Insper professor tells the origin story of a book that brings together three generations of Brazilian statisticians

Hedibert Freitas Lopes is co-author of the newly released third edition of a classic book on MCMC methods, a cornerstone of Bayesian statistics

By **Leandro Steiw**
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The third edition of the book *Markov Chain Monte Carlo: Stochastic Simulation for Bayesian Inference* is part of a 30-year history of Bayesian statistics taking root in Brazil. The original 1996 text by Dani Gamerman was published a year later, revised and expanded in 2006 by Dani and Insper professor Hedibert Freitas Lopes, and expanded again in 2026 by both of them together with Flávio Bambirra Gonçalves.

Academic coordinator of Insper's Data and Decision Sciences Unit (Núcleo de Ciências de Dados e Decisão), part of the Center for Management and Public Policy (CGPP), Hedibert donated 30 copies to the school's Scholarship Fund, with proceeds going toward undergraduate scholarships and student aid. The book will be launched at Insper at an event on December 2, at 3 p.m. On the occasion of the third edition, Hedibert looks back on the chain of events that shaped the careers of three generations of Brazilian statisticians and produced one of the classic books on Markov chain Monte Carlo methods (available on the publisher's website and at this link). Dani saw MCMC methods emerge in the Bayesian world; Hedibert learned them while they were still being built; and Flávio grew up inside them.

It all began with the monograph “Simulação estocástica via Cadeias de Markov” (Stochastic simulation via Markov chains), which Dani wrote in 1996 for a short course at the 12th SINAPE (Brazilian National Symposium on Probability and Statistics), held in Caxambu, Minas Gerais. At the time, Dani was a professor at UFRJ (Federal University of Rio de Janeiro) and had just returned from a sabbatical year in London, UK, working with Adrian Smith, one of the leading figures in Bayesian statistics. What he learned there became the monograph that instructors of SINAPE short courses are required to provide as supporting material.

In 1997, the British publisher Chapman & Hall/CRC turned the text into a book. Hedibert attended that symposium in Caxambu a few weeks before leaving for his PhD at the Institute of Statistics and Decision Sciences at Duke University, in the United States. “I used Dani’s first edition a lot in my classes at UFRJ,” Hedibert recalls. “In 2004, at one of those international Bayesian statistics meetings, we ran into each other in Viña del Mar, Chile. The publisher was pressing Dani for a second edition, and he asked me whether I’d be willing to help write it.”

Hedibert was already engaged in research involving MCMC methods while teaching at Chicago Booth, the University of Chicago’s business school, in the United States. Beyond their shared interest in the field, Dani and Hedibert had the same PhD advisor, Professor Mike West. It was only natural, then, for them to team up and devote 2005 to revising and expanding the book, which came out nine years after the original version.

In the second edition, Hedibert contributed expanded versions of several chapters, more examples, and computer code in the R language. “That code let readers run some of the examples on their computers, making the book more accessible to people who were really interested in MCMC,” says Hedibert. One of the new sections covered sequential Monte Carlo methods, a family of algorithms that was in vogue in the 1990s. According to Hedibert, it was a modest mention, fully expanded in the third edition.

Each expansion of the book was driven by the addition of a co-author. In 2026, Flávio, a professor at UFMG (Federal University of Minas Gerais), joined the team. Advised by Dani for his master’s degree, Flávio did his PhD at the University of Warwick, UK, with Gareth Roberts, another world reference in MCMC methods. “The book brings together three generations of MCMCers, as we’d say, who are computational Bayesian statisticians who make heavy use of these simulation methods in their research, whatever the field,” says Hedibert.

The connection between the authors

The Insper professor recalls a few dates and facts that underscore the connection between the three authors. In 1987, as Dani was finishing his PhD at the University of Warwick, MCMC was revolutionizing Bayesian statistics, which until then had been held back by computational inefficiency. “The personal computers of the 1980s and the more powerful PCs of the early 1990s opened the door for every area of statistics,” says Hedibert. “But Bayesian statistics in particular gained a great deal from this new way of doing computation.”

