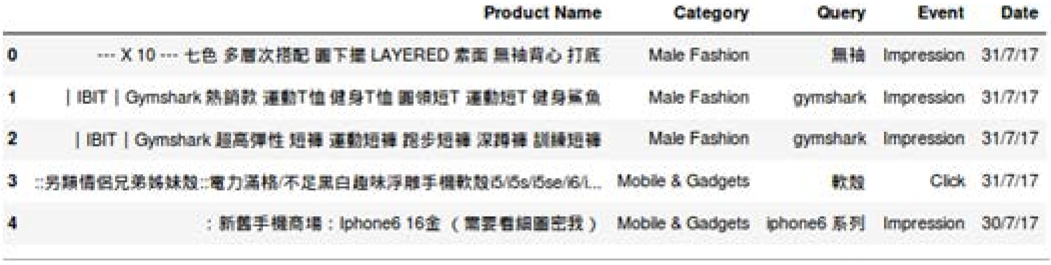
Procedures for the case study of product keywords extraction

Step 1: Clean the train data

Including loading the data, adding the header and removing the null data. The train data is represented as follows after processing



	Product Name	Category	Query	Event	Date
0	--- X 10 --- 七色 多層次搭配 圓下擺 LAYERED 素面 無袖背心 打底	Male Fashion	無袖	Impression	31/7/17
1	｜IBIT｜Gymshark 熱銷款 運動T恤 健身T恤 圓領短T 運動短T 健身鯊魚	Male Fashion	gymshark	Impression	31/7/17
2	｜IBIT｜Gymshark 超高彈性 短褲 運動短褲 跑步短褲 深蹲褲 訓練短褲	Male Fashion	gymshark	Impression	31/7/17
3	::另類情侶兄弟姊妹殼::電力滿格/不足黑白趣味浮雕手機軟殼i5/i5s/i5se/i6/i...	Mobile & Gadgets	軟殼	Click	31/7/17
4	：新舊手機商場：Iphone6 16金（需要看細圖密我）	Mobile & Gadgets	iphone6 系列	Impression	30/7/17

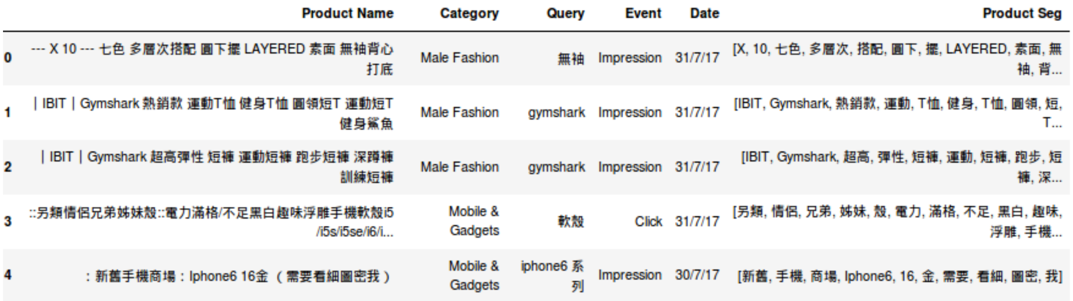
Function and description

Function	Description
preprocess	to clean the train data

The following steps (step 2 and step 3) aim to construct a similarity index model

