent interesting and pleasant. This cream contains a long list of ingredients, but I mostly smell a fragrant blend of lemon and herbs. I don't find the scent overwhelming, though any stronger and it would be too much for my taste. For those with nut allergy, macadamia nut oil is the second ingredient listed. The tube and outer packaging are pretty for gifting, and this cream is made in the USA. I really enjoy this Crabtree & Evelyn cream. It's an effective luxury hand cream that I'm likely to purchase in the future and highly recommend, except to those people who prefer unscented creams.

## Review2

I have the Babies R Us brand contoured changing pad, I was concerned it wouldn't fit since it doesn't specifically state that it can. I purchased the frog and giraffe prints. The giraffe print fits slightly more snug, so it doesn't fall into the contour when not in use, but it doesn't pop off when I put my 18lb baby girl on it either. The frog print fits perfectly and falls into the contour when not in use. So if you're going more for looks, I guess the frog print is a better choice. I'm not sure why the print matters with the size, maybe I got a faulty one. It still does the job it was manufactured to do, so it's fine with me :-)

## Review3

Perfect red for me.

## Review4

I use this for recording guitars as well as live vocals. I've knocked this microphone around a decent amount, and it is plenty rugged. I couldn't be happier with it.

## Review5

Great product especially for the price! They stick really well and look great. They cut around each shape nicely so you don't have to worry about your paint color and a weird white outline. These are awesome next to the changing table.

## Review6

The these strings are fantastic. The sound is deep and heavy, which is exactly what I was looking for. Makes the bass sound pretty bad\$\$\$. I cranked up the bass amplifier after putting on these strings and the sound is pure, powerful, and blew me away. Well worth the money.

## Review7

Nice color, applied pretty evenly.

## Review8

Knowing nothing about chemistry I cannot vouch for the efficacy of the components of this cream but after a week of use my skin does look more hydrated and it feels soft. I live in a climate with temperature extremes made worse because there I little humidity.

These factors take a visible toll so regular use of face creams is an essential part of my routine. And although I don't expect aging to stop or retreat, I do need products I use to provide solid performance to protect my skin from what can feel like an environmental assault.

Directions are to use the thick cream in the morning and evening. So with a cotton swab I apply a bit more than a pea-size dollop to my face and an equivalent amount on my neck. Based on that usage after a week I estimate the 1.7 ounce jar should last four to six weeks but this will vary.

Some products seem to sit on the surface of the skin leaving a greasy look but this moisturizer is quickly absorbed without leaving a shiny film. I have experienced no sensitivities, irritations or break-outs from the cream and so far I am pleased with the results.

## Review9

i got this stand and it simply works and look awesome, exactly what i was looking for, and for the price i can not get a better deal .totally satisfied!

Review10  
nice

#### CLUSTER NUMBER: 5

##### Review1

I have a love/hate relationship with this pump. I got it while on vacation after a massive milk spill in my PISA caused a disgusting mold growth on the canvas bag. The nice thing about it is that you can strap on a hands-free bra, clip the pump onto your belt, and do practically anything while pumping. I even cooked dinner wearing this thing. The weakness of this pump is the poor letdown. The 2 minute letdown phase is practically useless. The remaining pump time is OK, but also tugs on the nipples a little harder than the PISA. So those mothers with sensitive nipples should steer clear of this pump. It takes a bit longer to empty than the PISA. For me, it was an extra 5 minutes to a 20 minute session. I would recommend this pump as a decent secondary/back-up pump for someone with an established supply that wants to be able to roam around while pumping or plans to travel. It was fantastic mid-flight.

##### Review2

This is actually my first time purchasing an Essie polish and I couldn't be happier with it! Great, non-streaky formula, applies evenly and gives your natural nails a perfect, even base color. Great for a basic french mani or layered under more bold colors to help them pop. The finish was nice and shiny even without a topcoat and I got about 8 days out of it with minor tip wear. Definitely a perfect sheer pink. Will absolutely be purchasing more polishes from Essie in the very near future!

##### Review3

This was not at all worth the buy. It had absolutely no suction! Honestly, I have been unable to find a good syringe since we left the hospital.

##### Review4

Very nice

##### Review5

This product came on time and was in perfect condition. This color

is great and can be worn any time of the year!

#### Review6

I love this nail polish color so much!! The color in the bottle doesn't do it justice. It's gorgeous on the nails!!

#### Review7

What an terrific crib sheet! The name is "In Bloom", but what I received was tiny tiny pink and navy blue mini stars on a white background --ADORABLE and extremely soft. I couldn't be happier.

#### Review8

This is a fantastic seat. We had a space saver high chair that converted to a booster seat, but the arms/handles made it so that the chair couldn't really go under the table and be used without the tray. So, now that my daughter wants to sit at the table "no tray!" we needed something else. It is comfortable and does the job. Note: we have cloth seats so it does not suction but she is stable and not wiggly and it is fine. Love it.

#### Review9

When I read the description before choosing this product, it sounded really nice. My experience was "not so nice". Upon first opening, the smell was kind of unpleasant. I stirred it up a bit then tried it on my left wrist. I broke it back in January and have a lot of tenderness and nerve pain. I was hoping this cream might help. After several applications, I couldn't feel any difference and the cream leaves a greasy feel on my skin.

#### Review10

This is actually my first time purchasing an Essie polish and I couldn't be happier with it! Great, non-streaky formula, applies evenly and gives your natural nails a perfect, even base color. Great for a basic french mani or layered under more bold colors to help them pop. The finish was nice and shiny even without a topcoat and I got about 8 days out of it with minor tip wear. Definitely a perfect sheer pink. Will absolutely be purchasing more polishes from Essie in the very near future!

#### CLUSTER NUMBER: 6

##### Review1

These are spendy, but so worth it. They do not fall off and are very soft and well made. I recommend any new parent who is terrified

ed of clipping nails on a newborn to buy these!

#### Review2

Great both as an on the go toy and for attaching toys to the activity mat, to the baby crib, or to the baby carrier or stroller. Our 6 month son still likes the links, now they serve also as teething toys :-)

#### Review3

This is such a sweet little lamb that makes soothing sounds to comfort infants. It's every bit as cute and cuddly as the picture.

#### Review4

Wish I had known about these awesome bags when my son was new born . I cringe when I think of how many ziplock bags and other plastic bags I used carting soiled clothes home in! This is such a great idea whether you cloth diaper or not. Now that my son is a bit older, his clothes aren't ruined quite as often, so we use this to pack his wet bathing suit home. On the rare occasion that he does mess up his clothes, it's so easy to pack them in this bag and toss the bag into the diaper bag. Can see using this often during the potty training phase as well.

#### Review5

Well, I'm washing this for the last time and will be returning this after 2 months of use. First month, no leaks. Second month leaks all the time. My wash cycle is wash warm, hot, and line dry the pail and diapers. I would not recommend this to anyone, but I bought this based upon the great reviews it's received. My diaper pail is always wet and stinky because of this liner and I use the dry pail method but just spray poo off with diaper sprayer, so that's where the wetness is from. Bought a different liner, hope I have a dry pail now.

#### Review6

We're using those soothie pacifiers, so not all pacifier-clips work with them (they have a small hole you need to thread the clip through). This type is great! Strong clip. We've been using them for a couple months now and they've held up. Quality!

#### Review7

Not much to say about a guitar strap... except I had planned to use it on a Simga acoustic without a pin at the neck. I ended up using the strap on my Strat for the acoustic and this one is on the Strat. This one doesn't come with a wrap or tie for the nut so, it is for use with a guitar with a pin at both sides of the body. If you need to secure one end at the headstock, this is not an option



. It is comfortable though.

