

Instacart Exploratory Analysis

```
source("readDataToMemory.R")

##
## Attaching package: 'dplyr'
## The following objects are masked from 'package:stats':
##
##   filter, lag
## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union
## * Using Spark: 2.1.0

readInstacart()

library(DBI)
library(ggplot2)
library(ggthemes)

src_tbls(sc)

## [1] "departments_tbl"          "order_products__prior_tbl"
## [3] "order_products__train_tbl" "orders_tbl"
## [5] "products_tbl"

order_products__prior %>%
  select(order_id, product_id) %>%
  left_join(orders, by="order_id") %>%
  filter(user_id <= 10) %>%
  select(product_id, user_id) %>%
  group_by(user_id, product_id) %>%
  summarise(rating = n()) %>%
  rename(user = user_id) %>%
  mutate(item=product_id) %>%
  select(user, item, rating) ->
  user_item_rating

user_item_rating

## # Source:   lazy query [?? x 3]
## # Database: spark_connection
## # Groups:   user
##   user item rating
##   <int> <int> <dbl>
## 1    10 13512     1
## 2    10 13198     1
## 3    10  9339     3
## 4    10 27104     2
## 5    10 22825     1
## 6    10 34358     1
## 7    10 15290     1
```

```
## 8      10 14992      1
## 9      10  1529      3
## 10     10 32537      1
## # ... with 451 more rows
```

```
explicit_model <- ml_als_factorization( user_item_rating, iter.max = 5, regularization.parameter = 0.01
```

```
explicit_model
```

```
## $item.factors
```

##	id	V1	V2	V3	V4	V5
## 1	23	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 2	79	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 3	196	-0.57107013	0.36275500	0.926665127	0.097481996	2.58862448
## 4	248	0.06223182	0.24111231	0.065591149	0.330969155	0.49301457
## 5	260	1.54569006	-0.42426747	-0.452675998	0.023766426	-0.19499090
## 6	274	-0.09235497	-0.60935247	-0.073391385	0.179196969	-0.16272146
## 7	311	-0.39988753	-0.24365783	-0.407742679	0.208207607	0.17467330
## 8	481	-0.79977506	-0.48731565	-0.815485358	0.416415215	0.34934661
## 9	519	-0.18470994	-1.21870494	-0.146782771	0.358393937	-0.32544291
## 10	651	-0.03790793	-0.28363132	0.191145673	0.393591225	-0.02184282
## 11	1005	0.06223182	0.24111231	0.065591149	0.330969155	0.49301457
## 12	1200	0.06728055	0.21860844	-0.424716592	0.193160683	-0.15830821
## 13	1529	2.21084619	-0.78122121	-0.540700436	0.267759591	-0.29469123
## 14	1559	-0.46844518	2.71219087	-0.906467199	0.529930055	2.80440450
## 15	1819	0.18669547	0.72333688	0.196773440	0.992907465	1.47904372
## 16	2002	-0.14274247	1.94315159	-0.435963064	0.268031538	1.82304406
## 17	2078	-0.11372378	-0.85089403	0.573437035	1.180773616	-0.06552844
## 18	2573	-0.07137123	0.97157580	-0.217981532	0.134015769	0.91152203
## 19	2707	0.06728055	0.21860844	-0.424716592	0.193160683	-0.15830821
## 20	2732	-0.39988753	-0.24365783	-0.407742679	0.208207607	0.17467330
## 21	3151	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 22	3376	0.10005183	-0.14630252	0.159077302	0.176643997	-0.62419242
## 23	3634	-0.39988753	-0.24365783	-0.407742679	0.208207607	0.17467330
## 24	4071	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 25	4799	-0.03790793	-0.28363132	0.191145673	0.393591225	-0.02184282
## 26	4920	-1.46205187	-4.18800831	-0.298057288	1.283499956	-1.07638621
## 27	4945	-0.27706492	-1.82805741	-0.220174149	0.537590861	-0.48816434
## 28	4957	-0.80293071	-0.04596259	-0.882115185	0.460354686	0.73517036
## 29	5002	-0.39988753	-0.24365783	-0.407742679	0.208207607	0.17467330
## 30	5194	-0.39988753	-0.24365783	-0.407742679	0.208207607	0.17467330
## 31	5212	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 32	5322	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 33	5450	0.73476684	0.27285734	-0.334263325	0.078648016	0.35718939
## 34	5646	0.77284503	-0.21213374	-0.226337999	0.011883213	-0.09749545
## 35	5769	0.77284503	-0.21213374	-0.226337999	0.011883213	-0.09749545
## 36	5818	0.77284503	-0.21213374	-0.226337999	0.011883213	-0.09749545
## 37	5869	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 38	5907	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 39	5999	0.10005183	-0.14630252	0.159077302	0.176643997	-0.62419242
## 40	6141	-0.03790793	-0.28363132	0.191145673	0.393591225	-0.02184282
## 41	6361	-0.46177486	-3.04676247	-0.366956919	0.895984828	-0.81360728
## 42	6473	-0.03790793	-0.28363132	0.191145673	0.393591225	-0.02184282
## 43	6489	-0.79977506	-0.48731565	-0.815485358	0.416415215	0.34934661
## 44	6808	0.10005183	-0.14630252	0.159077302	0.176643997	-0.62419242

## 45	7160	0.06728055	0.21860844	-0.424716592	0.193160683	-0.15830821
## 46	7350	0.06728055	0.21860844	-0.424716592	0.193160683	-0.15830821
## 47	7503	0.06223182	0.24111231	0.065591149	0.330969155	0.49301457
## 48	7632	0.77284503	-0.21213374	-0.226337999	0.011883213	-0.09749545
## 49	7746	0.77284503	-0.21213374	-0.226337999	0.011883213	-0.09749545
## 50	7781	-0.10705686	1.45736372	-0.326972306	0.201023653	1.36728299
## 51	7952	-0.39988753	-0.24365783	-0.407742679	0.208207607	0.17467330
## 52	7963	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 53	8021	0.06223182	0.24111231	0.065591149	0.330969155	0.49301457
## 54	8138	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 55	8193	-0.03790793	-0.28363132	0.191145673	0.393591225	-0.02184282
## 56	8277	-0.27706492	-1.82805741	-0.220174149	0.537590861	-0.48816434
## 57	8296	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 58	8424	0.06003119	0.02313838	-0.026662761	0.076533064	0.22509454
## 59	8467	-0.39988753	-0.24365783	-0.407742679	0.208207607	0.17467330
## 60	8479	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 61	8518	-0.11650402	-1.76952612	0.006168820	0.686208367	-1.19870877
## 62	8834	-0.79977506	-0.48731565	-0.815485358	0.416415215	0.34934661
## 63	8952	-0.39988753	-0.24365783	-0.407742679	0.208207607	0.17467330
## 64	8988	0.77284503	-0.21213374	-0.226337999	0.011883213	-0.09749545
## 65	9124	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 66	9339	2.31853509	-0.63640124	-0.679013968	0.035649639	-0.29248634
