

# Homework 6

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Dark blue squares indicate strong positive correlations, while white squares represent weak or no correlation.and the red indicate strong negative correlation	54
but i didn't see any red spot. they are whether weak or no correlation or positive correlations. and all make with retangle or square it seem to cluster together with different area.	54
High VIF values indicate strong multicollinearity among predictor variables.	57
from the result,it is not spread average. some high vif value like groceries got 3136. and the jewelry only got 72.38215.	57
it mean this model combined variety of strong or weak multicollinearity among predictor variables	57
the first three components from this graph. from the fifth component, the marginal gain in explained variance is 0.	59
Principal Component 1 (Comp.1): This component represents discretionary spending.	62
Principal Component 2 (Comp.2): This component represents essential living expenses.	62
Principal Component 3 (Comp.3): This component represents leisure-related spending.	62
the maxium of vif value from linear regression was 3927.165. but using the principal components i chose to keep just 1.0	64
Higher values signify that it is difficult to impossible to assess accurately the contribution of predictors to a model. therefore, my principal component could be more accurate to predict the model.	64

**Understanding Coefficients:** In the regression model, the coefficients of principal components show how much each component influences the prediction of income. A positive coefficient means increasing that component leads to higher predicted income, while a negative one means the opposite.

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**Reducing Dimensions:** Using principal components in regression cuts down data dimensions while still capturing original variables' variance. This simplifies the model and can tackle issues like multicollinearity.

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**! Important**

Please read the instructions carefully before submitting your assignment.

1. This assignment requires you to only upload a PDF file on Canvas
2. Don't collapse any code cells before submitting.
3. Remember to make sure all your code output is rendered properly before uploading your submission.

Please add your name to the author information in the frontmatter before submitting your assignment

In this assignment, we will perform various tasks involving principal component analysis (PCA), principal component regression, and dimensionality reduction.

We will need the following packages:

```
packages <- c(
  "tibble",
  "dplyr",
  "readr",
  "tidyr",
  "purrr",
  "broom",
  "magrittr",
  "corrplot",
  "car"
)
# renv::install(packages)
sapply(packages, require, character.only=T)

library(factoextra)
```

Warning: package 'factoextra' was built under R version 4.3.3

Loading required package: ggplot2

Welcome! Want to learn more? See two factoextra-related books at <https://goo.gl/ve3WBa>

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## Question 1

💡 70 points

Principal component analysis and variable selection

### 1.1 (5 points)

The `data` folder contains a `spending.csv` dataset which is an illustrative sample of monthly spending data for a group of 5000 people across a variety of categories. The response variable, `income`, is their monthly income, and objective is to predict the `income` for an individual based on their spending patterns.

Read the data file as a tibble in R. Preprocess the data such that:

1. the variables are of the right data type, e.g., categorical variables are encoded as factors
2. all column names to lower case for consistency
3. Any observations with missing values are dropped

```
path <- "data/spending.csv"

df <- read_csv(path) %>%
  mutate_if(is.character, as.factor) %>%
  rename_with(tolower) %>%
  drop_na() # Insert your code here
```

Rows: 5000 Columns: 40

-- Column specification -----

Delimiter: ","

dbl (40): accessories, accommodation, alcohol, audio\_equipment, beverages, b...

i Use ``spec()`` to retrieve the full column specification for this data.

i Specify the column types or set ``show_col_types = FALSE`` to quiet this message.

```
head(df)
```

```
# A tibble: 6 x 40
  accessories accommodation alcohol audio_equipment beverages books cameras
      <dbl>          <dbl>    <dbl>          <dbl>      <dbl> <dbl>    <dbl>
1         4.45         90.1     39.2           7.6       57.9 45.1     6.62
2        10.9         84.9     28.7          44.3       43.9 42.3     27.5
3         5.77         18.5     37.5          13.4       57.3  8.65     7.13
4        15.0         77.8     33.3          101.       51.9 40.6     65.9
5        26.9         12.5     10.1           82.4       14.6  6.87     55.8
6         4.49         25.7     29.5          93.8       42.2 12.7     60.6
# i 33 more variables: car_rentals <dbl>, clothing <dbl>, coffee_shops <dbl>,
# dairy_products <dbl>, desktops <dbl>, electronics <dbl>, fast_food <dbl>,
# food_delivery <dbl>, fruits <dbl>, groceries <dbl>, gym_memberships <dbl>,
# jewelry <dbl>, laptops <dbl>, magazines <dbl>, meat <dbl>, movies <dbl>,
# music <dbl>, outdoor_activities <dbl>, public_transportation <dbl>,
# restaurant_meals <dbl>, seafood <dbl>, shoes <dbl>, smartphones <dbl>,
# snacks <dbl>, software <dbl>, sports_equipment <dbl>, ...
```

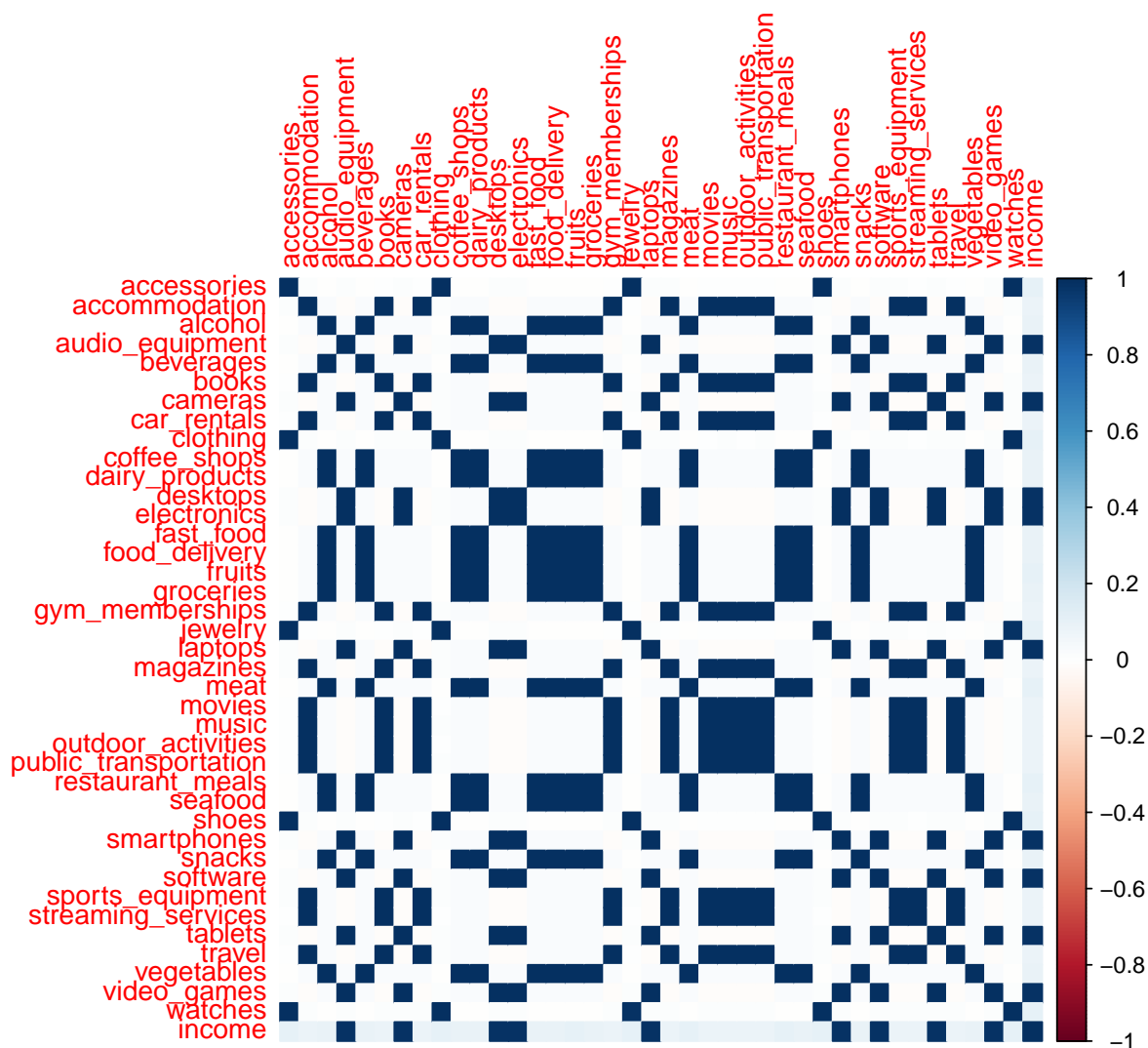
---

1.2 (5 points)

Visualize the correlation between the variables using the `corrplot()` function. What do you observe? What does this mean for the model?

```
correlation_matrix <- cor(df)

df_x <- corrplot(correlation_matrix, method = "color")
```



df\_x

\$corr

	accessories	accommodation	alcohol	audio_equipment
accessories	1.0000000000	0.010156922	-0.002377077	0.01277653
accommodation	0.0101569217	1.000000000	0.026474171	-0.01477922
alcohol	-0.0023770769	0.026474171	1.000000000	0.02717688

audio_equipment	0.0127765309	-0.014779215	0.027176884	1.00000000
beverages	-0.0017703850	0.027041557	0.998266334	0.02691528
books	0.0091358021	0.996828691	0.025594617	-0.01491504
cameras	0.0128334291	-0.016078315	0.027060066	0.99911984
car_rentals	0.0095676060	0.998269404	0.025114097	-0.01605982
clothing	0.9961752830	0.011170251	-0.003155228	0.01410026
coffee_shops	-0.0018566771	0.027756060	0.997443330	0.02633821
dairy_products	-0.0015237022	0.027110975	0.998525782	0.02671858
desktops	0.0132732029	-0.015545654	0.027237976	0.99911387
electronics	0.0119866717	-0.015081354	0.027495189	0.99964865
fast_food	-0.0019699126	0.027526488	0.998440860	0.02733868
food_delivery	-0.0013589950	0.027166294	0.998189422	0.02695111
fruits	-0.0014180691	0.027021848	0.998398925	0.02753635
groceries	-0.0015124591	0.027156606	0.998603032	0.02716984
gym_memberships	0.0098807707	0.998339252	0.026762367	-0.01422042
jewelry	0.9907349501	0.009876784	-0.001515553	0.01456830
laptops	0.0120082583	-0.014934205	0.027786853	0.99946393
magazines	0.0100346305	0.996871194	0.027757340	-0.01519459
meat	-0.0012731499	0.027551674	0.998499503	0.02751092
movies	0.0088569352	0.998287447	0.026555741	-0.01401707
music	0.0091689945	0.998298589	0.026740331	-0.01583353
outdoor_activities	0.0080890730	0.998260562	0.025600128	-0.01496576
public_transportation	0.0090511209	0.998273308	0.026540719	-0.01443355
restaurant_meals	-0.0017311421	0.027589852	0.998437192	0.02738920
seafood	-0.0008409656	0.027025610	0.998418867	0.02678655
shoes	0.9956389054	0.010613592	-0.003325268	0.01516455
smartphones	0.0118714000	-0.015256015	0.027683142	0.99959039
snacks	-0.0017851199	0.027469622	0.998162564	0.02713339
software	0.0125438557	-0.015064598	0.026911921	0.99912437
sports_equipment	0.0103810730	0.996918010	0.025730886	-0.01571323
streaming_services	0.0081608008	0.998746597	0.026546436	-0.01484509
tablets	0.0124410675	-0.014619370	0.027552900	0.99947256
travel	0.0098335713	0.998730430	0.027025424	-0.01486823
vegetables	-0.0008281898	0.027047792	0.998405803	0.02729605
video_games	0.0122784524	-0.015003070	0.027474783	0.99959455
watches	0.9910915006	0.014555443	-0.004392785	0.01366982
income	0.1040004544	0.086647149	0.099541889	0.98794577
	beverages	books	cameras	car_rentals
accessories	-0.001770385	0.009135802	0.01283343	0.009567606
accommodation	0.027041557	0.996828691	-0.01607831	0.998269404
alcohol	0.998266334	0.025594617	0.02706007	0.025114097
audio_equipment	0.026915276	-0.014915042	0.99911984	-0.016059825
beverages	1.000000000	0.026192772	0.02686673	0.025702284

books	0.026192772	1.000000000	-0.01619969	0.996349173
cameras	0.026866728	-0.016199692	1.000000000	-0.017276119
car_rentals	0.025702284	0.996349173	-0.01727612	1.000000000
clothing	-0.002530648	0.010174348	0.01416962	0.010516836
coffee_shops	0.998277854	0.026913541	0.02631604	0.026429162
dairy_products	0.999294766	0.026298768	0.02668059	0.025824114
desktops	0.026974532	-0.015759385	0.99879147	-0.016808476
electronics	0.027270847	-0.015254377	0.99928751	-0.016344450
fast_food	0.999157601	0.026678095	0.02726585	0.026190261
food_delivery	0.998933030	0.026316816	0.02691818	0.025875274
fruits	0.999178599	0.026193211	0.02750039	0.025676994
groceries	0.999338510	0.026291226	0.02712271	0.025836908
gym_memberships	0.027327033	0.996442121	-0.01551333	0.997829398
jewelry	-0.001026867	0.008674764	0.01452888	0.009270720
laptops	0.027560669	-0.015026675	0.99910893	-0.016197899
magazines	0.028325219	0.995113485	-0.01641869	0.996419381
meat	0.999287070	0.026654029	0.02747140	0.026226867
movies	0.027092815	0.996437014	-0.01529985	0.997859282
music	0.027302009	0.996378825	-0.01711453	0.997866105
outdoor_activities	0.026205819	0.996290763	-0.01626843	0.997763522
public_transportation	0.027085532	0.996402400	-0.01572518	0.997800950
restaurant_meals	0.999191113	0.026757902	0.02733690	0.026259594
seafood	0.999178553	0.026194244	0.02674878	0.025696334
shoes	-0.002741145	0.009631083	0.01526474	0.009967373
smartphones	0.027454806	-0.015379651	0.99923390	-0.016502059
snacks	0.998905929	0.026625013	0.02710711	0.026202496
software	0.026621114	-0.015186158	0.99879182	-0.016325835
sports_equipment	0.026268191	0.995026188	-0.01695388	0.996532537
streaming_services	0.027126845	0.996876065	-0.01609437	0.998312644
tablets	0.027315061	-0.014777805	0.99911960	-0.015855928
travel	0.027585430	0.996891212	-0.01613989	0.998278851
vegetables	0.999162083	0.026192734	0.02727239	0.025727123
video_games	0.027227822	-0.015129273	0.99923128	-0.016263885
watches	-0.003750861	0.013617306	0.01376222	0.013990504
income	0.099478439	0.086171924	0.98748158	0.085217646
	clothing	coffee_shops	dairy_products	desktops
accessories	0.996175283	-0.001856677	-0.0015237022	0.01327320
accommodation	0.011170251	0.027756060	0.0271109750	-0.01554565
alcohol	-0.003155228	0.997443330	0.9985257823	0.02723798
audio_equipment	0.014100262	0.026338212	0.0267185808	0.99911387
beverages	-0.002530648	0.998277854	0.9992947665	0.02697453
books	0.010174348	0.026913541	0.0262987681	-0.01575939
cameras	0.014169616	0.026316042	0.0266805929	0.99879147

car_rentals	0.010516836	0.026429162	0.0258241138	-0.01680848
clothing	1.000000000	-0.002565744	-0.0023038109	0.01461081
coffee_shops	-0.002565744	1.000000000	0.9986680683	0.02638125
dairy_products	-0.002303811	0.998668068	1.000000000	0.02677144
desktops	0.014610807	0.026381247	0.0267714404	1.00000000
electronics	0.013360952	0.026703247	0.0270704587	0.99928339
fast_food	-0.002718762	0.998556487	0.9995031724	0.02740551
food_delivery	-0.002074834	0.998333873	0.9992898667	0.02700123
fruits	-0.002194330	0.998552478	0.9995024359	0.02758659
groceries	-0.002247306	0.998715056	0.9996788880	0.02722561
gym_memberships	0.010893142	0.027981802	0.0274219384	-0.01501757
jewelry	0.992435440	-0.001102325	-0.0007672026	0.01505550
laptops	0.013417004	0.026963986	0.0273615868	0.99909894
magazines	0.010966438	0.029024893	0.0284492738	-0.01595442
meat	-0.002008696	0.998614871	0.9996193204	0.02756473
movies	0.009840798	0.027816619	0.0272225087	-0.01481600
music	0.010080852	0.028024690	0.0274229818	-0.01659544
outdoor_activities	0.009163108	0.026909544	0.0263105409	-0.01575689
public_transportation	0.010050698	0.027753592	0.0271876737	-0.01518514
restaurant_meals	-0.002500225	0.998558788	0.9995055942	0.02743077
seafood	-0.001638617	0.998519613	0.9995206185	0.02682101
shoes	0.997446330	-0.002782433	-0.0025235053	0.01572200
smartphones	0.013224361	0.026892030	0.0272525042	0.99921551
snacks	-0.002519262	0.998283496	0.9992618927	0.02716362
software	0.013865496	0.026058233	0.0264467683	0.99881514
sports_equipment	0.011398893	0.027065238	0.0264232458	-0.01643528
streaming_services	0.009124677	0.027854128	0.0272510640	-0.01562941
tablets	0.013825782	0.026733621	0.0271307685	0.99912968
travel	0.010782952	0.028266108	0.0277237152	-0.01564430
vegetables	-0.001596910	0.998493501	0.9995147813	0.02735807
video_games	0.013644829	0.026672807	0.0270282364	0.99921616
watches	0.992758271	-0.003789757	-0.0034530793	0.01418795
income	0.105553793	0.098940849	0.0993370803	0.98756426
	electronics	fast_food	food_delivery	fruits
accessories	0.01198667	-0.001969913	-0.0013589950	-0.0014180691
accommodation	-0.01508135	0.027526488	0.0271662942	0.0270218479
alcohol	0.02749519	0.998440860	0.9981894218	0.9983989252
audio_equipment	0.99964865	0.027338681	0.0269511095	0.0275363549
beverages	0.02727085	0.999157601	0.9989330299	0.9991785989
books	-0.01525438	0.026678095	0.0263168159	0.0261932110
cameras	0.99928751	0.027265853	0.0269181840	0.0275003945
car_rentals	-0.01634445	0.026190261	0.0258752737	0.0256769937
clothing	0.01336095	-0.002718762	-0.0020748341	-0.0021943298



