Advancing technology for avian safety and wind energy optimization

In the relentless pursuit of sustainable energy, wind power stands as a beacon of hope, reducing greenhouse gas emissions and mitigating the effects of climate change. However, the installation of wind parks, particularly in ecologically sensitive areas, poses significant challenges to avian wildlife.

In a bid to harmonize renewable energy production with environmental preservation, Nvisionist has leveraged its expertise in Artificial Intelligence (AI) and Machine Learning to develop an innovative bird detection and monitoring system. It aims to ensure the safety of birds while maximizing the efficiency of wind turbines.

Protecting avian fauna with advanced technology

The intersection of renewable energy and wildlife conservation is a delicate balance. Wind energy is pivotal in the global transition from fossil fuels, but it is imperative to mitigate its impact on avian fauna. Nvisionist, an innovative Greek high tech startup, has committed itself to this cause. Its passion for technology and dedication to environmental protection have culminated in the creation of nvbird®, a cutting edge bird detection and monitoring system. Combining advanced AI and machine learning, its aim is to protect birds, particularly endangered species, and ensure the sustainable development of wind energy projects.

Pioneering innovation in renewable energy

Nvisionist specializes in applied digital technology solutions based on AI and machine learning. Its team of highly skilled scientists and engineers boasts extensive know how in machine vision and AI, allowing it to design and produce high tech products and services that benefit the renewable energy sector. Its solutions not only enhance environmental protection and biodiversity but also promote green and responsible entrepreneurship, contributing to business efficiency and sustainable development.

The company employs state-of-the-art multiclass deep learning classification models and advanced AI tools such as YOLO (You Only Look Once) for real time object detection, ensuring the highest levels of accuracy and efficiency. The R&D team is constantly pushing the boundaries of technology, developing innovative solutions that address the unique challenges of the renewable energy landscape. Where necessary it collaborates with prestigious local and international universities and with PPC's Innovation Hub.

The challenge: bird collisions with wind turbines

Wind parks are often sited in areas where wildlife thrives, posing a risk to thousands of domestic and migratory birds. These birds, including endangered species, are invaluable to the ecosystem. The EU has enacted stringent environmental protection rules that mandate energy providers to install bird monitoring and deterrence systems in designated Natura 2000 areas. Failure to address bird collisions can lead to regulatory challenges, project delays, and negative publicity, impacting the financial performance of wind farms.

Pioneering bird protection technology

The nvbird® system stands at the forefront of bird protection technology. This innovative solution uses state-of-the-art AI algorithms and high definition cameras to detect birds in the vicinity of wind turbines. The system operates through several phases to ensure comprehensive monitoring and protection.

