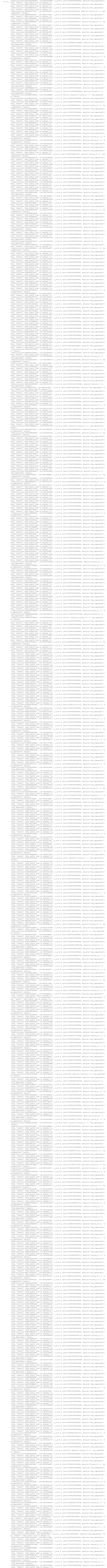
A2NWSAGRHCP8N5 439886341 1 1367193600 A2WNBOD3WNDNKT 439886341 3 1374451200 A1GIOU4ZRJA8WN 439886341 1 1334707200 A1QGNMC6O1VW39 511189877 5 1397433600  # Display the data electronics_data.head()  wserld productld Rating timestamp A2CX7LUOHB2NDG 321732944 5 1341100800 A2CX7LUOHB2NDG 439886341 1 1367193600 A2WNBOD3WNDNKT 439886341 3 1374451200	0 1 2	<pre>coad the Dataset and Add headers  electronics_data = pd.read_csv("ratings_Electronics.csv") electronics_data.columns = ['userId', 'productId', 'Rating', 'timestamp'] electronics_data.head()  userId</pre>
Lander and the confidence of t	1	A2CX7LUOHB2NDG 321732944 5 1341100800  A2NWSAGRHCP8N5 439886341 1 1367193600  A2WNBOD3WNDNKT 439886341 3 1374451200  A1GIOU4ZRJA8WN 439886341 1 1334707200  A1QGNMC6O1VW39 511189877 5 1397433600  ## Display the data electronics_data.head()  userld productld Rating timestamp  A2CX7LUOHB2NDG 321732944 5 1341100800
Let the a public of the between the same and a public of the same and a	(	A2NWSAGRHCP8N5 439886341 1 1367193600  A2WNBOD3WNDNKT 439886341 3 1374451200  A1GIOU4ZRJA8WN 439886341 1 1334707200  A1QGNMC6O1VW39 511189877 5 1397433600  #Shape of the data electronics_data.shape  1048575, 4)  #Taking subset of the dataset
And the control of the classes of th	u p R t d	#Check the datatypes electronics_data.dtypes serId object roductId object ating int64 imestamp int64 type: object electronics_data.info()
Les des a relates to file de des acres de maior de la company de la comp	R D d d	angeIndex: 1048575 entries, 0 to 1048574 ata columns (total 4 columns):  # Column Non-Null Count Dtype 0 userId 1048575 non-null object 1 productId 1048575 non-null object 2 Rating 1048575 non-null int64 3 timestamp 1048575 non-null int64 types: int64(2), object(2) emory usage: 32.0+ MB  #Five point summary electronics_data.describe()['Rating'].T
And the control of th	7 7 7	ean 3.973379e+00 td 1.399329e+00 in 1.000000e+00 5% 3.000000e+00 0% 5.000000e+00 ax 5.000000e+00 ax 5.000000e+00 ame: Rating, dtype: float64  #Find the minimum and maximum ratings print('Minimum rating is: %d' %(electronics_data.Rating.min())) print('Maximum rating is: %d' %(electronics_data.Rating.max())) inimum rating is: 1
Labeling to the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given 50 ar more than the control of the labeling to make it has given ton	- 1 - 1	#Check for missing values print('Number of missing values across columns: \n',electronics_data.isnull().sum())  umber of missing values across columns: userId 0 roductId 0 ating 0 imestamp 0
And the same of the data can be an after the same of t	3	# Check the distribution of the rating with sns.axes_style('white'):     g = sns.factorplot("Rating", data=electronics_data, aspect=2.0,kind='count')     g.set_ylabels("Total number of ratings")  :\Users\Prashant Varshney\anaconda3\lib\site-packages\seaborn\categorical.py:3717: UserWarning: The     function has been renamed to `catplot`. The original name will be removed in a future release. Pleour code. Note that the default `kind` in `factorplot` (`'point'`) has changed `'strip'` in `catplot     warnings.warn(msg) :\Users\Prashant Varshney\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass
E. Take a subset of the data and only into train and text dataset. (Fer more model.  S. Spits the data and only into train and text dataset. (Fer more model.)  S. Build Popularity Recommender model.	S	sing other arguments without an explicit keyword will result in an error or misinterpretation.  warnings.warn(  500000
Analyzing the rating  Total and the state of the data and only into train and text dataset. (For xxx mpple, spin it in 70/30 ratio)  B. Build Popularity Recommender model.  B. Build Collaborative Filtering model.	1	1 2 3 4 5  Ost of the people has given the rating of 5  Unique Users and products
Analyzing the rating		<pre>print("-"*50) print("\nTotal no of ratings :",electronics_data.shape[0]) print("Total No of Users :", len(np.unique(electronics_data.userId))) print("Total No of products :", len(np.unique(electronics_data.productId)))  otal data otal no of ratings : 1048575 otal No of Users : 786329 otal No of products : 61893</pre>
