

SQL 고객 추천 로직

추천 시스템1

1. "고객이 만족하는 베스트 셀러!"
2. 추천 테마 : 잘 팔리는 제품을 더 잘 팔리게!
 - a. 아마존이 추천하는 제품은 분명 믿을만하다고 생각할 것입니다.
 - b. `rating_count` , `review_id`
3. 구현 로직
 - a. 평점 수 상위 20% 필터링
 - b. 평점 개수가 데이터베이스 최대치인 8개 이상인 제품 필터링
 - c. 평점이 높은 순으로 정렬하고, 평점이 같을 때에는 평점 개수가 많은 순으로 정렬
 - d. 중복되거나 오류로 보이는 2개 이상의 `product_id`을 `rn` 을 통해 필터링

```
WITH RatingRecommendation AS(
  SELECT DISTINCT product_name,
    discounted_price,
    rating,
    rating_count,
    ROW_NUMBER() OVER(PARTITION BY product_id ORDER BY rating DESC, rating_count DESC) rn
  FROM `modulabs-project-480302.day4.amazon`
  WHERE rating_count >= (SELECT PERCENTILE_CONT(rating_count,0.8) OVER ()
                        FROM `modulabs-project-480302.day4.amazon`
                        LIMIT 1)
  AND ARRAY_LENGTH(SPLIT(review_id)) >= 8
)

SELECT product_name,
  discounted_price,
  rating,
  rating_count
FROM RatingRecommendation
WHERE rn=1
ORDER BY rating DESC, rating_count DESC;
```

4. 결과
 - a. `rating_count` 상위 20%인 약 21790 이상을 가진 제품들이 반환 / 리뷰 개수 8개가 충족된 제품들 반환

상위 20% ▾
21790.8

- b. 상위 20%의 `rating_count` 중 최고 리뷰 점수는 4.6점

명	product_name	discounted_price	rating	rating_count
1	Redgear MP35 Speed-Type Gaming Mousepad (Black/Red)	299.0	4.6	33434
2	Spigen EZ Fit Tempered Glass Screen Protector Guard for iPhone 14/13/13 Pro - 2 Pack	999.0	4.6	26603
3	SanDisk Extreme SD UHS I 64GB Card for 4K Video for DSLR and Mirrorless Cameras 170MB/s Read & 80MB/s Write	939.0	4.5	205052
4	AmazonBasics USB 2.0 Cable - A-Male to B-Male - for Personal Computer, Printer- 6 Feet (1.8 Meters), Black	209.0	4.5	107687
5	Crucial BX500 240GB 3D NAND SATA 6.35 cm (2.5-inch) SSD (CT240BX500SSD1)	1815.0	4.5	92925
6	AmazonBasics USB 2.0 Extension Cable for Personal Computer, Printer, 2-Pack - A-Male to A-Female - 3.3 Feet (1 Meter, Black)	299.0	4.5	74977
7	AmazonBasics USB 2.0 - A-Male to A-Female Extension Cable for Personal Computer, Printer (Black, 9.8 Feet/3 Meters)	199.0	4.5	74976
8	Logitech M235 Wireless Mouse, 1000 DPI Optical Tracking, 12 Month Life Battery, Compatible with Windows, Mac, Chromebook/PC/Laptop	699.0	4.5	54405
9	Seagate Expansion 1TB External HDD - USB 3.0 for Windows and Mac with 3 yr Data Recovery Services, Portable Hard Drive (STKM1000400)	4098.0	4.5	50810
10	Seagate One Touch 2TB External HDD with Password Protection - Black, for Windows and Mac, with 3 yr Data Recovery Services, and 4 Months Adobe CC Photography (STKY2000400)	5799.0	4.5	50273
11	Dell MS116 1000Dpi USB Wired Optical Mouse, Led Tracking, Scrolling Wheel, Plug and Play.	299.0	4.5	33176
12	Elv Aluminium Adjustable Mobile Phone Foldable Holder Tabletop Stand Dock Mount for All Smartphones, Tabs, Kindle, iPad (Moonlight Silver)	314.0	4.5	28978
13	ELV Aluminum Adjustable Mobile Phone Foldable Tabletop Stand Dock Mount for All Smartphones, Tabs, Kindle, iPad (Black)	269.0	4.5	28978
14	Duracell Ultra Alkaline AA Battery, 8 Pcs	266.0	4.5	28030
15	Crucial RAM 8GB DDR4 3200MHz CL22 (or 2933MHz or 2666MHz) Laptop Memory CT8G45FRA32A	1792.0	4.5	26194
16	Havells Aqua Plus 1.2 litre Double Wall Kettle / 304 Stainless Steel Inner Body / Cool touch outer body / Wider mouth/ 2 Year warranty (Black, 1500 Watt)	1625.0	4.5	23484
17	TP-Link UE300 USB 3.0 to RJ45 Gigabit Ethernet Network Adapter - Plug and Play	1099.0	4.5	22420
18	TP-Link UE300C USB Type-C to RJ45 Gigabit Ethernet Network Adapter/RJ45 LAN Wired Adapter for Ultrabook, Chromebook, Laptop, Desktop, Plug & Play, USB 3.0, Foldable and Portable Design	1199.0	4.5	22420
19	AmazonBasics Flexible Premium HDMI Cable (Black, 4K@60Hz, 18Gbps), 3-Foot	219.0	4.4	426973
20	Amazon Basics High-Speed HDMI Cable, 6 Feet - Supports Ethernet, 3D, 4K video,Black	309.0	4.4	426973

