Use AI and the largest telescope to find aliens and interstellar life

Indian astronomers will play a key role in the 16-nation Square Kilometer Array Observatory (SKAO), whose dish antenna array began setting up this month and will scan the corners. distant universe in 2027.

Worth 2.2 billion euros (2.4 billion USD), SKAO is an ambitious project with 16 member countries including South Africa, Australia, England, Canada, China, France, Germany, Japan, Italy. , Netherlands, Portugal, Korea, Spain, Sweden, Switzerland and India.

After joining in January, India will become a key player in a major scientific project in the 21st century: Mankind's largest telescope ever. The combination of radio astronomy and artificial intelligence (AI) will help observe the birth and death of the first stars, searching for habitable planets and life beyond Earth.

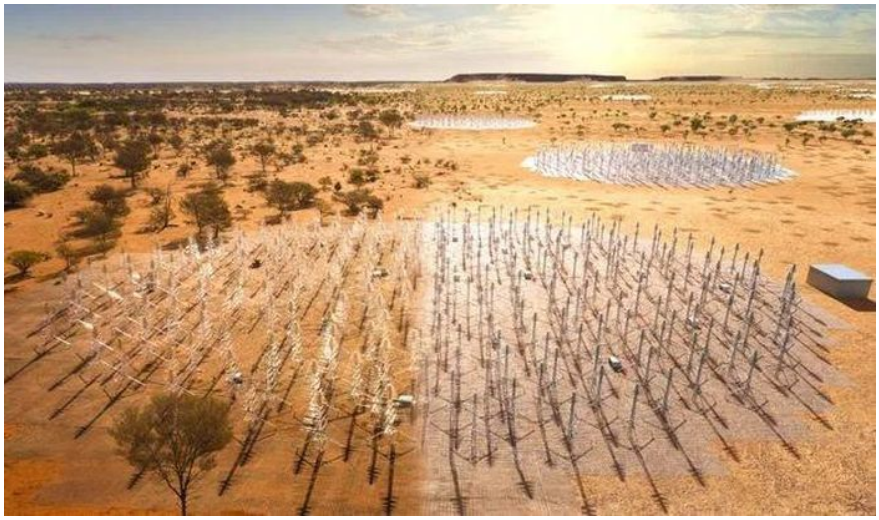
To do this, India has earmarked Rs 12.5 billion ($150 million) for a facility in Pune, a city bustling with radio astronomy research. The facility will be a regional data center equipped with supercomputers to process the vast amount of scientific data collected by the telescope.

With the help of radio interferometers, astronomers can combine signals from multiple antennas or telescopes to produce images that are sharper and brighter than what can be obtained from a single dish. unique name. This technology effectively scans large areas of the sky using radio telescope antenna dishes spread many kilometers apart but acting as a single observatory.

This global observatory, with thousands of units spread across the continents of Africa and Australia and a headquarters in Europe (near Manchester, England), has thousands of scientists and engineers around the world. The entire world is networked to develop advanced technologies. They will use SKAO to record space data that could fill 1.5 million laptops a year.

'The idea is to start training this year (using AI to decode scientific information) with about 2 petabytes (1 petabyte = 1,024 terabytes) of data stored through the GMRT telescope. We will use this to develop a small model that demonstrates that India is ready to receive and analyze data,' said Professor Yashwant Gupta, Director of the National Center for Radio Astrophysics (NCRA). in Pune, told RT news agency.

One component of the SKAO telescope is being built in the Karoo region of South Africa's Northern Cape province: An array of 197 conventional dish antennas spaced 150 km apart. The other half is an array of 131,072 2m high Christmas tree-shaped antennas in Western Australia spaced 65km apart. These locations are chosen away from human habitation to prevent signal interference.



2 meter high Christmas tree shaped antenna in Western Australia - Photo: SKAO

SKAO will help understand the origins of the universe, search for aliens or extraterrestrial intelligence (SETI), detect habitable worlds by identifying planets similar to Earth, recognize detect signs of the formation of new stars or the death of millions of old stars millions of light years away.

Astronomers worldwide estimate SKAO could pick up radio signals from every corner of the universe for at least 50 years from its launch in 2027-28. The radio waves that all celestial bodies emit provide more accurate information than those transmitted from light (used by optical telescopes), which can be obstructed or redirected by dust, clouds or rain.

This observatory will therefore complement ongoing research with the help of optical telescopes and space-based telescopes such as the James Webb Space Telescope, Hubble Space Telescope. The end result is that SKAO was also able to make some serendipitous discoveries.

Most prominent is the effort to decode the secrets of the universe through a combination of radio astronomy (a foundation that dates back to the 1930s) and AI. Big data generated by SKAO is estimated at 710 petabytes of information per year.

Leading the team designing the prototype of a regional data center are Indian radio astronomers, preparing to use scientific evidence recorded by the GMRT telescope located near the city of Pune.

Professor Yashwant Gupta said Indian astronomers and engineers will play an important role in the production of Observatory Monitor and Control System (observatory monitoring and control system), technical electronic equipment. digital technology required for signal processing at the Western Australian facility, and software development for the majority of SKAO systems.

He added: 'Our research institutions and industry will have the opportunity to design and manufacture the world-class hardware needed for SKAO.'

The suggestion to turn to AI and other tools to learn from data to make predictions or identify celestial objects faster than humans probably stems from a collaboration between NASA's Frontier Development Lab (FDL) and Large companies such as Microsoft, Google, IBM, Nvidia in Silicon Valley (USA). The goal is to solve problems in space science and severe space weather forecasting to prevent power outages or damage to satellites or harm to astronauts.

Frontier Development Lab (FDL) is a joint venture with NASA that uses AI to help solve challenges in earth science and space exploration.

With the help of this collaborative effort, the DAGGER computer model has been developed to provide 30-minute warning of solar storms that impact electrical distribution and communications networks in North America, Canada and other countries near the polar regions.

Furthermore, this collaborative effort also aids in flood forecasting, according to Dr. Madhulika Guhathakurta, renowned astrophysicist and Senior Advisor at NASA Heliophysicals.

NASA Heliophysics is a scientific research program within NASA focused on understanding the Solar System, from the Sun to planetary atmospheres and interplanetary environments.

Ms. Madhulika Guhathakurta said at FDL, satellite images or data collected by NASA's Solar Dynamics Observatory and past telescopes are prepared for AI to effectively demonstrate prediction. In a coronal ejection (CME), tons of red-hot dust (sometimes millions of tons) from the Sun move through interplanetary space at a speed of 3,000km/s to all planets, probes science, satellites and Earth.

Madhulika Guhathakurta says, 'We need a large amount of data stored from various sources to develop AI-based products. Even automatic calibration of instruments on scientific observatories that degrade over time is possible thanks to a combination of archived data and AI. It saves the cost of automatically calibrating instruments, which can be done through suborbital rocket launches with similar instruments. Virtual devices could also be created in space to replace damaged or malfunctioning sensors in collaboration with astronomers and computer experts.

Interdisciplinary research teams of scientists and AI experts will accelerate the discovery of new habitable worlds, aliens, and new organisms that exist in interplanetary space. in addition to launching products for applications such as early forecasting of storms in space and on Earth, among others, with a combination of legacy data and AI tools.