



# Laura S. Mendoza

RESEARCH ENGINEER · PH.D. IN APPLIED MATHEMATICS

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## Education

### Ph.D. in Numerical Methods for Plasma Physics

Garching, Germany

TECHNISCHE UNIVERSITÄT MÜNCHEN (TUM)

2012-2016

- Title: "A new approach discretizing the 2D poloidal plane of fusion devices"
- Supervisor: Eric Sonnendrücker (IPP, Germany)
- Co-supervisor: Virginie Grandgirard (CEA, France)
- Jury : Prof. Dr. Caroline Lasser (TUM), Prof. Dr. Francis Filbet (Université Toulouse III), Prof. Dr. Philippe Helluy (Université de Strasbourg)

### Master degree

Strasbourg, France

UNIVERSITÉ DE STRASBOURG

2010-2012

- Major in Scientific Calculus and minor in Computer Science Security
- Obtained with honors

### Bachelor's degree

Strasbourg, France

UNIVERSITÉ DE STRASBOURG

2010-2012

- Major in Applied Mathematics and minor in Computer Science
- Obtained with honors

## Experience

### Research Engineer (3-year fellowship)

Strasbourg, France

FRENCH NATIONAL INSTITUTE FOR COMPUTER SCIENCE AND APPLIED MATHEMATICS (INRIA)

2018-2021

- Context: *Eurofusion engineering grant* in collaboration with the CEA of Cadarache, France and Max-Planck Institute IPP, in Garching, Germany.
- Development and optimisation of a machine-independent open-source python library for synthetic tomography diagnostics and inversions.
- Code optimisation using Cython, and parallelization based on OpenMP.
- Packaging of code using Anaconda, continuous integration using Travis

### Post-doctoral Fellow

Strasbourg, France

FRENCH NATIONAL INSTITUTE FOR COMPUTER SCIENCE AND APPLIED MATHEMATICS (INRIA)

2017-2018

- Creation of a python Multi Patch Semi Lagrangian Library (Slappy) parallelized using OpenCL for GPU and CPU parallelization
- Adaptation of the Slappy library to Diffusion models

### Computer Science teacher

Strasbourg, France

LYCÉE KLÉBER, STRASBOURG FRANCE

(120h per year) 2016-2018

- Teaching of the programming language Scilab and introduction to algorithmic to first year students in Economics. Lectures and Practical classes.

### Post-doctoral Fellow

Strasbourg, France

UNIVERSITÉ DE STRASBOURG

2016-2017

- Implementation of an explicit Discontinuous Galerkin method in the Schnaps library to solve the transport equation. The code is parallelized in a hybrid fashion (CPU/GPU) using the MPI version of the StarPU task manager.
- Creation of more realistic geometries of fusion devices using Gmsh. Upgrading and adapting the mesh interface of the Schnaps code.
- Development of a high order transport SUPG solver on a mesh with non matching patches. Parallelization using the MPI version of StarPU. Study for the kinetic and MHD models on curved meshes (tokamaks)

### PhD program

Garching, Germany

MAX PLANCK INSTITUTE OF PLASMA PHYSICS (IPP)

2012-2016

- Creation of the SLMP library: modules, tools and algorithms for solving Advection and Poisson equations on a multi-patch domain. The code is part of the CLAPP library and uses the geometry module (CAID), the mesh module (SeLaLib), the splines modules (SPL) and some ODE solvers (SeLaLib). The code is able to work on complex 2D geometries defined by splines
- Development of an efficient quasi-interpolation solver and a Finite Element solver on the mapped hexagonal mesh. Interfaces with the Django and the SeLaLib codes

## Internship in a research laboratory on A.I.

LABORATORY QUANTUP

Strasbourg, France

(6 months) 2012

- Optimization of the Bin Packaging Problem in 2D with polygons using genetics algorithms and exploring others solutions using evolutionary algorithms

## Computer Science Security Analyst Intern

HÔPITAUX UNIVERSITAIRES, REGIONAL HOSPITALS INFORMATIONS CENTER

Strasbourg, France

(3 months) 2011

- Studied the risks linked to the applications development and their integration in an information system
- Analyzed the best utilities to improve an information system's security level

## Skills

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**Programming** Python, Cython, C, Fortran, OpenCL Scilab, Octave, OpenMP, C++

**DevOps** Jenkins, Gitlab, Github, Anaconda (miniconda), Docker

**OS** Ubuntu/Linux, OS X, Windows

**Languages** Spanish, French, English, German, Arabic (learning)

## International Conferences

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### Development of a parallelized open-source python library for synthetic diagnostics and inversions for fusion devices

Valencia, Spain

INTERNATIONAL CONGRESS FOR INDUSTRIAL AND APPLIED MATHEMATICS (ICIAM)

2019

### Application of the approximated BGK method on a Semi-Lagrangian parallel python solver on non-conforming patches

Garching, Germany

NUMKIN CONFERENCE

2018

### Introducing the IGA approach in plasma physics

Trondheim, Norway

THIRD INTERNATIONAL CONFERENCE ON ISOGOMETRIC ANALYSIS (IGA)

