DATA VISUALIZATION FOR NASA EYE ON ASTEROIDS

A PROJECT REPORT

Submitted by,

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ABSTRACT

An innovative data visualization tool called "Eyes on Asteroids" from NASA is intended to make tracking and comprehending near-Earth objects (NEOs) an immersive and interactive experience. This tool allows users to investigate the trajectories, size, and other important features of asteroids and comets that are close to Earth by utilizing real-time data. This tool's main goal is to improve public awareness and scientific involvement by providing educators, students, and space enthusiasts with easy access to and comprehension of complex astronomical data.

The ability of "Eyes on Asteroids" to model prospective Earth impacts and asteroid trajectories in the future is one of its primary characteristics. The tool projects asteroidal routes and determines the probability of an impact with Earth by fusing real-time data with prediction algorithms. For planetary defense programs, this predictive skill is essential since it aids in the development of mitigation methods and the prioritization of monitoring efforts by scientists and policymakers. These simulations can also be extremely helpful teaching tools, emphasizing the significance of watching asteroids and the continuous efforts to protect Earth.

By illustrating prospective asteroid threats and their potential impact scenarios, "Eyes on Asteroids" contributes significantly to planetary defense in addition to being a valuable educational resource. The programs offers vital insights into the routes and behaviors of NEOs, which helps NASA in its efforts to monitor and mitigate the risks associated with them. It promotes teamwork among scientists, academics, and the general public to further the continuous study of asteroids because it is an open-access resource. In the end, "Eyes on Asteroids" is a prime example of how data visualization can turn scientific information into useful knowledge that can be applied to improve awareness and readiness for asteroid-related events. To sum up, NASA's "Eyes on Asteroids" project is a noteworthy development in space science data visualization. Large amounts of asteroid data are transformed into an interactive 3D model by the platform, which improves public involvement and education while also facilitating planetary defense and scientific study. Tools like "Eyes on Asteroids" will be vital in sharing knowledge, influencing policy choices, and motivating the upcoming generation of scientists and space enthusiasts as our awareness of near-Earth asteroids continues to grow.

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INTRODUCTION

The innovative data visualization tool "Eyes on Asteroids" from NASA was created to give users a thorough and interactive perspective of near-Earth objects (NEOs), which include comets and asteroids. This cutting-edge platform uses sophisticated 3D modelling and real-time data to produce an immersive experience that enables both the scientific community and the general public to understand the complex dynamics of our solar system. Through the transformation of intricate astronomical information into an approachable and visually stimulating style, "Eyes on Asteroids" seeks to improve comprehension and consciousness regarding the possible risks and scientific prospects presented by these heavenly bodies.

Fundamentally, "Eyes on Asteroids" compiles information from numerous NASA missions, observatories, and telescopes located all throughout the world. Detailed data on thousands of known asteroids, such as their size, composition, orbital routes, and distance from Earth, are included in this vast database. The application enables users to investigate the solar system in previously unattainable detail by combining this data into a coherent model. A dynamic and interactive approach to studying these NEOs is provided by the ability for users to modify the 3D environment to view asteroids from various angles, zoom in on certain objects, and follow their movements over time. "Eyes on Asteroids" is unique since it can model asteroid movements in the future and possible collisions with Earth. Based on available data, the tool can project asteroidal courses and estimate the probability of future encounters using sophisticated prediction algorithms. This predictive capacity is essential for planetary defense because it helps scientists to recognize potentially dangerous asteroids and create plans to lessen the likelihood of an impact. The tool's simulations are useful for science, but they also make effective teaching examples that emphasize the value of ongoing observation and readiness.

In this, NASA's "Eyes on Asteroids" is an advanced data visualization platform that consists of multiple essential elements that work together to give users a thorough and engaging experience. These elements consist of:

1. Prediction and Trajectory Simulation: Its capability to model asteroids' past, current, and future trajectories is one of the platform's most important aspects. "Eyes on Asteroids" is able to project these objects' courses and determine the probability of future impacts with Earth through the use of predictive algorithms. This skill aids in the prioritization of monitoring and mitigation activities by scientists and is crucial for planetary defense.

