

Irish Government Awards Grant to Ubotica for AI-Powered Live Earth Intelligence Innovation through Disruptive Technologies Fund



SPACE:AI innovator, Ubotica Technologies is delighted to be part of a consortium of organisations to have recently received substantial grant funding from the Irish Government's Disruptive Technologies Innovation Fund (DTIF).

The Dublin-based satellite SPACE:AI specialist is part of the NSSPI project consortium that was awarded a total grant of over €7.9 million. The grant will be invested in the consortium's work to develop economically sustainable space technology that encompasses optical communications in space, autonomous satellites and spacecraft and payload modelling, simulation and test research support.

SPACE:AI powers autonomous satellites and spacecraft. Conventional Earth Observation (EO) offers snapshots – a singular moment – often needing terrestrial post-processing to yield any insights. While valuable, it doesn't support immediate decisions in pressing situations like environmental shifts, natural calamities, or security issues. SPACE:AI revolutionises today's EO by transforming it into actionable Live Earth Intelligence. Instead of static snapshots, SPACE:AI provides a

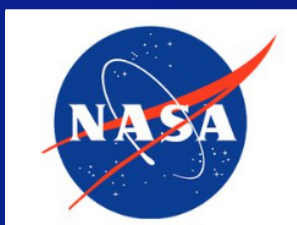
continuous live stream of actionable insights generated onboard through a full stack of Edge AI technology that can perform inference on diverse inputs such as optical, hyperspectral, and radar data.

With SPACE:AI, developers can deploy a wide range of innovative applications and models on satellites powered by Ubotica's SPACE:AI technology, laying the technology foundations for Ubotica to develop a Space App Store. With a single-click interface, developers can securely upload their AI models to satellites operating on the SPACE:AI platform. These orbital AI applications will generate real-time autonomous decisions and insights in space, removing the need to downlink and process copious amounts of data on Earth thus delivering significant capital and operational expenditure savings.

Fintan Buckley, Co-Founder and CEO of Ubotica Technologies said:

“We are thrilled to be part of the successful NSSPI consortium and grateful to benefit from generous funding from the DTIF for our Live Earth Intelligence technology. Advances in space technology are progressing at an astonishing speed and we are excited to be at the forefront at this important time for space innovation.”

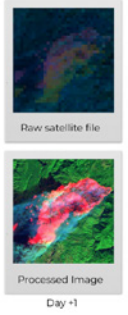
The DTIF was established by the Irish Government as part of its wider Project 2040 programme. The fund is managed by the Department of Enterprise, Trade and Employment and administered by Enterprise Ireland. It was set up to invest in the development and deployment of disruptive technologies on a commercial basis and drive collaboration and co-operation across the sector. As of late November 2023, €364 million has been awarded to 103 projects and consortiums across Ireland. 🌟



Ubotica Advances Space AI ‘App Store’

OLD
Polaroid from the past

Satellite schedules transmission of raw files to Earth for batch processing into a human readable image.

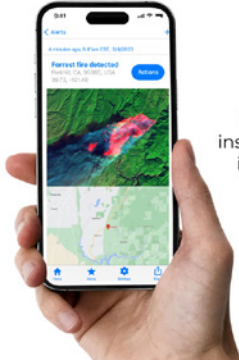


Raw satellite file

Processed Image

Day +1

NEW
Live Earth Intelligence



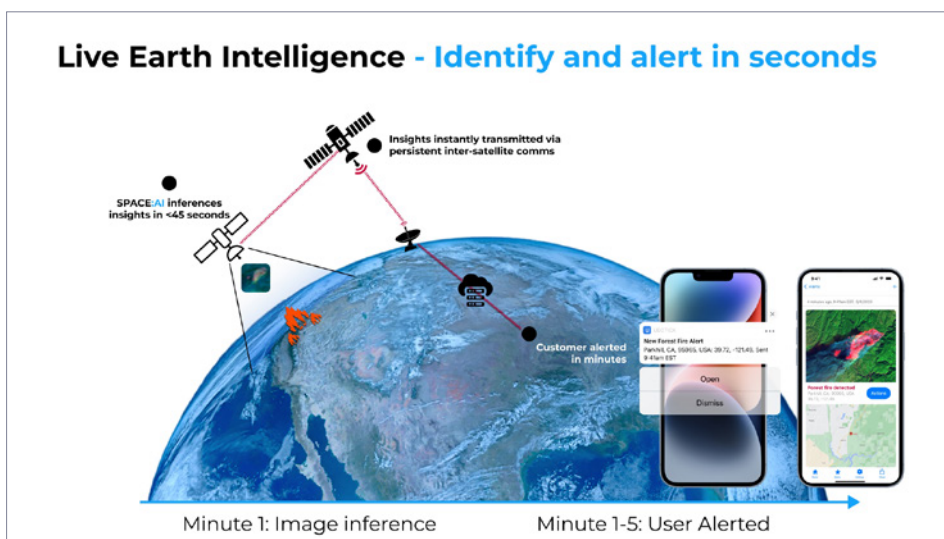
SPACE:AI extracts insights in seconds and instantly messages people on Earth.

