

## Monte-Carlo methods and numerical simulations

**Level:** L3

**Curriculum:**

**Semester:** S6

**Hourly volume:** 12CM

**Lecturer:** Mathieu Sart

**Contact:** [mathieu.sart@univ-st-etienne.fr](mailto:mathieu.sart@univ-st-etienne.fr)

### **Course objectives:**

Numerical simulations can be an effective tool for answering problems that are difficult to study or simply to evaluate the quality of a statistical procedure. This course is an introduction to these methods. We will use the statistical software `r`. A large part of the course will be devoted to methods for simulating random variables on the computer.

### **Course outline:**

1. Review of convergence theorems
2. Why simulate a random variable?
3. Simulation method by inversion of the distribution function
4. Rejection method
5. Metropolis algorithm

### **Evaluation methods:** Final exam

### **Prerequisites (to be mentioned only if any):**

Quantitative Methods 2: Linear Algebra  
Probability and Integration  
Probability 2: notions of randomness in multiple dimensions  
Markov chains and advanced probability