LA ROCHELLE, France

A beautiful thousand years old city with a mild and very sunny climate

A GREAT PLACE TO STUDY!
La Rochelle

2.5 hours from Paris by TGV

Near the beautiful Ré island
La Rochelle

A city of art and history which offers cultural events (Francofolies, film festivals, boat show...).

A city known for its quality of life.

Historical fact: La Rochelle proclaimed its independence in 1621 which led to the terrible siege of the city, recounted in the famous novel and movie “The 3 Musketeers”
La Rochelle University

A young and friendly university

8820 students
+80 diplomas offered

10 research laboratories
1 doctoral school

Photo: Thierry Guyot
A campus in the city, near the old harbour

Student house
Cultural activities

University Library

Law and management Institute

Science and Engineering Institute

Sport: 40 activities
For Master’s students in Mathematics or Computer Sciences:

Full Autumn Semester with courses taught in English, at the graduate Level, in the field of Mathematics and Applications:

- Advanced tools and methods for signal and image processing (6 ECTS)
- Deep Learning (6 ECTS)
- Geometry for science (6 ECTS)
- Machine learning and artificial intelligence (practical approach) (6 ECTS)

This can be completed with:
6 ECTS French Language (level A2, B1, B2 or C1)
6 ECTS Research methodology and data analysis (Code 222-1-02)
For Master’s students in Mathematics or Computer Sciences:

**Syllabus:**

- **Advanced tools and methods for signal and image processing (6 ECTS) – Code 254-3-11**
  - 48 hours: lecture (13.5 hours), tutorials (13.5 hours), practical work (21 hours).
  - **Content:**
    - Build and know how to implement a multi-resolution analysis using a filter bank.
    - Use the wavelet transform for signal or image processing (singularity detection, multi-scale analysis, non-linear denoising).
    - Introduce and manipulate the notions of compact acquisition (frame, parsimony, dictionary, etc.); know how to apply reconstruction methods and interpret the results.
    - Visualise methods for reconstructing a parsimonious signal; implement them in Python.
  - **Required knowledge:**
    - Basic knowledge of signal processing concerning the Fourier transform, its mathematical properties, and its use in Python, and basic image processing skills.

- **Deep Learning (6 ECTS) – Code 254-3-31**
  - 69 hours: lecture (19.5 hours), tutorials (19.5 hours), practical work (30 hours).
  - **Content:**
    - Understand the issues of supervised and unsupervised learning.
    - Master the theoretical foundations of neural networks and deep learning.
    - Use the gradient backpropagation algorithm for training a neural network.
    - Master the specification and use of a neural network in a framework (pytorch, tensorflow).
    - Use a deep learning method for forward or inverse problems in PDE models.
  - **Required knowledge:**
    - Basic knowledge of linear algebra, probabilities and optimization; good skills in Python.
For Master’s students in Mathematics or Computer Sciences:

• **Geometry for science (6 ECTS) – Code 254-3-21**
  48 hours: lecture (13.5 hours), tutorials (13.5 hours), practical work (21 hours).
  
  **Content:**
  - Provide spaces with structures of manifolds and submanifolds.
  - Provide spaces with Riemannian structures.
  - Characterise and describe the geodesics and Riemannian barycenters of the space of positive definite symmetric matrices.
  - Use Riemannian gradient, divergence and Laplacian.
  - Master the basic properties of mean curvature flow.
  - Implement a level-set algorithm.
  - Exploiting Riemannian structures for segmentation.
  
  **Required knowledge:**
  - Basic knowledge of differential calculus, linear algebra and algebraic structures; basics knowledge of partial differential equations; basic knowledge of Python.

• **Machine learning and artificial intelligence (practical approach) (6 ECTS) – Code 254-3-41**
  48 hours: lecture (4.5 hours), tutorials (4.5 hours), practical work (40 hours).
  
  **Content:**
  - Use networks for classic learning tasks (classification, segmentation, regression, etc.).
  - Visualise the learning filters of a convolutional neural network (intermediate activation maps).
  - Visualise the activation maps of a convolutional neural network (activation maps).
  - View class activation maps.
  - Adapt a pre-existing network to a dataset (finetuning).
  
  **Required knowledge:**
  - Basic knowledge of linear algebra, probabilities and optimization; good skills in Python.
For Master students in Mathematics or Computer Sciences:

Autumn or Spring semester in the field of Mathematics and Applications:

- It is also possible to apply for an internship in the following laboratories of La Rochelle University for a few weeks to a few months:
  - Laboratory of Informatics Image Interaction (L3I)
  - Laboratory of Engineering Sciences for the Environment (LaSiE)
FOR EXCHANGE STUDENTS

- ESN Erasmus Student Network: office in La Rochelle
- University accommodation offer
- Buddy scheme
- Free student “pass culture”
- And an international office to help you
LEARNING FRENCH

Free access to 6 ECTS credits per semester in French language for exchange students
Welcome to La Rochelle University!

Photo: Thierry Guyot