## 67	9387	0.31115910	1.20556152	0.327955723	1.654845715	2.46507287
## 68	9598	-0.27706492	-1.82805741	-0.220174149	0.537590861	-0.48816434
## 69	9681	-0.07137123	0.97157580	-0.217981532	0.134015769	0.91152203
## 70	9839	-0.07581586	-0.56726265	0.382291347	0.787182450	-0.04368563
## 71	9871	1.54569006	-0.42426747	-0.452675998	0.023766426	-0.19499090
## 72	10132	-0.39988753	-0.24365783	-0.407742679	0.208207607	0.17467330
## 73	10258	-0.51396310	0.32647949	0.833998621	0.087733790	2.32976198
## 74	10305	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 75	10326	-0.05710701	0.03627550	0.092666514	0.009748199	0.25886247
## 76	10504	-0.09235497	-0.60935247	-0.073391385	0.179196969	-0.16272146
## 77	10644	0.01767524	-0.19892175	0.125453189	0.360494167	0.15827385
## 78	10895	-0.27706492	-1.82805741	-0.220174149	0.537590861	-0.48816434
## 79	11068	0.55736494	-0.12535584	-0.169566303	0.061307732	0.09197246
## 80	11136	-0.03790793	-0.28363132	0.191145673	0.393591225	-0.02184282
## 81	11520	-0.09235497	-0.60935247	-0.073391385	0.179196969	-0.16272146
## 82	11777	0.40020731	-0.58521008	0.636309206	0.706575990	-2.49676967
## 83	11782	0.77284503	-0.21213374	-0.226337999	0.011883213	-0.09749545
## 84	11790	-0.39988753	-0.24365783	-0.407742679	0.208207607	0.17467330
## 85	11865	0.06728055	0.21860844	-0.424716592	0.193160683	-0.15830821
## 86	12000	-0.17842810	2.42893934	-0.544953823	0.335039437	2.27880502
## 87	12075	-0.39988753	-0.24365783	-0.407742679	0.208207607	0.17467330
## 88	12196	-0.18470994	-1.21870494	-0.146782771	0.358393937	-0.32544291
## 89	12258	-0.03568562	0.48578790	-0.108990766	0.067007884	0.45576102
## 90	12427	-0.57107013	0.36275500	0.926665127	0.097481996	2.58862448
## 91	12845	0.06223182	0.24111231	0.065591149	0.330969155	0.49301457
## 92	13032	-0.17132103	0.10882650	0.277999550	0.029244598	0.77658737
## 93	13083	0.77284503	-0.21213374	-0.226337999	0.011883213	-0.09749545
## 94	13176	-0.21869044	-0.49643487	0.070591107	0.231731907	0.41399288
## 95	13198	-1.79384470	-4.78043938	-0.309048533	1.472902536	-1.22230911
## 96	13212	0.77284503	-0.21213374	-0.226337999	0.011883213	-0.09749545
## 97	13249	-0.09235497	-0.60935247	-0.073391385	0.179196969	-0.16272146
## 98	13351	-0.41973257	0.72297472	-0.567987502	0.311928093	1.03217220

```

## 99 13512 0.77284503 -0.21213374 -0.226337999 0.011883213 -0.09749545
## 100 13629 0.77284503 -0.21213374 -0.226337999 0.011883213 -0.09749545
## 101 13740 -0.39988753 -0.24365783 -0.407742679 0.208207607 0.17467330
## 102 13742 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 103 13802 -0.09235497 -0.60935247 -0.073391385 0.179196969 -0.16272146
## 104 13829 1.54569006 -0.42426747 -0.452675998 0.023766426 -0.19499090
## 105 13870 0.10005183 -0.14630252 0.159077302 0.176643997 -0.62419242
## 106 13988 0.20010366 -0.29260504 0.318154603 0.353287995 -1.24838483
## 107 14084 -0.05710701 0.03627550 0.092666514 0.009748199 0.25886247
## 108 14267 -0.09235497 -0.60935247 -0.073391385 0.179196969 -0.16272146
## 109 14306 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 110 14332 -0.18470994 -1.21870494 -0.146782771 0.358393937 -0.32544291
## 111 14553 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 112 14992 0.77468866 -0.19501524 0.163750663 1.110237122 0.69618672
## 113 15011 0.77284503 -0.21213374 -0.226337999 0.011883213 -0.09749545
## 114 15143 0.01794640 -0.03798785 0.200604260 0.563385189 0.36110842
## 115 15290 0.77284503 -0.21213374 -0.226337999 0.011883213 -0.09749545
## 116 15349 0.10005183 -0.14630252 0.159077302 0.176643997 -0.62419242
## 117 15392 0.77284503 -0.21213374 -0.226337999 0.011883213 -0.09749545
## 118 15581 -0.18470994 -1.21870494 -0.146782771 0.358393937 -0.32544291
## 119 15592 -0.18470994 -1.21870494 -0.146782771 0.358393937 -0.32544291
## 120 15841 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 121 15937 0.63887101 -0.43148386 -0.030272633 0.353173167 -0.10378642
## 122 16018 -0.39988753 -0.24365783 -0.407742679 0.208207607 0.17467330
## 123 16154 -0.39988753 -0.24365783 -0.407742679 0.208207607 0.17467330
## 124 16168 0.10005183 -0.14630252 0.159077302 0.176643997 -0.62419242
## 125 16185 1.54569006 -0.42426747 -0.452675998 0.023766426 -0.19499090
## 126 16349 -0.03790793 -0.28363132 0.191145673 0.393591225 -0.02184282
## 127 16521 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 128 16589 -0.17842810 2.42893934 -0.544953823 0.335039437 2.27880502
## 129 16797 3.48483753 -0.14156790 -0.720938802 1.164494395 1.20177472
## 130 16857 0.77284503 -0.21213374 -0.226337999 0.011883213 -0.09749545
## 131 16965 0.12446364 0.48222461 0.131182298 0.661938310 0.98602915
## 132 17122 -0.05710701 0.03627550 0.092666514 0.009748199 0.25886247
## 133 17224 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 134 17600 -0.39988753 -0.24365783 -0.407742679 0.208207607 0.17467330
## 135 17638 -1.01590466 -6.70287704 -0.807305217 1.971166611 -1.78993595
## 136 17668 0.31115910 1.20556152 0.327955723 1.654845715 2.46507287
## 137 17758 -0.07137123 0.97157580 -0.217981532 0.134015769 0.91152203
## 138 17769 0.06728055 0.21860844 -0.424716592 0.193160683 -0.15830821
## 139 17794 0.34463793 -0.94471425 0.419609904 1.144933105 -0.12045446
## 140 17828 1.54569006 -0.42426747 -0.452675998 0.023766426 -0.19499090
## 141 17872 -0.10705686 1.45736372 -0.326972306 0.201023653 1.36728299
## 142 18370 0.06223182 0.24111231 0.065591149 0.330969155 0.49301457
## 143 18382 -0.09235497 -0.60935247 -0.073391385 0.179196969 -0.16272146
## 144 18441 0.77284503 -0.21213374 -0.226337999 0.011883213 -0.09749545
## 145 18479 -0.03790793 -0.28363132 0.191145673 0.393591225 -0.02184282
## 146 18523 -0.21411371 2.91472745 -0.653944612 0.402047306 2.73456597
## 147 18531 -0.07581586 -0.56726265 0.382291347 0.787182450 -0.04368563
## 148 18599 0.24892728 0.96444923 0.262364596 1.323876619 1.97205830
## 149 18656 0.77284503 -0.21213374 -0.226337999 0.011883213 -0.09749545
## 150 18761 0.10005183 -0.14630252 0.159077302 0.176643997 -0.62419242
## 151 18880 -0.09235497 -0.60935247 -0.073391385 0.179196969 -0.16272146
## 152 18926 -0.79977506 -0.48731565 -0.815485358 0.416415215 0.34934661

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## 153 18961 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 154 19019 0.72561800 -1.85927570 -0.475210965 0.483572423 -0.54761928
