Online Programme on Statistics and Machine Learning

Indian Statistical Institute
SQC & OR Unit, Hyderabad

Layola Academy
Hyderabad

Programme: Statistics plays a vital role in today's world of Artificial Intelligence and Machine Learning. Whether applications deal with big data or otherwise, basic tools applied there are the standard statistical theory and methods. Therefore, Learning and teaching them is crucial. The aim of this programme is to offer a crash course on some of the important topics (listed below) fundamental to the applications. The orientation of the course will be focused on providing important results (without getting into unnecessary proofs) with practical applications.

Course Details: This is an **online programme** offered under three modules listed below.

- **Module 1: Probability (Jan-Feb 2022)**
  This is a 30-hour module in which basic concepts of probability theory will be covered. This module will provide the fundamental ideas of probability theory and probability modelling that are essential for all other topics of Statistics such as Stochastic Processes, Statistical Methods, Machine Learning, etc.

- **Module 2: Stochastic Process and Timeseries Analysis (Mar-Apr 2022)**

  This is a 40-hour course. Stochastic Processes has wide range of practical applications and plays a pivotal role in Timeseries Analysis. Likewise, Timeseries Analysis is another important and widely applied subject and is the basis for many forecasting applications in areas such as meteorology, stock markets, business trends and so on. After providing the concepts and results of Stochastic Processes with live applications, the course will move onto Timeseries Analysis. In Timeseries Analysis we will cover the basic linear models and the widely used ARIMA models.

- **Module 3: Statistical Tools for Machine Learning (May-Jun 2022)**

  Machine Learning is the topic of the day in today's business world and the most sought-after subject. Massive migration is taking place from a variety of backgrounds into data science world. Many are trying to become data scientists/analysis without having proper background on the fundamental requirements of the subject. Against this backdrop, this course intends to provide the basic statistical technics and tools for Machine Learning. This module is also of 40 hours duration.

Faculty: **Dr. G S R Murthy, Indian Statistical Institute**

To facilitate wide participation, each session is replicated in two different time slots (see the schedule). Participants are required to choose one of the slots but are free to attend either or both sessions subject to availability of slots (each session can accommodate 100 participants).

Participants: The programme is primarily a Faculty Development Programme aimed at faculty interested in learning and/or refreshing Statistics for teaching the same. However, the orientation of the course is designed in such way that it would greatly benefit research scholars, students, and practitioners as well.

Depending on the interest and background, participants may choose to select and join the modules independently. Those who decide to participate in all the three modules by paying the fee in advance are offered a substantial discount.

Course Fee:

Participant Category	Academic	Non-Academic
Fee per Module	Rs. 400/- + GST @18%	Rs. 3000/- + GST @18%
Comprehensive fee	Rs. 800/- +GST @18%	Rs. 6000/- + GST @18%

Comprehensive fee includes fee for all the 3 modules and is to be paid at the beginning.

Certification:
Successful participants will be awarded certificates for each module separately. For those who register for all the 3 modules will get a comprehensive certificate. Participants will be evaluated through an online terminal exam.

Contact

For more details, contact:

Dr G S R Murthy, Professor, Indian Statistical Institute
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Mobile: 8660570869

Sri K V Ramana, Course Coordinator, ISI, Hyderabad
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Mobile: 9849295892, Landline: +914027153984

Send your application online to reach us on or before Dec 31, 2021. Selected applicants will be intimated latest by Jan 01, 2022. The last date for receiving fee is Jan 04, 2022.

Programme Schedule

Probability Module

Session:	6Am - 7.30AM		Repeat session		3.30PM - 5PM	
Jan-22						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
					1	2
3	4	5	6	7 Sankranti	8	9
10	11	12	13	15	15	16
17	18	19	20	21	22	23
24	25	Rday	27	28	29	30
31						
Feb-22						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28						

Statistical Tools for Machine Learning

Session:	6Am - 7.30AM		Repeat session		3.30PM - 5PM	
May-22						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					
Jun-22						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

Stochastic Processes and Timeseries

Session:	6Am - 7.30AM		Repeat Session		3.30PM - 5PM	
Mar-22						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	Holi	20
21	22	23	24	25	26	27
28	29	30	31			
Apr-22						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
				1	Ugadi	3
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11	12	13	Ambedk	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

1. Each lecture is taught in the morning session and the same is repeated in the afternoon session of the following day. A few sessions (about 5) will be of two hours duration. This is to cover the short fall.

2. Participants are free to attend one or both sessions. However, they have to register for either morning or afternoon sessions at the time of application.

3. If a session falls on a holiday, the session will be conducted the previous day.

All morning sessions are on Mondays, Wednesdays and Fridays	All afternoon sessions are on Tuesdays, Thursdays and Saturdays

Course Contents

Module 1:

Probability: Basic concepts of probability, random variables, probability density and distribution functions, quantiles, expectation and variance, conditional distribution, Bayes rule, independence and conditional independence; Standard probability models – discrete and continuous cases; Joint probability distributions, covariance and correlation, multivariate distributions, transformations and the central limit theorem; Simulation and its applications; Introduction to information theory, entropy, KL divergence and mutual information.

Module 2:

Stochastic Process: Markov chains, state space, transition probabilities, classification of states, steady-state probabilities, birth and death process, branching process, queuing chains, stationary distributions, Markov pure jump processes, Poisson process, birth and death processes, second order stationary processes, auto covariance and correlation functions; cross covariance function, Gaussian process, Applications of stochastic processes.

Timeseries: Live examples of application of timeseries models, linear models (moving average and auto regressive models), integration models (ARIMA and SARIMA).

Module 3:

Statistical Tools for Machine Learning: Introduction to Machine Learning, Statistical modelling, assessing model accuracy, brief introduction to handling statistical data using Python, linear regression, classification, logistic regression, discriminant analysis, k-nearest neighborhoods, cross validation and bootstrapping, linear model selection and regularization, polynomial regression, regression splines, generalized additive models, tree-based methods – decision trees, bagging, random forests, boosting, support vector machines; Unsupervised learning – principal component analysis, clustering.

Application Form

Training Programme on Statistics and Machine Learning

Indian Statistical Institute and Layola Academy

Last date for registration: December 31, 2021

Name:

Date of Birth: **Email:** **Mobile:**

Mailing address:

Nature of participant (put a tick in the appropriate box):

Academic (provide full particulars in a separate sheet with a proof of affiliation):

College faculty ☐ **Research Scholar** ☐ **Student** ☐

Non-Academic:

Organization:

Designation:

Application for: Module 1 ☐ **Module 2** ☐ **Module 3** ☐

Module Timings Registered for (put tick mark for only one):

Morning (6 am to 7.30 am) ☐ **Afternoon (3.30 pm to 5 pm)** ☐

Payment Particulars

Amount : Rs. DD No. / NEFT No.

Bank: Date:

Date: Signature :

Application must be submitted online first on or before Dec 31, 2021. Selected candidates will be intimated to pay the fee. The payment must reach us on or before Jan 04, 2022.

Mode of Payment: Pay the fee in the form of Demand Draft drawn in the favour of "Indian Statistical Institute, Payable at Hyderabad" or Online (NEFT) Bank Transfer (Name of the Account holder: Indian Statistical Institute, Current A/C No: 30451010000079 IFSC Code: CNRB0013045)