coffee_shops	0.02670325	0.998556487	0.9983338728	0.9985524778
dairy_products	0.02707046	0.999503172	0.9992898667	0.9995024359
desktops	0.99928339	0.027405513	0.0270012275	0.0275865922
electronics	1.00000000	0.027696054	0.0273115601	0.0278935869
fast_food	0.02769605	1.000000000	0.9991765730	0.9993771749
food_delivery	0.02731156	0.999176573	1.0000000000	0.9992087933
fruits	0.02789359	0.999377175	0.9992087933	1.0000000000
groceries	0.02751469	0.999568938	0.9993400381	0.9995682038
gym_memberships	-0.01452754	0.027824499	0.0274883868	0.0273147043
jewelry	0.01380963	-0.001113655	-0.0005660566	-0.0006375675
laptops	0.99963039	0.027975807	0.0275967916	0.0281646928
magazines	-0.01546168	0.028831383	0.0285479702	0.0283369147
meat	0.02787021	0.999499361	0.9992830019	0.9995165712
movies	-0.01431821	0.027602105	0.0273081235	0.0271016327
music	-0.01611387	0.027825322	0.0274976590	0.0273229350
outdoor_activities	-0.01526484	0.026676724	0.0263394593	0.0261352202
public_transportation	-0.01469642	0.027587906	0.0272744836	0.0271253508
restaurant_meals	0.02773620	0.999395086	0.9991751981	0.9993984514
seafood	0.02713097	0.999386136	0.9991904053	0.9994228503
shoes	0.01444569	-0.002948365	-0.0023470200	-0.0024095604
smartphones	0.99975496	0.027871009	0.0274987147	0.0280767423
snacks	0.02747759	0.999152578	0.9989293886	0.9991375125
software	0.99930748	0.027068009	0.0266689458	0.0272483584
sports_equipment	-0.01600448	0.026759170	0.0264500230	0.0263016853
streaming_services	-0.01511763	0.027653414	0.0273194585	0.0271214035
tablets	0.99964107	0.027737862	0.0273549141	0.0279458682
travel	-0.01517383	0.028091707	0.0277806572	0.0275979430
vegetables	0.02765362	0.999394736	0.9991734925	0.9993836164
video_games	0.99975319	0.027644418	0.0272586547	0.0278535258
watches	0.01293598	-0.003865751	-0.0032698646	-0.0034046717
income	0.98804055	0.099943559	0.0995687877	0.1001395560
	groceries	gym_memberships	jewelry	laptops
accessories	-0.0015124591	0.009880771	9.907350e-01	0.01200826
accommodation	0.0271566060	0.998339252	9.876784e-03	-0.01493421
alcohol	0.9986030318	0.026762367	-1.515553e-03	0.02778685
audio_equipment	0.0271698353	-0.014220423	1.456830e-02	0.99946393
beverages	0.9993385102	0.027327033	-1.026867e-03	0.02756067
books	0.0262912256	0.996442121	8.674764e-03	-0.01502667
cameras	0.0271227133	-0.015513332	1.452888e-02	0.99910893
car_rentals	0.0258369084	0.997829398	9.270720e-03	-0.01619790
clothing	-0.0022473061	0.010893142	9.924354e-01	0.01341700
coffee_shops	0.9987150563	0.027981802	-1.102325e-03	0.02696399
dairy_products	0.9996788880	0.027421938	-7.672026e-04	0.02736159

desktops	0.0272256099	-0.015017570	1.505550e-02	0.99909894
electronics	0.0275146924	-0.014527535	1.380963e-02	0.99963039
fast_food	0.9995689378	0.027824499	-1.113655e-03	0.02797581
food_delivery	0.9993400381	0.027488387	-5.660566e-04	0.02759679
fruits	0.9995682038	0.027314704	-6.375675e-04	0.02816469
groceries	1.0000000000	0.027445410	-6.965175e-04	0.02779283
gym_memberships	0.0274454101	1.0000000000	9.442923e-03	-0.01435039
jewelry	-0.0006965175	0.009442923	1.000000e+00	0.01384052
laptops	0.0277928275	-0.014350393	1.384052e-02	1.00000000
magazines	0.0285085493	0.996447572	9.609125e-03	-0.01528335
meat	0.9996828048	0.027814768	-4.378734e-04	0.02815921
movies	0.0272426104	0.997888634	8.603844e-03	-0.01419147
music	0.0274537587	0.997866583	8.773197e-03	-0.01594403
outdoor_activities	0.0263298618	0.997829433	8.087307e-03	-0.01512903
public_transportation	0.0272176530	0.997886793	8.836193e-03	-0.01454350
restaurant_meals	0.9995642729	0.027896543	-9.429742e-04	0.02801953
seafood	0.9995663485	0.027339786	-9.324495e-05	0.02741128
shoes	-0.0024820036	0.010289052	9.919792e-01	0.01448905
smartphones	0.0277032319	-0.014680318	1.365304e-02	0.99957717
snacks	0.9993030336	0.027784559	-1.027755e-03	0.02776197
software	0.0268970140	-0.014513324	1.432437e-02	0.99913745
sports_equipment	0.0264195306	0.996521164	1.021203e-02	-0.01583341
streaming_services	0.0272643828	0.998314752	7.787454e-03	-0.01497393
tablets	0.0275702227	-0.014091451	1.426194e-02	0.99944701
travel	0.0277314653	0.998309217	9.487827e-03	-0.01500887
vegetables	0.9995674287	0.027394496	-1.616300e-05	0.02792700
video_games	0.0274749229	-0.014451629	1.408950e-02	0.99957068
watches	-0.0035463421	0.014426497	9.873438e-01	0.01292558
income	0.0997888606	0.087155553	1.054730e-01	0.98789839
	magazines	meat	movies	music
accessories	0.010034631	-0.0012731499	0.008856935	0.009168995
accommodation	0.996871194	0.0275516739	0.998287447	0.998298589
alcohol	0.027757340	0.9984995031	0.026555741	0.026740331
audio_equipment	-0.015194591	0.0275109166	-0.014017069	-0.015833526
beverages	0.028325219	0.9992870702	0.027092815	0.027302009
books	0.995113485	0.0266540288	0.996437014	0.996378825
cameras	-0.016418685	0.0274713995	-0.015299846	-0.017114531
car_rentals	0.996419381	0.0262268667	0.997859282	0.997866105
clothing	0.010966438	-0.0020086958	0.009840798	0.010080852
coffee_shops	0.029024893	0.9986148711	0.027816619	0.028024690
dairy_products	0.028449274	0.9996193204	0.027222509	0.027422982
desktops	-0.015954419	0.0275647281	-0.014816003	-0.016595444
electronics	-0.015461678	0.0278702101	-0.014318207	-0.016113867

fast_food	0.028831383	0.9994993610	0.027602105	0.027825322
food_delivery	0.028547970	0.9992830019	0.027308124	0.027497659
fruits	0.028336915	0.9995165712	0.027101633	0.027322935
groceries	0.028508549	0.9996828048	0.027242610	0.027453759
gym_memberships	0.996447572	0.0278147685	0.997888634	0.997866583
jewelry	0.009609125	-0.0004378734	0.008603844	0.008773197
laptops	-0.015283350	0.0281592075	-0.014191472	-0.015944033
magazines	1.000000000	0.0288641315	0.996577685	0.996456461
meat	0.028864131	1.0000000000	0.027621435	0.027840607
movies	0.996577685	0.0276214351	1.000000000	0.997867355
music	0.996456461	0.0278406067	0.997867355	1.000000000
outdoor_activities	0.996427644	0.0267096680	0.997854625	0.997799719
public_transportation	0.996522105	0.0276257177	0.997871631	0.997900853
restaurant_meals	0.028892890	0.9994909048	0.027666967	0.027877230
seafood	0.028365243	0.9995160325	0.027126303	0.027325458
shoes	0.010275786	-0.0022185323	0.009286067	0.009514038
smartphones	-0.015647713	0.0280477723	-0.014515694	-0.016279668
snacks	0.028770404	0.9992466449	0.027555345	0.027781610
software	-0.015439738	0.0272298677	-0.014288068	-0.016084697
sports_equipment	0.995243729	0.0268319539	0.996440363	0.996564307
streaming_services	0.996965336	0.0276582278	0.998332762	0.998322999
tablets	-0.015027577	0.0279296659	-0.013854635	-0.015653355
travel	0.996876488	0.0281202182	0.998302096	0.998344915
vegetables	0.028389916	0.9994987369	0.027122770	0.027351695
video_games	-0.015368179	0.0278259690	-0.014249650	-0.016065481
watches	0.014347556	-0.0032623393	0.013312940	0.013542904
income	0.086167273	0.1001931979	0.087240149	0.085515678
outdoor_activities public_transportation restaurant_meals				
accessories	0.008089073		0.009051121	-0.0017311421
accommodation	0.998260562		0.998273308	0.0275898515
alcohol	0.025600128		0.026540719	0.9984371924
audio_equipment	-0.014965757		-0.014433552	0.0273891986
beverages	0.026205819		0.027085532	0.9991911125
books	0.996290763		0.996402400	0.0267579025
cameras	-0.016268433		-0.015725178	0.0273369042
car_rentals	0.997763522		0.997800950	0.0262595940
clothing	0.009163108		0.010050698	-0.0025002253
coffee_shops	0.026909544		0.027753592	0.9985587882
dairy_products	0.026310541		0.027187674	0.9995055942
desktops	-0.015756889		-0.015185143	0.0274307695
electronics	-0.015264842		-0.014696423	0.0277361982
fast_food	0.026676724		0.027587906	0.9993950860
food_delivery	0.026339459		0.027274484	0.9991751981

fruits	0.026135220	0.027125351	0.9993984514
groceries	0.026329862	0.027217653	0.9995642729
gym_memberships	0.997829433	0.997886793	0.0278965433
jewelry	0.008087307	0.008836193	-0.0009429742
laptops	-0.015129028	-0.014543497	0.0280195314
magazines	0.996427644	0.996522105	0.0288928905
meat	0.026709668	0.027625718	0.9994909048
movies	0.997854625	0.997871631	0.0276669671
music	0.997799719	0.997900853	0.0278772298
outdoor_activities	1.000000000	0.997770505	0.0267428562
public_transportation	0.997770505	1.000000000	0.0276412040
restaurant_meals	0.026742856	0.027641204	1.0000000000
seafood	0.026191770	0.027097466	0.9994172145
shoes	0.008610838	0.009476372	-0.0027208926
smartphones	-0.015424274	-0.014863157	0.0279164829
snacks	0.026612173	0.027566286	0.9991384243
software	-0.015198056	-0.014684292	0.0271139313
sports_equipment	0.996455699	0.996476963	0.0269021732
streaming_services	0.998244055	0.998308690	0.0276806317
tablets	-0.014819722	-0.014262635	0.0278033626
travel	0.998194738	0.998261270	0.0281727211
vegetables	0.026238335	0.027124655	0.9994059044
video_games	-0.015196543	-0.014630250	0.0277008074
watches	0.012520493	0.013490157	-0.0036666358
income	0.086173448	0.086872328	0.1000170385
	seafood	shoes	smartphones
accessories	-8.409656e-04	0.995638905	0.01187140
accommodation	2.702561e-02	0.010613592	-0.01525601
alcohol	9.984189e-01	-0.003325268	0.02768314
audio_equipment	2.678655e-02	0.015164547	0.99959039
beverages	9.991786e-01	-0.002741145	0.02745481
books	2.619424e-02	0.009631083	-0.01537965
cameras	2.674878e-02	0.015264737	0.99923390
car_rentals	2.569633e-02	0.009967373	-0.01650206
clothing	-1.638617e-03	0.997446330	0.01322436
coffee_shops	9.985196e-01	-0.002782433	0.02689203
dairy_products	9.995206e-01	-0.002523505	0.02725250
desktops	2.682101e-02	0.015722003	0.99921551
electronics	2.713097e-02	0.014445695	0.99975496
fast_food	9.993861e-01	-0.002948365	0.02787101
food_delivery	9.991904e-01	-0.002347020	0.02749871
fruits	9.994229e-01	-0.002409560	0.02807674
groceries	9.995663e-01	-0.002482004	0.02770323
		snacks	

gym_memberships	2.733979e-02	0.010289052	-0.01468032	0.027784559
jewelry	-9.324495e-05	0.991979172	0.01365304	-0.001027755
laptops	2.741128e-02	0.014489046	0.99957717	0.027761973
magazines	2.836524e-02	0.010275786	-0.01564771	0.028770404
meat	9.995160e-01	-0.002218532	0.02804777	0.999246645
movies	2.712630e-02	0.009286067	-0.01451569	0.027555345
music	2.732546e-02	0.009514038	-0.01627967	0.027781610
outdoor_activities	2.619177e-02	0.008610838	-0.01542427	0.026612173
public_transportation	2.709747e-02	0.009476372	-0.01486316	0.027566286
restaurant_meals	9.994172e-01	-0.002720893	0.02791648	0.999138424
seafood	1.000000e+00	-0.001894133	0.02732202	0.999175912
shoes	-1.894133e-03	1.000000000	0.01432442	-0.002717541
smartphones	2.732202e-02	0.014324423	1.00000000	0.027653454
snacks	9.991759e-01	-0.002717541	0.02765345	1.000000000
software	2.650590e-02	0.014964892	0.99924291	0.026850709
sports_equipment	2.627987e-02	0.010812033	-0.01615217	0.026814982
streaming_services	2.713973e-02	0.008551431	-0.01529248	0.027594748
tablets	2.718621e-02	0.014872216	0.99958709	0.027547352
travel	2.757624e-02	0.010241369	-0.01534207	0.028027541
vegetables	9.994216e-01	-0.001832086	0.02782689	0.999143011
video_games	2.707689e-02	0.014710029	0.99969363	0.027429013
watches	-2.867895e-03	0.992130853	0.01282252	-0.003780124
income	9.944031e-02	0.106507559	0.98796481	0.099724927
software sports_equipment streaming_services				
accessories	0.01254386	0.01038107		0.008160801
accommodation	-0.01506460	0.99691801		0.998746597
alcohol	0.02691192	0.02573089		0.026546436
audio_equipment	0.99912437	-0.01571323		-0.014845087
beverages	0.02662111	0.02626819		0.027126845
books	-0.01518616	0.99502619		0.996876065
cameras	0.99879182	-0.01695388		-0.016094372
car_rentals	-0.01632584	0.99653254		0.998312644
clothing	0.01386550	0.01139889		0.009124677
coffee_shops	0.02605823	0.02706524		0.027854128
dairy_products	0.02644677	0.02642325		0.027251064
desktops	0.99881514	-0.01643528		-0.015629408
electronics	0.99930748	-0.01600448		-0.015117627
fast_food	0.02706801	0.02675917		0.027653414
food_delivery	0.02666895	0.02645002		0.027319459
fruits	0.02724836	0.02630169		0.027121403
groceries	0.02689701	0.02641953		0.027264383
gym_memberships	-0.01451332	0.99652116		0.998314752
jewelry	0.01432437	0.01021203		0.007787454

laptops	0.99913745	-0.01583341	-0.014973930
magazines	-0.01543974	0.99524373	0.996965336
meat	0.02722987	0.02683195	0.027658228
movies	-0.01428807	0.99644036	0.998332762
music	-0.01608470	0.99656431	0.998322999
outdoor_activities	-0.01519806	0.99645570	0.998244055
public_transportation	-0.01468429	0.99647696	0.998308690
restaurant_meals	0.02711393	0.02690217	0.027680632
seafood	0.02650590	0.02627987	0.027139732
shoes	0.01496489	0.01081203	0.008551431
smartphones	0.99924291	-0.01615217	-0.015292484
snacks	0.02685071	0.02681498	0.027594748
software	1.00000000	-0.01594210	-0.015111250
sports_equipment	-0.01594210	1.00000000	0.996950044
streaming_services	-0.01511125	0.99695004	1.000000000
tablets	0.99915445	-0.01555246	-0.014664599
travel	-0.01514457	0.99698240	0.998782270
vegetables	0.02703582	0.02630136	0.027180931
video_games	0.99925841	-0.01592019	-0.015027870
watches	0.01352037	0.01506878	0.012661922
income	0.98755001	0.08553610	0.086435689
	tablets	travel	vegetables video_games
accessories	0.01244107	0.009833571	-0.0008281898 0.01227845
accommodation	-0.01461937	0.998730430	0.0270477916 -0.01500307
alcohol	0.02755290	0.027025424	0.9984058033 0.02747478
audio_equipment	0.99947256	-0.014868229	0.0272960485 0.99959455
beverages	0.02731506	0.027585430	0.9991620834 0.02722782
books	-0.01477781	0.996891212	0.0261927341 -0.01512927
cameras	0.99911960	-0.016139893	0.0272723868 0.99923128
car_rentals	-0.01585593	0.998278851	0.0257271234 -0.01626388
clothing	0.01382578	0.010782952	-0.0015969101 0.01364483
coffee_shops	0.02673362	0.028266108	0.9984935014 0.02667281
dairy_products	0.02713077	0.027723715	0.9995147813 0.02702824
desktops	0.99912968	-0.015644304	0.0273580725 0.99921616
electronics	0.99964107	-0.015173830	0.0276536244 0.99975319
fast_food	0.02773786	0.028091707	0.9993947357 0.02764442
food_delivery	0.02735491	0.027780657	0.9991734925 0.02725865
fruits	0.02794587	0.027597943	0.9993836164 0.02785353
groceries	0.02757022	0.027731465	0.9995674287 0.02747492
gym_memberships	-0.01409145	0.998309217	0.0273944957 -0.01445163
jewelry	0.01426194	0.009487827	-0.0000161630 0.01408950
laptops	0.99944701	-0.015008872	0.0279270018 0.99957068
magazines	-0.01502758	0.996876488	0.0283899164 -0.01536818

meat	0.02792967	0.028120218	0.9994987369	0.02782597
movies	-0.01385464	0.998302096	0.0271227701	-0.01424965
music	-0.01565336	0.998344915	0.0273516947	-0.01606548
outdoor_activities	-0.01481972	0.998194738	0.0262383345	-0.01519654
public_transportation	-0.01426264	0.998261270	0.0271246554	-0.01463025
restaurant_meals	0.02780336	0.028172721	0.9994059044	0.02770081
seafood	0.02718621	0.027576244	0.9994216296	0.02707689
shoes	0.01487222	0.010241369	-0.0018320860	0.01471003
smartphones	0.99958709	-0.015342072	0.0278268895	0.99969363
snacks	0.02754735	0.028027541	0.9991430111	0.02742901
software	0.99915445	-0.015144568	0.0270358217	0.99925841
sports_equipment	-0.01555246	0.996982404	0.0263013642	-0.01592019
streaming_services	-0.01466460	0.998782270	0.0271809315	-0.01502787
tablets	1.00000000	-0.014699316	0.0277115123	0.99957617
travel	-0.01469932	1.000000000	0.0276535610	-0.01508210
vegetables	0.02771151	0.027653561	1.0000000000	0.02760666
video_games	0.99957617	-0.015082095	0.0276066588	1.00000000
watches	0.01345371	0.014185892	-0.0028679861	0.01323194
income	0.98796171	0.086572192	0.0999503317	0.98801439
	watches	income		
accessories	0.991091501	0.10400045		
accommodation	0.014555443	0.08664715		
alcohol	-0.004392785	0.09954189		
audio_equipment	0.013669819	0.98794577		
beverages	-0.003750861	0.09947844		
books	0.013617306	0.08617192		
cameras	0.013762223	0.98748158		
car_rentals	0.013990504	0.08521765		
clothing	0.992758271	0.10555379		
coffee_shops	-0.003789757	0.09894085		
dairy_products	-0.003453079	0.09933708		
desktops	0.014187948	0.98756426		
electronics	0.012935982	0.98804055		
fast_food	-0.003865751	0.09994356		
food_delivery	-0.003269865	0.09956879		
fruits	-0.003404672	0.10013956		
groceries	-0.003546342	0.09978886		
gym_memberships	0.014426497	0.08715555		
jewelry	0.987343759	0.10547297		
laptops	0.012925582	0.98789839		
magazines	0.014347556	0.08616727		
meat	-0.003262339	0.10019320		
movies	0.013312940	0.08724015		

music	0.013542904	0.08551568
outdoor_activities	0.012520493	0.08617345
public_transportation	0.013490157	0.08687233
restaurant_meals	-0.003666636	0.10001704
seafood	-0.002867895	0.09944031
shoes	0.992130853	0.10650756
smartphones	0.012822524	0.98796481
snacks	-0.003780124	0.09972493
software	0.013520372	0.98755001
sports_equipment	0.015068775	0.08553610
streaming_services	0.012661922	0.08643569
tablets	0.013453710	0.98796171
travel	0.014185892	0.08657219
vegetables	-0.002867986	0.09995033
video_games	0.013231938	0.98801439
watches	1.000000000	0.10489952
income	0.104899523	1.00000000

