'Super' Wheat Ensures Food-Secure Future

Dialogue

By LONG Yun & BI Weizi

The agricultural bond between China and Pakistan is deeply rooted in their joint commitment to food security and sustainable development. With vast agricultural landscapes and growing populations, both nations have found collaboration in agricultural science and technology essential. Central to this partnership is wheat, a staple crop that feeds billions worldwide. Dr. Javed Ahmad, a scientist renowned for his work in wheat breeding and biotechnology, has been working hard to transform Pakistan's agricultural sector and promote international cooperation.

Dr. Javed Ahmad. (COURTESY PHOTO)

A scientist with a mission

Ahmad, chief scientist at the Wheat Research Institute in Faisalabad, Pakistan, has dedicated over three decades to improving wheat yields and crop resilience. His research has led to the development of more than 20 high-yielding, stress-tolerant wheat and barley varieties, including the nutritionally enriched "Akbar-19," notable for its high zinc content.

For Ahmad, the mission is clear: "Our primary objectives are to develop high-yielding, disease-resistant, and climate-resilient wheat varieties using conventional breeding and advanced biotechnology techniques."

His research addresses some of the most pressing challenges in global food security, from increasing productivity to enhancing nutritional value. "By developing innovative wheat varieties, we aim to contribute to the United Nations' Sustainable Development Goals, particularly Goal 2: Zero Hunger," he said.

Overcoming challenges with innovation

Developing 15 high-yielding and disease-resistant wheat varieties is no small feat. Ahmad and his team faced numerous challenges, from identifying suitable parental lines to accommodating diverse environmental conditions. "It required meticulous planning, rigorous testing, and collaboration with national and international partners," he said.

To tackle these challenges, Ahmad employed a combination of traditional breeding techniques and cutting-edge technologies like marker-assisted selection. Collaboration with international institutions, such as the International Maize and Wheat Improvement Center (CIMMYT), also played a pivotal role." Access to new genetic materials and expertise from global partners has been instrumental in overcoming these hurdles," he said.

The impact of his work is already evident. "With 75 percent of Pakistan's wheat varieties, including parental lines, created by our team, I foresee a significant long-term impact on the country's agricultural sector," Ahmad said. The varieties his team developed have demonstrated improved yields, disease resistance, and water use efficiency, helping farmers adapt to challenges posed by the climate change.

Joint efforts in advanced research

Ahmad is a strong advocate for international scientific collaboration, particularly in the face of global challenges like food security and environmental sustainability. "Collaboration enables the sharing of knowledge, expertise and resources," he said. "By working together, scientists from different countries can tackle complex global challenges more effectively."

One of the most significant outcomes of this collaborative spirit is the China-Pakistan Joint Wheat Molecular Breeding International Lab, launched in 2023. This lab has become a hub for cutting-edge research in wheat molecular breeding, leveraging advanced technologies and expertise from both countries. "The lab provides a platform for scientists to collaborate, share knowledge, and accelerate innovation," Ahmad said.

The lab's activities include collaborative research on molecular breeding, testing Chinese germplasm in Pakistan, and training scientists through workshops. "This partnership has enabled us to access advanced biotechnological tools and enhance our capacity for wheat breeding," Ahmad said. "It has also facilitated the transfer of technology and expertise, supporting the development of Pakistan's agricultural sector."

Creating opportunities for the younger generation

"The lab serves as a hub for training and capacity building, enabling young scientists from Pakistan to develop their skills and expertise in wheat research," Ahmad said. For young scientists aspiring to engage in cross-border research initiatives, he offers this advice: "Be open-minded, curious, and willing to learn."

This joint lab is just a small example of the agricultural sci-tech collaboration between China and Pakistan.

The collaborative environment fostered by the joint lab and other cooperative platforms accelerates innovation by encouraging exchanging ideas and resources. "It provides unique opportunities for young scientists to engage in international research collaborations and build their professional networks," Ahmad said.

As the world is confronted with crises like climate change and food insecurity, the work of scientists like Ahmad offers hope. By bridging borders and fostering innovation, they are not only feeding nations today but also sowing the seeds for a more sustainable and food-secure future.

In Ahmad's words, "By working together, we can nurture the next generation of wheat researchers and ensure the long-term sustainability of our research efforts." And in doing so, they are helping build a world where no one goes hungry.

HE Zhonghu from the Institute of Crop Sciences, CAAS / CIMMYT also contributed to this article.