Ubotica Technologies, a leader in Space AI, is developing the infrastructure to extend the Mobile App Store ecosystem into Space and unlock Live Earth Intelligence. The new infrastructure will enable developers to easily deploy AI applications to satellites equipped with Ubotica’s CogniSAT technology. Opening Space AI to developers will drive a surge in innovation like the transformative impact of the millions of applications built via the App Stores for mobile phones.

The ever-changing world contrasts sharply with today’s static Earth Observation (EO) methods. Traditional EO is akin to a Polaroid from the past—a singular, fixed moment requiring Earth-based post-processing to reveal an image. While valuable, EO today is inadequate for real-time decision-making in urgent situations like changes in the environment, natural disasters or security threats.

SPACE:AI is a game-changing approach that transforms EO into actionable, Live Earth Intelligence. Replacing static snapshots, SPACE:AI delivers a continuous live stream of actionable insights processed onboard through advanced Edge AI technology. SPACE:AI can take in a broad range of inputs including optical, hyperspectral, and radar observations to create real-time insights. Inter-satellite communications ensure real-time delivery of these insights directly to individuals and systems on Earth.

With SPACE:AI, developers can deploy a wide range of innovative applications and models on satellites featuring Ubotica’s CogniSAT technology. The outcome is a wealth of proactive Live Earth Intelligence beneficial to humanity. This includes, for example, early detection of forest fires, monitoring methane emissions, identifying suspicious oil tanker activities in international waters, or alerting to potential dam breaches. With an open infrastructure and easy deployment, the innovation of the developer community can be unleashed to bring new applications that have not been conceived of.



Ubotica team awarded NASA Honor Award



NASA
HONOR
AWARDS

We are pleased to announce that the Ubotica team have been awarded a prestigious NASA Group Achievement Award.

The Ubotica team were part of the ISS autonomy and instrument processing team that worked on the Spaceborne Computing 2, Qualcomm Snapdragon and Intel Myriad computers on the International Space Station. ●

Maritime Security

Vessel monitoring is ideally suited for our on-board processing solution, as a large area of water can be scanned via satellite in a short space of time, with vessels automatically detected and located using AI. The Ubotica team have developed a vessel detection solution that can support use cases such as the enforcing of fishing regulations or the identification of ships that may be involved in illicit activities. ●



Fish Farms

Ubotica's AI satellite technology can give fish farmers early warning of threats like changes in sea temperature which can lead to algal blooms that can destroy a full fish farm.

This gives them more time to harvest fish early, pump oxygen into the water or put up shields called marine curtains to block off any algal bloom. ●



Ubotica Establishes U.S. Corporate Entity and New US Headquarters at Ohio Aerospace Institute on the NASA Glenn Research Center Campus



In October, Ubotica announced the formation of a new U.S. corporate entity and the opening of its new US headquarters, strategically situated within the Ohio Aerospace Institute (OAI).

This new headquarters serves not only to expand Ubotica's growing commercial and government customer base across the Americas but also to deepen its public and private partnerships with NASA and the Defense Industry.

The new U.S. corporate structure enables Ubotica Technologies Inc. to engage in U.S. government procurement and collaborate extensively in Space:AI technologies, thereby accelerating AI autonomy in satellites in space. Being co-located with OAI, a leading hub for US aerospace research and innovation, enhances Ubotica's mission.



Ohio has long been a nexus for space exploration and aerospace advancements. **"Our co-location within OAI provides a great opportunity to integrate into an ecosystem at the forefront of space and aerospace innovation"**, said Sean Mitchell, Chairman and Chief Commercial Officer at Ubotica. "We are grateful to the Ohio Aerospace Institute for their support and eagerly anticipate future collaborative partnerships."

