

**Ph.D. in Information Technology
Thesis Defense**

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at 13:30

Sala Seminari Nicola Schiavoni, Building 20

Bianca DI DIODORO – XXXVI Cycle

ELECTRONIC NOSES FOR HEALTH AND FOOD APPLICATIONS: DEVELOPMENT OF SENSORS, SYSTEMS AND ALGORITHMS

Supervisor: Prof. Giacomo Langfelder

Abstract:

Electronic noses represent a promising solution in several fields of application, with many advantages with respect to other techniques for gas analysis. Different types of gas sensors can be employed inside an electronic nose, using a dedicated sampling system for headspace preparation, analog and digital electronics for signal acquisition and a pattern recognition system to process the sensors responses. This thesis discusses all of these aspects of the odor sensing chain. This work, in collaboration with the Dipartimento di Ingegneria Chimica, presents the development of an electronic nose adapted to a biomedical application within the DiagNose project, which aims to create a non-invasive diagnostic tool for prostate cancer detection from urine volatile organic compounds. For this application, a sampling system for urine headspace preparation and automated measurements is described and preliminarily tested. A food industry application is presented as well within the SOS-COOKS project, for which the electronic nose is used to detect the optimal baking time of bread products, obtaining a classification performance of 88%. For these applications, commercial and custom-made gas sensors have been considered, developing a low-noise acquisition circuit featuring amplitude modulation for noise reduction and a 16 bits ADC for signal digitization, obtaining a sub-0.015% resolution. The characterization of custom-made gas sensors, manufactured at Politecnico di Milano is discussed as well, presenting their sensitivity to various calibrants and addressing critical aspects such as repeatability and aging.

PhD Committee

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