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Artificial Intelligence Meets a Fine Nose German Fragrance House uses AI to Map Scent Relationships

What does vanilla smell like compared to musk? And what do citrus fragrances have in common at the molecular level? Leipzig-based Bell Flavors & Fragrances is turning to artificial intelligence to answer such questions. The company aims to accelerate fragrance development using AI-driven tools to make the process more targeted, efficient, and sustainable.

How Bell's Fragrance AI Learns to Smell

The system is built on several interconnected AI components, each handling a specific task in the fragrance development process—among them a molecule encoder, a formulation optimizer, and a digital scent map. Together, they analyse chemical structures, sensory descriptions, and formulation data. With every application, the AI continues to learn and delivers increasingly precise suggestions for the creation of new fragrance compositions.

A New Language for Scent

A central element of the project is an AI-powered scent map designed to translate sensory impressions and chemical structures into a coherent system. While sounds are described by frequency and colours by wavelength, no comparable framework yet exists for smells.

The AI learns which molecules are perceived as similar – and visualises these relationships. The result is a digital map that helps navigate the world of scent and provides a valuable foundation for more targeted fragrance development.

"Artificial intelligence helps us better understand the connection between scent and chemical structure. It processes large volumes of data, and we train it to present the results as a kind of map," explains project lead Peter Fichtelmann, who is pursuing his doctorate at Leipzig University with Bell as an industry partner.

Smarter Formulations, Faster to Market

Training the AI relies on a rich dataset drawn from Bell's decades of perfumery expertise – including thousands of fragrance formulations and detailed olfactory descriptions. These are enhanced by structured feedback from internal sensory teams, who document how new scents are experienced even before they reach customers.



"Artificial intelligence enables us to make our development processes more efficient and precise," says CEO Holger Wetzler. "This gives our medium-sized clients a real edge. With data-driven formulation suggestions, they can respond to market shifts more quickly and effectively."

Scientific Collaboration with Real-World Impact

Bell is developing its AI-based fragrance tools in close collaboration with the scientific community. Since 2024, the company has been working officially with Leipzig University. The aim is to apply scientific methods directly to practical fragrance development. Regular exchange with academic partners broadens Bell's technical perspective and brings new insights directly into application.

The project is also viewed positively from a university standpoint. Junior Professor Dr Julia Westermayr, who oversees the collaboration at the Faculty of Chemistry, explains:

"This project offers us a valuable opportunity to connect research with real-world challenges. The extensive data and practical insight provided by Bell enable new perspectives on the systematics of olfactory perception. It allows us to scientifically explore an area that, until now, has been largely unstructured."

Get Involved: Your Nose Can Help

Bell is inviting members of the public to contribute to its AI fragrance research. Anyone interested can visit the company's scent station on **20 June 2025, 6 – 10 pm,** during the *Long Night of Science* at the Faculty of Chemistry (Johannisallee 29, 04103 Leipzig).

Participants will be given a selection of fragrance samples to describe and evaluate on the spot. All responses will be stored anonymously. As a small thank-you, visitors will receive a gift and have the chance to learn more about Bell during a guided company tour.