

Graphics Card Optimization based on Playable Games



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[GitHub Repository](#)

Problem Description

The GPU market is too diverse for the common buyer to make an informed purchase

- Advances in the gaming industry requires new iterations and versions of GPUs
- Most people just want to play as many games as possible for the lowest price

Goals for this project:

- Optimize this selection for people who play Steam games on their computers
- Provide data-driven solution for making informed decisions on GPU purchases
- Compare datasets of GPU information and the requirements of Steam games
- Find the percentage of playable games per GPU

Optimization Model

The goal is to divide the percent of playable games by the price of each GPU

Each GPU and game has a performance score related to it

- Link a game's minimum GPU requirement to a performance score
- Compare GPU's against each other and against games with a performance score

Restrains for a large GPU market and Steam library of games:

- Exclude GPUs with scores below a certain threshold to establish a baseline
- Limit the analysis to currently available GPUs within a reasonable price range

Proposed Solution

Main goal is to find the “Performance per dollar” for each GPU as a solution

Non-convex

- Ratio between two variables

Feasible Set

1. Filter out low performance GPUs and those over \$1500

Numerical Solution

- Iterate through list of GPUs and calculate % of games playable per dollar
- json scraping → pandas, matplotlib → csv file

Implementation

1. Create useable databases

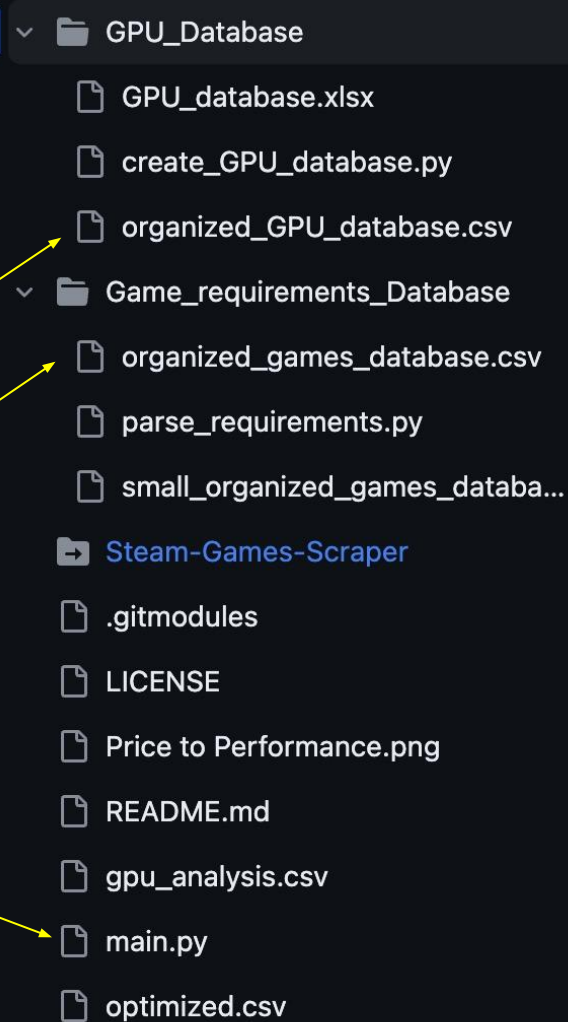
- Modify Steam-Games-Scraper for gathering every game's minimum GPU requirement
- Build a database from Passmark for GPU performance
- Associate every steam game with a GPU performance number

2. Filter under-performing and GPU's without prices:

```
for gpu_info in GPU_list:
    if gpu_info[2] == 0.0 or gpu_info[1] < 1000:
        continue
    else:
```

3. Implement the formula:

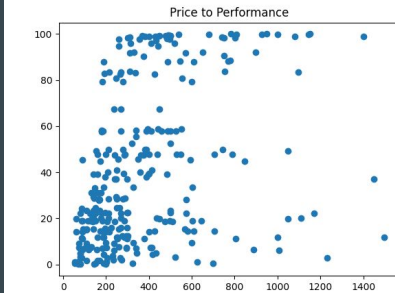
```
for game in games_list:
    if gpu_info[1] >= game[2]:
        playable += 1
    else:
        unplayable += 1
percent = float(playable)/(unplayable + playable)*100
playable_per_dollar = percent/gpu_info[2]
result = [gpu_info[0], gpu_info[1], gpu_info[2], playable, unplayable, percent, playable_per_dollar]
results.append(result)
if gpu_info[2] < 1500:
    price_percent.append([gpu_info[2],percent])
```



