Use case Selected

“Dentro del marketplace existen productos similares o idénticos entre sí (son productos vendidos por distintos sellers, en la api puedes obtener y descargar los títulos e incluso las imágenes!). ¿Cómo buscar dichos ítems para agruparlos y volverlos comparables entre sí? Esto permitiría mejorar la experiencia ante muchas opciones similares.”

TitleSimilarityMeLi

Project of title cosine similarity between products in MeLi

Exploration with multiple analysis

(fixed examples, only to explore, not to be run again):

- Tf-Idf and Cosine similarity
- Word Embeddings (word2vec) and Cosine similarity
- Plot titles proximity (of title embedding) in 2D with PCA, TSNE, (with colors both from KMeans and original Categories)

Implementation with selected analysis

(meant to be run multiple times as a train/test solution, to get new examples):

- Selected Algorithm: Word Embeddings and Cosine similarity (due to simplicity of implementation, more robust algorithm and fastness/smaller cosine matrix)
- Selected Plot: 2D with PCA and TSNE (only original Categories, for better understanding)

Pickles

- Historical products for comparison and to minimise computation time
- PCA for plot purposes, explain model importance and way of working to line of business

Observations: word embeddings are downloaded from web, since the file is too heavy to upload to git repo

Problem:

The problem to be solved is to find similar products for the current one the potential customer is looking at. Products both in the same category and 2 alternative categories, that might have some value to explore, to maximise the sale.

Hypotheses:

- If the customer has access to very similar products (more than 80% of cosine similarity according to initial explore, or with a maximum of X fixed selected items) in the same category might be helped in the selection of current article giving the potential customer access to slightly different articles
- If the customer has access to products with high some similarity from other categories might be tempted to buy other articles that have some relation to the one he/she is currently looking at.

Information:

The products selected were around 1000 per category.

- Main category 'Ropa y Accesorios'
    - Hypothesis: clothes is a big category (variety of products different products for women, men and children) that could be combined with others

- Alternative categories 'Deportes y Fitness' + 'Joyas y Relojes'
    - Hypothesis: that might have some relation with the main category. (“women clothes → women sports accessories + women watches”)

Insights:

- Products related to some areas like: women, men, kids, urban, sport, medical, work, gave interesting combinations with alternative categories.

- 'Deportes y Fitness' examples:
    - men trainers → football shorts
    - bra →women sport tights
    - women sporty trainers → cycling women accessories
    - kids jacket or boots → kids sleeping bag or kids bikes accessories

