# 大学英语 3

## College English 3

**DUT** 开发区校区

大学英语 3 教学团队

# Chapter 1_ 6G technology

## 1.1 Text reading

*Read the text below and answer the questions below.*

1) Which of the followings is NOT the characteristic of 6G technology?
A. High fidelity
B. High frequency
C. Low energy
D. Low latencies

2) What is the speed of chip-to-chip communication?
A. 100 Gbps or more
B. 150 Gbps or more
C. 200 Gbps or more
D. 250 Gbps or more

3) What can NOT be realized in the "high-fidelity holographic society"?
A. Remote surgeries
B. Remote education
C. Remote repair
D. Remote dining

*Text:*

### Study: 6G's Haptic, Holographic Future?

*Possibilities and challenges for future 6G communications networks*

By Payal Dhar

1. Imagine a teleconference but with holograms instead of a checkerboard of faces. Or envision websites and media outlets across the Internet that allow you to make haptic connections. Researchers studying the future of sixth-generation (6G) wireless communications are now sketching out possibilities—though not certainties—for the kinds of technologies a 6G future could entail.

2. Sixth-generation wireless technology—says Harsh Tataria, a communications engineering lecturer at Lund University, Sweden—will be characterized by low latencies and ultrahigh frequencies, with data transfer speeds potentially hitting 100 Gbps. Tataria, along with colleagues from Lund University, Spark New Zealand, University of Southern California (USC), and King's College London, recently published a paper in *Proceedings of the IEEE*, presenting a holistic, top-down view of 6G wireless system design. Their study began by

considering the challenges and technical requirements of next-generation networks—and forecasting some of the technological possibilities that could be practically realizable within that context.

3.  Such future-casting is to be expected as 5G deployment picks up speed around the world, at which point subsequent generations of wireless technologies come more into focus. Tataria calls this "a natural progression," to look at the emerging trends in both technology and consumer demands. "When we look at 6G, we're really looking at vastly connected societies," he says, "even a step beyond what 5G is capable of doing, such as real-time holographic communications."

4.  The study outlines what it calls a "high-fidelity holographic society," one in which "Holographic presence will enable remote users to be represented as a rendered local presence. For instance, technicians performing remote troubleshooting and repairs, doctors performing remote surgeries, and improved remote education in classrooms could benefit from hologram renderings." The authors note that 4G and expected 5G data rates may not enable such technologies—but that 6G might—owing to the fact that "holographic images will need transmission from multiple viewpoints to account for variation in tilts, angles, and observer positions relative to the hologram."

5.  Even simple phone conversations could involve new levels of multimedia-rich experience. "For example, in this interview…we could be talking to the rendered presence of each other," says Mansoor Shafi, another study co-author. "And that would provide a much richer experience than the audio call we are having at the moment."

6.  Another promising possibility the study teases involves what they call a haptic Internet. "We believe that a variety of sensory experiences may get integrated with holograms," the authors write. "To this end, using holograms as the medium of communication, emotion-sensing wearable devices capable of monitoring our mental health, facilitating social interactions, and improving our experience as users will become the building blocks of networks of the future."

7.  Mischa Dohler, another co-author, believes that 6G will consolidate the "Internet of skills" or the ability to transmit skills over the internet. "We can do it with audio and video, but we can't touch through the Internet…or move objects." The consolidation of edge computing, robotics, AI, augmented reality and 6G communications will make this possible, he says. "This next generation Internet…will democratize skills the very same way as the Internet has democratized information."

8.  Molisch also hopes that 6G will bring better chip-to-chip communication. "As we go to 200 Gbps or more…the cable connections are just not able to keep up," he says. "As we are [moving] to higher data rates, higher processing speeds…wireless links are one way in which this bottleneck can be overcome." This also means increased reliability as wireless connections are not impacted by shaking or vibration, and lower costs because replacing cables "might be more expensive than just putting in wireless transceivers on to the chips."

9.  Other use cases mentioned in the paper involve what they call extremely high-rate "information showers"—hotspots where one can experience terabits-per-second data transfer rates—mobile edge computing, and space-terrestrial integrated networks. But, as Molisch cautions, "There is still a lot of research that needs to be done…before the actual standardisation process can start."

10. With 6G going up to terahertz frequencies, there will be tremendous challenges in building new hardware as well, the researchers say. Better semiconductor technologies will also be needed for faster devices. Other challenges remain as well, including power consumption.

11. With frequency bands moving up in the hundreds of gigahertz, "even fundamental things like circuits and substrates to develop circuits are extremely tricky," says Tataria. "So getting all those things right, and going from the fundamental-level details all the way up to building a system is going to be substantially harder than what it first came across." Their study, therefore, attempts to explore the trade-offs involved in each futuristic technology.

12. As the authors point out, this study is not a comprehensive or definitive account of 6G's capabilities and limitations—but rather a documentation of the research conducted to date and the interesting directions for 6G technologies that future researchers could pursue.

## 1.2 Synonyms

*Read the article and find synonyms for the words or expressions in the box.*

| Defining words | Word in text | Part of speech | Paragraph number |
|---|---|---|---|
| Relating to or involving the sense of touch | | adj. | 1 |
| Considering a whole thing or being to be more than a collection of parts | | adj. | 2 |
| Happening or coming after something else | | adj. | 3 |
| Computing process using colour and shading in order to make it appear solid and three-dimensional. | | n. | 4 |
| Showing signs of being good or successful | | adj.. | 6 |
| To watch, keep track of ,or check usually for a special purpose. | | v. | 6 |
| Make something accessible to everyone | | v. | 7 |
| A continuous shaking movement or feeling | | n. | 8 |
| A device which transmits and receives radio or electronic signals | | n. | 8 |
| The outside limit of an object, a surface or an area; the part furthest from the center | | n. | 9 |

# 1.3 Terminology

*Read the article and find the English technical terms according to the Chinese equivalents.*

| English technical terms | Chinese equivalents |
|---|---|
|  | 实时全息通信 |
|  | 渲染技术 |
|  | 无线收发器 |
|  | 移动边缘计算 |
|  | 集成网络 |
|  | 触觉互联网 |

# 1.4 Collocation

**1.4.1 *What are the common verbs and adjectives that go with the n. "skill"? Complete the sentences with the verbs or adjectives in the box, so that they form appropriate collocations with the n. "skill".***

consummate; harness; sharpen; master; demonstrate; lack; practical; technical; particular; transferrable

(1) The manager must _____ the skills of the worker to firm objectives.
(2) With _____ skill, she steered the conversation away from any embarrassing subjects.
(3) She attends regular training weekends to _____ her skills.
(4) The lessons aim to help children to _____the skills necessary to live in the society.
(5) I guess they needed to _____ some skills to achieve that!
(6) Leaders who_____ skills will be coached.
(7) A_____ skills based approach is often really appreciated.
(8) The method to successful online presence requires considerable _____ skill.
(9) Management is a _____ skill that involves guiding people with different motivations in the same direction.
(10) _____ skills are your secret weapon for your job interviews.

**1.4.2 *Complete the collocation bubbles for the n. "skill" based on the above exercise. Think of***

*more verbs that form collocations with "skill" and write your answers in the bubble.*

   *1) v. + "skill"*
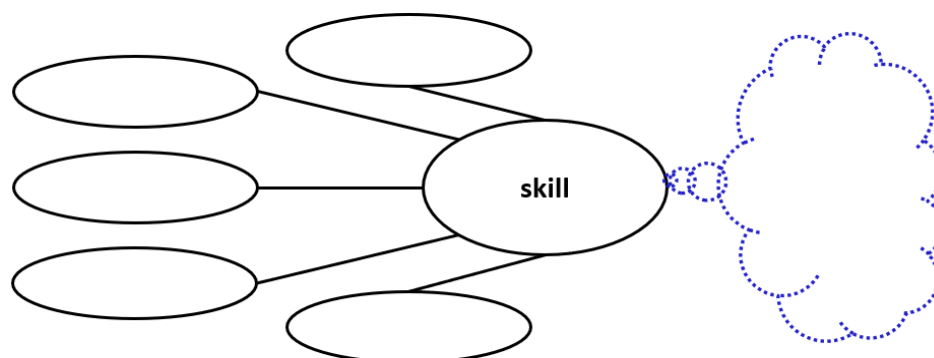


   *Complete the collocation bubbles for the n. "skill" based on the above exercise. Think of more adjectives that form collocations with "skill" and write your answers in the bubble.*

   *2) adj.+ "skill"*
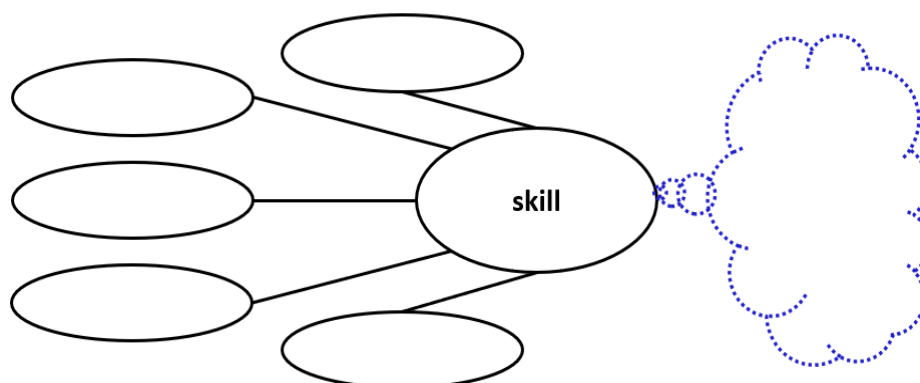


**1.4.3** *Translate the sentences below from Chinese to English using "skill" and its collocations in this section.*
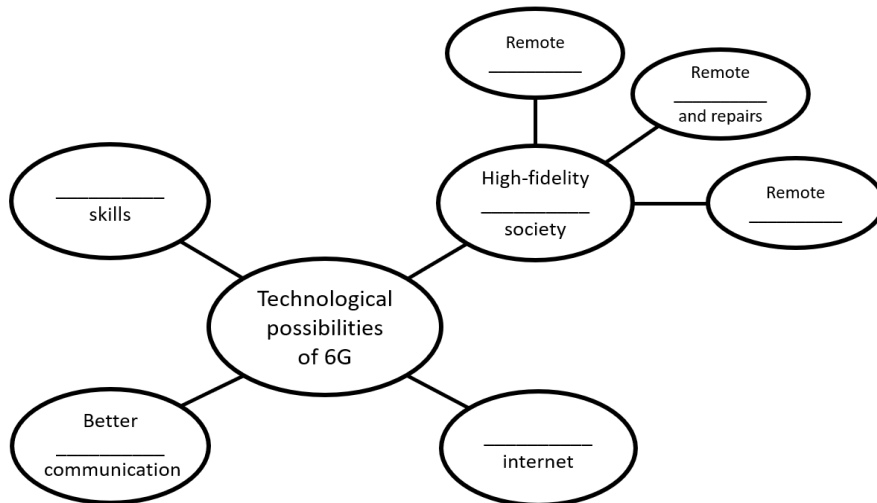
(1) 他不具备永久担任这两个职位中任何一个的的技能。

_____

(2) 编程是软件工程师必备的技能之一。

_____

(3) 我们的实习生获得有用的技能和能力，为将来的就业机会做准备。
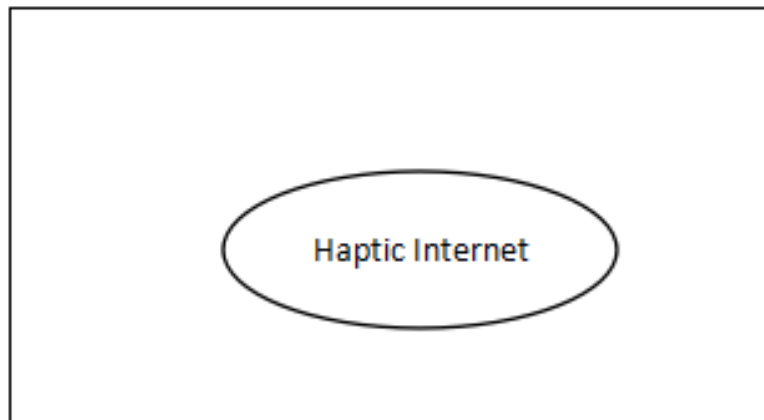
_____

(4) 自动化减少了人们练习人际交往技巧的机会。

_____

(5) 技术技能和专业技能与创造性和概念性思维一起培养。

_____

# 1.5 Idea Exploration

*1.5.1 Identify the information in the article that could be added to the mind map.*



*1.5.2 Create a mind map by yourself based on the key word below.*

# Chapter 2_ 2nm Chips

## 2.1 Text reading

*Read the text below and answer the questions below.*

1) In what way does IBM outdo Samsung and TSMC?
A. By using 7-nm based chips.
B. By introducing 2-nm Node Chip.
C. By using FinFet technology.
D. By introducing three-sided gates.