2. Details of the Asteroid Data: Extensive details about every asteroid in the database, including its size, shape, composition, orbit, and likelihood for impacting Earth, are included. This information is provided in an understandable manner and is accompanied by visual aids such as charts and graphs.

3. Historical Data and Interpretation: "Eyes on Asteroids" offers access to historical asteroidal data in addition to real-time data. This gives users the ability to examine historical trajectories and occurrences, providing important context and insights into the actions and tendencies of NEOs.

By integrating these essential elements, NASA's "Eyes on Asteroids" offers an efficient tool for comprehending, monitoring, and researching near-Earth asteroids, enriching scientific inquiry and public interaction with space science.

CHAPTER-2
METHODOLOGY

Our methodology involves a systematic approach to data collection, preprocessing, analysis, and visualization to gain insights into various aspects of the COVID-19 pandemic. We outline the key steps below:

1. Data Collection: We gather data from reliable sources like GitHub, kaggle and other repositories. This repository provides comprehensive datasets on NASA eye on asteroids. Additionally, we may incorporate data from other reputable sources to supplement our analysis.

2. Data Preprocessing: Before conducting analysis, we preprocess the raw data to ensure consistency, accuracy, and usability. This involves tasks such as handling missing values, We also perform data cleaning and validation to identify and correct any anomalies or discrepancies in the dataset.

3. Exploratory Data Analysis (EDA): We conduct exploratory data analysis to gain an initial understanding of the dataset and identify potential trends, patterns, and outliers. This involves descriptive statistics, data visualization, and hypothesis testing to uncover insights and formulate research questions for further analysis.

4. Descriptive Analysis: We perform descriptive analysis to summarize the key characteristics of the asteroids, including name, if it is hazardous or not , and their characteristics. This helps provide context and a baseline understanding of the asteroids impact on earth.

5. Temporal Analysis: We conduct time-series analysis to examine the temporal dynamics of NASA eye on Asteroids. This involves visualizing trends, fluctuations, and seasonality in the data using line charts, bar charts, and other time- series visualizations. We may also apply statistical techniques such as moving averages and exponential smoothing to smooth the data and identify underlying trends.
6. Comparative Analysis: We perform comparative analysis to understand if the asteroid is potentially hazardous or not.
7. Advanced Visualization Techniques: We utilize advanced data visualization techniques such as bar chart races, treemaps, and word clouds to create dynamic and interactive visualizations of the NASA eye on asteroids data. These visualizations help communicate complex information in a clear and engaging manner, facilitating better understanding and interpretation of the data.
8. Statistical Modeling (if applicable): Depending on the research questions and objectives, we may employ statistical modeling techniques such as regression analysis, time-series forecasting, or machine learning algorithms to identify underlying patterns, make predictions, or test hypotheses related to the pandemic.
9. Interpretation and Reporting: Finally, we interpret the findings from our analysis and summarize them in a comprehensive report or presentation. We communicate key insights, trends, and implications to stakeholders, policymakers, and the general public to inform decision-making and response efforts.

By following this methodology, we aim to provide a rigorous and comprehensive analysis of the NASA eye on asteroids leveraging data-driven insights to support evidence-based decision-making and response strategies.

CHAPTER-3

RESULTS

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```

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 7   Estimated Diameter Max (km)     7070 non-null   float64
 8   Is Potentially Hazardous Asteroid  7071 non-null  bool
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 10  Relative Velocity (km/h)        7071 non-null   float64
 11  Miss Distance (astronomical units)  7071 non-null  float64
 12  Miss Distance (kilometers)      7071 non-null   float64
 13  Orbiting Body                   7071 non-null   object
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memory usage: 725.2+ KB
```

```
[4] df.head()
```

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3	2023-		380818							2023-	

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RESULTS

