### *Taste of Quality, Sustainability, and Safety (TaQSSa) - AI-driven high-throughput multisensor platforms for food profiling*

Fingerprints, thanks to their uniqueness, irremovability and immutability, are one of the basic biometric features used to identify people. But not only this type of pattern is unique and characteristic for the owner - the iris of the eye, face geometry or the arrangement of veins on the hand can be used recognize a specific person as well. Identification techniques in food analytics may also be based on the recognition of "patterns" - i.e. signal sets that are characteristic and unique for a given sample. They can be entire NMR, UV/Vis, IR, MS spectra, or entire chromatograms. Such "fingerprints" – profiles, are a specific and unique sample signature, which can be used for comparison with other patterns in the library of standards, in order to extract information about individual, characteristic properties, components and their concentrations. In recent years, one of the identification techniques using "profiles" are electronic tongues and electronic noses. "Fingerprints" are generated using a set of chemical sensors, and their characteristic pattern is recognized for decoding analytically important information by numerical methods, including those based on artificial intelligence. Systems of this type resemble their natural counterparts, i.e. the senses of smell and taste, not only thanks to the use of a set of receptors (analogy to taste buds or receptors in the olfactory bulb), but also thanks to the recognition of the entire pattern (as it happens in our nervous system), and also thanks to the most common application – food analysis. However, the generation of such "fingerprints" is often limited due to hardware capabilities, which leads to limited content of "profile" libraries. **In this project, we would like to see if we can overcome this limitation - we want to combine the capabilities of high-throughput analytics with the recognition capabilities offered by electronic tongues.** We intend to check the capabilities of the developed high-throughput multi-sensor systems by examining the "taste" of:

- coffee - to check if it is adulterated (taste of quality);
- fruit chips, to recognize the processing method (taste of sustainability);
- fruit juices, for the detection of nano/microplastics (taste of safety).

Extensive data libraries containing profiles of the tested food products will be analyzed using artificial neural networks, and the overall assessment of the proposed high-throughput systems will involve objective performance parameters, such as classification accuracy, sensitivity and precision:
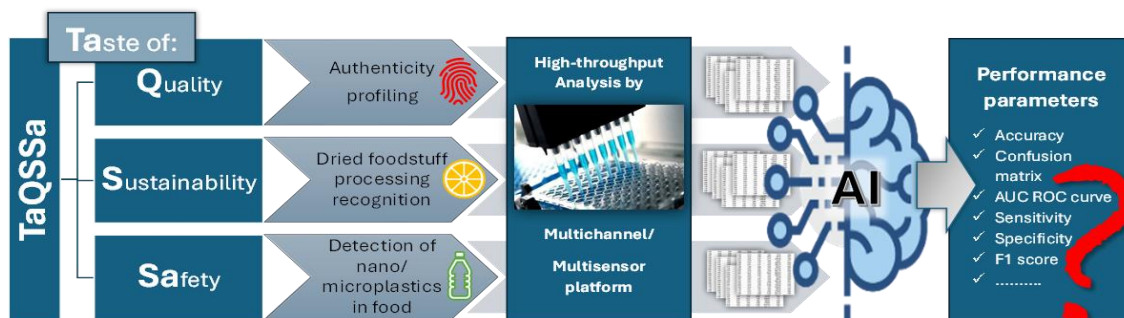
High-throughput food profiling has great potential as **fast, low-cost, high-throughput, versatile and easy-to-perform tests** that can find a variety of applications in food analysis. Just as high-throughput screening has revolutionized and accelerated drug discovery, the ability to high-throughput food profiling would also have a **major impact on product development and quality control in the food industry**.