BOOSTING GLOBAL CONNECTIVITY WITH AI-OPERATED SATELLITES

A startup in Japan is harnessing deep learning to ACCELERATE BROADBAND SATELLITE INTERNET AND INFORM DECISIONS on the best use of land.

The number of satellites orbiting our planet has rapidly increased over the past couple of decades, from fewer than 1,000 in 2006 to nearly 7,000 in 2022. Powering this trend is the growth of broadband internet services via satellites for under-served markets.

While the vast majority of internet traffic is routed through optical cables on the ocean floor, this infrastructure has not served some of the poorest, most isolated countries. Furthermore, it may be disrupted during natural disasters. An award-winning Earth-imaging startup, Tenchijin, based in Tokyo, Japan, is aiming to fulfil the promise of satellite internet through better use of ground stations.

Satellites depend on ground stations to relay data but they aren't always reliable. Due to congestion in conventional frequency bands, the new generation of satellite internet services has been using the higher frequency Ka radio band and optical laser communications. However, rain and clouds above ground stations can block signals in these bands, slowing communication.

SMART PREDICTION

That's where Tenchijin comes in. It has developed an artificial intelligence (AI) system that can accurately predict the best ground stations to use based on local conditions.

"We use surface and satellite observation data for deep-learning models that generate pinpoint precipitation and cloud forecasts and the predicted wave attenuation," explains Ayako Kimura, a Tenchijin project manager of R&D who lives in Guam, a US island territory in Micronesia. "It could benefit people who don't have great optical fibre infrastructure. For instance, satellite communication proved vital in Guam when we lost our optical fibre links for a month after a big typhoon. This was proof positive that our solution will become effective for these communities."

Tenchijin plans to verify its AI forecasting system with the 2025 launch of the Japan Aerospace Exploration Agency's (JAXA) Engineering Test Satellite-9. This demonstration satellite is designed to advance next-generation geostationary communications.

A JAXA spinoff, Tenchijin was founded in 2019 with the aim of harnessing satellites and AI. And in 2022, JAXA invested in a startup for the first time by providing financial backing to Tenchijin, which used the funds to develop its COMPASS service.

MANY APPLICATIONS

For example, in renewable energy, COMPASS has used wind, radiation, forest and regulatory data to determine the best places for solar and wind farms in Europe. In agriculture, it has advised fruit growers on ideal areas for kiwi fruit in Japan. In city planning, it has analysed data on temperature, moisture and soil to advise Japanese municipalities of most likely areas where water pipes will leak, improving maintenance efficiency. This innovation earned it first prize in the Copernicus Masters Japan Regional Prize, a competition sponsored by the European Union and the European Space Agency.

"Our focus is to evaluate the land and environment by using satellite data and AI for a more sustainable Earth," says Yuhei Urabe, manager of global business development at Tenchijin. "If we better understand human activities and the Earth's climate, we can make the planet more sustainable." ∎

▲ **Left: Communication satellites can provide stable internet connection to areas of the world lacking cables. Right: Tenchijin's COMPASS service can be used to determine best use of land.**

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Tenchijin
SPACE TECHNOLOGIES

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