

3rd International Workshop on Genomic Selection in Plant Breeding through Advanced R & Machine Learning

Limited
Seats
Available



RESEARCH
PROGRAM ON
Grain Legumes and
Dryland Cereals

Date : 18th - 22nd November 2019
Venue : ICRISAT, Patancheru, India

Registration Fee : USD 450 / INR 30,000
Last Date of Application : 20th September 2019



Dr. Abhishek Rathore, Principal Scientist and Theme Leader (SBDM), ICRISAT. He is an expert in Designing and Analysis of Experimental Trials, QTL Mapping and Genetic Map Construction. During the training he will be taking classes on good phenotyping practices, data quality, data management, R and concept of genomic predictions and application in plant breeding.

Course Coordinator



Dr. Osva Antonio Montesinos López, Associate Scientist, University of Colima, Mexico. His area of interest includes Genomic prediction, High dimensional data analysis, Multivariate analysis, Experimental designs, Generalized linear mixed models, Statistical Machine learning methods, Sampling methods, Bayesian analysis, Group testing, Monte Carlo sampling methods.

Course Instructor



Ms. Roma Rani Das, Statistician (SBDM), ICRISAT. Roma has extensive experience on Designing and Analysis of Experimental Trials and Mixed Models. She is also well versed with genomic and bioinformatics analysis involving molecular markers with special interest on diversity studies. During the workshop she will be taking classes on Basics of R, tidyverse and ggplot2.

Course Instructor

About The Course

BioNcube, a DBT BioNEST Ag-biotech Incubator and the Statistics, Bioinformatics and Data Management (SBDM) Theme (<http://data.icrisat.org/>) at ICRISAT (<https://www.icrisat.org/>) in collaboration with Professor Osva A Montesinos-López from University of Colima, Mexico (<https://www.ucol.mx>) is organizing a training workshop on Advanced R & Application of Machine

The course will be mainly divided into four modules.

First module will give general introduction on Genomic Selection in plant breeding, development of models and application. Various genomic selection models commonly used and basics of mixed model analysis and genomic selection using Bayesian approaches will be discussed. This module will introduce analyzing genomic selection using R. Illustrative examples of various GS models will be discussed with participants.

Second module will focus on basics of R. This module will introduce R to participants and will include installation, introduction to RStudio, basic data management with R, package installation, basic programming and use of R Graphics. After covering basic graphics we will also cover advanced graphics by introducing ggplot2 package.

Third module will focus on general machine learning, concepts, algorithms, application in genomic selection, overfitting problem and metrics for the evaluation of prediction performance. Participants will learn logistic regression and penalized logistic regression—with theory and illustrative examples. Concept of multinomial regression will also be discussed.

Fourth module will be focused on artificial neural networks and deep learning for continuous outcomes. Participants will learn defining different artificial neural networks topologies, activation functions, loss functions, early-stopping method of training, the backpropagation algorithm and examples in *keras* for binary, ordinal, and continuous outcomes and some successful applications of artificial neural networks and deep learnings.

Course Content

Module 1: Genomic Selection & Linear Mixed Models

- ◆ Basics of Genomic Selection (GS)
- ◆ Elements of mixed models for GS
- ◆ Different GS Model
- ◆ Illustrative examples

Module 2: Introduction to R

- ◆ Introduction to R & RStudio
- ◆ R Packages
- ◆ R for Data Manipulations
- ◆ R Graphics & ggplot2

Module 3: Elements of Machine Learning - I

- ◆ Logistic regression
- ◆ Penalized logistic regression
- ◆ Multinomial regression
- ◆ Overfitting problem

Module 4: Elements of Machine Learning - II

- ◆ Artificial neural networks vs Deep learning
- ◆ Artificial neural network topologies
- ◆ Deep learning for continuous outcomes
- ◆ Loss functions
- ◆ Early-Stopping Method of Training
- ◆ The backpropagation algorithm
- ◆ Example in Keras for univariate and multivariate outcomes

How to Apply

To apply, please complete following google form with details:
<https://forms.gle/4j7yBJYxGLCWQWz6>

- Selected candidate will be contacted with registration details
- Course fee includes lunch & coffee breaks for 5 days
- Accommodation available in ICRISAT on request
- **BioNEST incubatee / startups will be given 50% discount on course fee**