Validating Solution

Our results vs. November 2023 Steam Hardware Survey

-Many of our top choices are old cards with a good ratio but poor performance



1	GPU	Score	Price	Playable Games	Unplayable Games	Percent Playable	Percent Playable per dollar
2	Radeon R9 380	6207	89.99	3931	4739	45.34025374855825	0.5038365790483192
3	Radeon RX 6600M	13652	189.99	7627	1043	87.97001153402537	0.4630244304122605
4	GeForce GTX 1660 SUPER	12784	191.34	7173	1497	82.73356401384083	0.4323903209670787
5	GeForce GTX 1650 SUPER	10114	184.05	6885	1785	79.41176470588235	0.4314684308931396
6	GeForce RTX 3050	12966	214.99	7224	1446	83.32179930795847	0.38756127870114176
7	GeForce RTX 3060	17098	259.99	8461	209	97.58938869665513	0.3753582395348095
8	Radeon RX 7600	16057	259.99	8225	445	94.86735870818916	0.36488849074267915
9	GeForce GTX 470	3085	59.99	1709	6961	19.711649365628606	0.3285822531359994
10	GeForce RTX 4060	19382	299.99	8534	136	98.4313725490196	0.32811551234714353
11	GeForce GTX 980	11140	247.35	7000	1670	80.73817762399077	0.326412684956502
12	Radeon RX 6500 XT	9487	179.99	5048	3622	58.2237600922722	0.3234833051406867
13	Intel Arc A750	8987	179.99	5019	3651	57.88927335640138	0.3216249422545774
14	Radeon RX 580	8901	179.99	4983	3687	57.47404844290658	0.3193180090166486
15	Radeon RX 6700 XT	19894	309.99	8558	112	98.70818915801614	0.31842378514796005

NVIDIA GeForce RTX 3060	4.89%	-4.79%
NVIDIA GeForce GTX 1650	4.61%	+1.06%
NVIDIA GeForce GTX 1060	4.20%	-0.78%
NVIDIA GeForce RTX 3060 Laptop C	3.81%	+1.13%
NVIDIA GeForce RTX 2060	3.61%	-2.32%
NVIDIA GeForce RTX 3060 Ti	3.43%	-1.40%
NVIDIA GeForce RTX 3070	3.12%	-1.94%
NVIDIA GeForce GTX 1050 Ti	2.91%	+0.52%
NVIDIA GeForce RTX 3050	2.65%	+0.62%
NVIDIA GeForce GTX 1660 SUPER	2.39%	+0.25%
NVIDIA GeForce RTX 4060 Laptop C	2.33%	+0.96%
NVIDIA GeForce RTX 3080	2.15%	-0.43%
AMD Radeon Graphics	2.00%	+0.53%
Intel Iris Xe Graphics	1.87%	+0.47%
NVIDIA GeForce GTX 1660 Ti	1.76%	+0.27%
NVIDIA GeForce GTX 1070	1.47%	+0.28%
NVIDIA GeForce RTX 3070 Ti	1.46%	-0.40%
Intel(R) UHD Graphics	1.40%	+0.32%
NVIDIA GeForce GTX 1050	1.39%	+0.27%
NVIDIA GeForce RTX 2070 SUPER	1.32%	-0.06%
NVIDIA GeForce RTX 2060 SUPER	1.20%	-0.49%
NVIDIA GeForce RTX 4070	1.20%	-0.88%

Key Insights

Trends in GPU popularity

- Time since the release of the 3060 and introduction of a new model is the reason for the drop in popularity yet most people still prefer NVIDIA
- NVIDIA's dominant market share and the general rise in new GPU costs account for some of our top performers not being popular

Budget Constraints

- Money talks, and most people do not buy new GPUs for hundreds of dollars, preferring to settle with the cheaper option
- Many users own older models, which aren't currently for sale, and therefore were not analyzed in our process

Major Conclusions

Top GPUs based on our results are old AMD Radeon cards (R9 380 or RX6600M)

- Their prices are still listed as incredibly low compared to modern offerings, and performance still holds up

Top preferred GPU based on Steam Hardware Review is NVIDIA (GeForce RTX 3060)

- The 3060 can play over 97% of games for \$260
- Most consumers want almost all games to 'just work', and this is worth the price
- Diminishing returns after this point, not worth the extra money for an additional 2% of games

Since both Radeon and NVIDIA chips appear in our results and Steam's review, our experiment was rather successful in accurately depicting the GPU market

- Analytically, Radeon is the best deal
- The model is robust without taking into account market trends, general company preference, and overall PC compatibility

Suggestions for Improvement

Weigh the information taken into account differently

- Ability to support newer games more effectively than older chips
- Availability of each chip for purchase

Take genre sorting into account for more personalized use

Majority of the demographic prefers cheaper options over newest models

- Market trends always skew towards newest NVIDIA chips

Create an app or website that automatically compares our results with active market information and sales percentages for GPUs