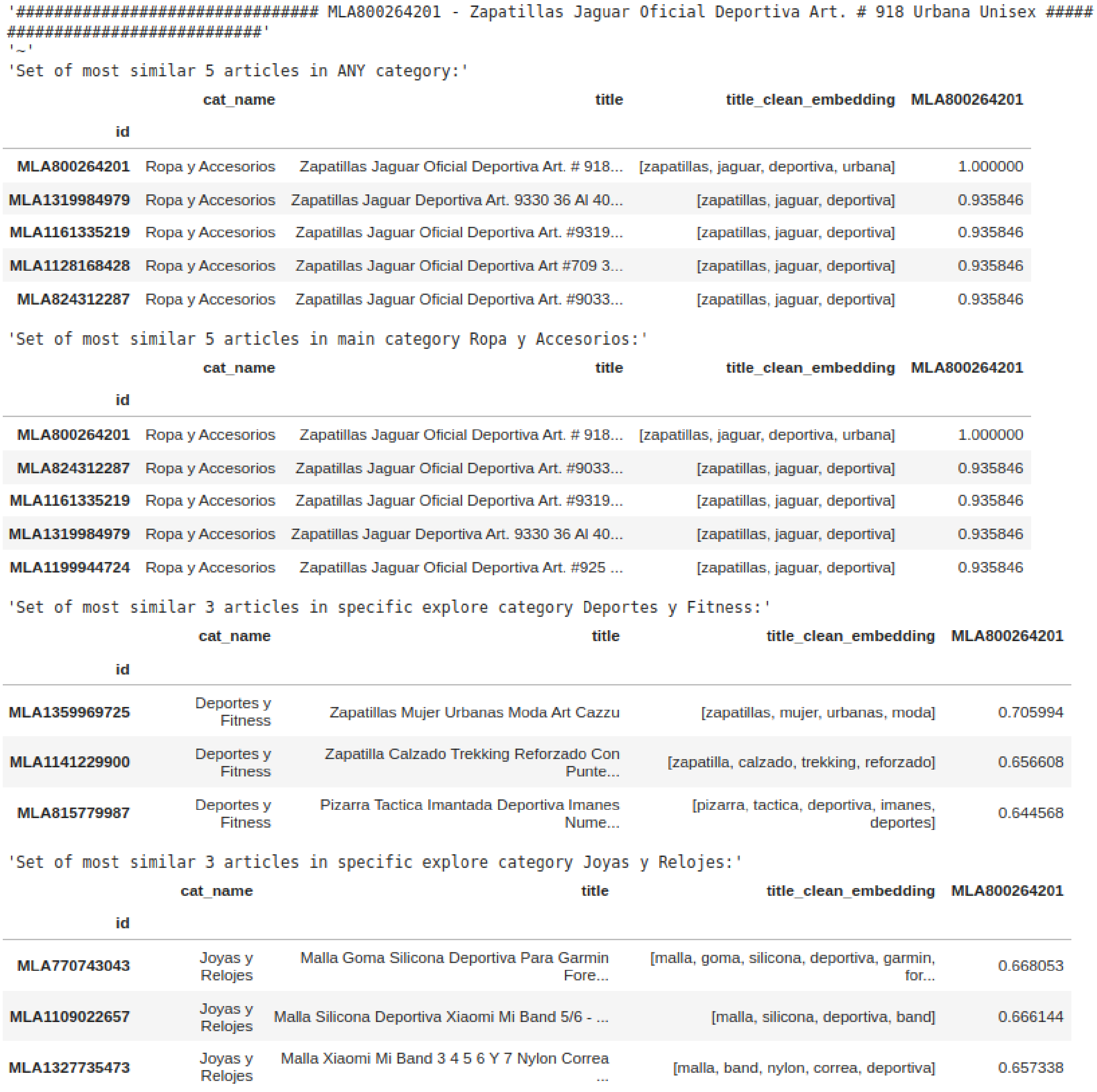
- 'Joyas y Relojes' examples:
    - sporty trainers → sporty watches
    - urban trainers → urban watches
    - kids clothes → kids watches
    - kids clothes → mother jewellery

- Very specific or rare products, or products made from other very specific materials, might not get as interesting mixes with other categories (ex: “rain pilot”).

- Figure:
    - In top the article analysed, (between “#”)
    - After 5 most similar articles in all 3 categories (almost always from original category)
    - After 5 most similar articles in original category (Ropa y Accesorios)
    - After 3 most similar articles in 1st alternative category (Deportes y Fitness)
    - After 3 most similar articles in 2nd alternative category (Joyas y Relojes)

- It found similar products (trainers) ordered by cosine similarity (descending) in same category (slightly different) and other less similar associated to sport category since there were sporty/urban trainers, and sporty watches too.

Ex1: Sporty trainers



```
'################################ MLA800264201 - Zapatillas Jaguar Oficial Deportiva Art. # 918 Urbana Unisex #####
###########################'
'~'
'Set of most similar 5 articles in ANY category:'
```

	cat_name	title	title_clean_embedding	MLA800264201
id				
MLA800264201	Ropa y Accesorios	Zapatillas Jaguar Oficial Deportiva Art. # 918...	[zapatillas, jaguar, deportiva, urbana]	1.000000
MLA1319984979	Ropa y Accesorios	Zapatillas Jaguar Deportiva Art. 9330 36 Al 40...	[zapatillas, jaguar, deportiva]	0.935846
MLA1161335219	Ropa y Accesorios	Zapatillas Jaguar Oficial Deportiva Art. #9319...	[zapatillas, jaguar, deportiva]	0.935846
MLA1128168428	Ropa y Accesorios	Zapatillas Jaguar Oficial Deportiva Art #709 3...	[zapatillas, jaguar, deportiva]	0.935846
MLA824312287	Ropa y Accesorios	Zapatillas Jaguar Oficial Deportiva Art. #9033...	[zapatillas, jaguar, deportiva]	0.935846

```
'Set of most similar 5 articles in main category Ropa y Accesorios:'
```