## 155 19051 -0.14274247 1.94315159 -0.435963064 0.268031538 1.82304406
## 156 19057 0.02469965 0.51648372 -0.398241490 0.193762213 0.21141483
## 157 19156 -0.21411371 2.91472745 -0.653944612 0.402047306 2.73456597
## 158 19240 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 159 19627 -0.39988753 -0.24365783 -0.407742679 0.208207607 0.17467330
## 160 19678 0.19691256 -1.22585332 -0.243101105 0.336487472 -0.34677112
## 161 20084 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 162 20323 0.06003119 0.02313838 -0.026662761 0.076533064 0.22509454
## 163 20574 -0.07137123 0.97157580 -0.217981532 0.134015769 0.91152203
## 164 20632 1.54569006 -0.42426747 -0.452675998 0.023766426 -0.19499090
## 165 20754 0.10005183 -0.14630252 0.159077302 0.176643997 -0.62419242
## 166 20785 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 167 20899 -0.39988753 -0.24365783 -0.407742679 0.208207607 0.17467330
## 168 20920 1.42485857 -0.60635257 -0.285486519 0.310466379 -0.19923882
## 169 20995 0.77284503 -0.21213374 -0.226337999 0.011883213 -0.09749545
## 170 21108 -0.39988753 -0.24365783 -0.407742679 0.208207607 0.17467330
## 171 21137 -0.82263452 -5.70594406 -0.627226710 2.337750196 -0.82003486
## 172 21150 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 173 21174 0.77284503 -0.21213374 -0.226337999 0.011883213 -0.09749545
## 174 21227 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 175 21298 -0.09235497 -0.60935247 -0.073391385 0.179196969 -0.16272146
## 176 21376 -0.07137123 0.97157580 -0.217981532 0.134015769 0.91152203
## 177 21413 0.20010366 -0.29260504 0.318154603 0.353287995 -1.24838483
## 178 21462 -0.39988753 -0.24365783 -0.407742679 0.208207607 0.17467330
## 179 21573 0.06728055 0.21860844 -0.424716592 0.193160683 -0.15830821
## 180 21616 0.10005183 -0.14630252 0.159077302 0.176643997 -0.62419242
## 181 21709 -0.07137123 0.97157580 -0.217981532 0.134015769 0.91152203
## 182 21833 0.77284503 -0.21213374 -0.226337999 0.011883213 -0.09749545
## 183 21903 0.48904642 1.93448782 0.505600691 2.576986074 3.88080955
## 184 22000 -0.18470994 -1.21870494 -0.146782771 0.358393937 -0.32544291
## 185 22035 1.95270967 0.28769407 -0.304488212 1.082819223 1.35150695
## 186 22124 -0.14274247 1.94315159 -0.435963064 0.268031538 1.82304406
## 187 22199 0.06728055 0.21860844 -0.424716592 0.193160683 -0.15830821
## 188 22474 -0.10705686 1.45736372 -0.326972306 0.201023653 1.36728299
## 189 22475 0.10005183 -0.14630252 0.159077302 0.176643997 -0.62419242
## 190 22559 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 191 22742 -0.09235497 -0.60935247 -0.073391385 0.179196969 -0.16272146
## 192 22825 0.73476684 0.27285734 -0.334263325 0.078648016 0.35718939
## 193 22829 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 194 22963 -0.40925387 -0.83565605 -0.533674777 0.788304746 0.61972791
## 195 23165 0.34463793 -0.94471425 0.419609904 1.144933105 -0.12045446
## 196 23400 -0.03790793 -0.28363132 0.191145673 0.393591225 -0.02184282
## 197 23516 -0.09235497 -0.60935247 -0.073391385 0.179196969 -0.16272146
## 198 23541 1.54569006 -0.42426747 -0.452675998 0.023766426 -0.19499090
## 199 23592 -0.39988753 -0.24365783 -0.407742679 0.208207607 0.17467330
## 200 23650 0.12446364 0.48222461 0.131182298 0.661938310 0.98602915
## 201 23712 -0.18470994 -1.21870494 -0.146782771 0.358393937 -0.32544291
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## 203 23879 1.54569006 -0.42426747 -0.452675998 0.023766426 -0.19499090
## 204 24010 0.12446364 0.48222461 0.131182298 0.661938310 0.98602915
## 205 24184 1.54569006 -0.42426747 -0.452675998 0.023766426 -0.19499090
## 206 24231 0.10005183 -0.14630252 0.159077302 0.176643997 -0.62419242

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## 207 24341 -0.79977506 -0.48731565 -0.815485358 0.416415215 0.34934661
## 208 24535 0.30015549 -0.43890756 0.477231920 0.529932022 -1.87257719
## 209 24768 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 210 24810 0.18669547 0.72333688 0.196773440 0.992907465 1.47904372
## 211 24838 -0.03790793 -0.28363132 0.191145673 0.393591225 -0.02184282
## 212 24852 0.55003613 3.15368676 -0.990330875 0.477480739 3.06355834
## 213 24952 -0.39988753 -0.24365783 -0.407742679 0.208207607 0.17467330
## 214 24954 -0.40755442 0.22567071 -0.483367532 0.257427603 0.58911419
## 215 24990 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
## 216 25133 -0.45685610 0.29020399 0.741332114 0.077985592 2.07089972
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## 218 25199 -0.09235497 -0.60935247 -0.073391385 0.179196969 -0.16272146
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## 221 25931 2.31853509 -0.63640124 -0.679013968 0.035649639 -0.29248634
## 222 26088 -0.11421403 0.07255100 0.185333028 0.019496398 0.51772493
## 223 26209 0.52870542 -0.63342232 -0.232109860 0.147084966 -0.20084813
## 224 26346 -0.09235497 -0.60935247 -0.073391385 0.179196969 -0.16272146
## 225 26405 -0.11421403 0.07255100 0.185333028 0.019496398 0.51772493
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## 243 28373 0.12446364 0.48222461 0.131182298 0.661938310 0.98602915
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## 253 29871 -0.27706492 -1.82805741 -0.220174149 0.537590861 -0.48816434
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## 259 30450 -0.05710701 0.03627550 0.092666514 0.009748199 0.25886247
## 260 30489 3.03143287 -0.34898531 -1.009019494 0.115175694 0.07557307

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## 261 30908 -0.03568562 0.48578790 -0.108990766 0.067007884 0.45576102