\$corrPos

	xName	yName	x	y	corr
1	accessories	accessories	1	40	1.000000e+00
2	accessories	accommodation	1	39	1.015692e-02
3	accessories	alcohol	1	38	-2.377077e-03
4	accessories	audio_equipment	1	37	1.277653e-02
5	accessories	beverages	1	36	-1.770385e-03
6	accessories	books	1	35	9.135802e-03
7	accessories	cameras	1	34	1.283343e-02
8	accessories	car_rentals	1	33	9.567606e-03
9	accessories	clothing	1	32	9.961753e-01
10	accessories	coffee_shops	1	31	-1.856677e-03
11	accessories	dairy_products	1	30	-1.523702e-03
12	accessories	desktops	1	29	1.327320e-02
13	accessories	electronics	1	28	1.198667e-02
14	accessories	fast_food	1	27	-1.969913e-03
15	accessories	food_delivery	1	26	-1.358995e-03
16	accessories	fruits	1	25	-1.418069e-03
17	accessories	groceries	1	24	-1.512459e-03
18	accessories	gym_memberships	1	23	9.880771e-03
19	accessories	jewelry	1	22	9.907350e-01
20	accessories	laptops	1	21	1.200826e-02
21	accessories	magazines	1	20	1.003463e-02
22	accessories	meat	1	19	-1.273150e-03
23	accessories	movies	1	18	8.856935e-03



24	accessories	music	1	17	9.168995e-03
25	accessories	outdoor_activities	1	16	8.089073e-03
26	accessories	public_transportation	1	15	9.051121e-03
27	accessories	restaurant_meals	1	14	-1.731142e-03
28	accessories	seafood	1	13	-8.409656e-04
29	accessories	shoes	1	12	9.956389e-01
30	accessories	smartphones	1	11	1.187140e-02
31	accessories	snacks	1	10	-1.785120e-03
32	accessories	software	1	9	1.254386e-02
33	accessories	sports_equipment	1	8	1.038107e-02
34	accessories	streaming_services	1	7	8.160801e-03
35	accessories	tablets	1	6	1.244107e-02
36	accessories	travel	1	5	9.833571e-03
37	accessories	vegetables	1	4	-8.281898e-04
38	accessories	video_games	1	3	1.227845e-02
39	accessories	watches	1	2	9.910915e-01
40	accessories	income	1	1	1.040005e-01
41	accommodation	accessories	2	40	1.015692e-02
42	accommodation	accommodation	2	39	1.000000e+00
43	accommodation	alcohol	2	38	2.647417e-02
44	accommodation	audio_equipment	2	37	-1.477922e-02
45	accommodation	beverages	2	36	2.704156e-02
46	accommodation	books	2	35	9.968287e-01
47	accommodation	cameras	2	34	-1.607831e-02
48	accommodation	car_rentals	2	33	9.982694e-01
49	accommodation	clothing	2	32	1.117025e-02
50	accommodation	coffee_shops	2	31	2.775606e-02
51	accommodation	dairy_products	2	30	2.711097e-02
52	accommodation	desktops	2	29	-1.554565e-02
53	accommodation	electronics	2	28	-1.508135e-02
54	accommodation	fast_food	2	27	2.752649e-02
55	accommodation	food_delivery	2	26	2.716629e-02
56	accommodation	fruits	2	25	2.702185e-02
57	accommodation	groceries	2	24	2.715661e-02
58	accommodation	gym_memberships	2	23	9.983393e-01
59	accommodation	jewelry	2	22	9.876784e-03
60	accommodation	laptops	2	21	-1.493421e-02
61	accommodation	magazines	2	20	9.968712e-01
62	accommodation	meat	2	19	2.755167e-02
63	accommodation	movies	2	18	9.982874e-01
64	accommodation	music	2	17	9.982986e-01
65	accommodation	outdoor_activities	2	16	9.982606e-01
66	accommodation	public_transportation	2	15	9.982733e-01

67	accommodation	restaurant_meals	2	14	2.758985e-02
68	accommodation	seafood	2	13	2.702561e-02
69	accommodation	shoes	2	12	1.061359e-02
70	accommodation	smartphones	2	11	-1.525601e-02
71	accommodation	snacks	2	10	2.746962e-02
72	accommodation	software	2	9	-1.506460e-02
73	accommodation	sports_equipment	2	8	9.969180e-01
74	accommodation	streaming_services	2	7	9.987466e-01
75	accommodation	tablets	2	6	-1.461937e-02
76	accommodation	travel	2	5	9.987304e-01
77	accommodation	vegetables	2	4	2.704779e-02
78	accommodation	video_games	2	3	-1.500307e-02
79	accommodation	watches	2	2	1.455544e-02
80	accommodation	income	2	1	8.664715e-02
81	alcohol	accessories	3	40	-2.377077e-03
82	alcohol	accommodation	3	39	2.647417e-02
83	alcohol	alcohol	3	38	1.000000e+00
84	alcohol	audio_equipment	3	37	2.717688e-02
85	alcohol	beverages	3	36	9.982663e-01
86	alcohol	books	3	35	2.559462e-02
87	alcohol	cameras	3	34	2.706007e-02
88	alcohol	car_rentals	3	33	2.511410e-02
89	alcohol	clothing	3	32	-3.155228e-03
90	alcohol	coffee_shops	3	31	9.974433e-01
91	alcohol	dairy_products	3	30	9.985258e-01
92	alcohol	desktops	3	29	2.723798e-02
93	alcohol	electronics	3	28	2.749519e-02
94	alcohol	fast_food	3	27	9.984409e-01
95	alcohol	food_delivery	3	26	9.981894e-01
96	alcohol	fruits	3	25	9.983989e-01
97	alcohol	groceries	3	24	9.986030e-01
98	alcohol	gym_memberships	3	23	2.676237e-02
99	alcohol	jewelry	3	22	-1.515553e-03
100	alcohol	laptops	3	21	2.778685e-02
101	alcohol	magazines	3	20	2.775734e-02
102	alcohol	meat	3	19	9.984995e-01
103	alcohol	movies	3	18	2.655574e-02
104	alcohol	music	3	17	2.674033e-02
105	alcohol	outdoor_activities	3	16	2.560013e-02
106	alcohol	public_transportation	3	15	2.654072e-02
107	alcohol	restaurant_meals	3	14	9.984372e-01
108	alcohol	seafood	3	13	9.984189e-01
109	alcohol	shoes	3	12	-3.325268e-03

110	alcohol	smartphones	3	11	2.768314e-02
111	alcohol	snacks	3	10	9.981626e-01
112	alcohol	software	3	9	2.691192e-02
113	alcohol	sports_equipment	3	8	2.573089e-02
114	alcohol	streaming_services	3	7	2.654644e-02
115	alcohol	tablets	3	6	2.755290e-02
116	alcohol	travel	3	5	2.702542e-02
117	alcohol	vegetables	3	4	9.984058e-01
118	alcohol	video_games	3	3	2.747478e-02
119	alcohol	watches	3	2	-4.392785e-03
120	alcohol	income	3	1	9.954189e-02
121	audio_equipment	accessories	4	40	1.277653e-02
122	audio_equipment	accommodation	4	39	-1.477922e-02
123	audio_equipment	alcohol	4	38	2.717688e-02
124	audio_equipment	audio_equipment	4	37	1.000000e+00
125	audio_equipment	beverages	4	36	2.691528e-02
126	audio_equipment	books	4	35	-1.491504e-02
127	audio_equipment	cameras	4	34	9.991198e-01
128	audio_equipment	car_rentals	4	33	-1.605982e-02
129	audio_equipment	clothing	4	32	1.410026e-02
130	audio_equipment	coffee_shops	4	31	2.633821e-02
131	audio_equipment	dairy_products	4	30	2.671858e-02
132	audio_equipment	desktops	4	29	9.991139e-01
133	audio_equipment	electronics	4	28	9.996487e-01
134	audio_equipment	fast_food	4	27	2.733868e-02
135	audio_equipment	food_delivery	4	26	2.695111e-02
136	audio_equipment	fruits	4	25	2.753635e-02
137	audio_equipment	groceries	4	24	2.716984e-02
138	audio_equipment	gym_memberships	4	23	-1.422042e-02
139	audio_equipment	jewelry	4	22	1.456830e-02
140	audio_equipment	laptops	4	21	9.994639e-01
141	audio_equipment	magazines	4	20	-1.519459e-02
142	audio_equipment	meat	4	19	2.751092e-02
143	audio_equipment	movies	4	18	-1.401707e-02
144	audio_equipment	music	4	17	-1.583353e-02
145	audio_equipment	outdoor_activities	4	16	-1.496576e-02
146	audio_equipment	public_transportation	4	15	-1.443355e-02
147	audio_equipment	restaurant_meals	4	14	2.738920e-02
148	audio_equipment	seafood	4	13	2.678655e-02
149	audio_equipment	shoes	4	12	1.516455e-02
150	audio_equipment	smartphones	4	11	9.995904e-01
151	audio_equipment	snacks	4	10	2.713339e-02
152	audio_equipment	software	4	9	9.991244e-01

153	audio_equipment	sports_equipment	4	8	-1.571323e-02
154	audio_equipment	streaming_services	4	7	-1.484509e-02
155	audio_equipment	tablets	4	6	9.994726e-01
156	audio_equipment	travel	4	5	-1.486823e-02
157	audio_equipment	vegetables	4	4	2.729605e-02
158	audio_equipment	video_games	4	3	9.995946e-01
159	audio_equipment	watches	4	2	1.366982e-02
160	audio_equipment	income	4	1	9.879458e-01
161	beverages	accessories	5	40	-1.770385e-03
162	beverages	accommodation	5	39	2.704156e-02
163	beverages	alcohol	5	38	9.982663e-01
164	beverages	audio_equipment	5	37	2.691528e-02
165	beverages	beverages	5	36	1.000000e+00
166	beverages	books	5	35	2.619277e-02
167	beverages	cameras	5	34	2.686673e-02
168	beverages	car_rentals	5	33	2.570228e-02
169	beverages	clothing	5	32	-2.530648e-03
170	beverages	coffee_shops	5	31	9.982779e-01
171	beverages	dairy_products	5	30	9.992948e-01
172	beverages	desktops	5	29	2.697453e-02
173	beverages	electronics	5	28	2.727085e-02
174	beverages	fast_food	5	27	9.991576e-01
175	beverages	food_delivery	5	26	9.989330e-01
176	beverages	fruits	5	25	9.991786e-01
177	beverages	groceries	5	24	9.993385e-01
178	beverages	gym_memberships	5	23	2.732703e-02
179	beverages	jewelry	5	22	-1.026867e-03
180	beverages	laptops	5	21	2.756067e-02
181	beverages	magazines	5	20	2.832522e-02
182	beverages	meat	5	19	9.992871e-01
183	beverages	movies	5	18	2.709282e-02
184	beverages	music	5	17	2.730201e-02
185	beverages	outdoor_activities	5	16	2.620582e-02
186	beverages	public_transportation	5	15	2.708553e-02
187	beverages	restaurant_meals	5	14	9.991911e-01
188	beverages	seafood	5	13	9.991786e-01
189	beverages	shoes	5	12	-2.741145e-03
190	beverages	smartphones	5	11	2.745481e-02
191	beverages	snacks	5	10	9.989059e-01
192	beverages	software	5	9	2.662111e-02
193	beverages	sports_equipment	5	8	2.626819e-02
194	beverages	streaming_services	5	7	2.712685e-02
195	beverages	tablets	5	6	2.731506e-02

196	beverages	travel	5	5	2.758543e-02
197	beverages	vegetables	5	4	9.991621e-01
198	beverages	video_games	5	3	2.722782e-02
199	beverages	watches	5	2	-3.750861e-03
200	beverages	income	5	1	9.947844e-02
201	books	accessories	6	40	9.135802e-03
202	books	accommodation	6	39	9.968287e-01
203	books	alcohol	6	38	2.559462e-02
204	books	audio_equipment	6	37	-1.491504e-02
205	books	beverages	6	36	2.619277e-02
206	books	books	6	35	1.000000e+00
207	books	cameras	6	34	-1.619969e-02
208	books	car_rentals	6	33	9.963492e-01
209	books	clothing	6	32	1.017435e-02
210	books	coffee_shops	6	31	2.691354e-02
211	books	dairy_products	6	30	2.629877e-02
212	books	desktops	6	29	-1.575939e-02
213	books	electronics	6	28	-1.525438e-02
214	books	fast_food	6	27	2.667810e-02
215	books	food_delivery	6	26	2.631682e-02
216	books	fruits	6	25	2.619321e-02
217	books	groceries	6	24	2.629123e-02
218	books	gym_memberships	6	23	9.964421e-01
219	books	jewelry	6	22	8.674764e-03
220	books	laptops	6	21	-1.502667e-02
221	books	magazines	6	20	9.951135e-01
222	books	meat	6	19	2.665403e-02
223	books	movies	6	18	9.964370e-01
224	books	music	6	17	9.963788e-01
225	books	outdoor_activities	6	16	9.962908e-01
226	books	public_transportation	6	15	9.964024e-01
227	books	restaurant_meals	6	14	2.675790e-02
228	books	seafood	6	13	2.619424e-02
229	books	shoes	6	12	9.631083e-03
230	books	smartphones	6	11	-1.537965e-02
231	books	snacks	6	10	2.662501e-02
232	books	software	6	9	-1.518616e-02
233	books	sports_equipment	6	8	9.950262e-01
234	books	streaming_services	6	7	9.968761e-01
235	books	tablets	6	6	-1.477781e-02
236	books	travel	6	5	9.968912e-01
237	books	vegetables	6	4	2.619273e-02
238	books	video_games	6	3	-1.512927e-02

239	books	watches	6	2	1.361731e-02
240	books	income	6	1	8.617192e-02
241	cameras	accessories	7	40	1.283343e-02
242	cameras	accommodation	7	39	-1.607831e-02
243	cameras	alcohol	7	38	2.706007e-02
244	cameras	audio_equipment	7	37	9.991198e-01
245	cameras	beverages	7	36	2.686673e-02
246	cameras	books	7	35	-1.619969e-02
247	cameras	cameras	7	34	1.000000e+00
248	cameras	car_rentals	7	33	-1.727612e-02
249	cameras	clothing	7	32	1.416962e-02
250	cameras	coffee_shops	7	31	2.631604e-02
251	cameras	dairy_products	7	30	2.668059e-02
252	cameras	desktops	7	29	9.987915e-01
253	cameras	electronics	7	28	9.992875e-01
254	cameras	fast_food	7	27	2.726585e-02
255	cameras	food_delivery	7	26	2.691818e-02
256	cameras	fruits	7	25	2.750039e-02
257	cameras	groceries	7	24	2.712271e-02
258	cameras	gym_memberships	7	23	-1.551333e-02
259	cameras	jewelry	7	22	1.452888e-02
260	cameras	laptops	7	21	9.991089e-01
261	cameras	magazines	7	20	-1.641869e-02
262	cameras	meat	7	19	2.747140e-02
263	cameras	movies	7	18	-1.529985e-02
264	cameras	music	7	17	-1.711453e-02
265	cameras	outdoor_activities	7	16	-1.626843e-02
266	cameras	public_transportation	7	15	-1.572518e-02
267	cameras	restaurant_meals	7	14	2.733690e-02
268	cameras	seafood	7	13	2.674878e-02
269	cameras	shoes	7	12	1.526474e-02
270	cameras	smartphones	7	11	9.992339e-01
271	cameras	snacks	7	10	2.710711e-02
272	cameras	software	7	9	9.987918e-01
273	cameras	sports_equipment	7	8	-1.695388e-02
274	cameras	streaming_services	7	7	-1.609437e-02
275	cameras	tablets	7	6	9.991196e-01
276	cameras	travel	7	5	-1.613989e-02
277	cameras	vegetables	7	4	2.727239e-02
278	cameras	video_games	7	3	9.992313e-01
279	cameras	watches	7	2	1.376222e-02
280	cameras	income	7	1	9.874816e-01
281	car_rentals	accessories	8	40	9.567606e-03

282	car_rentals	accommodation	8 39	9.982694e-01
283	car_rentals	alcohol	8 38	2.511410e-02
284	car_rentals	audio_equipment	8 37	-1.605982e-02
285	car_rentals	beverages	8 36	2.570228e-02
286	car_rentals	books	8 35	9.963492e-01
287	car_rentals	cameras	8 34	-1.727612e-02
288	car_rentals	car_rentals	8 33	1.000000e+00
289	car_rentals	clothing	8 32	1.051684e-02
290	car_rentals	coffee_shops	8 31	2.642916e-02
291	car_rentals	dairy_products	8 30	2.582411e-02
292	car_rentals	desktops	8 29	-1.680848e-02
293	car_rentals	electronics	8 28	-1.634445e-02
294	car_rentals	fast_food	8 27	2.619026e-02
295	car_rentals	food_delivery	8 26	2.587527e-02
296	car_rentals	fruits	8 25	2.567699e-02
297	car_rentals	groceries	8 24	2.583691e-02
298	car_rentals	gym_memberships	8 23	9.978294e-01
299	car_rentals	jewelry	8 22	9.270720e-03
300	car_rentals	laptops	8 21	-1.619790e-02
301	car_rentals	magazines	8 20	9.964194e-01
302	car_rentals	meat	8 19	2.622687e-02
303	car_rentals	movies	8 18	9.978593e-01
304	car_rentals	music	8 17	9.978661e-01
305	car_rentals	outdoor_activities	8 16	9.977635e-01
306	car_rentals	public_transportation	8 15	9.978010e-01
307	car_rentals	restaurant_meals	8 14	2.625959e-02
308	car_rentals	seafood	8 13	2.569633e-02
309	car_rentals	shoes	8 12	9.967373e-03
310	car_rentals	smartphones	8 11	-1.650206e-02
311	car_rentals	snacks	8 10	2.620250e-02
312	car_rentals	software	8 9	-1.632584e-02
313	car_rentals	sports_equipment	8 8	9.965325e-01
314	car_rentals	streaming_services	8 7	9.983126e-01
315	car_rentals	tablets	8 6	-1.585593e-02
316	car_rentals	travel	8 5	9.982789e-01
317	car_rentals	vegetables	8 4	2.572712e-02
318	car_rentals	video_games	8 3	-1.626388e-02
319	car_rentals	watches	8 2	1.399050e-02
320	car_rentals	income	8 1	8.521765e-02
321	clothing	accessories	9 40	9.961753e-01
322	clothing	accommodation	9 39	1.117025e-02
323	clothing	alcohol	9 38	-3.155228e-03
324	clothing	audio_equipment	9 37	1.410026e-02