```
df.tail()
```

	Date	ID	Name	Neo Reference ID	NASA JPL URL	Absolute Magnitude H	Estimated Diameter Min (km)	Estimated Diameter Max (km)	Is Potentially Hazardous Asteroid	Close Approach Date Full	Rela Velo (k
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 5   Absolute Magnitude H             7070 non-null   float64
 6   Estimated Diameter Min (km)      7070 non-null   float64
 7   Estimated Diameter Max (km)      7070 non-null   float64
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 12  Miss Distance (kilometers)       7070 non-null   float64
 13  Orbiting Body                    7070 non-null   object
dtypes: bool(1), float64(6), int64(2), object(5)
memory usage: 780.2+ KB
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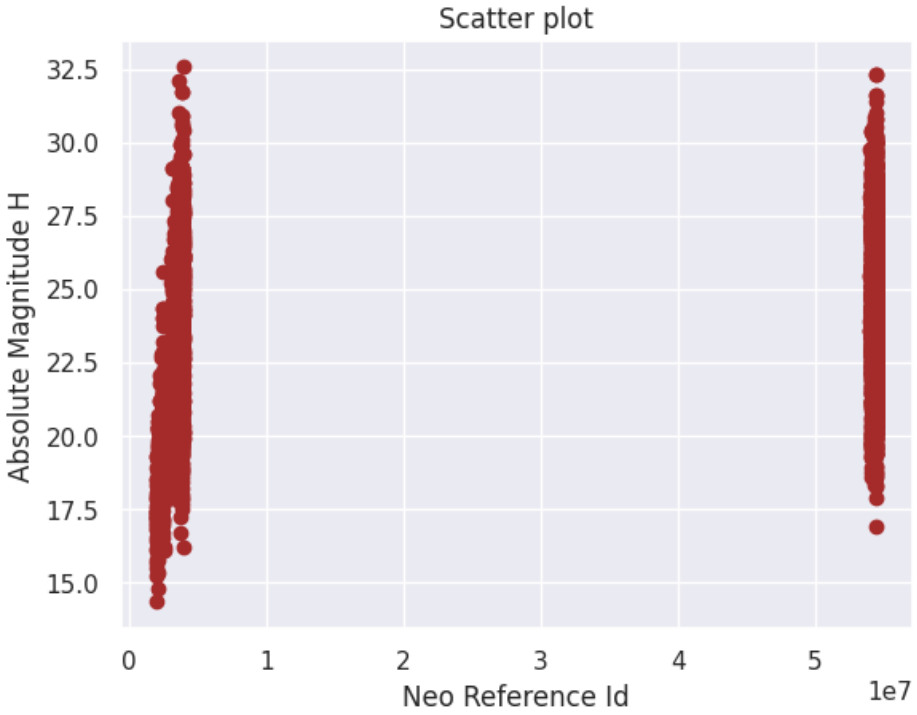
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5
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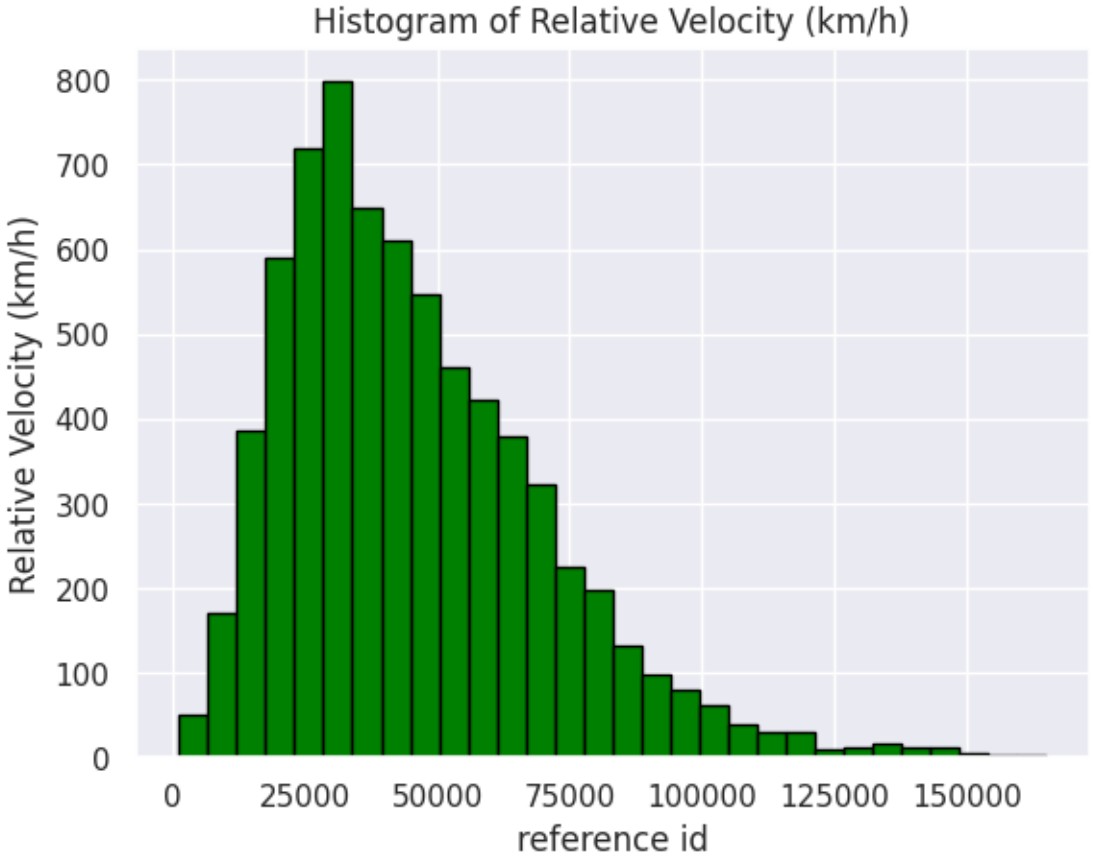
Neo Reference Id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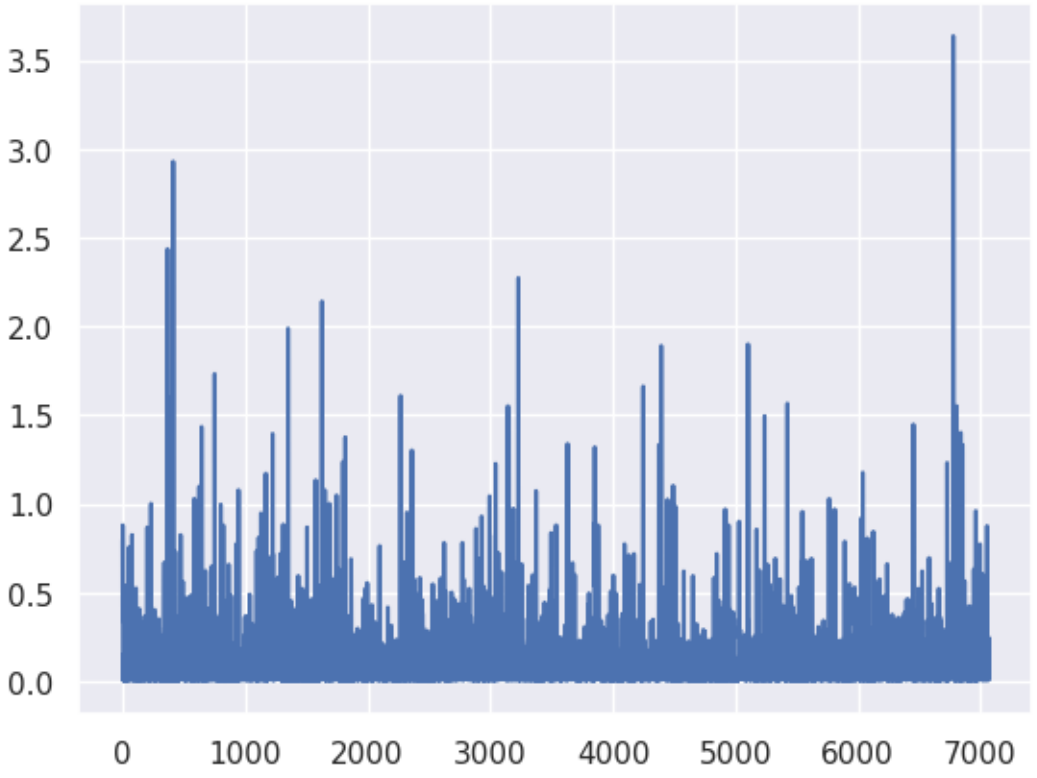
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5000
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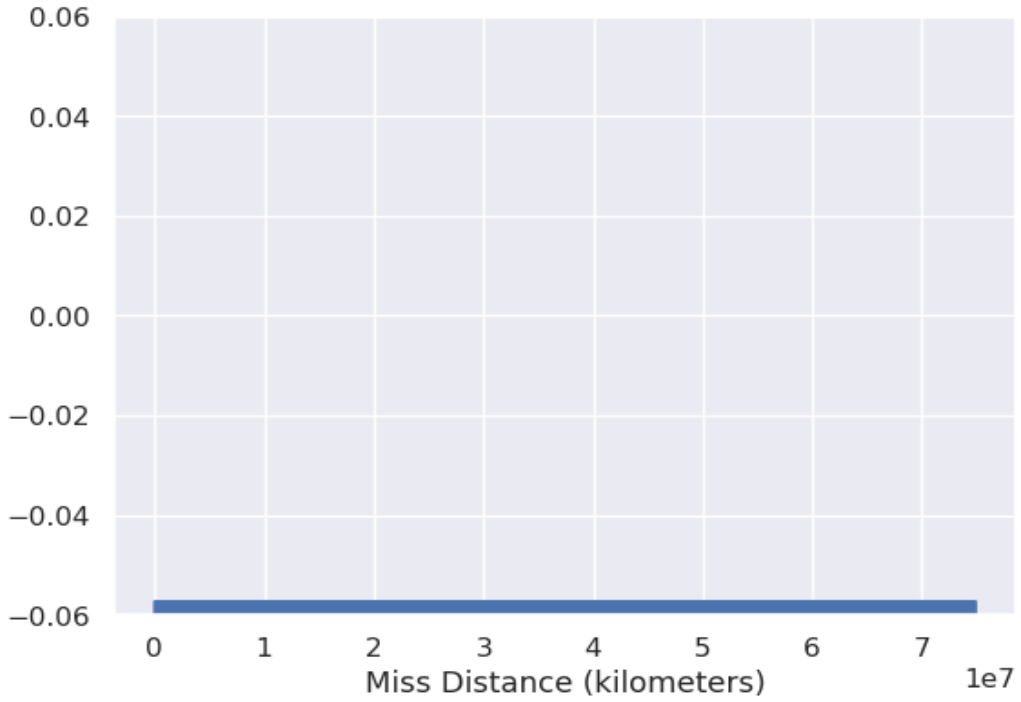
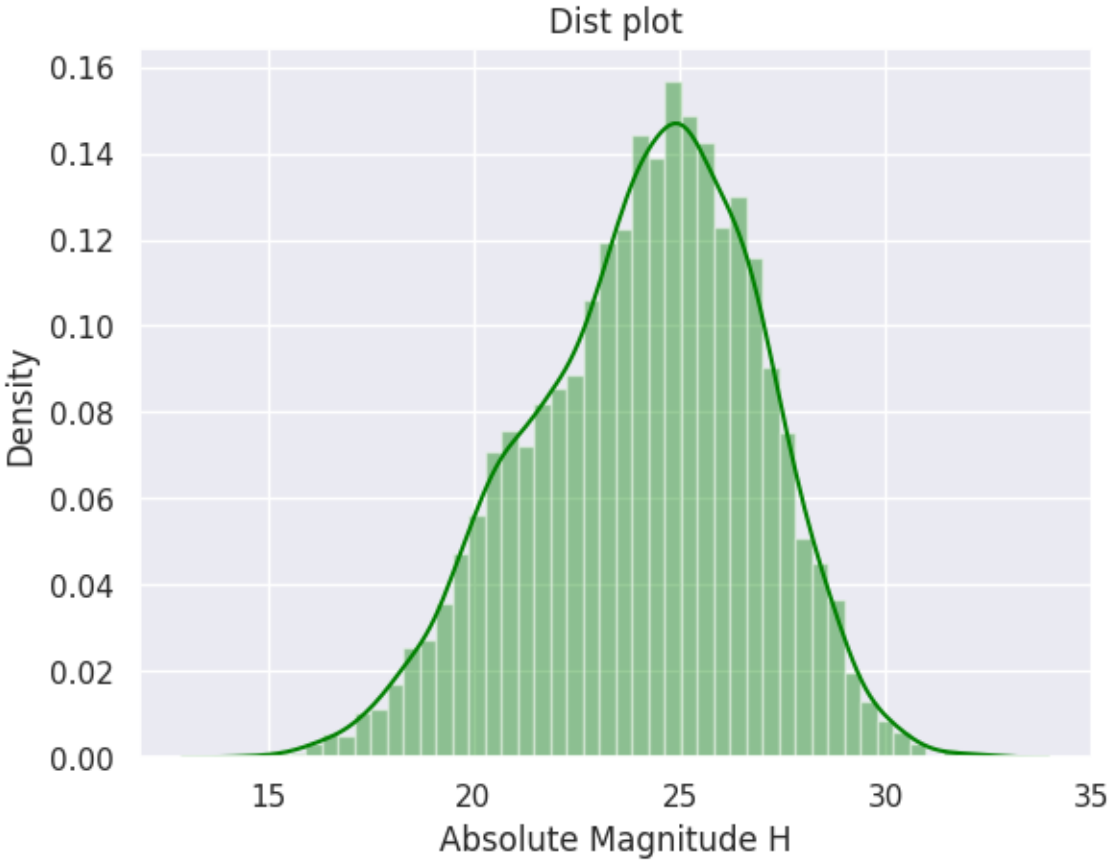
7000

CHAPTER-3

RESULTS





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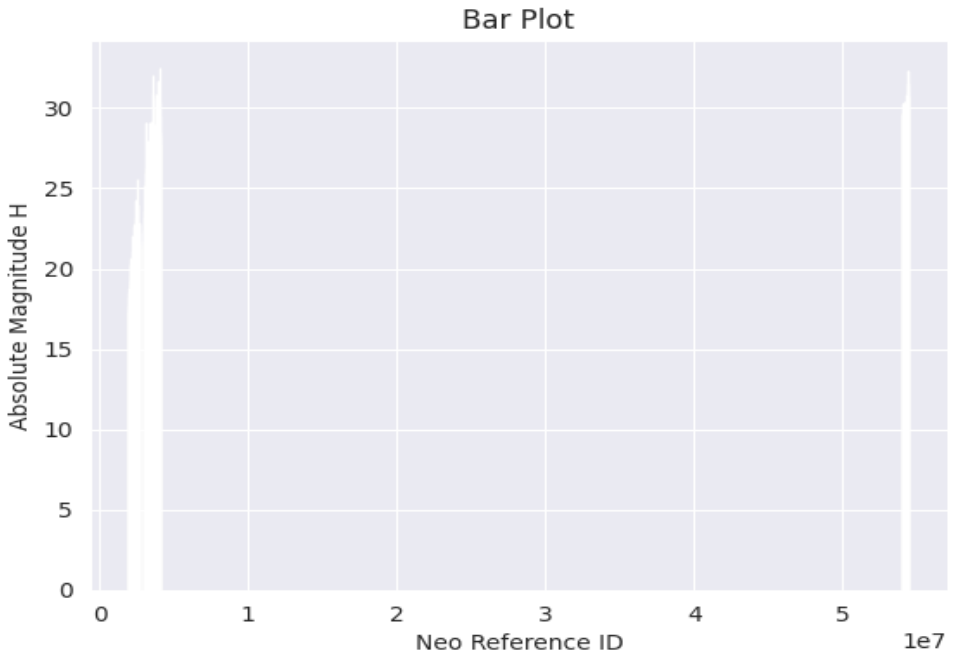