#### Review8

I had seen a few people using these bags and wanted to try one out for myself. This bag will easily hold a sandwich, even with the larger size bread. It has a smooth interior lining, not just the outer shell. I've also used it for things like baby carrots and it did fine with those, too. It is not air or water-tight. When zippered, you can squeeze out air and if there's liquid inside, it will drip out of the corners or zipper. If filled with liquid and squeezed, it can come out of the sides of the bag, too. So damp foods like veggies are ok, but don't expect to be a complete replacement if you need something that's water-tight or air-tight. It's dishwasher safe, and when I ran it through ours it did fine on the top rack, although it flopped over during the cycle and still had some liquid in it. It survived the drying cycle without incident.

#### Review9

I fell in love with this little rinser because our nursery was beach themed. At first, we just used a small squirt bottle for baby when she started having full immersion baths. But as she grew, we were having to refill the bottle just to rinse her off. So we finally got this off our registry because it was bigger than the squirt bottle and cuter than a plain cup. It was the perfect size when it arrived, but all the water rushed out the first time we poured it over her. There was no good way to see how close the water level was to the lip edge in order to control a slower pour. Even after we figured out how to control the speed of the pour, the rounded pelican mouth prevents controlling the volume of water poured. If it had just a slight point, it would be much easier to aim. Since we spent the money on it, we use it to rinse her back and we'll try to rinse her head with it again once she gets a little older. But so far this is ending up to be a major inconvenience and disappointment. Also, I have NOT noticed any scum/mold like some other reviewers.

#### Review10

Really takes off makeup, especially stubborn gel eyeliner. I have extremely sensitive skin and this doesn't irritate it at all. Not greasy either

#### CLUSTER NUMBER: 7

##### Review1

These work just like described but I needed a larger amount of baby food per feeding. So I just use smaller Tupperware.

#### Review2

My son enjoys the flashing lights and as he gets older I think he'll enjoy the other sound mode where you can add in and remove certain instrument sections of the music. he has figured out at 14 weeks to push the buttons and start the music.

#### Review3

I pump at work 4 times a day and have for 9 months. I couldn't live without this. If I take home to wash and forget to bring it back it ruins my whole day. I don't wear it as a normal bra but put it on just to pump. It takes about 2 seconds. Totally worth it to have time to work or just play on my phone while pumping.

#### Review4

My child would much rather have an actual set of keys any day of the week, to be fair she has turned down pretty much every chewing toy we have given her, they just don't interest her. I think, however, if they made noise like actual keys do she may have liked them better.

#### Review5

These are fun and fabulous! When you start introducing solids, you can put chunks of juicy food in these bags and let your baby go to town. Watermelon is the best! And they're safe - you, as the parent, get to relax for a moment or two while your baby gets to go to town on something tasty and new! The closure is very strong - our kid never got them open by herself. Teething or a super-hot day? I put ice in it. (supervision is required for all baby feeding!) Peaches, bananas, plums, melons, anything squishy and juicy! Keep the camera ready too!

#### Review6

My daughter is in kindergarten and Dr. Seuss is really big right now. She loved the design on this bag and was very excited that she could take this in her lunch at school, rather than a plastic baggie for snacks. The zipper is fluid and nice, when comparing to a Ziploc bag. I would highly recommend this to someone who is looking for a reusable bag for their kid to use in their lunches at school. Other kids have admired it because of the design, and have asked where I got it (I volunteer, and find myself in her cafeteria once a week). My daughter loves it, and I do too. Not to mention it's nice to be able to cut down on our use of clear plastic sandwich bags for everything!

#### Review7

I'm pretty disappointed with this product. It looked like durable plastic and for the price and appearance I thought that it was good

ng to last for years (well, I should say for more than 1 1/2 years ). I did not read the other reviews, I don't think there were that many by the time I got it. Basically the table fell apart and broke in two, the part that broke is near the left side holes where you slide the table in and out of the chair - I guess if I were to call the company (who is the maker of this product anyway?) they would say I didn't use it properly... Who knows, I can only think of one way to use it which is to hold both holes and push it in and out of the chair, this is how I used it anyway... Some might say my review is somewhat unfair since I used it 3 times a day for about 18 months... Well, as I said before, I purchase items that I intended to use for my future children or pass down to friends and family , not something that will last me just shy of 2 years. I expected more... and am not happy.

#### Review8

This was actually the second rock-n-play I bought. I wanted one for my home and one for daycare. This is now my must buy gift for any baby shower I attend. This has been a life saver for me. On the practical side, I felt this was way better than a bassinet for my newborn because I could easily see her while she slept. The bassinet you have to look down into to check on the baby where as this you can just glance over and see her. Also, my daughter was born with Jaundice and we had to wrap her in a biliblanket (which is essentially a plastic light pad) when we first brought her home. No matter where we tried to lay her, even when we held her she cried with that biliblanket around her. We didn't know what to do, she hated the biliblanket. But we finally thought to put her in the rock-n-play and she loved it! She didn't cry at all. I don't know what we would have done without the rock-n-play, it was literally the only way she would tolerate the biliblanket. My child normally sleeps in her crib and has slept through the night since 7 weeks old. But on nights when she was sick with a cold and was congested , she really hated laying flat. The rock-n-play saved the day again! She slept so soundly when she was sick because of being on an incline in the rock-n-play. People say you can elevate the crib mattress but she moves around so much she would end up turned around on a downhill slant in her crib. That is the nice thing about the rock-n-play is that they are snuggled in there so they don't move around so much which helps with a peaceful sleep. The key with the rock-n-plays is to use them in moderation because you don't want your baby to get used to sleeping in the cozy sling instead of the crib. They can only sleep in them until 25 lbs, so at some point they won't be able to sleep in there anymore. I have friends who slept their baby in one every night and had a really hard time breaking their child of the rock-n-play at 4-5 months (or later). It can be a blessing or a curse if you overuse it. I will say my baby sleeps in her crib fine at night and I slept her in the rock-n-play for her naps during the day for the first few months of her life. So as long as the crib is being used at night, I think that helps. I know some people scoff at these and say oh you shouldn't rock your baby or they will get used to it. Or you shouldn't use t

hese instead of a crib.. But really, I am proof it doesn't matter. It is all in routine and incorporating the crib. Whether it is this one or another color or style.. HIGHLY reommend the rock-n-play. I know there are other versions by other companies, but some of them have smaller seats or the incline is slightly different. You can't go wrong, getting the Fisher-Price version. It is the best! Also it has breathable material on the sides so you don't have to worry about suffocation or anything. I liked that this one is particular because it had a vibrating feature on it. But really my daughter didn't seem to care about that. She just likes to be snuggled in there. Can't say enough about how much I love these things!!

#### Review9

We bought a more expensive tub first and returned it, after which my mom bought us this one. Needless to say, it was perfect. We used it when our baby was tiny with the little butt bumper in, and now that he's almost eight months old we use it without the bumper and he just sits up in it (I lay him down to rinse his hair). We'll use it for as long as he fits! The little orange cup is one of his favorite toys, and the price is excellent too.

#### Review10

I don't know what colors the other reviewers are talking about but I bought Green, Shake your \$\$ Maker. The color looks awesome in the bottle, but when you paint it on your nails it is a very translucent green. As one reviewer said, it looks watery. After three coats it still doesn't look right. I always use a clear top coat and that doesn't help it from looking terribly matte as well. Just beware, maybe other shades fare better.

I'm a huge Essie fan and it saddens me because this looks like such a great color and they currently do not offer anything close to it. I have discontinued colors that are similar but don't have the punch that this one has.

#### CLUSTER NUMBER: 8

##### Review1

I have this Moby and a baby bjorn. This is nice because it is small, can be worn in different ways, but is less supportive than the bjorn, which I prefer to wear when I actually have to be walking a ny sort of distance with baby on.

##### Review2

I like the sensation from the misting spray and I don't find the scent as strong as other reviewers have mentioned. It feels great, but I'm not seeing any radiance coming through for me, but my radi

ant days are pretty much history. I do like this a lot and have been using it daily and will continue using it until it's all gone, but at the same time IMHO the product is way overpriced as opposed to what one can make with one's home grown concoctions (shout out to other reviewers for some great tips). I would rate this a solid four stars if not for the current selling price on the Amazon page. It's a nice mister and all, but it's a very expensive mister for a bit of facial please.

