

NITTE MEENAKSHI INSTITUTE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION, AFFILIATED TO VISVESVARAYA TECHNOLOGICAL UNIVERSITY,

BELGAUM, APPROVED BY AICTE & GOVT.OF KARNATAKA



COURSE PROJECT REPORT

on

COSMIC VOYAGER

Space Blog

*Submitted in partial fulfilment of the requirement for the award of Degree of
Bachelor of Engineering*

in

Computer Science and Engineering

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CERTIFICATE

This is to certify that the Course Project titled “**COSMIC VOYAGER – Space Blog**” is an authentic work carried out by **Kumuda K (1NT18CS082)**, **Ritika Subudhi (1NT18CS133)** and **Shreya A Hegde (1NT18CS153)** bonafide students of **Nitte Meenakshi Institute of Technology**, Bangalore in partial fulfilment for the award of the degree of **Bachelor of Engineering** in COMPUTER SCIENCE AND ENGINEERING of Visvesvaraya Technological University, Belagavi during the academic year **2019-2020**.

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DECLARATION

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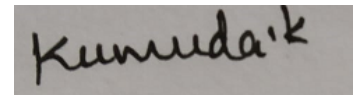
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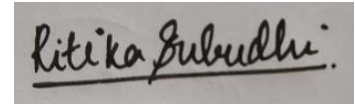
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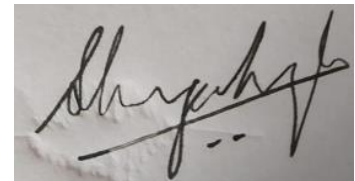
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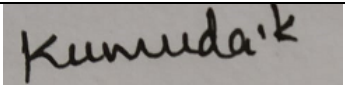
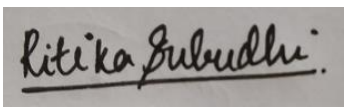
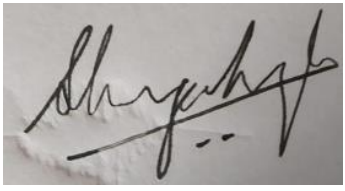
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ABSTRACT

The cosmos is the Universe. Using the word cosmos rather than the word universe implies viewing the universe as a complex and orderly system or entity; the opposite of chaos.

The cosmos, and our understanding of the reasons of its existence and significance, are studied in cosmology – a very broad discipline covering any scientific, religious or philosophical contemplation of the cosmos and its nature, or reasons for existing.

The philosopher Pythagoras first used the term cosmos for the order of the universe. The term became part of the modern language in the 19th century when geographer-polymath Alexander von Humboldt resurrected the use of the word from the ancient Greek, assigned to his five-volume treatise, Kosmos, which influenced the modern and somewhat holistic perception of the universe as one interacting entity.

Our blog aims to pique our reader's interest about our universe and make them want to learn more about the planet we live in, the other planets in our solar system, the galaxy that these planets are part of, more galaxies that surround us and about other mystifying things still being researched about in our universe, such as black holes.

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INTRODUCTION

The universe is all of space and time and their contents, including planets, stars, galaxies and all other forms of matter and energy. While the spatial size of the entire universe is unknown, it is possible to measure the size of the observable universe, which is currently estimated to be 93 million light-years in diameter. In various multiverse hypotheses, a universe is one of many causally disconnected constituent parts of a larger multiverse, which itself comprises all of space and time and its contents; as a consequence, ‘the universe’ and ‘the multiverse’ are synonymous in such theories.

The earliest cosmological models of the universe were developed by ancient Greek and Indian philosophers and were geocentric, placing Earth at the centre. Over the centuries, more precise astronomical observations led Nicolaus Copernicus to develop the heliocentric model with the Sun at the centre of the Solar System. In developing the law of universal gravitation, Isaac Newton built upon Copernicus' work as well as Johannes Kepler's laws of planetary motion and observations by Tycho Brahe. Further, observational improvements led to the realization that the Sun is one of hundreds of billions of stars in the Milky Way, which is one of at least hundreds of billions of galaxies in the universe. Many of the stars in our galaxy have planets. At the largest scale, galaxies are distributed uniformly and the same in all directions, meaning that the universe has neither an edge nor a centre. At smaller scales, galaxies are distributed in clusters and superclusters which form immense filaments and voids in space, creating a vast foam-like structure. Discoveries in the early 20th century have suggested that the universe had a beginning and that space has been expanding since then, and is currently still expanding at an increasing rate.