2) What are the breakthrough developments in enabling 2-nm node chips?
A. The use of BDI to produce 12-nm gate lengths.
B. The application of EUV patterning to the FEOL.
C. The solutions to the interconnect issues.
D. The development of Multi-VT scheme for SoC and HPC applications.

3) Which of the following statements are TRUE about 2-nm node chip?
A. It could reduce the carbon footprint of data centers.
B. It will prolong the cell phone battery life.
C. It will provide faster object detection for autonomous cars.
D. It will require users to charge their devices very night.

*Text:*

### IBM Introduces the World's First 2-nm Node Chip

*New chip milestone offers greater efficiency and performance*

By Dexter Johnson

1.  IBM has become the first in the world to introduce a 2-nanometer (nm) node chip. IBM claims this new chip will improve performance by 45 percent using the same amount of power, or use 75 percent less energy while maintaining the same performance level, as today's 7-nm-based chips. To give some sense of scale, with 2-nm technology, IBM could put 50 billion transistors onto a chip the size of a fingernail.

2.  The foundation of the chip is <u>nanosheet technology</u> in which each transistor is made up of three stacked horizontal sheets of silicon, each only a few nanometers thick and completely surrounded by a gate. Nanosheet technology is poised to replace so-called FinFet technology named for the fin-like ridges of current-carrying silicon that project from the chip's surface. The life expectancy of FinFet has been more or less set at the 7-nm node. If it were to go any

smaller, transistors would become difficult to switch off: Electrons would leak out, even with the three-sided gates.

3. One can't help but sense a bit of one-upmanship in IBM's development after Taiwan Semiconductor Manufacturing Co. (TSMC) decided to stay with FinFETs for its next generation process, the 3-nanometer node. While IBM's manufacturing partner, Samsung, does plan to use nanosheet technology for its 3-nm node chips, IBM outdid them both by using nanosheets and going down another step to a 2-nm node.

4. To further enable the chip beyond nanosheets, IBM has used bottom dielectric isolation (BDI) to produce 12-nm gate lengths, a feature representing a first in the industry. BDI involves the introduction of a dielectric layer underneath both the source and drain gate regions. The benefits of implementing a full BDI scheme is to reduce sub-channel leakage, immunity to process variation and power-performance improvement.

5. Another first for these chips was IBM's application of extreme-ultraviolet lithography (EUV) patterning to the front-end-of-line (FEOL) where the individual devices (transistors, capacitors, resistors, etc.) are patterned in the semiconductor. After a decade of hand-wringing over whether EUV would ever deliver on its promises, it has in the last few years become a keystone for enabling 7-nm chips. Now, in this latest step in its evolution, EUV patterning has made it possible for IBM to produce variable nanosheet widths from 15-nm to 70-nm.

6. IBM has also developed a multi-threshold-voltage (Multi-VT) scheme for both system-on-a-chip (SoC) and high-performance computing (HPC) applications. Threshold voltages—also known as gate voltages—are the minimum voltage differential needed between a gate and the source to create a conducting path between the source and drain terminals. Multi-VT schemes leverage gates with different thresholds to optimize for power, timing, and area constraints.

7. While these all represent breakthrough developments in enabling 2-nm node chips, it does raise the question of interconnect crowding. In a press conference this week, Mukesh Khare, vice president of Hybrid Cloud at IBM Research in Albany, NY, addressed this question by explaining that this latest announcement is focused primarily on the transistor. According to Khare, the transistor is critical to address questions of scale, especially in scaling the gate length and the power and performance. However, he was quick to acknowledge the importance of interconnect issues.

8. "Interconnect scaling is equally important as the transistor," said Khare. "We are continuing to drive the correct scaling for the interconnects as well. That's part of our full 2-nm technology features."

9. Khare was reticent to discuss the specifics of standard cell library density and SRAM, and only offered that it will likely follow the same bench marking that the industry has been tracking with 7-, 5- to 2-nm nodes.

10. IBM expects this chip design will be the foundation for future systems for both IBM and non-IBM chip players, and the potential benefits of these advanced 2-nm chips will be exponential for today's most advanced semiconductors.

11. The company anticipates that that 2-nm node could potentially reduce the carbon footprint of data centers. It estimates that if every data center changed their servers to 2-nm-based processors, it could save enough energy to power 43 million homes.

12. Closer to most of us is what IBM expects this to do our laptops and portable devices' functions—including quicker processing in applications, easier language translation, and faster 5G or 6G connections.

13. For those who find daily phone charging annoying, 2-nm node chips will quadruple cell phone battery life vs. 7-nm node chips, which the company says could require users to charge their devices only every third or fourth day, rather than every night.

14. IBM also anticipates that this may impact autonomous cars by providing faster object detection and reaction.

15. All of this sounds promising and it may not be that far off. Khare suggested that 2-nm chip modes could be rolling out of fabs as early as 2024.

## 2.2 Synonyms

*Read the article and find synonyms for the words or expressions in the box.*

| Defining words | Word in text | Part of speech | Paragraph number |
|---|---|---|---|
| How well or badly something works | | n. | 1 |
| A small electronic part that controls the flow of electricity | | n. | 1 |
| To make something continue at the same level, standard, etc. | | v. | 1 |
| A material such as glass or porcelain with negligible electrical or thermal conductivity | | n. | 4 |
| The procedure of calculating; determining something by mathematical or logical methods | | n. | 6 |
| The level at which something starts to happen or have an effect | | n. | 6 |
| To make, regulate, measure, or estimate according to some rate or standard | | v. | 7 |
| Something that consists of or comes from a mixture of two or more other things | | n. | 7 |
| Able to be carried or moved easily | | adj. | 12 |
| To expect | | v. | 14 |

## 2.3 Terminology

*Read the article and find the English technical terms according to the Chinese equivalents.*

| English technical terms | Chinese equivalents |
|---|---|
|  | 纳米片技术 |
|  | 底部介电隔离 |
|  | 高性能计算 |
|  | 阈值电压 |
|  | 混合云 |
|  | 便携式设备 |

## 2.4 Collocation

**2.4.1** *What are the common verbs and nouns that go with the n. "performance"? Complete the sentences with the verbs and nouns in the box, so that they form appropriate collocations with the n. "performance".*

> maintain; product; affect; power; detect; scale; optimum; improve; run-time; system

(1) IBM claims this new chip will _____ performance by 45 percent using the same amount of power.

(2) This new chip will use 75 percent less energy while _____ the same performance level, as today's 7-nm-based chips.

(3) This method is usually intended for environments where _____ performance is more important than reliability.

(4) These are irrelevant and don't _____ the performance of the application.

(5) The _____ performance, fuel economy, and exhaust emission of the vehicle engines are improved considerably through the electronic control.

(6) A living example is introduced to demonstrate how to _____ the performance problem of Java software with the aid of the tool developed.

(7) If the simulation results are not matched by the _____ performance, some work needs to be done.

(8) These new materials possibly reduce the cost and improve _____ performance.

(9) Linux _____ performance was not degraded during the long duration of the run.
(10) Energy efficiency is one of the critical parameters to _____ the performance of wireless networks.

**2.4.2 Complete the collocation bubbles for the n. "performance" based on the above exercise. Think of more verbs that form collocations with "performance" and write your answers in the bubble.**

1) + *"performance"*
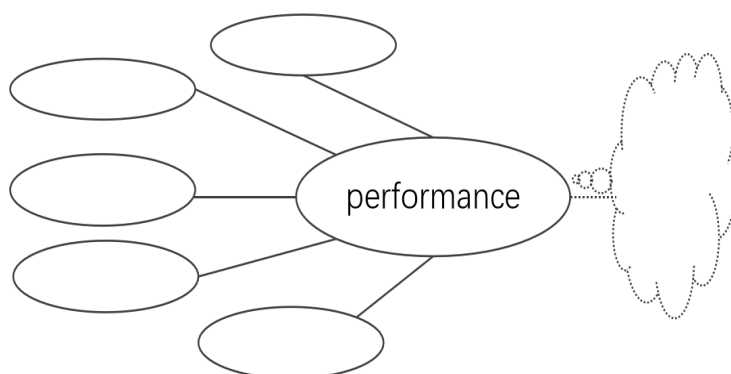


*Complete the collocation bubbles for the n. "performance" based on the above exercise. Think of more nouns that form collocations with "performance" and write your answers in the bubble.*