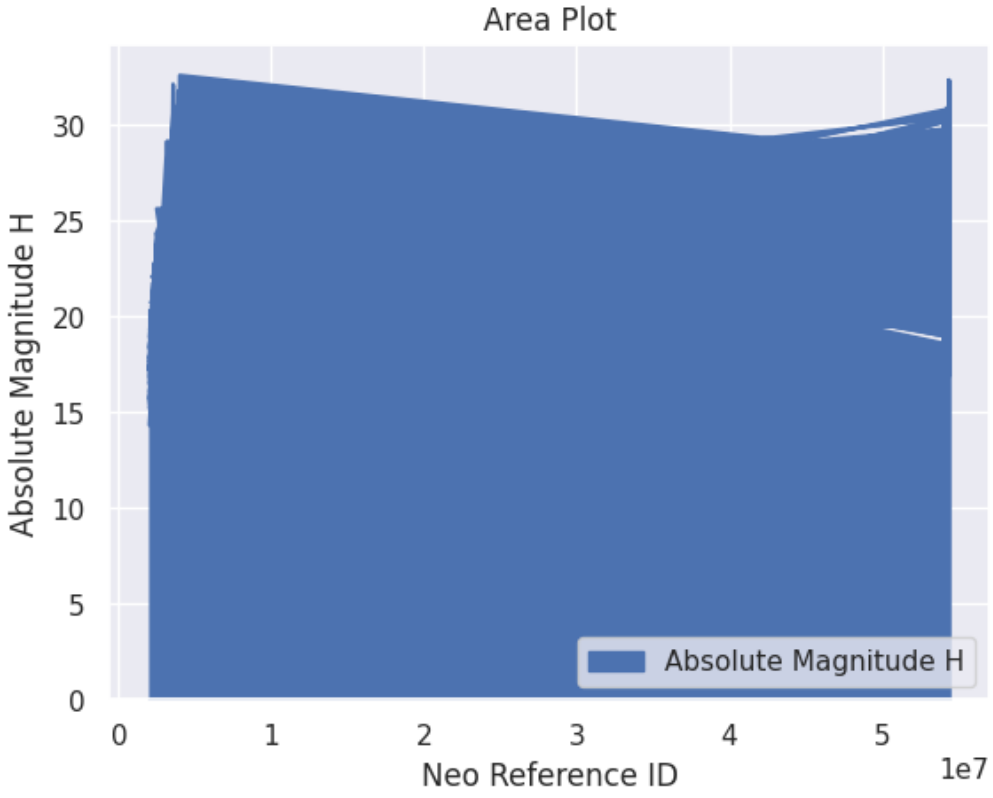

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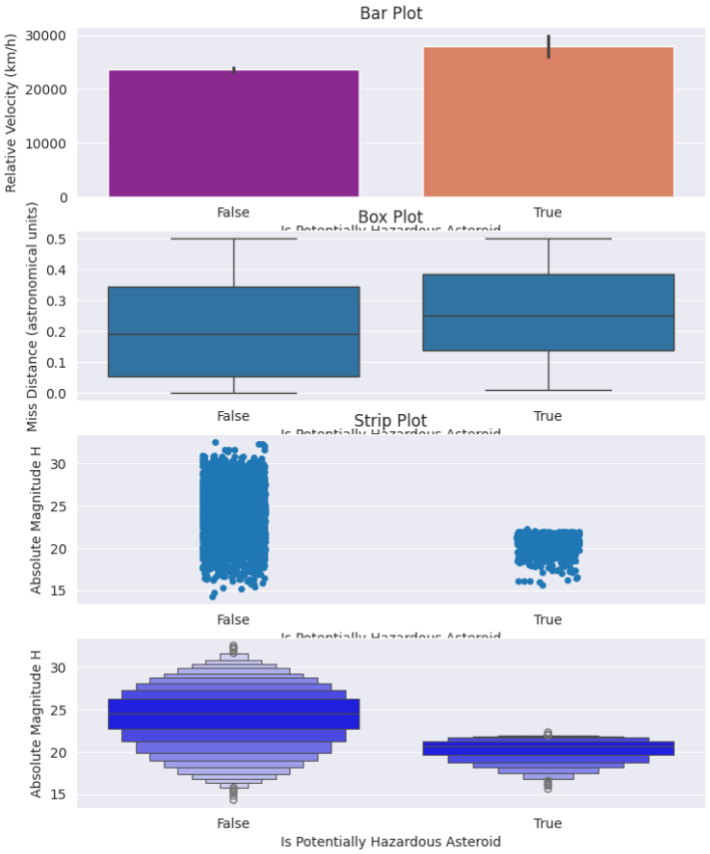

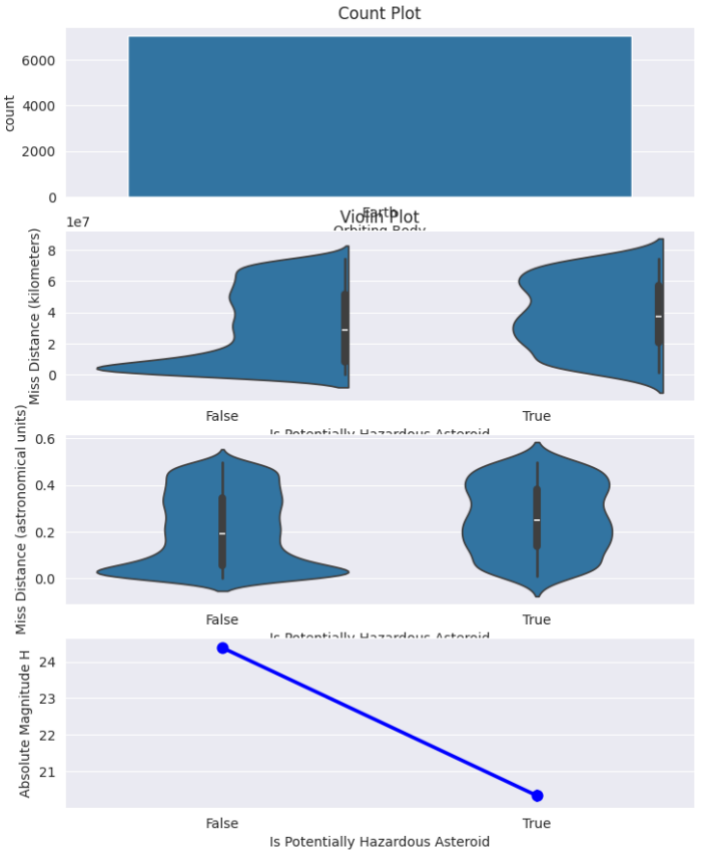

CHAPTER-4
CONCLUSION

In conclusion, NASA's "Eyes on Asteroids" project is a noteworthy accomplishment in the fields of data visualization and space research. This platform, with its unique methodology and extensive functionalities, not only offers insightful information about the behavior of near-Earth objects (NEOs), but also acts as a driving force behind scientific research, planetary defense, and public participation.