From studying the movement of galaxies, it has been discovered that the universe contains much more matter than is accounted for by visible objects; stars, galaxies, nebulae and interstellar gas. Our blog, Cosmic Voyager, aims to make learning about these visible objects fun, interesting and interactive.

LITERATURE SURVEY

Humans have always looked up into the night sky and dreamed about space. For centuries astronomers and many astrophysicists have worked together to solve the mysteries of space.

The advancement of technology has not only proved many theories but we have also successfully discovered many aspects in this voyage of mystery solving.

The cosmos is the universe. Using the word cosmos rather than the word universe implies viewing the universe as a complex and orderly system or entity; the opposite of chaos.

The **universe** (Latin: *universus*) is all of space and time and their contents, including planets, stars, galaxies, and all other forms of matter and energy.

The Cosmic Voyager Project is an attractive space blog which highlights topics such as Black Holes, Planets of our Solar System and Galaxies in the universe. The project also has an inbuilt enthralling Cosmic Voyager Quiz.

Although there are number of web-based applications which are, one way or the other similar to this website and related to Space Quiz, however, there are only a few that help in learning and contribute to the academic enhancement in a play way for students. Most Space Quizzes available online either have poor question quality or an unattractive page.

The website also has a feature to receive updates on facts periodically once the user registers through the website. A person can play the game any number of times she/he wishes to before saving their score.

Another feature of the Cosmic Voyager Quiz is that it shows the number of questions attempted and the score is updated in real time. Other feature regarding the quiz is similar to the usual quiz applications, i.e. it has only multiple-choice questions and once the player answers, the option selected is marked red if wrong and green if correct.

The fundamental idea behind our project is to create a product that would offer new aspects to learning and meets modern age technologies while it stays true to the facts.

IMPLEMENTATION

Cosmic Voyager project has been implemented using the following technologies

3.1) HTML:

This stands for **Hyper Text Markup Language**, which is the most widely used language on Web to develop web pages. **HTML** was created by Berners-Lee in late 1991 but "HTML 2.0" was the first standard HTML specification which was published in 1995.

Originally, **HTML** was developed with the intent of defining the structure of documents like headings, paragraphs, lists, and so forth to facilitate the sharing of scientific information between researchers. Now, HTML is being widely used to format web pages with the help of different tags available in HTML language.

3.2) CSS:

Cascading Style Sheets (CSS) is a stylesheet language used to describe the presentation of a document written in HTML or XML (including XML dialects such as SVG, MathML or XHTML). CSS describes how elements should be rendered on screen, on paper, in speech, or on other media.

3.3) JavaScript:

JavaScript ("JS" for short) is a full-fledged dynamic programming language that, when applied to an HTML document, can provide dynamic interactivity on websites.

It is a programming language that adds interactivity to your website (for example games, responses when buttons are pressed or data is entered in forms, dynamic styling, and animation etc).

3.4) Php:

The **PHP Hypertext Pre-processor (PHP)** is a programming language that allows web developers to create dynamic content that interacts with databases. PHP is basically used for developing web-based software applications.

3.5) MySQL:

MySQL is the most popular Open Source Relational SQL Database Management System. It is one of the best RDBMS being used for developing various web-based software applications.