2) n.+ *"performance"*
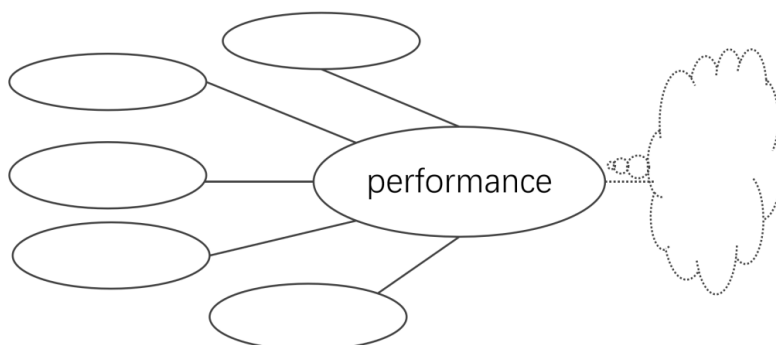


**2.4.3 Translate the sentences below from Chinese to English using "skill" and its collocations in this section.**

(1) 我们设计了一组实验来评估混合模型的性能。

_____
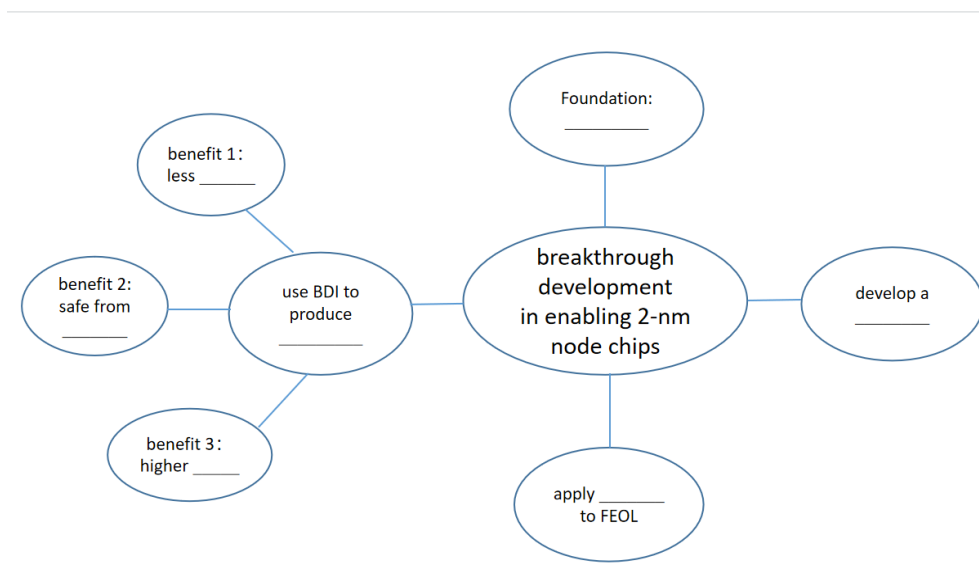
(2) 提取主要的功能码以达到简化协议、增强控制器性能的目的。

_____

(3) 通过利用这些特性，您可以更有效地管理数据，同时提供最佳的数据库性能。
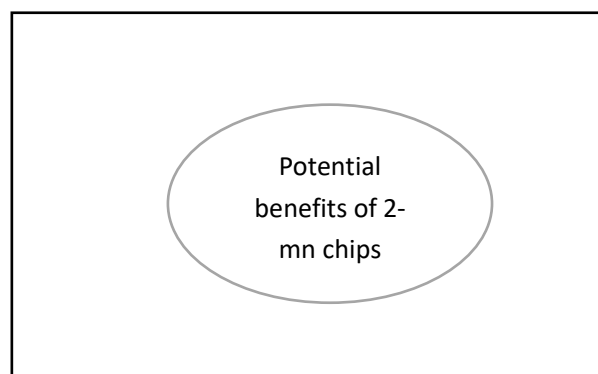
_____

(4) 我们需要解决经常出现的质量问题，这些问题威胁到企业经营业绩。

_____

(5) 该系统将在客户信息记录、售后服务支持和销售业绩分析等方面显示出其强大的功能。

_____

# 2.5 Idea Exploration

### 2.5.1 Identify the information in the article that could be added to the mind map.



### 2.5.2 Create a mind map by yourself based on the key word below.

# Chapter 3_ AI Image Technology

## 3.1 Text reading

*Read the text below and answer the questions below.*

1) To how much pixels of resolution can LostGANs synthesize images compared with prior AI modes?
A. 150 x 150
B. 1920 x 1080
C. 640 x 480
D. 512 x 512

2) What is LostGANs?
A. It is an AI model for image generation.
B. It is developed by two Ph.D. students from Australian university.
C. The paper on LostGANs is published in the journal of IEEE Transaction.
D. Compared with GANs, LostGANs can generate more consistent images when the input layout is reconfigurable.

3) For what scenarios can LostGANs be used to help generate images according to the passage?
A. education
B. online shopping
C. news broadcasting
D. autonomous vehicles

*Text:*

### Harnessing the Wild Power of AI Image Generation

***A layout- and style-based architecture shows how to control AI capabilities to generate complex images***

By Jeremy Hsu

1. AI has already shown off the capability to create photorealistic images of cats, dogs, and people's faces that never existed before. More recently, researchers have been investigating how to train AI models to create more complex images that could include many different objects arranged in different poses and configurations.

2. The challenge involves figuring out how to get AI models—in this case typically a class of deep learning algorithms known as generative adversarial networks (GANs)—to generate more controlled images based on certain conditions rather than simply spitting out any random image. A team at North Carolina State University has developed a way for GANs to create

such conditional images more reliably by using reconfigurable image layouts as the starting point.

3.  "We want a model that is flexible enough such that when the input layout is reconfigurable, then we can generate an image that can be consistent," says Tianfu Wu, an assistant professor in the department of electrical and computer engineering at North Carolina State University in Raleigh.

4.  This layout- and style-based architecture for GANs (nicknamed "LostGANs") came out of research by both Wu and Wei Sun, a former Ph.D. student in the department of electrical and computer engineering at North Carolina State University who is currently a research scientist at Facebook. Their paper on this work was published last month in the journal IEEE Transactions on Pattern Analysis and Machine Intelligence.

5.  The starting point for the LostGANs approach involves a simple reconfigurable layout that includes rectangular bounding boxes showing where a tree, road, bus, sky, or person should be within the overall image. Yet previous AI models have generally failed to create photorealistic and perfectly proportioned images when they tried to work directly from such layouts.

6.  This is why Wu and Sun trained their AI model to use the bounding boxes in the layout as a starting point to first create "object masks" that look like silhouettes of each object. This intermediate "layer-to-mask" step allows the model to further refine the general shape of such object silhouettes, which helps to make a more realistic and final "mask-to-image" result where all the visual details have been filled in.

7.  The team's approach also enables researchers to have the AI change the visual appearance of specific objects within the overall image layout based on reconfigurable "style codes." For example, the AI can generate different versions of the same general wintry mountain landscape with people skiing by making specific style changes to the skiers' clothing or even their body pose.

8.  The results from the LostGANs approach are still not exactly photorealistic—such AI-generated images can sometimes resemble impressionistic paintings with strangely distorted proportions and poses. But LostGANs can synthesize images at a resolution of up to 512 x 512 pixels compared to prior layout-to-image AI models that usually generated lower-resolution images. The LostGANs approach also demonstrated some performance improvements over the competition during benchmark testing with the COCO-Stuff dataset and Visual Genome dataset.

9.  Next step for LostGANs could involve better capturing the details of interactions between people and small objects, such as a person holding a tennis racket in a certain way. One way that LostGANs might improve here would be to use "part-level masks" that represent various components making up an object.

10. But just as importantly, Wu and Sun showed how to train LostGANs more efficiently using fewer labeled conditions without having to sacrifice the quality of the final image. Such semi-supervised training can rely on just 50 percent of the usual training images to bring LostGANs

up to its usual performance standards. The source code and pretrained models of LostGANs are available online at GitHub for any other researchers interested in giving this approach a try.

11. Tech companies and organizations with much deeper pockets than academic labs have already begun showing the potential of harnessing AI-generated images. In 2019, NVIDIA demonstrated an AI art application called GauGAN that can convert rough sketches drawn by human artists into realistic-looking final images. In early 2021, OpenAI showed off a DALL·E version of its GPT-3 language model that can convert text prompts such as "an armchair in the shape of an avocado" into a realistic final image.

12. Still, the LostGANs research has a lot to offer despite not yet achieving as polished image results. By taking the layout-to-mask-to-image approach, LostGANs enables researchers to better understand how the AI model is generating the various objects within an image. Such transparency offered by LostGANs represents an improvement on the typical "black box" approach to many AI models that can leave even experts scratching their heads over how the final image was generated.

13. "For example, if you look at the image and the person doesn't look correct, you can trace it back and see that it's because the mask is not correctly computed," Wu explains. "The mask is better for understanding what's going on in the generated image and also makes it easier to control the image generation."

14. The research could eventually help robots and AI agents to better envision the results of future interactions with objects within their immediate environment. Such image generation based on reconfigurable layouts could also potentially help generate different visual scenarios that could help train autonomous vehicles.

15. And in the near-term, LostGANs could play the role of an educational tool that invites students and other curious learners to interact with AI through setting up a simple image layout. During a departmental open house, an early version of LostGANs attracted the attention of local high school students with its still imperfect AI-generated images

16. "I think that will be fun for those students to play with," Wu says. "Then they can get a rough understanding that 'Oh, this is something where I can interact with an AI system through this simple painting.'"

## 3.2 Synonyms

*Read the article and find synonyms for the words or expressions in the box.*

| Defining words | Word in text | Part of speech | Paragraph number |
|---|---|---|---|
| the particular arrangement or pattern of a group of related things | | n. | 1 |
| a set of mathematical instructions or rules that, especially if given to a computer, will help to calculate an answer to a problem | | n. | 2 |
| able to produce or create something | | adj. | 2 |
| opposing or disagreeing with each other | | adj. | 2 |
| to produce | | v. | 3 |
| shaped like a rectangle | | | 5 |
| a dark shape seen against a light surface | | n. | 6 |
| to make something by combining different things or substances | | v. | 8 |
| to cut or damage a surface or your skin slightly with or on something sharp or rough | | v. | 12 |
| to imagine something that you think might happen in the future | | v | 14 |

## 3.3 Terminology

*Read the article and find the English technical terms according to the Chinese equivalents.*

| English technical terms | Chinese equivalents |
|---|---|
| | 深度学习算法 |
| | 生成对抗网络 |
| | 半监督学习 |
| | 视觉场景 |
| | 对象/物体轮廓 |
| | 矩形边界框 |

# 3.4 Collocation

*3.4.1 scan the text and complete the sentence containing the word "image".*

1) AI has already shown off the capability to _____ images of cats, dogs, and people's faces that never existed before

2) ……how to train AI models to _____ images that could include many different objects……

3) ……to generate more controlled images based on certain conditions rather than simply _____ image.

4) ……. we can _____ an image that can be consistent……

5) …… previous AI models have generally failed to _____ images

6) But LostGANs can _____ images at a resolution of up to 512 x 512 pixels….

7) using fewer labeled conditions without having to sacrifice the quality of the _____ image

8) LostGANs attracted the attention of local high school students with its still imperfect _____ images

*3.4.2 Complete the collocation bubbles for the n. "image"   Think of more verbs that form collocations with "image" and write your answers in the bubble.*

1) *v. + "image"*
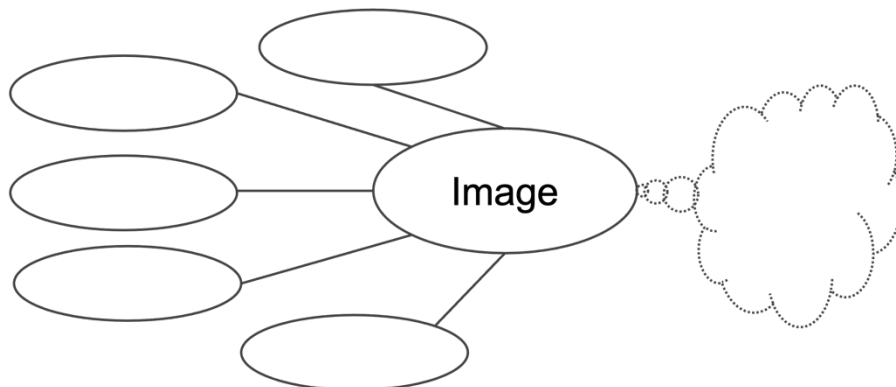


*Complete the collocation bubbles for the n. "image". Think of more adjectives that form collocations with "image" and write your answers in the bubble.*