Step 2: Process the train data

2.1 Segment the product name in the train data using jieba



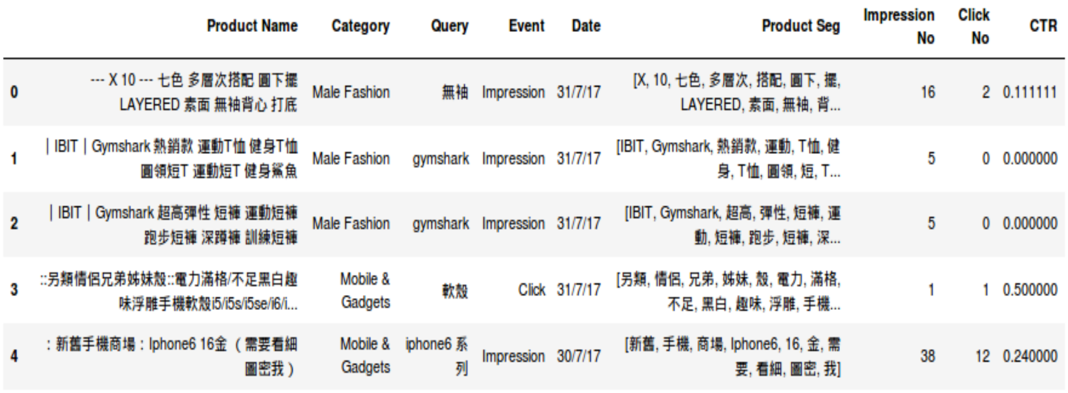
	Product Name	Category	Query	Event	Date	Product Seg
0	--- X 10 --- 七色 多層次搭配 圓下擺 LAYERED 素面 無袖背心 打底	Male Fashion	無袖	Impression	31/7/17	[X, 10, 七色, 多層次, 搭配, 圓下, 擺, LAYERED, 素面, 無袖, 背...
1	｜IBIT｜Gymshark 熱銷款 運動T恤 健身T恤 圓領短T 運動短T 健身鯊魚	Male Fashion	gymshark	Impression	31/7/17	[IBIT, Gymshark, 熱銷款, 運動, T恤, 健身, T恤, 圓領, 短, T...
2	｜IBIT｜Gymshark 超高彈性 短褲 運動短褲 跑步短褲 深蹲褲 訓練短褲	Male Fashion	gymshark	Impression	31/7/17	[IBIT, Gymshark, 超高, 彈性, 短褲, 運動, 短褲, 跑步, 短褲, 深...
3	::另類情侶兄弟姊妹殼::電力滿格/不足黑白趣味浮雕手機軟殼i5/i5s/i5se/i6/i...	Mobile & Gadgets	軟殼	Click	31/7/17	[另類, 情侶, 兄弟, 姊妹, 殼, 電力, 滿格, 不足, 黑白, 趣味, 浮雕, 手機...
4	：新舊手機商場：Iphone6 16金（需要看細圖密我）	Mobile & Gadgets	iphone6 系列	Impression	30/7/17	[新舊, 手機, 商場, Iphone6, 16, 金, 需要, 看細, 圖密, 我]

Function and description

Function	Description
jieba_fenci	to exclude all the special symbols and segment the product name
remove_space	to remove null data after split the product name

2.2 Evaluate the queries

Impression No – frequency of a query appears as ‘Impression’ in train data set.
Click No – frequency of a query that appear as ‘Click’ in the train data set.
CTR – Click No/(Click No+ Impression No)



	Product Name	Category	Query	Event	Date	Product Seg	Impression No	Click No	CTR
0	--- X 10 --- 七色 多層次搭配 圓下擺 LAYERED 素面 無袖背心 打底	Male Fashion	無袖	Impression	31/7/17	[X, 10, 七色, 多層次, 搭配, 圓下, 擺, LAYERED, 素面, 無袖, 背...	16	2	0.111111
1	｜IBIT｜Gymshark 熱銷款 運動T恤 健身T恤 圓領短T 運動短T 健身鯊魚	Male Fashion	gymshark	Impression	31/7/17	[IBIT, Gymshark, 熱銷款, 運動, T恤, 健身, T恤, 圓領, 短, T...	5	0	0.000000
2	｜IBIT｜Gymshark 超高彈性 短褲 運動短褲 跑步短褲 深蹲褲 訓練短褲	Male Fashion	gymshark	Impression	31/7/17	[IBIT, Gymshark, 超高, 彈性, 短褲, 運動, 短褲, 跑步, 短褲, 深...	5	0	0.000000
3	::另類情侶兄弟姊妹殼::電力滿格/不足黑白趣味浮雕手機軟殼i5/i5s/i5se/i6/i...	Mobile & Gadgets	軟殼	Click	31/7/17	[另類, 情侶, 兄弟, 姊妹, 殼, 電力, 滿格, 不足, 黑白, 趣味, 浮雕, 手機...	1	1	0.500000
4	：新舊手機商場：Iphone6 16金（需要看細圖密我）	Mobile & Gadgets	iphone6 系列	Impression	30/7/17	[新舊, 手機, 商場, Iphone6, 16, 金, 需要, 看細, 圖密, 我]	38	12	0.240000

Function and description

Function	Description
event_count	to count the number of 'impression' and 'click' for each query

