

# **Ecole Doctorale Carnot-Pasteur**

## **Proposition de sujet de thèse**

### **Intitulé français du sujet de thèse proposé :**

Approche numérique aux surfaces de Riemann compactes

### **Intitulé en anglais :**

Numerical approach to compact Riemann surfaces

### **Unité de recherche :**

IMB

### **Nom, prénom et courriel du directeur (et co-encadrant) de thèse :**

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### **Domaine scientifique principal de la thèse :**

Mathématiques

### **Domaine scientifique secondaire de la thèse :**

### **Description du projet scientifique**

Riemann surfaces have applications in many fields of mathematics and physics as cryptography and classical mechanics, hydrodynamics, and nonlinear optics. An obstacle to their efficient use has been for a long time the numerical evaluation of functions given on these surfaces or the associated moduli space. It is therefore the goal of this thesis to develop algorithms to compute various quantities associated to Riemann surfaces and to implement them in numerical schemes.

In the focus of this thesis will be the application of homotopy tracing methods to identify the critical points of algebraic curves including schemes adapted to high order singularities.

Another important point will be the identification of the defining equation of an algebraic curve for given critical points and monodromies. Existing codes to compute monodromies will have to be optimized.

### **Connaissances et compétences requises :**

Basic programming knowledge (Matlab, C++ or Fortran).