

## **French Polytech network form for PhD Research Grants from the China Scholarship Council**

This document describes one of the PhD subjects proposed by the French Polytech network. The network is composed of 15 engineering schools/universities. The document also provides information about the supervisor. Please contact the PhD supervisor by email for further information regarding your application.

<b>Supervisor information</b>	
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<b>Polytech name</b>	Nice Sophia
<b>University name</b>	Universite Cote d'Azur
<b>Country</b>	France

<b>PhD information</b>	
<b>Title</b>	Protein Adductomics: A Novel Approach for Deciphering the Exosome of Cancer in Breast and Colorectal Tissues Using High-Resolution Mass Spectrometry
<b>Main topics regards to CSC list (3 topics at maximum)</b>	Bio-informatics, Omics technologies, Exosome

<b>Required skills in science and engineering</b>	Bio-informatics (R and Python programming), Mass spectrometry analysis and data interpretation, Statistical analysis, Epidemiology, Biological Engineering.
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## Subject description (two pages maximum including biblio)

Cancer remains a complex and multifactorial disease, with breast and colorectal cancer representing major global health challenges. The exposome, encompassing the totality of environmental and lifestyle exposures, plays a pivotal role in cancer development. Protein adductomics, a cutting-edge approach utilizing high-resolution mass spectrometry, has emerged as a promising tool to uncover exposure-related modifications in proteins. This proposed PhD research aims to pioneer the development of innovative mass spectrometry methods and bioinformatics preprocessing techniques to extract and analyze protein adductomics data from clinical datasets, shedding light on the exposome's influence on breast and colorectal cancer.

The primary objectives of this PhD research are as follows:

- Develop novel mass spectrometry methods to detect and quantify protein adducts in clinical samples.
- Design and implement advanced bioinformatics preprocessing techniques for the extraction of protein adductomics data.
- Apply statistical and machine learning approaches to identify exposure-related protein modifications associated with breast and colorectal cancer in the context of the exposome.
- Explore the biological mechanisms underpinning protein adduct formation and their implications in carcinogenesis.

This research will involve state-of-the-art high-resolution mass spectrometry techniques to detect and quantify protein adducts. AI based bio-informatics pipelines will be developed for data preprocessing, quality control, and statistical analysis to identify exposome-related protein modifications.

Protein adductomics has the potential to provide unique insights into the exposome's impact on cancer development by uncovering specific protein modifications linked to environmental exposures. This research can inform targeted interventions and personalized risk assessment strategies.

The outcomes of this PhD research will include the development of novel mass spectrometry methods and bioinformatics tools for protein adductomics data analysis. Additionally, it is expected to identify exposure-associated protein modifications relevant to breast and colorectal cancer, contributing to a deeper understanding of the exposome-cancer relationship. This proposed PhD research represents an innovative and interdisciplinary approach to elucidating the exposome's influence on breast and colorectal cancer.

**Keywords:** Protein Adductomics, Mass Spectrometry, Exposome, Breast Cancer, Colorectal Cancer, Bioinformatics, Data Processing, Cancer Risk Factors.