2) *adj.+ "image"*
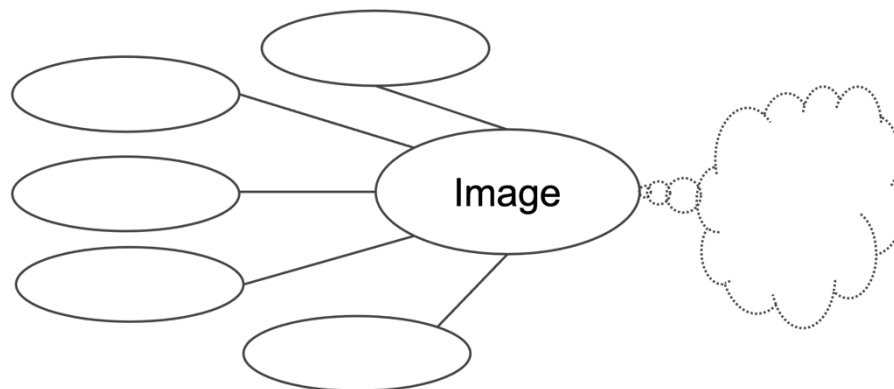
***3.4.3 Translate the sentences below from Chinese to English using "image" and its collocation in this section.***
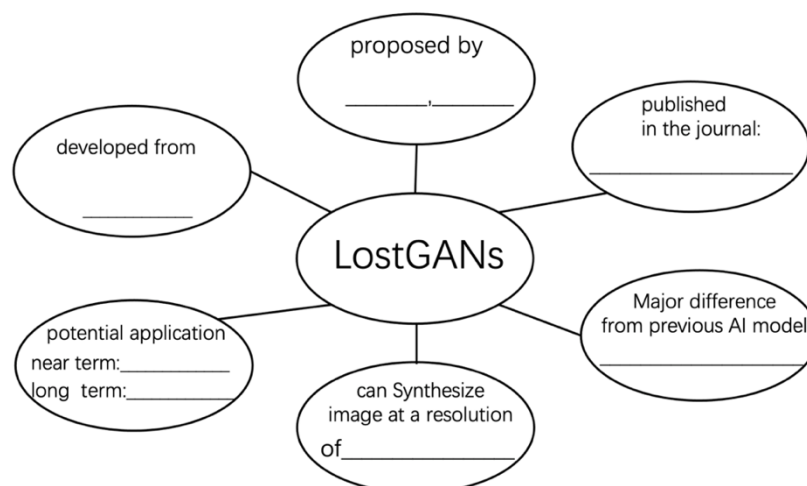
(1) 你可以把这些图像存储在单独的计算机文件夹中。

_____

(2) 这项技术能够显示用于呈现数字图像的像素信息。

_____

(3) 视觉图像正在逐步取代文字。
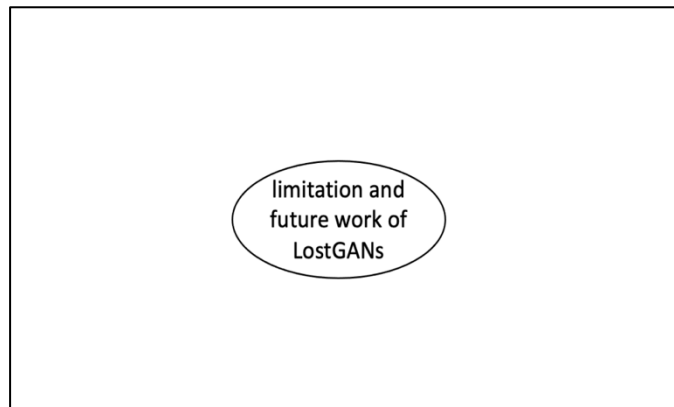
_____

(4) 我画了一个网格，并把它粘贴起来创建图像。

_____

(5) 它还可以被用来从正在运行的安装中生成图像，包括所有数据和应用，用于备份目的。

_____

# 3.5 Idea Exploration

***3.5.1 Identify the information in the article that could be added to the mind map.***



19

*3.5.2 Create a mind map by yourself based on the key word below.*

limitation and future work of LostGANs

# Chapter 4_ Robots

## 4.1 Text reading

***Read the text below and answer the questions below.***

1) What is the PR2 robot NOT capable of?
A. Bringing a bowl
B. Pouring milk into a cup
C. Tossing the milk box into the dishwasher
D. Putting the cereal box back into its storage location

2) How long did the PR2 robots take to complete all the tasks set in the competition?
A. 20 mins
B. 50 mins
C. 70 mins
D. 90 mins

3) How many times did PR2 succeed in the table setting tasks?
A. 1
B. 3
C. 5
D. 7

*Text:*

### It's (Still) Really Hard for Robots to Autonomously Do Household Chores

***Something as simple as breakfast takes this PR2 90 minutes to set up and then clean, and it's not always successful***

By Evan Ackerman

1.  Every time we think that we're getting a little bit closer to a household robot, new research comes out showing just how far we have to go. Certainly, we've seen lots of progress in specific areas like grasping and semantic understanding and whatnot, but putting it all together into a hardware platform that can actually get stuff done autonomously still seems quite a way off.

2.  In a paper presented at ICRA 2021 this month, researchers from the University of Bremen conducted a "Robot Household Marathon Experiment," where a PR2 robot was tasked with first setting a table for a simple breakfast and then cleaning up afterwards in order to "investigate and evaluate the scalability and the robustness aspects of mobile manipulation."

While this sort of thing kinda seems like something robots should have figured out, it may not surprise you to learn that it's actually still a significant challenge.

3.  PR2's job here is to prepare breakfast by bringing a bowl, a spoon, a cup, a milk box, and a box of cereal to a dining table. After breakfast, the PR2 then has to place washable objects into the dishwasher, put the cereal box back into its storage location, toss the milk box into the trash. The objects vary in shape and appearance, and the robot is only given symbolic descriptions of object locations (in the fridge, on the counter). It's a very realistic but also very challenging scenario, which probably explains why it takes the poor PR2 90 minutes to complete it.

4.  First off, kudos to that PR2 for still doing solid robotics research, right? And this research is definitely solid—the fact that all of this stuff works as well as it does, perception, motion planning, grasping, high level strategizing, is incredibly impressive. Remember, this is 90 minutes of full autonomy doing tasks that are relatively complex in an environment that's only semi-structured and somewhat, but not overly, robot-optimized. In fact, over five trials, the robot succeeded in the table setting task five times. It wasn't flawless, and the PR2 did have particular trouble with grasping tricky objects like the spoon, but the framework that the researchers developed was able to successfully recover from every single failure by tweaking parameters and retrying the failed action. Arguably, failing a lot but also being able to recover a lot is even more useful than not failing at all, if you think long term.

5.  The cleanup task was more difficult for the PR2, and it suffered <span style="color:red">unrecoverable failures</span> during two of the five trials. The paper describes what happened:

6.  Cleaning the table was more challenging than table setting, due to the use of the dishwasher and the difficulty of sideways grasping objects located far away from the edge of the table. In two out of the five runs we encountered an unrecoverable failure. In one of the runs, due to the instability of the grasping trajectory and the robot not tracking it perfectly, the fingers of the robot ended up pushing the milk away during grasping, which resulted in a very unstable grasp. As a result, the box fell to the ground in the carrying phase. Although during the table setting the robot was able to pick up a toppled over cup and successfully bring it to the table, picking up the milk box from the ground was impossible for the PR2. The other unrecoverable failure was the dishwasher grid getting stuck in PR2's finger. Another major failure happened when placing the cereal box into its vertical drawer, which was difficult because the robot had to reach very high and approach its joint limits. When the gripper opened, the box fell on a side in the shelf, which resulted in it being crushed when the drawer was closed.

7.  While we're focusing a little bit on the failures here, that's really just to illustrate the exceptionally challenging edge cases that the robot encountered. Again, I want to emphasize that while the PR2 was not successful all the time, its performance over 90 minutes of fully autonomous operation is still very impressive. And I really appreciate that the researchers committed to an experiment like this, putting their robot into a practical environment doing practical tasks under full autonomy over a long period of time. We often see lots of incremental research headed in this general direction, but it'll take a lot more work like we're seeing here for robots to get real-world useful enough to reliably handle those critical breakfast tasks.

## 4.2 Synonyms

*Read the article and find synonyms for the words or expressions in the box.*

| Defining words | Word in text | Part of speech | Paragraph number |
|---|---|---|---|
| independently | | adv. | 1 |
| ductility, expansion | | n. | 2 |
| being powerful or strong | | n. | 2 |
| operation, control | | n. | 2 |
| scenario | | n. | 3 |
| sense, consciousness | | n. | 4 |
| test, experiment | | n. | 4 |
| adjust, regulate | | v. | 4 |
| argument | | n. | 4 |
| increasing, ascending | | adj. | 7 |

## 4.3 Terminology

*Read the article and find the English technical terms according to the Chinese equivalents.*

| English technical terms | Chinese equivalents |
|---|---|
| | 鲁棒性 |
| | 运动规划 |
| | 优化 |
| | 抓取轨迹 |
| | 自动化操作 |
| | 增量研究 |

# 4.4 Collocation

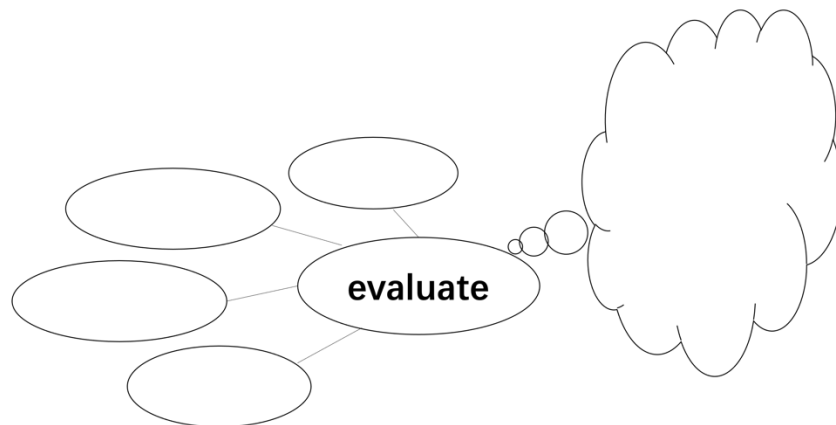**4.4.1 *Complete the sentences with the adverbs in the box, so that they form appropriate collocations with the verb "evaluate".***

| |
|---|
| quantitatively    constantly    critically    independently |

(1) Students need to reflect on and _____ evaluate their own work.

(2) The trial is now being evaluated _____ by the Institute of Human Ageing at Liverpool University.

(3) These schemes will be _____ evaluated regarding, for example, effect, costs, maintenance, and visual impact.

(4) We are _____ evaluating and updating our IT training courses and would like to hear from you.

**4.4.2 *Complete the collocation map for the verb "evaluate" based on the above exercise. Think of more adverbs that form collocations with "evaluate" and write your answers in the bubble.***

*1) Adv. + "evaluate"*



**4.4.3 *What are the common nouns that go with the verb "evaluate"? Complete the following sentences with the English translations.***

(1) Experienced mentors evaluate _____ (教学表现) of trainees.

(2) You must evaluate _____ (这些资源的影响) on student learning.

(3) The agent evaluates _____ (可能的结果) of pursuing each possible course of

(4) action.

(5) An experimental study is planned to evaluate _____ (可行性) of these

(6) techniques.

(7) The task is to analyze and evaluate _____ (证据) and then draw and justify

(8) conclusions.

(9) We need to understand and critically evaluate _____ (数据分析方法) that are proposed.