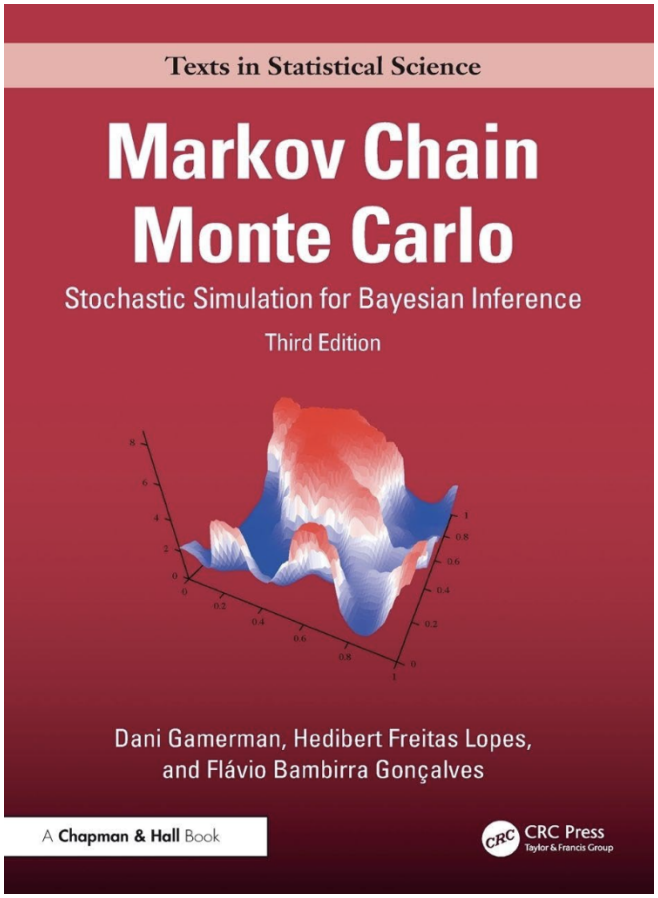
The first edition of *Markov Chain Monte Carlo: Stochastic Simulation for Bayesian Inference* was born in this period of ferment. In 1996, Hedibert was starting his PhD at Duke University, one of the hotbeds of MCMC. At that point, the method was a “toolbox under construction.” Growing interest justified a second edition in 2006, which outsold the original by several hundred printed copies.

According to Hedibert, starting in the 1990s Bayesian statistics flooded into the natural sciences, computer science, climatology, meteorology, geology, and the biomedical sciences, among others. “Flávio, who came after Dani and me, was trained when Bayesian statistics was already well established, so he had no alternative,” says Hedibert. “But he had time to reflect and choose the direction in which he would deepen his studies. Many other people did the same.”

Bayesian statistics supported the first steps of large language models (LLMs), which power artificial intelligence tools. The enormous scale of today’s predictive models behind ChatGPT, Claude, or Gemini, capable of assembling logical sequences of words, rests on statistical models. Despite the field’s constant evolution, MCMC remains the gold standard for rigorous Bayesian inference, the authors argue.

The trajectory of Dani, Hedibert, and Flávio is thus immersed in the 30-year recent history of Bayesian statistics, a period in which Monte Carlo methods broke through a dam that, for almost a hundred years, had held back the theory of the English mathematician Thomas Bayes (1701–1761). “When the dam opens, that immense volume of water rushes through, and that’s what happened in the 1990s,” says Hedibert. “There was a flood of papers solving problems from a Bayesian point of view, no longer tied to the limitations of computing power.”

In the conversation about the creation and consolidation of MCMC methods, the names of pioneers come up, such as Stanislaw Ulam (1909–1984), John von Neumann (1903–1957), and Nicholas Metropolis (1915–1999) — or Arianna Rosenbluth (1927–2020), Marshall Rosenbluth (1927–2003), Augusta Teller (1909–2000), and Edward Teller (1908–2003), who created the method's first algorithm. For Hedibert, three generations of Brazilian statisticians have kept the chain running.



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