	cat_name	title	title_clean_embedding	MLA800264201
id				
MLA800264201	Ropa y Accesorios	Zapatillas Jaguar Oficial Deportiva Art. # 918...	[zapatillas, jaguar, deportiva, urbana]	1.000000
MLA824312287	Ropa y Accesorios	Zapatillas Jaguar Oficial Deportiva Art. #9033...	[zapatillas, jaguar, deportiva]	0.935846
MLA1161335219	Ropa y Accesorios	Zapatillas Jaguar Oficial Deportiva Art. #9319...	[zapatillas, jaguar, deportiva]	0.935846
MLA1319984979	Ropa y Accesorios	Zapatillas Jaguar Deportiva Art. 9330 36 Al 40...	[zapatillas, jaguar, deportiva]	0.935846
MLA1199944724	Ropa y Accesorios	Zapatillas Jaguar Oficial Deportiva Art. #925 ...	[zapatillas, jaguar, deportiva]	0.935846

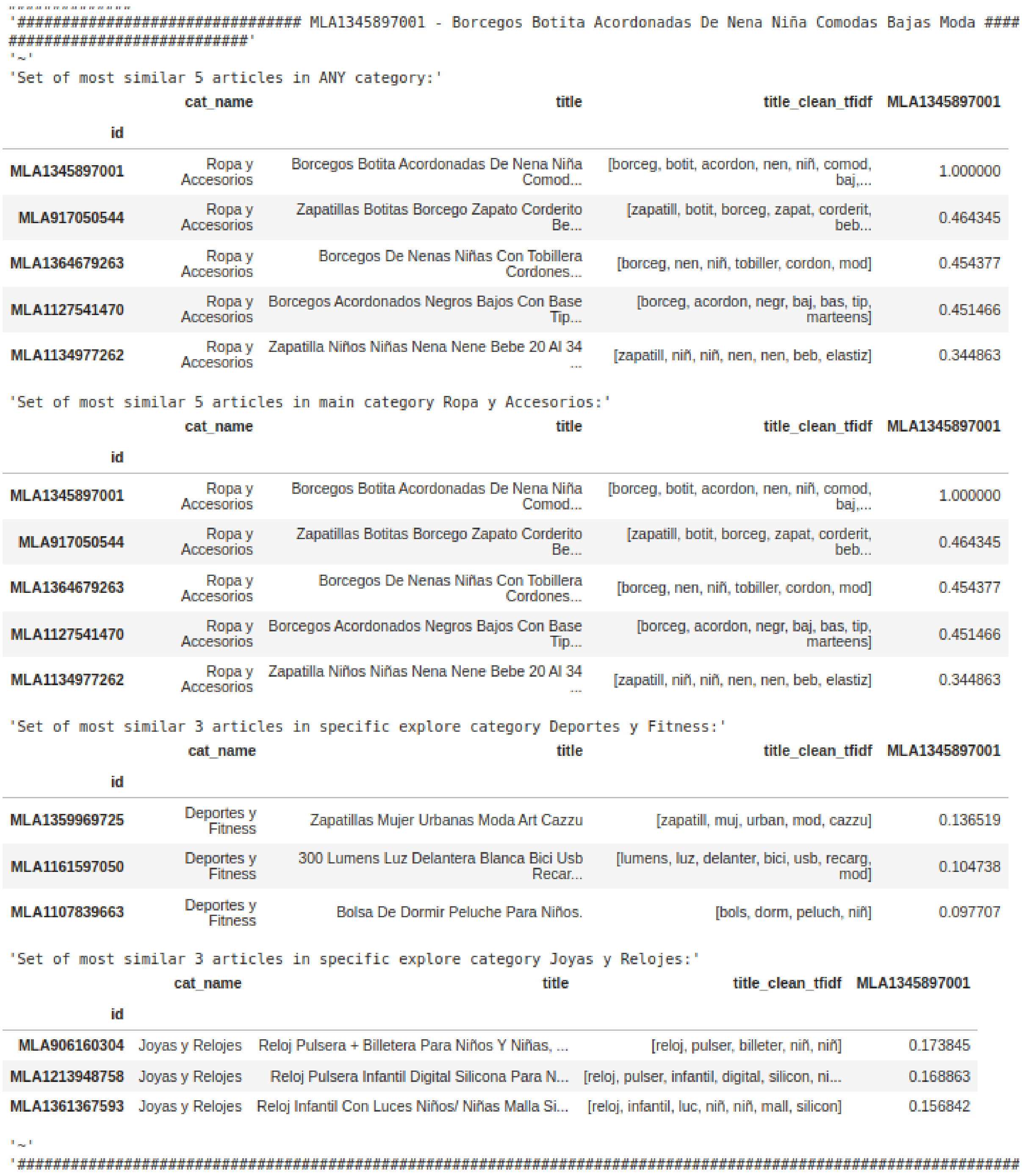
```
'Set of most similar 3 articles in specific explore category Deportes y Fitness:'
```