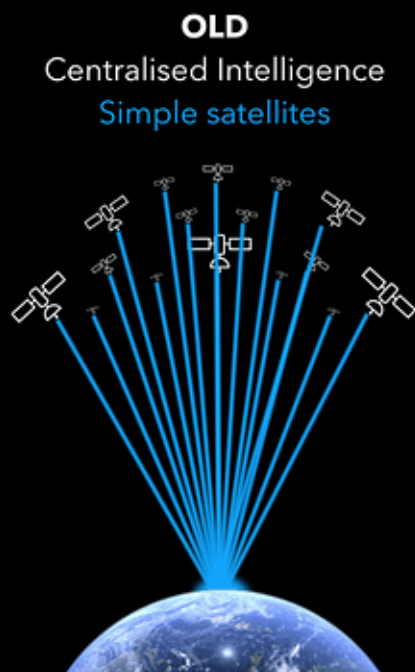


Ubotica's Senior Director of U.S. Business Development Aaron Rood added, **"This strategic move to establish our US headquarters and corporate entity at OAI positions us ideally to advance AI autonomy in satellites and expand our U.S. operations."**



MISSION UPDATE

The PLATERO Mission by Open Cosmos, powered with SPACE:AI from Ubotica, to intelligently track biodiversity, desertification, emergencies



In the landscape of satellite technology, we are witnessing a pivotal transition from the conventional centralized model to a cutting-edge framework of edge AI. Traditional “simple” satellites give way to efficient, autonomous, intelligent AI-powered counterparts. This shift to AI operating in space allows for collaborative operations and optimizes space activities, turning satellites into proactive decision-makers. With real-time analytics and communications, AI-powered satellites are becoming crucial in sectors like security, commerce, and sustainability, where immediate and accurate data delivery is invaluable to humanity.

The PLATERO mission by Open Cosmos, will demonstrate the power of AI in space. The PLATERO satellite, funded by the Junta de Andalucía through the Andalusian Agricultural and Fisheries Management Agency (AGAPA), integrates Earth Observation (EO), Internet of Things (IoT) connectivity, and Artificial Intelligence(AI) powered by Ubotica, for enhanced environmental monitoring.

PLATERO will track biodiversity, desertification, emergencies (e.g., wildfires, floods), and farming impacts, aiding sustainable policy development. Equipped with a high-performance multispectral camera and IoT capabilities, PLATERO enables real-time, ground-based sensor communication, streamlining decision-making.

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MISSION UPDATE continued...

COMBINING AI, EO AND IOT IN SPACE

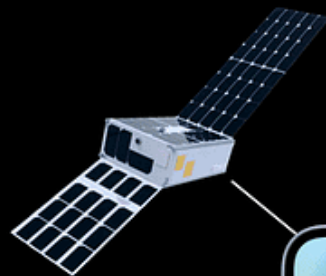
The combination of Earth Observation (EO), the Internet of Things (IoT), and SPACE:AI by Ubotica, transforms satellites into providers of Live Earth Intelligence.

Imagine a scenario where an IoT sensor network is deployed across a stretch of ocean or a large lake. These sensors can detect anomalies that could indicate environmental hazards—such as sudden increases in bilge discharge from ships or the early formation of harmful algal blooms.

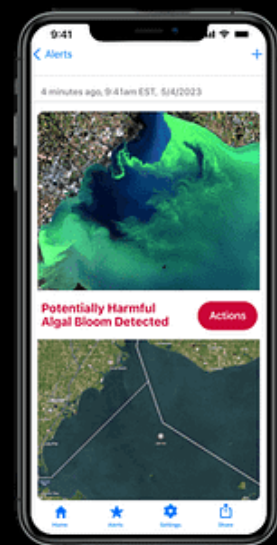
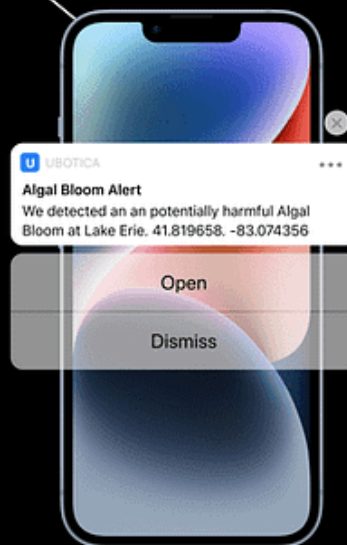
Upon detecting such potential threats, the IoT system sends an immediate alert to an AI-equipped satellite. This satellite, with its high-resolution imaging capabilities, swiftly orients to capture detailed imagery of the affected area. Onboard SPACE:AI, trained in image recognition and pattern analysis, processes this data in real-time to immediately identify hazard signs, such as oil slick patterns characteristic of bilge discharge or the distinct colouration of an algal bloom.