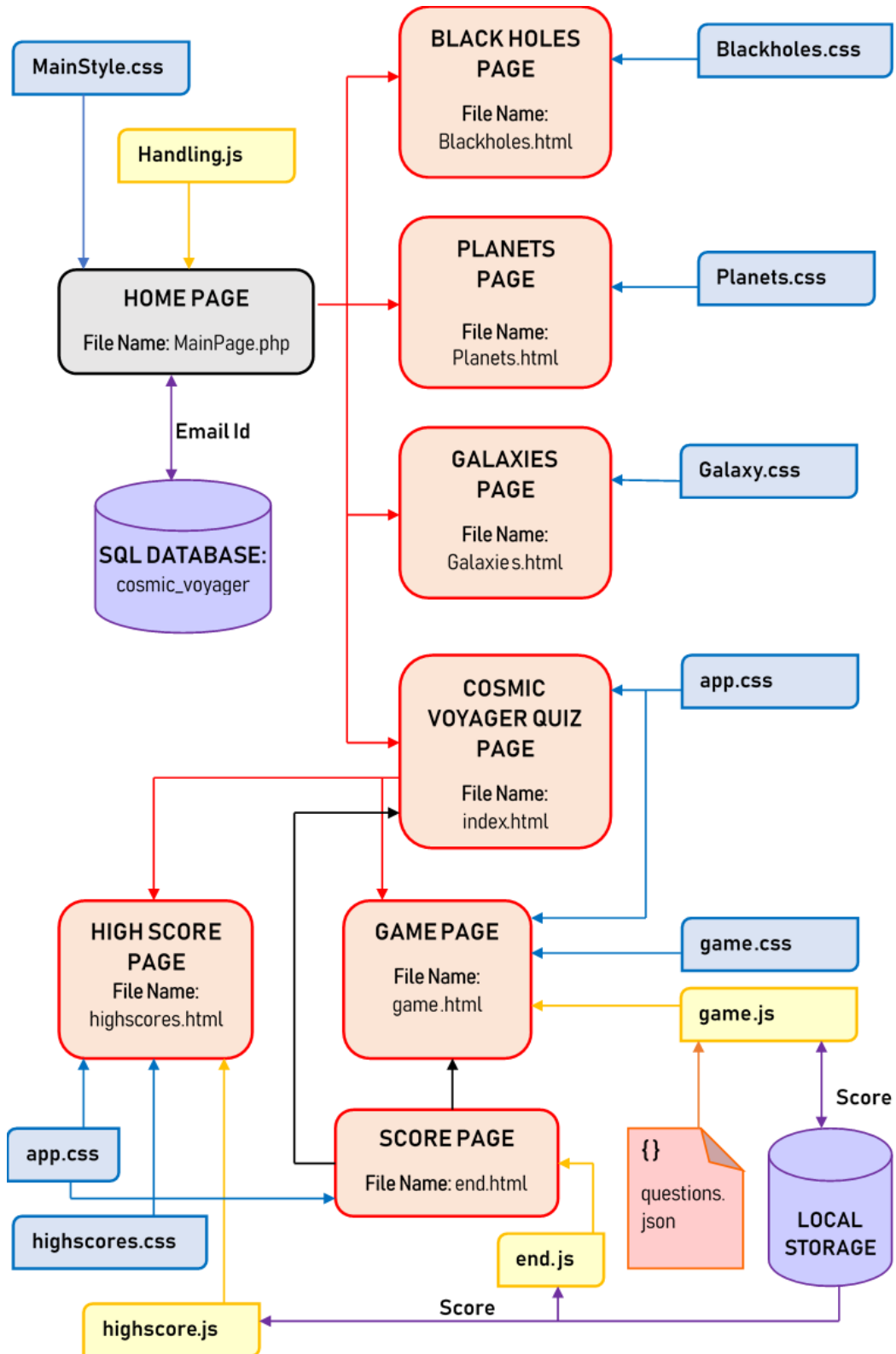
3.6) Node.js:

Node.js is an open-source, cross-platform, JavaScript runtime environment that executes JavaScript code outside of a web browser. Node.js lets developers use JavaScript to write command line tools and for server-side scripting—running scripts server-side to produce dynamic web page content before the page is sent to the user's web browser.

3.7) JSON:

JavaScript Object Notation is an open standard file format, and data interchange format, that uses human-readable text to store and transmit data objects consisting of attribute–value pairs and array data types (or any other serializable value). It is a very common data format, with a diverse range of applications, such as serving as a replacement for XML in AJAX systems.

JSON is a language-independent data format.