2015

### Modelling Vlasov equations on complex geometries using the SL scheme

Bochum, Germany

DEUTSCHE PHYSIKALISCHE GESELLSCHAFT (DPG)

2015

### Solving Vlasov equations using the SL scheme on a 2D hexagonal mesh

Garching, Germany

NUMKIN CONFERENCE

2014

## Workshops and Seminars

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### ToFu: Update on latest advances and IMAS compatibility

ITER, Cadarache, France

ITER: DIAGNOSTIC DIVISION WEEKLY MEETING

2019

### Application of the approximated BGK method on a Semi-Lagrangian parallel python solver on non-conforming patches

Breitenbach, France

EUCOR INTERNATIONAL WORKSHOP

2019

### ToFu Numerical Advances: a 3-year roadmap

Cadarache, France

IRFM RST MEETING, CEA

2017

### A new approach discretizing the 2D poloidal plane of fusion devices

Strasbourg, France

INVITED SEMINAR, IRMA

2016

### Solving the Vlasov equation using the Semi-Lagrangian method on multiple patches for the GYSELA code (poster)

Strausberg, Germany

HEPP COLLOQUIUM

2014

## Journal papers

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### Optimization of a discontinus finite element solver with OpenCL and StarPU

International Journal on Finite Volumes

B. BRAMAS, P. HELLUY, L. MENDOZA, B. WEBER

submitted, 2019

### Finite Volume Scheme with Local High Order Discretization of the Hydrostatic Equilibrium for the Euler Equations with External Forces

Journal of Scientific Computing

E. FRANCK, L. MENDOZA

October 2016, Vol. 69, Issue 1, p. 314?354

## Proceedings

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### Task-based parallelization of an implicit kinetic scheme

J. BADWAIK, M. BOILEAU, D. COULETTE, E. FRANCK, P. HELLUY, L. MENDOZA, H. OBERLIN

*ESAIM: Proceedings and Surveys*

June 2018, Vol. 63, p. 60-77

### Solving the guiding-center model on a regular hexagonal mesh

L. MENDOZA, M. MEHRENERGER, C. PROUVEUR, E. SONNENDRÜCKER

*ESAIM: Proceedings and Surveys*

March 2016, Vol. 53, p. 149 - 176

## Reports

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### A new approach discretising the 2D poloidal plane of fusion devices

LAURA S. MENDOZA

*Ph.D. Thesis*

2017

### Modelling of a storage water heater

S. EBERHARD, M. FERREIRA, N. S. JOHNSEN, L. MENDOZA, I. ZARVANSKY

*26-th ECMI's Project Report*

2012

## Training and Summer Schools

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### Conda Day: Packaging codes with Anaconda

LOOPS NETWORK, INRIA SACLAY, TEACHING BY: L. GOUARIN (CMAP - CNRS), A. JEANDET (LPP), V. ROUVREAU (INRIA)

*Paris, France*

9 octobre 2018

### Horizon Start-Up: Creating your own Start-up

INRIA - NANCY GRAND EST

*Nancy, France*

3 juillet 2018

### Numerical challenges in parallel scientific computing

SUMMER SCHOOL CEMRACS AT CIRM (CENTRE INTERNATIONAL DES RENCONTRES MATHÉMATIQUES)

*Marseille, France*

6 weeks 2016

### Coupling Multi-Physics Models involving Fluids

SUMMER SCHOOL CEMRACS AT CIRM (CENTRE INTERNATIONAL DES RENCONTRES MATHÉMATIQUES)

*Marseille, France*

5 weeks 2015

### Numerical modeling of plasmas

SUMMER SCHOOL CEMRACS AT CIRM (CENTRE INTERNATIONAL DES RENCONTRES MATHÉMATIQUES)

*Marseille, France*

6 weeks 2014

### European Summer School in Industrial Mathematics and Modelling Week

ECMI (EUROPEAN CONSORTIUM FOR MATHEMATICS IN INDUSTRY)

*Dresden, Germany*

2 weeks 2012

## Extracurricular Activity

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### Volunteer

SYRIA-ALSACE ASSOCIATION

*Strasbourg, France*

2016-PRESENT

### Elected Ph.D. student Representative

MAX-PLANCK IPP DOCTORAL SCHOOL

*Garching, Germany*

2014-2016

### Elected Student Representative

FACULTY COUNCIL OF THE UNIVERSITY OF STRASBOURG

*Strasbourg, France*

2011-2013

### Elected Vice-president

CSSI MASTER'S ALUMNI ASSOCIATION OF THE UNIVERSITY OF STRASBOURG

*Strasbourg, France*

2010-2011

### Elected Past Papers Responsible

MATHEMATICS' ALUMNI ASSOCIATION

*Strasbourg, France*

2010-2011

## Hobbies

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Lino-cut, learning arabic, amateur astronomy, cooking, knitting, etc.