With the precise location and nature of the event confirmed, the satellite system can then communicate this information back to Earth. The relevant authorities receive actionable notifications, complete with imagery and an analysis of the potential hazard. This enables a rapid response—whether that is dispatching cleanup crews to the site, alerting nearby vessels to avoid the area, or initiating closer monitoring to track the development of the situation.

The integration of IoT, EO, and SPACE:AI delivers Live Earth Intelligence—turning real-time data into actionable insights. This fusion not only accelerates the detection and response to specific environmental hazards, such as water contamination, but also empowers proactive monitoring and protection of water resources. Unlike traditional methods that react slower, this AI-powered system swiftly identifies, analyses, and provides precise intelligence to mitigate such threats effectively. 🌊



SPACE:AI
transforms satellites from
Earth Observers into
Live Earth Intelligence
providers.



MISSION UPDATE

Revolutionizing Earth Observation: Open Cosmos' MANTIS powered by Ubotica's Groundbreaking SPACE:AI



Open Cosmos and the European Space Agency (ESA) have announced their collaboration for the launch of the MANTIS satellite on SpaceX's Transporter-9 mission, set to lift-off from Vandenberg Space Force Base in California, U.S. MANTIS's game changing AI processing onboard the satellite is powered by Ubotica's SPACE:AI.

MANTIS (Mission Agile Nanosatellite for Terrestrial Imagery Services), funded by UKSA in collaboration with ESA, will deliver high-resolution imagery critical for monitoring logistics, energy infrastructure, and natural resources.

Satellites today are central to many impactful applications. Integrated with onboard AI, they can monitor greenhouse gasses, provide insights into global temperature fluctuations, oversee polar ice caps, sea levels, ocean currents, enhance forest monitoring, detect deforestation, and pinpoint oil spills even before they're perceptible from the ground. Such capabilities underpin projections that the Earth Observation (EO) market will be worth \$11.3 billion by 2031.

MANTIS AI: POWERED BY UBOTICA

The dynamic nature of our world contrasts with current static Earth Observation (EO) methods. Conventional EO offers snapshots – a singular moment – often needing terrestrial post-processing to yield an image. While valuable, it doesn't support immediate decisions in pressing situations like environmental shifts, natural calamities, or security issues.

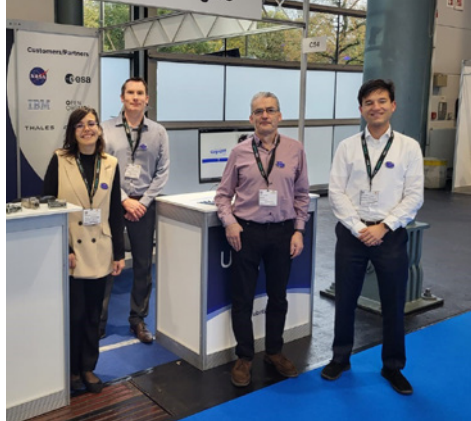
SPACE:AI revolutionizes today's Earth Observation (EO) by transforming it into actionable Live Earth Intelligence. Instead of static snapshots, SPACE:AI provides a continuous live stream of actionable insights processed onboard through a full stack of Edge AI technology that can perform inference on diverse inputs such as optical, hyperspectral, and radar data.

Sean Mitchell, Chief Commercial Officer at Ubotica, said, **"We're proud to announce that MANTIS's onboard AI utilizes Ubotica's SPACE:AI technology, marking Ubotica's debut as the AI processing partner in OpenConstellation. The aim is for MANTIS to transform Earth Observation from static imagery to a continuous stream of actionable, Live Earth Intelligence, processed onboard through breakthrough Edge AI."** 🌟

Space Tech Expo Europe

In November the Ubotica team travelled to Bremen in Germany to join the international space community at Space Tech Expo Europe.