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## 263 31066 -0.39988753 -0.24365783 -0.407742679 0.208207607 0.17467330
## 264 31343 -0.18470994 -1.21870494 -0.146782771 0.358393937 -0.32544291
## 265 31506 2.31853509 -0.63640124 -0.679013968 0.035649639 -0.29248634
## 266 31683 -0.73883975 -4.87481976 -0.587131083 1.433575749 -1.30177164
## 267 31717 0.50932288 -0.60324520 -0.088348448 0.231196582 -0.56642413
## 268 32030 -0.07581586 -0.56726265 0.382291347 0.787182450 -0.04368563
## 269 32052 -0.10705686 1.45736372 -0.326972306 0.201023653 1.36728299
## 270 32139 -0.14274247 1.94315159 -0.435963064 0.268031538 1.82304406
## 271 32177 -0.27706492 -1.82805741 -0.220174149 0.537590861 -0.48816434
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## 273 32299 0.77284503 -0.21213374 -0.226337999 0.011883213 -0.09749545
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## 276 32792 -0.32117057 4.37209082 -0.980916917 0.603070974 4.10184908
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## 315 39275 -0.36941987 -2.43740988 -0.293565542 0.716787875 -0.65088582
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## 317 39657 -0.05710701 0.03627550 0.092666514 0.009748199 0.25886247
## 318 39812 -0.03790793 -0.28363132 0.191145673 0.393591225 -0.02184282
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## 322 40198 -0.07137123 0.97157580 -0.217981532 0.134015769 0.91152203
## 323 40571 -0.80293071 -0.04596259 -0.882115185 0.460354686 0.73517036
## 324 40604 2.46697950 -0.34520182 -0.614729762 0.462209761 0.33272055
## 325 40706 2.16692185 -0.75096524 -0.387044400 0.263442397 -1.07708693
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## 331 41844 -0.39988753 -0.24365783 -0.407742679 0.208207607 0.17467330
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## 357 45007 0.55736494 -0.12535584 -0.169566303 0.061307732 0.09197246
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## 369 46969 -0.09235497 -0.60935247 -0.073391385 0.179196969 -0.16272146
## 370 46979 3.09138012 -0.84853494 -0.905351996 0.047532853 -0.38998181
## 371 47042 2.31853509 -0.63640124 -0.679013968 0.035649639 -0.29248634
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## 374 47209 -0.28548494 3.88630319 -0.871926129 0.536063075 3.64608812
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## 376 47380 1.54569006 -0.42426747 -0.452675998 0.023766426 -0.19499090
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## 389 48523 0.12446364 0.48222461 0.131182298 0.661938310 0.98602915
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## 391 48775 0.68727958 -0.28269109 -0.052205767 0.149137065 -0.57066661
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## 396 49508 -0.18470994 -1.21870494 -0.146782771 0.358393937 -0.32544291
## 397 49533 -0.03790793 -0.28363132 0.191145673 0.393591225 -0.02184282
## 398 49683 0.06223182 0.24111231 0.065591149 0.330969155 0.49301457
##          V6          V7          V8          V9          V10
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## 2 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 3 -4.281514645 -0.23372321 7.98088980 0.2733246982 0.90743506
## 4 -0.337068588 -0.15835473 0.09370056 -0.0362838283 -0.55150604
## 5 0.662326992 -0.40715405 0.11912420 0.4456840158 -0.21524523
## 6 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 7 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 8 -0.614917815 -0.18011814 -0.18784532 -0.8150474429 0.90714365
## 9 -0.167881936 -1.11544096 -0.08153672 0.7307813168 -0.07698573
## 10 0.051794194 0.31434867 0.23173521 0.5344988108 -0.46498758
## 11 -0.337068588 -0.15835473 0.09370056 -0.0362838283 -0.55150604
## 12 -0.100641072 0.22314908 0.68741179 0.3758259714 0.07782383
## 13 0.987695694 -0.40186119 0.30955052 0.9609429240 -0.58676410
## 14 0.743398011 -2.43249273 2.76378822 -0.2669667602 1.33177197
## 15 -1.011205792 -0.47506419 0.28110167 -0.1088514850 -1.65451813
## 16 0.637637615 -1.60809398 1.91275167 -0.0029596549 0.70399922
## 17 0.155382574 0.94304603 0.69520563 1.6034964323 -1.39496267
## 18 0.318818808 -0.80404699 0.95637584 -0.0014798274 0.35199961
## 19 -0.100641072 0.22314908 0.68741179 0.3758259714 0.07782383
## 20 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 21 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 22 0.122075513 -0.27981231 0.57850814 -0.1533530504 -0.07751781
## 23 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183

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## 24	0.159409404	-0.40202349	0.47818792	-0.0007399137	0.17599981
## 25	0.051794194	0.31434867	0.23173521	0.5344988108	-0.46498758
## 26	-0.947290361	-3.82346869	-0.35599503	2.4129981995	-0.16772351
## 27	-0.251822919	-1.67316139	-0.12230507	1.0961719751	-0.11547860
## 28	-0.454152972	-0.52493501	0.23638104	-0.7871467471	1.02908850
## 29	-0.307458907	-0.09005907	-0.09392266	-0.4075237215	0.45357183
## 30	-0.307458907	-0.09005907	-0.09392266	-0.4075237215	0.45357183
## 31	0.159409404	-0.40202349	0.47818792	-0.0007399137	0.17599981
## 32	0.159409404	-0.40202349	0.47818792	-0.0007399137	0.17599981
## 33	0.489014179	-0.60371393	0.53609699	0.2213830650	0.06818809
## 34	0.331163496	-0.20357703	0.05956210	0.2228420079	-0.10762262
## 35	0.331163496	-0.20357703	0.05956210	0.2228420079	-0.10762262
## 36	0.331163496	-0.20357703	0.05956210	0.2228420079	-0.10762262
## 37	0.159409404	-0.40202349	0.47818792	-0.0007399137	0.17599981
## 38	0.159409404	-0.40202349	0.47818792	-0.0007399137	0.17599981
## 39	0.122075513	-0.27981231	0.57850814	-0.1533530504	-0.07751781
## 40	0.051794194	0.31434867	0.23173521	0.5344988108	-0.46498758
## 41	-0.419704854	-2.78860235	-0.20384179	1.8269534111	-0.19246434
## 42	0.051794194	0.31434867	0.23173521	0.5344988108	-0.46498758
## 43	-0.614917815	-0.18011814	-0.18784532	-0.8150474429	0.90714365
## 44	0.122075513	-0.27981231	0.57850814	-0.1533530504	-0.07751781
## 45	-0.100641072	0.22314908	0.68741179	0.3758259714	0.07782383