FLOW DIAGRAM

RESULTS

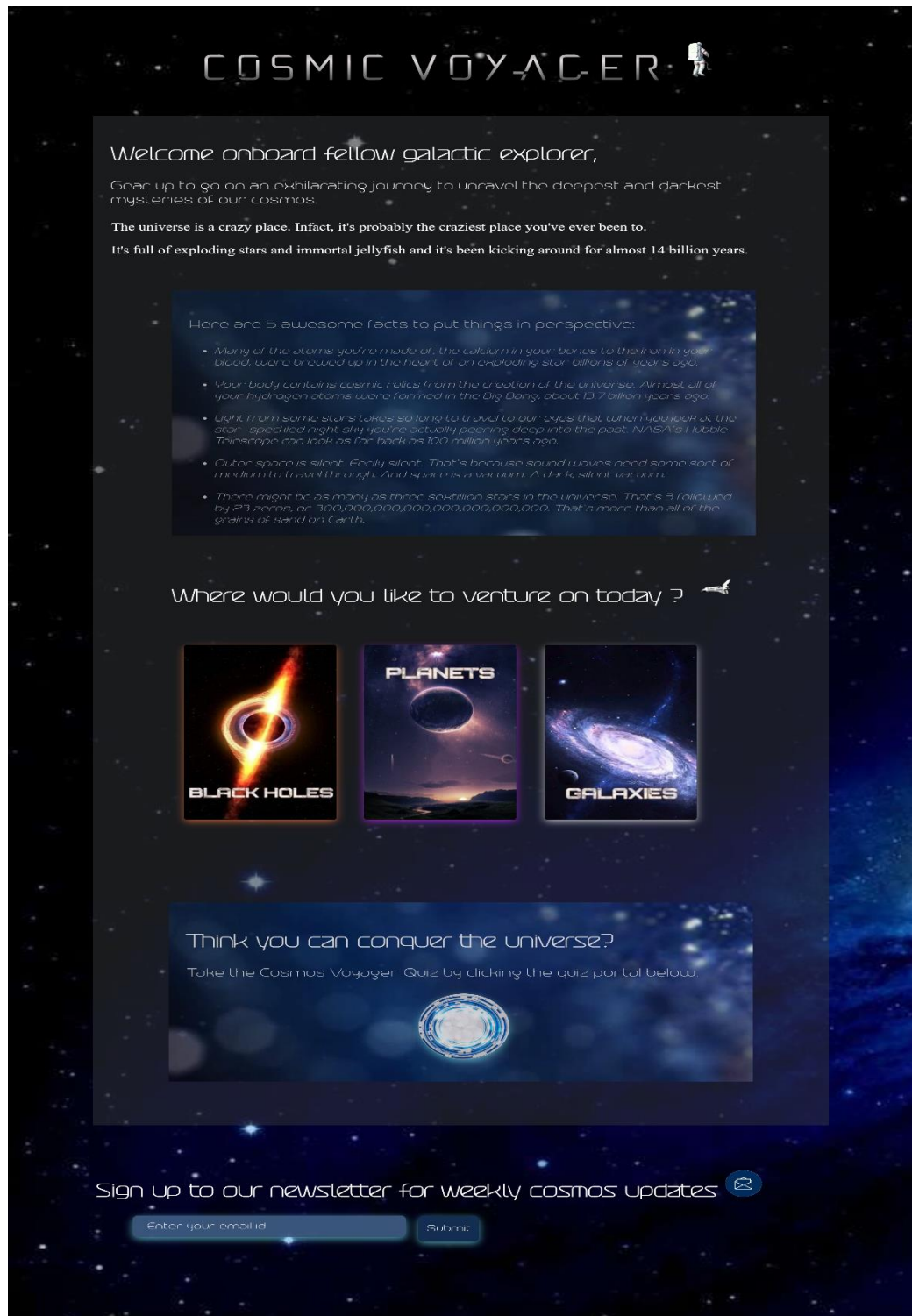


Fig. Main Page

BLACK HOLES

What are black holes?

The simplest definition of a black hole is an object that is so dense that not even light can escape its surface.

But how does that happen?

The concept of a black hole can be understood by thinking about how fast something needs to move to escape the gravity of another object – this is called the escape velocity. Escape velocity is the speed an object must attain to “break free” of the gravitational attraction of another body.



There are two things that affect the escape velocity – the mass of object and the distance to the center of that object. For example, a rocket must accelerate to 11.2 km/s in order to escape Earth's gravity. If, instead, that rocket was on a planet with the same mass as Earth but half the diameter, the escape velocity would be 15.8 km/s. Even though the mass is the same, the escape velocity is greater, because the object is smaller (and more dense).

What if we made the size of the object even smaller?

If we squished the Earth's mass into a sphere with a radius of 9 mm, the escape velocity would be the speed of light. Just a pinch-bit smaller, and the escape velocity is greater than the speed of light. But the speed of light is the cosmic speed limit, so it would be impossible to escape that tiny sphere, if you got close enough.

The radius at which a mass has an escape velocity equal to the speed of light is called the Schwarzschild radius. Any object that is smaller than its Schwarzschild radius is a black hole – in other words, anything with an escape velocity greater than the speed of light is a black hole. For something the mass of our sun would need to be squeezed into a volume with a radius of about 3 km.

Structure of black holes

There are two basic parts to a black hole: the singularity and the event horizon.



The event horizon is the “point of no return” around the black hole. It is not a physical surface, but a sphere surrounding the black hole that marks where the escape velocity is equal to the speed of light. Its radius is the Schwarzschild radius mentioned earlier. One thing about the event horizon: once matter is inside it, that matter will fall to the center.

