Practice HiMCM

G005

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Report by Karena Peterson, Ashley Li, and Avanti Moghe

Summary:

Our goal was to create a roller coaster ranking system that is based on objective factors rather than subjective ones. We began by collecting data from several websites that rank roller coasters, documenting which coasters were mentioned or repeated. We found these coasters in the data given in the HiMCM excel page and wrote the values for each category in a separate table. Then, using the data points we just identified, we found the average and made that value the standard for most desirable. To find a proper weight of each category, we found the standard deviation of each, with the category with a wider range being less weight and vice versa. With this new process, we identified a new top 10 coasters by applying the algorithm to the data set provided.

Introduction:

It is very uncommon to find or test rollercoasters based on objective factors, since many of them are tested usually on subjective factors. In this model we attempt to create an algorithm that takes in objective factors of rollercoasters such as height, speed, drop, etc. to rank rollercoasters around the world. The information that we gain from this algorithm would then be used to calculate the rank of the rollercoasters provided in the dataset and that information would be converted into a list of “Top Ten Rollercoasters”. This algorithm and ranking system would be later translated into the form of a user-friendly app so that other users can figure out the best rollercoasters using purely objective factors.

Assumptions:

- We assumed that the rankings on the websites were reliable and most often agreed upon by the majority of people.
- We took the values from the coasters mentioned in the top 10 and assumed that those were generally the most desirable.
- All the roller coasters in the given data set are safe to ride and do not have any concerns about severe weather that may impact the overall enjoyment of the ride.

Model and Solution:

Creating New Dataset using Online Databases

Because the superiority of rollercoasters is inherently subjective (rollercoaster's primary goal is enjoyment), we started with data that was subjective. Specifically, we found online databases that ranked top rollercoasters based on rider's ratings. We then cross referenced with the provided database to find if the ride information was given, and, if it was, compiled it into our own database of top rollercoasters. This provided us with numerical, objective data from subjective, which we could then base our algorithm on.

Numerical Components Calculation Method

We used the new dataset that was just identified to find the average of each numerical category. These categories include length, height, speed, etc.

The averages can be seen in the table below. They are in the following order:

	1985		45	3200	NO	0	72	2:00		
	2011.518519	164.7846154	68.12592593	3815.55		2	174.9	2:01	4.2	82.1

- Average we found based of the newly created dataset
- Goes from year created to the average height for some of the best rollercoasters, the average speed, length, etc.

1. Then we took specific categories of the characteristics used to judge rollercoasters.

- For each rollercoaster we took their number for that category and subtracted it from the average.
- Then we took the absolute value of that number, in other words it is kind of like a linear regression.
- Components we want to check
    - Rollercoaster height
    - Rollercoaster Length
    - Material
    - G-Force
    - Vertical Angles
    - Drop(Feet)
    - Number of inversion

- This number would be the amount of “points” that rollercoaster gained for that category.

C2 =ABS(B2-164.7846154)

	A	B	C
1	**Rollercoaster**	**Height (feet)**	Points
2	10 Inversion Roller Coaster	98.4	66.3846154
3	Abismo	151.6	12.4
4	Adrenaline Peak	72	92
5	Afterburn	113	51
6	Alpengeist	195	31
7	Alpina Blitz	108.3	55.7
8	Altair	108.3	55.7
9	American Eagle	127	37
10	Anaconda	118.1	45.9
11	Apocalypse	100	64
12	Apocalypse the Ride	95	69
13	Apollo's Chariot	170	6
14	Atlantica SuperSplash	98.4	65.6
15	Backlot Stunt Coaster	45.2	118.8
16	Balder	118.1	46.6846154

