

# INVITED TALK

by

**Dootika Vats**

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*Dootika Vats*

is an Associate Professor in the Department of Mathematics and Statistics at the Indian Institute of Technology, Kanpur. She previously held an NSF Postdoctoral Fellowship under the supervision of Prof. Gareth Roberts at the University of Warwick. She earned her PhD from the University of Minnesota, Twin Cities, where she worked with Prof. Galin Jones. Her research interests include Markov chain Monte Carlo methods and output analysis for stochastic simulation. More recently, her work has expanded to include stochastic optimization algorithms.

## Lecture 1: A Gentle Introduction to Markov Chain Monte Carlo

Monte Carlo sampling techniques are often either inefficient or practically impossible when sampling from high-dimensional and complicated distributions. In such situations, Markov chain Monte Carlo techniques are popularly employed. However, owing to the introduction of correlated sampling, special care must be taken to ensure ergodicity of the underlying process. I will motivate the need for Markov chain Monte Carlo (MCMC) and explain popular algorithms that yield theoretically well-behaved Markov chains. The popular Metropolis–Hastings algorithm will be given special attention and some variants of the algorithm will be discussed. Further, I will touch upon the practical difficulties of implementing MCMC algorithms in the modern world of big data.


 Auditorium, Satyakam Bhawan

 10:30 AM

## Lecture 2: Statistical Inference for Stochastic Gradient Descent

The stochastic gradient descent (SGD) algorithm is used for parameter estimation in machine learning, particularly for massive datasets and online learning. Inference in SGD has been a generally neglected problem and has only recently started to get some attention. I will first introduce SGD for relatively simple statistical models and explain the limiting behavior of averaged SGD. Then, I will present a memory-reduced batch-means estimator of the limiting covariance matrix that is both consistent and amenable to finite-sample corrections. Further, I will discuss the practical usability of error covariance matrices for problems where SGD is relevant, and present ongoing challenges in this area.

 Room 5, Satyakam Bhawan

 02:30 PM