추천 시스템2~4

현재 보고 있는 제품 기반 추천 시스템 제공

추천 시스템2

1. 보고 있는 제품과 비슷한 제품!
2. 추천 테마 : 같은 카테고리 내, 비슷한 가격의 제품을 추천
 - a. 관심 있는 분야의 제품이라면 비슷한 가격대에서도 만족할만한 제품이 있을 것입니다.
 - b. `category` , `discounted_price`
3. 구현 로직
 - a. 카테고리의 마지막 분류를 추출하여 이와 같은 제품들을 반환
 - b. 가격의 +-20%의 가격 내에서 검색
 - c. 예시 타겟 `product_id` : `BOBPJBTB3F`

```
WITH Cat AS(
SELECT *,
    REGEXP_EXTRACT(category, r'[^|]+$',) AS last1_cat
FROM modulabs-project-480302.day4.amazon
),
Cat_Based_Recommendation AS(
SELECT product_id
FROM Cat
WHERE last1_cat=(SELECT last1_cat FROM Cat WHERE product_id = 'BOBPJBTB3F') -- 타겟 카테고리 : FanHeaters
AND (discounted_price >= (SELECT discounted_price
    FROM Cat
    WHERE product_id = 'BOBPJBTB3F')*0.8
AND discounted_price <= (SELECT discounted_price
    FROM Cat
    WHERE product_id = 'BOBPJBTB3F')*1.2) -- 타겟 가격 : 1299.0
AND product_id != 'BOBPJBTB3F'
)

SELECT product_name,
    discounted_price,
    rating,
    rating_count,
    last1_cat
FROM modulabs-project-480302.day4.amazon AS am
JOIN Cat_Based_Recommendation AS r
ON am.product_id=r.product_id
ORDER BY rating_count DESC, rating DESC;
```

4. 결과

- 현재 보고 있는 제품의 카테고리 **FanHeaters**
- 현재 보고 있는 제품 가격(1299.0)의 $\pm 20\%$ 내의 가격의 제품을 반환 : 1039.2 ~ 1,558.8
- 자기 자신을 제외한 제품 중, 같은 마지막 카테고리 6 제품

영	product_name	discounted_price	rating	rating_count	last1_cat
1	Amazon Brand - Solimo 2000/1000 Watts Room Heater with Adjustable Thermostat (ISI certified, White colour, Ideal for small to medium room/area)	1199.0	4	18543	FanHeaters
2	Orpat OEH-1260 2000-Watt Fan Heater (Grey)	1464.0	4.1	14120	FanHeaters
3	Candes Gloster All in One Silent Blower Fan Room Heater Ideal for Small and Medium Area, 2000 Watts (White)	1069.0	3.9	313	FanHeaters
4	Inalsa Electric Fan Heater Hotty - 2000 Watts Variable Temperature Control Cool/Warm/Hot Air Selector Over Heat Protection ISI Certification, White	1349.0	3.8	166	FanHeaters
5	Amazon Basics 2000/1000 Watt Room Heater with Adjustable Thermostat (ISI certified, White color, Ideal for small to medium room/area)	1049.0	3.1	111	FanHeaters
6	Candes BlowHot All in One Silent Blower Fan Room Heater (ABS Body, White, Brown) 2000 Watts	1090.0	3.5	57	FanHeaters