With such strong gravity, the matter squashes to just a point – a tiny, tiny volume with a crazy-high density. That point is called the singularity. It is vanishingly small, so it has essentially an infinite density. It's likely that the laws of physics break down at the singularity. Scientists are actively engaged in research to better understand what happens at these singularities, as well as how to develop a full theory that better describes what happens at the center of a black hole.

Seeing the unseen

If light can't escape a black hole, how can we see black holes?

Astronomers don't exactly see black holes directly. Instead, astronomers observe the presence of a black hole by its effect on its surroundings. A black hole, by itself out in the middle of our galaxy would be very difficult to detect.

Imagine you arrive home one night to find the kitchen a mess. You know that it was clean when you left, but now there are dirty dishes in the sink and crumbs strewn about the counter. From the evidence, you know someone used the kitchen while you were out – in fact, you can even say that they made a sandwich and chips because of the types of crumbs you see on the counter. You might even be able to identify who in your household was in the kitchen based on what kind of chips they had or what they put on their sandwich. You never saw that person in the kitchen, but their effect on the kitchen was evident.

Studying black holes relies heavily on indirect detection. Astronomers cannot observe black holes directly, but see behaviors in other objects that can only be explained by the presence of a very large and dense object nearby. The effects can include materials getting pulled into the black hole, accretion disks forming around the black hole, or stars orbiting a massive but unseen object.

Types of black holes

Traditionally, astronomers have talked about two basic classes of black hole – those with masses about 3-20 times that of the sun, which are called stellar-mass black holes, and those with masses millions to billions times that of the sun, which are called supermassive black holes.



Stellar-mass black holes are formed when a massive star runs out of fuel and collapses. They are found scattered throughout the galaxy, in the same places where we find stars, since they began their lives as stars. Some stellar-mass black holes started their lives as part of a binary star system, and the way the black hole affects its companion and their environment can be a clue to astronomers about their presence.



Supermassive black holes are found at the center of nearly every large galaxy. They have supermassive black holes born in an active area of research for astronomers. Recent studies have shown that the size of the black hole is correlated with the size of the galaxy, so that there must be some connection between the formation of the black hole and the galaxy.

What about the gap between stellar-mass and supermassive black holes?

For a long time astronomers had proposed a third class, called intermediate mass black holes, but it was just in the past decade or so that they have started finding possible evidence of this class of black hole.

With only a few candidate intermediate black holes, astronomers are just beginning to study them in any detail. These studies are complicated by the fact that many of the objects that initially looked like strong intermediate black hole candidates can be explained in other ways. For example, there is a class of object called ultraluminous X-ray sources (ULXs). These objects emit more X-ray light than known stellar processes. One model postulated that ULXs harbor an intermediate black hole; however, further study of these objects has favored alternate models for most of them.

STAY TUNED as astronomers work to unravel the mysteries of these elusive objects.

Fig. Blackholes.html

PLANETS

What are planets?

This seemingly simple question doesn't have a simple answer. A planet is a celestial object that orbits a star, the sun is the star in our celestial neighborhood.

But can you consider any celestial object that orbits a star as planet?

The most recent definition of a planet was adopted by the International Astronomical Union in 2006. It says a planet must do three things:

1. It must orbit a star (in our cosmic neighborhood, the Sun).
2. It must be big enough to have enough gravity to force it into a spherical shape.
3. It must be big enough that its gravity cleared away any other objects of a similar size near its orbit around the Sun.

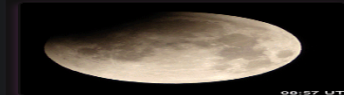
How are planets formed?

How did the Solar System's planets come to be? The leading theory is something known as the "protoplanet hypothesis", which essentially says that very small objects stuck to each other and grew bigger and bigger—big enough to even form planets, but how is that possible?

About 4.6 billion years ago, the location of today's Solar System was nothing more than a loose collection of gas and dust—what we call a nebula. A nebula is a giant cloud of dust and gas in space. Some nebulae come from the gas and dust blown out by the explosion of a dying star, such as a supernova; other nebulae are the birthplaces of new stars. A supernova is the biggest explosion that humans have ever seen. Then something happened that triggered a pressure change in the center of the cloud, leading to change in gravity due to which the cloud collapsed and created a disc of material. The center of this disc saw a great increase in pressure that eventually was so powerful that hydrogen atoms formally floating in the cloud began to come into contact. Eventually, they fused and produced helium, kickstarting the formation of the sun. The sun was a hungry youngster—it ate up 99% of what was swirling around, but this still left 1% of the disc available for other things, and this is where planet formation began and happened relatively quickly. Small bits of dust and gas began to clump together. The young sun produced much of the gas out to the outer Solar System, the cause of this is still under investigation, but some scientists believe it was because the gas giants were moving around and perturbing smaller bodies at the fringe of the Solar System. In simple terms, the clumping together of protoplanets (planets formation) eventually formed the planets.