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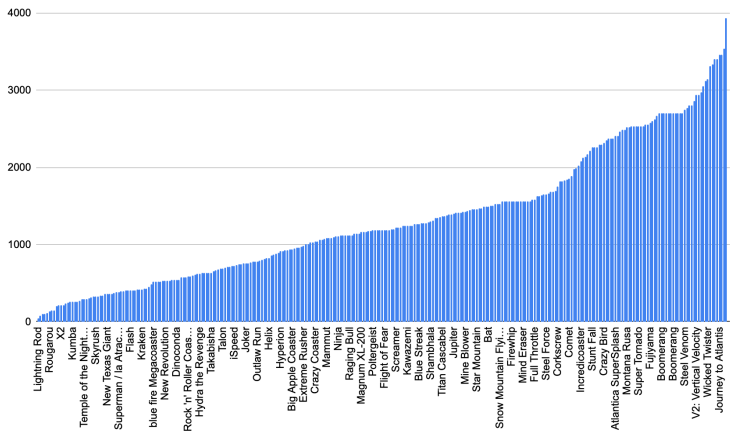
2. We recognize that not all numerical components are equally important. Thus, we created a system to weigh the points. To do so, we standardized the data between 0 - 1, found standard deviation of the standardized data, and subtracted that value from .5. We repeated this across numerical categories. We then took the resulting number and multiplied it by the points previously given to each ride. By doing so, points were weighted based on the variability of the data, as higher variably would indicate a lower importance and vice versa.

3. These points are then added to create a total number of points for each rollercoaster. The smaller the numbers indicate that rollercoasters are closer to the averages that are considered the best rollercoasters from the data given. Therefore the rollercoaster with the least number of points would be the better rollercoaster.



Rollercoasters on the far left, with the least weighted points are the closest to the averages, while the rollercoasters on the right are the farthest.

Using this algorithm, we found that the top ten rollercoasters were the following:

Top Ten Rollercoasters

#1	Lightning Rod
#2	Vortex
#3	Alpengeist
#4	Viper
#5	Raptor
#6	Rougarou
#7	Steel Eel
#8	Smiler
#9	Katun
#10	Medusa

Analysis:

Through the creation of this algorithm we were able to objectively sort out the best rollercoasters in our given data. Our algorithm allowed us to compare the rollercoasters we had to a variety of some of the best rollercoasters from various other datasets, while also maintaining the weightage of certain criteria and how it mattered in the grand scale of things. This system ensures our rankings were based on the numerical values of the rollercoasters in our Best Rollercoasters dataset. Therefore, our top-ranked rollercoasters have numerical values similar to those of the dataset, ensuring their superiority. However like all models our had some positives and negatives.

Pros	Cons
- Used relevant verified data to objectively categorize our rollercoasters (made sure that our	- Limited reference data may have skewed results so not as universal (in future would want to extend the

rankings were majorly accurate). - Weighted criteria to make sure that some irrelevant data did not play a huge role in ranking our rollercoasters.	datasets we use)

For comparison, we found two other online ratings of top rollercoasters. From coasterbuzz.com, they ranked:

1. Steel Vengeance
2. VelociCoaster
3. Fury 325
4. Iron Gwazi
5. Wildcat's Revenge
6. El Toro
7. Millennium Force
8. **Lightning Rod**
9. Iron Rattler
10. Voyage

Additionally, captaincoaster.com ranks:

1. Steel Vengeance
2. Iron Gwazi
3. Zadra
4. VelociCoaster
5. Eejanaika
6. The Ride to Happiness
7. Hakugei
8. Taiga
9. ArieForce One
10. Maverick

Bolded rides are those found in our top ten. Currently, our model only has one in common with these rankings. However, it is notable that the very-top rides may be interchangeable; case in point: VelociCoaster is ranked #2 by coasterbuzz.com but #4 by captaincoaster.com . Because of this, we also underlined those that were found in our top 30

rides. Additionally, one of the biggest limits was the size of the dataset provided. Thus, we have highlighted any that were not in our original dataset, and thus could not be ranked. We believe this likely had a negative impact on our accuracy, which reflects on the dataset, but not the algorithm. For instance, after manually researching the information on Iron Gwazi, it would have ranked as #3.

Conclusion:

Using the methods covered earlier in this paper, we were able to identify a new list of top 10 roller coasters based only on objective data. This provides a reliable reference for people who want to search for a roller coaster to ride, one that applies to the majority of the population.

A next step for this could be to implement geographical factors such as frequency of severe weather (preventing the roller coaster from operating) or creating a list of top 10 for those who are afraid/sensitive to heights. Additionally, the data set that we used was not a complete list of all the roller coasters in the world. To improve on our list of top 10, we should consider any and all rides. There may be a ride that isn't included in the given data set that could have made the top 10 but was not considered.

App Design:

Based on the given algorithm we would now create an app that sorts our data to generate the best rollercoasters for the user to choose from. Our app differentiates between how numerical and non-numerical data is dealt.

