

Asistent:
Elena Akik

Nikola Pantić IN 40/2020
Srđan Petrović IN 47/2020

Preporuka Steam Igara



Sistemi baza podataka

Link do repozitorijuma: <https://github.com/ssspetrovic/steam-recommendations>

Tema

- Kao temu, odabrali smo “Game recommendations on Steam” skup podataka
- Steam - najveća svetska platforma igara na svetu
- Ovaj skup podataka fokusira se na preporuke korisnika na Steam platformi.
- Sadrži informacije o različitim igrama, njihovim karakteristikama i interakcijama korisnika.
- Preporuke se temelje na ponašanju korisnika, kao što su ocene igara, vreme igranja, dodavanje u listu želja itd.

Datoteke i broj zapisa

- **games.csv** : Informacije o igrama - **50.872** zapisa
- **recommendations.csv**: Informacije o recenzijama - **41.154.794** zapisa
- **users.csv**: Informacije o igracima - **14.306.064** zapisa

Semantika kolona

- **games.csv:**
 - **app_id:** Jedinstveni identifikator igre.
 - **title:** Naslov igre.
 - **date_release:** Datum izdavanja igre.
 - **rating:** Ocena igre.
 - **positive_ratio:** Procenat pozitivnih recenzija u odnosu na ukupan broj recenzija.
 - **user_reviews:** Broj recenzija koje je igra dobila od korisnika.
 - **win:** Da li je igra dostupna za Windows platformu (true/false).
 - **mac:** Da li je igra dostupna za Mac platformu (true/false).
 - **linux:** Da li je igra dostupna za Linux platformu (true/false).
 - **steam_deck:** Da li je igra dostupna za Steam Deck platformu (true/false).
 - **price_final:** Konačna cena igre.
 - **price_original:** Originalna cena igre pre popusta.
 - **discount:** Procenat popusta na cenu igre.
- **recommendations.csv:**
 - **user_id:** Jedinstveni identifikator korisnika koji je ostavio preporuku.
 - **review_id:** Jedinstveni identifikator recenzije.
 - **app_id:** Jedinstveni identifikator igre na koju se odnosi preporuka.
 - **funny:** Broj korisnika koji su označili recenziju kao smešnu.
 - **helpful:** Broj korisnika koji su označili recenziju kao korisnu.
 - **date:** Datum kada je preporuka ostavljena.
 - **is_recommended:** Da li je igra preporučena (true/false).
 - **hours:** Broj sati koje je korisnik proveo igrajući igru.
- **users.csv:**
 - **user_id:** Jedinstveni identifikator korisnika.
 - **products:** Može predstavljati proizvode koje je korisnik kupio, registrovao ili koristi.
 - **reviews:** Broj recenzija koje je korisnik napisao.

Predlog logičke šeme baze podataka

<p>1. Kolekcija: Games</p> <pre>{ "_id": ObjectId("..."), "app_id": "54321", "title": "Amazing Game", "date_release": ISODate("2022-03-15T00:00:00Z"), "rating": 4.7, "positive_ratio": 0.92, "user_reviews": 1500 }</pre>	<p>2. Kolekcija: Platform</p> <pre>{ "_id": ObjectId("..."), "app_id": "54321", "windows": true, "mac": true, "linux": false, "steam_deck": true }</pre>	<p>3. Kolekcija: Price</p> <pre>{ "_id": ObjectId("..."), "app_id": "54321", "price_final": 29.99, "price_original": 49.99, "discount": 40 }</pre>
<p>4. Kolekcija: Recommendations:</p> <pre>{ "_id": ObjectId("..."), "review_id": "67890", "user_id": "12345", "app_id": "54321", "date": ISODate("2023-05-10T00:00:00Z"), "is_recommended": true, "hours": 35.0 }</pre>	<p>5. Kolekcija: Review Feedback</p> <pre>{ "_id": ObjectId("..."), "review_id": "67890", "funny": 2, "helpful": 25 }</pre>	<p>6. Kolekcija: Users</p> <pre>{ "_id": ObjectId("..."), "user_id": "12345", "products": 50, "reviews": 20 }</pre>

Agregacije nad podacima - Nikola

1. Najigranije plaćene igre na Linuxu koje su izašle do 2010. godine:

```
1 {
2   {
3     $lookup: {
4       from: "Platform",
5       localField: "app_id",
6       foreignField: "app_id",
7       as: "platform_info"
8     }
9   },
10  {
11    $match: {
12      "platform_info.linux": true,
13      date_release: {
14        $lt: ISODate("2010-01-01T00:00:00Z")
15      }
16    }
17  },
18  {
19    $lookup: {
20      from: "Price",
21      localField: "app_id",
22      foreignField: "app_id",
23      as: "price_info"
24    }
25  },
26  {
27    $match: {
28      "price_info.price_final": {
29        $ne: 0
30      }
31    }
32  },
33  {
34    $sort: {
35      user_reviews: -1
36    }
37  },
38  {
39    $limit: 10
40  },
41  {
42    $project: {

```

PIPELINE OUTPUT

Sample of 10 documents

OUTPUT OPTIONS ▾

title: "Garry's Mod"

rating: "Overwhelmingly Positive"

user_reviews: 853733

price_final: 10

title: "Left 4 Dead 2"

rating: "Overwhelmingly Positive"

user_reviews: 574470

price_final: 10

title: "Counter-Strike"

rating: "Overwhelmingly Positive"

user_reviews: 136118

price_final: 9.99

title: "Half-Life 2"

rating: "Overwhelmingly Positive"

user_reviews: 122230

price_final: 9.99

title: "Portal"

rating: "Overwhelmingly Positive"

user_reviews: 117868

price_final: 10

title: "Counter-Strike: Source"

rating: "Overwhelmingly Positive"

user_reviews: 103720

price_final: 9.99

Agregacije nad podacima - Nikola

2. Koliko bi koštalo da se kupe sve igre za svaku od platformi?

```
1 [
2   {
3     $group: {
4       _id: "$app_id",
5       app_id: {
6         $first: "$app_id"
7       }
8     },
9   },
10  {
11    $lookup: {
12      from: "platform",
13      localField: "app_id",
14      foreignField: "app_id",
15      as: "platforms"
16    }
17  },
18  {
19    $lookup: {
20      from: "Price",
21      localField: "app_id",
22      foreignField: "app_id",
23      as: "prices"
24    }
25  },
26  {
27    $unwind: "$platforms"
28  },
29  {
30    $unwind: "$prices"
31  },
32  {
33    $facet: {
34      windows: [
35        {
36          $group: {
37            _id: null,
38            total_price: {
39              $sum: {
40                $cond: [
41                  {
42                    $eq: {

```

PIPELINE OUTPUT
Sample of 4 documents

OUTPUT OPTIONS ▾

platform	: "Steam Deck"
total_price	: 5905.89

platform	: "Windows"
total_price	: 5905.89

platform	: "Mac"
total_price	: 1451.99

platform	: "Linux"
total_price	: 825

Agregacije nad podacima - Nikola

3. Najviše recenzirane igre za svaki kvartal:

```
1 [
2   {
3     $lookup: {
4       from: "Recommendations",
5       localField: "app_id",
6       foreignField: "app_id",
7       as: "reviews"
8     }
9   },
10  {
11    $unwind: "$reviews"
12  },
13  {
14    $group: {
15      _id: {
16        title: "$title",
17        year: {
18          $year: "$reviews.date"
19        },
20        quarter: {
21          $concat: [
22            {
23              $toString: {
24                $year: "$reviews.date"
25              }
26            },
27            " ",
28            "Q",
29            {
30              $cond: [
31                {
32                  $lte: [
33                    {
34                      $month: "$reviews.date"
35                    },
36                    3
37                  ]
38                },
39                "1",
40                {
41                  $cond: [
42                    {