#### Review3

This is ok, it's a lil over stuffed and not as conforming as it could be for comfort. Also, the case it comes in is like paper, doesn't soften much with washing. This means you'd have to spend even more money to buy a softer pillow case for this. Kinda a waste of money

#### Review4

This is a cute hamper. It looks great in a blue/white/grey themed nursery. I am happy with the quality and would recommend it.

#### Review5

I have other more expensive light weight strollers but despite everything i keep going back to this. In terms of features, size, weight this is the one i love carrying, It has a single hand close features, lever to lock it, simple to open/close, cup holders and tray come with it. basket also. What more can you ask for. The whole product overall doesnt give an expensive feel, but its great for the price.

#### Review6

I have been looking at the baby bullet for some time but didn't want to spend the money on the system as you have to buy the steamer separately. This product has it all in one.

#### Review7

Super soft and absorbent. They definitely improved over time. When my daughter outgrew them I purchased another brand and really wish I had bought these again instead. The OsoCozy had a much more quality feel and I very seldom had problems with leaking. I resold them for almost what I paid for them!

#### Review8

Great for what we need it for. We travel to visit relatives up north a few times a month in the summer and this has a great range and we can easily throw them into our bag to take with us. I also love the talk back feature.

## Review9

I love this mattress pad. This is very comfortable and makes all the difference in the comfort of the mattress.

## Review10

Getting a second car seat base is a good idea if you like to switch cars with your partner a lot

## CLUSTER NUMBER: 9

## Review1

This foundation is a very good match to my complexion. I am very pale, and the color doesn't stand out. I need a light coverage foundation, and this is light and makes my skin look dewy and glowing. A very nice product, even for older skin.

## Review2

the strings keep the netting off the baby, the mesh is tight enough to keep the bugs out, elastic fit over my carseat easily.

## Review3

My dermatologist recommended this and I haven't been disappointed.

## Review4

Awesome fits my stroller perfect and holds my coffee which is even better

## Review5

a true fuchsia which is really hard to find. Very nice formula coverage is good and the color is WOW!

## Review6

My skin is glowing thanks to this product. Refreshing and cleansing.

## Review7

this is awesome ! my sweet baby loves it,she sleeps like a dream to the music.and when awake she talks and talks to it. i would do it again

## Review8

The fabric is ok, the price is awesome. Baby loves it very much. Lets hear it from my baby. Oo eh woo eh woo woo ehh ehh

#### Review9

This fit my changing pad and i couldn't believe how soft it is. My baby stays quiet (for now) and i think it helps keep him warm during changes.

#### Review10

The Cassis Noir candle is truly a near-black color. The "flammable" warning is pretty funny, considering this is a candle! I think that was the point, though. The smell is quite strong, but pleasant. It would be good for a "mood" smell. It isn't quite describable, but I like it. The packaging was entertaining, and I hope this company does well with its entertaining, long-lasting, pleasant-smelling candles.

#### CLUSTER NUMBER: 10

##### Review1

Snap broke after using it twice. Bag is very pretty and bright though. Just don't expect the snap to last.

##### Review2

love the whole oribe line for color treated hair!!

##### Review3

I've tried everything from premium designer stuff to the value stuff. When it comes down to it, it's really just shaving soap. This stuff is no different. Proraso is a very good shaving product. It doesn't have the variety of scents that other soaps/creams have, but for the price, it's a good low-frills product. The soap is just hard enough to load my brush on it, but soft enough to get a really good load without too much effort. It really whips up a great rich lather that is very slick. It leaves my skin feeling hydrated and it works great with the Nivea aftershave balm. The only gripe I have is the scent. I don't particularly care for the soapy scent. It's not bad, I just wouldn't wear it as a cologne. Of course, smell is completely subjective. Like most all soaps, the scent doesn't linger for more than a few minutes anyway.

Overall, the soap performs great. There's plenty of product in there to last more than a couple of months. It performs as well as TOBS, but 25% less expensive.

## Review4

Beautiful color for the summer!

## Review5

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## Review6

Normal pickguard screws, nothing special here. You do get a nice a mount for the money, though, so this is still a good, if not great, deal. Good to buy for stocking up with, just don't expect anything special because of the Fender name.

## Review7

I'm giving this head support a 3 start because it is nice looking and for the price, if it works, I think it is great. Unfortunately, my daughter would fuss the moment I laid her on this, therefore it never got any use...

## Review8

I have used this pump 1-2 times 5 days a week for 7 months now. About 3 months ago the power cord stopped working which is unfortunate but it is actually more portable with batteries and its not that terrible I just use rechargeable batteries because I go through a lot of them! Other than that its nice and small and portable and I've been very happy with how it works overall.

## Review9

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Overall, the soap performs great. There's plenty of product in there to last more than a couple of months. It performs as well as TOBS, but 25% less expensive.

#### Review10

Good price works so well ad much more sanitary.keeps your mil from spilling and thaws easily. Can use for multiple babies

#### CLUSTER NUMBER: 11

##### Review1

The smell didn't bother me like it did for others. I washed it, air dried it, and gave to my LO. She gnaws on it from time-to-time and likes to squeeze it. It's super easy for her to grip - even before she developed her gripping skills. Also great to tether onto the stroller or carseat for her to play with. Would recommend.

##### Review2

This is very light weight and soft! works great for my Graco Pack n' play. I would recommend and buy again.

##### Review3

Does what it is supposed to do, easy to put on and easier to toss out once finished. This is also super absorbent!

##### Review4

I feel like I tried every product under the sun to get my son to sleep without vomiting or spitting up. This was my last resort as it was on sale at the time. He now sleeps in this as his primary bed (he's only 3 months old) and has for approximately two months now. It's easy to assemble, he loves the vibration, and it's very light and can easily travel with us anywhere. I only wish I had gotten the snuggabunny one because this fabric isn't exactly soft inside. I've been laying a soft blanket under him to resolve that issue and he couldn't be happier.

## Review5

Great. I always buy this brush even though it'd very expensive. I like to take good care of my hair.

## Review6

I expected it to be a bit better for the price. It works good though. Pretty clear picture and clear sound for sure.

## Review7

I have been using the Proraso shave cream with great success. I purchased this "Soap in the Bowl" to support a recent vacation as I did not want to travel with my ceramic bowl. This product provided a very comparable lather and since it was the same ingredients as the cream in the tube, I did not experience any break-outs as a result. This is a must have for travel or for anyone not wanting to mess with the separates.

## Review8

This is super cute and I think the quality is exactly what is needed for a toddler bed. It doesn't look like it would last forever, but it looks like it will last much longer than I need! I love the fact that the top sheet is sewn to the bottom sheet! I've never seen this before and I can't believe I never thought to do this myself! My 22 month old son LOVES to point out the different characters to me as we read books before bed. Anything to distract Mommy into staying longer...Would totally buy this again.

## Review9

I have lupus and acne this is really helping with my irritated skin, used it twice and my skin is much less red and softer without feeling greasy.

## Review10

I like this color it is exactly as pictured. an opaque cool pink. I used two coats for even coverage.

## CLUSTER NUMBER: 12

## Review1

Great product and great price.

## Review2

Great company and great product!

## CLUSTER NUMBER: 13

## Review1

So cute and works well.

## Review2

This guitar strap performs as expected for it's price. Great entry level guitar strap for those just getting started (or for a backup strap).

## Review3

This diaper pail liner is working perfectly in my Safety First diaper pail with my cloth diapers. I wash it every time I wash diapers (about every 4 days) and then line dry it. It's so cute and still in perfect condition.

## Review4

This product works great. Love the weighted plate to keep the wipes in place. Feels and looks very sturdy. Looks very clean as well.