## 46	-0.100641072	0.22314908	0.68741179	0.3758259714	0.07782383
## 47	-0.337068588	-0.15835473	0.09370056	-0.0362838283	-0.55150604
## 48	0.331163496	-0.20357703	0.05956210	0.2228420079	-0.10762262
## 49	0.331163496	-0.20357703	0.05956210	0.2228420079	-0.10762262
## 50	0.478228182	-1.20607042	1.43456376	-0.0022197412	0.52799940
## 51	-0.307458907	-0.09005907	-0.09392266	-0.4075237215	0.45357183
## 52	0.159409404	-0.40202349	0.47818792	-0.0007399137	0.17599981
## 53	-0.337068588	-0.15835473	0.09370056	-0.0362838283	-0.55150604
## 54	0.159409404	-0.40202349	0.47818792	-0.0007399137	0.17599981
## 55	0.051794194	0.31434867	0.23173521	0.5344988108	-0.46498758
## 56	-0.251822919	-1.67316139	-0.12230507	1.0961719751	-0.11547860
## 57	0.159409404	-0.40202349	0.47818792	-0.0007399137	0.17599981
## 58	0.656005025	-0.42272088	0.09408043	0.2039104253	-0.50010258
## 59	-0.307458907	-0.09005907	-0.09392266	-0.4075237215	0.45357183
## 60	0.159409404	-0.40202349	0.47818792	-0.0007399137	0.17599981
## 61	-0.067244619	-1.80066836	0.61172301	0.7618774176	-0.19651572
## 62	-0.614917815	-0.18011814	-0.18784532	-0.8150474429	0.90714365
## 63	-0.307458907	-0.09005907	-0.09392266	-0.4075237215	0.45357183
## 64	0.331163496	-0.20357703	0.05956210	0.2228420079	-0.10762262
## 65	0.159409404	-0.40202349	0.47818792	-0.0007399137	0.17599981
## 66	0.993490458	-0.61073112	0.17868631	0.6685260534	-0.32286784
## 67	-1.685342908	-0.79177368	0.46850279	-0.1814191341	-2.75753021
## 68	-0.251822919	-1.67316139	-0.12230507	1.0961719751	-0.11547860
## 69	0.318818808	-0.80404699	0.95637584	-0.0014798274	0.35199961
## 70	0.103588387	0.62869734	0.46347043	1.0689976215	-0.92997515
## 71	0.662326992	-0.40715405	0.11912420	0.4456840158	-0.21524523
## 72	-0.307458907	-0.09005907	-0.09392266	-0.4075237215	0.45357183
## 73	-3.853363037	-0.21035089	7.18280077	0.2459922433	0.81669152
## 74	0.159409404	-0.40202349	0.47818792	-0.0007399137	0.17599981
## 75	-0.428151459	-0.02337232	0.79808897	0.0273324717	0.09074350
## 76	-0.083940968	-0.55772048	-0.04076836	0.3653906584	-0.03849287
## 77	0.549558342	-0.08820425	0.25035450	0.5672712922	-0.74435854

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## 78 -0.251822919 -1.67316139 -0.12230507 1.0961719751 -0.11547860
## 79 0.678449690 -0.43063369 0.10534913 0.2908640802 -0.42060485
## 80 0.051794194 0.31434867 0.23173521 0.5344988108 -0.46498758
## 81 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 82 0.488302052 -1.11924922 2.31403255 -0.6134122014 -0.31007126
## 83 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 84 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 85 -0.100641072 0.22314908 0.68741179 0.3758259714 0.07782383
## 86 0.797046959 -2.01011729 2.39093947 -0.0036995686 0.87999904
## 87 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 88 -0.167881936 -1.11544096 -0.08153672 0.7307813168 -0.07698573
## 89 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 90 -4.281514645 -0.23372321 7.98088980 0.2733246982 0.90743506
## 91 -0.337068588 -0.15835473 0.09370056 -0.0362838283 -0.55150604
## 92 -1.284454346 -0.07011696 2.39426708 0.0819974095 0.27223051
## 93 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 94 -0.871057570 -0.75124985 1.57890022 0.4559625089 0.16927193
## 95 -1.137241483 -4.36287022 -0.41780385 2.7394905090 -0.17682187
## 96 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 97 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 98 0.037598379 -0.85429257 0.83971721 -0.3590443134 0.73742455
## 99 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 100 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 101 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 102 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 103 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 104 0.662326992 -0.40715405 0.11912420 0.4456840158 -0.21524523
## 105 0.122075513 -0.27981231 0.57850814 -0.1533530504 -0.07751781
## 106 0.244151026 -0.55962461 1.15701628 -0.3067061007 -0.15503563
## 107 -0.428151459 -0.02337232 0.79808897 0.0273324717 0.09074350
## 108 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 109 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 110 -0.167881936 -1.11544096 -0.08153672 0.7307813168 -0.07698573
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## 113 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 114 -0.217906356 0.12563598 0.25408331 0.3923792243 -0.78873044
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## 116 0.122075513 -0.27981231 0.57850814 -0.1533530504 -0.07751781
## 117 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 118 -0.167881936 -1.11544096 -0.08153672 0.7307813168 -0.07698573
## 119 -0.167881936 -1.11544096 -0.08153672 0.7307813168 -0.07698573
## 120 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 121 0.333020747 0.09683255 0.25363737 0.6593143940 -0.49859712
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## 123 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 124 0.122075513 -0.27981231 0.57850814 -0.1533530504 -0.07751781
## 125 0.662326992 -0.40715405 0.11912420 0.4456840158 -0.21524523
## 126 0.051794194 0.31434867 0.23173521 0.5344988108 -0.46498758
## 127 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 128 0.797046959 -2.01011729 2.39093947 -0.0036995686 0.87999904
## 129 0.236911550 -1.34686792 0.50859040 0.8196275234 -2.34876180
## 130 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 131 -0.674137175 -0.31670946 0.18740112 -0.0725676566 -1.10301208

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## 132 -0.428151459 -0.02337232 0.79808897 0.0273324717 0.09074350
