

April 4, 2021

POSTDOCTORAL OPPORTUNITY in Stochastic Simulation

Topic: Random number generation
Where: DIRO, Université de Montréal, Canada
Start: Summer 2021 (target)

We have an opening for a postdoctoral fellow in the area of stochastic simulation, to work on the design, analysis, implementation, and statistical testing of random number generators with multiple streams, as well as counter-based generators, for single and parallel processors.

Monte Carlo methods are ubiquitous in modern computing and scientific research, in particular in automatic learning, computational statistics, computer image generation, and much more. These methods require fast random number generators (RNGs), whose output sequences are deterministic and easily reproducible, while imitating the statistical behavior of independent uniform random variables. Multiple streams and substreams of random numbers, and facilities to jump ahead quickly without generating intermediate values, are also important for parallel simulation and to help implementing variance-reduction and optimization methods. In recent specialized hardware such as graphical processing units (GPUs), tensor processing units (TPUs), and other hardware accelerators for artificial intelligence and other applications, the available set of instructions, the word length, and the fast-access memory are often limited, for efficiency reasons. Fast, robust, and well-tested RNGs adapted to these types of architectures are required, and the current solutions are not fully satisfactory. The objectives of our project are to improve knowledge on the design, mathematical analysis, statistical testing, and software implementation of RNGs for simulation and Monte Carlo algorithms, and to provide effective solutions adapted to the leading-edge parallel computing architectures, as well as to the more classical ones.

The research will be performed under the supervision of prof. Pierre L'Ecuyer at the Département d'Informatique et de Recherche Opérationnelle (DIRO), Université de Montréal. Professor L'Ecuyer is associated with the GERAD and CIRRELT research centers, and the IVADO research institute. Some of the research will be in collaboration with other researchers and with leading industry.

A Ph.D. with a strong background in mathematics (mainly probability and statistics) and computer science (numerical computation, algorithmics, software development) is required. Excellent skills in programming, working on large software projects, writing documentation and reports, and providing oral explanations (in English), are also essential. The project will involve C, C++, parallel programming extensions, and other programming tools. The postdoc may have to help supervise a few summer interns and master students. Good knowledge of Monte Carlo methods and the capacity to read and understand French, would be valuable assets. To be eligible, applicants must have obtained their PhD in the last four years.

The amount of financial support will depend on the qualifications and the level of excellence of the candidate, and can be up to 60,000\$.

All applicants are invited to submit: (1) a full curriculum vitae, (2) a copy of all their university-level transcripts, (3) a short statement (at most one page) describing why they want to work on this project and why they think they are qualified to do so; (4) a copy of their thesis and of their two best scientific publications; and (5) the names and contact details of three persons (including graduate supervisors) who can act as references. All these documents should be in .pdf (preferable) or .jpg format. They should be sent together in a single email to:

Pierre L'Ecuyer, professeur
<http://www.iro.umontreal.ca/~lecuyer/>
email: lecuyer@iro.umontreal.ca

We expect to make a selection in **April 2021**. Applications will be accepted until the position is filled. Only the applications that contain *all* the requested documents will be considered.

Université de Montréal upholds the principles of employment equity with regard to women, visible minorities, aboriginals and people with disabilities.