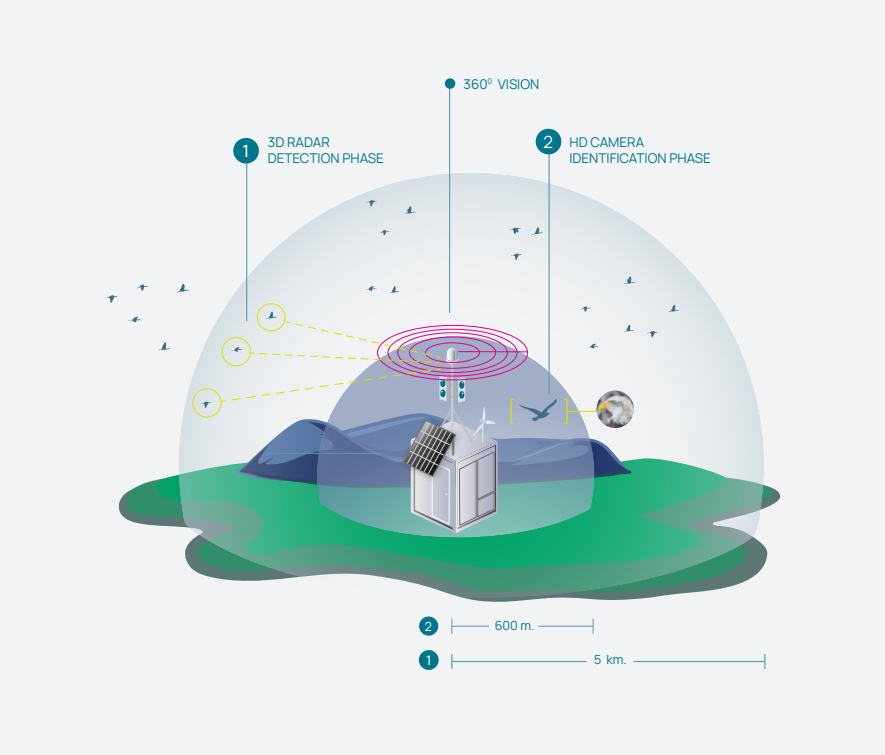
Onshore system

The onshore system is designed to be installed on each wind turbine generator, covering its surrounding area for long distances. During the detection phase, high resolution cameras record approaching birds and their flight trajectories, providing real time data. Advanced Edge AI and machine learning algorithms track the birds and estimate their distance from the WTG based on an innovative monocular approach. When the bird is detected within the critical zone, an Acoustic Startle Response (ASR) sound is activated to deter the bird. If the bird continues towards the Rotor Swept Area (RSA), the system sends a direct signal to the SCADA (Supervisory Control and Data Acquisition) in time to stop the wind turbine generator.

The DAY & NIGHT system also includes the use of thermal cameras to detect bat activity in real time. The nvbird® OPC client ensures a two way communication with the WTG, so that any multi factor BAT mitigation protocol can be implemented, eg. EUROBATS guidelines, considering factors like bat activity, ambient temperature, wind speed, time of year and WTG Cut in speed.

Offshore system

For offshore wind farms, the system uses 3D radars deployed around the perimeter in combination with HD cameras, extending coverage up to 10 kilometers. The offshore system shares the same advanced detection and tracking capabilities as the onshore



nvbird® preconstruction

system but combines input from the radar & cameras, to ensure comprehensive protection of avian fauna. The robust design of the offshore system allows it to withstand harsh marine environments, providing reliable operation and maintenance free functionality for extended periods.

Preconstruction system

Due to extensive collaboration with ornithologists and environmental agencies the company decided to offer a solution for a specific problem. Before constructing wind parks, conducting comprehensive environmental studies on avian fauna is essential. Nvisionist's nvbird® pre-construction system is a fully autonomous solution designed for continuous remote monitoring of bird populations.

The system consists of a combination of advanced 3D radar, HD cameras, and AI software, functioning independently with its own power supply and communication capabilities. It provides critical data on bird trajectories, speed, direction, and species, aiding in the early identification of potential impacts on bird populations.

End to end use of AI

At the heart of nvbird® is a sophisticated AI and machine learning framework. The system employs a multiclass deep learning classification model that leverages vast datasets of bird images and flight patterns. This model enables the system to identify and track birds with high accuracy, even in challenging environmental conditions. The continuous retraining of our AI model, based on new data collected from the field, ensures that nvbird® remains at the cutting edge of bird detection and protection technology.

The R&D team, composed of experts in machine vision and AI, has developed proprietary algorithms that enable real time object detection and tracking. Tools such as YOLO (You Only Look Once) are integrated into our system to provide rapid and precise identification of birds in the vicinity of wind turbines. This end to end use of AI, from detection to classification to deterrence, sets nvbird® apart from other bird protection systems on the market.