The event is the largest b2b event for the space industry with over 650 exhibitors from 40+ countries. There was lots of interest in how we are developing the infrastructure to extend the Mobile App Store ecosystem into Space and unlock Live Earth Intelligence. 🌐



UK Space Conference in Belfast



The Ubotica team joined our industry colleagues, partners and friends in November at The UK Space Conference.

The UK Space Conference is a significant biennial event for the UK Space sector. The event unites the UK and international space communities, such as government, industry, and academia.

The conference provides a platform for the space sector to exchange ideas, plans, and partnerships that encourage development and success in the emerging space age. 🌐

IBM's Engage event in Dublin

In October, we were delighted to showcase Ubotica's Space:AI AppStore supported by IBM cloud at IBM Engage. Enabling easy and secure deployment of AI Apps directly to satellites in-orbit. 🌐



TechIreland AI Event

In November the Ubotica team joined Google, Microsoft and leading Irish tech companies at the TechIreland TCD event on Generative AI.

Dr Patricia Scanlon, Ireland's AI Ambassador, emphasised the pace that AI is evolving and the ethical challenges it poses. She reinforced the findings of a recent survey by TechIreland that half of Irish tech companies are already using some form of AI and want to know more about regulation, pitfalls and trustworthy applications.

David Moloney, Chief Scientist at Ubotica Technologies shared information about Ubotica's pioneering AI solutions for [satellites] satellites and [space]space technology. 🌟



ESA Earth Observation Commercialization Forum

In November, the Ubotica team joined investors, institutions and entrepreneurs from the Earth observation sector at ESA's Head Quarters in Paris for The EO Commercialization Forum.

The forum focused on the commercial potentials and challenges of Earth observation, as well as the technical, industrial and risk-capital support available to European companies.

Fintan Buckley, Co-Founder and CEO of Ubotica, gave a presentation about Live Earth Intelligence and how Ubotica is developing the infrastructure to extend the Mobile App Store ecosystem into Space and unlock Live Earth Intelligence. 🌟



Smallsats Conference 2023



In November, Aubrey Dunne, Co-Founder & CTO of Ubotica, joined the panel discussion about the future of the satellite industry and, Earth Observation data and how sharing information gathered across different systems brings an incredible amount of value to end-users. 🌟

Building Efficient SPACE-AI Models for Earth Observation Satellites



INTRODUCTION

As the industry faces challenges in integrating Artificial Intelligence (AI) into Earth Observation (EO) satellites, Ubotica's CTO, Aubrey Dunne, presented a paper on this topic at the European Data Handling & Data Processing Conference. His paper, titled 'Efficient In-Orbit Convolutional Neural Network (CNN) Updates,' tackles an important, but often ignored, issue related to deploying effective AI applications on satellites.

THE CHALLENGE: BUILDING ROBUST AI MODELS FOR EO SATELLITES

Building AI models for Earth Observation (EO) satellites is challenging due to the scarcity of real-world training data for specific sensors and satellites. Remotely updating these models with actual in-orbit data is critical, a challenge that the paper seeks to address.

The issue of limited real-world data is exacerbated by the diverse array of sensors found on Earth Observation satellites. Changes in sensor configurations or in satellite pointing stability can render existing models less effective, even when data from previous missions are available. Thus, it's crucial to update trained models with real-time data once the satellite is operational. The paper delves into methods for remotely updating these in-orbit models and outlines how to manage the update size through training parameters.

The objectives are twofold:

1. **Maximise Accuracy:** Enhance model performance using fresh in-orbit data.
2. **Minimise Update Size:** Reduce the data volume needed for the update, saving crucial bandwidth.

THE SOLUTION: EFFICIENT IN-ORBIT CONVOLUTIONAL NEURAL NETWORK UPDATES

The paper focuses on determining which CNN layer weights should be adjusted, and which should remain fixed during training, to both improve accuracy and minimise the update size for uplinking to in-orbit satellites. The method supports user control of the balance between update size and accuracy improvement. A Convolutional Neural Network (CNN) is a specialised AI algorithm that is ideal for application to image data. It segments images into smaller sections to identify key features, making it highly efficient for tasks such as object detection and classification. This capability is particularly advantageous for Earth Observation satellites.