	cat_name	title	title_clean_embedding	MLA800264201
id				
MLA1359969725	Deportes y Fitness	Zapatillas Mujer Urbanas Moda Art Cazzu	[zapatillas, mujer, urbanas, moda]	0.705994
MLA1141229900	Deportes y Fitness	Zapatilla Calzado Trekking Reforzado Con Punte...	[zapatilla, calzado, trekking, reforzado]	0.656608
MLA815779987	Deportes y Fitness	Pizarra Tactica Imantada Deportiva Imanes Nume...	[pizarra, tactica, deportiva, imanes, deportes]	0.644568

```
'Set of most similar 3 articles in specific explore category Joyas y Relojes:'
```

	cat_name	title	title_clean_embedding	MLA800264201
id				
MLA770743043	Joyas y Relojes	Malla Goma Silicona Deportiva Para Garmin Fore...	[malla, goma, silicona, deportiva, garmin, for...	0.668053
MLA1109022657	Joyas y Relojes	Malla Silicona Deportiva Xiaomi Mi Band 5/6 - ...	[malla, silicona, deportiva, band]	0.666144
MLA1327735473	Joyas y Relojes	Malla Xiaomi Mi Band 3 4 5 6 Y 7 Nylon Correa ...	[malla, band, nylon, correa, deportiva]	0.657338

Ex2: Kids Boots



```
'################################ MLA1345897001 - Borcegos Botita Acordonadas De Nena Niña Comodas Bajas Moda ####
###########################'
'~'
'Set of most similar 5 articles in ANY category:'
```

id	cat_name	title	title_clean_tfidf	MLA1345897001
MLA1345897001	Ropa y Accesorios	Borcegos Botita Acordonadas De Nena Niña Comod...	[borceg, botit, acordon, nen, niñ, comod, baj,...	1.000000
MLA917050544	Ropa y Accesorios	Zapatillas Botitas Borcego Zapato Corderito Be...	[zapatill, botit, borceg, zapat, corderit, beb...	0.464345
MLA1364679263	Ropa y Accesorios	Borcegos De Nenas Niñas Con Tobillera Cordones...	[borceg, nen, niñ, tobiller, cordon, mod]	0.454377
MLA1127541470	Ropa y Accesorios	Borcegos Acordonados Negros Bajos Con Base Tip...	[borceg, acordon, negr, baj, bas, tip, marteens]	0.451466
MLA1134977262	Ropa y Accesorios	Zapatilla Niños Niñas Nena Nene Bebe 20 Al 34 ...	[zapatill, niñ, niñ, nen, nen, beb, elastiz]	0.344863

```
'Set of most similar 5 articles in main category Ropa y Accesorios:'
```

id	cat_name	title	title_clean_tfidf	MLA1345897001
MLA1345897001	Ropa y Accesorios	Borcegos Botita Acordonadas De Nena Niña Comod...	[borceg, botit, acordon, nen, niñ, comod, baj,...	1.000000
MLA917050544	Ropa y Accesorios	Zapatillas Botitas Borcego Zapato Corderito Be...	[zapatill, botit, borceg, zapat, corderit, beb...	0.464345
MLA1364679263	Ropa y Accesorios	Borcegos De Nenas Niñas Con Tobillera Cordones...	[borceg, nen, niñ, tobiller, cordon, mod]	0.454377
MLA1127541470	Ropa y Accesorios	Borcegos Acordonados Negros Bajos Con Base Tip...	[borceg, acordon, negr, baj, bas, tip, marteens]	0.451466
MLA1134977262	Ropa y Accesorios	Zapatilla Niños Niñas Nena Nene Bebe 20 Al 34 ...	[zapatill, niñ, niñ, nen, nen, beb, elastiz]	0.344863

```
'Set of most similar 3 articles in specific explore category Deportes y Fitness:'
```