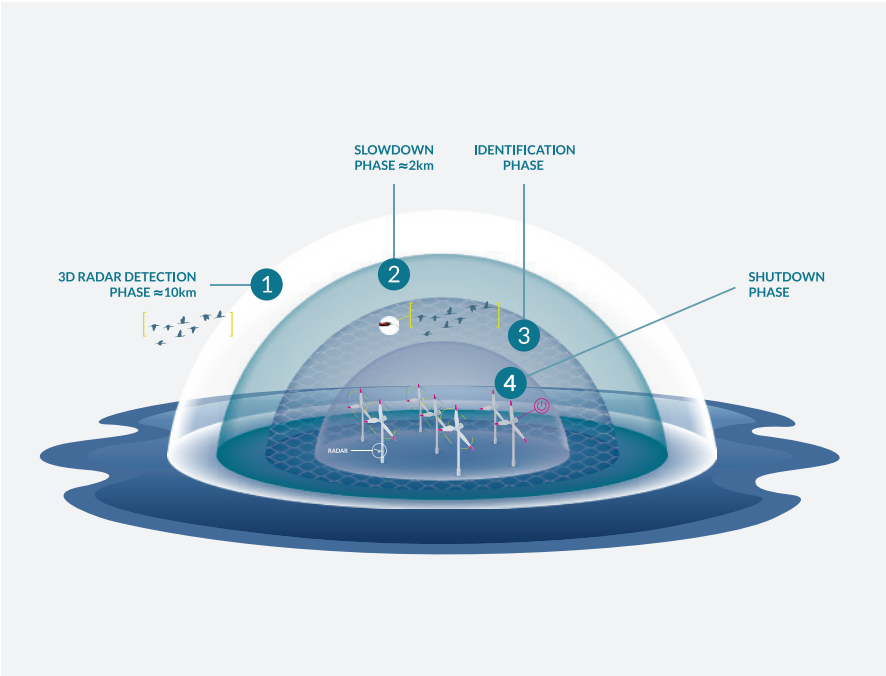
Central NOC for 24/7 monitoring

A unique advantage of nvbird® is the central Network Operations Center (NOC), which provides round the clock monitoring of all parts of its systems worldwide. This centralized approach ensures that our systems are always operational, and any issues are promptly addressed, maximizing the effectiveness of bird protection measures.

Customer success and global recognition

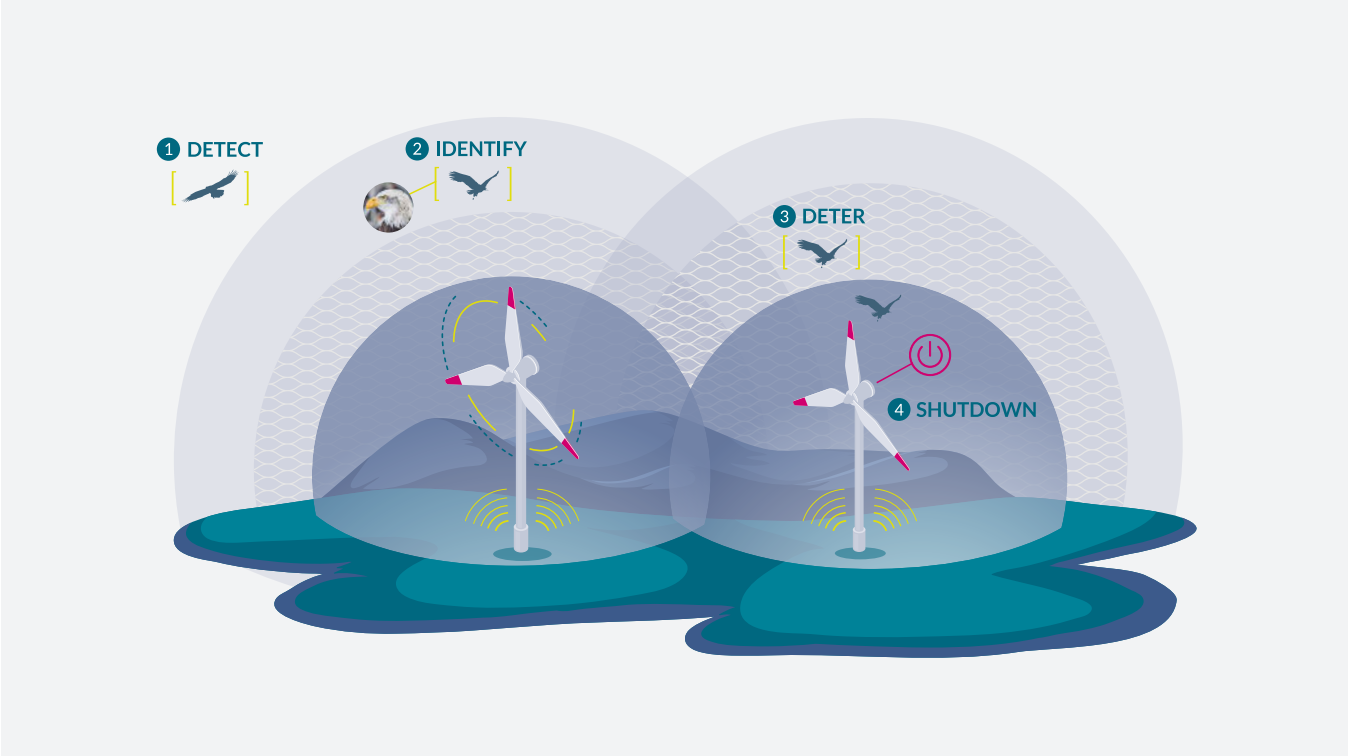
The system has garnered significant recognition and numerous awards, including the prestigious WITSA Global ICT Excellence Award for two consecutive years. and has represented Greece in the European Long-term Investors Association (ELTI) awards. It was also one of the 10 shortlisted nominees for the Future Unicorn Award in 2024 by Digital Europe.