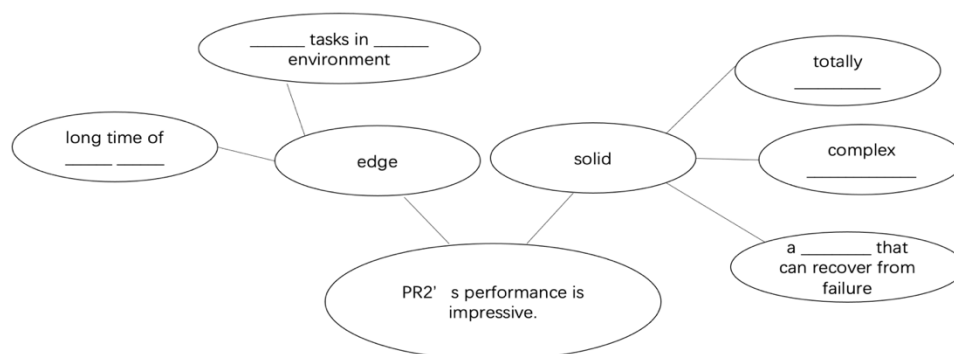(10) These are quick and cost-effective procedures for evaluating _____ (风险和成本) involved in implementing new systems.

**4.4.4 Complete the collocation map for the verb "evaluate" based on the above exercise. Think of more nouns that form collocations with "evaluate" and write your answers in the bubble.**
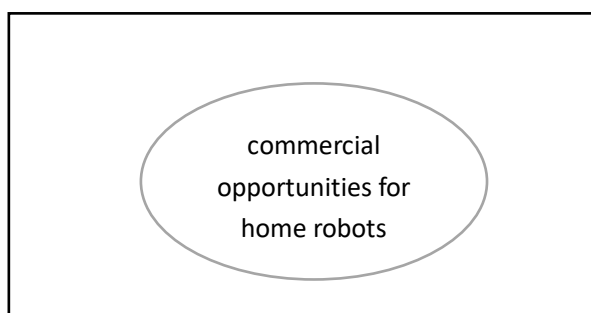
    *2) "evaluate"+ n.*

evaluate
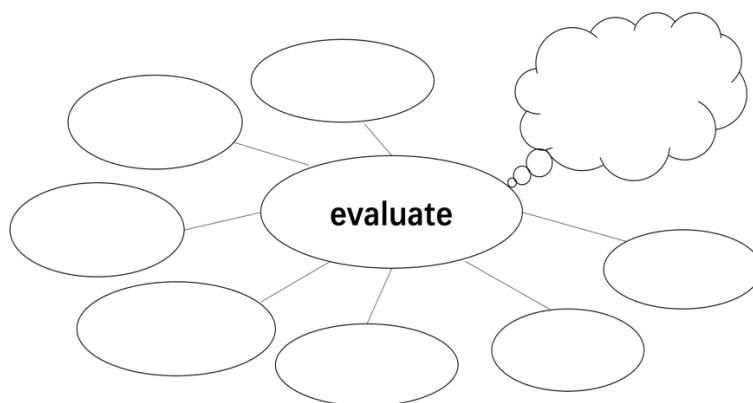
# 4.5 Idea Exploration

**4.5.1 Identify the information in the article that could be added to the mind map.**

_____ tasks in _____ environment

long time of _____ _____

edge

PR2' s performance is impressive.

solid

totally _____

complex _____

a _____ that can recover from failure

**4.5.2 Create a mind map by yourself based on the key word below.**

commercial opportunities for home robots

# Chapter 5_ Electric Vehicles

## 5.1 Text reading

*Read the text below and answer the questions below.*

1) How many sales did Tesla Model 3 make in January, 2020?
A. 36,700
B. 20,000
C. 21,500
D. 36,000

2) What is the drive range for Wuling Hong Guang Mini EV?
A. 2.9 meter
B. 665km
C. 170km
D. 177km

3) What is the starting price for Mini Cooper EV in the US?
A. 20,000
B. 23,245
C. 30,745
D. 37,495

*Text:*

### Most Popular EV is No Longer a Tesla transportation

*PA new EV made by General Motors and Chinese manufacturers underlines the virtues of Lilliputian size*

By Lawrence Ulrich

1. Tesla sales in China more than doubled in 2020, to nearly $6.6 billion, accounting for 21 percent of the company's booming worldwide total. But Tesla no longer makes China's most popular electric car: Meet the tiny Wuling Hong Guang Mini EV, whose equally microscopic price helped it find 36,700 buyers in January. That easily kneecapped the 21,500 sales of the Model 3 sedan, even as Tesla ramps up production at a new plant in Shanghai.

2. The four-passenger Wuling Mini went on sale last July, a joint project between Wuling, General Motors and Chinese state-owned automaker SAIC. The doorstop-shaped city car is just 2.9 meters long, about 0.7 meters shorter than the Chevrolet Spark subcompact that's the smallest car sold in America.

3. With a modest 20 kilowatts (27 horsepower), 85 Nm of peak torque, a 100-kph (62 mph) top speed and 170 km (106 miles) of driving range, the Wuling is no match for a Model 3 in space, tech, range or performance. But the Tesla, which starts for around $36,000 in China, can't touch the Wuling's price: Just $4,500 (RMB 28,800), or $6,000 (RMB 38,800) with a larger, 13.9-kWh battery.

4. A price more in line with motorcycles has made the Mini a best-seller in what's already the world's biggest market (in total sales) for both cars and electrified vehicles. Among 25.1 million cars sold in China in 2020, 5.4 percent were so-called "New Electric Vehicles," a category that includes EVs, hybrids and plug-in hybrids. Since its introduction in late July 2020, the Mini found 200,000 buyers in its first 200 days, according to Irene Shen, head of communications for GM China.

5. The Mini "is tapping into a large consumer base in China, and makes an EV truly affordable for everyone," Shen said.

6. Shorter than even Japan's famous, penny-pinching Kei cars, the Wuling is designed to negotiate tight city streets and tighter parking. Four passengers fit aboard, with room for two 26-inch suitcases or a stroller when rear seats are folded. The Mini can recharge its larger battery in nine hours on China's standard 220-volt, 50-Hertz outlets.

7. Compared with some bargain-basement cars of the past—most notoriously, India's star-crossed Tata Nano—the Wuling seems more engineered to modern standards. GM says 57 percent of the structure is made from high-strength steel. Anti-lock brakes, electronic brake-force distribution, ISOFIX rear child-safety restraints and ultrasonic rear-parking sensors are standard; but not the electronic stability control that's been required on new cars in the U.S. and EU for several years, or an automated emergency braking system. While GM cites "16 rigorous safety tests" for the Wuling, it did not confirm whether the car could meet current crash-test standards in Western nations.

8. Westerners, or Tesla fans, might be tempted to scoff at the Wuling's speck-sized body, glacial acceleration or limited range. But while the Wuling is too small to crack the size-obsessed American market, its philosophy may be instructive; especially for cities and nations looking to "microtransit" as a potential solution to traffic-clogged streets, emissions and urban quality-of-life issues.

9. The Wuling weighs just 665 kilograms (1,466 pounds), which helps it squeeze 170 km of range from just 13.9 kWh of battery.

10. Batteries remain by far the most expensive part of an EV, even as costs for lithium-ion cells have fallen toward $100 per kilowatt hour. Analysts say the battery in a typical electric family sedan can cost between $10,000 and $15,000—roughly double the price of the entire Wuling. So the Wuling creates a virtuous cycle: The smaller and lighter the car, the less battery it needs to deliver a given range. And a smaller battery itself weighs less. That keeps a lid on mass and costs, for automakers and consumers.

11. America, in fact, has an analog for the Wuling: The new electric Mini Cooper SE. In the current EV climate, obsessed with the range race to 300, 400 miles or more, the Mini's 110-mile (177 km) driving range can make it seem as quaint as the Wuling. In some

quarters, short-hop EVs are seen as a dead-end in design and market viability. But look again.

12. The U.K.-based, BMW-owned Mini is a relative giant compared with Wuling's "Mini," including more than twice the curb weight (1,430 kilograms). Accordingly, the Mini Cooper carries more than double the battery to deliver similar official range of 177 kilometers (110 miles), albeit with massively superior power and performance. But in America, the Mini Cooper is the Lilliputian, with attendant advantages: Its 32.6 kWh, 220-kilogram pack is one-third the size of Tesla's largest packs, and one-sixth the size of the brawny, 200-kWh packs that GM will begin stuffing into its longest-range GMC Hummer EV later this year. Setting aside any Muskian advantages in Gigafactory battery costs, the Mini battery should cost one-third the price of Tesla's.

13. It all leads to the Mini being among the slimmest and most affordable EVs in America. The Mini starts from just $30,745, versus $37,495 for the larger-batteried Chevy Bolt, and $39,125 for a Nissan Leaf Plus. Subtract a $7,500 federal tax credit, and the luxurious, sharp-handling Cooper SE falls to $23,245, on par with gasoline econoboxes like the Toyota Corolla. Incentives in California and other states can push the price closer to $20,000, making the Mini a potential electric steal.

14. Light makes right in another way: In my testing in Miami and New York, the Mini proved it can easily top its official EPA ratings, covering closer to 210 kilometers (130 miles) in real-world drives. Again, that doesn't sound like much for interstate trips. But for everyday errands or school drop-offs—or in cities that may look to tax or even ban combustion-engine cars—130 miles is more than enough for days of local driving. And EV skeptics consistently fail to acknowledge that owners plug in daily or nightly at work or home. They wake up to a car with maximum range fully restored, and never visit a gas station again.

15. Mini executives underline that, for 78 percent of owners, the Mini is the second, third or even fourth car in the household.

16. The point? For Americans whose driveways are littered with gasoline-burning cars, an EV like the Mini Cooper SE—the closest we may ever get to a speck-sized Wuling—can still make a whole lot of sense.

## 5.2 Synonyms

*Read the article and find synonyms for the words or expressions in the box.*

| Defining words | Word in text | Part of speech | Paragraph number |
|---|---|---|---|
| extremely small and difficult or impossible to see without a microscope | | adj. | 1 |
| shoot (someone) in the knee or leg as a form | | v. | 1 |

| | | | |
|---|---|---|---|
| of punishment | | | |
| bolster or strengthen | | v. | 1 |
| to be well-known for something bad | | adv. | 7 |
| to talk about sb/sth in a way that makes it clear that you think they are stupid or ridiculous | | v. | 8 |
| to no longer be able to function normally because of pressure | | v. | 8 |
| to get liquid out of sth by pressing or twisting it hard | | v. | 9 |
| behaving in a very good and moral way | | adj. | 10 |
| something that decides or limits the way in which something can be done | | n. | 11 |
| although, though, even though, even if | | conj. | 12 |

## 5.3 Terminology

***Read the article and find the English technical terms according to the Chinese equivalents.***

| English technical terms | Chinese equivalents |
|---|---|
| | 峰值扭矩 |
| | 续驶里程 |
| | 防抱死系统 |
| | 电子刹车力分配系统 |
| | 撞击试验 |
| | 空车重量 |

## 5.4 Collocation

**5.4.1 *What are the common verbs that go with "account"? Choose the verbs from the box below to complete the sentences with appropriate expressions formed together with the word "account".***

keep;   settle;   open;   take;   give;   provide

(1) If you are trying to _____ a second account under the same name, or using the same credit card, you will not be allowed to.
(2) Know thy ideal, and live to that. For, each soul must _____ account for its own self.
(3) You are expected to _____ account with this company.
(4) I can't _____ account of the new books I bought this year.
(5) The company is able to _____ account with clean and disinfection consultation.
(6) However, recent researches do not _____account of the economic factor of Internet service provider.t weapon for your job interviews.