## Review5

This foot controller is wonderful switch between all four channels and the volume pedal wah pedal and built in tuner makes it the complete package for my line 6 amp!!!

## Review6

I love using this for soiled clothing to go between daycare and home. My daycare uses plastic bags and this alternative is great for the environment.

## Review7

Good toy trap for the bath. The suction cup works pretty well, in the 6 months we have had it it has only fallen 3 times so I would say it works very well.

## Review8

We have used this in our son's playard for over a year. He sleeps fine on it and it fits his playard very well.

## Review9

Looks great in our nursery. We were able to spread this over 3 walls

ls and it went up easily - excellent quality.

#### Review10

Great, not just for the price! We've been cloth diapering for about 5 months and it's held up very well, comparable most to our Charlie Banana OS and it doesn't clean up as well, slight staining, but more importantly it absorbs very well, possibly better than Charlie Banana. However, of those in our cloth collection I prefer my insert one's best, Flip and EconoBum (also only 10\$ for a trial and comes with 2 prefolds and 1 cover).

#### CLUSTER NUMBER: 14

##### Review1

Product seems well made, but it's larger than I think makes sense for a teether and the vibration is so strong it scares my pretty brave 8 month old. I wouldn't buy it again, but I'm glad it works well for other people.

##### Review2

I love using a manual pump better than my electronic - for me, the manual is faster and I get way more because I can control the angle/speed so much better. I haven't tried any others, but I love the Medela Harmony. Its easy to use and very quiet.

##### Review3

This is a nice item to slip into a travel bag. It was easy to use and did a good job on my toe nails.

##### Review4

Good toy to grip. It does not make too much sound when shaken but still makes a good noise! Son loves it!

##### Review5

I did a lot of research to finally find an infant spoon made in the USA with soft-bite tip free of toxins.

##### Review6

Great stool for kids to learn how to wash hand, my son use it in front of his indoor trampoline and he loves it

##### Review7

I like this product, as does my son (though he hasn't quite figure

d out how to jump yet). But, it is totally not worth \$170. I fail to see why it is so expensive, and no toy for an infant should cost that much. It only really plays one song. For \$170 it should offer many more features. I bought mine at a consignment store and paid next to nothing. I say it's worth \$75 at most brand new, which is about the price of the Rainforest Jumparoo. It is a great toy, though it is big and rather cumbersome to lug around. However, to us it was a much better option than a door jamb jumper.

#### Review8

I noticed that most of the negative reviews are due to these straps not holding a sippy cup. So I want to start off by saying that I haven't tried securing a sippy cup with these straps, so not sure how it works in that regards. I wanted something to help keep my son's toys inside his carseat during car rides. These buddy-straps work well! If my son accidentally drops his toy outside his carseat, he has learned to pull on the string to bring the toy back. Also it works great when he's in a restaurant highchair. He used to always drive me insane whenever he threw his toys out of the high chair and onto the floor. I would then either ask my hubby to wash the toy, or clean it with wipes. But, now, I can just use these secure straps and voila, no more lost, dirty toys! Oh, and another plus. We went and visited family a few months ago and we brought my son's carseat in. Well he has all his toys attached to his seat, and as soon as we took the baby out, the other kids went for the toys to try to play with em. Well, thank goodness for these straps, the kids couldn't go very far with the toys and, again, no more lost toys!

#### Review9

Our little guy is teething early and Sophie is easy for him to "hug" and chew, since he is only 3 months and still working on the fine motor skills. She is big enough that he can wrap his arm around her and chew away. He loves the contrast between the skin and the spots and smiles when we pull her out. Cute squeek too! He has already learned to hug her tight to get a little squeek. Just not sure how to clean her, using soap and warm water, but the directions were a bit ambiguous on the proper technique.

#### Review10

This is oh so pretty! Love it! Goes on great! Beautiful matte finish. I did pay a steep price of \$20.00. The price listed is half of what I paid sadly...

CLUSTER NUMBER: 15

#### Review1

So, my first impression was very bad with these liners, they kept bunching and making a baby thong and not catching anything but that was only when using a pre-fold and cover. When we switched to pocket diapers these started working amazingly. I lay it all the way out and let the edges lay over the outside of the legs and that holds it tight across the diaper and catches everything. So I love them now. I have never tried any others, so I don't have anything to compare them to. My son is also in the largest size of his one size Kawaii diapers and this cover almost the whole way from front to back of diaper.

#### Review2

I used this for about 3 months and at first it worked great and I was so happy to keep my toddler out of the fridge. After some time the stickiness wore off and my toddler pulled open the door. Its very hard to get the glue off the fridge now.

#### Review3

We like this stroller because it is light weight and easy to fold up and store. Perfect for traveling! What we don't like is the sun shade-it falls down a lot, hitting my son (lightly) on the arms. The bottom basket is really small but we didn't expect anything large. You won't be able to fit your baby bag anywhere on this stroller. However the top bottle holders and little pocket area for keys /phone etc. is great. The 5 point harness is nice and easy to close and open. Overall a great buy!

#### Review4

Yes, it is expensive, and no, it doesn't give you huge voluminous lashes. But I wasn't looking for a mascara that would give me big lashes, I was looking for a mascara that didn't smear all over and didn't crumble into my eyes/get stuck on my contact lenses. I have tried numerous brands - Clinique, Revlon, loreal, Pacifica, Paula's Choice. All have either melted/smeared or crumbled by the end of the day. I do have really oily lids, which is part of the problem. Once Blinc dries, it stays put. It doesn't crumble. It doesn't smear. It doesn't flake off into my lenses causing me to run out of meetings so I can wash chunks of mascara out of my eyes. Sure, it isn't an amazing mascara in terms of producing volume or length, but it does help darken and define. I won't use anything else now. The only downside is if you get any water on the mascara before it dries, it bleeds out and creates a massive mess. Make sure your lashes are super dry when you apply.

#### Review5

This stuff works great in my fine hair for when I'm curling it. I feel like it does protect my hair and keeps my curls in longer. Doesn't make it too stiff or unnatural looking.

## Review6

I bought these for my daughter shortly before I gave birth. I chose these b/c I planned on breastfeeding her and wanted an orthodontic pacifier that would reduce the chance of nipple confusion. These are great! She was taking a pacifier at 2 days old and did just fine switching between these, breast and bottle. I have some NUK ones that my son used and loved(that's what she first used) but now these are the only ones she'll take. In fact I just ordered another pack so I can have spares. I love that you don't have to worry about putting them in upside down. Especially nice in the middle of the night when you're half asleep. B/c of their open design they are also very easy to clean. The vents also keep baby from getting a rash which is very important for me b/c my daughter has eczema and very sensitive skin. The curved shape also helps even the tiniest baby keep these in their mouth. However, I think the cap that comes with them sounds like a good idea, but for me it's really not that practical as a) you're probably not going to use it unless you're storing them and b) they are just one more thing to lose! (I've already lost one, who can keep track of a teeny cap when they're busy with a baby?) The plastic case these come in is pretty nice though and is great for storing them in. All in all these are wonderful. No need to look any further. Give these a try!

## Review7

I was very impressed on how fast it was delivered, in less than a week - product was well packed. It doesn't look exactly like the picture, there are some visible "bolts" and the finish is alright, the bolts look ok with the style - the greatest feature is the fact it doesn't close automatically so it is safe for children, which is what I need. It's good for a kid room but I would not put this in a living room as again the finish is not great but for the price, I can't complain - overall I would recommend it for a kid room.