```

PIPELINE OUTPUT

Sample of 30 documents

total_reviews : 510
quarter : "2015, Q1"
title : "Counter-Strike: Global Offensive"

total_reviews : 1748
quarter : "2015, Q2"
title : "Grand Theft Auto V"

total_reviews : 488
quarter : "2015, Q3"
title : "Counter-Strike: Global Offensive"

total_reviews : 2253
quarter : "2015, Q4"
title : "Fallout 4"

total_reviews : 605
quarter : "2016, Q1"
title : "Fallout 4"

total_reviews : 1037
quarter : "2016, Q2"
title : "DARK SOULS™ III"

total_reviews : 5960
quarter : "2016, Q3"
title : "No Man's Sky"

Agregacije nad podacima - Nikola

4. Koje igre su i dalje popularne?

```
1 [
2   {
3     $lookup: {
4       from: "Recommendations",
5       localField: "app_id",
6       foreignField: "app_id",
7       as: "recommendations"
8     },
9   },
10  {
11    $unwind: "$recommendations"
12  },
13  {
14    $match: {
15      date_release: {
16        $lt: ISODate("2010-05-25")
17      },
18      "recommendations.date": {
19        $gte: ISODate("2020-05-25")
20      }
21    }
22  },
23  {
24    $group: {
25      _id: "$_id",
26      title: {
27        $first: "$title"
28      },
29      date_release: {
30        $first: "$date_release"
31      },
32      positive_reviews_last_year: {
33        $sum: 1
34      }
35    }
36  },
37  {
38    $sort: {
39      positive_reviews_last_year: -1
40    }
41  }
42 ]
```

PIPELINE OUTPUT

Sample of 3 documents

OUTPUT OPTIONS ▾

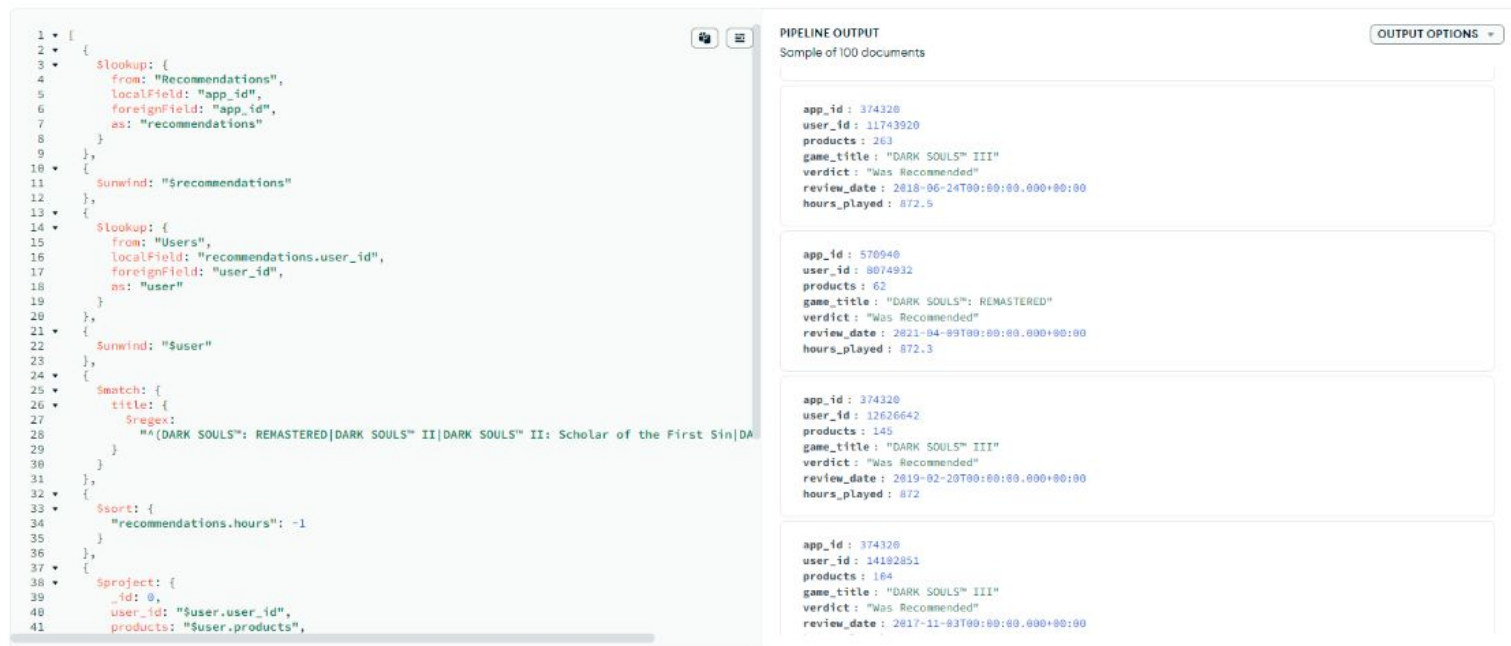
```
_id: ObjectId('666c57337620c964d5fd1ac0')
title: "Garry's Mod"
date_release: 2006-11-29T00:00:00.000+00:00
positive_reviews_last_year: 2859
```

```
_id: ObjectId('666c57337620c964d5fd1064')
title: "Left 4 Dead 2"
date_release: 2009-11-16T00:00:00.000+00:00
positive_reviews_last_year: 584
```

```
_id: ObjectId('666c57337620c964d5fd97d1')
title: "Team Fortress 2"
date_release: 2007-10-10T00:00:00.000+00:00
positive_reviews_last_year: 117
```


Agregacije nad podacima - Nikola

5. Igrači sa najviše sati u Dark Souls igrama:



The screenshot displays a MongoDB Aggregation Pipeline interface. On the left, a JSON query is shown with line numbers 1 through 41. The query performs a lookup from the 'Recommendations' collection to the 'Users' collection, sorts by 'recommendations.hours' in descending order, and projects the user ID, user name, and product count.

```
1 {  
2   {  
3     $lookup: {  
4       from: "Recommendations",  
5       localField: "app_id",  
6       foreignField: "app_id",  
7       as: "recommendations"  
8     },  
9   },  
10  {  
11    $unwind: "$recommendations"  
12  },  
13  {  
14    $lookup: {  
15      from: "Users",  
16      localField: "recommendations.user_id",  
17      foreignField: "user_id",  
18      as: "user"  
19    },  
20  },  
21  {  
22    $unwind: "$user"  
23  },  
24  {  
25    $match: {  
26      title: {  
27        $regex: "^(DARK SOULS*: REMASTERED|DARK SOULS* II|DARK SOULS* II: Scholar of the First Sin|DA  
28      }  
29    }  
30  },  
31  },  
32  {  
33    $sort: {  
34      "recommendations.hours": -1  
35    },  
36  },  
37  {  
38    $project: {  
39      _id: 0,  
40      user_id: "$user.user_id",  
41      products: "$user.products",
```

On the right, the 'PIPELINE OUTPUT' section shows a sample of 100 documents. It contains four document examples, each with fields: app_id, user_id, products, game_title, verdict, review_date, and hours_played.