325	clothing	beverages	9	36	-2.530648e-03
326	clothing	books	9	35	1.017435e-02
327	clothing	cameras	9	34	1.416962e-02
328	clothing	car_rentals	9	33	1.051684e-02
329	clothing	clothing	9	32	1.000000e+00
330	clothing	coffee_shops	9	31	-2.565744e-03
331	clothing	dairy_products	9	30	-2.303811e-03
332	clothing	desktops	9	29	1.461081e-02
333	clothing	electronics	9	28	1.336095e-02
334	clothing	fast_food	9	27	-2.718762e-03
335	clothing	food_delivery	9	26	-2.074834e-03
336	clothing	fruits	9	25	-2.194330e-03
337	clothing	groceries	9	24	-2.247306e-03
338	clothing	gym_memberships	9	23	1.089314e-02
339	clothing	jewelry	9	22	9.924354e-01
340	clothing	laptops	9	21	1.341700e-02
341	clothing	magazines	9	20	1.096644e-02
342	clothing	meat	9	19	-2.008696e-03
343	clothing	movies	9	18	9.840798e-03
344	clothing	music	9	17	1.008085e-02
345	clothing	outdoor_activities	9	16	9.163108e-03
346	clothing	public_transportation	9	15	1.005070e-02
347	clothing	restaurant_meals	9	14	-2.500225e-03
348	clothing	seafood	9	13	-1.638617e-03
349	clothing	shoes	9	12	9.974463e-01
350	clothing	smartphones	9	11	1.322436e-02
351	clothing	snacks	9	10	-2.519262e-03
352	clothing	software	9	9	1.386550e-02
353	clothing	sports_equipment	9	8	1.139889e-02
354	clothing	streaming_services	9	7	9.124677e-03
355	clothing	tablets	9	6	1.382578e-02
356	clothing	travel	9	5	1.078295e-02
357	clothing	vegetables	9	4	-1.596910e-03
358	clothing	video_games	9	3	1.364483e-02
359	clothing	watches	9	2	9.927583e-01
360	clothing	income	9	1	1.055538e-01
361	coffee_shops	accessories	10	40	-1.856677e-03
362	coffee_shops	accommodation	10	39	2.775606e-02
363	coffee_shops	alcohol	10	38	9.974433e-01
364	coffee_shops	audio_equipment	10	37	2.633821e-02
365	coffee_shops	beverages	10	36	9.982779e-01
366	coffee_shops	books	10	35	2.691354e-02
367	coffee_shops	cameras	10	34	2.631604e-02



368	coffee_shops	car_rentals	10	33	2.642916e-02
369	coffee_shops	clothing	10	32	-2.565744e-03
370	coffee_shops	coffee_shops	10	31	1.000000e+00
371	coffee_shops	dairy_products	10	30	9.986681e-01
372	coffee_shops	desktops	10	29	2.638125e-02
373	coffee_shops	electronics	10	28	2.670325e-02
374	coffee_shops	fast_food	10	27	9.985565e-01
375	coffee_shops	food_delivery	10	26	9.983339e-01
376	coffee_shops	fruits	10	25	9.985525e-01
377	coffee_shops	groceries	10	24	9.987151e-01
378	coffee_shops	gym_memberships	10	23	2.798180e-02
379	coffee_shops	jewelry	10	22	-1.102325e-03
380	coffee_shops	laptops	10	21	2.696399e-02
381	coffee_shops	magazines	10	20	2.902489e-02
382	coffee_shops	meat	10	19	9.986149e-01
383	coffee_shops	movies	10	18	2.781662e-02
384	coffee_shops	music	10	17	2.802469e-02
385	coffee_shops	outdoor_activities	10	16	2.690954e-02
386	coffee_shops	public_transportation	10	15	2.775359e-02
387	coffee_shops	restaurant_meals	10	14	9.985588e-01
388	coffee_shops	seafood	10	13	9.985196e-01
389	coffee_shops	shoes	10	12	-2.782433e-03
390	coffee_shops	smartphones	10	11	2.689203e-02
391	coffee_shops	snacks	10	10	9.982835e-01
392	coffee_shops	software	10	9	2.605823e-02
393	coffee_shops	sports_equipment	10	8	2.706524e-02
394	coffee_shops	streaming_services	10	7	2.785413e-02
395	coffee_shops	tablets	10	6	2.673362e-02
396	coffee_shops	travel	10	5	2.826611e-02
397	coffee_shops	vegetables	10	4	9.984935e-01
398	coffee_shops	video_games	10	3	2.667281e-02
399	coffee_shops	watches	10	2	-3.789757e-03
400	coffee_shops	income	10	1	9.894085e-02
401	dairy_products	accessories	11	40	-1.523702e-03
402	dairy_products	accommodation	11	39	2.711097e-02
403	dairy_products	alcohol	11	38	9.985258e-01
404	dairy_products	audio_equipment	11	37	2.671858e-02
405	dairy_products	beverages	11	36	9.992948e-01
406	dairy_products	books	11	35	2.629877e-02
407	dairy_products	cameras	11	34	2.668059e-02
408	dairy_products	car_rentals	11	33	2.582411e-02
409	dairy_products	clothing	11	32	-2.303811e-03
410	dairy_products	coffee_shops	11	31	9.986681e-01

411	dairy_products	dairy_products	11	30	1.000000e+00
412	dairy_products	desktops	11	29	2.677144e-02
413	dairy_products	electronics	11	28	2.707046e-02
414	dairy_products	fast_food	11	27	9.995032e-01
415	dairy_products	food_delivery	11	26	9.992899e-01
416	dairy_products	fruits	11	25	9.995024e-01
417	dairy_products	groceries	11	24	9.996789e-01
418	dairy_products	gym_memberships	11	23	2.742194e-02
419	dairy_products	jewelry	11	22	-7.672026e-04
420	dairy_products	laptops	11	21	2.736159e-02
421	dairy_products	magazines	11	20	2.844927e-02
422	dairy_products	meat	11	19	9.996193e-01
423	dairy_products	movies	11	18	2.722251e-02
424	dairy_products	music	11	17	2.742298e-02
425	dairy_products	outdoor_activities	11	16	2.631054e-02
426	dairy_products	public_transportation	11	15	2.718767e-02
427	dairy_products	restaurant_meals	11	14	9.995056e-01
428	dairy_products	seafood	11	13	9.995206e-01
429	dairy_products	shoes	11	12	-2.523505e-03
430	dairy_products	smartphones	11	11	2.725250e-02
431	dairy_products	snacks	11	10	9.992619e-01
432	dairy_products	software	11	9	2.644677e-02
433	dairy_products	sports_equipment	11	8	2.642325e-02
434	dairy_products	streaming_services	11	7	2.725106e-02
435	dairy_products	tablets	11	6	2.713077e-02
436	dairy_products	travel	11	5	2.772372e-02
437	dairy_products	vegetables	11	4	9.995148e-01
438	dairy_products	video_games	11	3	2.702824e-02
439	dairy_products	watches	11	2	-3.453079e-03
440	dairy_products	income	11	1	9.933708e-02
441	desktops	accessories	12	40	1.327320e-02
442	desktops	accommodation	12	39	-1.554565e-02
443	desktops	alcohol	12	38	2.723798e-02
444	desktops	audio_equipment	12	37	9.991139e-01
445	desktops	beverages	12	36	2.697453e-02
446	desktops	books	12	35	-1.575939e-02
447	desktops	cameras	12	34	9.987915e-01
448	desktops	car_rentals	12	33	-1.680848e-02
449	desktops	clothing	12	32	1.461081e-02
450	desktops	coffee_shops	12	31	2.638125e-02
451	desktops	dairy_products	12	30	2.677144e-02
452	desktops	desktops	12	29	1.000000e+00
453	desktops	electronics	12	28	9.992834e-01

454	desktops	fast_food	12	27	2.740551e-02
455	desktops	food_delivery	12	26	2.700123e-02
456	desktops	fruits	12	25	2.758659e-02
457	desktops	groceries	12	24	2.722561e-02
458	desktops	gym_memberships	12	23	-1.501757e-02
459	desktops	jewelry	12	22	1.505550e-02
460	desktops	laptops	12	21	9.990989e-01
461	desktops	magazines	12	20	-1.595442e-02
462	desktops	meat	12	19	2.756473e-02
463	desktops	movies	12	18	-1.481600e-02
464	desktops	music	12	17	-1.659544e-02
465	desktops	outdoor_activities	12	16	-1.575689e-02
466	desktops	public_transportation	12	15	-1.518514e-02
467	desktops	restaurant_meals	12	14	2.743077e-02
468	desktops	seafood	12	13	2.682101e-02
469	desktops	shoes	12	12	1.572200e-02
470	desktops	smartphones	12	11	9.992155e-01
471	desktops	snacks	12	10	2.716362e-02
472	desktops	software	12	9	9.988151e-01
473	desktops	sports_equipment	12	8	-1.643528e-02
474	desktops	streaming_services	12	7	-1.562941e-02
475	desktops	tablets	12	6	9.991297e-01
476	desktops	travel	12	5	-1.564430e-02
477	desktops	vegetables	12	4	2.735807e-02
478	desktops	video_games	12	3	9.992162e-01
479	desktops	watches	12	2	1.418795e-02
480	desktops	income	12	1	9.875643e-01
481	electronics	accessories	13	40	1.198667e-02
482	electronics	accommodation	13	39	-1.508135e-02
483	electronics	alcohol	13	38	2.749519e-02
484	electronics	audio_equipment	13	37	9.996487e-01
485	electronics	beverages	13	36	2.727085e-02
486	electronics	books	13	35	-1.525438e-02
487	electronics	cameras	13	34	9.992875e-01
488	electronics	car_rentals	13	33	-1.634445e-02
489	electronics	clothing	13	32	1.336095e-02
490	electronics	coffee_shops	13	31	2.670325e-02
491	electronics	dairy_products	13	30	2.707046e-02
492	electronics	desktops	13	29	9.992834e-01
493	electronics	electronics	13	28	1.000000e+00
494	electronics	fast_food	13	27	2.769605e-02
495	electronics	food_delivery	13	26	2.731156e-02
496	electronics	fruits	13	25	2.789359e-02

497	electronics	groceries	13	24	2.751469e-02
498	electronics	gym_memberships	13	23	-1.452754e-02
499	electronics	jewelry	13	22	1.380963e-02
500	electronics	laptops	13	21	9.996304e-01
501	electronics	magazines	13	20	-1.546168e-02
502	electronics	meat	13	19	2.787021e-02
503	electronics	movies	13	18	-1.431821e-02
504	electronics	music	13	17	-1.611387e-02
505	electronics	outdoor_activities	13	16	-1.526484e-02
506	electronics	public_transportation	13	15	-1.469642e-02
507	electronics	restaurant_meals	13	14	2.773620e-02
508	electronics	seafood	13	13	2.713097e-02
509	electronics	shoes	13	12	1.444569e-02
510	electronics	smartphones	13	11	9.997550e-01
511	electronics	snacks	13	10	2.747759e-02
512	electronics	software	13	9	9.993075e-01
513	electronics	sports_equipment	13	8	-1.600448e-02
514	electronics	streaming_services	13	7	-1.511763e-02
515	electronics	tablets	13	6	9.996411e-01
516	electronics	travel	13	5	-1.517383e-02
517	electronics	vegetables	13	4	2.765362e-02
518	electronics	video_games	13	3	9.997532e-01
519	electronics	watches	13	2	1.293598e-02
520	electronics	income	13	1	9.880406e-01
521	fast_food	accessories	14	40	-1.969913e-03
522	fast_food	accommodation	14	39	2.752649e-02
523	fast_food	alcohol	14	38	9.984409e-01
524	fast_food	audio_equipment	14	37	2.733868e-02
525	fast_food	beverages	14	36	9.991576e-01
526	fast_food	books	14	35	2.667810e-02
527	fast_food	cameras	14	34	2.726585e-02
528	fast_food	car_rentals	14	33	2.619026e-02
529	fast_food	clothing	14	32	-2.718762e-03
530	fast_food	coffee_shops	14	31	9.985565e-01
531	fast_food	dairy_products	14	30	9.995032e-01
532	fast_food	desktops	14	29	2.740551e-02
533	fast_food	electronics	14	28	2.769605e-02
534	fast_food	fast_food	14	27	1.000000e+00
535	fast_food	food_delivery	14	26	9.991766e-01
536	fast_food	fruits	14	25	9.993772e-01
537	fast_food	groceries	14	24	9.995689e-01
538	fast_food	gym_memberships	14	23	2.782450e-02
539	fast_food	jewelry	14	22	-1.113655e-03

540	fast_food	laptops	14	21	2.797581e-02
541	fast_food	magazines	14	20	2.883138e-02
542	fast_food	meat	14	19	9.994994e-01
543	fast_food	movies	14	18	2.760211e-02
544	fast_food	music	14	17	2.782532e-02
545	fast_food	outdoor_activities	14	16	2.667672e-02
546	fast_food	public_transportation	14	15	2.758791e-02
547	fast_food	restaurant_meals	14	14	9.993951e-01
548	fast_food	seafood	14	13	9.993861e-01
549	fast_food	shoes	14	12	-2.948365e-03
550	fast_food	smartphones	14	11	2.787101e-02
551	fast_food	snacks	14	10	9.991526e-01
552	fast_food	software	14	9	2.706801e-02
553	fast_food	sports_equipment	14	8	2.675917e-02
554	fast_food	streaming_services	14	7	2.765341e-02
555	fast_food	tablets	14	6	2.773786e-02
556	fast_food	travel	14	5	2.809171e-02
557	fast_food	vegetables	14	4	9.993947e-01
558	fast_food	video_games	14	3	2.764442e-02
559	fast_food	watches	14	2	-3.865751e-03
560	fast_food	income	14	1	9.994356e-02
561	food_delivery	accessories	15	40	-1.358995e-03
562	food_delivery	accommodation	15	39	2.716629e-02
563	food_delivery	alcohol	15	38	9.981894e-01
564	food_delivery	audio_equipment	15	37	2.695111e-02
565	food_delivery	beverages	15	36	9.989330e-01
566	food_delivery	books	15	35	2.631682e-02
567	food_delivery	cameras	15	34	2.691818e-02
568	food_delivery	car_rentals	15	33	2.587527e-02
569	food_delivery	clothing	15	32	-2.074834e-03
570	food_delivery	coffee_shops	15	31	9.983339e-01
571	food_delivery	dairy_products	15	30	9.992899e-01
572	food_delivery	desktops	15	29	2.700123e-02
573	food_delivery	electronics	15	28	2.731156e-02
574	food_delivery	fast_food	15	27	9.991766e-01
575	food_delivery	food_delivery	15	26	1.000000e+00
576	food_delivery	fruits	15	25	9.992088e-01
577	food_delivery	groceries	15	24	9.993400e-01
578	food_delivery	gym_memberships	15	23	2.748839e-02
579	food_delivery	jewelry	15	22	-5.660566e-04
580	food_delivery	laptops	15	21	2.759679e-02
581	food_delivery	magazines	15	20	2.854797e-02
582	food_delivery	meat	15	19	9.992830e-01

583	food_delivery	movies	15	18	2.730812e-02
584	food_delivery	music	15	17	2.749766e-02
585	food_delivery	outdoor_activities	15	16	2.633946e-02
586	food_delivery	public_transportation	15	15	2.727448e-02
587	food_delivery	restaurant_meals	15	14	9.991752e-01
588	food_delivery	seafood	15	13	9.991904e-01
589	food_delivery	shoes	15	12	-2.347020e-03
590	food_delivery	smartphones	15	11	2.749871e-02
591	food_delivery	snacks	15	10	9.989294e-01
592	food_delivery	software	15	9	2.666895e-02
593	food_delivery	sports_equipment	15	8	2.645002e-02
594	food_delivery	streaming_services	15	7	2.731946e-02
595	food_delivery	tablets	15	6	2.735491e-02
596	food_delivery	travel	15	5	2.778066e-02
597	food_delivery	vegetables	15	4	9.991735e-01
598	food_delivery	video_games	15	3	2.725865e-02
599	food_delivery	watches	15	2	-3.269865e-03
600	food_delivery	income	15	1	9.956879e-02
601	fruits	accessories	16	40	-1.418069e-03
602	fruits	accommodation	16	39	2.702185e-02
603	fruits	alcohol	16	38	9.983989e-01
604	fruits	audio_equipment	16	37	2.753635e-02
605	fruits	beverages	16	36	9.991786e-01
606	fruits	books	16	35	2.619321e-02
607	fruits	cameras	16	34	2.750039e-02
608	fruits	car_rentals	16	33	2.567699e-02
609	fruits	clothing	16	32	-2.194330e-03
610	fruits	coffee_shops	16	31	9.985525e-01
611	fruits	dairy_products	16	30	9.995024e-01
612	fruits	desktops	16	29	2.758659e-02
613	fruits	electronics	16	28	2.789359e-02
614	fruits	fast_food	16	27	9.993772e-01
615	fruits	food_delivery	16	26	9.992088e-01
616	fruits	fruits	16	25	1.000000e+00
617	fruits	groceries	16	24	9.995682e-01
618	fruits	gym_memberships	16	23	2.731470e-02
619	fruits	jewelry	16	22	-6.375675e-04
620	fruits	laptops	16	21	2.816469e-02
621	fruits	magazines	16	20	2.833691e-02
622	fruits	meat	16	19	9.995166e-01
623	fruits	movies	16	18	2.710163e-02
624	fruits	music	16	17	2.732293e-02
625	fruits	outdoor_activities	16	16	2.613522e-02

626	fruits	public_transportation	16	15	2.712535e-02
627	fruits	restaurant_meals	16	14	9.993985e-01
628	fruits	seafood	16	13	9.994229e-01
629	fruits	shoes	16	12	-2.409560e-03
630	fruits	smartphones	16	11	2.807674e-02
631	fruits	snacks	16	10	9.991375e-01
632	fruits	software	16	9	2.724836e-02
633	fruits	sports_equipment	16	8	2.630169e-02
634	fruits	streaming_services	16	7	2.712140e-02
635	fruits	tablets	16	6	2.794587e-02
636	fruits	travel	16	5	2.759794e-02
637	fruits	vegetables	16	4	9.993836e-01
638	fruits	video_games	16	3	2.785353e-02
639	fruits	watches	16	2	-3.404672e-03
640	fruits	income	16	1	1.001396e-01
641	groceries	accessories	17	40	-1.512459e-03
642	groceries	accommodation	17	39	2.715661e-02
643	groceries	alcohol	17	38	9.986030e-01
644	groceries	audio_equipment	17	37	2.716984e-02
645	groceries	beverages	17	36	9.993385e-01
646	groceries	books	17	35	2.629123e-02
647	groceries	cameras	17	34	2.712271e-02
648	groceries	car_rentals	17	33	2.583691e-02
649	groceries	clothing	17	32	-2.247306e-03
650	groceries	coffee_shops	17	31	9.987151e-01
651	groceries	dairy_products	17	30	9.996789e-01
652	groceries	desktops	17	29	2.722561e-02
653	groceries	electronics	17	28	2.751469e-02
654	groceries	fast_food	17	27	9.995689e-01
655	groceries	food_delivery	17	26	9.993400e-01
656	groceries	fruits	17	25	9.995682e-01
657	groceries	groceries	17	24	1.000000e+00
658	groceries	gym_memberships	17	23	2.744541e-02
659	groceries	jewelry	17	22	-6.965175e-04
660	groceries	laptops	17	21	2.779283e-02
661	groceries	magazines	17	20	2.850855e-02
662	groceries	meat	17	19	9.996828e-01
663	groceries	movies	17	18	2.724261e-02
664	groceries	music	17	17	2.745376e-02
665	groceries	outdoor_activities	17	16	2.632986e-02
666	groceries	public_transportation	17	15	2.721765e-02
667	groceries	restaurant_meals	17	14	9.995643e-01
668	groceries	seafood	17	13	9.995663e-01