Planets in our solar system:

There are eight planets in our solar system, let us learn about them in order of increasing distance of planet from sun.




MERCURY

Mercury is the smallest and innermost planet in the Solar System. It orbits around the sun taking 87.97 days, the shortest of all the planets in the Solar System. Due to its proximity to the Sun, Mercury is also the hottest planet in our solar system. Due to Mercury's elliptical orbit, planet orbits and changes its distance from the sun, appearing to rise directly up and rise again from some parts of the planet's surface. The same thing happens in reverse at sunset.




VENUS

Venus is the second planet from the Sun. Mercurian orbit, closely in the opposite direction most planets do. The thick atmosphere traps heat in a runaway greenhouse effect, making it the hottest planet in our solar system with surface temperatures hot enough to melt lead. Its orbit around the Sun takes 225 days and one length of the day is 116.75 days. Venus is the second brightest natural object in the night sky after the Moon.



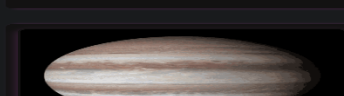
EARTH

Earth is the third planet from the sun. It's the only planet known to have an atmosphere with life. It has the largest ocean on the sun, and its orbit around the sun is the most circular of all the planets in the solar system. It has a unique magnetic field that protects it from the sun's radiation. It is the only planet in the solar system with liquid water on its surface. It is the only planet in the solar system with a large moon.




MARS

Mars is the fourth planet from the Sun and the second largest planet in the Solar System after Mercury. It is the only planet in the solar system with a thin atmosphere. It is the only planet in the solar system with a polar ice cap. It is the only planet in the solar system with a day-night cycle. It is the only planet in the solar system with a large volcano.



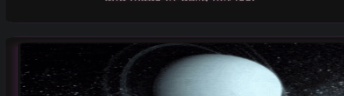
JUPITER

Jupiter is the fifth planet from our Sun and is, by far, the largest planet in the solar system. It is the only planet in the solar system with a ring system. It is the only planet in the solar system with a large number of moons. It is the only planet in the solar system with a large storm.




SATURN

Saturn is the sixth planet from the Sun and the second largest planet in the Solar System after Jupiter. It is the only planet in the solar system with a ring system. It is the only planet in the solar system with a large number of moons. It is the only planet in the solar system with a large storm.



URANUS

Uranus is the seventh planet from the Sun. It has the second largest ring system in the solar system. It is the only planet in the solar system with a ring system. It is the only planet in the solar system with a large number of moons. It is the only planet in the solar system with a large storm.



NEPTUNE

Neptune is the eighth and farthest known planet from the Sun in the Solar System. It is the fourth-largest planet by diameter, the third-most-massive planet, and the densest planet in the solar system. It is the only planet in the solar system with a ring system. It is the only planet in the solar system with a large number of moons. It is the only planet in the solar system with a large storm.

Fig. Planets.html

15



Fig. Home page of quiz.

