The goal of this Master project is to explore infrared nano-imaging for bioimaging applications. The specific goals of this project are to:

- Test and select the best parameters for infrared nano-imaging
- Resolve chemical composition and morphology of biological cells at the nanometer scale

The results of this project will help us to understand if infrared nano-imaging can be used to diagnose disease. So far, clinical pathology has relied on adding dyes to human tissue biopsies and using an optical microscope to see the patterns of organization and shape of normal and cancer cells to diagnose tumors. However, the shape and color induced by the dye provide very limited information about the underlying molecular changes that drive cancer. Infrared imaging could fundamentally change how pathology is done in the clinic because it can measure the chemical changes in cells when disease occurs. If combined with machine learning, infrared imaging could prevent errors, shorten diagnosis time and may even predict disease outcome. Despite this potential, infrared imaging cannot resolve the fine morphological details of cells at the level of optical microscopy. The overarching idea of this project is thus to test if we can improve diagnostic value by using novel infrared nano-imaging methods.

In the first part of this project, the student will compare two established methods for infrared nano-imaging and determine the most promising method. To this end, the student will fabricate test samples and measure them on state-of-the-art microscopes in the nano-optics laboratory. In the second part, the student can image ultrathin sections of biological cells. The aim is to understand the image contrast and to verify that cell morphology is correctly resolved. Basic knowledge on infrared spectroscopy is beneficial; knowledge of Matlab is needed to perform data analysis.

We offer an excellent opportunity to work in an international environment and perform leading research in infrared nanoimaging.

Description of the research group:

The **Nanooptics Group** in CIC nanoGUNE is interested in the development of advanced microscopy techniques and their application to a variety of fields including nanophotonics, materials science and biomedical imaging.
https://www.nanogune.eu/nanooptics

Application:

If you are a master student and you are interested in this project, please get in touch with the scientist in charge: **Martin Schnell (m.schnell@nanogune.eu).**

To apply for a master scholarship fill in the form below and follow the instructions and recomendations 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.