Hyderabad Tourist Information



Hyderabad is the capital of Telangana and the fifth largest city in India, with an ancient civilization and culture. Attached to the city is its twin, Secunderabad, which is part of Hyderabad. The twin cities of Hyderabad and Secunderabad are separated by the Hussain Sagar, an artificial lake constructed during the time of Ibrahim Quli Qutub Shah Wali in 1562 A.D. While Telangana is known as the most IT savvy state in India, Hyderabad is emerging as a major center for IT exports. Hyderabad was founded on the River Musi five miles east of Golconda, in 1591-92 by Muhammad Quli Qutub Shah. In the 16th century the city grew spontaneously to accommodate the surplus population of Golconda, which was the capital of the Qutub Shahi rulers. The city is more than 400 years old and is noted for its natural beauty, mosques and minarets, bazaars and bridges, hills and lakes. It is perched on the top of the Deccan Plateau, 1776 ft., above sea level, and sprawls over an area more than 100 sq. miles.



ICRISAT	SBDM @ ICRISAT	BioNcube @ ICRISAT	University of Colima, Mexico
<p>The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) (https://www.icrisat.org) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, and 644 million of these are the poorest of the poor. ICRISAT and its partners help empower these poor people to overcome poverty hunger and a degraded environment through better agriculture. ICRISAT is headquartered in Hyderabad, Telangana, India, with two regional hubs and four country offices in Sub-Saharan Africa. It belongs to the Consortium of Centers supported by the Consultative Group on International Agricultural Research (CGIAR).</p>	<p>The Statistics, Bioinformatics & Data Management (SBDM) (https://data.icrisat.org) is a cross-cutting theme of ICRISAT with a mandate to provide high quality data analytic support to ICRISAT researchers. Activities of this theme are categorised mainly in providing biometrics and statistics support, performing advanced bioinformatics analysis and providing research data management support to ICRISAT researchers. SBDM works with various research programs across Asia, ESA and WCA and also provide support to various NARES partners through training, consultation and collaboration. This theme is also involved in providing supports to ICRISAT breeders and other scientists in digitalizing breeding activities by introducing modern data bases and modern ways of data capture. SBDM theme is a group of statisticians, bioinformatics experts and data programmer.</p>	<p>BioNcube is a BioNEST Ag-biotech incubator supporting Ag-biotech innovation, development and applications of broad range of biotechnological solutions spreading across various domains from basic research to product translation. The value proposition of the BIRACBioNEST Ag-biotech incubator is to link business incubation to translation and support ag-biotech start-ups from proof-of-concept stage through to technology translation and commercialization that will further benefit farming communities. Agribiotech start-ups incubated in BioNEST, have access to the scientific knowledge of ICRISAT, biotechnology laboratories with state-of the art equipment's, and infrastructure such as plant genotyping, phenotyping and transgenic facilities, glass-houses, green-houses, plug-and-play modular labs, molecular biology lab, analytical lab, transformation facility, contained fields etc.</p>	<p>The University of Colima (in Spanish: Universidad de Colima) (https://www.ucol.mx) is a Mexican public university with several campuses across the state of Colima, bordering the Pacific Ocean. It was created on September 16, 1940 by the President Lázaro Cárdenas as People's University of Colima (Universidad Popular de Colima), and intended to serve the educational needs of the Michoacán, Jalisco, and Colima provinces. It has an academic population of 27, 005 students (13,814 high school, 12, 670 bachelor and 521 post-graduate) and 2,186 professors (745 high schools, 1, 441 bachelor and postgraduate). It offers 66 undergraduate programs and 37 graduate programs. The Secretariat of Education of the Government of Mexico, known as SEP, certifies the high quality of the programs of the University of Colima annually.</p>

Workshop Organizer

Dr. Abhishek Rathore
Principal Scientist & Theme Leader
Statistics, Bioinformatics & Data Management
ICRISAT Patancheru, Hyderabad
Telangana, India—502 324
email: a.rathore@cgiar.org

BioNcube Contact

Dr. Pooja Bhatnagar Mathur
Principal Scientist & Theme Leader
CMB & Genetic Engineering
ICRISAT Patancheru, Hyderabad
Telangana, India—502 324
email: p.bhatnagar@cgiar.org
Office Landline: +91 40 3071 3485

Logistics & Accommodation

Ms. Laxmi Sarika
ICRISAT Patancheru, Hyderabad
Telangana, India—502 324
email: L.Sarika@cgiar.org
Office Landline: +91 40 3071 3365
Mobile: +91-9703028538