669	groceries	shoes	17	12	-2.482004e-03
670	groceries	smartphones	17	11	2.770323e-02
671	groceries	snacks	17	10	9.993030e-01
672	groceries	software	17	9	2.689701e-02
673	groceries	sports_equipment	17	8	2.641953e-02
674	groceries	streaming_services	17	7	2.726438e-02
675	groceries	tablets	17	6	2.757022e-02
676	groceries	travel	17	5	2.773147e-02
677	groceries	vegetables	17	4	9.995674e-01
678	groceries	video_games	17	3	2.747492e-02
679	groceries	watches	17	2	-3.546342e-03
680	groceries	income	17	1	9.978886e-02
681	gym_memberships	accessories	18	40	9.880771e-03
682	gym_memberships	accommodation	18	39	9.983393e-01
683	gym_memberships	alcohol	18	38	2.676237e-02
684	gym_memberships	audio_equipment	18	37	-1.422042e-02
685	gym_memberships	beverages	18	36	2.732703e-02
686	gym_memberships	books	18	35	9.964421e-01
687	gym_memberships	cameras	18	34	-1.551333e-02
688	gym_memberships	car_rentals	18	33	9.978294e-01
689	gym_memberships	clothing	18	32	1.089314e-02
690	gym_memberships	coffee_shops	18	31	2.798180e-02
691	gym_memberships	dairy_products	18	30	2.742194e-02
692	gym_memberships	desktops	18	29	-1.501757e-02
693	gym_memberships	electronics	18	28	-1.452754e-02
694	gym_memberships	fast_food	18	27	2.782450e-02
695	gym_memberships	food_delivery	18	26	2.748839e-02
696	gym_memberships	fruits	18	25	2.731470e-02
697	gym_memberships	groceries	18	24	2.744541e-02
698	gym_memberships	gym_memberships	18	23	1.000000e+00
699	gym_memberships	jewelry	18	22	9.442923e-03
700	gym_memberships	laptops	18	21	-1.435039e-02
701	gym_memberships	magazines	18	20	9.964476e-01
702	gym_memberships	meat	18	19	2.781477e-02
703	gym_memberships	movies	18	18	9.978886e-01
704	gym_memberships	music	18	17	9.978666e-01
705	gym_memberships	outdoor_activities	18	16	9.978294e-01
706	gym_memberships	public_transportation	18	15	9.978868e-01
707	gym_memberships	restaurant_meals	18	14	2.789654e-02
708	gym_memberships	seafood	18	13	2.733979e-02
709	gym_memberships	shoes	18	12	1.028905e-02
710	gym_memberships	smartphones	18	11	-1.468032e-02
711	gym_memberships	snacks	18	10	2.778456e-02



712	gym_memberships	software	18	9	-1.451332e-02
713	gym_memberships	sports_equipment	18	8	9.965212e-01
714	gym_memberships	streaming_services	18	7	9.983148e-01
715	gym_memberships	tablets	18	6	-1.409145e-02
716	gym_memberships	travel	18	5	9.983092e-01
717	gym_memberships	vegetables	18	4	2.739450e-02
718	gym_memberships	video_games	18	3	-1.445163e-02
719	gym_memberships	watches	18	2	1.442650e-02
720	gym_memberships	income	18	1	8.715555e-02
721	jewelry	accessories	19	40	9.907350e-01
722	jewelry	accommodation	19	39	9.876784e-03
723	jewelry	alcohol	19	38	-1.515553e-03
724	jewelry	audio_equipment	19	37	1.456830e-02
725	jewelry	beverages	19	36	-1.026867e-03
726	jewelry	books	19	35	8.674764e-03
727	jewelry	cameras	19	34	1.452888e-02
728	jewelry	car_rentals	19	33	9.270720e-03
729	jewelry	clothing	19	32	9.924354e-01
730	jewelry	coffee_shops	19	31	-1.102325e-03
731	jewelry	dairy_products	19	30	-7.672026e-04
732	jewelry	desktops	19	29	1.505550e-02
733	jewelry	electronics	19	28	1.380963e-02
734	jewelry	fast_food	19	27	-1.113655e-03
735	jewelry	food_delivery	19	26	-5.660566e-04
736	jewelry	fruits	19	25	-6.375675e-04
737	jewelry	groceries	19	24	-6.965175e-04
738	jewelry	gym_memberships	19	23	9.442923e-03
739	jewelry	jewelry	19	22	1.000000e+00
740	jewelry	laptops	19	21	1.384052e-02
741	jewelry	magazines	19	20	9.609125e-03
742	jewelry	meat	19	19	-4.378734e-04
743	jewelry	movies	19	18	8.603844e-03
744	jewelry	music	19	17	8.773197e-03
745	jewelry	outdoor_activities	19	16	8.087307e-03
746	jewelry	public_transportation	19	15	8.836193e-03
747	jewelry	restaurant_meals	19	14	-9.429742e-04
748	jewelry	seafood	19	13	-9.324495e-05
749	jewelry	shoes	19	12	9.919792e-01
750	jewelry	smartphones	19	11	1.365304e-02
751	jewelry	snacks	19	10	-1.027755e-03
752	jewelry	software	19	9	1.432437e-02
753	jewelry	sports_equipment	19	8	1.021203e-02
754	jewelry	streaming_services	19	7	7.787454e-03

755	jewelry	tablets	19	6	1.426194e-02
756	jewelry	travel	19	5	9.487827e-03
757	jewelry	vegetables	19	4	-1.616300e-05
758	jewelry	video_games	19	3	1.408950e-02
759	jewelry	watches	19	2	9.873438e-01
760	jewelry	income	19	1	1.054730e-01
761	laptops	accessories	20	40	1.200826e-02
762	laptops	accommodation	20	39	-1.493421e-02
763	laptops	alcohol	20	38	2.778685e-02
764	laptops	audio_equipment	20	37	9.994639e-01
765	laptops	beverages	20	36	2.756067e-02
766	laptops	books	20	35	-1.502667e-02
767	laptops	cameras	20	34	9.991089e-01
768	laptops	car_rentals	20	33	-1.619790e-02
769	laptops	clothing	20	32	1.341700e-02
770	laptops	coffee_shops	20	31	2.696399e-02
771	laptops	dairy_products	20	30	2.736159e-02
772	laptops	desktops	20	29	9.990989e-01
773	laptops	electronics	20	28	9.996304e-01
774	laptops	fast_food	20	27	2.797581e-02
775	laptops	food_delivery	20	26	2.759679e-02
776	laptops	fruits	20	25	2.816469e-02
777	laptops	groceries	20	24	2.779283e-02
778	laptops	gym_memberships	20	23	-1.435039e-02
779	laptops	jewelry	20	22	1.384052e-02
780	laptops	laptops	20	21	1.000000e+00
781	laptops	magazines	20	20	-1.528335e-02
782	laptops	meat	20	19	2.815921e-02
783	laptops	movies	20	18	-1.419147e-02
784	laptops	music	20	17	-1.594403e-02
785	laptops	outdoor_activities	20	16	-1.512903e-02
786	laptops	public_transportation	20	15	-1.454350e-02
787	laptops	restaurant_meals	20	14	2.801953e-02
788	laptops	seafood	20	13	2.741128e-02
789	laptops	shoes	20	12	1.448905e-02
790	laptops	smartphones	20	11	9.995772e-01
791	laptops	snacks	20	10	2.776197e-02
792	laptops	software	20	9	9.991374e-01
793	laptops	sports_equipment	20	8	-1.583341e-02
794	laptops	streaming_services	20	7	-1.497393e-02
795	laptops	tablets	20	6	9.994470e-01
796	laptops	travel	20	5	-1.500887e-02
797	laptops	vegetables	20	4	2.792700e-02

798	laptops	video_games	20	3	9.995707e-01
799	laptops	watches	20	2	1.292558e-02
800	laptops	income	20	1	9.878984e-01
801	magazines	accessories	21	40	1.003463e-02
802	magazines	accommodation	21	39	9.968712e-01
803	magazines	alcohol	21	38	2.775734e-02
804	magazines	audio_equipment	21	37	-1.519459e-02
805	magazines	beverages	21	36	2.832522e-02
806	magazines	books	21	35	9.951135e-01
807	magazines	cameras	21	34	-1.641869e-02
808	magazines	car_rentals	21	33	9.964194e-01
809	magazines	clothing	21	32	1.096644e-02
810	magazines	coffee_shops	21	31	2.902489e-02
811	magazines	dairy_products	21	30	2.844927e-02
812	magazines	desktops	21	29	-1.595442e-02
813	magazines	electronics	21	28	-1.546168e-02
814	magazines	fast_food	21	27	2.883138e-02
815	magazines	food_delivery	21	26	2.854797e-02
816	magazines	fruits	21	25	2.833691e-02
817	magazines	groceries	21	24	2.850855e-02
818	magazines	gym_memberships	21	23	9.964476e-01
819	magazines	jewelry	21	22	9.609125e-03
820	magazines	laptops	21	21	-1.528335e-02
821	magazines	magazines	21	20	1.000000e+00
822	magazines	meat	21	19	2.886413e-02
823	magazines	movies	21	18	9.965777e-01
824	magazines	music	21	17	9.964565e-01
825	magazines	outdoor_activities	21	16	9.964276e-01
826	magazines	public_transportation	21	15	9.965221e-01
827	magazines	restaurant_meals	21	14	2.889289e-02
828	magazines	seafood	21	13	2.836524e-02
829	magazines	shoes	21	12	1.027579e-02
830	magazines	smartphones	21	11	-1.564771e-02
831	magazines	snacks	21	10	2.877040e-02
832	magazines	software	21	9	-1.543974e-02
833	magazines	sports_equipment	21	8	9.952437e-01
834	magazines	streaming_services	21	7	9.969653e-01
835	magazines	tablets	21	6	-1.502758e-02
836	magazines	travel	21	5	9.968765e-01
837	magazines	vegetables	21	4	2.838992e-02
838	magazines	video_games	21	3	-1.536818e-02
839	magazines	watches	21	2	1.434756e-02
840	magazines	income	21	1	8.616727e-02

841	meat	accessories	22	40	-1.273150e-03
842	meat	accommodation	22	39	2.755167e-02
843	meat	alcohol	22	38	9.984995e-01
844	meat	audio_equipment	22	37	2.751092e-02
845	meat	beverages	22	36	9.992871e-01
846	meat	books	22	35	2.665403e-02
847	meat	cameras	22	34	2.747140e-02
848	meat	car_rentals	22	33	2.622687e-02
849	meat	clothing	22	32	-2.008696e-03
850	meat	coffee_shops	22	31	9.986149e-01
851	meat	dairy_products	22	30	9.996193e-01
852	meat	desktops	22	29	2.756473e-02
853	meat	electronics	22	28	2.787021e-02
854	meat	fast_food	22	27	9.994994e-01
855	meat	food_delivery	22	26	9.992830e-01
856	meat	fruits	22	25	9.995166e-01
857	meat	groceries	22	24	9.996828e-01
858	meat	gym_memberships	22	23	2.781477e-02
859	meat	jewelry	22	22	-4.378734e-04
860	meat	laptops	22	21	2.815921e-02
861	meat	magazines	22	20	2.886413e-02
862	meat	meat	22	19	1.000000e+00
863	meat	movies	22	18	2.762144e-02
864	meat	music	22	17	2.784061e-02
865	meat	outdoor_activities	22	16	2.670967e-02
866	meat	public_transportation	22	15	2.762572e-02
867	meat	restaurant_meals	22	14	9.994909e-01
868	meat	seafood	22	13	9.995160e-01
869	meat	shoes	22	12	-2.218532e-03
870	meat	smartphones	22	11	2.804777e-02
871	meat	snacks	22	10	9.992466e-01
872	meat	software	22	9	2.722987e-02
873	meat	sports_equipment	22	8	2.683195e-02
874	meat	streaming_services	22	7	2.765823e-02
875	meat	tablets	22	6	2.792967e-02
876	meat	travel	22	5	2.812022e-02
877	meat	vegetables	22	4	9.994987e-01
878	meat	video_games	22	3	2.782597e-02
879	meat	watches	22	2	-3.262339e-03
880	meat	income	22	1	1.001932e-01
881	movies	accessories	23	40	8.856935e-03
882	movies	accommodation	23	39	9.982874e-01
883	movies	alcohol	23	38	2.655574e-02

884	movies	audio_equipment	23	37	-1.401707e-02
885	movies	beverages	23	36	2.709282e-02
886	movies	books	23	35	9.964370e-01
887	movies	cameras	23	34	-1.529985e-02
888	movies	car_rentals	23	33	9.978593e-01
889	movies	clothing	23	32	9.840798e-03
890	movies	coffee_shops	23	31	2.781662e-02
891	movies	dairy_products	23	30	2.722251e-02
892	movies	desktops	23	29	-1.481600e-02
893	movies	electronics	23	28	-1.431821e-02
894	movies	fast_food	23	27	2.760211e-02
895	movies	food_delivery	23	26	2.730812e-02
896	movies	fruits	23	25	2.710163e-02
897	movies	groceries	23	24	2.724261e-02
898	movies	gym_memberships	23	23	9.978886e-01
899	movies	jewelry	23	22	8.603844e-03
900	movies	laptops	23	21	-1.419147e-02
901	movies	magazines	23	20	9.965777e-01
902	movies	meat	23	19	2.762144e-02
903	movies	movies	23	18	1.000000e+00
904	movies	music	23	17	9.978674e-01
905	movies	outdoor_activities	23	16	9.978546e-01
906	movies	public_transportation	23	15	9.978716e-01
907	movies	restaurant_meals	23	14	2.766697e-02
908	movies	seafood	23	13	2.712630e-02
909	movies	shoes	23	12	9.286067e-03
910	movies	smartphones	23	11	-1.451569e-02
911	movies	snacks	23	10	2.755535e-02
912	movies	software	23	9	-1.428807e-02
913	movies	sports_equipment	23	8	9.964404e-01
914	movies	streaming_services	23	7	9.983328e-01
915	movies	tablets	23	6	-1.385464e-02
916	movies	travel	23	5	9.983021e-01
917	movies	vegetables	23	4	2.712277e-02
918	movies	video_games	23	3	-1.424965e-02
919	movies	watches	23	2	1.331294e-02
920	movies	income	23	1	8.724015e-02
921	music	accessories	24	40	9.168995e-03
922	music	accommodation	24	39	9.982986e-01
923	music	alcohol	24	38	2.674033e-02
924	music	audio_equipment	24	37	-1.583353e-02
925	music	beverages	24	36	2.730201e-02
926	music	books	24	35	9.963788e-01

927	music	cameras	24	34	-1.711453e-02
928	music	car_rentals	24	33	9.978661e-01
929	music	clothing	24	32	1.008085e-02
930	music	coffee_shops	24	31	2.802469e-02
931	music	dairy_products	24	30	2.742298e-02
932	music	desktops	24	29	-1.659544e-02
933	music	electronics	24	28	-1.611387e-02
934	music	fast_food	24	27	2.782532e-02
935	music	food_delivery	24	26	2.749766e-02
936	music	fruits	24	25	2.732293e-02
937	music	groceries	24	24	2.745376e-02
938	music	gym_memberships	24	23	9.978666e-01
939	music	jewelry	24	22	8.773197e-03
940	music	laptops	24	21	-1.594403e-02
941	music	magazines	24	20	9.964565e-01
942	music	meat	24	19	2.784061e-02
943	music	movies	24	18	9.978674e-01
944	music	music	24	17	1.000000e+00
945	music	outdoor_activities	24	16	9.977997e-01
946	music	public_transportation	24	15	9.979009e-01
947	music	restaurant_meals	24	14	2.787723e-02
948	music	seafood	24	13	2.732546e-02
949	music	shoes	24	12	9.514038e-03
950	music	smartphones	24	11	-1.627967e-02
951	music	snacks	24	10	2.778161e-02
952	music	software	24	9	-1.608470e-02
953	music	sports_equipment	24	8	9.965643e-01
954	music	streaming_services	24	7	9.983230e-01
955	music	tablets	24	6	-1.565336e-02
956	music	travel	24	5	9.983449e-01
957	music	vegetables	24	4	2.735169e-02
958	music	video_games	24	3	-1.606548e-02
959	music	watches	24	2	1.354290e-02
960	music	income	24	1	8.551568e-02
961	outdoor_activities	accessories	25	40	8.089073e-03
962	outdoor_activities	accommodation	25	39	9.982606e-01
963	outdoor_activities	alcohol	25	38	2.560013e-02
964	outdoor_activities	audio_equipment	25	37	-1.496576e-02
965	outdoor_activities	beverages	25	36	2.620582e-02
966	outdoor_activities	books	25	35	9.962908e-01
967	outdoor_activities	cameras	25	34	-1.626843e-02
968	outdoor_activities	car_rentals	25	33	9.977635e-01
969	outdoor_activities	clothing	25	32	9.163108e-03

970	outdoor_activities	coffee_shops	25	31	2.690954e-02
971	outdoor_activities	dairy_products	25	30	2.631054e-02
972	outdoor_activities	desktops	25	29	-1.575689e-02
973	outdoor_activities	electronics	25	28	-1.526484e-02
974	outdoor_activities	fast_food	25	27	2.667672e-02
975	outdoor_activities	food_delivery	25	26	2.633946e-02
976	outdoor_activities	fruits	25	25	2.613522e-02
977	outdoor_activities	groceries	25	24	2.632986e-02
978	outdoor_activities	gym_memberships	25	23	9.978294e-01
979	outdoor_activities	jewelry	25	22	8.087307e-03
980	outdoor_activities	laptops	25	21	-1.512903e-02
981	outdoor_activities	magazines	25	20	9.964276e-01
982	outdoor_activities	meat	25	19	2.670967e-02
983	outdoor_activities	movies	25	18	9.978546e-01
984	outdoor_activities	music	25	17	9.977997e-01
985	outdoor_activities	outdoor_activities	25	16	1.000000e+00
986	outdoor_activities	public_transportation	25	15	9.977705e-01
987	outdoor_activities	restaurant_meals	25	14	2.674286e-02
988	outdoor_activities	seafood	25	13	2.619177e-02
989	outdoor_activities	shoes	25	12	8.610838e-03
990	outdoor_activities	smartphones	25	11	-1.542427e-02
991	outdoor_activities	snacks	25	10	2.661217e-02
992	outdoor_activities	software	25	9	-1.519806e-02
993	outdoor_activities	sports_equipment	25	8	9.964557e-01
994	outdoor_activities	streaming_services	25	7	9.982441e-01
995	outdoor_activities	tablets	25	6	-1.481972e-02
996	outdoor_activities	travel	25	5	9.981947e-01
997	outdoor_activities	vegetables	25	4	2.623833e-02
998	outdoor_activities	video_games	25	3	-1.519654e-02
999	outdoor_activities	watches	25	2	1.252049e-02
1000	outdoor_activities	income	25	1	8.617345e-02
1001	public_transportation	accessories	26	40	9.051121e-03
1002	public_transportation	accommodation	26	39	9.982733e-01
1003	public_transportation	alcohol	26	38	2.654072e-02
1004	public_transportation	audio_equipment	26	37	-1.443355e-02
1005	public_transportation	beverages	26	36	2.708553e-02
1006	public_transportation	books	26	35	9.964024e-01
1007	public_transportation	cameras	26	34	-1.572518e-02
1008	public_transportation	car_rentals	26	33	9.978010e-01
1009	public_transportation	clothing	26	32	1.005070e-02
1010	public_transportation	coffee_shops	26	31	2.775359e-02
1011	public_transportation	dairy_products	26	30	2.718767e-02
1012	public_transportation	desktops	26	29	-1.518514e-02

