

## تمرین سری ششم – گزارش کار

مهرشاد فلاح اسطلخ‌زیر – ۴۰۱۵۲۱۴۶۲

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برای استفاده از مدل‌ها از ollama در ویندوز استفاده کردم. برای تست کردن این موضوع هم از مدل سبک mistral استفاده کردم و برای تست کردن هم از یک پرامپت برای گفتن داستان کوتاهی در رابطه با سفر با زمان استفاده کردم.

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PS C:\Windows\System32> ollama run mistral
>>> Tell me a short story about travelling in time.
Title: The Time-Traveling Locket

In the quaint town of Clocksbury, lived a young woman named Amelia. She was an antiquarian, known for her curiosity and love for old artifacts. One day, she found a peculiar locket during an auction. It wasn't the usual gold or silver; it was made of an unknown metal, etched with intricate patterns that seemed to shift under light.

Upon opening the locket, Amelia discovered a note: "To unlock time, love must be your guide." Intrigued, she decided to wear the locket close to her heart. The next morning, as she was about to leave for work, the locket glowed, and Amelia found herself standing in a bustling street that wasn't Clocksbury.

She quickly realized she had traveled back in time. She saw horses-drawn carriages, people wearing Victorian clothing, and the air was filled with a scent of coal and horse manure. She was in 1850s London!

Amelia, armed with her modern knowledge, observed the city. She witnessed the Great Exhibition at Crystal Palace, met Charles Dickens, and even attended a seance. However, she promised herself not to interfere with the past.

After a week of exploring, she found herself back in Clocksbury, right outside her antiquarian shop. The locket had returned to its original state. Amelia was overjoyed and couldn't wait to travel again.

Over the years, Amelia traveled to different eras, learning from each experience. She met famous figures, witnessed significant events, and even had a glimpse of the future. Yet, she never deviated from her promise.

One day, the locket glowed again, but this time it took her not to a specific era, but to a person in need - a woman about to make a wrong decision that would alter history. With her newfound wisdom, Amelia guided her and restored the timeline.

From then on, Amelia's travels weren't just for personal exploration anymore. She used her time-traveling locket to help people and ensure history unfolded as it should. Her story served as a reminder that love, in its purest form, could guide us not only through time but also through life.
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در بخش بعدی علاوه بر مدل mistral به مدل llama3 هم نیازمند هستم و به همین منظور این مدل را هم pull می‌کنم.

برای مقایسه از ۵ پرامپت ساده استفاده می‌کنم.

1-what is the speed of light In vacuum?

2-Explain why the sky is blue?

3-Who proposed the theory of general relativity?

4-What is the chemical formula of water, and what do its atom represent

## 5- Name the three states of matter and give an example of each

به ترتیب برای هر مدل پاسخها را به ۵ سوال بالا نمایش میدم.