The potential of "Eyes on Asteroids" to convert difficult astronomical data into a clear, interactive format is among its most important accomplishments. The platform provides users with a comprehensive perspective of the solar system by integrating real-time data from multiple sources. This allows users to investigate the trajectories, characteristics, and potential risks posed by asteroids and other NEOs.

Furthermore, "Eyes on Asteroids" is essential to the advancement of planetary defence initiatives. Because of its predictive powers, scientists may evaluate the likelihood of an asteroid impacting Earth and model future asteroid trajectories, which gives them important information for averting any dangers. The technology enables academics and governments to create plans for protecting Earth and lessening the possibility of a catastrophic impact by detecting and monitoring dangerous asteroids. Apart from its scientific value, "Eyes on Asteroids" is a potent teaching tool that piques people's interest in space travel and encourages curiosity in schoolchildren and the general public. Its approachable interface and educational materials help students of all ages understand difficult scientific ideas, igniting their interest in STEM subjects and fostering the next wave of inventors, scientists, and engineers.

In the future, "Eyes on Asteroid’s ongoing development and improvement could lead to significant breakthroughs in our knowledge of NEOs and their effects on Earth. NASA's ground-breaking platform will continue to push the limits of space exploration, improve our readiness for any asteroid strikes, and arouse awe and interest about the cosmos by utilizing technology and data visualization.

"Eyes on Asteroids" essentially captures NASA's dedication to research, exploration, and the expansion of human knowledge. This revolutionary platform will continue to shine as a beacon of innovation, guiding humanity's path to the stars and shedding light on the mysteries of the cosmos as we continue to stare into the depths of space.