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AI Surpasses Human Experts in Detecting Deadly Vine Disease in French Vineyards

Researchers achieve up to 94% accuracy in lab tests, but technical hurdles delay real-world deployment in Champagne region

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Artificial intelligence is showing significant promise in the fight against flavescence dorée, a serious disease affecting grapevines in France. At a recent conference on artificial intelligence in viticulture, organized by InterLoire in Saumur, the Comité

Champagne announced that AI now outperforms human experts in detecting the disease on vine leaves—at least under laboratory conditions.

The Champagne region is known for its rigorous approach to vineyard management. Last autumn, teams of winegrowers and technicians surveyed 22,350 hectares of vineyards over 264 half-days, responding to 27,000 summonses issued by the Comité Champagne. The operation involved 480 lead winegrowers and 80 volunteer experts overseeing the inspections. Despite these efforts, not all of the region’s 35,000 hectares could be covered, and fatigue among participants is becoming a concern.

Mathieu Liébart, project manager at the Comité Champagne, presented these figures at the January 29 conference. He acknowledged that organizing such large-scale inspections is time-consuming and energy-intensive. Even with this effort, human operators detect only about 50% of diseased plants. Some infected vines go unnoticed, while healthy ones are sometimes mistakenly flagged as suspicious.

To address these limitations, the Comité Champagne has been working for five years to develop AI tools capable of identifying flavescence dorée more accurately. By training AI systems with thousands of images of healthy leaves and those affected by various diseases or discolorations, researchers have achieved recognition rates above 80%, reaching up to 94% for certain techniques applied to chardonnay leaves collected in July.

However, these high success rates have so far been achieved only in laboratory settings. The computational power required to analyze real-time video footage from cameras mounted on tractors is currently too great for field deployment. Researchers are continuing their work to overcome this technical barrier.

Other groups are also advancing AI applications in plant health. The Pl@ntNet consortium has developed an app used by 25 million people worldwide to identify plant species. While it can now recognize seven foliar diseases in rapeseed, identifying diseases in grapevines remains a challenge. Lydia Bousset-Vaslin, a plant pathogen epidemiologist at INRAE Rennes, invited winegrowers to collaborate as beta testers by submitting annotated images of vine diseases to help improve the technology.

The Pl@ntNet team relies on contributions from amateur botanists and plans to expand its database through similar community involvement for new projects like Pl@ntAgroEco. Bousset-Vaslin emphasized the need for image collections covering all stages of disease development across different grape varieties. Her team uses Meta's DINOv2 model for image analysis and recognition.

AI is also making strides in wine analysis beyond disease detection. Stéphanie Marchand-Marion, a researcher at Bordeaux's Institute of Vine and Wine Sciences, shared results from a study where AI analyzed gas chromatography data from classified growths in Saint-Emilion and Médoc. The AI was able to distinguish between wines from these two regions—something traditional analysis could not achieve.

In another development presented at the conference, a Spanish team used AI to describe the taste profiles of 30 tempranillo and grenache wines from Spain and Australia almost as accurately as expert tasting panels. The process combined chromatographic and voltammetric analyses with machine learning, resulting in faster and less expensive sensory evaluations.

Marchand-Marion urged the wine industry to take ownership of these technological advances and communicate proactively about their wines. She warned that if producers do not engage with these new tools and share accurate information about their products, others may step in and spread misinformation.

The integration of artificial intelligence into viticulture is still evolving. While laboratory results are promising—especially with detection rates as high as 94%—the challenge remains to adapt these technologies for practical use in vineyards. Researchers continue to seek collaboration with growers and additional funding to bring these innovations from the lab to the field.