Numerical Data:

Numerical Data goes through the same algorithm that we derived earlier. Then after each rollercoaster's numerical data goes through the algorithm it is then sorted into a list of data that lists the rollercoaster's ranking solely based on the numerical data of the rollercoaster. This will be stored in the app's memory but won't be displayed in the app screen of the user since it has not gone through all the steps yet.

Non-Numerical Data:

The non-numerical data is our chance to now personalize the data according to the user; this would include the material of the rollercoaster, whether it has inversions or not, where it is, etc. The user has the ability to pick and choose whatever non-numerical data they would like to see specifically. The data is then reconfigured to exclude any rollercoasters that do not have the non-numerical criteria as chosen by the user. This means that rollercoasters that are still in the ranking list after the excluded ones are taken out move up to take up new spots in the ranking.

- FOR EXAMPLE:
    - From ranking generated by the algorithm we had certain rollercoaster A placed at #24 in the ranking and rollercoaster B placed at position #167 (assume both rollercoasters are from France).
    - The user chose that they only want to see rollercoasters in France.
    - The app accordingly would take out any rollercoasters that are not in France, thus moving up rollercoaster A which was at position 24 to position 1 and rollercoaster B from position 167 to 2 (assuming there were no other rollercoasters in the middle that were from France.

This makes sure that the app generates the top ten objectively but also that the top ten rollercoasters are relevant to what the user prefers.

In this way we aim to create an app that makes it possible for various people to choose the rollercoaster most close to their likings.

GENIUSES FIGURE HOW TO PICK PERFECT ROLLERCOASTER!

Have you ever heard multiple good reviews about a rollercoaster and when you actually go to try it ends up being a disappointment? Have you ever trusted someone's judgement in rollercoasters but then regretted it because their choice was a bore? Have you ever struggled in finding the right rollercoaster for you? Well a new built app and algorithm have solved this problem for so many people. Karry Parkerson, Ashel Licomb, and Ava Morris's new algorithm has made it possible to objectively rank rollercoasters so that you can find the perfect rollercoaster for you!

These three students from the Maryland Academy of Actuarialism have developed the perfect way to rank rollercoasters using only MATH! A topic that was considered previously subjective is now able to be objectively done using the help of an expertly devised algorithm that makes it possible to determine the best to worst in rollercoasters. The team was led by Karry Parkerson. When we asked what intrigued her and prompted her to solve this problem she said, "I have always loved math and rollercoasters! I can't imagine my life without any of them! So when I got this problem, I jumped at the opportunity to solve it with my two friends."

Parkerson and her team were provided with nothing more than a database of rollercoasters, their data regarding speed, height,etc., and pure determination to get through this problem. From there they researched extensively using online databases to figure their own database of the best rollercoasters. Then using this database they derived the averages of the heights of these rollercoasters all the way to the averages of the rollercoaster length. These averages gave them an idea of the qualities that the best rollercoaster would have, "By figuring out the averages my team were able to figure out what were the ideal qualities for any roller coaster, for example the ideal height for rollercoaster was around 164 ft, so we figured any rollercoasters with a height close to 164 ft would be better in rankings of rollercoaster." said Ashel Licomb. They also used complex mathematics techniques to figure out how much each criteria (for example height, length, speed) would be weighted. This way, more important criteria would be given higher weighting. In this manner each rollercoaster went through an algorithm to be given a certain number of points that determine its ranking.

This same algorithm was converted into a user-friendly app, so that daring folks who love rollercoasters can find the best ones out there! This user-friendly app makes it very simple for people to find and choose the best rollercoasters near as per their likings but also the ones that are objectively the best, so they have no disappointment in the decision they make. Now everybody can enjoy and find their favorite rollercaster. "For people who think that math is boring or uninteresting, I urge them to think again. Because this is math right here that made so many people be able to find their best enjoyment!"

References:

Websites we used to derive our model
World Roller Coaster Rankings

https://rockymtnconstruction.com/blog-post/2024-world-roller-coaster-rankings/

https://coaster-count.com/page/poll

https://en.wikipedia.org/wiki/Iron_Gwazi

coasterbuzz.com

captaincoaster.com

AI Use Report:

We did not use AI in our project.