추천 시스템 3

- 보고 있는 제품을 산 고객이 구매한 상품(비슷한 카테고리)!
- 추천 테마 : 비슷한 카테고리 내에서 같은 제품을 고객이 구매한 제품을 추천
 - 하나의 제품을 구매했다고 하더라도, 구매의 스펙트럼이 넓어 원치 않은 추천을 할 수 있습니다. 그렇기에 비슷한 카테고리에서 구매한 적이 있으면 그 제품을 추천합니다.
 - category** , **user_id**
- 구현 로직
 - 마지막 2번째 카테고리를 추출 후 같은 카테고리 내에서 추천
 - 구매한 고객 중 다른 제품을 구매한 적이 있는 상품을 추천
 - 예시 product_id : **B07JW9H4J1**

```

WITH UserIdSplit AS(
SELECT DISTINCT product_id,
  user_id_split,
  REGEXP_EXTRACT(category, r'^([^\|]+)\|([^\|]+)$') AS last2_cat
FROM modulabs-project-480302.day4.amazon am,
  UNNEST(SPLIT(user_id,',')) AS user_id_split
),
User_Based_Recommendation AS(
SELECT DISTINCT product_id
FROM UserIdSplit uis
JOIN (SELECT DISTINCT user_id_split
      FROM UserIdSplit
      WHERE product_id = 'B07JW9H4J1') target_
ON uis.user_id_split=target_.user_id_split
WHERE product_id != 'B07JW9H4J1'
  AND last2_cat = (SELECT DISTINCT last2_cat -- 타겟 카테고리 : Cables
                  FROM UserIdSplit
                  WHERE product_id = 'B07JW9H4J1')
)

SELECT am.product_id,
  product_name,
  discounted_price,
  rating,
  rating_count,
  last2_cat
FROM modulabs-project-480302.day4.amazon AS am
JOIN User_Based_Recommendation AS r
ON am.product_id=r.product_id
ORDER BY rating_count DESC, rating DESC;

```

- 결과
 - 현재 보고 있는 뒤에서 2번째 카테고리 **Cables**
 - rating** 과 **rating_count** 가 모두 같은 것으로 보아, 비슷한 제품을 하나로 관리하는 시스템을 사용하는 것으로 보입니다.
 - 보고 있는 제품을 제외한 5가지의 상품이 추천 대상

행	product_id	product_name	discounted_price	rating	rating_count	last2_cat
1	B07JH1C41D	Wayona Nylon Braided (2 Pack) Lightning Fast Usb Data Cable Fast Charger Cord For Iphone, Ipad Tablet (3 Ft Pack Of 2, Grey)	649.0	4.2	24269	Cables
2	B07JGDB5M1	Wayona Nylon Braided 2M / 6Ft Fast Charge Usb To Lightning Data Sync And Charging Cable For Iphone, Ipad Tablet (6 Ft Pack Of 1, Grey)	449.0	4.2	24269	Cables
3	B07JW1Y6XV	Wayona Nylon Braided 3A Lightning to USB A Syncing and Fast Charging Data Cable for iPhone, Ipad (3 FT Pack of 1, Black)	399.0	4.2	24269	Cables
4	B07JH1CBGW	Wayona Nylon Braided Usb Syncing And Charging Cable Sync And Charging Cable For Iphone, Ipad (3 Ft, Black) - Pack Of 2	649.0	4.2	24269	Cables
5	B07LGT55SJ	Wayona Usb Nylon Braided Data Sync And Charging Cable For Iphone, Ipad Tablet (Red, Black)	399.0	4.2	24269	Cables