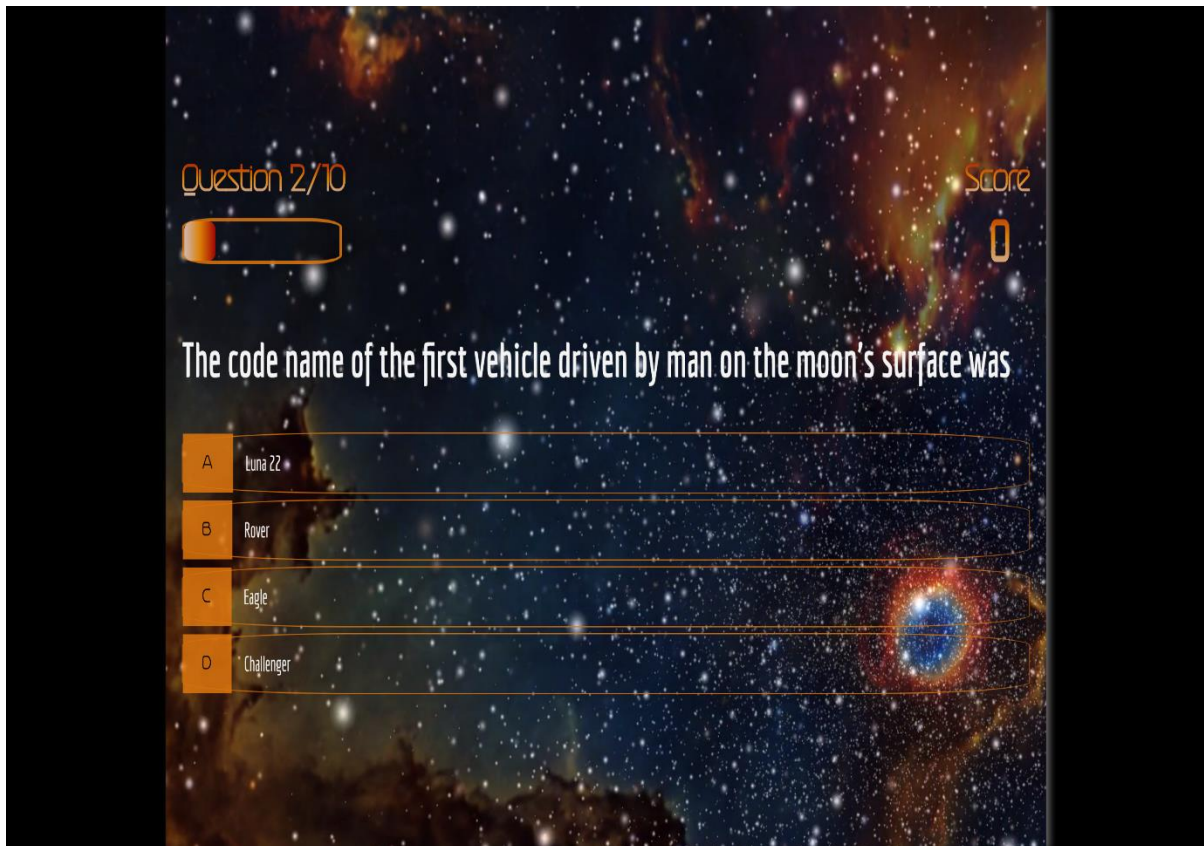


Fig. Sample Question in quiz.

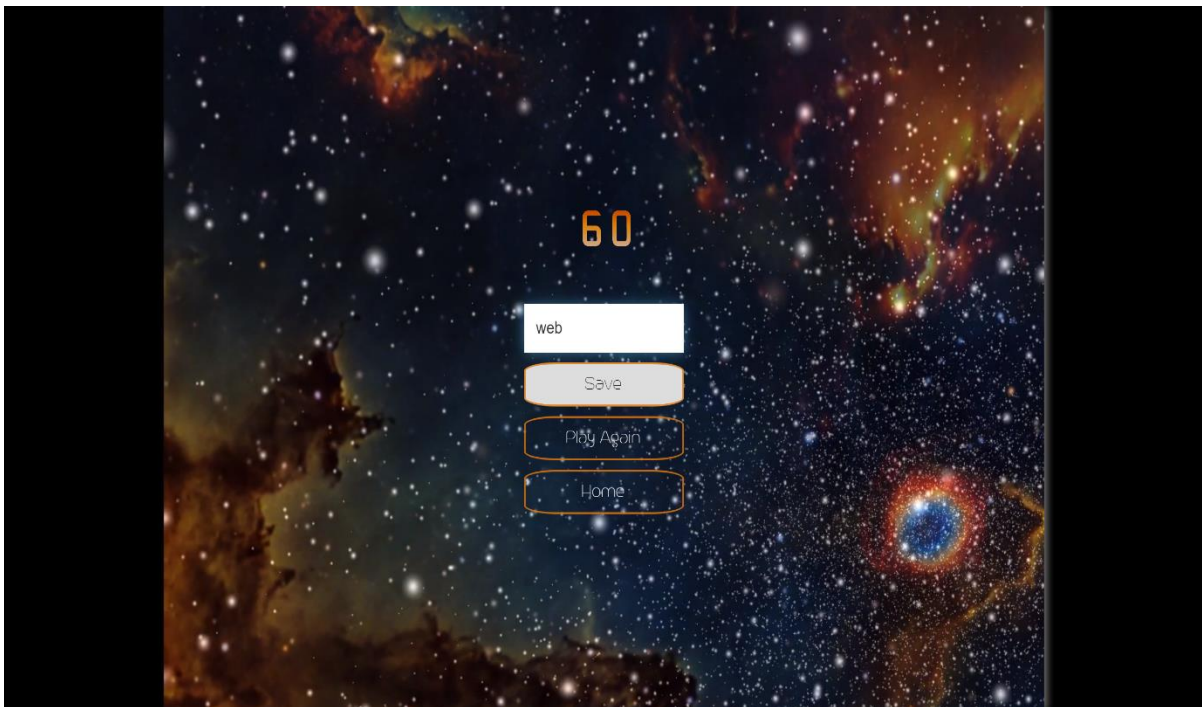


Fig. To save the score by entering the username.