id	cat_name	title	title_clean_tfidf	MLA1345897001
MLA1359969725	Deportes y Fitness	Zapatillas Mujer Urbanas Moda Art Cazzu	[zapatill, muj, urban, mod, cazzu]	0.136519
MLA1161597050	Deportes y Fitness	300 Lumens Luz Delantera Blanca Bici Usb Recar...	[lumens, luz, delanter, bici, usb, recarg, mod]	0.104738
MLA1107839663	Deportes y Fitness	Bolsa De Dormir Peluche Para Niños.	[bols, dorm, peluch, niñ]	0.097707

```
'Set of most similar 3 articles in specific explore category Joyas y Relojes:'
```

id	cat_name	title	title_clean_tfidf	MLA1345897001
MLA906160304	Joyas y Relojes	Reloj Pulsera + Billetera Para Niños Y Niñas, ...	[reloj, pulser, billeter, niñ, niñ]	0.173845
MLA1213948758	Joyas y Relojes	Reloj Pulsera Infantil Digital Silicona Para N...	[reloj, pulser, infantil, digital, silicon, ni...	0.168863
MLA1361367593	Joyas y Relojes	Reloj Infantil Con Luces Niños/ Niñas Malla Si...	[reloj, infantil, luc, niñ, niñ, mall, silicon]	0.156842