As a subset of the data randomly into train and test dataset. For more than the subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train and test dataset. For manuple, apilit it in 10-30 ratio.  It like a subset of the data randomly into train a		<pre>analyzing the rating #Analysis of rating given by the user no_of_rated_products_per_user = electronics_data.groupby(by='userId')['Rating'].count().sort_values</pre>
2. Take a subset of the data randomly into train and test dataset. (For sample, spirit in 170/30 ratio)  3. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  4. Build Popularity Recommender model.  4. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  4. Build Popularity Recommender model.  4. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  4. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  4. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  5. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  5. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  6. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  6. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  6. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  6. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  6. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  6. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  6. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  6. Spill the data randomly into train and test dataset. (For sample, spill time in 170/30 ratio)  6. Spill the data randomly into train and test dataset. (For sample, spill the sample in 170/30 ratio)  6. Spill the data randomly into train and test dataset. (For sample in 170/30 ratio)  6. Spill the data randomly into train and test dataset. (For sample in 170/30 ratio)  6. Spill the data randomly into train and test dataset. (For sample in 170/30 ratio)  6. Spill the data randomly in	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	5JLAU2ARJOBO 412 231WM2Z2JLOU3 249 25HBO5V8S8SEA 164 6FIAB28IS79 146 T6CZDCP4TRGA 128 ame: Rating, dtype: int64  no_of_rated_products_per_user.describe()  ount 786329.000000 ean 1.333507 td 1.385613 in 1.000000
Author for the data can be seen to the data set to make it less sparse / denser or example, sept it in 170/201 ratios)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain to train and test dataset. ( For example, sept it in 170/201 ratio)  Split the data can domain	7	1.000000 1.000000 1.000000 1.000000 1.000000 1.0100000 1.010000000 1.01000000 1.01000000 1.01000000 1.01000000 1.01000000 1.010000000 1.010000000 1.010000000 1.010000000 1.010000000 1.0100000000
To lake a subset of the dataset to make it less sparse/ denser or example, feep the users only who has given 30 or more under the data and only it less sparse/ denser or example, feep the users only who has given 30 or more under the data and only it less sparse/ denser or example, sparse/		<pre>plt.scatter(x=quantiles.index[::25], y=quantiles.values[::25], c='m', label = "quantiles with 0.25 in plt.ylabel('No of ratings by user') plt.xlabel('Value at the quantile') plt.legend(loc='best') plt.show()  Quantiles and their Values  Auo quantiles with 0.05 intervals quantiles with 0.25 intervals quantiles with 0.25 intervals</pre>
E. Take a subset of the dataset to make it less sparse/ denser or example, keep the users only who has given 50 or more uniting of a subset of the dataset to make it less sparse/ denser or example, keep the users only who has given 50 or more uniting of a subset of the dataset of the datase	The second of the second	200 -
The complex of the co		Take a subset of the dataset to make it less sparse/ denseit
S. Spilt the gallet an andomyly into train and test dataset. (For xample, spilt in 70/30 ratio)  S. Spilt the gallet in 70/30 ratio)  S. Spilt represent some spile in 70/30 ratio of 70/30 r		or example, keep the users only who has given 50 or more number of ratings)  print('\n No of rated product more than 50 per user: {}\n'.format(sum(no_of_rated_products_per_user))  No of rated product more than 50 per user: 38