1013	public_transportation	electronics	26	28	-1.469642e-02
1014	public_transportation	fast_food	26	27	2.758791e-02
1015	public_transportation	food_delivery	26	26	2.727448e-02
1016	public_transportation	fruits	26	25	2.712535e-02
1017	public_transportation	groceries	26	24	2.721765e-02
1018	public_transportation	gym_memberships	26	23	9.978868e-01
1019	public_transportation	jewelry	26	22	8.836193e-03
1020	public_transportation	laptops	26	21	-1.454350e-02
1021	public_transportation	magazines	26	20	9.965221e-01
1022	public_transportation	meat	26	19	2.762572e-02
1023	public_transportation	movies	26	18	9.978716e-01
1024	public_transportation	music	26	17	9.979009e-01
1025	public_transportation	outdoor_activities	26	16	9.977705e-01
1026	public_transportation	public_transportation	26	15	1.000000e+00
1027	public_transportation	restaurant_meals	26	14	2.764120e-02
1028	public_transportation	seafood	26	13	2.709747e-02
1029	public_transportation	shoes	26	12	9.476372e-03
1030	public_transportation	smartphones	26	11	-1.486316e-02
1031	public_transportation	snacks	26	10	2.756629e-02
1032	public_transportation	software	26	9	-1.468429e-02
1033	public_transportation	sports_equipment	26	8	9.964770e-01
1034	public_transportation	streaming_services	26	7	9.983087e-01
1035	public_transportation	tablets	26	6	-1.426264e-02
1036	public_transportation	travel	26	5	9.982613e-01
1037	public_transportation	vegetables	26	4	2.712466e-02
1038	public_transportation	video_games	26	3	-1.463025e-02
1039	public_transportation	watches	26	2	1.349016e-02
1040	public_transportation	income	26	1	8.687233e-02
1041	restaurant_meals	accessories	27	40	-1.731142e-03
1042	restaurant_meals	accommodation	27	39	2.758985e-02
1043	restaurant_meals	alcohol	27	38	9.984372e-01
1044	restaurant_meals	audio_equipment	27	37	2.738920e-02
1045	restaurant_meals	beverages	27	36	9.991911e-01
1046	restaurant_meals	books	27	35	2.675790e-02
1047	restaurant_meals	cameras	27	34	2.733690e-02
1048	restaurant_meals	car_rentals	27	33	2.625959e-02
1049	restaurant_meals	clothing	27	32	-2.500225e-03
1050	restaurant_meals	coffee_shops	27	31	9.985588e-01
1051	restaurant_meals	dairy_products	27	30	9.995056e-01
1052	restaurant_meals	desktops	27	29	2.743077e-02
1053	restaurant_meals	electronics	27	28	2.773620e-02
1054	restaurant_meals	fast_food	27	27	9.993951e-01
1055	restaurant_meals	food_delivery	27	26	9.991752e-01



1056	restaurant_meals	fruits	27	25	9.993985e-01
1057	restaurant_meals	groceries	27	24	9.995643e-01
1058	restaurant_meals	gym_memberships	27	23	2.789654e-02
1059	restaurant_meals	jewelry	27	22	-9.429742e-04
1060	restaurant_meals	laptops	27	21	2.801953e-02
1061	restaurant_meals	magazines	27	20	2.889289e-02
1062	restaurant_meals	meat	27	19	9.994909e-01
1063	restaurant_meals	movies	27	18	2.766697e-02
1064	restaurant_meals	music	27	17	2.787723e-02
1065	restaurant_meals	outdoor_activities	27	16	2.674286e-02
1066	restaurant_meals	public_transportation	27	15	2.764120e-02
1067	restaurant_meals	restaurant_meals	27	14	1.000000e+00
1068	restaurant_meals	seafood	27	13	9.994172e-01
1069	restaurant_meals	shoes	27	12	-2.720893e-03
1070	restaurant_meals	smartphones	27	11	2.791648e-02
1071	restaurant_meals	snacks	27	10	9.991384e-01
1072	restaurant_meals	software	27	9	2.711393e-02
1073	restaurant_meals	sports_equipment	27	8	2.690217e-02
1074	restaurant_meals	streaming_services	27	7	2.768063e-02
1075	restaurant_meals	tablets	27	6	2.780336e-02
1076	restaurant_meals	travel	27	5	2.817272e-02
1077	restaurant_meals	vegetables	27	4	9.994059e-01
1078	restaurant_meals	video_games	27	3	2.770081e-02
1079	restaurant_meals	watches	27	2	-3.666636e-03
1080	restaurant_meals	income	27	1	1.000170e-01
1081	seafood	accessories	28	40	-8.409656e-04
1082	seafood	accommodation	28	39	2.702561e-02
1083	seafood	alcohol	28	38	9.984189e-01
1084	seafood	audio_equipment	28	37	2.678655e-02
1085	seafood	beverages	28	36	9.991786e-01
1086	seafood	books	28	35	2.619424e-02
1087	seafood	cameras	28	34	2.674878e-02
1088	seafood	car_rentals	28	33	2.569633e-02
1089	seafood	clothing	28	32	-1.638617e-03
1090	seafood	coffee_shops	28	31	9.985196e-01
1091	seafood	dairy_products	28	30	9.995206e-01
1092	seafood	desktops	28	29	2.682101e-02
1093	seafood	electronics	28	28	2.713097e-02
1094	seafood	fast_food	28	27	9.993861e-01
1095	seafood	food_delivery	28	26	9.991904e-01
1096	seafood	fruits	28	25	9.994229e-01
1097	seafood	groceries	28	24	9.995663e-01
1098	seafood	gym_memberships	28	23	2.733979e-02

1099	seafood	jewelry	28	22	-9.324495e-05
1100	seafood	laptops	28	21	2.741128e-02
1101	seafood	magazines	28	20	2.836524e-02
1102	seafood	meat	28	19	9.995160e-01
1103	seafood	movies	28	18	2.712630e-02
1104	seafood	music	28	17	2.732546e-02
1105	seafood	outdoor_activities	28	16	2.619177e-02
1106	seafood	public_transportation	28	15	2.709747e-02
1107	seafood	restaurant_meals	28	14	9.994172e-01
1108	seafood	seafood	28	13	1.000000e+00
1109	seafood	shoes	28	12	-1.894133e-03
1110	seafood	smartphones	28	11	2.732202e-02
1111	seafood	snacks	28	10	9.991759e-01
1112	seafood	software	28	9	2.650590e-02
1113	seafood	sports_equipment	28	8	2.627987e-02
1114	seafood	streaming_services	28	7	2.713973e-02
1115	seafood	tablets	28	6	2.718621e-02
1116	seafood	travel	28	5	2.757624e-02
1117	seafood	vegetables	28	4	9.994216e-01
1118	seafood	video_games	28	3	2.707689e-02
1119	seafood	watches	28	2	-2.867895e-03
1120	seafood	income	28	1	9.944031e-02
1121	shoes	accessories	29	40	9.956389e-01
1122	shoes	accommodation	29	39	1.061359e-02
1123	shoes	alcohol	29	38	-3.325268e-03
1124	shoes	audio_equipment	29	37	1.516455e-02
1125	shoes	beverages	29	36	-2.741145e-03
1126	shoes	books	29	35	9.631083e-03
1127	shoes	cameras	29	34	1.526474e-02
1128	shoes	car_rentals	29	33	9.967373e-03
1129	shoes	clothing	29	32	9.974463e-01
1130	shoes	coffee_shops	29	31	-2.782433e-03
1131	shoes	dairy_products	29	30	-2.523505e-03
1132	shoes	desktops	29	29	1.572200e-02
1133	shoes	electronics	29	28	1.444569e-02
1134	shoes	fast_food	29	27	-2.948365e-03
1135	shoes	food_delivery	29	26	-2.347020e-03
1136	shoes	fruits	29	25	-2.409560e-03
1137	shoes	groceries	29	24	-2.482004e-03
1138	shoes	gym_memberships	29	23	1.028905e-02
1139	shoes	jewelry	29	22	9.919792e-01
1140	shoes	laptops	29	21	1.448905e-02
1141	shoes	magazines	29	20	1.027579e-02

1142	shoes	meat	29	19	-2.218532e-03
1143	shoes	movies	29	18	9.286067e-03
1144	shoes	music	29	17	9.514038e-03
1145	shoes	outdoor_activities	29	16	8.610838e-03
1146	shoes	public_transportation	29	15	9.476372e-03
1147	shoes	restaurant_meals	29	14	-2.720893e-03
1148	shoes	seafood	29	13	-1.894133e-03
1149	shoes	shoes	29	12	1.000000e+00
1150	shoes	smartphones	29	11	1.432442e-02
1151	shoes	snacks	29	10	-2.717541e-03
1152	shoes	software	29	9	1.496489e-02
1153	shoes	sports_equipment	29	8	1.081203e-02
1154	shoes	streaming_services	29	7	8.551431e-03
1155	shoes	tablets	29	6	1.487222e-02
1156	shoes	travel	29	5	1.024137e-02
1157	shoes	vegetables	29	4	-1.832086e-03
1158	shoes	video_games	29	3	1.471003e-02
1159	shoes	watches	29	2	9.921309e-01
1160	shoes	income	29	1	1.065076e-01
1161	smartphones	accessories	30	40	1.187140e-02
1162	smartphones	accommodation	30	39	-1.525601e-02
1163	smartphones	alcohol	30	38	2.768314e-02
1164	smartphones	audio_equipment	30	37	9.995904e-01
1165	smartphones	beverages	30	36	2.745481e-02
1166	smartphones	books	30	35	-1.537965e-02
1167	smartphones	cameras	30	34	9.992339e-01
1168	smartphones	car_rentals	30	33	-1.650206e-02
1169	smartphones	clothing	30	32	1.322436e-02
1170	smartphones	coffee_shops	30	31	2.689203e-02
1171	smartphones	dairy_products	30	30	2.725250e-02
1172	smartphones	desktops	30	29	9.992155e-01
1173	smartphones	electronics	30	28	9.997550e-01
1174	smartphones	fast_food	30	27	2.787101e-02
1175	smartphones	food_delivery	30	26	2.749871e-02
1176	smartphones	fruits	30	25	2.807674e-02
1177	smartphones	groceries	30	24	2.770323e-02
1178	smartphones	gym_memberships	30	23	-1.468032e-02
1179	smartphones	jewelry	30	22	1.365304e-02
1180	smartphones	laptops	30	21	9.995772e-01
1181	smartphones	magazines	30	20	-1.564771e-02
1182	smartphones	meat	30	19	2.804777e-02
1183	smartphones	movies	30	18	-1.451569e-02
1184	smartphones	music	30	17	-1.627967e-02

1185	smartphones	outdoor_activities	30	16	-1.542427e-02
1186	smartphones	public_transportation	30	15	-1.486316e-02
1187	smartphones	restaurant_meals	30	14	2.791648e-02
1188	smartphones	seafood	30	13	2.732202e-02
1189	smartphones	shoes	30	12	1.432442e-02
1190	smartphones	smartphones	30	11	1.000000e+00
1191	smartphones	snacks	30	10	2.765345e-02
1192	smartphones	software	30	9	9.992429e-01
1193	smartphones	sports_equipment	30	8	-1.615217e-02
1194	smartphones	streaming_services	30	7	-1.529248e-02
1195	smartphones	tablets	30	6	9.995871e-01
1196	smartphones	travel	30	5	-1.534207e-02
1197	smartphones	vegetables	30	4	2.782689e-02
1198	smartphones	video_games	30	3	9.996936e-01
1199	smartphones	watches	30	2	1.282252e-02
1200	smartphones	income	30	1	9.879648e-01
1201	snacks	accessories	31	40	-1.785120e-03
1202	snacks	accommodation	31	39	2.746962e-02
1203	snacks	alcohol	31	38	9.981626e-01
1204	snacks	audio_equipment	31	37	2.713339e-02
1205	snacks	beverages	31	36	9.989059e-01
1206	snacks	books	31	35	2.662501e-02
1207	snacks	cameras	31	34	2.710711e-02
1208	snacks	car_rentals	31	33	2.620250e-02
1209	snacks	clothing	31	32	-2.519262e-03
1210	snacks	coffee_shops	31	31	9.982835e-01
1211	snacks	dairy_products	31	30	9.992619e-01
1212	snacks	desktops	31	29	2.716362e-02
1213	snacks	electronics	31	28	2.747759e-02
1214	snacks	fast_food	31	27	9.991526e-01
1215	snacks	food_delivery	31	26	9.989294e-01
1216	snacks	fruits	31	25	9.991375e-01
1217	snacks	groceries	31	24	9.993030e-01
1218	snacks	gym_memberships	31	23	2.778456e-02
1219	snacks	jewelry	31	22	-1.027755e-03
1220	snacks	laptops	31	21	2.776197e-02
1221	snacks	magazines	31	20	2.877040e-02
1222	snacks	meat	31	19	9.992466e-01
1223	snacks	movies	31	18	2.755535e-02
1224	snacks	music	31	17	2.778161e-02
1225	snacks	outdoor_activities	31	16	2.661217e-02
1226	snacks	public_transportation	31	15	2.756629e-02
1227	snacks	restaurant_meals	31	14	9.991384e-01

1228	snacks	seafood	31	13	9.991759e-01
1229	snacks	shoes	31	12	-2.717541e-03
1230	snacks	smartphones	31	11	2.765345e-02
1231	snacks	snacks	31	10	1.000000e+00
1232	snacks	software	31	9	2.685071e-02
1233	snacks	sports_equipment	31	8	2.681498e-02
1234	snacks	streaming_services	31	7	2.759475e-02
1235	snacks	tablets	31	6	2.754735e-02
1236	snacks	travel	31	5	2.802754e-02
1237	snacks	vegetables	31	4	9.991430e-01
1238	snacks	video_games	31	3	2.742901e-02
1239	snacks	watches	31	2	-3.780124e-03
1240	snacks	income	31	1	9.972493e-02
1241	software	accessories	32	40	1.254386e-02
1242	software	accommodation	32	39	-1.506460e-02
1243	software	alcohol	32	38	2.691192e-02
1244	software	audio_equipment	32	37	9.991244e-01
1245	software	beverages	32	36	2.662111e-02
1246	software	books	32	35	-1.518616e-02
1247	software	cameras	32	34	9.987918e-01
1248	software	car_rentals	32	33	-1.632584e-02
1249	software	clothing	32	32	1.386550e-02
1250	software	coffee_shops	32	31	2.605823e-02
1251	software	dairy_products	32	30	2.644677e-02
1252	software	desktops	32	29	9.988151e-01
1253	software	electronics	32	28	9.993075e-01
1254	software	fast_food	32	27	2.706801e-02
1255	software	food_delivery	32	26	2.666895e-02
1256	software	fruits	32	25	2.724836e-02
1257	software	groceries	32	24	2.689701e-02
1258	software	gym_memberships	32	23	-1.451332e-02
1259	software	jewelry	32	22	1.432437e-02
1260	software	laptops	32	21	9.991374e-01
1261	software	magazines	32	20	-1.543974e-02
1262	software	meat	32	19	2.722987e-02
1263	software	movies	32	18	-1.428807e-02
1264	software	music	32	17	-1.608470e-02
1265	software	outdoor_activities	32	16	-1.519806e-02
1266	software	public_transportation	32	15	-1.468429e-02
1267	software	restaurant_meals	32	14	2.711393e-02
1268	software	seafood	32	13	2.650590e-02
1269	software	shoes	32	12	1.496489e-02
1270	software	smartphones	32	11	9.992429e-01

1271	software	snacks	32	10	2.685071e-02
1272	software	software	32	9	1.000000e+00
1273	software	sports_equipment	32	8	-1.594210e-02
1274	software	streaming_services	32	7	-1.511125e-02
1275	software	tablets	32	6	9.991545e-01
1276	software	travel	32	5	-1.514457e-02
1277	software	vegetables	32	4	2.703582e-02
1278	software	video_games	32	3	9.992584e-01
1279	software	watches	32	2	1.352037e-02
1280	software	income	32	1	9.875500e-01
1281	sports_equipment	accessories	33	40	1.038107e-02
1282	sports_equipment	accommodation	33	39	9.969180e-01
1283	sports_equipment	alcohol	33	38	2.573089e-02
1284	sports_equipment	audio_equipment	33	37	-1.571323e-02
1285	sports_equipment	beverages	33	36	2.626819e-02
1286	sports_equipment	books	33	35	9.950262e-01
1287	sports_equipment	cameras	33	34	-1.695388e-02
1288	sports_equipment	car_rentals	33	33	9.965325e-01
1289	sports_equipment	clothing	33	32	1.139889e-02
1290	sports_equipment	coffee_shops	33	31	2.706524e-02
1291	sports_equipment	dairy_products	33	30	2.642325e-02
1292	sports_equipment	desktops	33	29	-1.643528e-02
1293	sports_equipment	electronics	33	28	-1.600448e-02
1294	sports_equipment	fast_food	33	27	2.675917e-02
1295	sports_equipment	food_delivery	33	26	2.645002e-02
1296	sports_equipment	fruits	33	25	2.630169e-02
1297	sports_equipment	groceries	33	24	2.641953e-02
1298	sports_equipment	gym_memberships	33	23	9.965212e-01
1299	sports_equipment	jewelry	33	22	1.021203e-02
1300	sports_equipment	laptops	33	21	-1.583341e-02
1301	sports_equipment	magazines	33	20	9.952437e-01
1302	sports_equipment	meat	33	19	2.683195e-02
1303	sports_equipment	movies	33	18	9.964404e-01
1304	sports_equipment	music	33	17	9.965643e-01
1305	sports_equipment	outdoor_activities	33	16	9.964557e-01
1306	sports_equipment	public_transportation	33	15	9.964770e-01
1307	sports_equipment	restaurant_meals	33	14	2.690217e-02
1308	sports_equipment	seafood	33	13	2.627987e-02
1309	sports_equipment	shoes	33	12	1.081203e-02
1310	sports_equipment	smartphones	33	11	-1.615217e-02
1311	sports_equipment	snacks	33	10	2.681498e-02
1312	sports_equipment	software	33	9	-1.594210e-02
1313	sports_equipment	sports_equipment	33	8	1.000000e+00

1314	sports_equipment	streaming_services	33	7	9.969500e-01
1315	sports_equipment	tablets	33	6	-1.555246e-02
1316	sports_equipment	travel	33	5	9.969824e-01
1317	sports_equipment	vegetables	33	4	2.630136e-02
1318	sports_equipment	video_games	33	3	-1.592019e-02
1319	sports_equipment	watches	33	2	1.506878e-02
1320	sports_equipment	income	33	1	8.553610e-02
1321	streaming_services	accessories	34	40	8.160801e-03
1322	streaming_services	accommodation	34	39	9.987466e-01
1323	streaming_services	alcohol	34	38	2.654644e-02
1324	streaming_services	audio_equipment	34	37	-1.484509e-02
1325	streaming_services	beverages	34	36	2.712685e-02
1326	streaming_services	books	34	35	9.968761e-01
1327	streaming_services	cameras	34	34	-1.609437e-02
1328	streaming_services	car_rentals	34	33	9.983126e-01
1329	streaming_services	clothing	34	32	9.124677e-03
1330	streaming_services	coffee_shops	34	31	2.785413e-02
1331	streaming_services	dairy_products	34	30	2.725106e-02
1332	streaming_services	desktops	34	29	-1.562941e-02
1333	streaming_services	electronics	34	28	-1.511763e-02
1334	streaming_services	fast_food	34	27	2.765341e-02
1335	streaming_services	food_delivery	34	26	2.731946e-02
1336	streaming_services	fruits	34	25	2.712140e-02
1337	streaming_services	groceries	34	24	2.726438e-02
1338	streaming_services	gym_memberships	34	23	9.983148e-01
1339	streaming_services	jewelry	34	22	7.787454e-03
1340	streaming_services	laptops	34	21	-1.497393e-02
1341	streaming_services	magazines	34	20	9.969653e-01
1342	streaming_services	meat	34	19	2.765823e-02
1343	streaming_services	movies	34	18	9.983328e-01
1344	streaming_services	music	34	17	9.983230e-01
1345	streaming_services	outdoor_activities	34	16	9.982441e-01
1346	streaming_services	public_transportation	34	15	9.983087e-01
1347	streaming_services	restaurant_meals	34	14	2.768063e-02
1348	streaming_services	seafood	34	13	2.713973e-02
1349	streaming_services	shoes	34	12	8.551431e-03
1350	streaming_services	smartphones	34	11	-1.529248e-02
1351	streaming_services	snacks	34	10	2.759475e-02
1352	streaming_services	software	34	9	-1.511125e-02
1353	streaming_services	sports_equipment	34	8	9.969500e-01
1354	streaming_services	streaming_services	34	7	1.000000e+00
1355	streaming_services	tablets	34	6	-1.466460e-02
1356	streaming_services	travel	34	5	9.987823e-01