### Mistral

```
PS C:\Windows\System32> ollama run mistral
>>> What is speed of light in vacuum?
The speed of light in a vacuum is approximately 299,792 kilometers per second (approximately 186,282 miles per second). This value is often denoted as c and is a fundamental constant in physics.

>>> Explain why the sky is blue.
The color of the sky appears blue to our eyes because of a process called Rayleigh scattering. When sunlight reaches Earth's atmosphere, it interacts with molecules and tiny particles in the air, such as nitrogen and oxygen. Blue light is scattered more effectively than other colors because its shorter wavelength allows it to interact with smaller molecules. This scattered blue light is then detected by our eyes, making the sky appear blue to us.

>>> Who Proposed the theory of general relativity?
The theory of General Relativity was proposed by Albert Einstein in 1915. It unified Newton's law of gravity with special relativity and revolutionized our understanding of the universe. Einstein's theory describes gravity as a curvature of spacetime caused by mass and energy, rather than a force acting between objects. This theory has been confirmed by numerous experiments and observations and remains one of the fundamental pillars of modern physics.

>>> What is the chemical formula of water and what do its atoms represent
The chemical formula for water is H2O. In this formula, H represents hydrogen and O represents oxygen. Each molecule of water contains two hydrogen atoms bonded to one oxygen atom. The atoms in a water molecule are represented as follows:

Hydrogen (H) has 1 proton, 1 electron
Oxygen (O) has 8 protons, 8 electrons, and shares 2 extra electrons with neighboring hydrogen atoms.

The structure of the water molecule is bent or V-shaped due to the strong polar bond between the oxygen and hydrogen atoms. This polarity makes water a unique liquid that can dissolve many substances and play a crucial role in life on Earth, as well as in numerous chemical reactions and processes.

>>> Name the three states of matter and give an example of each
The three states of matter are solid, liquid, and gas.

1. Solid: A solid is a state of matter that has a definite shape and volume. It cannot be compressed or decompressed easily. An example of a solid is a block of ice.
2. Liquid: A liquid is a state of matter that has a definite volume but takes the shape of its container. It can flow, and its molecules are close together but not as tightly packed as in solids. Water in a glass is an example of a liquid.
3. Gas: A gas is a state of matter that has neither a definite shape nor a definite volume. Its molecules are widely separated from one another and move freely in all directions. An example of a gas is air, which you can see around you right now.
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### Llama3

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PS C:\Windows\System32> ollama run llama3
>>> What is speed of light in vacuum?
A classic question!

The speed of light in a vacuum, denoted by c, is a fundamental constant in physics and is approximately equal to:

c = 299,792,458 meters per second (m/s) or 186,282 miles per second (mi/s)

This speed is a universal limit for the transmission of information, and it's the same for all observers, regardless of their relative motion. It's a cornerstone of modern physics, particularly in Einstein's theory of special relativity.

Note that this value is exact, as it's been experimentally confirmed to a very high degree of accuracy.

>>> Explain why the sky is blue.
The color of the sky! It's one of the most fascinating and awe-inspiring sights in our daily lives. So, let's dive into the science behind why the sky appears blue!

**Scattering of Light**

When sunlight enters Earth's atmosphere, it encounters tiny molecules of gases like nitrogen (N2) and oxygen (O2). These molecules scatter the light in all directions, but they don't scatter all wavelengths of light equally. Instead, they scatter shorter (blue) wavelengths more than longer (red) wavelengths.

This phenomenon is known as Rayleigh scattering, named after the British physicist Lord Rayleigh, who first described it in the late 19th century. The shorter wavelengths, like blue and violet, are scattered more because they have a higher frequency and are therefore more easily deflected by the small molecules.

**Blue Light Dominance**

As sunlight travels through the atmosphere, the blue light is scattered in all directions, reaching our eyes from all parts of the sky. This scattered blue light is what makes the sky appear blue to us! The other colors, like red and orange, are not scattered as much and continue to travel in a more direct path to our eyes.

**Atmospheric Conditions**

The color of the sky can be influenced by atmospheric conditions, such as:

1. **Dust and water vapor**: Tiny particles in the air can scatter light, making the sky appear more hazy or orange.
2. **Clouds**: Clouds can reflect and scatter sunlight, changing the apparent color of the sky.
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2. **Clouds**: Clouds can reflect and scatter sunlight, changing the apparent color of the sky.  