Nvisionist belongs to the Greek Public Power Corporation (PPC) Group which has invested in the company's equity capital. Participation in Wind Europe's Technology Workshops with papers presenting our technological advancements, but also the company's collaboration with EU ENV D3 (nature protection) demonstrates its commitment to innovation and environmental stewardship. Nvbird has been installed on wind turbines in multiple wind parks throughout Europe and has even reached locations in Japan.



Offshore

Nvisionist envisions a future where renewable energy and wildlife conservation coexist harmoniously.



Onshore

Future vision and potential

Nvisionist envisions a future where renewable energy and wildlife conservation coexist harmoniously. Its ongoing investment in R&D and partnerships aims to enhance the capabilities of the system and expand its application to other areas of environmental protection. By continually improving its technology, it strives to contribute to global sustainability goals and the protection of biodiversity. Being one of the 10 shortlisted nominees for the 2024 edition of the 'Future Unicorn Award' competition from DIGITAL EUROPE is proof of its strive to 'add value to the green energy'.

Conclusion: committed to environmental protection and innovation

The nvbird® system represents a significant leap forward in bird protection technology, combining advanced AI and machine learning with robust, innovative design. The company's dedication to environmental stewardship and renewable energy excellence positions it as a leader in the field, ready to address the challenges of tomorrow with cutting edge solutions today.

www.nvisionist.com

Unique and innovative features

nvbird® is distinguished by its five key innovations, developed by the R&D team:

1. Advanced AI algorithms: the system uses cutting edge AI to detect birds in risk zones accurately.
2. Radars, high definition and thermal vision cameras: These sensor detectors enable 24 hour, all weather detection, ensuring continuous operation and protection.
3. Cloud based nvbird® platform and NOC: the user friendly platform gives all necessary information and reports of all incidents including photos and videos. The NOC system ensures very high levels of system availability.
4. Robust and modular design: nvbird® is built to withstand harsh environments and minimize maintenance requirements. The modular patented design along with high quality materials allow for easy installation and removal without deinstallation of external components and system longevity with minimum maintenance needs.
5. Omnidirectional patented speaker technology: for wind turbines with high pylons, a 360 degree speaker is installed on the nacelle, which coupled with an artificial ASR sound, provides very effective bird deterrence and easy maintenance.