## Review8

My 5-month old son took to this immediately. The shape of the neck makes it easy to hold and the shape of the legs allows him to stick the feet toward the backs of his gums for sucking and chewing, easing discomfort from teething. (Only the Melissa and Doug bug container seems to offer similar toys that reach back there with ease. Few toys have that extension and texture.) Especially in his car seat, he often falls asleep with the tip of a leg in his mouth. I was surprised that the toy is so soft and hollow; I'd expected a foam and not the "dog toy" texture. And sure enough, my dog LOVES this giraffe! We stepped out of the room to change a diaper and the dog, who normally shadows us, was nowhere to be seen. Suddenly "squeak squeak squeak" could be heard from across the house. Our darling mutt schemed to wait til we left to grab the giraffe and race off with his prize. LOL... every chance he gets! I suppose that's a downside, but we just clean it with soap and hot water or stick it in the dishwasher and we're good to go. Anyway, we can leg

intimately say that the WHOLE family loves this toy!

#### Review9

I'm a pro musician and music teacher. These are the original pick punches, by the company from the guy who invented them... At least that's what it says on his website. The others are knockoffs. They probably all work about the same, and they're all about the same price now, so why not support the dude who invented them. He's really into making picks, and has some pretty cool ideas and instructions on his website. I'm pretty crafty, and really like this. Bumped about rough edges? Buy a fine sanding sponge at any hardware store, sand the edges for a few seconds, and be done with it. He also sells sheets of plastic from his website, at quite good prices, and ink for stamping them. I got a cheap rubber stamp made with my URL for about \$10 online, and make my own "business card" picks now. I also found some cool sheets of celluloid on eBay, it's not easy to find the right stuff but the picks I make now are just as good as any you would purchase, and the cost is way less for personalized pics anyway. If you need hundreds or thousands of picks made, well then you're better off ordering them, but I have fun making 10 or 20 of them at a time to hand out to potential students and clients. Oh yeah, I can still recycle old cards and stuff too, my students like bringing them in and making their own picks as well. Everybody knows that picks just evaporate when you lose them anyway, what could possibly be greener?

#### Review10

My daughter has loved this from about 4 months on and she is now 10 months and still enjoys it a little. One day though I heard her whining, felt it was typical, only to discover her wrist had got wrapped up in the string you pull to get the green toy to spin. It was blue...thank goodness I checked to see what the fussing was about! So just be aware they can get their hands or fingers wrapped up in that string when they are little. This doesn't happen now that she's older.



## Conclusion.

In general, we observe that the K means has clubbed reviews on the basis of different products which the users have bought. These are more specific and closely related as compared to  $k = 4$ . For instance -

- 1) Cluster 3 reviews talk about baby products like teethingers and tubed bottles.
- 2) Cluster 4 reviews talk about musical instruments and related things like guitars, guitar strings, microphones, mostly.
- 3) Cluster 5 reviews are a mix of breast pump and breastfeeding products and suction pumps along with nail polishes. There lies ambiguity here.
- 4) Cluster 8 reviews talk about infant products strollers, diapers/hampers mostly.
- 5) Cluster 11 reviews talk about skin care items and toiletries like toothbrush, lotions, shaving creams.

Only 5 to 6 out of 15 clusters can be identified correctly.

Note that 15 clusters did a pretty good job as compared to  $k = 4$ . But there still seems a scope of improvement. I think increasing  $k$  to 20 can help us figure out.

## Trying the algorithm for $k = 20$ and $N = 30$ .

```
In [69]: cluster_tf_idf_df_NEW = tf_idf_df.copy()
# clustering into k clusters.
k = 20
cluster_tf_idf_df_NEW, new_cluster_mean_df = k_means_clustering(k,
cluster_tf_idf_df_NEW)

# running the algorithm N=5 times.
N = 30
cluster_tf_idf_df_NEW_input = cluster_tf_idf_df_NEW
new_cluster_mean_df_input = new_cluster_mean_df
cluster_tf_idf_df_NEW_final, new_cluster_mean_df_final = reclustering_repetitions(N,k,cluster_tf_idf_df_NEW_input, new_cluster_mean_df_input)
cluster_tf_idf_df_NEW_final["Cluster Number"].value_counts()
```

```
/Users/aniruddh/opt/anaconda3/lib/python3.7/site-packages/ipykerne
l_launcher.py:13: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead
```

See the caveats in the documentation: [http://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](http://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)

```
del sys.path[0]
```

```
Out[69]: 6      4935
        15      3322
        7      1642
        2      1376
        11      859
        16      799
        8       659
        14      410
        17      296
        3       165
        20      125
        18       89
        19       84
        5       71
        4       66
        10      40
        13      34
        1       14
        9       13
        12       1
Name: Cluster Number, dtype: int64
```

```
In [79]: ## Cluster Review types
for i in range(k):
    print("CLUSTER NUMBER: " + str(i+1))
    reviews = cluster_tf_idf_df_NEW_final.index[cluster_tf_idf_df_NEW_final["Cluster Number"] == i+1].tolist()
    if i == 11:
        indices = random.sample(reviews, 1)
    else:
        indices = random.sample(reviews, 5)
    df = sample_data_amazon.iloc[indices, -2]

    for i in range(df.shape[0]):
        print("Review" + str(i+1))
        print(df.iloc[i,])
        print("\n")
    print("\n\n")
```

```
CLUSTER NUMBER: 1
Review1
thanks
```

## Review2

We bought this crib for a second home, and since we had already bought a pricy crib and were only using this one infrequently/temporarily, I couldn't justify spending money on the Oeuf Sparrow crib, which is really what I wanted. I read the reviews and managed my expectations, so was pleasantly surprised when the Babyletto crib arrived! It went together easily, it's sturdy (we are using it for our 2 year old) and the conversion kit came with it, which was another money-saver. The paint/wood stain are well-done and I don't see any signs of wear/peeling after three months of use. I was expecting a crib that looks cheap, but this one doesn't. The only minor issue is that the corners along the bottom base of the bed are not as rounded as the tops, so we put corner protectors on them in case our daughter is rolling on the floor near it (which she does). Aside from that, a great product that delivers good style at a reasonable price!

## Review3

We use these for our two two year olds who run unpredictably. It's a safety thing. We use them on walks so they don't run into the street, and at theme parks and restaurants so they don't trip other people. These will probably only be needed for a couple years, if that, but they are invaluable to us! I've washed them in the machine a few times and they've come out fine. We encourage our kids to "take your pet on a walk and show them..." We put the handle/little loop of the leash/tail around the neck of the animal and hold the big loop, and their hand also if possible.

## Review4

Perfecto

## Review5

Thanks :)

## CLUSTER NUMBER: 2

## Review1

I have a full sized Original Arms Reach CoSleeper, and these sheets fit perfectly. They are very soft, and they hold up well in the wash. Very pleased with this purchase!

## Review2

I have the Graco Travel System in Barcelona Bluegrass. It comes with the stroller and a Graco SnugRide carseat that holds infants up to 22 pounds. <http://www.amazon.com/Graco-Travel-System-Barcelona>

na-Bluegrass/dp/B002RL7UQC/ref=sr\_1\_1?ie=UTF8&qid;=1348523756&sr;=8-1&keywords;=graco+barcelonaI was worried that the car seat would n't fit since its wasn't the Graco SnugRide 32 or 35. I couldn't find any reviews that stated this type of car seat would fit this adapter either. I was very excited to see that it snaps right in with no problems. The adapter comes with safety straps as well to ensure an even more secure fit. I really couldn't be happier!

#### Review3

Perfect! Exactly as expected. The larger size provides extra vertical coverage, but both sides are going to fit anyone circumference-wise. I love being able to have my hands free, takes my focus away from pumping so I don't stress about the amount.

#### Review4

I have an arms reach cosleeper. I bought a couple of these to use as a mattress protector and they worked great. Now that she is 9 months and in a crib, I use them as changing pads. Great price and great quality. I definitely recommend.

#### Review5

I was not going to buy a \$200.00 car seat for my second old car or my mom's car so I bought two of these and guess what???? they are no frills car seats that seem fine. Not a lot of cushion like my expensive one but as long as it keeps my baby safe and it says it's crash approved so that will work. Only thing is the flimsy head cushion detaches all the time and the drink holder was so cheap I didn't install it.