**5.4.2** *Complete the collocation map for the noun "account" based on the above exercise. Think of more verbs that form collocations with "account" and write your answers in the bubble.*
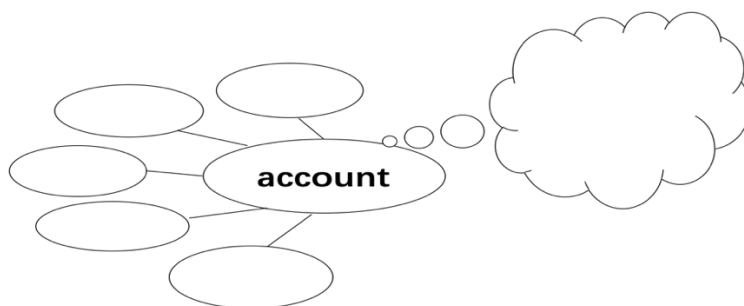



**5.4.3** *What are the meanings of "account" in the following sentences? Translate the underlined part into Chinese, paying special attention to the usages of "account".*
(1) He gave the police a full account of the accident.
_____
(2) Trains from Shanghai may be up to ten minutes late, on account of repairs to the track.
_____
(3) No. APS may also be used for a non- discretionary account upon request of a customer.
_____
(4) On no account must the contents of this document be shown to any other person.
_____
(5) It will be a good test for us to play the Brazilian team and hopefully we can give a good account of ourselves.
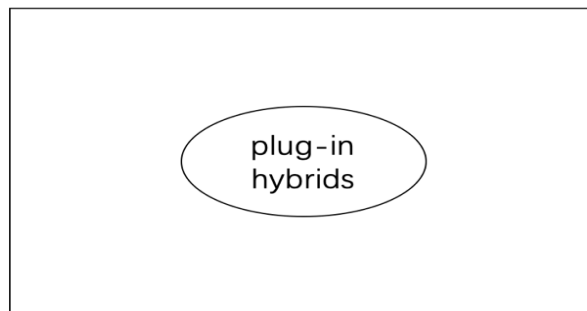_____
(6) The little prince crossed the desert and met with only one flower. It was a flower with three petals, a flower of no account at all.
_____

# 5.5 Idea Exploration

*5.5.1 Identify the information in the article that could be added to the mind map.*
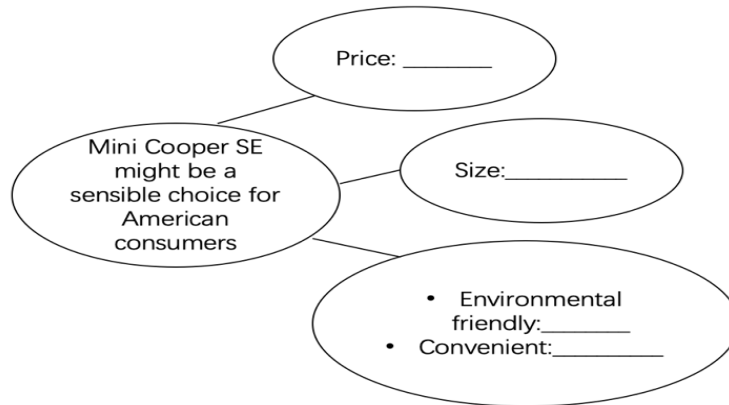


*5.5.2 Create a mind map by yourself based on the key word below.*

# Chapter 6_ Aerospace

## 6.1 Text reading

***Read the text below and answer the questions below.***

1)   How does China ensure the safety of residents in rocket launch areas
A. Calculate the areas in which stages and side boosters fall
B. Build all the spaceports on the coast
C. Issue local warnings in advance
D. Implement evacuation orders in advance

2)   Which rockets were launched on the coast?
A. Long March 5B
B. Long March 7A
C. Long March 8
D. Long March 3B

3)   What did Long March 7A use?
A. relatively clean kerosene
B. liquid oxygen propellant
C. Toxic fuel
D. Oxidizer mix

*Text:*

### China Tries To Solve Its Rocket Debris Problem

***Warnings aren't enough, but reusable rockets might be***

By Andrew Jones

1.   On the morning of 17 June, China launched the first astronauts to its Tianhe space station module, with a Long March 2F rocket sending the crewed Shenzhou-12 spacecraft into orbit.

2.   Overlooked from this major success, however, was that downrange from its Gobi Desert launch site, empty rocket stages fell to ground. As getting to orbit is about reaching velocity high enough to overcome gravity (roughly 7.8 kilometers per second), rockets consist of stages, with tanks and engines optimized for flying through atmosphere dumped to reduce mass once empty. A video posted on the Twitter-like Sina Weibo emerged that seems to show one of these as part of the recovery process, with apparent residual, hazardous propellant leaking from the broken boosters. According to the source, road closures and evacuations allowed a safe clean up.

3. Stunningly, this is not unusual for Chinese space launches. China's three main spaceports were built during the Cold War when security was paramount, with the U.S. and Soviet Union considering the possibility of preemptive strikes on facilities linked to China's fledging nuclear weapon capabilities. Only the Wenchang launch center, established in 2016 for new rockets, is on the coast. As China has been aiming to launch as many as 40 or more times annually in the last few years, the issue is growing, with some stages falling on or near inhabited areas, including close to a school.

4. However where the stages fall and how they are dealt with is not as haphazard as it appears. The areas in which stages and side boosters fall are calculated to avoid major populations, and local warnings and evacuation orders are issued and implemented in advance. The array of amateur footage of falling rocket stages backs up the claim that the events are known and expected. No casualties from these events have so far been reported.

5. Yet this approach is costly, disruptive and not without continued risks and occasional damage.

6. To mitigate and eventually solve the problem, the China Aerospace Science and Technology Corp. (CASC), the country's main space contractor is developing controllable parafoils to constrain the areas in which the stages fall, most recently tested on a Long March 3B launch from Xichang, southwest China, one of China's workhorse launchers, which most frequently threaten inhabited areas. Grid fins, the kind which help guide Falcon 9 rocket core stages to landing areas, have been tested on smaller Long March 2C and 4B launch vehicles.

7. The latter step is part of attempts to develop rockets that can launch, land and be reused like the Falcon 9, thus controlling the fall of large first stages.

8. The Long March 8, which had a debut (expendable) flight in December, is expected to be CASC's first such launcher. Chinese commercial companies including Landspace, iSpace, Galactic Energy and Deep Blue Aerospace, are also working on reusable rockets. Low altitude hop tests are expected this year. Though, as SpaceX has demonstrated in a self-depreciating compilation, landing rockets vertically is no mean feat.

9. Additionally, the Long March 7A rocket, which launches from the coast, is expected to eventually replace the aging Long March 3B rocket for launches to geostationary orbit. As a bonus the 7A uses relatively clean kerosene and liquid oxygen propellant instead of the toxic fuel and oxidizer mix used by the 3B. The Long March 2F used for crewed launches could also be replaced by a Long March 7 or a low-Earth orbit version of a new-generation rocket being developed to eventually send Chinese astronauts to the moon.

10. China has also developed the ability to conduct launches at sea. Its new Long March 5B, which launches from the coast, also has its own particular issue, namely the first stage actually (and unusually) reaching orbit, and returning to Earth wherever and whenever the atmosphere drags it back down.

11. Despite these measures, launching over land and population centers is fraught with risk. The debris issues and events above are when things go well; failures could bring yet greater danger. China's space industry and activities have expanded greatly in recent

decades, including lunar and planetary exploration, human spaceflight, remote sensing, spy, weather and other satellites, as well as a new commercial space sector. Some areas of space operations playing catch up.

# 6.2 Synonyms

*Read the article and find synonyms for the words or expressions in the box.*

| Defining words | Word in text | Part of speech | Paragraph number |
|---|---|---|---|
| the speed at which sth. moves in a particular direction. | | n. | 2 |
| to make something as good as it can be | | v. | 2 |
| the act of removing the contents of something | | n. | 2 |
| having superior power and influence | | adj. | 3 |
| apply in a manner consistent with its purpose or design | | v. | 4 |
| as a hobby but not as a job | | adj. | 4 |
| causing problems, noise, etc. so that sth. cannot continue normally | | adj. | 5 |
| to make sth. less harmful, serious, etc. | | v. | 6 |
| to become less valuable over a period of time | | v. | 8 |
| Pieces of wood, metal, brick, etc. that are left after sth. has been destroyed | | n. | 11 |

# 6.3 Terminology

*Read the article and find the English technical terms according to the Chinese equivalents.*

| English technical terms | Chinese equivalents |
|---|---|
| | 侧置助推器 |
| | 低空跳跃试验 |
| | 对地静止轨道 |

| | 液氧推进剂 |
| --- | --- |
| | 月球和行星探索 |
| | 遥感 |

# 6.4 Collocation

*6.4.1 What are the common nouns and adverbs that go with the v. "develop"? complete the sentences with the nouns and adverbs in the box, so that they form appropriate collocations with the v. "develop".*

Initially   rapidly   fully   jointly   gradually   system   technique   plan   relationship   method

(1)   They develop a romantic _____ and finally marry.
(2)   Back pain can occur suddenly, but more often develops _____ .
(3)   A seed is not a _____ developed plant.
(4)   The PowerPC was_____ developed by Apple, IBM, and Motorola.
(5)   Developing a strategic _____ is essential in digital marketing.
(6)   In recent decades, developmental biologists have been researching and developing _____ to facilitate same-sex reproduction.
(7)   One school is currently developing an activity recording _____ .
(8)   However, some birds have developed _____ for keeping cool.
(9)   Automobiles were _____ developed as self-propelled versions of horse-drawn vehicles.
(10) The brains of young children change and develop _____ .