 3. **Pollution**: Air pollution can increase the amount of particles in the air, scattering blue light and turning the sky more gray.

**Blue Skies at Sunrise and Sunset**

During sunrise and sunset, the sun appears orange or reddish because the shorter wavelengths (blue and violet) have been scattered away by the atmosphere. This leaves mainly longer wavelengths (red, yellow, and orange) to reach our eyes, giving the sky its warm, golden hue.

In summary, the blue color of the sky is due to the scattering of sunlight by tiny molecules in the atmosphere, with shorter wavelengths (blue) being scattered more than longer wavelengths (red). This phenomenon is known as Rayleigh scattering.

>>> Who Proposed the theory of general relativity?  
 A question that takes us back to the world of physics and one of its most brilliant minds!

The theory of General Relativity was proposed by Albert Einstein in 1915. At the time, Einstein was a professor at the University of Berlin and was working on a new understanding of gravity.

**The Problem with Newton's Law**

Sir Isaac Newton had described gravity as a force that acts between two objects, with the strength of the force depending on their mass and distance from each other. However, this law didn't account for several phenomena, such as:

- Gravitational redshift**: The wavelength of light emitted by stars in strong gravitational fields appears shorter than expected.
- Bending of light**: The path of light is affected by the curvature of spacetime around massive objects.

Einstein recognized that these issues were due to the limitations of Newton's Law and set out to develop a new theory that would unify gravity, electromagnetism, and special relativity (which he had introduced in 1905).

**The Theory of General Relativity**

In his paper "Die Grundlage der allgemeinen Relativitätstheorie" (The Foundation of the General Theory of Relativity), Einstein proposed that:

- Gravity is not a force**: Instead, it's a curvature of spacetime caused by the presence of mass and energy.
- Spacetime is flexible**: Mass and energy warp spacetime, causing objects to move along geodesic paths (shortest possible routes) rather than being pulled by an invisible force.

This theory revolutionized our understanding of gravity, black holes, cosmology, and the behavior of celestial bodies. It also led to a deeper understanding of the nature of space and time itself!

Einstein's work on General Relativity earned him numerous accolades, including the Nobel Prize in Physics in 1921 (for his explanation of the

>>> What is the chemical formula of water and what do its atoms represent  
 A refreshing question!

The chemical formula for water is H<sub>2</sub>O.

Let's break it down:

- \* **H**\* represents hydrogen atoms. In this case, there are two hydrogen atoms (H<sub>1</sub> and H<sub>2</sub>).
- \* The number 2 in front of the "H" indicates that there are two hydrogen atoms.
- \* **O**\* represents an oxygen atom.

So, the chemical formula H<sub>2</sub>O tells us that one molecule of water consists of:

- \* Two hydrogen atoms (H)
- \* One oxygen atom (O)

In other words, a single molecule of water has two tiny hydrogen atoms bonded to a larger oxygen atom. This unique combination gives water its essential properties and allows it to play such a crucial role in our planet's ecosystems!

Fun fact: Water is often referred to as the "universal solvent" because it can dissolve an incredibly wide range of substances, from salts and minerals to sugars and acids. Its versatility makes it an essential component of many biological processes!

>>> Name the three states of matter and give an example of each  
 A question that gets to the heart of what matters!

The three main states of matter are:

- Solid**: A state where particles are closely packed, with a fixed position in space.  
 \* Example: A rock or a piece of ice.
- Liquid**: A state where particles are close together but can move freely past each other.  
 \* Example: Water, juice, or oil.
- Gas**: A state where particles are widely spaced and can move freely in any direction.  
 \* Example: Air (the mixture of gases that surrounds the Earth), helium, or hydrogen.

These three states of matter are the foundation of our understanding of the physical world, and they're essential for describing many natural phenomena!

Fun fact: Did you know that there's a fourth state of matter, called **plasma**? It's a high-energy state where atoms or molecules are ionized, meaning they've lost their electrons to become charged particles. Examples include lightning, stars, and plasma TVs!

قابل مشاهده است که در مقام مقایسه به مراتب مدل Llama3 در جواب دادن به سراغ جوابهای طولانی تر و کامل تر می‌رود و همچنین این مورد که در سوال آخر به حالت ماده پلاسما هم اشاره می‌کند و به نحوی سوال پرسیده شده را هم اصلاح می‌کند حائز اهمیت است.

دما رندومنس را تنظیم می‌کند و مقدار تصادفی بودن را،  $\text{top-k}$  برای نمونه برداری از  $k$  توکن برتر است. و  $\text{top-p}$  برای توکن‌هایی است که مجموع احتمال آن‌ها از  $\text{top-p}$  بیشتر باشد. کوآنتیزاسیون هم با کاهش اعداد شناور در مدل‌ها باعث کاهش حجم و فضای مدل میشه. به دلیل نداشتن حافظه کافی نتوانستم مدل‌های مختلفی با کوآنتیزاسیون مختلف و یا پارامترهای مختلف را درست کنم و تست کنم.