Step 3: Create a similarity model

3.1 Create a ‘dictionary’ of the training corpus’ raw text:

dictionary = corpora.Dictionary(texts_cut)

3.2 Convert the training corpus to vector space:

corpus = dictionary.doc2bow(texts_cuts)

3.3 Initialize the TF-IDF model and convert the corpus to vectors in tf-idf space

tfidf = models.TfidfModel(corpus)
corpus_tfidf = tfidf[corpus]

3.4 Create a similarity index model

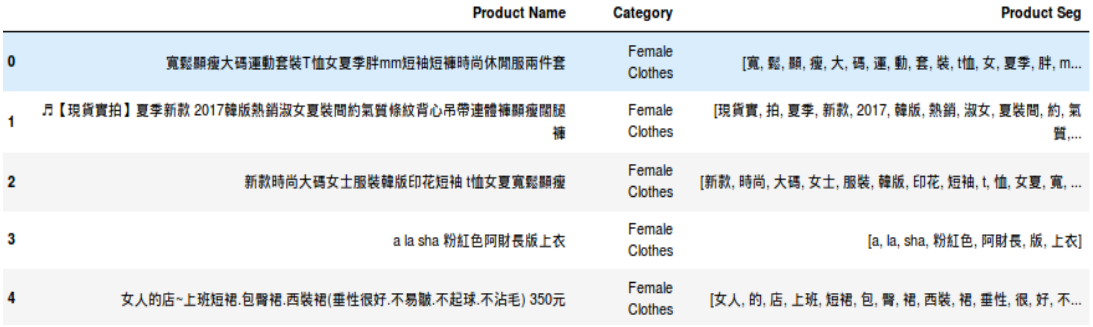
index =similarities.MatrixSimilarity(corpus_tfidf)

Function and description

Function	Description
get_index	to create a dictionary, corpus, tdidf model and a similarity index model

Step 4: Get the similar product list for a new product from test data

4.1 Segment the product name in the test data



	Product Name	Category	Product Seg
0	寬鬆顯瘦大碼運動套裝T恤女夏季胖mm短袖短褲時尚休閒服兩件套	Female Clothes	[寬, 鬆, 顯, 瘦, 大, 碼, 運, 動, 套, 裝, t恤, 女, 夏季, 胖, m...
1	♬【現貨實拍】夏季新款 2017韓版熱銷淑女夏裝間約氣質條紋背心吊帶連體褲顯瘦闊腿褲	Female Clothes	[現貨實, 拍, 夏季, 新款, 2017, 韓版, 熱銷, 淑女, 夏裝間, 約, 氣質,...
2	新款時尚大碼女士服裝韓版印花短袖 t恤女夏寬鬆顯瘦	Female Clothes	[新款, 時尚, 大碼, 女士, 服裝, 韓版, 印花, 短袖, t, 恤, 女夏, 寬, ...
3	a la sha 粉紅色阿財長版上衣	Female Clothes	[a, la, sha, 粉紅色, 阿財長, 版, 上衣]
4	女人的店~上班短裙.包臀裙.西裝裙(垂性很好.不易皺.不起球.不沾毛) 350元	Female Clothes	[女人, 的, 店, 上班, 短裙, 包, 臀, 裙, 西裝, 裙, 垂性, 很, 好, 不...

4.2 For a new product, get the similarity product list

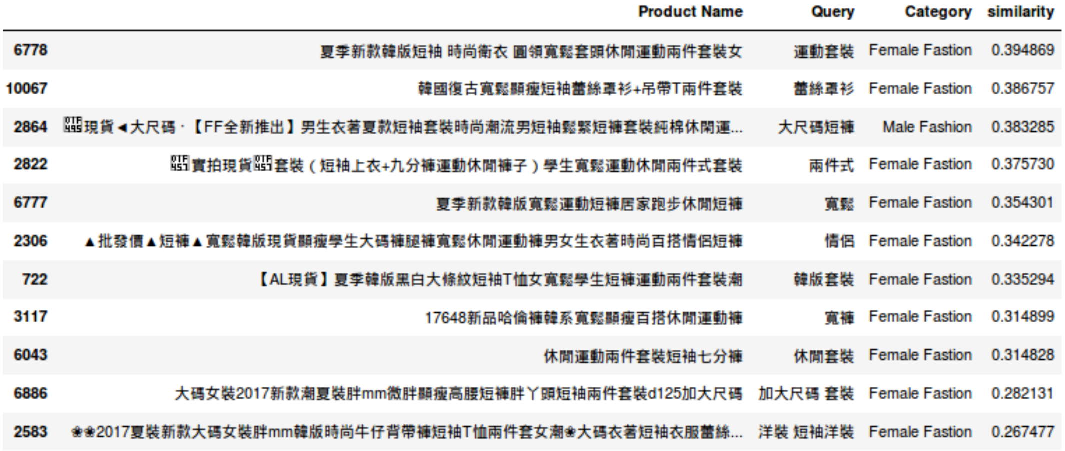
```
query_bow = dictioary.doc2bow(query_product_cuts)
query_tfidf = tfidf[query_bow]
sim = index[query_tfidf]
```