PIPELINE OUTPUT
Sample of 100 documents

OUTPUT OPTIONS

app_id : 374320
user_id : 11743920
products : 263
game_title : "DARK SOULS™ III"
verdict : "Was Recommended"
review_date : 2018-06-24T00:00:00.000+00:00
hours_played : 872.5

app_id : 570940
user_id : 8074932
products : 62
game_title : "DARK SOULS™: REMASTERED"
verdict : "Was Recommended"
review_date : 2021-04-09T00:00:00.000+00:00
hours_played : 872.3

app_id : 374320
user_id : 12626642
products : 145
game_title : "DARK SOULS™ III"
verdict : "Was Recommended"
review_date : 2019-02-20T00:00:00.000+00:00
hours_played : 872

app_id : 374320
user_id : 14182851
products : 164
game_title : "DARK SOULS™ III"
verdict : "Was Recommended"
review_date : 2017-11-03T00:00:00.000+00:00

Agregacije nad podacima - Srđan

1. Recenzije koje su označene kao smešne za igre sa visokim pozitivnim rejtingom na Steam Deck platformi

```

1  ▼ [
2      {
3      ▼ {
4          $lookup: {
5              from: "Games",
6              localField: "review_id",
7              foreignField: "app_id",
8              as: "game_reviews"
9          },
10     },
11     {
12     ▼ $unwind: "$game_reviews"
13     },
14     {
15     ▼ $lookup: {
16         from: "Platform",
17         localField: "game_reviews.app_id",
18         foreignField: "app_id",
19         as: "game_platform"
20     },
21     },
22     {
23     ▼ $unwind: "$game_platform"
24     },
25     {
26     ▼ $match: {
27         "game_reviews.positive_ratio": { $gte: 80 },
28         "game_platform.steam_deck": true,
29         funny: { $gt: 0 }
30     },
31     },
32     {
33     ▼ $project: {
34         review_id: 1,
35         funny: 1,
36         "game_reviews.title": 1,
37         "game_reviews.positive_ratio": 1
38     },
39     },
40     {
41     ▼ $limit: 5
42     }
43 ]

```

PIPELINE OUTPUT

Sample of 5 documents

OUTPUT OPTIONS ▾

```
_id: ObjectId('666c989cb678980ed027d9e2')
funny: 1253
review_id: 500
game_reviews: Object
  title: "Left 4 Dead"
  positive_ratio: 96
```

```
_id: ObjectId('666c989cb67898ed027de56')
funny: 95
review_id: 1640
game_reviews: Object
  title: "Disciples II: Gallean's Return"
  positive_ratio: 81
```

```
_id: ObjectId('666c989cb678980ed027e0fe')
funny: 15
review_id: 2320
game_reviews: Object
  title: "Quake II"
  positive_ratio: 94
```

```
_id: ObjectId('666c989cb678980ed027e126')
funny: 8
review_id: 2360
game_reviews: Object
```

```
_id: ObjectId('666c989cb678980ed027e536')
funny: 2
review_id: 3400
game_reviews: Object
```

Agregacije nad podacima - Srđan

2. Maksimalan broj sati koje su korisnici igrali igre za koje nisu preporučili, grupišući ih po igrama.

```
1 ▾ [
2   {
3     $lookup: {
4       from: "Recommendations",
5       localField: "app_id",
6       foreignField: "app_id",
7       as: "recommendations"
8     }
9   },
10  {
11    $unwind: "$recommendations"
12  },
13  {
14    $match: {
15      "recommendations.is_recommended": false
16    }
17  },
18  {
19    $group: {
20      _id: {
21        game_id: "$app_id",
22        game_name: "$title"
23      },
24      max_hours_played: {
25        $max: "$recommendations.hours"
26      },
27      users_with_max_hours: {
28        $push: {
29          user_id: "$recommendations.user_id",
30          hours: "$recommendations.hours"
31        }
32      }
33    }
34  },
35  {
36    $project: {
37      _id: 0,
38      game_id: "$_id.game_id",
39      game_name: "$_id.game_name",
40      max_hours_played: 1,
41      user_id: {
42        $arrayElemAt: [

```

PIPELINE OUTPUT

Sample of 5 documents

OUTPUT OPTIONS ▾

max_hours_played : 999.9
game_id : 386360
game_name : "SMITE"
user_id : 9932417

max_hours_played : 999.9
game_id : 381210
game_name : "Dead by Daylight"
user_id : 13826219

max_hours_played : 999.9
game_id : 570
game_name : "Dota 2"
user_id : 10263359

max_hours_played : 999.9
game_id : 377160
game_name : "Fallout 4"
user_id : 11834030

max_hours_played : 999.8
game_id : 376210
game_name : "The Isle"
user_id : 9726305

Agregacije nad podacima - Srđan

3. Najveći fanovi "Dota 2" igre na osnovu maksimalnog broja sati koje su igrali.

```
1 [
2   {
3     $match: {
4       hours: { $gt: 20 },
5       is_recommended: true,
6       user_id: { $mod: [10, 2] }
7     }
8   },
9   {
10    $lookup: {
11      from: "Games",
12      localField: "app_id",
13      foreignField: "app_id",
14      as: "game_info"
15    }
16  },
17  {
18    $unwind: "$game_info"
19  },
20  {
21    $match: {
22      "game_info.title": "Dota 2"
23    }
24  },
25  {
26    $group: {
27      _id: "$user_id",
28      max_hours_played: { $max: "$hours" }
29    }
30  },
31  {
32    $sort: {
33      max_hours_played: -1
34    }
35  },
36  {
37    $limit: 10
38  },
39  {
40    $project: {
41      _id: 0,
42      user_id: 1,
43      max_hours_played: 1
44    }
45  }
46 ]
```

PIPELINE OUTPUT

Sample of 10 documents

OUTPUT OPTIONS ▾

max_hours_played : 999.8

user_id : 10330952

max_hours_played : 998.4

user_id : 5528372

max_hours_played : 995.5

user_id : 1017772

max_hours_played : 991.9

user_id : 6022732

max_hours_played : 989.4

user_id : 5350942

max_hours_played : 985.6

user_id : 4917322

max_hours_played : 981.5

user_id : 10893502

max_hours_played : 978.7

user_id : 13811782

max_hours_played : 977.2

Agregacije nad podacima - Srđan

4. Procenat igara koje imaju vrlo pozitivan rejting, uz prosečnu cenu i prosečne korisničke recenzije.

```
1 [
2   {
3     $lookup: {
4       from: "Price",
5       localField: "app_id",
6       foreignField: "app_id",
7       as: "price_info"
8     },
9   },
10  {
11    $unwind: "$price_info"
12  },
13  {
14    $group: {
15      _id: "$rating",
16      count: { $sum: 1 },
17      average_price: { $avg: "$price_info.price_final" },
18      average_reviews: { $avg: "$user_reviews" }
19    },
20  },
21  {
22    $group: {
23      _id: null,
24      total: { $sum: "$count" },
25      ratings: {
26        $push: {
27          rating: "$_id",
28          count: "$count",
29          average_price: "$average_price",
30          average_reviews: "$average_reviews"
31        }
32      }
33    },
34  },
35  {
36    $unwind: "$ratings"
37  },
38  {
39    $project: {
40      _id: 0,
41      rating: "$ratings.rating",
42      percentage: 1
43    }
44  }
45 ]
```

PIPELINE OUTPUT

Sample of 1 document

OUTPUT OPTIONS

```
rating : "Very Positive"
percentage : 25.8275672275515
average_price : 10.183091559479411
average_reviews : 4082.434431844128
```

