



# BOSE INSTITUTE

(AN AUTONOMOUS INSTITUTE UNDER  
DEPARTMENT OF SCIENCE & TECHNOLOGY, GOVT. OF INDIA)

## 108<sup>TH</sup> FOUNDATION DAY

## 85<sup>TH</sup> ACHARYA J. C. BOSE MEMORIAL LECTURE

### 30 November 2024





**BOSE INSTITUTE**

KOLKATA

CELEBRATION OF

**108<sup>TH</sup> FOUNDATION DAY**

Director  
and

Staff Members of Bose Institute  
request the pleasure of your company at the

**85<sup>TH</sup> ACHARYA J. C. BOSE MEMORIAL LECTURE**

Speaker

**Prof. Sankar K. Pal**

National Science Chair, Gol  
President, Indian Statistical Institute  
Distinguished Scientist and Former Director  
Indian Statistical Institute, Kolkata

titled

**Pattern Recognition, Machine Intelligence to Deep Learning  
and Data Science: Evolution, Challenges and Concerns**

on

**30 November 2024 at 3.00 pm**

**Prof. Anuradha Lohia**

Former Vice Chancellor  
Presidency University, Kolkata

will preside over the programme.

*Venue:*

Bose Institute Rajabazar  
93/1, A.P.C. Road  
Kolkata - 700 091

RSVP: <https://forms.office.com/r/8DSAMLR08J>

or scan

(Please RSVP by 24 November 2024)



**Prof. Kaustuv Sanyal**

Director  
Bose Institute

*"The true laboratory is the mind, where behind illusions we uncover the laws of truth."*

*- Sir J. C. Bose*



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PROGRAMME

**30 November 2024**

12:00 - 12:30	...	Homage Floral Offerings at the Samadhi, Bose Institute Rajabazar Garlanding the busts of Acharya J. C. Bose at Unified Academic Campus, Bose Institute Kankurgachi, Bose Institute Madhyamgram, Bose Institute Falta, Bose Institute Shyamnagar and Bose Institute Darjeeling
12:30 - 14:30	...	Lunch
15:00 - 15:05	...	Invocation
15:05 - 15:20	...	Welcome Address & Director's Report by Prof. Kaustuv Sanyal, Director, Bose Institute
15:20 - 15:30	...	Introduction to the Speaker by Prof. Anuradha Lohia Former Vice Chancellor Presidency University, Kolkata
15:30 - 16:15	...	85 <sup>th</sup> Acharya J. C. Bose Memorial Lecture by Prof. Sankar K. Pal
16:15 - 16:25	...	Chairperson's Address by Prof. Anuradha Lohia Former Vice Chancellor Presidency University, Kolkata
16:25 - 16:30	...	Vote of Thanks by the Chairman of the Foundation Day Committee
		NATIONAL ANTHEM
17:00 - 17:30	...	High Tea
17:30 - 19:30	...	Cultural Programme





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**PAST LECTURERS**

Shri Rabindranath Tagore	: 1938	Prof. Niharranjan Ray	: 1980
Prof. M. N. Saha	: 1939	Prof. Sukumar Sen	: 1981
Prof. S. S. Bhatnagar	: 1940	Prof. B. K. Bachhawat	: 1982
Dr. J. C. Ghosh	: 1941	Swami Lokeshwarananda	: 1983
Sir Cyril S. Fox	: 1943	Prof. N. S. Subbarao	: 1984
Dr. K. P. Biswas	: 1944	Prof. R. C. Majumder	: 1985
Dr. P. Jarija	: 1945	Prof. C. N. R. Rao	: 1986
Dr. S. K. Mitra	: 1946	Prof. S. Chandrasekher	: 1987
Dr. J. N. Mukherjee	: 1947	Dr. A. P. Mitra	: 1988
Prof. K. N. Bhal	: 1948	Prof. O. Siddiqi	: 1989
Dr. K. C. Mehta	: 1949	Dr. S. R. Ramachandran	: 1990
Dr. S. K. Banerji	: 1950	Prof. P. N. Tandon	: 1991
Dr. P. C. Mahalanobis	: 1951	Prof. H. Sarat Chandra	: 1992
Prof. R. C. Majumder	: 1952	Dr. U. R. Rao	: 1993
Dr. N. K. Bose	: 1953	Dr. S. Z. Qasim	: 1994
Prof. S. N. Bose	: 1954	Dr. P. K. Iyenger	: 1995
Dr. S. I. Hora	: 1955	Dr. G. Padmanaban	: 1996
Dr. A. C. Ukil	: 1956	Prof. V. Ramalingaswami	: 1997
Dr. D. N. Wadia	: 1957	Prof. N. K. Ganguly	: 1998
Dr. S. Radhakrishnan	: 1958	Dr. R. A. Mashelkar	: 1999
Sir Jhangir Gandhi	: 1959	Prof. P. Balaram	: 2000
Dr. V. R. Khanolkar	: 1960	Prof. Ramanath Kowsik	: 2001
Dr. B. C. Guha	: 1961	Dr. Pushpa M. Bhargava	: 2002
Dr. D. N. Ramachandran	: 1962	Prof. M. S. Valiathan	: 2003
Dr. S. Bhagavantam	: 1963	Prof. Asok Sen	: 2004
Shri Asoke Mehta	: 1964	Prof. Rajesh Kochhar	: 2005
Prof. P. Maheshwari	: 1965	Prof. V. S. Ramamurthy	: 2006
Dr. Atma Ram	: 1966	Swami Jitatmananda	: 2007
Acamedician A. I. Oparin	: 1967	Prof. F. P. Marconi	: 2008
Dr. B. D. Nag Chowdhuri	: 1968	Prof. J. N. Mohanty	: 2009
Dr. Homi N. Seethna	: 1969	Prof. André Béteille	: 2010
Dr. P. R. Ray	: 1970	Swami Atmapriyananda	: 2011
Dr. N. K. Bose	: 1971	Shri Gopal Krishna Gandhi	: 2012
Prof. S. Swaminathan	: 1972	Prof. Mushirul Hasan	: 2013
Dr. A. Srinivasan	: 1973	Dr. Srikumar Banerjee	: 2014
Dr. A. Ramachandran	: 1974	Dr. T. Ramasami	: 2015
Dr. B. Mukherjee	: 1975	Prof. Raghavendra Gadagkar	: 2016
Prof. G. P. Talwar	: 1976	Prof. Ada Yonath	: 2017
Dr. Raja Ramanna	: 1977	Prof. T. V. Ramakrishnan	: 2018
Prof. (Mrs.) A. Chatterjee	: 1978	Prof. Subhash Kak	: 2019
Prof. S. K. Mukherjee	: 1979	Prof. Gautam R. Desiraju	: 2021
		Prof. Ashutosh Sharma	: 2022
		Prof. Dr. Paolo Giubellino	: 2023