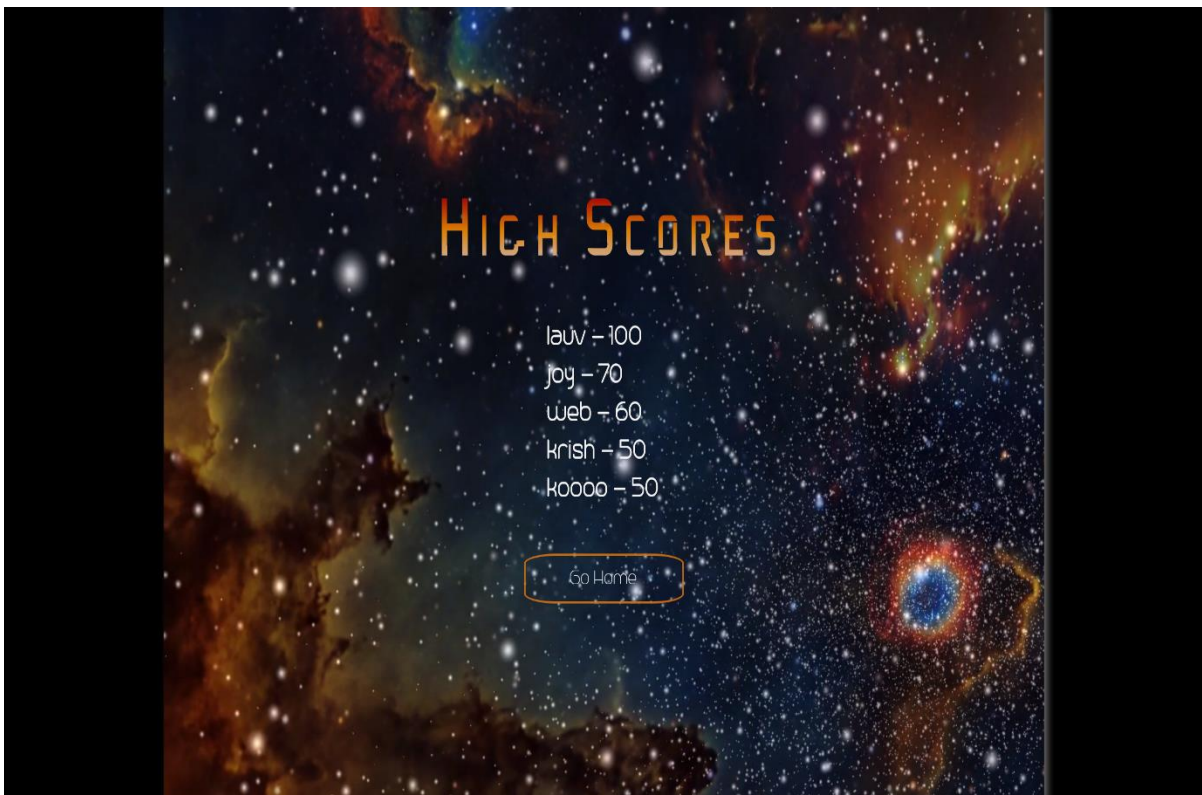


Fig. Displaying scores of the top 5 scores.

```
mysql> use cosmic_voyager;
Database changed
mysql> desc newsletter_list;
+-----+-----+-----+-----+-----+-----+
| Field | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| email | varchar(50)   | NO   | PRI | NULL    |       |
+-----+-----+-----+-----+-----+-----+
1 row in set (1.27 sec)
```

Fig. Table newsletter_list to store email-id.

CONCLUSION

Cosmic Voyager project is about making learning more interesting and effective. As humans, we are always curious about how this universe including black-holes, planets, galaxies and many other forms of energy and matter were formed. This cosmic Voyager website gives information regarding how the universe, black-holes, planets and galaxies were formed with attractive Graphics Interchange Format(gif)'s and the website allows users to register with an email-id to get updates on new interesting facts about the universe and to play a quiz based on the universe, making learning interesting, effective and fun.

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