For a given product such as

寬鬆顯瘦大碼運動套裝T恤女夏季胖mm短袖短褲時尚休閒服兩件套

Get the similar product list from the train dataset

similarity - similarity between the given product and the similar products



	Product Name	Query	Category	similarity
6778	夏季新款韓版短袖 時尚衛衣 圓領寬鬆套頭休閒運動兩件套裝女	運動套裝	Female Fastion	0.394869
10067	韓國復古寬鬆顯瘦短袖蕾絲罩衫+吊帶T兩件套裝	蕾絲罩衫	Female Fastion	0.386757
2864	□現貨◄大尺碼·【FF全新推出】男生衣著夏款短袖套裝時尚潮流男短袖鬆緊短褲套裝純棉休閒運...	大尺碼短褲	Male Fashion	0.383285
2822	□實拍現貨□套裝（短袖上衣+九分褲運動休閒褲子）學生寬鬆運動休閒兩件式套裝	兩件式	Female Fastion	0.375730
6777	夏季新款韓版寬鬆運動短褲居家跑步休閒短褲	寬鬆	Female Fastion	0.354301
2306	▲批發價▲短褲▲寬鬆韓版現貨顯瘦學生大碼褲腿褲寬鬆休閒運動褲男女生衣著時尚百搭情侶短褲	情侶	Female Fastion	0.342278
722	【AL現貨】夏季韓版黑白大條紋短袖T恤女寬鬆學生短褲運動兩件套裝潮	韓版套裝	Female Fastion	0.335294
3117	17648新品哈倫褲韓系寬鬆顯瘦百搭休閒運動褲	寬褲	Female Fastion	0.314899
6043	休閒運動兩件套裝短袖七分褲	休閒套裝	Female Fastion	0.314828
6886	大碼女裝2017新款潮夏裝胖mm微胖顯瘦高腰短褲胖丫頭短袖兩件套裝d125加大尺碼	加大尺碼 套裝	Female Fastion	0.282131
2583	❀❀2017夏裝新款大碼女裝胖mm韓版時尚牛仔背帶褲短袖T恤兩件套女潮❀大碼衣著短袖衣服蕾絲...	洋裝 短袖洋裝	Female Fastion	0.267477

Function and description

Function	Description
get_similar_product_list	to get a similar product list for product from test data (configurable parameter: num_similar_product_list)

Step 5: Further evaluate query quality so as to recommend the keywords

5.1 Calculate more evaluators of the query
query_count – frequency of a ‘query’ that appears in the similar product list
relevance_score – relevance between the ‘query’ and the given product

5.2 Compute the total score for a particular query
To get a total score for a ‘query’, we sum up the evaluator with different weights.

evaluator = [query_count, click*, CTR, event, similarity, relevance_score]*
weights = [0.1, 0.1, 0.1, 0.1, 0.2, 0.4]

To make sure each evaluator is [0,1], we need to standardization the evaluators.