## 133 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 134 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 135 -0.923350632 -6.13492537 -0.44845194 4.0192975998 -0.42342153
## 136 -1.685342908 -0.79177368 0.46850279 -0.1814191341 -2.75753021
## 137 0.318818808 -0.80404699 0.95637584 -0.0014798274 0.35199961
## 138 -0.100641072 0.22314908 0.68741179 0.3758259714 0.07782383
## 139 0.344387323 0.78919142 0.70499897 1.6763145924 -1.40762436
## 140 0.662326992 -0.40715405 0.11912420 0.4456840158 -0.21524523
## 141 0.478228182 -1.20607042 1.43456376 -0.0022197412 0.52799940
## 142 -0.337068588 -0.15835473 0.09370056 -0.0362838283 -0.55150604
## 143 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 144 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 145 0.051794194 0.31434867 0.23173521 0.5344988108 -0.46498758
## 146 0.956456363 -2.41214085 2.86912751 -0.0044394825 1.05599880
## 147 0.103588387 0.62869734 0.46347043 1.0689976215 -0.92997515
## 148 -1.348274350 -0.63341892 0.37480223 -0.1451353133 -2.20602417
## 149 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 150 0.122075513 -0.27981231 0.57850814 -0.1533530504 -0.07751781
## 151 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 152 -0.614917815 -0.18011814 -0.18784532 -0.8150474429 0.90714365
## 153 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 154 0.194882154 -1.71352053 -0.03209316 1.2345788479 -0.23536508
## 155 0.637637615 -1.60809398 1.91275167 -0.0029596549 0.70399922
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## 158 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 159 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 160 0.002465494 -1.12646103 -0.04695098 0.7805356383 -0.12223172
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## 162 0.656005025 -0.42272088 0.09408043 0.2039104253 -0.50010258
## 163 0.318818808 -0.80404699 0.95637584 -0.0014798274 0.35199961
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## 165 0.122075513 -0.27981231 0.57850814 -0.1533530504 -0.07751781
## 166 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 167 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 168 0.660358250 -0.15251432 0.28159395 0.8101286888 -0.54268062
## 169 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 170 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 171 -1.393913388 -5.84473085 -0.25440726 3.5992889404 -1.29085958
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## 173 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 174 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 175 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 176 0.318818808 -0.80404699 0.95637584 -0.0014798274 0.35199961
## 177 0.244151026 -0.55962461 1.15701628 -0.3067061007 -0.15503563
## 178 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 179 -0.100641072 0.22314908 0.68741179 0.3758259714 0.07782383
## 180 0.122075513 -0.27981231 0.57850814 -0.1533530504 -0.07751781
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## 183 -2.761181593 -1.22981560 0.70906126 -0.3635151386 -4.26377106
## 184 -0.167881936 -1.11544096 -0.08153672 0.7307813168 -0.07698573
## 185 -0.323640645 -0.96725100 0.43411270 0.3900484145 -2.00367522

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## 186 0.637637615 -1.60809398 1.91275167 -0.0029596549 0.70399922
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## 190 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
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## 192 0.489014179 -0.60371393 0.53609699 0.2213830650 0.06818809
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## 195 0.344387323 0.78919142 0.70499897 1.6763145924 -1.40762436
## 196 0.051794194 0.31434867 0.23173521 0.5344988108 -0.46498758
## 197 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 198 0.662326992 -0.40715405 0.11912420 0.4456840158 -0.21524523
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## 202 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 203 0.662326992 -0.40715405 0.11912420 0.4456840158 -0.21524523
## 204 -0.674137175 -0.31670946 0.18740112 -0.0725676566 -1.10301208
## 205 0.662326992 -0.40715405 0.11912420 0.4456840158 -0.21524523
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## 219 -0.100641072 0.22314908 0.68741179 0.3758259714 0.07782383
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## 222 -0.856302917 -0.04674464 1.59617794 0.0546649434 0.18148701
## 223 0.192416668 -0.58705950 0.01485783 0.4540431499 -0.11313336
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## 225 -0.856302917 -0.04674464 1.59617794 0.0546649434 0.18148701
## 226 -0.100641072 0.22314908 0.68741179 0.3758259714 0.07782383
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## 230 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
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## 237 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
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## 239 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981

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## 245 0.993490458 -0.61073112 0.17868631 0.6685260534 -0.32286784
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## 247 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 248 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 249 0.103588387 0.62869734 0.46347043 1.0689976215 -0.92997515
## 250 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 251 -0.614917815 -0.18011814 -0.18784532 -0.8150474429 0.90714365
## 252 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 253 -0.251822919 -1.67316139 -0.12230507 1.0961719751 -0.11547860
## 254 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 255 -0.251822919 -1.67316139 -0.12230507 1.0961719751 -0.11547860
## 256 -0.614917815 -0.18011814 -0.18784532 -0.8150474429 0.90714365
## 257 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 258 -0.587586761 -3.90404344 -0.28537852 2.5577347279 -0.26945007
## 259 -0.428151459 -0.02337232 0.79808897 0.0273324717 0.09074350
## 260 1.476273894 -1.21607959 0.72174257 0.8837749958 -0.24856015
## 261 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 262 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 263 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 264 -0.167881936 -1.11544096 -0.08153672 0.7307813168 -0.07698573
## 265 0.993490458 -0.61073112 0.17868631 0.6685260534 -0.32286784
## 266 -0.671527743 -4.46176386 -0.32614687 2.9231252670 -0.30794293
## 267 0.242511600 -0.65270710 0.38835111 0.2675996125 -0.14336832
## 268 0.103588387 0.62869734 0.46347043 1.0689976215 -0.92997515
## 269 0.478228182 -1.20607042 1.43456376 -0.0022197412 0.52799940
## 270 0.637637615 -1.60809398 1.91275167 -0.0029596549 0.70399922
## 271 -0.251822919 -1.67316139 -0.12230507 1.0961719751 -0.11547860
## 272 0.051794194 0.31434867 0.23173521 0.5344988108 -0.46498758
## 273 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 274 -1.011205792 -0.47506419 0.28110167 -0.1088514850 -1.65451813
## 275 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 276 1.434684634 -3.61821127 4.30369139 -0.0066592232 1.58399820
## 277 0.318818808 -0.80404699 0.95637584 -0.0014798274 0.35199961
## 278 0.051794194 0.31434867 0.23173521 0.5344988108 -0.46498758
## 279 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 280 0.251646668 -2.10313511 2.16045213 -0.6950692534 1.62343597
## 281 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 282 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 283 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 284 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 285 0.051794194 0.31434867 0.23173521 0.5344988108 -0.46498758
## 286 0.338704050 0.44301200 0.47931820 1.1678144932 -0.95311069
## 287 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 288 0.478228182 -1.20607042 1.43456376 -0.0022197412 0.52799940
## 289 -0.167881936 -1.11544096 -0.08153672 0.7307813168 -0.07698573
## 290 -0.201282144 0.44629815 1.37482357 0.7516519427 0.15564767
## 291 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 292 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 293 -0.428151459 -0.02337232 0.79808897 0.0273324717 0.09074350

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## 294 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 295 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 296 -0.100641072 0.22314908 0.68741179 0.3758259714 0.07782383
## 297 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 298 0.808869421 -1.40289795 1.48452723 0.2225545645 0.41572979
## 299 0.662326992 -0.40715405 0.11912420 0.4456840158 -0.21524523
## 300 -1.007291675 -6.69264555 -0.48922029 4.3846879005 -0.46191439
## 301 0.039919138 -0.12372167 0.86333966 0.2819447517 0.18608549
## 302 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 303 -0.419704854 -2.78860235 -0.20384179 1.8269534111 -0.19246434
## 304 -0.614917815 -0.18011814 -0.18784532 -0.8150474429 0.90714365
## 305 -0.614917815 -0.18011814 -0.18784532 -0.8150474429 0.90714365
## 306 1.303141594 -0.83884692 0.18797058 0.4158100784 -0.98046374
## 307 -0.337068588 -0.15835473 0.09370056 -0.0362838283 -0.55150604
## 308 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 309 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 310 -0.428151459 -0.02337232 0.79808897 0.0273324717 0.09074350
## 311 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 312 0.051794194 0.31434867 0.23173521 0.5344988108 -0.46498758
## 313 -0.251822919 -1.67316139 -0.12230507 1.0961719751 -0.11547860
## 314 -3.370685816 -1.58354735 0.93700558 -0.3628382683 -5.51506042
## 315 -0.335763872 -2.23088193 -0.16307344 1.4615626335 -0.15397146
## 316 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 317 -0.428151459 -0.02337232 0.79808897 0.0273324717 0.09074350
## 318 0.051794194 0.31434867 0.23173521 0.5344988108 -0.46498758
## 319 0.489014179 -0.60371393 0.53609699 0.2213830650 0.06818809
## 320 -0.337068588 -0.15835473 0.09370056 -0.0362838283 -0.55150604
## 321 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 322 0.318818808 -0.80404699 0.95637584 -0.0014798274 0.35199961
## 323 -0.454152972 -0.52493501 0.23638104 -0.7871467471 1.02908850
## 324 0.589465857 -0.83234560 0.30442598 0.6416109800 -1.04143727
## 325 1.032613397 -0.90388823 0.91714394 0.3853599131 -0.38531852
## 326 -1.091232538 -7.25036621 -0.52998865 4.7500786781 -0.50040728
## 327 0.656005025 -0.42272088 0.09408043 0.2039104253 -0.50010258
## 328 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 329 0.051794194 0.31434867 0.23173521 0.5344988108 -0.46498758
## 330 0.320984125 -0.79853231 0.94215262 -0.0017420432 0.34878436
## 331 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 332 -0.446079940 -0.75780064 0.05619747 0.3480431139 -0.62530690
## 333 -0.100641072 0.22314908 0.68741179 0.3758259714 0.07782383
## 334 0.489014179 -0.60371393 0.53609699 0.2213830650 0.06818809
## 335 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 336 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 337 -0.337068588 -0.15835473 0.09370056 -0.0362838283 -0.55150604
## 338 0.662326992 -0.40715405 0.11912420 0.4456840158 -0.21524523
## 339 0.662326992 -0.40715405 0.11912420 0.4456840158 -0.21524523
## 340 0.333020747 0.09683255 0.25363737 0.6593143940 -0.49859712
## 341 -0.587586761 -3.90404344 -0.28537852 2.5577347279 -0.26945007
## 342 -0.637352943 -0.56420684 -0.20540972 -0.5072627664 0.82529664
## 343 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 344 0.051794194 0.31434867 0.23173521 0.5344988108 -0.46498758
## 345 0.192416668 -0.58705950 0.01485783 0.4540431499 -0.11313336
## 346 0.366226524 -0.83943689 1.73552442 -0.4600591362 -0.23255345
## 347 -0.100641072 0.22314908 0.68741179 0.3758259714 0.07782383

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## 348 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 349 -1.348274350 -0.63341892 0.37480223 -0.1451353133 -2.20602417
