Project Title: Design of an eNose for low-cost, non-invasive, non-irradiating and specific breast cancer screening

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Whilst the number of diagnosed breast cancer patients is on the raise, the need for a low-cost, non-invasive and non-irradiating breast cancer screening device becomes more urgent. As a response to the current debate on the worthiness of the mammogram, a new opportunity has appeared for a novel breast cancer screening solution that performs with enough sensitivity and improved specificity with respect to that of the mammogram. The proposed project is a continuation of a previous bachelor thesis [link] that proved the following hypothesis:

> "The study of the volatile organic compounds present in urine is sufficiently significant to enable class prediction among control subjects and metastatic breast cancer patients"

In the previous work, to test such hypothesis a gas chromatography-mas spectroscopy of urine samples was performed. The signal was then classified on control vs cancer by PCA and kNN. When implemented on an Arduino board, the sensitivity was of 75%.

This new step of the project aims at enhancing the previous embedded system by implementing:

- A Neural Networks algorithm that provides a better specificity

- To perform NN classification on the cloud and hence be able to run a more powerful algorithm

- If possible, to use a larger data set. Previous was of 90 subjects.

Learning Objectives
1. To gain a deeper understanding of artificial intelligence and machine learning
2. To learn how to implement a classification algorithm on the cloud and make up for the challenges it poses: security, privacy…
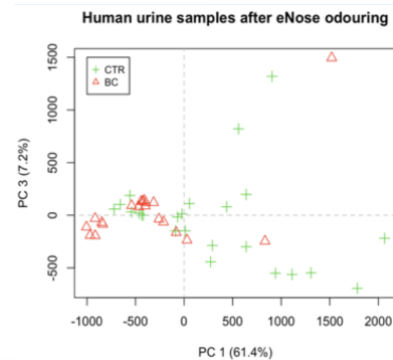3. To continue a project that has long been my passion

Technology and Tools
- Processing board that supports NN and internet access. Raspberry Pi for instance
- 4 or more metal oxide sensors
- Basic electronic components
- Python. Keras module to implement NN

Project Illustration
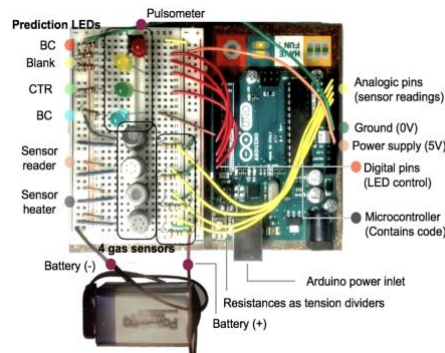
eNose, the result of the last project

Final classification of the previous eNose