

Internship (+ PhD) in applied mathematics:
**Compositional functions networks for scientific machine
learning and uncertainty quantification**

Project description

The approximation of high-dimensional functions is a challenging task in computational science. Many modern tools for dimension reduction or high-dimensional approximation are based on compositions of functions. The most prominent examples are deep neural networks and tree tensor networks. The composition of functions yields model classes with high approximation power. However, these are highly nonlinear manifolds and the development of stable and efficient learning algorithms remains a pressing open problem, in particular when only limited information or computational resources can be used.

The aim of the project is to analyse the properties of a large class of compositional functions, which includes neural networks and tree tensor networks, and to devise new robust learning algorithms based on optimal and adaptive sampling strategies. The proposed approaches will be applied to challenging problems in the solution of forward and inverse problems in scientific machine learning and uncertainty quantification.

This internship, followed by a PhD, is part of the COFNET project which will be funded by ANR and DFG (French and German national research agencies) from 2022 to 2025. Partners of this project are the Laboratoire de Mathématiques Jean Leray (Centrale Nantes, Nantes Université) and the Weierstrass Institut for Applied Analysis and Stochastics in Berlin.

Candidate profile

We are seeking for candidates with a solid training in mathematics, with a specialization in statistical learning, numerical analysis or scientific computing. Very good skills in scientific programming are expected.

Details

- Supervisors: Anthony Nouy (Centrale Nantes, Nantes Université) and Martin Eigel (WIAS, Berlin)
- Start: Spring 2022, followed by a PhD starting in Fall 2022.
- Location: Laboratoire de Mathématiques Jean Leray, Centrale Nantes, Nantes Université, and WIAS Berlin.

How to apply

The candidates should send a CV, statement of interest and letters of recommendation to Anthony Nouy (anthony.nouy@ec-nantes.fr) and Martin Eigel (eigel@wias-berlin.de).