Agregacije nad podacima - Srđan

5. Najpopularnije igre na platformama Mac i Linux sa cenom manjom od 15 dolara, sortirane po broju korisničkih recenzija.

```
1  {
2    $lookup: {
3      from: "Platform",
4      localField: "app_id",
5      foreignField: "app_id",
6      as: "platform"
7    },
8  },
9  },
10 {
11   $lookup: {
12     from: "Price",
13     localField: "app_id",
14     foreignField: "app_id",
15     as: "price"
16   },
17 },
18 },
19 {
20   $match: {
21     "platform.mac": true,
22     "platform.linux": true,
23     "price.price_final": { $lt: 15 }
24   },
25 },
26 {
27   $project: {
28     _id: 0,
29     app_id: 1,
30     title: 1,
31     user_reviews: 1,
32     price_final: { $arrayElemAt: ["$price.price_final", 0] }
33   },
34 },
35 {
36   $sort: {
37     user_reviews: -1
38   },
39 },
40 {
41   $limit: 10
42 }
43 }
```

PIPELINE OUTPUT

Sample of 10 documents

OUTPUT OPTIONS ▾

app_id : 570
title : "Data 2"
user_reviews : 2045628
price_final : 0

app_id : 440
title : "Team Fortress 2"
user_reviews : 985819
price_final : 0

app_id : 105600
title : "Terraria"
user_reviews : 943413
price_final : 10

app_id : 4000
title : "Garry's Mod"
user_reviews : 853733
price_final : 10

app_id : 550
title : "Left 4 Dead 2"
user_reviews : 574470
price_final : 10

app_id : 304930
title : "Unturned"
user_reviews : 515016
price_final : 0

Restruktuiranje šema baze podataka

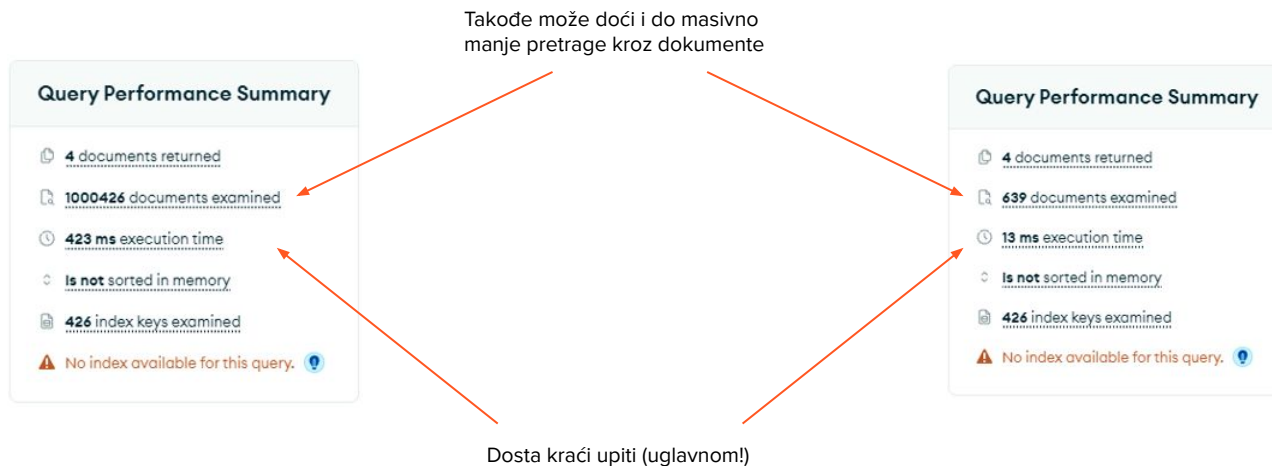
Rešenje za naš sistem baza podataka je sledeće:

- Users: ostaje isti, redundantno bi bilo da se restruktuiru
- Games: uvedena je proširena referenca na cenu igre, pošto se često može upotrebiti
- Platform: odrađen je Subset pri čemu umesto da imamo podatke kao što su True i False za svaku platformu u svakom redu se ili nalazi platforma ako je igra igriva na njoj ili ne
- Price: takođe odrađen Subset, u ovom slučaju se unosi final_price uvek, ali ako je original_price isti, odbacuju se original_price i discount za taj red
- Recommendations: urađeno je baketiranje, pri čemu imamo skupljene podatke u nizove, čiji je ključ app_id
- ReviewFeedbacks: koristi se Computed restruktuiranje kako bi imali i zbir ukupnih odgovora na recenziju

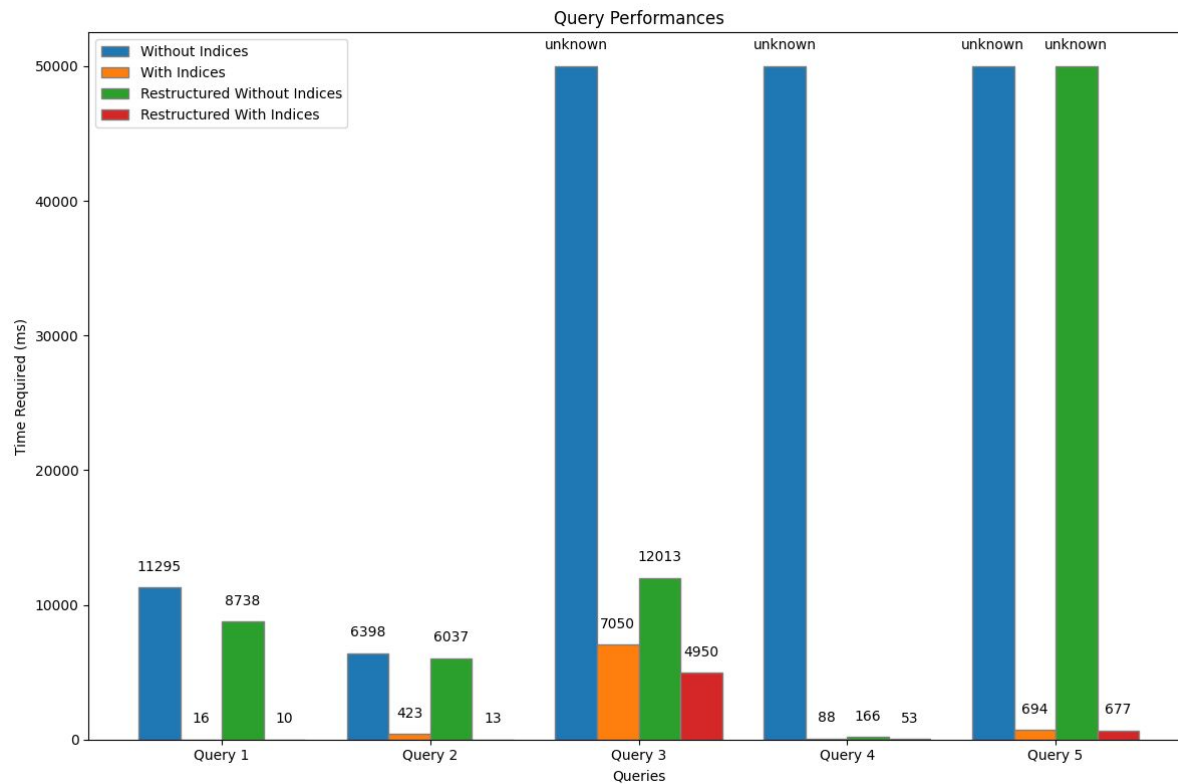
Restruktuirane šeme baze podataka

<p>1. Kolekcija: Games</p> <pre>{ "_id": { "\$oid": "666cae77e2ba1ab06ce5c962" }, "app_id": 13500, "date_release": { "\$date": "2008-11-21T00:00:00.000Z" }, "title": "Prince of Persia: Warrior Within", "rating": "Very Positive", "positive_ratio": 84, "user_reviews": 2199, "price": 9.99 }</pre>	<p>2. Kolekcija: Platform</p> <pre>{ "_id": { "\$oid": "666c40e23e3905b5a5489f23" }, "app_id": 13500, "platforms": ["Windows", "Steam Deck"] }</pre>	<p>3. Kolekcija: Price</p> <pre>{ "_id": { "\$oid": "666c414aaf7b1f1f9e55b957" }, "app_id": 13500, "price_final": 9.99 }</pre>
<p>4. Kolekcija: Recommendations:</p> <pre>{ "_id": { "\$oid": "666c5ac6933ffcb2665a82ed" }, "app_id": 629730, "end_date": { "\$date": "2021-12-07T00:00:00.000Z" }, "recommendations": [{ "review_id": 31, "user_id": 747452, "date": { "\$date": "2021-02-10T00:00:00.000Z" }, "is_recommended": true, "hours": 40.3 }, ...] }</pre>	<p>5. Kolekcija: Review Feedback</p> <pre>{ "_id": { "\$oid": "666c75eaaec435bb146b23f0" }, "review_id": 500, "funny": 1253, "helpful": 1494, "total_feedback": 2747 }</pre>	<p>6. Kolekcija: Users</p> <pre>{ "_id": { "\$oid": "666c70ca0c3f3875ba4c729f" }, "user_id": 6366584, "products": 1597, "reviews": 129 }</pre>