1357	streaming_services	vegetables	34	4	2.718093e-02
1358	streaming_services	video_games	34	3	-1.502787e-02
1359	streaming_services	watches	34	2	1.266192e-02
1360	streaming_services	income	34	1	8.643569e-02
1361	tablets	accessories	35	40	1.244107e-02
1362	tablets	accommodation	35	39	-1.461937e-02
1363	tablets	alcohol	35	38	2.755290e-02
1364	tablets	audio_equipment	35	37	9.994726e-01
1365	tablets	beverages	35	36	2.731506e-02
1366	tablets	books	35	35	-1.477781e-02
1367	tablets	cameras	35	34	9.991196e-01
1368	tablets	car_rentals	35	33	-1.585593e-02
1369	tablets	clothing	35	32	1.382578e-02
1370	tablets	coffee_shops	35	31	2.673362e-02
1371	tablets	dairy_products	35	30	2.713077e-02
1372	tablets	desktops	35	29	9.991297e-01
1373	tablets	electronics	35	28	9.996411e-01
1374	tablets	fast_food	35	27	2.773786e-02
1375	tablets	food_delivery	35	26	2.735491e-02
1376	tablets	fruits	35	25	2.794587e-02
1377	tablets	groceries	35	24	2.757022e-02
1378	tablets	gym_memberships	35	23	-1.409145e-02
1379	tablets	jewelry	35	22	1.426194e-02
1380	tablets	laptops	35	21	9.994470e-01
1381	tablets	magazines	35	20	-1.502758e-02
1382	tablets	meat	35	19	2.792967e-02
1383	tablets	movies	35	18	-1.385464e-02
1384	tablets	music	35	17	-1.565336e-02
1385	tablets	outdoor_activities	35	16	-1.481972e-02
1386	tablets	public_transportation	35	15	-1.426264e-02
1387	tablets	restaurant_meals	35	14	2.780336e-02
1388	tablets	seafood	35	13	2.718621e-02
1389	tablets	shoes	35	12	1.487222e-02
1390	tablets	smartphones	35	11	9.995871e-01
1391	tablets	snacks	35	10	2.754735e-02
1392	tablets	software	35	9	9.991545e-01
1393	tablets	sports_equipment	35	8	-1.555246e-02
1394	tablets	streaming_services	35	7	-1.466460e-02
1395	tablets	tablets	35	6	1.000000e+00
1396	tablets	travel	35	5	-1.469932e-02
1397	tablets	vegetables	35	4	2.771151e-02
1398	tablets	video_games	35	3	9.995762e-01
1399	tablets	watches	35	2	1.345371e-02



1400	tablets	income	35	1	9.879617e-01
1401	travel	accessories	36	40	9.833571e-03
1402	travel	accommodation	36	39	9.987304e-01
1403	travel	alcohol	36	38	2.702542e-02
1404	travel	audio_equipment	36	37	-1.486823e-02
1405	travel	beverages	36	36	2.758543e-02
1406	travel	books	36	35	9.968912e-01
1407	travel	cameras	36	34	-1.613989e-02
1408	travel	car_rentals	36	33	9.982789e-01
1409	travel	clothing	36	32	1.078295e-02
1410	travel	coffee_shops	36	31	2.826611e-02
1411	travel	dairy_products	36	30	2.772372e-02
1412	travel	desktops	36	29	-1.564430e-02
1413	travel	electronics	36	28	-1.517383e-02
1414	travel	fast_food	36	27	2.809171e-02
1415	travel	food_delivery	36	26	2.778066e-02
1416	travel	fruits	36	25	2.759794e-02
1417	travel	groceries	36	24	2.773147e-02
1418	travel	gym_memberships	36	23	9.983092e-01
1419	travel	jewelry	36	22	9.487827e-03
1420	travel	laptops	36	21	-1.500887e-02
1421	travel	magazines	36	20	9.968765e-01
1422	travel	meat	36	19	2.812022e-02
1423	travel	movies	36	18	9.983021e-01
1424	travel	music	36	17	9.983449e-01
1425	travel	outdoor_activities	36	16	9.981947e-01
1426	travel	public_transportation	36	15	9.982613e-01
1427	travel	restaurant_meals	36	14	2.817272e-02
1428	travel	seafood	36	13	2.757624e-02
1429	travel	shoes	36	12	1.024137e-02
1430	travel	smartphones	36	11	-1.534207e-02
1431	travel	snacks	36	10	2.802754e-02
1432	travel	software	36	9	-1.514457e-02
1433	travel	sports_equipment	36	8	9.969824e-01
1434	travel	streaming_services	36	7	9.987823e-01
1435	travel	tablets	36	6	-1.469932e-02
1436	travel	travel	36	5	1.000000e+00
1437	travel	vegetables	36	4	2.765356e-02
1438	travel	video_games	36	3	-1.508210e-02
1439	travel	watches	36	2	1.418589e-02
1440	travel	income	36	1	8.657219e-02
1441	vegetables	accessories	37	40	-8.281898e-04
1442	vegetables	accommodation	37	39	2.704779e-02

1443	vegetables	alcohol	37	38	9.984058e-01
1444	vegetables	audio_equipment	37	37	2.729605e-02
1445	vegetables	beverages	37	36	9.991621e-01
1446	vegetables	books	37	35	2.619273e-02
1447	vegetables	cameras	37	34	2.727239e-02
1448	vegetables	car_rentals	37	33	2.572712e-02
1449	vegetables	clothing	37	32	-1.596910e-03
1450	vegetables	coffee_shops	37	31	9.984935e-01
1451	vegetables	dairy_products	37	30	9.995148e-01
1452	vegetables	desktops	37	29	2.735807e-02
1453	vegetables	electronics	37	28	2.765362e-02
1454	vegetables	fast_food	37	27	9.993947e-01
1455	vegetables	food_delivery	37	26	9.991735e-01
1456	vegetables	fruits	37	25	9.993836e-01
1457	vegetables	groceries	37	24	9.995674e-01
1458	vegetables	gym_memberships	37	23	2.739450e-02
1459	vegetables	jewelry	37	22	-1.616300e-05
1460	vegetables	laptops	37	21	2.792700e-02
1461	vegetables	magazines	37	20	2.838992e-02
1462	vegetables	meat	37	19	9.994987e-01
1463	vegetables	movies	37	18	2.712277e-02
1464	vegetables	music	37	17	2.735169e-02
1465	vegetables	outdoor_activities	37	16	2.623833e-02
1466	vegetables	public_transportation	37	15	2.712466e-02
1467	vegetables	restaurant_meals	37	14	9.994059e-01
1468	vegetables	seafood	37	13	9.994216e-01
1469	vegetables	shoes	37	12	-1.832086e-03
1470	vegetables	smartphones	37	11	2.782689e-02
1471	vegetables	snacks	37	10	9.991430e-01
1472	vegetables	software	37	9	2.703582e-02
1473	vegetables	sports_equipment	37	8	2.630136e-02
1474	vegetables	streaming_services	37	7	2.718093e-02
1475	vegetables	tablets	37	6	2.771151e-02
1476	vegetables	travel	37	5	2.765356e-02
1477	vegetables	vegetables	37	4	1.000000e+00
1478	vegetables	video_games	37	3	2.760666e-02
1479	vegetables	watches	37	2	-2.867986e-03
1480	vegetables	income	37	1	9.995033e-02
1481	video_games	accessories	38	40	1.227845e-02
1482	video_games	accommodation	38	39	-1.500307e-02
1483	video_games	alcohol	38	38	2.747478e-02
1484	video_games	audio_equipment	38	37	9.995946e-01
1485	video_games	beverages	38	36	2.722782e-02

1486	video_games	books	38	35	-1.512927e-02
1487	video_games	cameras	38	34	9.992313e-01
1488	video_games	car_rentals	38	33	-1.626388e-02
1489	video_games	clothing	38	32	1.364483e-02
1490	video_games	coffee_shops	38	31	2.667281e-02
1491	video_games	dairy_products	38	30	2.702824e-02
1492	video_games	desktops	38	29	9.992162e-01
1493	video_games	electronics	38	28	9.997532e-01
1494	video_games	fast_food	38	27	2.764442e-02
1495	video_games	food_delivery	38	26	2.725865e-02
1496	video_games	fruits	38	25	2.785353e-02
1497	video_games	groceries	38	24	2.747492e-02
1498	video_games	gym_memberships	38	23	-1.445163e-02
1499	video_games	jewelry	38	22	1.408950e-02
1500	video_games	laptops	38	21	9.995707e-01
1501	video_games	magazines	38	20	-1.536818e-02
1502	video_games	meat	38	19	2.782597e-02
1503	video_games	movies	38	18	-1.424965e-02
1504	video_games	music	38	17	-1.606548e-02
1505	video_games	outdoor_activities	38	16	-1.519654e-02
1506	video_games	public_transportation	38	15	-1.463025e-02
1507	video_games	restaurant_meals	38	14	2.770081e-02
1508	video_games	seafood	38	13	2.707689e-02
1509	video_games	shoes	38	12	1.471003e-02
1510	video_games	smartphones	38	11	9.996936e-01
1511	video_games	snacks	38	10	2.742901e-02
1512	video_games	software	38	9	9.992584e-01
1513	video_games	sports_equipment	38	8	-1.592019e-02
1514	video_games	streaming_services	38	7	-1.502787e-02
1515	video_games	tablets	38	6	9.995762e-01
1516	video_games	travel	38	5	-1.508210e-02
1517	video_games	vegetables	38	4	2.760666e-02
1518	video_games	video_games	38	3	1.000000e+00
1519	video_games	watches	38	2	1.323194e-02
1520	video_games	income	38	1	9.880144e-01
1521	watches	accessories	39	40	9.910915e-01
1522	watches	accommodation	39	39	1.455544e-02
1523	watches	alcohol	39	38	-4.392785e-03
1524	watches	audio_equipment	39	37	1.366982e-02
1525	watches	beverages	39	36	-3.750861e-03
1526	watches	books	39	35	1.361731e-02
1527	watches	cameras	39	34	1.376222e-02
1528	watches	car_rentals	39	33	1.399050e-02

1529	watches	clothing	39	32	9.927583e-01
1530	watches	coffee_shops	39	31	-3.789757e-03
1531	watches	dairy_products	39	30	-3.453079e-03
1532	watches	desktops	39	29	1.418795e-02
1533	watches	electronics	39	28	1.293598e-02
1534	watches	fast_food	39	27	-3.865751e-03
1535	watches	food_delivery	39	26	-3.269865e-03
1536	watches	fruits	39	25	-3.404672e-03
1537	watches	groceries	39	24	-3.546342e-03
1538	watches	gym_memberships	39	23	1.442650e-02
1539	watches	jewelry	39	22	9.873438e-01
1540	watches	laptops	39	21	1.292558e-02
1541	watches	magazines	39	20	1.434756e-02
1542	watches	meat	39	19	-3.262339e-03
1543	watches	movies	39	18	1.331294e-02
1544	watches	music	39	17	1.354290e-02
1545	watches	outdoor_activities	39	16	1.252049e-02
1546	watches	public_transportation	39	15	1.349016e-02
1547	watches	restaurant_meals	39	14	-3.666636e-03
1548	watches	seafood	39	13	-2.867895e-03
1549	watches	shoes	39	12	9.921309e-01
1550	watches	smartphones	39	11	1.282252e-02
1551	watches	snacks	39	10	-3.780124e-03
1552	watches	software	39	9	1.352037e-02
1553	watches	sports_equipment	39	8	1.506878e-02
1554	watches	streaming_services	39	7	1.266192e-02
1555	watches	tablets	39	6	1.345371e-02
1556	watches	travel	39	5	1.418589e-02
1557	watches	vegetables	39	4	-2.867986e-03
1558	watches	video_games	39	3	1.323194e-02
1559	watches	watches	39	2	1.000000e+00
1560	watches	income	39	1	1.048995e-01
1561	income	accessories	40	40	1.040005e-01
1562	income	accommodation	40	39	8.664715e-02
1563	income	alcohol	40	38	9.954189e-02
1564	income	audio_equipment	40	37	9.879458e-01
1565	income	beverages	40	36	9.947844e-02
1566	income	books	40	35	8.617192e-02
1567	income	cameras	40	34	9.874816e-01
1568	income	car_rentals	40	33	8.521765e-02
1569	income	clothing	40	32	1.055538e-01
1570	income	coffee_shops	40	31	9.894085e-02
1571	income	dairy_products	40	30	9.933708e-02

1572	income	desktops	40	29	9.875643e-01
1573	income	electronics	40	28	9.880406e-01
1574	income	fast_food	40	27	9.994356e-02
1575	income	food_delivery	40	26	9.956879e-02
1576	income	fruits	40	25	1.001396e-01
1577	income	groceries	40	24	9.978886e-02
1578	income	gym_memberships	40	23	8.715555e-02
1579	income	jewelry	40	22	1.054730e-01
1580	income	laptops	40	21	9.878984e-01
1581	income	magazines	40	20	8.616727e-02
1582	income	meat	40	19	1.001932e-01
1583	income	movies	40	18	8.724015e-02
1584	income	music	40	17	8.551568e-02
1585	income	outdoor_activities	40	16	8.617345e-02
1586	income	public_transportation	40	15	8.687233e-02
1587	income	restaurant_meals	40	14	1.000170e-01
1588	income	seafood	40	13	9.944031e-02
1589	income	shoes	40	12	1.065076e-01
1590	income	smartphones	40	11	9.879648e-01
1591	income	snacks	40	10	9.972493e-02
1592	income	software	40	9	9.875500e-01
1593	income	sports_equipment	40	8	8.553610e-02
1594	income	streaming_services	40	7	8.643569e-02
1595	income	tablets	40	6	9.879617e-01
1596	income	travel	40	5	8.657219e-02
1597	income	vegetables	40	4	9.995033e-02
1598	income	video_games	40	3	9.880144e-01
1599	income	watches	40	2	1.048995e-01
1600	income	income	40	1	1.000000e+00

\$arg

\$arg\$type

[1] "full"

Dark blue squares indicate strong positive correlations, while white squares represent weak or no correlation. and the red indicate strong negative correlation

but i didn't see any red spot. they are whether weak or no correlation or positive correlations. and all make with rectangle or square it seem to cluster together with different area.

---

1.3 (5 points)

Run a linear regression model to predict the `income` variable using the remaining predictors. Interpret the coefficients and summarize your results.

```
model <- lm(income ~ ., data = df)

summary(model) # Insert your code here
```

Call:

```
lm(formula = income ~ ., data = df)
```

Residuals:

Min	1Q	Median	3Q	Max
-8.6875	-1.6569	0.0427	1.6633	9.5623

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	-0.077509	0.121730	-0.637	0.524330
accessories	0.299876	0.031786	9.434	< 2e-16 ***
accommodation	0.113632	0.031262	3.635	0.000281 ***
alcohol	-0.005958	0.033266	-0.179	0.857873
audio_equipment	0.602004	0.033483	17.979	< 2e-16 ***
beverages	0.043335	0.034111	1.270	0.204000
books	0.070530	0.033238	2.122	0.033892 *
cameras	0.461827	0.033572	13.756	< 2e-16 ***
car_rentals	0.124875	0.032809	3.806	0.000143 ***
clothing	0.504228	0.026055	19.352	< 2e-16 ***
coffee_shops	0.048839	0.034909	1.399	0.161864
dairy_products	0.024548	0.032715	0.750	0.453082

desktops	0.391673	0.033393	11.729	< 2e-16	***
electronics	1.079627	0.030035	35.946	< 2e-16	***
fast_food	0.077531	0.033014	2.348	0.018893	*
food_delivery	-0.004903	0.034257	-0.143	0.886188	
fruits	0.059089	0.033321	1.773	0.076237	.
groceries	0.077694	0.031601	2.459	0.013981	*
gym_memberships	0.141168	0.033410	4.225	2.43e-05	***
jewelry	0.213726	0.032834	6.509	8.30e-11	***
laptops	0.594328	0.032548	18.260	< 2e-16	***
magazines	0.080762	0.033694	2.397	0.016571	*
meat	0.081262	0.032367	2.511	0.012083	*
movies	0.110296	0.033326	3.310	0.000941	***
music	0.159925	0.033398	4.788	1.73e-06	***
outdoor_activities	0.087846	0.032356	2.715	0.006651	**
public_transportation	0.061138	0.033022	1.851	0.064169	.
restaurant_meals	0.066129	0.033225	1.990	0.046611	*
seafood	0.061318	0.033786	1.815	0.069596	.
shoes	0.463185	0.029613	15.641	< 2e-16	***
smartphones	0.780150	0.031538	24.737	< 2e-16	***
snacks	0.007464	0.033229	0.225	0.822290	
software	0.408500	0.034102	11.979	< 2e-16	***
sports_equipment	0.033328	0.033969	0.981	0.326574	
streaming_services	0.150614	0.031902	4.721	2.41e-06	***
tablets	0.637266	0.033133	19.234	< 2e-16	***
travel	0.129161	0.031457	4.106	4.09e-05	***
vegetables	-0.066111	0.033162	-1.994	0.046257	*
video_games	0.863309	0.031392	27.501	< 2e-16	***
watches	0.145853	0.033467	4.358	1.34e-05	***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.434 on 4960 degrees of freedom

Multiple R-squared: 0.9999, Adjusted R-squared: 0.9999

F-statistic: 1.834e+06 on 39 and 4960 DF, p-value: < 2.2e-16

---

1.3 (5 points)

Diagnose the model using the `vif()` function. What do you observe? What does this mean for the model?

```
vif_values <- vif(model)
```

```
print(vif_values) # Insert your code here
```

accessories	accommodation	alcohol
152.06821	681.15504	387.23376
audio_equipment	beverages	books
1755.56441	914.69186	192.91781
cameras	car_rentals	clothing
785.43147	423.55906	282.25143
coffee_shops	dairy_products	desktops
425.39644	2336.74847	776.75697
electronics	fast_food	food_delivery
3927.16511	1519.85171	921.68162
fruits	groceries	gym_memberships
1550.05678	3136.80325	438.30224
jewelry	laptops	magazines
72.38215	1658.76990	198.53619
meat	movies	music
2284.43676	437.28082	437.03990
outdoor_activities	public_transportation	restaurant_meals
411.17302	427.77815	1540.26240
seafood	shoes	smartphones
1594.08027	233.33301	2772.27822
snacks	software	sports_equipment
868.24282	810.28919	201.00255
streaming_services	tablets	travel
709.25592	1718.78339	690.69616
vegetables	video_games	watches
1536.40686	2745.64421	75.56457



**High VIF values indicate strong multicollinearity among predictor variables.**

**from the result, it is not spread average. some high vif value like groceries got 3136. and the jewelry only got 72.38215.**

**it mean this model combined variety of strong or weak multicollinearity among predictor variables**

---

1.4 (5 points)