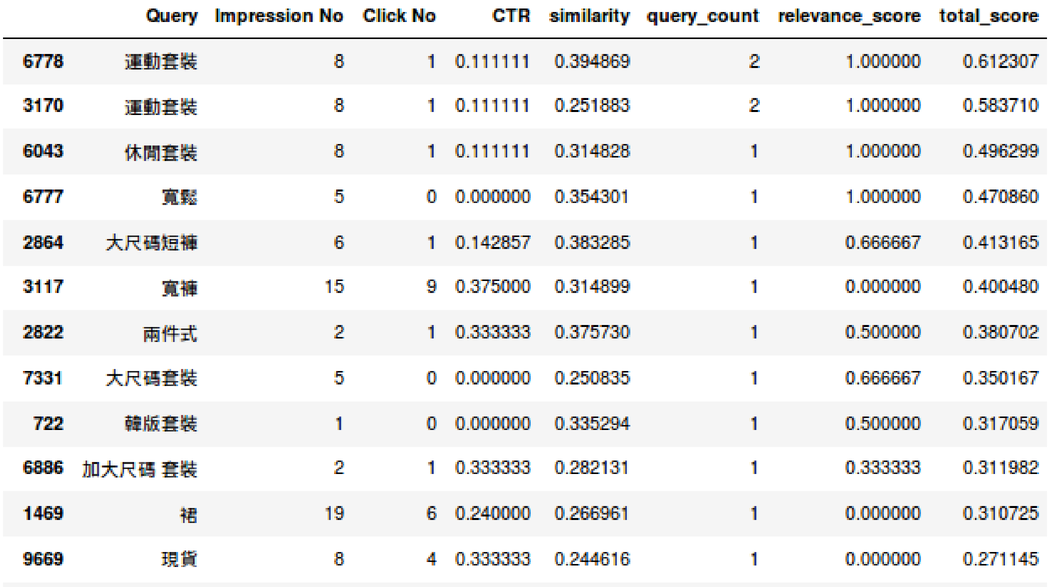
query_count= query_count/ query_count.max()*
click = Click No/ Click No.max()*

the total score can be evaluated as follows:

*total_score = sum(evaluator.*weights)*

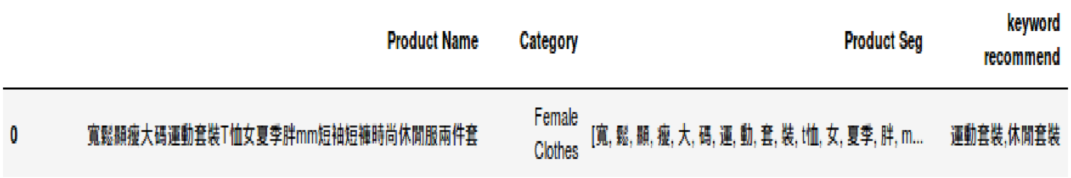
the total_score for each query falls into [0,1].

The performance for the query is listed as follows:



	Query	Impression No	Click No	CTR	similarity	query_count	relevance_score	total_score
6778	運動套裝	8	1	0.111111	0.394869	2	1.000000	0.612307
3170	運動套裝	8	1	0.111111	0.251883	2	1.000000	0.583710
6043	休閒套裝	8	1	0.111111	0.314828	1	1.000000	0.496299
6777	寬鬆	5	0	0.000000	0.354301	1	1.000000	0.470860
2864	大尺碼短褲	6	1	0.142857	0.383285	1	0.666667	0.413165
3117	寬褲	15	9	0.375000	0.314899	1	0.000000	0.400480
2822	兩件式	2	1	0.333333	0.375730	1	0.500000	0.380702
7331	大尺碼套裝	5	0	0.000000	0.250835	1	0.666667	0.350167
722	韓版套裝	1	0	0.000000	0.335294	1	0.500000	0.317059
6886	加大尺碼 套裝	2	1	0.333333	0.282131	1	0.333333	0.311982
1469	裙	19	6	0.240000	0.266961	1	0.000000	0.310725
9669	現貨	8	4	0.333333	0.244616	1	0.000000	0.271145

Then we recommend the keywords based on the total score of the query.
Let num_keywords =2,



	Product Name	Category	Product Seg	keyword recommend
0	寬鬆顯瘦大碼運動套裝T恤女夏季胖mm短袖短褲時尚休閒服兩件套	Female Clothes	[寬, 鬆, 顯, 瘦, 大, 碼, 運, 動, 套, 裝, t恤, 女, 夏季, 胖, m...	運動套裝,休閒套裝

Function and description

Function	Description
get_relevance	to evaluate the relevance between the recommend query and the given product
get_evaluate_product_list	to get a similar product list with more evaluators
get_recommed_key_word	to recommend keywords according the overall query performance(configurable parameter: num_keywords)