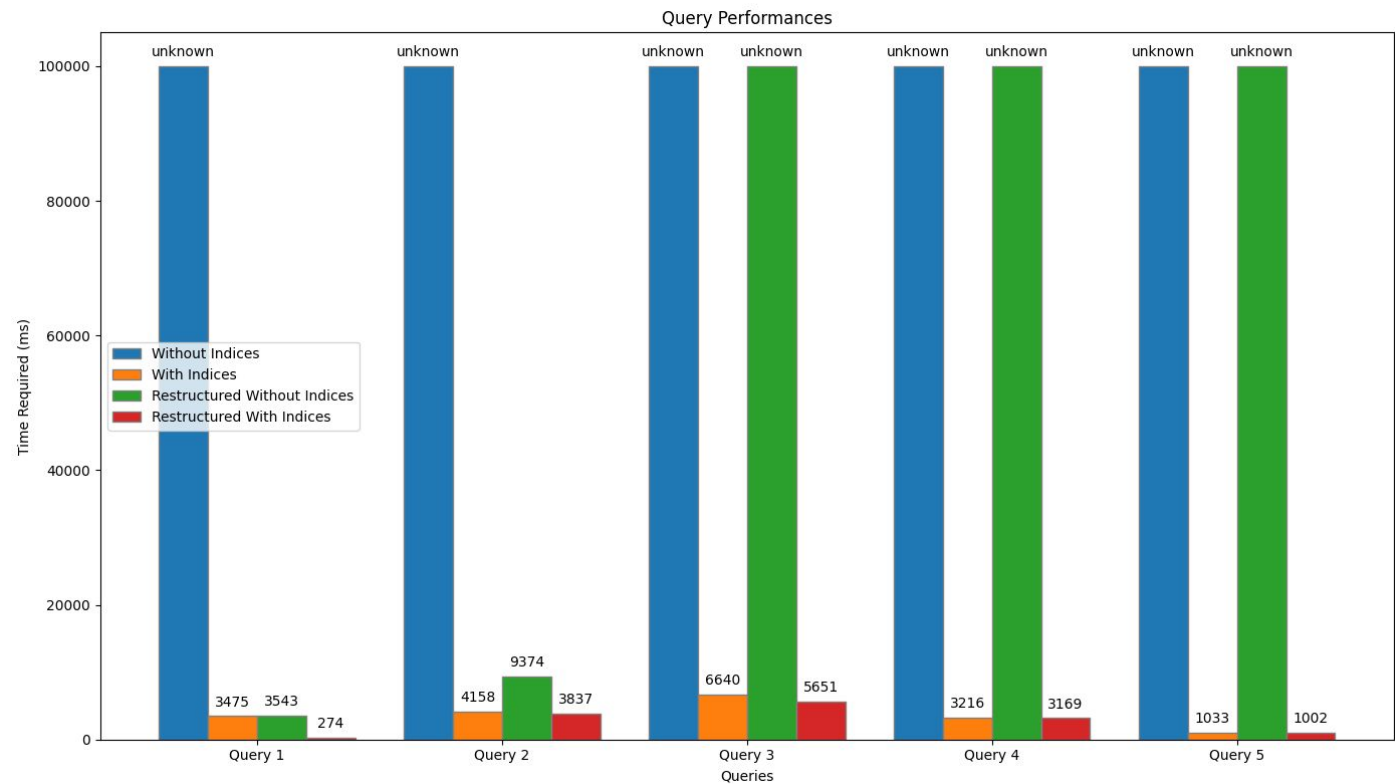
Primer performansi



Performanse - Nikola

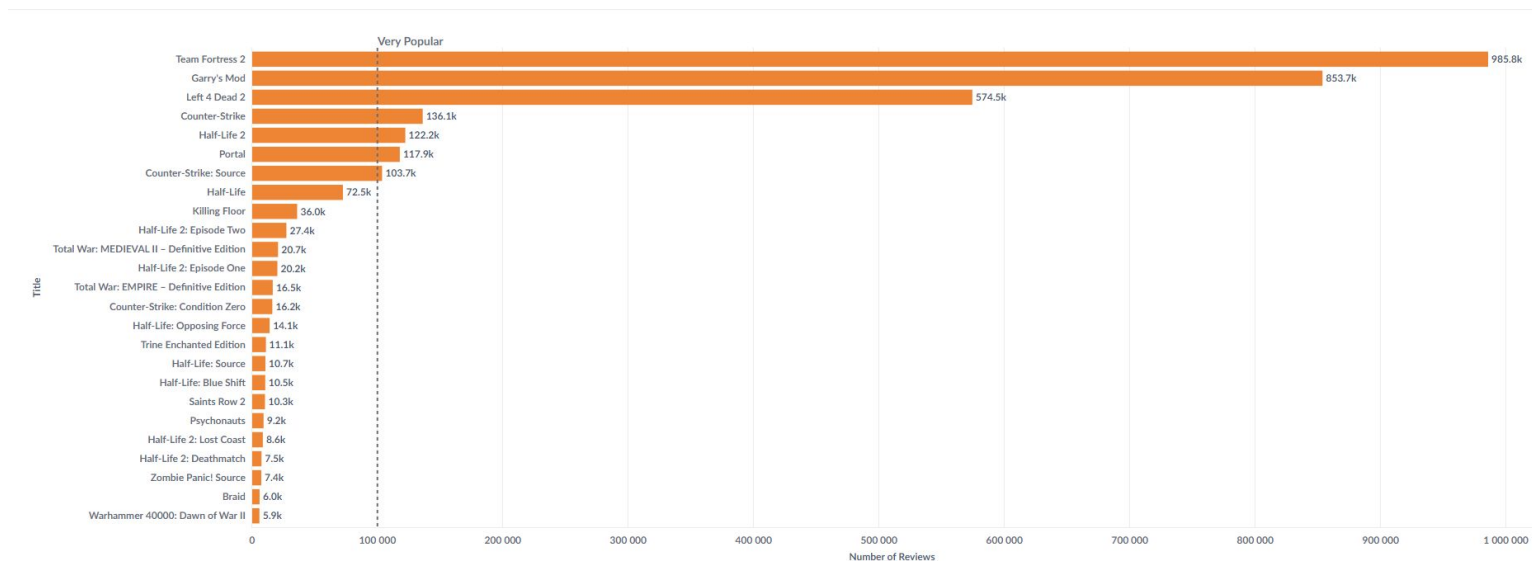


Performanse - Srdan



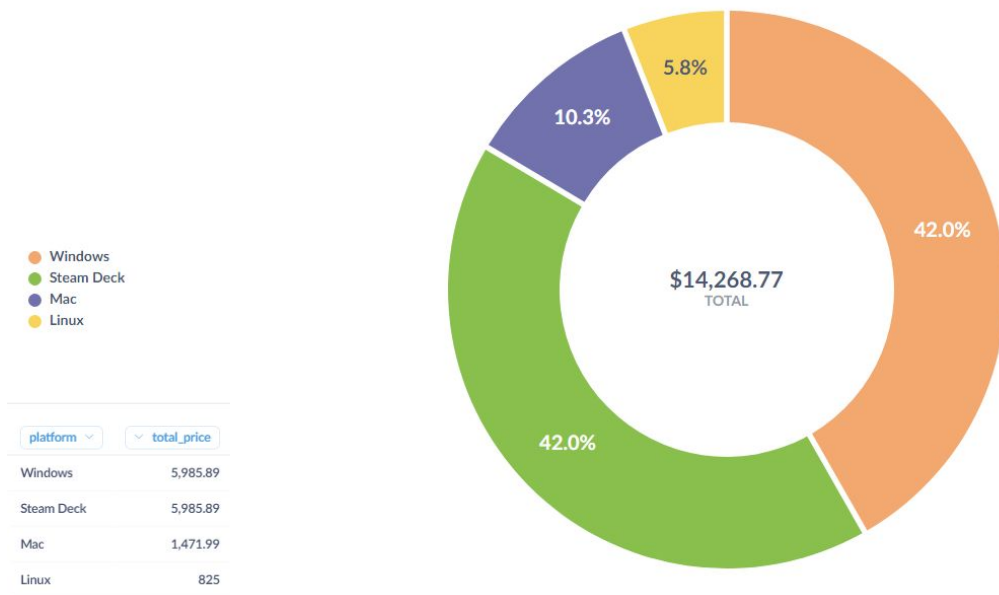
Metabase Upiti - Nikola

1. Najigranije plaćene igre na Linuxu koje su izašle do 2010. godine:



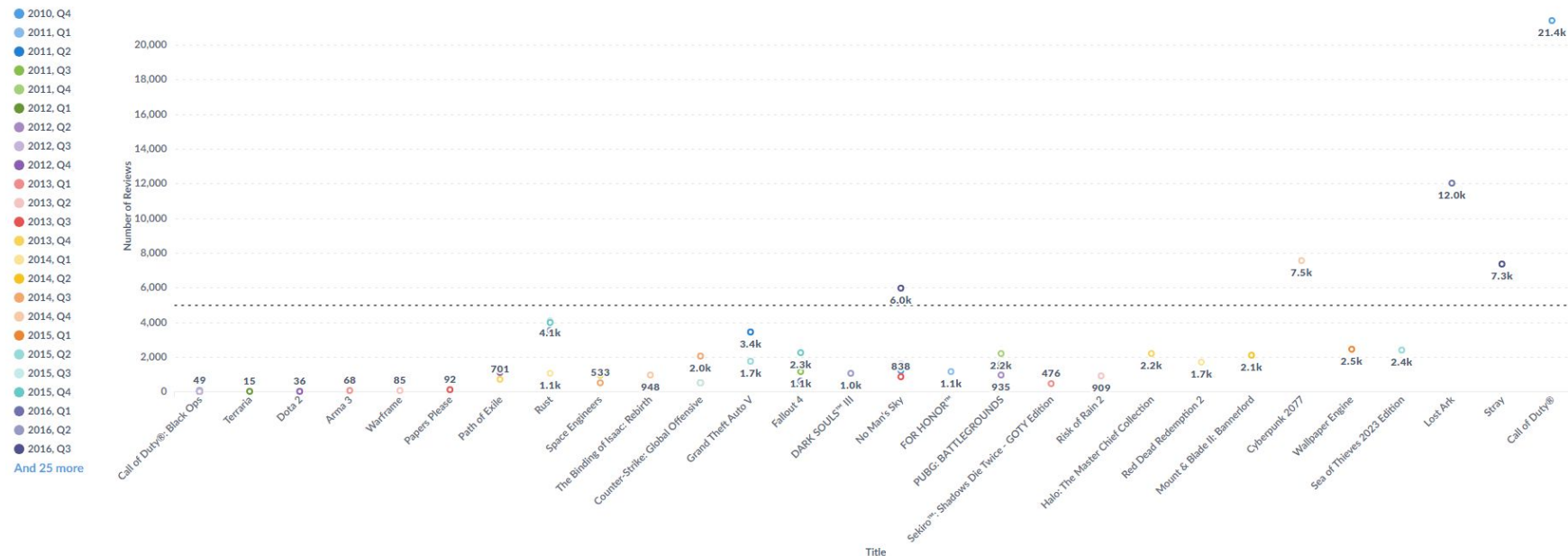