## 350 -0.503645837 -3.34632277 -0.24461015 2.1923439503 -0.23095720
## 351 0.051794194 0.31434867 0.23173521 0.5344988108 -0.46498758
## 352 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 353 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 354 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 355 -0.674137175 -0.31670946 0.18740112 -0.0725676566 -1.10301208
## 356 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 357 0.678449690 -0.43063369 0.10534913 0.2908640802 -0.42060485
## 358 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 359 0.214590937 -4.10904551 1.62230074 1.6915494204 0.48818171
## 360 -0.251822919 -1.67316139 -0.12230507 1.0961719751 -0.11547860
## 361 0.318818808 -0.80404699 0.95637584 -0.0014798274 0.35199961
## 362 -0.419704854 -2.78860235 -0.20384179 1.8269534111 -0.19246434
## 363 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 364 -0.614917815 -0.18011814 -0.18784532 -0.8150474429 0.90714365
## 365 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 366 -1.284454346 -0.07011696 2.39426708 0.0819974095 0.27223051
## 367 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 368 0.318818808 -0.80404699 0.95637584 -0.0014798274 0.35199961
## 369 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 370 1.324653983 -0.81430811 0.23824841 0.8913680315 -0.43049046
## 371 0.993490458 -0.61073112 0.17868631 0.6685260534 -0.32286784
## 372 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 373 -0.307458907 -0.09005907 -0.09392266 -0.4075237215 0.45357183
## 374 1.275275230 -3.21618795 3.82550335 -0.0059193098 1.40799844
## 375 -0.335763872 -2.23088193 -0.16307344 1.4615626335 -0.15397146
## 376 0.662326992 -0.40715405 0.11912420 0.4456840158 -0.21524523
## 377 1.476273894 -1.21607959 0.72174257 0.8837749958 -0.24856015
## 378 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 379 0.662326992 -0.40715405 0.11912420 0.4456840158 -0.21524523
## 380 -0.083940968 -0.55772048 -0.04076836 0.3653906584 -0.03849287
## 381 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 382 -2.707164049 -1.78638387 1.31630039 -0.3107257783 -4.52093554
## 383 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 384 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 385 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 386 0.318818808 -0.80404699 0.95637584 -0.0014798274 0.35199961
## 387 0.331163496 -0.20357703 0.05956210 0.2228420079 -0.10762262
## 388 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 389 -0.674137175 -0.31670946 0.18740112 -0.0725676566 -1.10301208
## 390 0.656005025 -0.42272088 0.09408043 0.2039104253 -0.50010258
## 391 0.357176214 -0.38161108 0.50466710 0.0539848842 -0.14602514
## 392 -0.959875286 -0.65096563 1.57580435 0.4508779943 0.14253235
## 393 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 394 0.656005025 -0.42272088 0.09408043 0.2039104253 -0.50010258
## 395 0.159409404 -0.40202349 0.47818792 -0.0007399137 0.17599981
## 396 -0.167881936 -1.11544096 -0.08153672 0.7307813168 -0.07698573
## 397 0.051794194 0.31434867 0.23173521 0.5344988108 -0.46498758
## 398 -0.337068588 -0.15835473 0.09370056 -0.0362838283 -0.55150604
##
## $user.factors
##      id      V1      V2      V3      V4      V5

```



```

## 1 1 -0.06523395 0.02360640 0.09998150 0.01545092 0.2802125
## 2 2 -0.04090880 0.52896428 -0.12957187 0.08360580 0.4947680
## 3 3 0.08485514 0.28344941 0.06790266 0.38869330 0.5729561
## 4 4 0.06717686 0.23062745 -0.43092567 0.19634265 -0.1504299
## 5 5 0.11133213 -0.16596684 0.15118960 0.19483693 -0.6620698
## 6 6 0.07892490 0.01391441 -0.02921643 0.08414906 0.2244886
## 7 7 -0.11570577 -0.66632068 -0.07499070 0.22022495 -0.1751667
## 8 8 -0.03540586 -0.30469775 0.20251252 0.42045286 -0.0234536
## 9 9 -0.42187467 -0.25695044 -0.42986241 0.22225514 0.1799834
## 10 10 0.84590495 -0.22465749 -0.24123612 0.02144960 -0.1076614
##      V6      V7      V8      V9      V10
## 1 -0.47306916 -0.04037477 0.87637973 0.039740346 0.09871496
## 2 0.17697221 -0.45134693 0.52661818 -0.007213087 0.19660461
## 3 -0.39638466 -0.18662637 0.13527927 -0.029548073 -0.61093515
## 4 -0.09830880 0.21698050 0.70365804 0.379324764 0.08216541
## 5 0.12769553 -0.30249196 0.61562788 -0.175115332 -0.06948889
## 6 0.66817558 -0.42539933 0.09996568 0.219077900 -0.51403552
## 7 -0.10378722 -0.63440311 -0.04166670 0.393653244 -0.06495409
## 8 0.06235339 0.33215091 0.24839865 0.573880672 -0.49966124
## 9 -0.32309669 -0.09969188 -0.09111568 -0.432678819 0.47951314
## 10 0.34860501 -0.22522068 0.07420477 0.231570810 -0.12958056
##
## $data
## <job[285]>
##      class org.apache.spark.sql.Dataset
##      [user: int, item: int ... 2 more fields]
##
## $ml.options
## $id.column
## [1] "id39c62154fdf5"
##
## $response.column
## [1] "response39c613aebb7f"
##
## $features.column
## [1] "features39c64a889a6e"
##
## $model.transform
## NULL
##
## $only.model
## [1] FALSE
##
## $na.action
## [1] "na.omit"
##
## attr(,"class")
## [1] "ml_options"
##
## $model.parameters
## $model.parameters$id
## [1] "id39c62154fdf5"
##
## $model.parameters$model

```

```

## [1] "org.apache.spark.ml.recommendation.ALS"
##
##
## $.call
## ml_als_factorization(user_item_rating, iter.max = 5, regularization.parameter = 0.01)
##
## $.model
## <jobj[296]>
##   class org.apache.spark.ml.recommendation.ALSModel
##   als_1f442148a9c2
##
## attr("class")
## [1] "ml_model_als_factorization" "ml_model"

# rows: products
v <- as.matrix(explicit_model$item.factors)
vf <- v[,-1]
vid <- v[,1]

# rows: users
u <- as.matrix(explicit_model$user.factors)
uf <- u[,-1]
uid <- u[,1]

# rows: users
# columns: products
af <- uf %*% t(vf)

user <- 1
ratings <- af[user,]
best <- which(ratings > 3)
vid[best]

## [1] 196 1559 10258 12427 18523 19156 24852 25133 32792 39190 47209
## [12] 47766

implicit_predictions <- explicit_model$.model %>%
  invoke("transform", spark_dataframe(user_item_rating)) %>%
  collect()

order_products__prior %>%
  colnames %>%
  print

## [1] "order_id"          "product_id"         "add_to_cart_order"
## [4] "reordered"

orders %>%
  colnames %>%
  print

## [1] "order_id"          "user_id"
## [3] "eval_set"          "order_number"
## [5] "order_dow"         "order_hour_of_day"
## [7] "days_since_prior_order"

```