ETICS 2024
École Thématique sur les Incertitudes en Calcul Scientifique
Research School on Uncertainty in Scientific Computing

https://www.gdr-mascotnum.fr/etics.html

September, 22-27, VVF, France
https://www.vvf.fr/villages-vacances/vacances-saissac-vvf-villages.html

Source: payscathare.org

Objectives: The goal of this school is to develop the skills of researchers and engineers in the domain of uncertainty management of computer codes and machine learning techniques in support to engineering studies. Lectures will be followed by practical computer works. Discussions and poster sessions will promote exchanges between participants. The prerequisites to possess are the mathematical bases of the uncertainty quantification science.

Lecturers:
- Prof. Sébastien Da Veiga (ENSAI, France) - Tutorial on conformal prediction, with a discussion for numerical experiments
- Prof. Bruno Galerne (Université d'Orléans, France) - Introduction to image generative models
- Prof. Pierre L'Ecuyer (Université de Montréal, Canada) - Introduction to randomized quasi-Monte Carlo methods in simulation

Warning: The language of this ETICS edition will be in French

Organization

Under the scientific labeling of the GdR

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Registration: https://www.gdr-mascotnum.fr/eticsregister24, Registration fees (935€, taxes included, 850€ without tax) include accommodation, meals and transport by bus from/to Toulouse train station.

Schedule

Sunday, September, 22th: Bus (~1h) from Toulouse (train station) to VVF at 17:30

Monday, September,23th:

09:00 - 9:15	Opening and Welcome speech	Bertrand Iooss & Claire Cannamela
09:15 – 12:30	Conformal prediction (Part 1)	Sébastien Da Veiga
14:00 – 17:30	Image generative models (Part 1)	Bruno Galerne
18 :30 – 20 :00	Apéritif	All

Tuesday, September, 24th:

09:00 – 12:30	Image generative models (Part 2)	Bruno Galerne
14:00 – 17 :30	Randomized quasi-Monte Carlo methods (Part 1)	Pierre L'Ecuyer

Wednesday, September, 25th:

09:00 – 12:30	Talks from PhD students	
14:00 – 20 :00	Social event or free afternoon	

Thursday, September, 26th:

09:00 – 12:30	Randomized quasi-Monte Carlo methods (Part 2)	Pierre L'Ecuyer
14:00 – 17:30	Conformal prediction (Part 2)	Sébastien Da Veiga

Friday, September, 27th:

10:00 – 12:15	Talks from participants	
14:00	Bus to Toulouse (train station)	

Coffee breaks of 30mn every day at 10:30 and 15:30

ABSTRACTS

Prof. Sébastien Da Veiga (ENSAI, France): Tutorial on conformal prediction, with a discussion for numerical experiments - Conformal prediction has emerged recently as a promising and popular framework for producing confidence intervals around predictions with no assumptions on the data distribution and without relying on asymptotics on the number of observations. In this tutorial we will start by introducing the basics of conformal prediction, and discuss the numerous extensions that have been proposed to widen its practical applicability (for time-series, when there is distribution-shift, for several machine learning models, and so on) and computability. In the end, we will also discuss extensively open questions related to how it can be applied or not in the field of numerical experiments. The tutorial will also contain several practical sessions in R and Python.

Prof. Bruno Galerne (Université d'Orléans, France): Introduction to image generative models - The goal of this course is to present and study generative models that can be used for various image generation tasks. The first part of the course will quickly review established generative models such as Generative Adversarial Networks (GAN) and Variational Auto-Encoders (VAE). The remainder of the course will be dedicated to the study of a new contender in generative modeling called diffusion models or Score-Based Generative Models. We will study the mathematical aspects (Time reversal of stochastic processes, …) and practical aspects of these algorithms. Applications of these models for conditional image generation and imaging inverse problems will be discussed.

Prof. Pierre L'Ecuyer (Université de Montréal, Canada): Introduction to randomized quasi-Monte Carlo methods in simulation - Randomized quasi-Monte Carlo (RQMC) provides unbiased estimators whose variance converges at a faster rate than standard Monte Carlo when estimating an integral, under appropriate conditions. Variants of RQMC have been designed recently for the simulation of Markov chains, for function approximation and optimization, for density estimation, for solving partial differential equations, etc. In this tutorial, we will review the basic principles and main results on RQMC, discuss their practical aspects, and give numerical illustrations showing that they can reduce the variance by huge factors. We will look at how RQMC point sets are constructed, how we measure their uniformity, why they can work even for high-dimensional integrals, and how can they work when simulating Markov chains over a large number of steps. We will show how these methods can be applied in practice by using a Java software library that supports RQMC. The participants will be able to try it on some test cases. Practical works with the SSJ library (in Java); doc for RQMC

Lectures from PhD students' and participants