Metabase Upiti - Nikola

2. Koliko bi koštalo da se kupe sve igre za svaku od platformi?



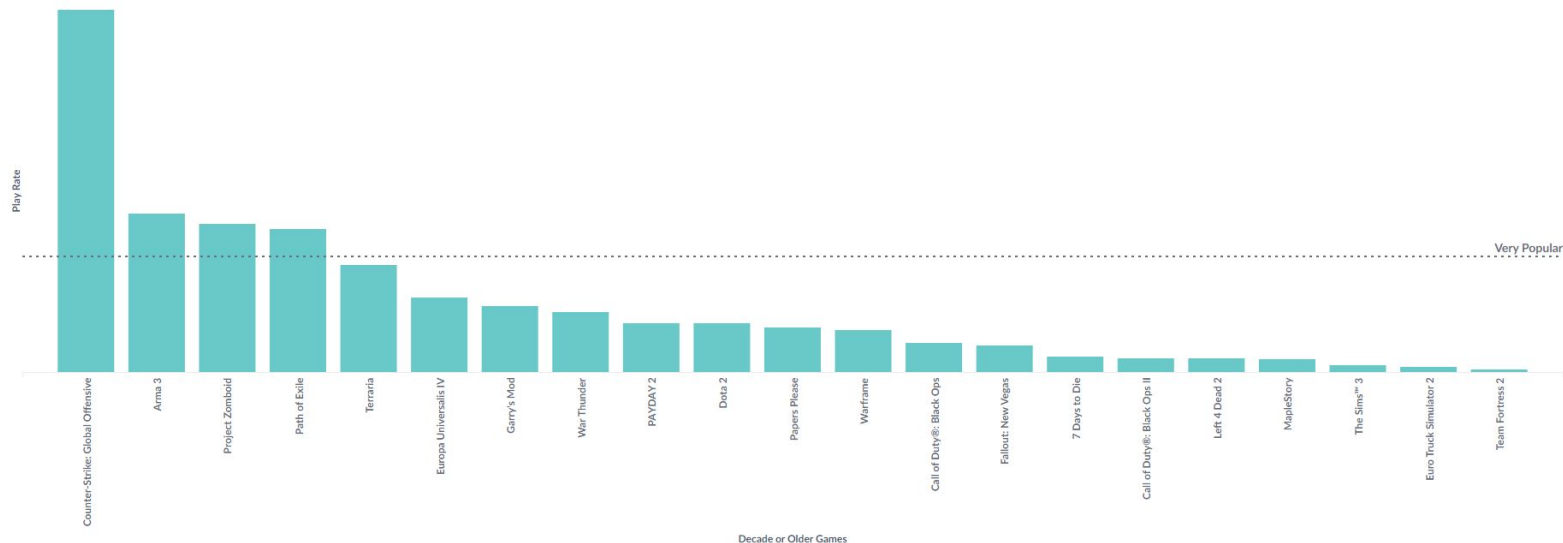
Metabase Upiti - Nikola

3. Najviše recenzirane igre za svaki kvartal:



Metabase Upiti - Nikola

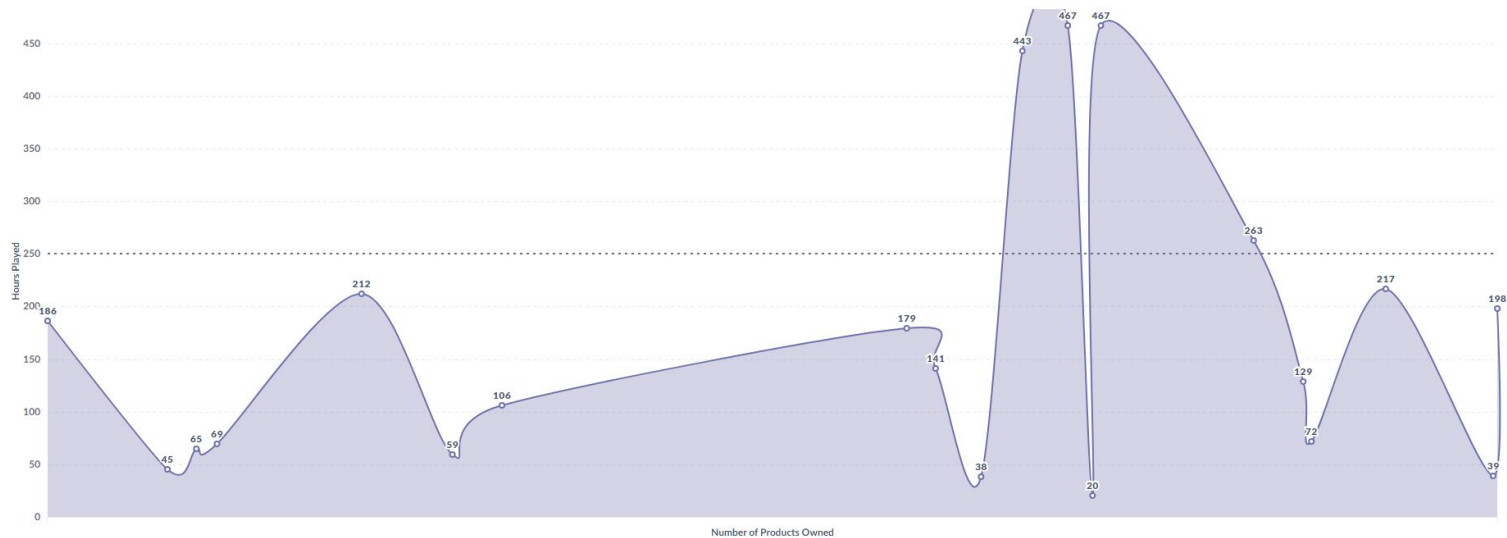
4. Top 20 trenutno najpopularnijih igara koje su izašle pre 2014. godine:



