Cancer diseases are one of the leading causes of mortality within world population today. The incidence of thyroid cancer, particularly, is observed to rise worldwide. The challenge in treatment of thyroid cancer patients is to balance the therapeutic approach to avoid over-treatment of patients with a lower risk of disease, and to provide a more aggressive treatment to the ones with a more advanced disease. Therefore, the accurate diagnosis of the severity of thyroid cancer plays a central role in the management of this disease.

The goal of this project is to develop a simple and fast electrochemical platform for the ultrasensitive detection of a thyroid cancer biomarker (thyroglobulin), based on polymer nanoparticles functionalized with antibodies and a 3D nanostructured electrode. The resulting system should be applicable in a design of a lateral flow immunoassay system. The *modus operandi* of such a system would be based on the reaction of nanoparticles deposited on the support of the lateral flow system with the sample containing the biomarker. Next steps involve the migration of nanoparticles towards the electrode surface modified by antibodies, and their immobilization onto the modified electrode by immunoreaction, resulting in anchoring that will modify the intensity of the electrochemical signals. This original concept can be successfully extended to different types of antigens and therefore to various types of cancer or even to DNA sensors and aptasensors, thus opening the fields of application from biomedical to the environment.