추천 시스템4

- 보고 있는 브랜드가 판매 중인 상품!
- 추천 테마 : 브랜드 로열티를 활용하여 추천
 - 제품을 선정할 때, 브랜드 로열티를 바탕으로 구매하는 고객도 존재
 - `product_link`
 - 예시 타겟 `product_id` : `B09P8M18QM`
- 구현 로직
 - 링크를 봤을 때, `https://www.amazon.in/` 뒤에 나오는 1~3 개의 단어가 브랜드일 확률이 굉장히 큼
 - 따라서 첫 `-` (dash)가 나오기 전 까지의 글자와 같은 제품들을 추천
 - 브랜드가 `V-smash` 로 추정되는 제품이 있지만, 이 경우에는 'V-' 가 유니크 할 것이라고 판단하였습니다.
 - `LIKE` 를 활용하여 브랜드가 포함된 링크를 가지고 있는 제품들을 반환

```
SELECT product_name,
       discounted_price,
       rating,
       rating_count
FROM modulabs-project-480302.day4.amazon
WHERE product_link LIKE (SELECT CONCAT(REGEXP_EXTRACT(product_link, r'^([^-]+)'), '-%')
                        FROM modulabs-project-480302.day4.amazon
                        WHERE product_id = 'B09P8M18QM')
AND product_id != 'B09P8M18QM'
ORDER BY rating_count DESC, rating DESC;
```

- 결과
 - `https://www.amazon.in/7SEVEN-` 로 시작하는 `product_link` 를 가진 제품을 반환
 - 브랜드는 7SEVEN 으로 확인됨
 - 보고 있는 제품을 제외한 4가지의 상품이 추천 대상

행	product_name	discounted_price	rating	rating_count
1	7SEVEN® Compatible for Samsung Smart 4K Ultra HD TV Monitor Remote Control Replacement of Original Samsung TV Remote for LED OLED UHD QLED and Suitable for 6 7 8 Series Samsung TV with Hot Keys BN59-01259E	399.0	3.6	493
2	7SEVEN® Compatible Lg Smart Tv Remote Suitable for Any LG LED OLED LCD UHD Plasma Android Television and AKB75095303 replacement of Original Lg Tv Remote Control	349.0	4.2	284
3	7SEVEN® Suitable Sony Tv Remote Original Bravia for Smart Android Television Compatible for Any Model of LCD LED OLED UHD 4K Universal Sony Remote Control	349.0	3.9	214
4	7SEVEN® Compatible Vu Smart Tv Remote Control Suitable for Original 4K Android LED Ultra HD UHD Vu Tv Remote with Non Voice Feature without google assistant	499.0	3.7	185

추천 시스템 5

- 보석 같은 제품 발굴하기!
- 추천 테마 : `rating_count`가 적은 제품 중 평판이 좋은 제품들을 추천
 - 판매 수가 적으나 좋은 제품은 분명히 있다. 이것을 찾아 추천해보자
 - `review_id` , `rating`
- 구현 로직
 - 리뷰 수는 충분한 것을 확인하기 위해 리뷰 최대 수인 8개를 보유한 제품 선택
 - 평점 필터링을 통해 4.0 이상인 제품만 추천
 - `rating` 중 `1` 인 제품은 제외
 - 리뷰 수 중 상위 20개의 제품만 추천

```
SELECT product_name,
       discounted_price,
       rating,
```

```

rating_count
FROM modulabs-project-480302.day4.amazon
WHERE ARRAY_LENGTH(SPLIT(review_id','))>=8
AND rating NOT LIKE '%|%'
AND CAST(rating AS float64) > 4.0
ORDER BY rating_count
LIMIT 20;

```

4. 결과

- rating 4 점이 넘는 제품 중 rating_count 가 적은 순으로 20개를 추천
- 해당 제품을 판매하는 기업의 평점 작업일 수도 있으나, 리뷰 내용을 확인해본 결과 대체로 긍정적인 반응을 확인