Izmenjena donja granica za bolji prikaz upita*

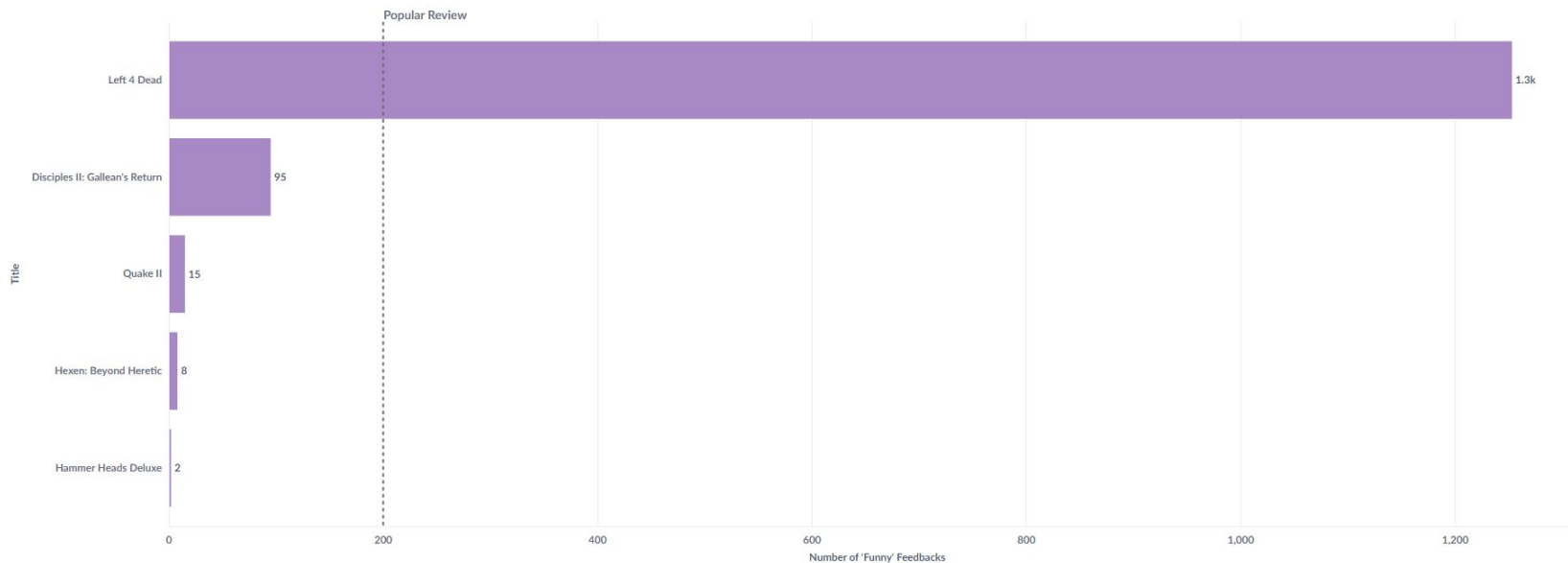
Metabase Upiti - Nikola

5. Koliko utiče broj posedovanih igara na broj sati u Dark Souls serijalu?



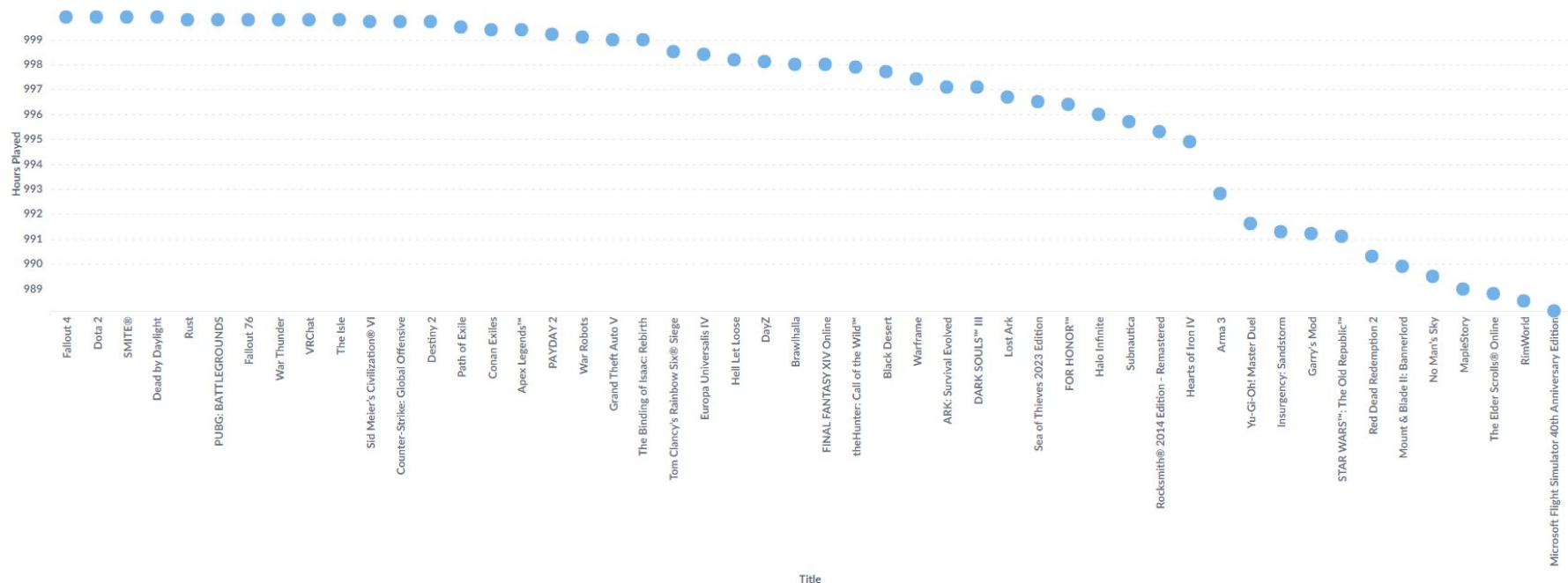
Metabase Upiti - Srđan

1. Recenzije koje su označene kao smešne za igre sa visokim pozitivnim rejtingom na Steam Deck platformi:



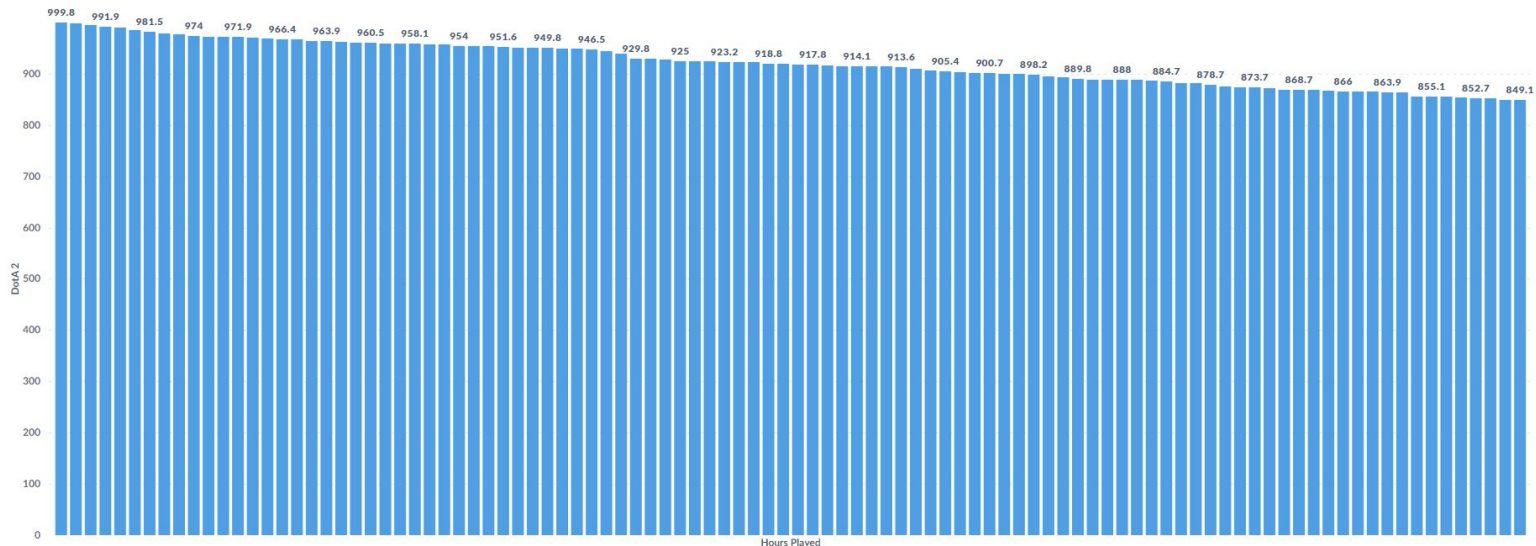
Metabase Upiti - Srđan

2. Maksimalan broj sati koje su korisnici igrali igre za koje nisu preporučili, grupišući ih po igrama.