Security and a securi		new_df=electronics_data.groupby("productId").filter(lambda x:x['Rating'].count() >=50)  1. Split the data randomly into train and test dataset. (For example, split it in 70/30 ratio)  1. Split the data randomly into train and test dataset. (For example, split it in 70/30 ratio)  1. Split the data randomly into train and test dataset. (For example, split it in 70/30 ratio)
As Build Popularity Recommender model.  Build Popularity Recommender to the service of the servi		<pre>from surprise import Reader import os from surprise.model_selection import train_test_split  #Reading the dataset reader = Reader(rating_scale=(1, 5)) data = Dataset.load_from_df(new_df,reader)</pre>
A STATE OF THE COLUMN TO THE C		. Build Popularity Recommender model.  . of_ratings_per_movie = new_df.groupby(by='productId')['Rating'].count().sort_values(ascending=Falue)  fig = plt.figure(figsize=plt.figaspect(.5))  ax = plt.gca() plt.plot(no_of_ratings_per_movie.values) plt.title('# RATINGS per Product') plt.xlabel('Product') plt.ylabel('No of Users who rated a product')
Security of the control of the contr		plt.ylabel('No of Users who rated a product') ax.set_xticklabels([]) plt.show()  # RATINGS per Product
And the second s		Product  #Average rating of the product  new_df.groupby('productId')['Rating'].mean().head()  roductId 400501466 3.560000
Security and a security of the control of the contr		400501466
Secretary deposits on the Control of		00005LE76
Additional particles of the property of the pr		<pre>ame: Rating, dtype: int64  ratings_mean_count = pd.DataFrame(new_df.groupby('productId')['Rating'].mean())  ratings_mean_count['rating_counts'] = pd.DataFrame(new_df.groupby('productId')['Rating'].count())  ratings_mean_count.head()  Rating_rating_counts  productId</pre>
The regiment of content (a) (1) and a second (a) (1) and a second (a) (1) and a second (a) (a)		400501466 3.560000 250 400501520 4.243902 82 400501776 3.884892 139 400532620 3.684211 171 400532655 3.727273 484
Security products and advantage of the second products of the second		<pre>plt.figure(figsize=(8,6)) plt.rcParams['patch.force_edgecolor'] = True ratings_mean_count['rating_counts'].hist(bins=50)  AxesSubplot:&gt;</pre>
So a solution of the control of the	1	500
promption (fight Pare Jo. 5):  Discrepance (fight Pare Jo. 5):  Di	2	<pre>0 2000 4000 6000 8000  plt.figure(figsize=(8,6)) plt.rcParams['patch.force_edgecolor'] = True ratings_mean_count['Rating'].hist(bins=50)  AxesSubplot:&gt;</pre>
ppilitinary (typical (see 1), 10 and	L	50
popular_products = pd_blasPrame(new_dfl_groupsy(*product.to*)* *Falling* .count.()) most_popular_products = pd_blasPrame(new_dfl_groupsy(*product.to*)* *Falling* .count.()) most_popular_poducts.sort_values(*Rating*, ascending=False) most_popular_head(30).plot(xind = "bar")  AxesSubplot:xlobel='productId'>  Rating  ###################################		plt.figure(figsize=(8,6)) plt.rcParams['patch.force_edgecolor'] = True sns.jointplot(x='Rating', y='rating_counts', data=ratings_mean_count, alpha=0.4) seaborn.axisgrid.JointGrid at 0x1f319d43a60>
popular products = pd.BataFrame(new df.groupby('productId')['Bating'].count()) most popular = popular products.sort. values('Bating', sacending-False) most popular.head(30).plot(kind = "bar")  (AxesSubplot:xlabel='productId'>    Rating	Tation contra	6000 -
Rating  Rating		popular_products = pd.DataFrame(new_df.groupby('productId')['Rating'].count()) most_popular = popular_products.sort_values('Rating', ascending=False) most_popular.head(30).plot(kind = "bar")
# Use user_based true/false to switch between user-based or item-based collaborative filtering algo = KNNWithMeans (k=5, sim_options={'name': 'pearson_baseline', 'user_based': False}) algo.fit(trainset)  # Stimating biases using als  # Use prediction_algorithms.knns.KNNWithMeans at 0x1f327047100>  # run the trained model against the testset test_pred = algo.test(testset)	1	
<pre>algo.fit(trainset)  Stimating biases using als Computing the pearson_baseline similarity matrix Done computing similarity matrix. Surprise.prediction_algorithms.knns.KNNWithMeans at 0x1f327047100&gt;  # run the trained model against the testset test_pred = algo.test(testset)</pre>	1 1 1	Rating  000 -  000 -  000 -  000 -
	8 6 4	Rating  Rating
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```
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