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**ABSTRACT**

## **Pattern Recognition, Machine Intelligence to Deep Learning and Data Science: Evolution, Challenges and Concerns**

The talk describes the development of a discipline over about 50 years starting from pattern recognition and fuzzy sets in 1975 to image processing, expert system and AI, knowledge-based system, neural networks, soft computing, rough technology, machine intelligence, granular data mining, Big data, and deep learning (DL) with applications and challenges involved. New technologies and terms evolved during the process and their relevance are explained. Characteristics of some of the machine learning (ML) tools developed are stated. Modeling uncertainty and rough granular computing concerning data analytics are emphasized.

The second part deals with some granular mining applications such as video tracking in ambiguous situations in the context of both shallow and deep learning. It is shown how the rough lower-upper approximations in temporal domain provide an estimate of object model in unsupervised tracking, even under complete occlusion. This is followed by the new concept of granulated deep learning (GDL). Merits of a G-RCNN (granulated region proposal network) in enhancing the object detection accuracy are featured with applications to real time traffic scenario.

The talk concludes by mentioning some challenging issues and future directions in DL and data science research including certain concerns for beginners.



## BOSE INSTITUTE

KOLKATA



### **Prof. Sankar K. Pal**

National Science Chair, Gol  
President, Indian Statistical Institute  
Distinguished Scientist and Former Director  
Indian Statistical Institute, Kolkata

**Sankar K. Pal** (<https://www.isical.ac.in/~sankar>) is a Distinguished Scientist and former Director of Indian Statistical Institute (ISI). Currently, he is a National Science Chair, and the President of ISI. He founded the Machine Intelligence Unit and the Center for Soft Computing Research: A National Facility in ISI, Calcutta. He received a Ph.D. in Radio Physics and Electronics from ISI/University of Calcutta in 1979, and another Ph.D. in Electrical Engineering along with DIC from Imperial College, University of London in 1982. He joined ISI where he became a Full Professor in 1987, the Director in 2005, and the President in 2022. He pioneered the development of fuzzy set theory, and neuro-fuzzy and rough-fuzzy computing, in general, and their applications in pattern recognition, image processing, machine learning, knowledge-based systems, and data science and analytics, in particular. He has received the S.S. Bhatnagar Prize, Padma Shri and many prestigious awards in India and abroad. He is a co-author of twenty-one books, about five hundred research publications and two US patents in the areas of Pattern Recognition and Machine Learning, Image Processing, Data Mining, Soft Computing, Neural Nets, Genetic Algorithms, Fuzzy Sets, Rough Sets, Web Intelligence, Social Networks, Cognitive Machine and Bioinformatics.

Prof. Pal is a Fellow of IEEE, the World Academy of Sciences (TWAS), International Association for Pattern recognition, International Association of Fuzzy Systems, International Rough Set Society, Asia-Pacific Artificial Intelligence Association (AAIA), International Artificial Intelligence Industry Alliance (AIIA), Web Intelligence Academy (WIA), and all the four National Academies for Science/Engineering in India.