#### CLUSTER NUMBER: 3

##### Review1

A bright, yet deep hue...very "royal"...has a great shine.

##### Review2

GREAT PRODUCT!!!!!! WONDERFUL!!!! Highly Recommend this skincare line!!!!

##### Review3

My baby is 10days old today and I've been using this pillow for both breast feeding and a place for her to hang out with us on the couch. She gets strapped in and sleeps on the pillow on the couch (supervised, of course). I almost want another one for upstairs so I don't have to carry it everywhere, highly recommend over the actual boppy pillow.

## Review4

This capo is expensive, but I have never found one that works so well. It is worth the money in my opinion.

## Review5

I only buy this through Amazon.com! Great price!

## CLUSTER NUMBER: 4

## Review1

This was the best option I could find for a sun shade that wouldn't block the baby's view of the outside world. It works alright for keeping the sun out of his eyes, BUT it doesn't stay in place well and it needs to be adjusted every few minutes. Also, it would be more useful if the arm was longer. It really only works if the sun is coming from the right or left, not from the front or from above.

## Review2

My son absolutely loves these! He doesn't like his legs confined, but he loves his arms swaddled, so this works perfectly. I've bought 3 just so I have a nice rotation for washing.

## Review3

As expected. Nice blue color

## Review4

I really liked these.

## Review5

My 2 year old boy likes it for pee, not #2, when he sits on it his bottom is higher up on the back instead of on the orange bowl part where you need everything to fall in place. It is kind of annoying to empty out - can be messy.

## CLUSTER NUMBER: 5

## Review1

Tiny tube of basic cream.

## Review2

It was NOT THE COLOR SHOWN NOR WHAT I expected...its a brown/gray

## Review3

This is actually my first time purchasing an Essie polish and I couldn't be happier with it! Great, non-streaky formula, applies evenly and gives your natural nails a perfect, even base color. Great for a basic french mani or layered under more bold colors to help them pop. The finish was nice and shiny even without a topcoat and I got about 8 days out of it with minor tip wear. Definitely a perfect sheer pink. Will absolutely be purchasing more polishes from Essie in the very near future!

## Review4

LOVE wubbanubs! They've simplified our lives so we are never searching for that fallen paci under the crib in the middle of the night-instead baby can find it herself. Our baby loves to snuggle her Wubbanubs. They clean up easy enough though if the paci came unattached it would be a bit easier. Still a great product-we have several of the Mary Meyer styles and they're all adorable!

## Review5

There is no bottom to the Playzone had to purchase the Edushape to fit into the bottom so baby was not sitting on bare tile floor. There is no protection for baby As shown it appears there was a white bottom this is not so as I found out with speaking to customer service at Friendly toys. I did not see in description that you would have to purchase a foam insert.Easy to put together Just be careful as a couple of the plastic spokes bent but was able to redirect into the holes. There were about 3 holes which I needed to adjust to accommodate the insertion of the spoke. It is my opinion that Friendly Toys should reimburse me for having to purchase the EduShape squares to place on bottom of this item along with the shipping charges as I needed it in one day.

## CLUSTER NUMBER: 6

## Review1

The nail clippers, hairbrush, and comb are great but I did not care for the rest. It would be cost effective to buy the items separately from this company.

## Review2

Shipping was fast and overall I can say nothing bad about the shipper. The product itself is horrible. The neon color applies streak

y and when it dries it almost looks like candle wax, even when applying a glossy top coat. I heard that you should apply a white color nailpolish base first and then apply the color. I am going to try that. The product itself is a little hard to work with. I love the color though.

#### Review3

My baby likes this swing best for sleeping. The seat bucket is very cozy, the fabric cover is soft and easy to remove for washing. It is great that the position of the swing can be adjusted. We are happy with this swing. Update: after 5.5 months of daily use, the motor died. I called the company and they sent me a new motor free of charge. We put the new motor on and there is still an odd noise with the new one, and the swing motion does not seem as big. Baby still loves the swing though!

#### Review4

This is a normal sized laundry basket (like any other standing mesh basket). I think the dimensions or another review had given me the impression it was small trash can sized, but it's not. Perfect and very sturdy. After several months of use the sides have worn and the bars that hold it upright no longer stay in. Traded it in for a normal laundry basket.

#### Review5

I loved this pillow. I am a side sleeper and it helped me to stay comfortable as my belly grew. I took it to the hospital and it was helpful during labor as I moved around. I use it as a wedge under my arm now that I'm nursing. It is a great product.

### CLUSTER NUMBER: 7

#### Review1

Material is very soft and I found the sage color very attractive. Have some padding inside so if your little one likes to bang his head on the side, at least there's a bit of padding. Prevents any chewing as well. Only problem is the fit. Length was perfect but because of the style of my crib, the ties were a little short at the corners.

#### Review2

bought this product for my daughter inlaw her second child is due in May 2013, she had these on wish list. Rec'd on time and package d well. It the washcloths matched the towels I purchased and she was happy.

## Review3

I bought this maybe 6 + months ago and I don't like it like other Dream on me stuff I had bought in the past, first, my 3 year old scratch it and it looked horrible just a week after purchase, that 's my fault for buying black furniture, second, the drawer handle fell off after a few days of use, besides that, it's sturdy and a good product, I guess next time I won't buy black furniture, I give it 4 stars because of the drawer handle

## Review4

Nice for bath time

## Review5

This is my first time using this perfume, and I like it. The description seems accurate, as this is a complex scent. The alcohol is a little strong at first, but it mellows quickly to a pleasant, all day wearing aura of femininity. As with all perfume, you should smell it for yourself in person if possible; but if you can't do that, you can be assured that this will be an intricate enough aroma that you will find occasions for which you think it is perfect. I like this one.

## CLUSTER NUMBER: 8

## Review1

My twins LOVE this toy. I credit this with helping them both become excellent sitters because it held their attention for long periods of times and helped build their core strength. I can't say enough good things about this toy.

## Review2

The color is more orangey than it appears online which is not a good color for me.

## Review3

After trying many cup holders and parent organizers on my Uppababy Cruz, I finally decided to give this one a shot because I had read somewhere that it works... and it does! Hallelujah! All I needed was a place to put a drink, nothing fancy, but every cup holder I tried interfered with the fold of the stroller. The Bugaboo with the largest attachment placed on the foam part of the handle (I placed it off to the side of the stroller, but you can also place it on the actual handlebar as to not increase the width of the stroller) and it works great! I'm able to fold the stroller up easily, and the cup holder holds even my heavy kleen kanteen water bottles.



Seems like it's good quality. I'm a happy camper!

#### Review4

I use this about once a week and use acid peels in between. Its mild, but effective. It arrived quickly and I will probably reorder when I run out.

#### Review5

I like the contours, keeps baby safer on the table. Waterproof is true, needs a cover though because the plastic is crinkly and cold .

#### CLUSTER NUMBER: 9

##### Review1

This foundation is a very good match to my complexion. I am very pale, and the color doesn't stand out. I need a light coverage foundation, and this is light and makes my skin look dewy and glowing . A very nice product, even for older skin.

##### Review2

The Cassis Noir candle is truly a near-black color. The "flammable" warning is pretty funny, considering this is a candle! I think that was the point, though. The smell is quite strong, but pleasant. It would be good for a "mood" smell. It isn't quite describable, but I like it. The packaging was entertaining, and I hope this company does well with its entertaining, long-lasting, pleasant-smelling candles.

##### Review3

Awesome fits my stroller perfect and holds my coffee which is even better

##### Review4

I bought this and it quit working at the 6 month mark and the charger wouldn't charge it anymore. It was good while it lasted!

##### Review5

This fit my changing pad and i couldn't believe how soft it is. My baby stays quiet (for now) and i think it helps keep him warm during changes.

## CLUSTER NUMBER: 10

## Review1

Snap broke after using it twice. Bag is very pretty and bright though. Just don't expect the snap to last.