Metabase Upiti - Srđan

3. Najveći fanovi "Dota 2" igre na osnovu maksimalnog broja sati koje su igrali.



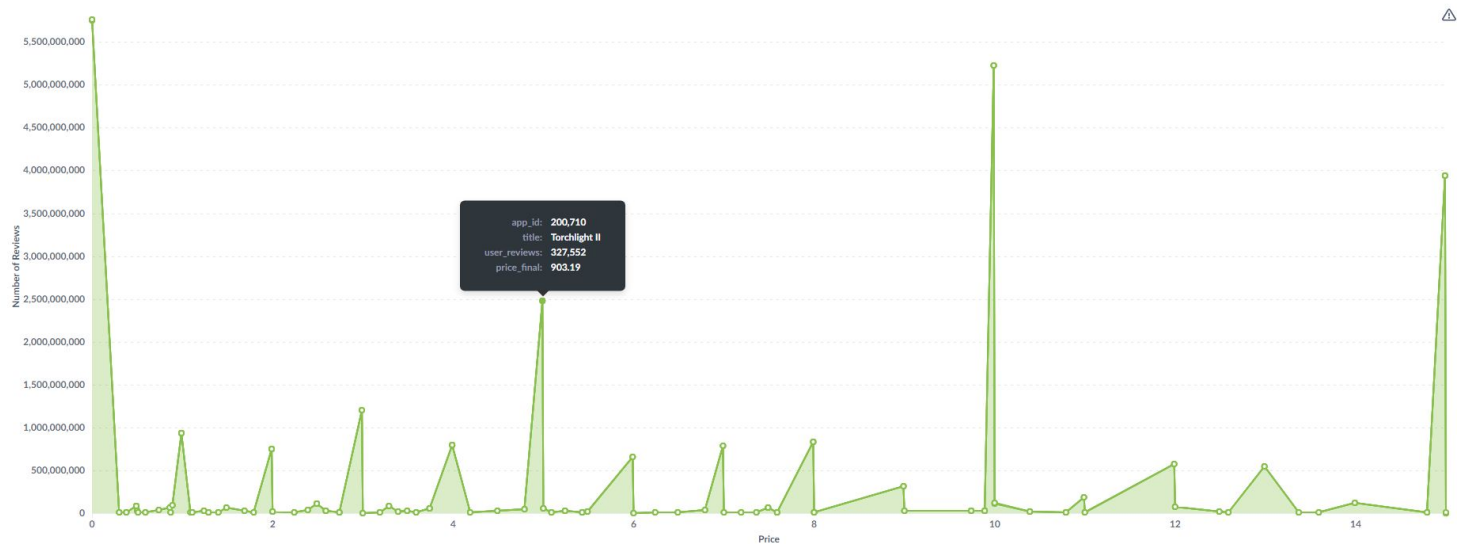
Metabase Upiti - Srđan

4. Procenat igara koje imaju vrlo pozitivan rejting, uz prosečnu cenu i prosečne korisničke recenzije.

rating	Very Positive
percentage	100
average_price	10.18
average_reviews	4,082.43

Metabase Upiti - Srđan

5. Najpopularnije igre na platformama Mac i Linux sa cenom manjom od 15 dolara, sortirane po broju korisničkih recenzija.



Hvala!