행	product_name	discounted_price	rating	rating_count
1	Portable, Handy Compact Plug-in Portable Digital Electric Heater Fan Wall-Outlet Handy Air Warmer Blower Adjustable Timer Digital Display Heater for Home/Office/Camper (Black, 400 Watts)	799.0	4.4	17
2	Homeistic Appliance™ Instant Electric Water Heater Faucet Tap For Kitchen And Bathroom Sink Digital Water Heating Tap with Shower Head ABS Body- Shock Proof (Pack Of 1. White)	1448.0	4.5	19
3	KLAM LCD Writing Tablet Screenwriting Toys Board Smart Digital E-Note Pad 8.5 Inch Light Weight Magic Slate for Drawing Playing Noting by Kids and Adults Best Birthday Gift Girls Boys, Multicolor	175.0	4.1	21
4	Amazon Basics Wireless Mouse 2.4 GHz Connection, 1600 DPI Type - C Adapter Upto 12 Months of Battery Life Ambidextrous Design Suitable for PC/Mac/Laptop	499.0	5.0	23
5	Oratech Coffee Frother electric, milk frother electric, coffee beater, cappuccino maker, Coffee Foamer, Mocktail Mixer, Coffee Foam Maker, coffee whisker electric, Froth Maker, coffee stirrers electric, coffee frothers, Coffee Blender, (6 Month Warranty) (Multicolour)	279.0	4.8	28
6	Noise_Colorfit Smart Watch Charger 2 Pin USB Fast Charger Magnetic Charging Cable Adapter (Smart Watch Charger 2 pin)	249.0	4.5	38
7	Kitchenenix's Mini Waffle Maker 4 Inch- 350 Watts: Stainless Steel Non-Stick Electric Iron Machine for Individual Belgian Waffles, Pan Cakes, Paninis or Other Snacks (Red)	899.0	4.2	39
8	Tuasro 8K HDMI 2.1 Cable 48Gbps , 1.5 Meter High-Speed Braided HDMI Cable (8K@60HZ, 4K@120HZ, 2K@240HZ) HDMI 2.1 Cable Compatible with Monitors , Television , Laptops , Projectors , Game Consoles and more with HDMI Ports Device	599.0	4.2	47
9	Zuvexa USB Rechargeable Electric Foam Maker - Handheld Milk Wand Mixer Frother for Hot Milk, Hand Blender Coffee, Egg Beater (Black)	499.0	4.7	54
10	AGARO Royal Double Layered Kettle, 1.5 Litres, Double Layered Cool Touch , Dry Boiling Protection, Black	1260.0	4.3	55
11	Crompton Insta Delight Fan Circulator Room Heater with 3 Heat Settings (Slate Grey & Black, 2000 Watt)	2590.0	4.1	63
12	Gadgetronics Digital Kitchen Weighing Scale & Food Weight Machine for Health, Fitness, Home Baking & Cooking (10 KGs,1 Year Warranty & Batteries Included)	799.0	4.5	63
13	TCL 80 cm (32 inches) HD Ready Certified Android Smart LED TV 32S615 (Black)	11990.0	4.2	64
14	Room Heater Warmer Wall-Outlet 400 Watts Electric Handy Room Heater (Room Heaters Home for Bedroom, Reading Books, Work, bathrooms, Rooms, Offices, Home Offices,2022	799.0	4.3	70
15	Fire-Bolt Gladiator 1.96" Biggest Display Smart Watch with Bluetooth Calling, Voice Assistant & 123 Sports Modes, 8 Unique UI Interactions, SpO2, 24/7 Heart Rate Tracking	3999.0	4.4	73
16	Cablet 2.5 inch SATA USB 3.0 HDD/SSD Portable External Enclosure for 7mm and 9.5mm, Tool-Free Design, Supports UASP Max 6TB	499.0	4.3	74
17	VRPRIME Lint Roller Lint Remover for Clothes, Pet 360 Sheets Reusable Sticky Easy-Tear Sheet Brush for Clothes, Furniture, Carpet, Dog Fur, Sweater, Dust & Dirt (4 Rolls - 90 Sheet Each Roll)	499.0	4.6	79
18	Borosil Volcano 13 Fin Oil Filled Radiator Room Heater, 2900 W, Black	9495.0	4.2	79
19	Lapster usb 2.0 mantra cable, mantra mfs 100 data cable (black)	199.0	4.2	85
20	LS LAPSTER Quality Assured USB 2.0 morpho cable, morpho device cable for Mso 1300 E3/E2/E Biometric Finger Print Scanner morpho USB cable (Black)	199.0	4.3	87