## Review2

This is THE most beautiful blue polish I've ever owned! Perfect for summer time (or any season!).

## Review3

Great for little ones to keep them from getting hurt

## Review4

The only curling iron for short hair

## Review5

I've tried everything from premium designer stuff to the value stuff. When it comes down to it, it's really just shaving soap. This stuff is no different. Proraso is a very good shaving product. It doesn't have the variety of scents that other soaps/creams have, but for the price, it's a good low-frills product. The soap is just hard enough to load my brush on it, but soft enough to get a really good load without too much effort. It really whips up a great rich lather that is very slick. It leaves my skin feeling hydrated and it works great with the Nivea aftershave balm. The only gripe I have is the scent. I don't particularly care for the soapy scent. It's not bad, I just wouldn't wear it as a cologne. Of course, smell is completely subjective. Like most all soaps, the scent doesn't linger for more than a few minutes anyway.

Overall, the soap performs great. There's plenty of product in there to last more than a couple of months. It performs as well as TOBS, but 25% less expensive.

## CLUSTER NUMBER: 11

## Review1

Expensive for what you get. Works great until it doesn't.

## Review2

Leaves a lot of fibers behind and on baby's clothes. However it is large enough to swaddle my 3 month old and a great cold weather cover for the car seat. It is thick enough that I wouldn't advise us

ing it without supervision to avoid suffocation.

#### Review3

This is the perfect length covers the entire rail and velcro is very strong, no problems with the fabric moving or coming loose.

#### Review4

Love it!

#### Review5

I have been using sunless tanning products for many years to keep my legs from looking pale and to even out the color. My skin tends toward a pasty color which looks awful.

I like the natural looking tan that I got with XEN-TAN. The lotion was thick, creamy, and easy to apply. It had no unpleasant chemical odor like I've come to expect with self-tanners. Instead, it had a pleasant vanilla scent.

The lotion has a dark tint which provided an instant tan, however the complete tanning process takes a few hours longer. The resulting color looked great - my legs were tan, not orange.

I used the [XEN-TAN Deluxe Tanning Mitt](/XEN-TAN-Deluxe-Tanning-Mitt/dp/B002UOCTSU/ref=cm_cr_ar_p_d_rvw_txt?ie=UTF8) and applied using a circular motion. It is not necessary to use the mitt, but it did a nice job keeping my hands clean and was easy to rinse out. I washed off the tanner after about three hours and the color was perfect and lasted almost a week.

I've tried many products over the years with varying levels of success and find that XEN-TAN makes some of the best.

#### CLUSTER NUMBER: 12

##### Review1

Great product and great price.

#### CLUSTER NUMBER: 13

##### Review1

So cute and works well.

## Review2

This colors and unique

## Review3

This teether is just okay. My son doesn't seem to like teethers like this. Maybe it's just his personal preference.

## Review4

Love this blanket! Great price and great quality!

## Review5

This hamper is very cute and good quality. It looks great in my baby's room and goes well with the matching sheets and lamp.

## CLUSTER NUMBER: 14

## Review1

This is a great little toothbrush. My 6 month old LOVES to chew on it. My only complaint is that it's a little snug. I can use it but my husband certainly couldn't fit it on his finger.

## Review2

was very easy to assemble ,it is a nice Rocker,the most I like its you can used for long time form newborn and until your child is toddler.good quality.I recommend this product

## Review3

My son is 6 months old and still using it. I initially bought it for a bassinet next to our bed until he moved into the crib in his room. At 3 months he moved into the crib but he still likes to sit in here to play and often drifts off to sleep in it. When he got his first cold he couldn't sleep in his crib, he was so congested he was only able to sleep in our arms or in this sleeper, because it elevated him. We also packed it up in our car and took it on vacation with us, it folds up pretty flat. I'm sure we'll still be using it now and then for quite some time.

## Review4

Excellent quality. Love this line. Perfect for my mid-forties mild rosacea - gentle and lovely. Recommend going to a store that carries Jane Iredale product to find your color match. You can find those on the website. Then you can order whatever you like with confidence.

## Review5

I live in a 100 year old house and this just did not work for us. The only doorway this fit was the added on laurdry room... clearly that is not ideal. Had to return :(

## CLUSTER NUMBER: 15

## Review1

These things are great at work when I don't want to do a complete wash of all my parts after each pumping session. They do a wonder ful job and I just keep a big stash in my pump bag. My only regret is that they're so expensive.

## Review2

I bought 3 or of these when my daughter started walking. They hav e been up for the last 4 months and we have not had any accidents. Very easy to install. Love the fact taht they close automatically.

## Review3

Fits many bottles, nipples, and pacifiers plus pumping parts. Easy to clean, spins easily and doesn't tip when full. What else can I say.

## Review4

We have tried other Nuk's, Playtex, Tommie Tippie, and while the t ommie tippie ones did work (all my son has to do is bite the end a nd liquid comes out) he really didnt like them and mostly just mad e chew toyes out of them. Now that he is 8 months old I really wan t to push the sippy cup on him because after his first birthday bo ttles are done. I did however find them cheaper at the Army Commi nary (also no tax) so I recommend that you shop around a little be fore buying them here (though they are cheaper here to but not by much).All in all great sippy cup and so worth the money.

## Review5

It's great until that one day you're child shoves up against it ha rd enough and it flies off the door and breaks into several pieces . If you are going to buy one though, here is what came in handie st about our's while it lasted...we have a young nephew who is old enough to go to the bathroom on his own, but our toddler was forev er trying to follow him in there. This kept the toddler out but t he nephew was able to open it on his own, gave the nephew his priv acy, and we didn't have to worry about the younger one getting his fingers shut in the door.

## CLUSTER NUMBER: 16

## Review1

I decided to get a pump when my child was about 8 months because I wanted to express milk for a friend who was having trouble with nursing. Up until then, I had been hand expressing. I was hoping this would speed up the process and make it more convenient to get all that milk. I will say it takes less concentration than hand expressing, but it takes about the same amount of time and it is less effective. My breasts still have milk in them when this thing cannot get another drop. I am not sure if that is just pumps in general (as this is the only one I have used), or if it is just this pump. However, I do like that it has a battery or AC option so I can take it anywhere, and it does a decent job without any real discomfort, and I can just sit back and watch TV or read rather than focusing like I do with hand expression. It comes with extra inside pieces so you don't have to wash so much, but it doesn't come with a second pump part or the little silicone petal part, so I do end up doing a lot of washing anyway to use it multiple times a day. I think it is okay for the money, but I am on the fence as to whether I would buy it again, because hand expressing was working so well for me.

## Review2

For some reason my baby doesn't care for these. They are a great product, soft silicone, flexible, sturdy and well-made. Maybe in a few months he'll favor these over other teething toys. Your baby may love it, who knows?

## Review3

This stroller met all of our needs. We purchased it for a trip to San Francisco and it was great for our 3 year old and 11 mo old. Our 3 year alternated between sitting and standing and our 11 mo old sat contently in the front. We did opt to click in the car seat when the baby was asleep a couple of times. It is easy to open/close and fits perfectly in both our SUV and Sedan. I would recommend this stroller -- great for the price as well!

## Review4

It's my fault I didn't read more reviews. We are having our second child and needed something with a lot more room. If you are 2 or more kids...this won't cut it. At least for us. It's barely bigger than our current small bag. Well made but just wish it was bigger!

## Review5

A cute little monster that's surprisingly loud and versatile. I bought primarily for travel and I'm pleased with my purchase. Don't expect too much for \$20 (it's all plastic) and you should be satisfied too. The amp comes with helpful instructions showing different tone settings (fuzz, twang, etc.). I also purchased the AC adaptor since these things typically eat batteries.