Letter to the Editor

DeepSeek Democratizes AI Access

By Md Altab Hossin

Dr. Md Altab Hossin. (COURTESY PHOTO)

The AI industry has undergone transformative changes over the past decade, with advances in machine learning, natural language processing, and computer vision reshaping the way we interact with technology.

Among the key players driving this revolution is Chinese-based DeepSeek, a free AI-powered chatbot and assistant that is pushing the boundaries of AI innovation. By developing cutting-edge solutions and fostering a culture of research and collaboration, DeepSeek has become a game-changer in the AI landscape.

A revolution with limited resources

Since the debut of ChatGPT in November 2022, the AI industry has been booming, with many tech giants like Meta, Microsoft, and Google investing billions of USD in the field and developing a range of similar models. AI has become an integral part of our daily lives with versatile applications that not only improve productivity, efficiency, and quality, but also reduce time and costs.

Such AI models require high computing power with many graphic processing units (GPUs). For example, U.S. multinational NVIDIA, one of the pioneering chip companies, focuses on advanced GPUs with high computing power, which is crucial for AI models. As a result, the company became the most valuable company in the world, with a stock value of 3.5 trillion USD.

However, in parallel with this AI revolution, the U.S. has restricted China from obtaining advanced AI chips, even via other countries, to limit the development of AI models, citing concerns that China could use AI technology for military purposes. As a result, many Chinese companies were restricted to downstream applications and linked AI to hardware systems.

After the first release of the AI open-source chatbot model on January 20, a relatively unknown company, DeepSeek, became the talk of the town, especially in Silicon Valley. The DeepSeek-R1 model competes with the leading OpenAI 01 model on the basis of capability, cost and speed.

The company has focused on software-based development and is trying to find an alternative way, rather than focusing on advanced hardware systems and supercomputers, to develop a robust AI model using limited resources, including AI chips and GPUs. It has used a chain of thoughts, reinforcement learning, trial and error, reward engineering, distillation, emergent behavior network, mixing of experts, and memory-efficient techniques to circumvent the scarcity of AI chips and redesign the radical structure of AI models.

The miraculous rise of DeepSeek, with low-cost and memory-efficient techniques, not only stunned the tech giants, but also led to a rethinking about the cost of AI training and its relevant use of AI chips. As a result, NVIDIA lost 600 billion USD in market value in one night, and many tech giants, such as ByteDance and Alibaba, lowered the price of their AI models. DeepSeek has shown how to leverage memory and computing power to train and run AI models with billions of parameters, paving the way for an AI industry revolution with limited resources.

AI access for all

One of DeepSeek's most significant contributions to the AI industry is its commitment to democratizing access to AI technologies. Recognizing that the benefits of AI should be available to all, the company has developed easy-to-use models, tools, and platforms that enable users to leverage AI without requiring extensive technical expertise. Soon after its release, the DeepSeek App became the most downloaded free App in the U.S. Apple Store, recognizing its popularity made DeepSeek available to its users.

Unlike ChatGPT, DeepSeek is an open-source AI model under the license of the Massachusetts Institute of Technology, which means that anyone can use the model for professional or personal purposes without restrictions on tokens and parameters. In addition, anyone can run the DeepSeek-R1 model on a local computer based on their hardware configuration, making the model accessible to a wide range of users and more extensible to link with versatile applications and learning.

Through its cutting-edge technologies, low cost, and commitment to democratizing access to AI, the company is redefining what is possible with AI. DeepSeek is paving the way for a future where AI is not only powerful, but also inclusive, responsible, and beneficial to all.

In a world increasingly shaped by technology, DeepSeek stands as a beacon of progress, demonstrating how AI can be a force for good and a catalyst for positive change. With its impressive track record and ambitious vision, DeepSeek is not just transforming the AI industry — it is shaping the future of humanity.

Dr. Md Altab Hossin is a Bangladeshi expert at the School of Innovation and Entrepreneurship, Chengdu University.

LAMOST: Only Telescope to Release Spectra over 10 Million

Science Outreach

By Staff Reporters

LAMOST (Large sky Area Multi-Object fiber Spectroscopic Telescope) is a Chinese national scientific research facility operated by the National Astronomical Observatories, Chinese Academy of Sciences. Used for primary science survey from 2009, it is the only spectral survey project in the world to release tens of millions of spectra. LAMOST published over 25.12 million spectra in March 2024.

Using a cutting-edge active optics method, LAMOST continuously modifies the mirror surface to produce a variety of reflecting Schmidt systems at various periods. By combining a big aperture (a clear aperture up to 4.9 meters in diameter) and a wide field of view (five degrees), it has overcome the bottleneck that hindered previous large-scale spectroscopic survey observations.