IMPRESSIVE RESULTS

The paper presents compelling results for a sample network. Without using the Efficient Network Updates (ENU) method, the update size was 44.5MB with an original network size of 48.9MB, achieving an accuracy improvement from 78.4% to 79.9%. However, with the ENU method, the update size was reduced to just 18MB while still achieving an accuracy of 78.9%. This shows the method's efficacy in balancing update size with accuracy improvements.

CONCLUSION: A STEP FORWARD IN EO SATELLITE TECHNOLOGY

Aubrey's presentation and paper offers a viable solution to a key challenge to deploying AI in space, and sets the stage for further innovations in the field. 🌐

Space Economy Summit

In October, the Ubotica USA team attended The Space Economy Summit as a guest of SkyFi.

At the event, expert speakers discussed how industries and governments can maximise commercial returns from the final frontier. Uncover the latest developments and innovations in the space economy, and discover how space technology can help to mitigate climate change and protect Earth.

As well as the aerospace and defence sectors, the event uncovered how more mainstream industries and government agencies can benefit from the Space Economy. 🌐



17th Symposium on Advanced Space Technologies in Robotics and Automation



In October, the Ubotica team travelled to the Netherlands to attend the 17th Symposium on Advanced Space Technologies in Robotics and Automation.

David Rijlaarsdam, Senior Space System Engineer at Ubotica's Netherlands office gave a presentation about Autonomous Operational Scheduling on CogniSat-6 based on Onboard Artificial Intelligence. 🌐

2023 AUSA Annual Meeting & Exposition

In October, the Ubotica USA team attended The 2023 AUSA Annual Meeting & Exposition in Washington to catch up on the latest news and views from Government, Military and the Defense Industry. 🌐





An interview with Brian Quinn, Chief Strategy Officer for Ubotica

Q. What is involved in your role as Chief Strategy Officer for Ubotica?

A. I joined Ubotica in October 2019 as Chief Strategy Officer, and I am based in Dublin, Ireland.

I look after our long-term strategy, aligned with our ambition to be the pre-eminent provider of AI platforms and solutions in space, SPACE:AI. My role needs to take into consideration all Ubotica activity, from our R&D portfolio through to product, our supply chain, our strategic partnerships and our global customer pipeline. Ensuring all efforts are aligned to our vision.

A key strategic perspective for us is how end users ultimately consume time-sensitive insights from satellite on-board AI services. We are fundamentally changing the paradigm, from satellites simply capturing and transmitting raw data to scenarios where satellites provide relevant and valuable insights in a timely manner, and deliver this insight direct to an end-user. This is game changing for the sector, and we are creating a new marketplace.

Q. In 2024 Ubotica will launch its own satellite. What does this mean for the company?

A. We are committed to launching a satellite next year, and in doing so, we will instantiate a full end-to-end satellite on-board AI service. This end-to-end service incorporates a number of key stages, including running AI model inference on sensor data on the satellite, extracting valuable insights from this inference, and then, critically, delivering these insights directly to an end user, for example direct to their mobile phone. An insight delivered when and where it is needed.

Another breakthrough and benefit of our on-board satellite data processing, is that it will reduce hugely the economic and environmental cost of



transferring, storing and processing large volumes of zero or low value space data. For instance, large volumes of EO (Earth Observation) data with low information content (e.g. cloudy images) ends up in power hungry data centres, by placing AI based analysis of data on board the satellite we ensure that only rich and meaningful data is sent to earth for further analysis.

Q. Which sectors do Ubotica's customers come from and how do you help them?

A. Space is more and more important in all aspects of our daily lives, from the sustainability of our food supply, to the vital management of our vulnerable environment.

Agriculture and the Marine are two sectors that are a priority for us, and we have directly engaged with a number of users across these sectors.

A great example is fish farming. It is hugely important for the world's global food chain and in support of the growing world population. However, fish farms, which are placed in the open sea, are at risk to many environmental factors including harmful algal blooms (HABs). In a matter of days, these

blooms can kill thousands of fish worth millions of Euros. In 2019, in Norway, 8 million farmed salmon were killed in 2 days by a HAB.

Our EO (Earth Observation) satellite technology can help prevent this, we can give fish farmers early warning to threats like harmful algal blooms. This early alert gives them more time to react, for instance, to harvest the fish straight away, to pump oxygen into the water or to active an air bubble curtain that isolates the fish from the bloom.

