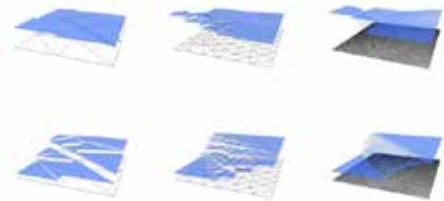
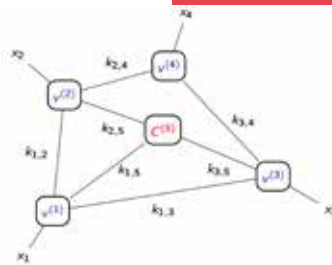
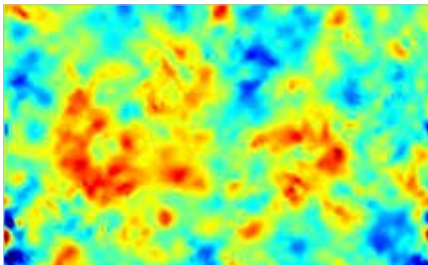



**2<sup>ND</sup> AND 3<sup>RD</sup> YEAR SPECIALISATION**

# MATHEMATICS AND APPLICATIONS

This specialisation provides a broad-based curriculum in applied mathematics, from the core notions in analysis, probability and statistics to more applied vocational concepts in statistical learning or scientific computing. The multidisciplinary nature of this specialisation represents an advantage across a wide range of sectors requiring a sound understanding of mathematical tools and concepts in order to meet new technical and economic challenges.

The aim is not only to provide a solid grounding in mathematics, but also a good grasp of the current issues in applied mathematics. The teaching staff undertake research linked to different industrial sectors, thus illustrating mathematical concepts and tools on concrete applications and guiding students towards possible career orientations.



## COURSE CONTENT

**CORE COURSES:**

- > Probability
- > Hilbertian analysis
- > Deterministic numerical methods
- > Probabilistic numerical methods
- > Statistical learning
- > Advanced statistical learning
- > Stochastic processes
- > Uncertainty quantification
- > Project

**NUMERICAL ANALYSIS AND PROBABILITY TRACK:**

- > Partial differential equations
- > Numerical analysis
- > Advanced numerical analysis
- > Stochastic modelling
- > Modelling for health and biology

**STATISTICS AND DATA SCIENCE TRACK:**

- > Statistics 1
- > Statistics 2
- > Computational statistics
- > High dimensional statistics
- > Bayesian methods and hierarchical models



## INDUSTRY SECTORS

- > Health
- > Environment
- > Finance
- > Insurance
- > Energy
- > Transport
- > Telecommunications

## CAREER PROSPECTS

- > Data scientist
- > Statistical engineer
- > Simulation engineer
- > Logistics engineer
- > Quantitative analyst
- > R&D engineer
- > Researcher
- > Banking/Insurance consultant
- > Actuarial analyst

## TEACHING STAFF

### HEAD OF SPECIALISATION:

Anthony Nouy

### LECTURERS:

Paul Rochet, Marianne Bessemoulin, Marie Billaud-Friess, Philippe Carmona, Antonio Falco, Françoise Foucher, Benoît Grébert, Bertrand Michel, Anthony Nouy, Nicolas Pétrélis, Anne Philippe, Mazen Saad, François Jauberteau, Hélène Mathis.

Some courses are taught jointly in conjunction with the Master in Applied Mathematics at the University of Nantes.

### CONTACT:

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## EXAMPLES OF PREVIOUS PROJECTS

- > Portfolio optimization
- > Optimal uncertainty quantification for solving stochastic differential equations
- > Monte Carlo methods for rare event estimation
- > Statistical learning methods for metamodelling of a flight controller
- > Patterns of Alan Turing
- > Portfolio risk measures
- > Population dynamics and breast cancer tumor growth modelling
- > Data mining for the analysis of petroglyphs
- > Numerical simulation of the transport of nuclear waste
- > Matrix completion for painting restoration
- > Multilevel Monte Carlo methods for option pricing
- > Metamodelling of chaotic dynamical systems
- > Study of the graph of Erdos Renyi

## EXAMPLES OF PREVIOUS INTERNSHIPS

- > Classification and Forecasting of load curves (GDF Suez strategy division)
- > Outsourcing of post-trade tasks (Accenture)
- > Integration of external variables to optimize hotel prices (Amadeus)
- > Development of a simulator (Thalès Alenia Space)
- > Reporting of investment funds (Prévoir)
- > Environmental characterization of the aircraft fleet (Safran)
- > Actuarial problems in reinsurance (Wills Re)
- > Reliability assessment of hybrid dynamical systems (EDF, Division Management of Industrial Risks)
- > Reporting of market risks for gas portfolio (EDF, Division Economy, Rate and Price)
- > Uncertainty quantification of Pégase (SAFRAN)
- > Structure condition forecast using Markov chains (University of Nevada Las Vegas)
- > Combination of statistical models for photovoltaic power forecasting (Reuniwatt)
- > Optimization of a statistical tool for sale forecasting (PSA)
- > Stochastic methods for the solution of high-dimensional PDEs (Ecole Centrale Nantes)
- > Mathematical analysis and numerical methods for a PDE model governing a ratchet-cap pricing in the EURIBOR (Universidad Cardenal Herrera Valencia)