## CLUSTER NUMBER: 17

## Review1

This bag is nice for the price. The material is relatively substantial. I would like to mention that it was a VERY snug fit for a First Years Ignite stroller. Sitting in the living room and getting it in the bag seemed pretty doable but when I was at the end of the gate with people pushing past while wrangling a toddler and the rest of my carry on luggage, it got pretty frustrating. My husband had to leave it partially unzipped on one of our flights because he couldn't get it zipped all the way. For that reason I would not recommend this bag for the Ignite, even though it technically does (barely) fit if you get it in just right. I might try to take off the wheels next time. If you have an Ignite, I would recommend you keep looking.

## Review2

Use this for my daughter's art supplies. It looks cute sitting out on my desk and is very functional! We can fit a bunch of markers, pencils and crayons in an organized way.

## Review3

Let's not talk about the cuteness factor... Everyone knows cloth diapered little butts are adorable...1. The fit: The combination of snaps, buttons, and elastic is BRILLIANT! You get the perfect size for any baby.2. The insert: Incredibly thin, and INCREDIBLY reliable. They hold water like there is no tomorrow!3. The leaks: The what?? Ha! No leaks whatsoever!! Disposables leak more!4. # 2 mess: Never! It's fabric, not plastic... The "stuff" doesn't slide like it does with disposables.5. Stains: I use a diaper sprayer and I have not seen the first stain yet (2 months of use)Note that I use Rockin green detergent. That stuff is awesome as well!Also, I do my diaper laundry in a Wonder Wash (that does not require electricity). I haven't had any problems.

## Review4

My son is only 7 days old but we've used the Boppy 8-12 times a day. : He loves the colors and I love the pattern. Great price compared to retail stores.

## Review5

Easy to fold and unfold. Stands nicely on its own. Nice and compact. LOVE the roomy seat, baby has room to grow, and she is so comfortable in it too. Love the deep recline. LOVE the big canopy. Love the fabric and print. Pushes nicely. Very good quality. I did buy this stroller to take in car and use at the malls and stores etc. I use on all terrains for long neighborhood walks and parks etc. I probably wouldn't use this one on rougher terrain.

## CLUSTER NUMBER: 18

## Review1

We have the bigger pack 'n play for our daily use while we cook, etc. in the kitchen (love that one! With the bugs, etc. graphics). This pack n play is perfect for storing in the back of the car and for on the go. We love it!

## Review2

For all those EC moms, this is a perfect product. It's a nice small size (for infants) and easy to use and clean.

## Review3

it was a gift and there are no complaints

## Review4

This clock is completely adorable and looks amazing in my kids bathroom! The battery compartment is a little snug but once I got the battery in I was pleased to see that the clock works. I'm really glad I bought this. It was packaged well, came undamaged.

## Review5

I love these lovies. My first son has a white lamb that was given to him as a gift. We bought this one for our second son due in a few weeks. My son sleeps with his every night and absolutely loves it.

## CLUSTER NUMBER: 19

## Review1

I cannot believe my grandbaby has 6 teeth, and these really seem to help with the teething pain! I am a BELIEVER!



## Review2

I won the Beaba from a blog giveaway, but I don't think I would ever spend the money to buy one. I only used mine about a dozen times before passing it on to a friend. It did everything it was advertised to do. I don't think it saves on time and effort, though. You still have to clean, peel, and cut your fruits or veggies into chunks, so no time saved there. If anything it takes MORE time to prepare baby food with the Beaba simply because it has such a small capacity. You can put about a cup to a cup and a half of chopped raw food in the steamer, which seems like a good amount of food. However, by the time you steam and puree your food, you end up with only about half a cup of baby food, maybe a bit more. Let's say you're going to make some sweet potatoes. Always a great food to start babies on because it's mild and sweet and can be pureed really smooth and creamy. The Beaba can only cook about half of an average sweet potato at a time. I can cook four LARGE sweet potatoes and puree them in my 7-cup food processor all at once. With the Beaba, start to finish, from peeling to chopping to steaming to blending to cooling, you're looking at around 30 to 45 minutes before you can feed your baby. Also, food coming out of the Beaba is EXTREMELY hot, rightly so, but you can't feed a baby food that hot so you have to let it cool, which just adds to your food prep time. Anyone who is serious about making most or all of their own baby food is going to want to make baby food in BULK. Most busy moms don't have time to waste on a product like the Beaba that makes such a small amount of food at a time. Just one hour in the kitchen on Sunday and I had enough baby food to last all week, if not longer. I have a KitchenAid 7-cup food processor which I found on sale at BB&B; for around sixty bucks. I would steam my veggies and fruits on the stove or even in the microwave, then puree them quickly in the food processor, usually making about 4 cups of baby food at a time. Also, one pot, one steamer basket, and one food processor was MUCH easier to clean than the Beaba. The Beaba steamer basket was stained orange the first time I used it and I didn't care for all the little parts and pieces I needed to clean on the Beaba. Don't waste your money on fancy or expensive baby food storage containers. Gladware makes small 4-ounce containers. I believe a pack of 8 is under 3 bucks. I would fill about a dozen of these at a time with 3 or 4 different foods and pop them in the freezer. Each night before I went to bed, I would pull a couple of containers out of the freezer and stick them in the fridge for the next day. Come mealtime, it was fast and easy to scoop out what I needed and warm it up in the microwave. After several months of freezing and heating the little blue lids of the Gladware containers would crack, but they're so affordable that I didn't mind tossing some in the recycling bin and buying another set.

## Review3

So much easier than swaddling with a blanket. Used it for the first month and it was perfect. My baby is 10 lbs but it's too short no

w so now I use the swaddle me small size.

#### Review4

A few of the pieces to this were damaged out of the box. The funny thing is that none of the damaged pieces were packaged toward the outside and they clearly couldn't have happened during shipping. It had to be packaged already damaged. This really ticks me off. I would return it, but it is so much of a hassle. The damage doesn't effect the structural integrity of it, so I will try to hide it with decorative ribbon or something. I would probably give it 5 stars if Graco hadn't clearly packaged an already damaged item. The color is nice and it was pretty easy to assemble. We wanted something light to be able to move and use in different rooms in the downstairs of our house. This will do the job.

#### Review5

My wife used our boba carrier the whole time my son was little. The straps are nice and long, so if you are a bit larger they fit around you easily and don't dig into you. It has a flap to cover the baby's head if he is sleeping and it keeps people from touching and messing with him.

#### CLUSTER NUMBER: 20

##### Review1

This is the best product out there for a stuffy baby nose. I really don't know how we would get along without it. I use it with the Saline Drops.

##### Review2

Best carrier so far!! Love this for my 8 month old. Wish I had it earlier! Comfortable and easy! :)

##### Review3

I can't wait to use this bath. It is so different from the others. I can't wait til my baby is born to use it.

##### Review4

Love it. Started using this in Afghanistan in 2008.

##### Review5

This one is easy - buy it! I've owned many effects over 32yrs playing . . . some ok, some didn't last 48 hours, others never parted with - this one fits in that category. Gives excellent range of Ma

rshall emulated sounds

## Conclusion.

In general, we observe that the K means has clubbed reviews on the basis of different products which the users have bought. These are more specific and closely related as compared to  $k = 15$  and  $k = 4$ . For instance -

- 1) Cluster 2 reviews talk about CoSleepers and Car seats mostly.
- 2) Cluster 7 reviews talk about bathing products like towel, perfumes wash clothes mostly.
- 3) Cluster 10 reviews talk about hair, nail polishes, soapy products and accessories in general.
- 4) Cluster 13 reviews talk about baby products like teethers and hamper/diapers.
- 5) Cluster 15 reviews talk about baby bottles, bibs and nipples, pumps and toddler chewy items.
- 6) Cluster 17 reviews talk about musical instruments and guitar stings and straps.
- 7) Cluster 18 reviews talk about battery operated items like lamps and clocks.

And So on...

Note: around 12 out of 20 clusters can be identified closely.

Also Note that 20 clusters did a pretty good job as compared to  $k = 4$  and  $k = 15$ . The products were more or less classified properly within their cluster groups. Though there are still some ambiguities.