

In this project, we are optimizing a machine learning protocol for extracting chemical information from spectral data. FTIR, Raman or surface-enhanced Raman scattering (SERS) techniques have the potential of unveiling hidden information from complex spectra of biochemical mixtures. As a result, from thousands of measurements, a large spectral data set is analyzed by machine learning methods. The methods proposed in this project will be used to detect disease-specific biomarkers at very low concentrations from bio-samples for the detection of Alzheimer's disease.

#### Job description:

- Increase the number of significant features in large data sets by systematic measurements with different spectroscopic techniques (Raman, FTIR, SERS, ...).
- Microscopy and fluorescence microscopy image acquisition.
- Develop the machine learning algorithms further that we already have, to reduce error rates in detection.
- Identify additional machine learning models and strategies of classification/regression that fit to the main objective of the project.

#### Main outcome of the project:

- Dataset from different spectroscopic techniques based on human samples of healthy and not healthy groups.
- Optimized machine learning protocol for the detection of biomarkers from vibrational spectroscopy data.
- Description of the capabilities, performance, and benefits of the method proposed.
- A guideline for the implementation of machine learning algorithms applied to data from several spectroscopy techniques.

#### Description of the research group:

The **Nanoengineering Group** focuses on research at the interface between fundamental nanoscience and applied engineering, particularly in the area of photonic medical diagnostics, environmental issues, and food control.

We encourage highly motivated candidates to carry out their final Master's thesis in an international, multidisciplinary research environment. Preferably, the students should have the following background: Computer Science, Mathematics, Physics, Chemistry, Biomedical Engineering, etc. For more information, please visit our website <http://www.nanogune.eu/nanoengineering>.

Application:

If you are a master student and you are interested in this project, please get in touch with the group leader in charge: **Andreas Seifert** ([a.seifert@nanogune.eu](mailto:a.seifert@nanogune.eu))

To apply for a master scholarship fill in the form below and follow the instructions and recommendations of the general call (**open until 30 June 2022**).

*NOTES:*

*(i) All applicants will receive an answer after the end of the selection process; but please note that due to the large number of submissions that are expected, we cannot provide individual feedback.*

*(ii) Additional information about nanoGUNE's commitment towards HR excellence in Research and Gender Equality are available on our website.*

*(iii) We encourage you to subscribe to our HR mailing list to receive information related to nanoGUNE's open positions and open calls for different training and talent attraction programs.*