*6.4.2 Complete the collocation bubbles for the v. "develop" based on the above exercise. Think of more nouns that form collocations with "develop" and write your answers in the bubble.*

  *1)* 〝*develop*〞*+n.*
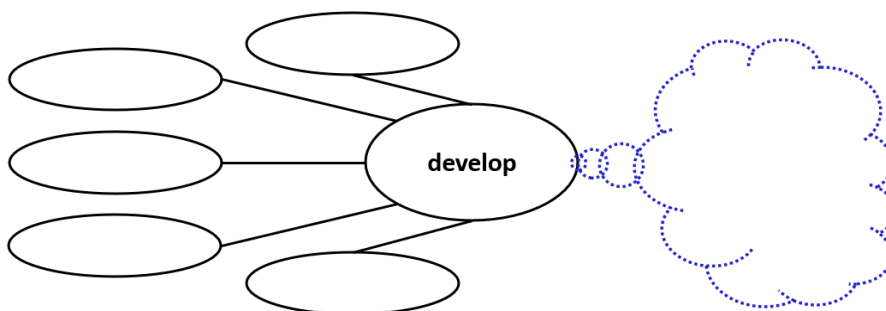
*Complete the collocation bubbles for the v. "develop" based on the above exercise. Think of more adverbs that form collocations with "develop" and write your answers in the bubble.*

*2) adv.+"develop"*
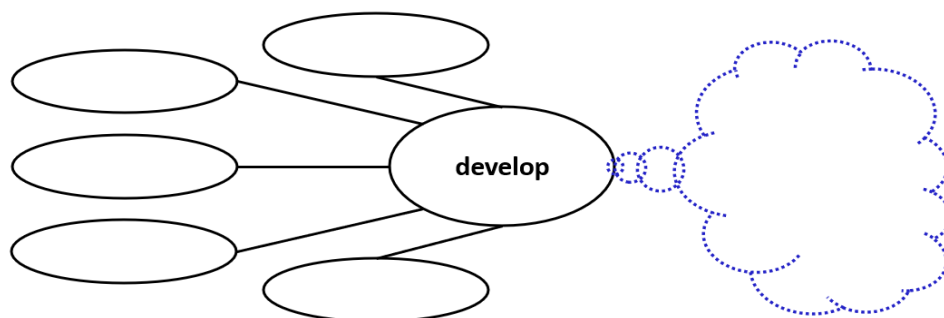


**1.4.3** *Translate the sentences below from Chinese to English using "develop" and its collocations in this section.*
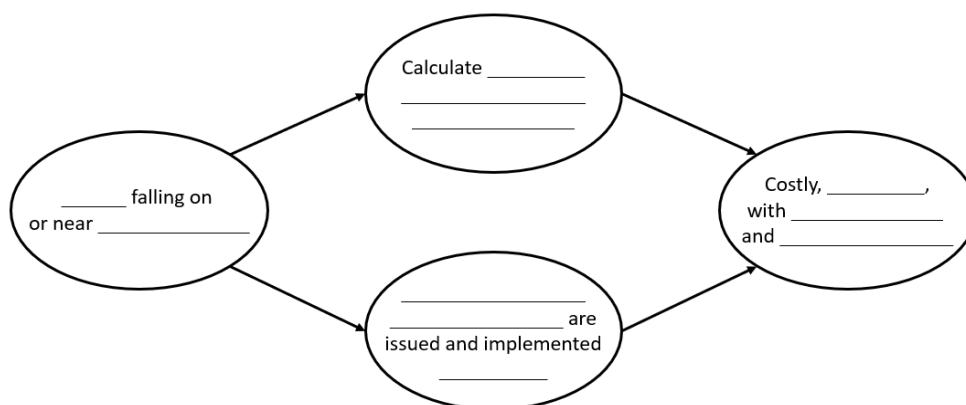
(1) 深色皮肤的人很少得皮肤病。

_____

(2) 培养良好的沟通技巧是另一项重要的职业技能。

_____

(3) 其中一些是最近才发展起来的，而另一些则是早在 20 世纪初就存在了。

_____

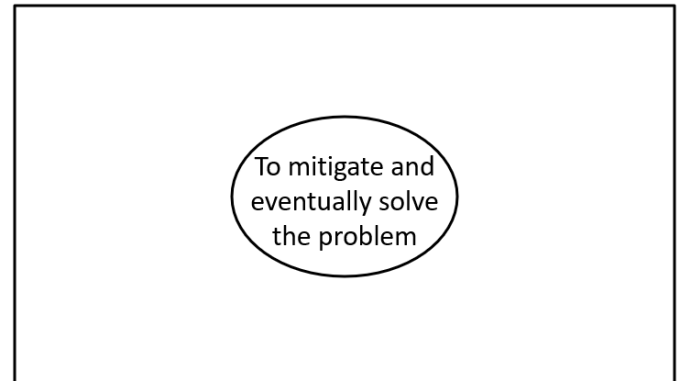(4) 他喜欢开发计算机程序，尤其是通讯工具和游戏。

_____

(5) 为了评估视力，研究人员特别开发了一种低对比度字母眼表。

_____

# 6.5 Idea Exploration

*6.5.1 Identify the information in the article that could be added to the mind map.*

*6.5.2 Create a mind map by yourself based on the key word below.*

To mitigate and eventually solve the problem

# Chapter 7_ Cloud Computing

## 7.1 Text reading

*Read the text below and answer the questions below.*

1)  What consequences of cloud computing development are mentioned in the passage?
A.  It earns a lot of money.
B.  It consumes a lot of energy.
C.  It attracts many companies
D.  It benefits innovation.


2)  What is NOT true about cloud computing according to this passage?
A.  Moore's Law keep the power budget in check as we scaled up our computing resources at earlier time.
B.  The most immediate solution is to process more data at the edge, before it goes into the cloud.
C.  There should be no worry about the situation where computing and power consumption will be strongly coupled as 60 years ago.
D.  Software and hardware engineering will have to consider their design around power efficiency.


*Text:*

### Cloud Computing's Coming Energy Crisis

*The cloud's electricity needs are growing unsustainably*

By Mark Pesce

1.  How much of our computing now happens in the cloud? A lot. Providers of public cloud services alone take in more than a quarter of a trillion U.S. dollars a year. That's why Amazon, Google, and Microsoft maintain massive data centers all around the world. Apple and Facebook, too, run similar facilities, all stuffed with high-core-count CPUs, sporting terabytes of RAM and petabytes of storage.

2.  These machines do the heavy lifting to support what's been called "surveillance capitalism": the endless tracking, user profiling, and algorithmic targeting used to distribute advertising. All that computing rakes in a lot of dollars, of course, but it also consumes a lot of watts: Bloomberg recently estimated that about 1 percent of the world's electricity goes to cloud computing.

3.  That figure is poised to grow exponentially over the next decade. Bloomberg reckons that, globally, we might exit the 2020s needing as much as 8 percent of all electricity to power the future cloud. That might seem like a massive jump, but it's probably a

conservative estimate. After all, by 2030, with hundreds of millions of augmented-reality spectacles streaming real-time video into the cloud, and with the widespread adoption of smart digital currencies seamlessly blending money with code, the cloud will provide the foundation for nearly every financial transaction and user interaction with data.

4. How much energy can we dedicate to all this computing? In an earlier time, we could have relied on Moore's Law to keep the power budget in check as we scaled up our computing resources. But now, as we wring out the last bits of efficiency from the final few process nodes before we reach atomic-scale devices, those improvements will hit physical limits. It won't be long until computing and power consumption will once again be strongly coupled—as they were 60 years ago, before integrated CPUs changed the game.

5. We can't devote the whole of the planet's electricity generation to support the cloud. Something will have to give.

6. We seem to be hurtling toward a brick wall, as the rising demand for computing collides with decreasing efficiencies. We can't devote the whole of the planet's electricity generation to support the cloud. Something will have to give.

7. The most immediate solutions will involve processing more data at the edge, before it goes into the cloud. But that only shifts the burden, buying time for rethinking how to manage our computing in the face of limited power resources.

8. Software and hardware engineering will no doubt reorient their design practices around power efficiency. More code will find its way into custom silicon. And that code will find more reasons to run infrequently, asynchronously, and as minimally as possible. All of that will help, but as software progressively eats more of the world—to borrow a now-famous metaphor—we will confront this challenge in ever-wider realms.

9. We can already spy one face of this future in the nearly demonic coupling of energy consumption and private profit that provides the proof-of-work mechanism for cryptocurrencies like Bitcoin. Companies like Square have announced investments in solar energy for Bitcoin mining, hoping to deflect some of the bad press associated with this activity. But more than public relations is at stake.

10. Bitcoin asks us right now to pit the profit motive against the health of the planet. More and more computing activities will do the same in the future. Let's hope we never get to a point where the fate of the Earth hinges on the fate of the transistor.

*This article appears in the August 2021 print issue as "Cloud Computing's Dark Cloud."*

## 7.2 Synonyms

*Read the article and find synonyms for the words or expressions in the box.*

| Defining words | Word in text | Part of speech | Paragraph number |
|---|---|---|---|
| extremely large | | a. | 1 |
| make lot of money easily | | verb phrase | 2 |
| growing rapidly | | adv. | 3 |
| increase greatly in size or amount | | verb phrase | 4 |
| to squeeze or twist wet material, to apply pressure to compel someone to do something | | verb phrase | 4 |
| throw forcefully | | v. | 6 |
| not existing or happening at the same time. | | adv. | 8 |
| to change the direction of | | v. | 8 |
| to see suddenly | | v. | 9 |
| depend on | | verb phrase | 10 |

## 7.3 Terminology

*Read the article and find the English technical terms according to the Chinese equivalents.*

| English technical terms | Chinese equivalents |
|---|---|
| | TB 级 RAM 和 PB 级存储 |
| | 增强现实眼镜 |
| | 摩尔定律 |
| | 计算资源 |
| | 加密货币 |
| | 工作量证明机制 |

## 7.4 Collocation

**7.4.1** *Scan the text and complete the sentence containing "scale".*

(1) "scale" as a verb:

In an earlier time, we could have relied on Moore's Law to keep the power budget in check as we _____ our computing resources.

(2) "scale" as a noun:

We wring out the last bits of efficiency from the final few process nodes before we reach _____.

**7.4.2** *Use adjectives to complete the collocation bubble for "scale" as a noun.*
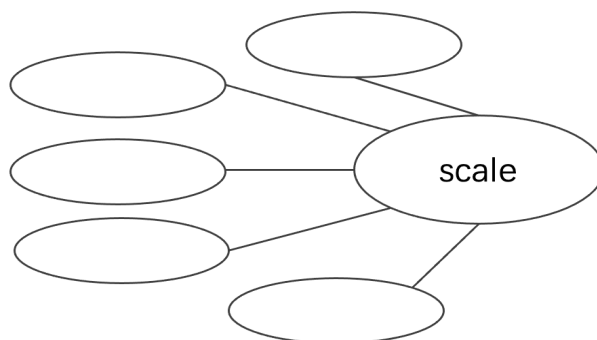


**7.4.3** *Translate the sentences below from Chinese to English using "scale" and its collocation in this section.*
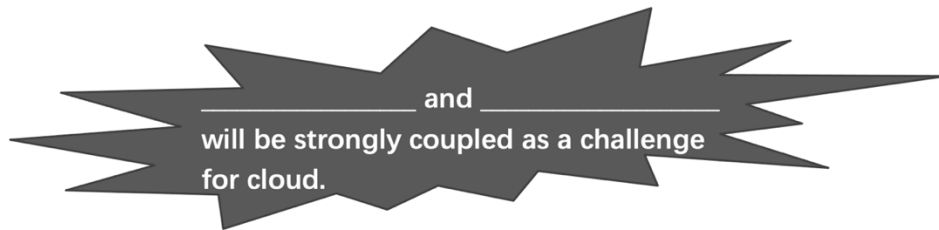
(1) 起初只是小事，但很快就变成了全面战争。

_____

(2) 该公司小规模生产这些计算机组件。

_____

(3) 如果你想在山上行走不迷路，你需要一张大比例尺的地图。

_____

(4) 你能给我一个完成这个项目的时间表吗？

_____

(5) 10 年后，她奋斗到了薪酬的顶端。

_____

## 7.5 Idea Exploration

**7.5.1** *Identify the information in the article that could be added to the mind map.*

_____ and _____
will be strongly coupled as a challenge
for cloud.

**SOLUTIONS and risks:**

1) The most immediate solutions will _____, but
   that only shifts the burden, buying time for _____
   _____ .

2) The other solution is to _____,
   but that will bring on _____ as
   _____.