Perform PCA using the `princomp` function in R. Print the summary of the PCA object.

```
pca <- princomp(df[-ncol(df)], cor = TRUE) # Insert your code here
summary(pca) # Insert your code here
```

Importance of components:

	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5
Standard deviation	3.6201099	3.4479976	2.9939875	2.2288727	0.1125697569
Proportion of Variance	0.3360307	0.3048381	0.2298452	0.1273814	0.0003249218
Cumulative Proportion	0.3360307	0.6408688	0.8707140	0.9980954	0.9984202743
	Comp.6	Comp.7	Comp.8	Comp.9	
Standard deviation	0.0960605322	0.0708312069	0.0691539249	0.0670242037	
Proportion of Variance	0.0002366058	0.0001286426	0.0001226222	0.0001151857	
Cumulative Proportion	0.9986568801	0.9987855227	0.9989081448	0.9990233306	
	Comp.10	Comp.11	Comp.12	Comp.13	
Standard deviation	0.0653196274	5.099363e-02	0.0498072940	4.762347e-02	
Proportion of Variance	0.0001094014	6.667565e-05	0.0000636094	5.815371e-05	
Cumulative Proportion	0.9991327320	9.991994e-01	0.9992630170	9.993212e-01	
	Comp.14	Comp.15	Comp.16	Comp.17	
Standard deviation	0.0469865879	4.611213e-02	0.0459026903	4.552808e-02	
Proportion of Variance	0.0000566087	5.452125e-05	0.0000540271	5.314888e-05	
Cumulative Proportion	0.9993777794	9.994323e-01	0.9994863278	9.995395e-01	
	Comp.18	Comp.19	Comp.20	Comp.21	
Standard deviation	4.516751e-02	3.944038e-02	0.0358645643	3.505209e-02	
Proportion of Variance	5.231037e-05	3.988573e-05	0.0000329812	3.150383e-05	
Cumulative Proportion	9.995918e-01	9.996317e-01	0.9996646540	9.996962e-01	

	Comp.22	Comp.23	Comp.24	Comp.25
Standard deviation	3.460809e-02	3.435268e-02	3.297822e-02	3.240319e-02
Proportion of Variance	3.071076e-05	3.025915e-05	2.788623e-05	2.692223e-05
Cumulative Proportion	9.997269e-01	9.997571e-01	9.997850e-01	9.998119e-01
	Comp.26	Comp.27	Comp.28	Comp.29
Standard deviation	3.135574e-02	2.976920e-02	2.508623e-02	2.460025e-02
Proportion of Variance	2.520981e-05	2.272321e-05	1.613638e-05	1.551723e-05
Cumulative Proportion	9.998371e-01	9.998599e-01	9.998760e-01	9.998915e-01
	Comp.30	Comp.31	Comp.32	Comp.33
Standard deviation	2.426600e-02	2.374599e-02	2.334190e-02	2.283049e-02
Proportion of Variance	1.509843e-05	1.445825e-05	1.397036e-05	1.336491e-05
Cumulative Proportion	9.999066e-01	9.999211e-01	9.999350e-01	9.999484e-01
	Comp.34	Comp.35	Comp.36	Comp.37
Standard deviation	2.119139e-02	1.968544e-02	1.937808e-02	1.742835e-02
Proportion of Variance	1.151475e-05	9.936319e-06	9.628464e-06	7.788395e-06
Cumulative Proportion	9.999599e-01	9.999699e-01	9.999795e-01	9.999873e-01
	Comp.38	Comp.39		
Standard deviation	1.677847e-02	1.464440e-02		
Proportion of Variance	7.218385e-06	5.498931e-06		
Cumulative Proportion	9.999945e-01	1.000000e+00		

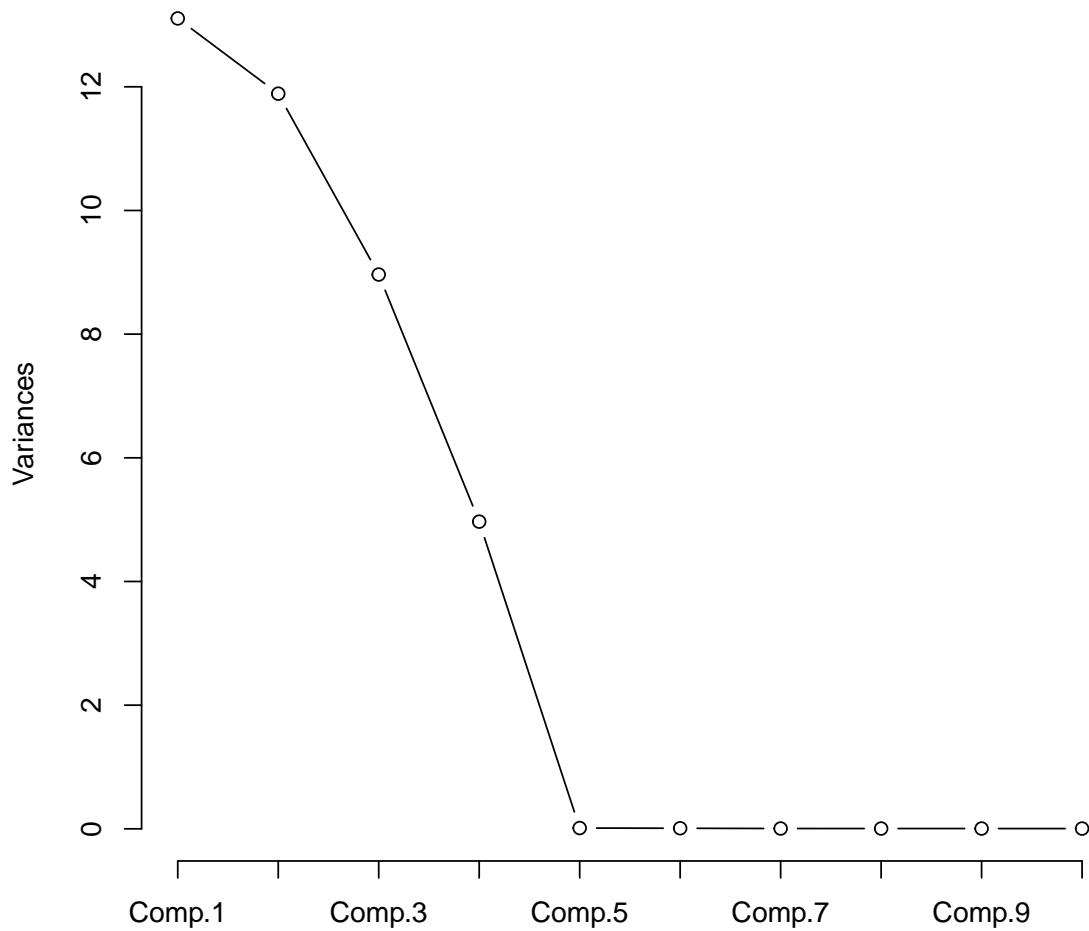
---

1.5 (5 points)

Make a screeplot of the proportion of variance explained by each principal component. How many principal components would you choose to keep? Why?

```
screeplot(pca, type = "line", main = "Screeplot of PCA") # Insert your code here
```

**Screepplot of PCA**



**the first three components from this graph. from the fifth component, the marginal gain in explained variance is 0.**

1.6 (5 points)

By setting any factor loadings below 0.2 to 0, summarize the factor loadings for the principal components that you chose to keep.

```

clean_loadings <- pca$loadings
clean_loadings[clean_loadings < 0.2] <- 0
summary_loadings <- clean_loadings[, 1:3]
print(summary_loadings)

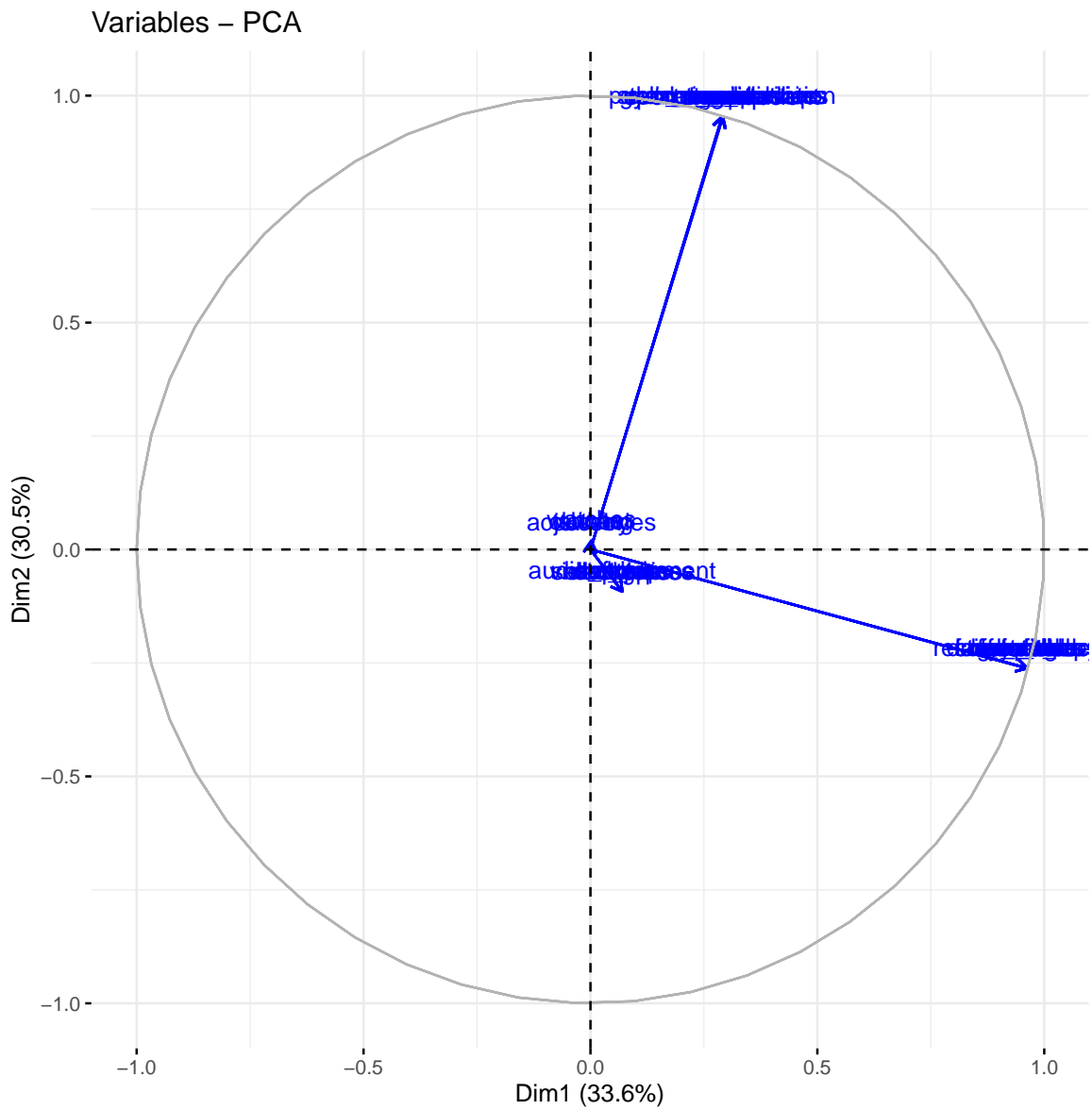
```

	Comp.1	Comp.2	Comp.3
accessories	0.0000000	0.0000000	0.0000000
accommodation	0.0000000	0.2768181	0.0000000
alcohol	0.2656478	0.0000000	0.0000000
audio_equipment	0.0000000	0.0000000	0.3316308
beverages	0.2658566	0.0000000	0.0000000
books	0.0000000	0.2764520	0.0000000
cameras	0.0000000	0.0000000	0.3315123
car_rentals	0.0000000	0.2768463	0.0000000
clothing	0.0000000	0.0000000	0.0000000
coffee_shops	0.2657562	0.0000000	0.0000000
dairy_products	0.2659380	0.0000000	0.0000000
desktops	0.0000000	0.0000000	0.3315230
electronics	0.0000000	0.0000000	0.3316519
fast_food	0.2659484	0.0000000	0.0000000
food_delivery	0.2658712	0.0000000	0.0000000
fruits	0.2659151	0.0000000	0.0000000
groceries	0.2659579	0.0000000	0.0000000
gym_memberships	0.0000000	0.2766851	0.0000000
jewelry	0.0000000	0.0000000	0.0000000
laptops	0.0000000	0.0000000	0.3316000
magazines	0.0000000	0.2762993	0.0000000
meat	0.2659759	0.0000000	0.0000000
movies	0.0000000	0.2766976	0.0000000
music	0.0000000	0.2767158	0.0000000
outdoor_activities	0.0000000	0.2767729	0.0000000
public_transportation	0.0000000	0.2767015	0.0000000
restaurant_meals	0.2659556	0.0000000	0.0000000
seafood	0.2659076	0.0000000	0.0000000
shoes	0.0000000	0.0000000	0.0000000
smartphones	0.0000000	0.0000000	0.3316263
snacks	0.2658868	0.0000000	0.0000000
software	0.0000000	0.0000000	0.3315471
sports_equipment	0.0000000	0.2764848	0.0000000
streaming_services	0.0000000	0.2768134	0.0000000
tablets	0.0000000	0.0000000	0.3316202
travel	0.0000000	0.2767748	0.0000000

vegetables	0.2659134	0.0000000	0.0000000
video_games	0.0000000	0.0000000	0.3316416
watches	0.0000000	0.0000000	0.0000000

Visualize the factor loadings.

```
fviz_pca_var(pca, col.var = "blue")
```



---

1.7 (15 points)

Based on the factor loadings, what do you think the principal components represent?

Provide an interpretation for each principal component you chose to keep.

**Principal Component 1 (Comp.1): This component represents discretionary spending.**

**Principal Component 2 (Comp.2): This component represents essential living expenses.**

**Principal Component 3 (Comp.3): This component represents leisure-related spending.**

---

1.8 (10 points)

Create a new data frame with the original response variable `income` and the principal components you chose to keep. Call this data frame `df_pca`.

```
df_pca <- cbind(df[, "income", drop = FALSE], pca$scores[, 1:3])

# Rename the principal components
colnames(df_pca)[2:4] <- paste0("PC", 1:3)

# Display the first few rows of df_pca
head(df_pca)
```

	income	PC1	PC2	PC3
1	198.79	1.9482067	4.774097	-4.4197420
2	423.35	-0.1336445	4.355272	-1.8740991
3	154.83	-0.7641850	-3.424712	-4.6065070
4	799.07	0.8123437	3.262874	1.8651041
5	617.97	-5.5881896	-3.177685	0.5379956
6	680.76	-1.9700421	-2.447838	1.1126950

Fit a regression model to predict the `income` variable using the principal components you chose to keep. Interpret the coefficients and summarize your results.

```
model_pca <- lm(income ~ PC1 + PC2 + PC3, data = df_pca)

# Summarize the model
summary(model_pca) # Insert your code here
```

Call:

```
lm(formula = income ~ PC1 + PC2 + PC3, data = df_pca)
```

Residuals:

Min	1Q	Median	3Q	Max
-44.345	-18.599	-0.293	18.730	47.846

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	628.17783	0.30371	2068.4	<2e-16	***
PC1	13.33571	0.08390	159.0	<2e-16	***
PC2	-1.16303	0.08808	-13.2	<2e-16	***
PC3	95.58547	0.10144	942.3	<2e-16	***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 21.48 on 4996 degrees of freedom

Multiple R-squared: 0.9946, Adjusted R-squared: 0.9946

F-statistic: 3.044e+05 on 3 and 4996 DF, p-value: < 2.2e-16

Compare the results of the regression model in 1.3 and 1.9. What do you observe? What does this mean for the model?

```
compare_vif <- function(model1, model2) {
  vif_values1 <- car::vif(model1)
  vif_values2 <- car::vif(model2)

  comparison <- data.frame(
    Model = c("Original Predictors", "Principal Components"),
    Max_VIF = c(max(vif_values1), max(vif_values2))
  )

  return(comparison)
```

```

}

comparison <- compare_vif(model, model_pca)
print(comparison)# Insert your code here

```

	Model	Max_VIF
1	Original Predictors	3927.165
2	Principal Components	1.000

**the maxium of vif value from linear regression was 3927.165. but using the principal components i chose to keep just 1.0**

**Higher values signify that it is difficult to impossible to assess accurately the contribution of predictors to a model. therefore, my principal component could be more accurate to predict the model.**

---

1.10 (10 points)

Based on your interpretation of the principal components from Question 1.7, provide an interpretation of the regression model in Question 1.9.

**Understanding Coefficients: In the regression model, the coefficients of principal components show how much each component influences the prediction of income. A positive coefficient means increasing that component leads to higher predicted income, while a negative one means the opposite.**

**#Understanding Principal Components:** Principal components are blends of original variables, so to interpret regression coefficients, we look at how original variables relate to these components. We check factor loadings from PCA to see which variables contribute most to each component.



**Reducing Dimensions: Using principal components in regression cuts down data dimensions while still capturing original variables' variance. This simplifies the model and can tackle issues like multicollinearity.**

---

---

## Session Information

Print your R session information using the following command

```
sessionInfo()
```

```
R version 4.3.2 (2023-10-31 ucrt)
```

```
Platform: x86_64-w64-mingw32/x64 (64-bit)
```

```
Running under: Windows 11 x64 (build 22631)
```

```
Matrix products: default
```

```
locale:
```

```
[1] LC_COLLATE=English_United States.utf8
```

```
[2] LC_CTYPE=English_United States.utf8
```

```
[3] LC_MONETARY=English_United States.utf8
```

```
[4] LC_NUMERIC=C
```

```
[5] LC_TIME=English_United States.utf8
```

```
time zone: America/New_York
```

```
tzcode source: internal
```

```
attached base packages:
```

```
[1] stats      graphics  grDevices  utils      datasets  methods    base
```

```
other attached packages:
```

```
[1] factoextra_1.0.7 ggplot2_3.4.4    car_3.1-2        carData_3.0-5
```

```
[5] corrplot_0.92    magrittr_2.0.3   broom_1.0.5      purrr_1.0.2
```

```
[9] tidyr_1.3.1      readr_2.1.5      dplyr_1.1.4      tibble_3.2.1
```

```
loaded via a namespace (and not attached):
```

```
[1] utf8_1.2.4        generics_0.1.3    rstatix_0.7.2     hms_1.1.3
```

```
[5] digest_0.6.34     evaluate_0.23     grid_4.3.2        fastmap_1.1.1
```

```
[9] jsonlite_1.8.8    ggrepel_0.9.5     backports_1.4.1    fansi_1.0.6
```

```
[13] scales_1.3.0      codetools_0.2-19  abind_1.4-5        cli_3.6.2
```

```
[17] rlang_1.1.3       crayon_1.5.2      bit64_4.0.5        munsell_0.5.0
```

```
[21] withr_3.0.0       yaml_2.3.8        tools_4.3.2        parallel_4.3.2
```

```
[25] tzdb_0.4.0        ggsignif_0.6.4    colorspace_2.1-0   ggpubr_0.6.0
```

```
[29] vctrs_0.6.5       R6_2.5.1          lifecycle_1.0.4    bit_4.0.5
```

```
[33] vroom_1.6.5      pkgconfig_2.0.3  pillar_1.9.0    gtable_0.3.4
[37] glue_1.7.0       Rcpp_1.0.12      xfun_0.41        tidyselect_1.2.0
[41] rstudioapi_0.15.0 knitr_1.45        farver_2.1.1     htmltools_0.5.7
[45] labeling_0.4.3    rmarkdown_2.25   compiler_4.3.2
```