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'~'
'#################################################################################################################
```

Methodology and Algorithms applied:

- *Title preprocessing of words: lower case, remove symbols, remove stop words, remove words with no value in similarity context (related to the delivery or colours)*

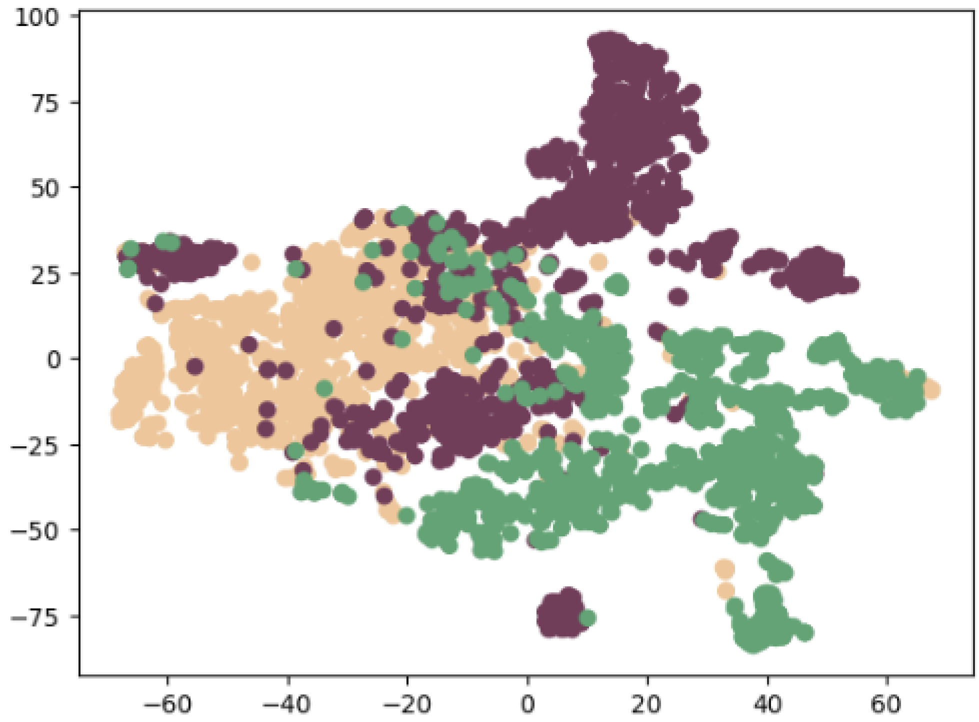
- *Word importance and meaning:*

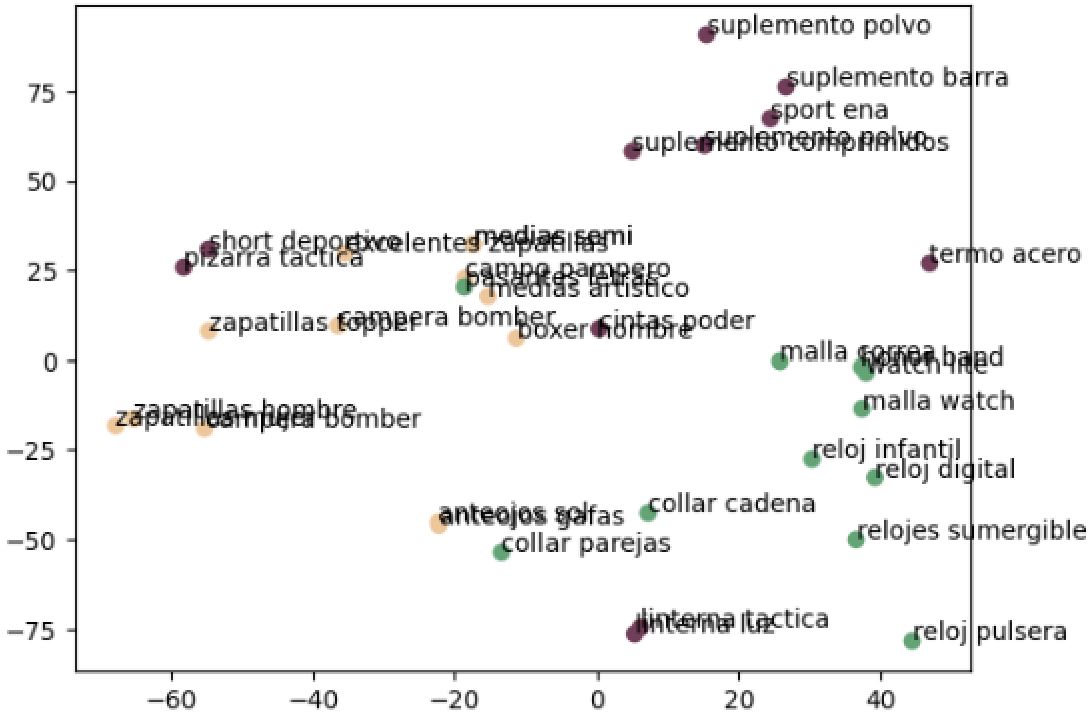
- *Tf-idf was used to check word importance. This is a simpler approach but slower and too fixed to training data → not selected for final solution*
- *Embeddings were used to understand word meaning. Faster approach (smaller vector representation) and simpler implementation for a variety of words (captures similarity between different words that might not be part of original training ex. "Mujer", "Dama", ..) → selected for final solution*

- *Title similarity:*
    - *Word vectors (from each title) were summed up into one vector to represent the "product title representation" as a simple approach in both cases*
    - *Cosine similarity between product vectors to order from most to least similar product*

- *Plots for better Line of Business Explainability*
    - *PCA and TSNE over product vectors to reduce variables and understand weights in each products, and plot results in 2 dimesions*
    - *Kmeans over PCA of product vectors to try to find different groups of categories, given more time and training might have found better clusters.*
    - *Original Categories used to show intersections between different categories*

TSNE plot with colours of **3 different categories** analysed to show intersection between categories. And some examples (first 2 words of title used in embedding) to show how similar products are close to each other in a very graphical way (2D representation).





Final solution, metrics and conclusion:

Since this solution has a very **unsupervised approach**, there is not a specific metric. From exploratory analysis a good measure of cosine similarity could be 80%-100% to be on the safe side. Anyway there are products very similar but lower scores. 80% minimum similarity could be an initial standard to suggest to the line of business to start a pilot with, or a fixed amount of similar items with most similarity.

The final solution is trained on 80% of the data, and tested on 20% never seen by the model. It generates a historical database of train product representation (embeddings).

The idea is to get the best similarities of new products (test) among themselves and with historical products (train). These similarity scores are ordered from highest to lowest, in general and by categories to give both true similar products and other category similarities the customer might be interested in.

This approach is meant to be fast on new products.

Next steps:

This **solution could be piloted** and with some **feedback** from customers (clicks/buys of items suggested) a **predictive model** could be trained, **to refine % of similarity** by category.

Also, **more specific clusters** (jackets, trousers,.. or women, men, kids, .. etc) could be created for other purposes.