Another good example comes from agriculture industry. Our EO technology (using hyperspectral sensors), can measure in real-time soil temperature and soil moisture content. Presenting farmers with timely and specific detail about the condition of soil on their land. This, timely information, has big implications in terms of their everyday decisions on land irrigation needs, and crop planting and harvesting schedules.

We know it's really critical in crop management that you plant at the optimal time. If you plant when it's slightly too wet, slightly too dry or slightly too warm, this can have a major impact on your yield. We can

continue...

offer farmers an accurate, up-to-date assessment of their soil temperature and moisture, which can make a huge difference.

In addition, soil moisture content is a leading indicator of forest fires. When moisture levels get too low, it's a direct indication of dryness and a higher risk of fires breaking out. We can spot danger signs, as well as alert people when a fire does break out, early information gives a better opportunity to react.

In summary, we can observe, interpret and deliver relevant and valuable information from space direct to our customers when and where they need it.

Q: How is Ubotica assisting critical infrastructure engineers?

A. Critical infrastructure is another area that can benefit for timely insights and alerts from space. For instance, when electrical infrastructure, oil or water pipelines, railways or roads are damaged, it is critical to have insight into the damage as soon as possible and therefore be all to response to the risk presented.

In working with our customers in this area of critical infrastructure, an interesting pattern is emerging, one where we combine different monitoring options to more thoroughly assess a potential damage situation.

In short, the satellite can take a broad scope view and make an initial assessment of potential critical infrastructure damage, it will immediately then send an alert to earth. This alert can then trigger, for example, a drone to go and have a closer look. Drones are already being used to monitor critical infrastructure, but our technology will mean that they can be prompted by satellites with respect to specifically where to go to and have a closer look.

This hybrid approach combines what the satellite can detect across a large special area with other forms of monitoring, including drones, that can go in closer for a more comprehensive assessment of the situation.



Q: What can you tell me about how Ubotica is growing its team around the world?

A. We have gone to where the talent is, and already have a dispersed and diverse team across Europe and beyond.

For instance, we have found brilliant space systems talent in the Netherlands, and similarly with computer vision expertise in Spain, AI modelling talent in Tunisia and digital image processing in Canada.

We are very flexible in our recruiting methods and locations, however forming clusters in specific places is definitely of benefit, both for the company and for the co-located teams that are formed in these clusters.

Our teams work both virtually and in situation together, and as we grow and welcome people from different national cultures, diversities and backgrounds we believe that we are building an innovative, inclusive, trusted and collaborative team culture across Ubotica, this is really important to us.

Q: What do you see in Ubotica's future over the next couple of years or so, besides growing your team around the world and developing your own satellite?

A. We will continue to build out and validate our end-to-end solution with the key milestone of the launch our own satellite in March 2024. As reference, our own satellite allows us to instantiate our end-to-end SPACE:AI solution.

Beyond that, it really is all about addressing customer needs, and delivering customer value, therefore allowing us realise customer adoption of our solutions. Innovation is ultimately about people and customers adopting a new solution or a new way of doing things, for Ubotica solution adoption is the goal.

We will advance many customer engagements across numerous sectors, understand where timely insights from space can have most benefit, and that can drive social, environmental and economic value.

Constellations are of huge importance to us, as they allow persistent coverage over areas of interest across the global. We are currently engaged in constellation planning with a number of Tier one space providers, overall we are keen to develop partnerships on this side of our business. We believe that constellations are the ultimate means to provide persistent real-time insights from space to our customers.

Q: Ubotica is developing the infrastructure to extend the Mobile App Store ecosystem into space and unlock Live Earth Intelligence?

A. It is essential that we have an easy to use, secure and scalable means to deploy and manage our AI applications in space. To achieve this, we are working closely with a number of enterprise IT companies.

Just like technology platforms in any other industry, as you scale up your offering and scope of coverage, you need more complex infrastructure and IT management, in our case to enable deployment and management of AI solutions in space including the updating of existing solutions.

IBM are an important partner for us. We are working with them to specifically deliver on a deployment and management infrastructure for AI applications in space. Our vision in this regard to make it as easy as possible for developers to deploy and manage on our AI platforms in space as it is to deploy and manage to well-known mobile app stores e.g. AppStore or GooglePlay.

For instance, post-deployment upgrading in the same way that phone apps get upgraded after they have been installed. Considering the space technology that assesses soil moisture levels, we can upgrade the application while in situ so that it is more accurate than before, or perhaps to add functionality that measures moisture levels in trees. 🌱