*7.5.2 Create a mind map by yourself based on the key word below.*

> other SOLUTIONS
> to deal with cloud
> energy crisis
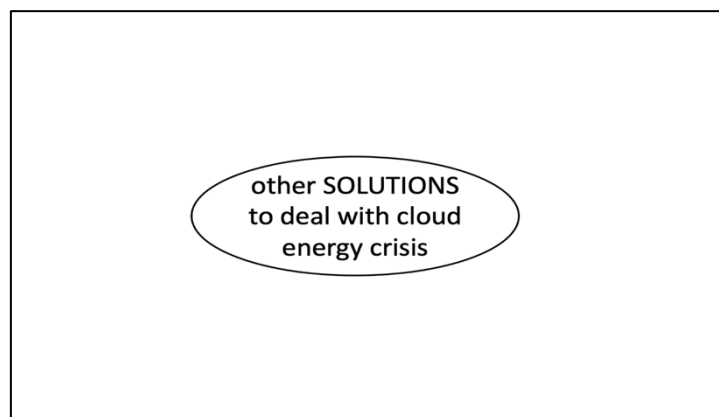
# Chapter 8_ Smart Farm

## 8.1 Text reading

*Read the text below and answer the questions below.*

1) What comes with the digital technology in the era of "smart agriculture"?
A. IoT
B. Big data
C. Network security loopholes
D. Cloud Computing

2) Which of the followings is NOT the goal of Agriculture 4.0?
A. Increased efficiency
B. Powerful data analysis
C. More intelligent automation
D. Greenhouse cultivation

3) What technologies are available to alleviate some of the existing problems?
A. Blockchain
B. Edge computing
C. Artificial Intelligence
D. Network intrusion detectors

*Text:*

### Cybersecurity Report: "Smart Farms" Are Hackable Farms

*Net- and IoT-connected agriculture could help feed 8.5 billion by 2030 — but also may be broadly vulnerable to cybersecurity threats*

By Payal Dhar

1. Some have dubbed this the era of "smart agriculture"—with farms around the world scaling up their use of the Internet, IoT, big data, cloud computing and artificial intelligence to increase yields and sustainability. Yet with so much digital technology, naturally, also comes heightened potential cybersecurity vulnerabilities.

2. There's no scaling back smart agriculture either. By the end of this decade we will need the extra food it produces—with world's population projected to cross 8.5 billion, and more than 840 million people affected by acute hunger. Unless smart agriculture can dramatically increase the global food system's efficiency, the prospect of reducing

global malnutrition and hunger—let alone the ambitious goal of zero hunger by 2030—appears very difficult indeed.

3.  Agriculture 4.0 (as smart ag is also called) aims not just at growing more food but also at increased efficiency, more powerful data analysis, and more intelligent automation and decision-making.

4.  Although smart agriculture has been extensively studied, "the security issues around smart agriculture have not," says Xing Yang from Nanjing Agricultural University in China. Research in the field to date, he adds, has mostly involved applying conventional cybersecurity wisdom to agricultural tech. Agricultural cybersecurity, by contrast, he says, is not given enough attention.

5.  Yang and his colleagues surveyed the different kinds of smart agriculture, as well as the key technologies and applications specific to them. Agricultural IoT applications have unique characteristics that give rise to security issues, which the authors enumerate and suggest countermeasures for. (Their research was published in a recent issue of the journal IEEE/CAA Journal of Automatica Sinica.)

6.  For example, while field agriculture might be subject to threats from damage to the facility, poultry and livestock breeding may face sensor failures, and greenhouse cultivation could face control system intrusions. All of these could result in damage to the IoT architecture, both hardware and software, leading to failure or malfunction in farming operations. Plus, there are threats to data acquisition technologies—malicious attacks, unauthorized access, privacy leaks, and so on—while blockchain technologies can be vulnerable to access control failure and unsafe consensus agreement.

7.  In Yang's opinion, the most pressing security problems in smart agriculture involve the physical environment, such as plant factory control system intrusion and unmanned aerial vehicle (UAV) false positioning. "The network for rural areas is not as good as that of cities," he says, "which means that the network signals in some areas are poor, which leads to…false base station signals."

8.  The researchers also paid extra attention to agricultural equipment as potential security threats, something that recent studies have not done. "Considering that the deployment of IoT devices in farmland is relatively sparse and cannot be effectively supervised, how to ensure the physical security of these devices is a challenge," Yang says. "In addition, the delay caused by long-distance signal transmission also increases the risk of Sybil attacks which is transmitting malicious data through virtual nodes."

9.  In their experiments with solar insecticidal lamps, for instance, they found that the lamp's high voltage pulse affects the data transmission from Zigbee-based IoT devices and data acquisition sensors. Thus, Yang says, to minimize unnecessary losses, it's important to study each device in the context of how it's actually deployed in the field, including the possible safety risks of specific agricultural equipment.

10. The study also summarizes existing security and privacy countermeasures suitable for smart agriculture, including authentication and access control protocols, privacy-preserving frameworks, robust intrusion detection systems, and cryptography and key management. Yang is optimistic that the application of existing technologies—such as edge computing, artificial intelligence and blockchain—can be used to mitigate some of the existing problems. He says that AI algorithms can be developed that might detect the presence of malicious users, while existing industrial security standards can be applied to design a targeted security scheme for agricultural IoT.

11. This represents a significant research challenge, he says, because current datasets used in deep-learning approaches are not based on smart agriculture environments. Therefore, new datasets are required to build network intrusion detectors in a smart agriculture environment. "These new technologies can help the development of smart agriculture and solve some of the existing security problems," Yang says, "but they have loopholes, so they also bring new security issues."

# 8.2 Synonyms

*Read the article and find synonyms for the words or expressions in the box.*

| Defining words | Word in text | Part of speech | Paragraph number |
|---|---|---|---|
| the amount of food produced on an area of land or by a number of animals | | n. | 1 |
| ability to continue for a long time | | n. | 1 |
| being easy to attack or criticize | | n. | 1 |
| greatly and suddenly | | adv. | 2 |
| to name a list of things one by one | | v. | 5 |
| an action taken to prevent another action from having a harmful effect | | n. | 5 |
| the preparation and use of land for growing plants or crops | | n. | 6 |
| having or showing hatred and a desire to harm somebody or hurt their feelings | | adj. | 8 |
| the act of getting something | | n. | 9 |
| entrance by force or without permission or welcome | | n. | 10 |

## 8.3 Terminology

*Read the article and find the English technical terms according to the Chinese equivalents.*

| English technical terms | Chinese equivalents |
|---|---|
|  | 网络安全漏洞 |
|  | 列举对策 |
|  | 恶意攻击 |
|  | 数据采集传感器 |
|  | 温室栽培 |
|  | 入侵检测系统 |

## 8.4 Collocation

**8.4.1** *What are the common nouns that go with the verb "increase"? Complete the following sentences with the Chinese translations.*

(1) The nature of the packing material also can increase _____ (传播疾病的风险）.

(2) Excessive fertilization can not increase the _____ (产量) significantly, but has negative effect on profit.

(3) He predicted that the company could increase _____ (利润率) by 0.8% this year and next.

(4) The pesticide application system could reduce the impact of pesticides on environments, increase the _____ (生态系统可持续性), and protect the operators.

(5) The agricultural expert system is to increase_____ (农业生产效率）  and to promote agricultural knowledge.

(6) If farmers switch to grazing practices that mimic the movements of wild herds, this can easily increase _____ (碳的比例) stored in dry soils from 1% to 2%.

(7) To raise grain yield, it is necessary to increase _____ (农业投入）  and to ensure proper scale of growing area under grain crops.

(8) Personal computers and the Internet promised to create wealth, increase _____ (获取信息途径), and foster community among their users.

**8.4.2** *Complete the collocation map for the verb "increase" based on the above exercise. Think of more nouns that form collocations with "increase" and write your answers in the bubble.*

*1) "increase" + n.*
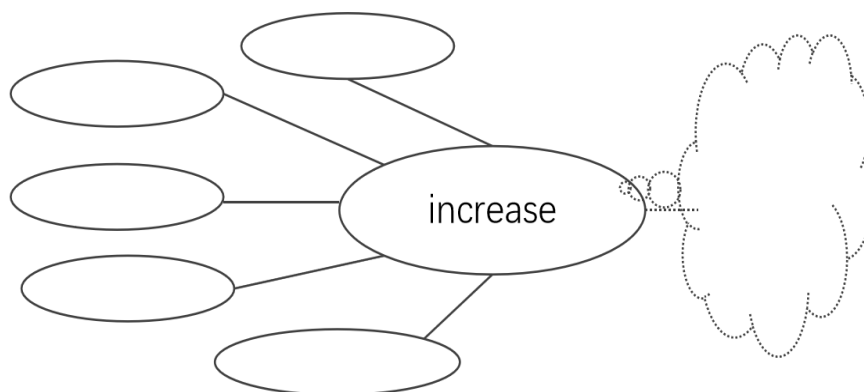


**8.4.3 Complete the sentences with the adverbs in the box, so that they form appropriate collocations with the verb "increase".**

| slightly    dramatically    progressively    steadily |
| :---: |

(1) The problems of hunger and food insecurity have global dimensions and even increase _____ in some regions.

(2) PE participation held steady between 1995 and 2003, after which it began to increase, but only _____.

(3) The bribery crime is the supreme crime of happening rate, and has the tendency to increase _____ year by year.

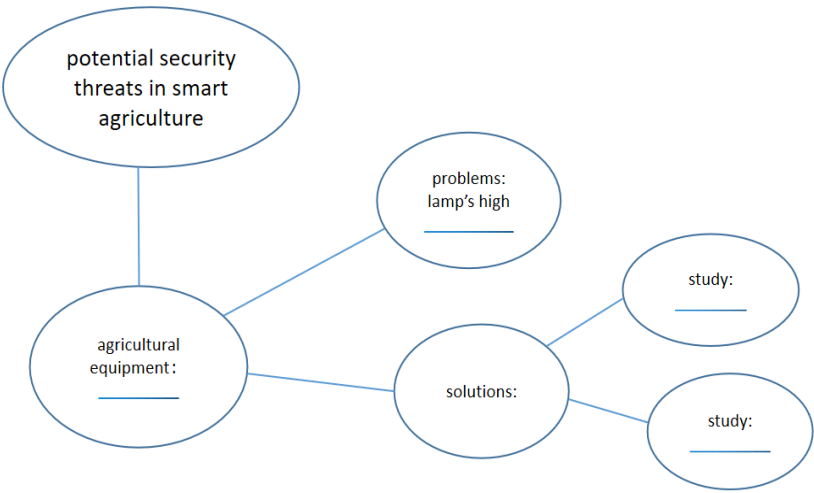(4)  Systematic and scientific measures must be taken to increase the income of peasants _____.

**8.4.4 Complete the collocation map for the verb "increase" based on the above exercise. Think of more adverbs that form collocations with "increase" and write your answers in the bubble.**

*2) adv. + "increase"*
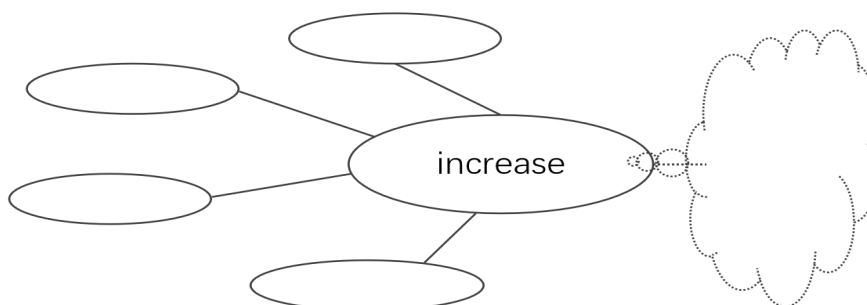
# 8.5 Idea Exploration

*8.5.1 Identify the information in the article that could be added to the mind map.*



*8.5.2 Create a mind map by yourself based on the key word below.*