



National Board For Higher Mathematics



INDIAN WOMEN AND MATHEMATICS (IWM)

A Mini Course on

Introduction to martingales on discrete probability spaces

by

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Chennai Mathematical Institute

28 and 29 January, 2023

About the course

The notion of a Martingale has been a powerful technique in probability theory for a long time, but a standard course usually requires a strong background in measure theory. One of the first bottlenecks is the definition itself, which has the notion of a conditional expectation given a sigma field!

In these lectures, I will introduce Martingales on discrete probability spaces, avoiding entirely the difficulties associated with measure theory and sigma fields. Thus the entire discussion can be accessible to anyone with a mathematics background at undergraduate level as one only needs sequences and series of numbers.

We will discuss some examples that illustrate the power of martingales as a technical tool in probability and its applications, including random walks, option pricing, estimation of signals transmitted on noisy communication lines, and reinforced learning (in the theme of machine learning). We will also discuss connections with Markov chains.

If time permits, we will introduce martingales of real valued random variables and their applications.

Schedule

The lectures will be of one-hour duration followed by additional 15 minutes of time for discussions. They will be conducted in online mode as per the following schedule.

Lecture I: 10:30 a.m. – 11:30 a.m., 28 January, 2023

Lecture II: 12:00 noon – 01:00 p.m., 28 January, 2023

Lecture III: 10:30 a.m. – 11:30 a.m., 29 January, 2023

Lecture IV: 12:00 noon – 01:00 p.m., 29 January, 2023

Zoom platform will be used to conduct the lectures. YouTube links will be provided for those unable to join via Zoom. Links to join will be provided to selected participants.

Who can apply?

All mathematicians who have some interest in learning about Probability and its applications to real world problems. Even BSc final year students and MSc - Ph D students can attend. Interested faculty members can join too. Also those with some statistics background will learn a lot of new material.

How to apply?

Participation is free of cost. Please fill up the form in the following link to apply:

<https://forms.gle/VMzpRNLcNc6NMS2u8>

Registration date extended to midnight of 20th January, 2023. The list of selected participants will be available on the IWM website by 22th January, 2023. For any queries, please contact us at iwmuoh@uohyd.ac.in

About the instructor



Professor Rajeeva L Karandikar obtained his Ph. D. at the Indian Statistical Institute, Kolkata in 1981. He spent some years as a visiting professor in USA and returned to the Indian Statistical Institute, Delhi in 1984 as an Associate Professor. He became a full professor in 1989 and served as Head of department of Mathematics and Statistics at the Institute and also as Head of the Delhi Centre of the Institute. He has been a visiting professor at several universities in USA and Europe. In 2006, he moved to Cranes Software International Limited as Executive Vice President - Analytics. In 2010, he returned to Academics and became Distinguished Professor at the Chennai Mathematical Institute. He was the Director of Chennai Mathematical Institute, Chennai, India from 2011 till 2021.

Prof. Karandikar has made significant contributions to various areas including Stochastic Calculus, Filtering theory, Markov processes and martingale problems, limit theorems, Monte Carlo techniques, queuing theory, game theory, theory of option pricing. He has authored two books with Professor G Kallianpur, one on filtering theory and one on option pricing. He is a fellow of Indian National Science Academy and Indian Academy of sciences and has been awarded the young scientist medal by Indian National Science Academy (1985), S S Bhatnagar prize by Council of Industrial and scientific research (1999), C R Rao National award in statistics by Government of India (2000) and P C Mahalanobis Memorial Medal awarded by Indian National Science Congress.

Prof. Karandikar has been an Editor of Sankhya and on the editorial boards of Annals of Probability and Journal of Statistical Planning and Inference.

Prof. Karandikar has been involved in numerous consultancy projects over the years. He has worked on development of proprietary Blockcipher algorithms for Indian defense services. Prof. Karandikar has been involved with opinion polls and exit polls in India since 1998. He has worked with India Today, Doordarshan, T V Today (Aaj Tak) during 1998-2005. From 2005, he has been associated with CNN-IBN for opinion polls and has been responsible for all poll projections made on CNN-IBN since the launch of the Channel.

Organizers (on behalf of the IWM executive committee)

Archana Morye, School of Mathematics and Statistics, University of Hyderabad

Abhay Soman, School of Mathematics and Statistics, University of Hyderabad

IWM Website: <https://iwm.org.in>