Its design combines segmented active optics with thin deformable mirror active optics. The active aspherical corrective mirror has 24 hexagonal submirrors, while the spherical primary mirror has 37.

Parallel controllable fiber positioning technology is another crucial LAMOST technology. In contrast to 2dF's magnetic buckle technique and the Sloan Digital Sky Survey's (SDSS) drilled aluminum plate, LAMOST uses a dual-rotation fiber positioning unit approach.

LAMOST's focal plane is about the size of a dinner table, with a diameter of 1.75 meters. Each of the 4,000 fiber positioning units, which are spaced 25.6 mm apart on the focus plane, drives the optical fiber to operate inside a 33 mm diameter. The 4,000 positioning units operate in parallel, significantly reducing positioning time.

Additionally, unlike the SDSS, it has eliminated the hassle of having to replace the fiber aluminum plate after every observation. It is an awesome sight as 8,000 motors power 4,000 fiber positioning devices on a dining table-sized focal plane.

Through a spectral survey of millions of objects in much of the northern sky, LAMOST will enable research in a number of contemporary frontier topics in astrophysics, such as the discovery of the first generation stars in the galaxy, pinning down the formation and evolution history of galaxies, and looking for signs of the distribution of dark matter and possible sub-structures in the Milky Way.

LAMOST in Chengde, Hebei province. (PHOTO: VCG)

Daring to Follow Dream of Flying

Traditional Eastern Wisdom

By BI Weizi

Floating high in air, seemingly free of any restrictions as the wind takes it across the sky. Kite flying is a simple yet effective way of enjoying the outdoors while letting your mind wonder.

The world's first kite originated during the Spring and Autumn Period (770-476 BCE) in ancient China.

According to legend, it was crafted by the famous Chinese philosopher Mozi in what is now present-day Weifang in the east coast province of Shandong. It is said that Mozi took three years to make a wooden bird, which could fly into the sky and is recognized as the earliest known kite in human history. Later, Mozi's student Lu Ban, a master craftsman improved the wooden bird's production process by using bamboo.

During the Eastern Han Dynasty (25-220 AD), following Cai Lun's improvements to the papermaking technique, people started crafting kites using paper. These kites, are also known as Zhiyuan or "paper kites."

Usually, bamboo, paper and silk are used for making traditional kites. Bamboo with a wall thickness of three to five cm can be cut into strips and used to make the skeleton of the kite. The skeleton can be woven into various shapes, such as a dragon or butterfly. Paper with a thin texture, long fibers and durability are most suitable for being pasted on the bamboo skeleton. The paper can also be painted in the crafter's favorite colors, and a ribbon or paper ring can be added for flair and kite handling.

The shape of kites mainly imitates creatures in nature, such as birds, insects and animals. As for the patterns, they are mainly designed by personal preferences.

The reason why kites can fly is due to the discovery and application of aerodynamics by ancient Chinese inventors. The production process may seem simple, but actual production is highly demanding in terms of craftsmanship. For example, creating a symmetrical kite frame that conforms to the principles of aerodynamics requires that the wind-receiving area and weight on both sides be as equal as possible, which is the most basic requirement. In addition, when installing the lifting line, you need to find the center point of the kite so that both sides can be balanced. Generally, you need to find an initial adjustment point first, and then make fine adjustments to achieve maximum stable lift. At the same time, kites generally have long tails, which also play a balancing role, so that the kite will not spin around in the air.

Since the day it was invented, kite has been the embodiment of the ancient people's dream of flying in the sky. On May 20, 2006, the kite-making technique was approved by the State Council to be included in the first batch of the national intangible cultural heritage list.

AI Injection for Smarter Agriculture

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Meanwhile, in the management of agricultural production scenarios, an intelligent platform called "Nongbozhiwen" has proven its strength. The platform was developed by an agriculture AI laboratory jointly established by Southern Finance Omnimedia Corp., China Telecom Guangdong, and Guangdong Mancloud IoT Technology Co., Ltd.

Based on the support of financial data, communications technologies, Internet of Things (IoT) and AI, the platform can realize the smart collection and analysis of agricultural data, and offer precise solutions to different agricultural scenarios, covering multiple phases of agricultural production.

Whether it's fertilization and pesticide control, or responding to climate change, the platform can provide farmers and enterprises with efficient management tools.

The platform is now able to offer customized and smart management schemes for more than 10 species, including rice. By monitoring the growing environment of crops in real time via IoT equipment, the platform can generate the best management strategies using AI algorithms, thus helping farmers cut resource waste and enhance production efficiency.